

# How does knowledge integration occur during Information Systems projects. An empirical investigation of the influence of social capital.

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## RÉSUMÉ.

*Les projets concernant les systèmes d'information sont caractérisés par leur forte dimension organisationnelle. Ils doivent intégrer les connaissances spécifiques possédées par les membres de l'organisation pour réussir. Cela implique de nombreux échanges avec des personnes du groupe de projet, mais aussi hors de ce groupe. L'intégration des connaissances, c'est-à-dire le partage et la création de nouvelles connaissances, fait partie de chaque projet. Cette intégration suit différentes phases, qui sont souvent longues et complexes, dépendant des acteurs impliqués. Par conséquent, la l'intégration des connaissances peut être affectée par le capital social des membres du projet. Une étude empirique sur deux PME françaises cherchant à transformer leur système d'information montre que les trois dimensions du capital social (structurelle, relationnelle et cognitive) influencent le processus de capitalisation, même si nous n'observons pas d'effet différencié dans les différentes phases du processus. La distinction de trois phases dans l'intégration, mobilisant différents niveaux de connaissance, est confirmée, proposant un cadre de compréhension prometteur des mécanismes de création de la connaissance dans le contexte des projets de système d'information.*

MOTS CLEFS : GESTION DE PROJET – GESTION DE LA CONNAISSANCE – CAPITAL SOCIAL – ÉTUDE DE CAS.

## ABSTRACT.

*IS Projects are characterized by their organizational scope. They need to integrate the specific knowledge held by an organization's members to succeed. To do so, broad exchanges between people inside and outside the project team are required. Knowledge integration, i.e. sharing and creation of new knowledge, is part of any project. Knowledge integration follows several phases that are often long and complex, depending on the actors involved. As a consequence, knowledge integration can be affected by the social capital of the project members. An empirical investigation in two French SMEs aiming to improve their information systems shows that the three dimensions of social capital (structural, relational and cognitive) influence the knowledge integration process, even if no differentiated effect is observed through the different phases of the process. The distinction of three phases in integration, mobilizing different levels of knowledge, is confirmed, offering a promising understanding of the knowledge creation mechanisms in context of IS projects.*

KEYWORDS: PROJECT MANAGEMENT - KNOWLEDGE MANAGEMENT - SOCIAL CAPITAL - CASE STUDY

# 1 INTRODUCTION.

The growing interest towards organizational knowledge is the reflection of the entry into a knowledge economy. Interest in the field of knowledge management has been shown by both practitioners and academics for several years. On a practical level, the recurring concern of companies has been to link their knowledge management practices to their performance improvement; while, academic researchers have been improving their understanding of the organization as a "system of knowledge" (Tsoukas, 1996). Much research deals with knowledge management as a whole, but now, there is a need to better investigate and understand the various steps constituting this process and to get inside the black box of knowledge management.

In our research, we choose to focus on the notion of knowledge integration. We define knowledge integration as the process of social interactions between individuals leading to the combination of existing knowledge and the creation of new shared organizational knowledge. Until now, only a limited amount of research has focused on knowledge integration. However integration constitutes an important process in knowledge management, especially in project based-organizations. Thus, the empirical investigation carried out during this research analyses two information systems projects and highlights the important features of knowledge integration in this context.

In our research, we mobilize the perspective of the firm as a socially efficient community for knowledge creation and transfer (Kogut and Zander, 1992, 1996; Nonaka and Takeuchi, 1995; Spender, 1996), generating a competitive advantage. According to this perspective, knowledge integration is a current and daily activity

and constitutes one of the objectives of the organization (Grant, 1996). We focus on a specific context of knowledge integration which is a project team work. Our objective is to analyse the knowledge integration process during cross-functional organizational projects.

A first question to come out of this research is: how does the knowledge integration process operate during a project? The research of Newell, Tansley and Huang (2004) provides an initial answer: it underlines the influence of social capital in the knowledge integration process. Following this research, we adopt an original approach to the knowledge integration process. The second aspect of our research focuses on the real influence of social capital on the integration process. Hence a second question: what are the role and the influence of social capital on the knowledge integration process during a project?

The first part of the paper presents the conceptual framework: we define the concept of knowledge integration and we propose a conceptual model to analyse this process. In the second part, we define the concept of social capital and its role in knowledge management. This literature review leads us to formulate several research propositions. In the third part, the empirical study details two case studies of information system projects and concludes our research.

## 2 IMPLEMENTING KNOWLEDGE INTEGRATION DURING CROSS-FUNCTIONAL PROJECTS.

The growing references to knowledge management in the academic literature entail the use of many concepts directly or indirectly linked to knowledge management: knowledge creation, knowledge sharing, knowledge transfer, know-

ledge diffusion, knowledge integration... To evaluate the use of each of these concepts, we carried out a bibliometric analysis. We surveyed the abstracts of the academic articles on the EB-

SCO (Business Source Premier) data bases from 1994 (publication of the seminal article of Nonaka in *Organization Science*) to 2006, leading to the following results (Figure 1).

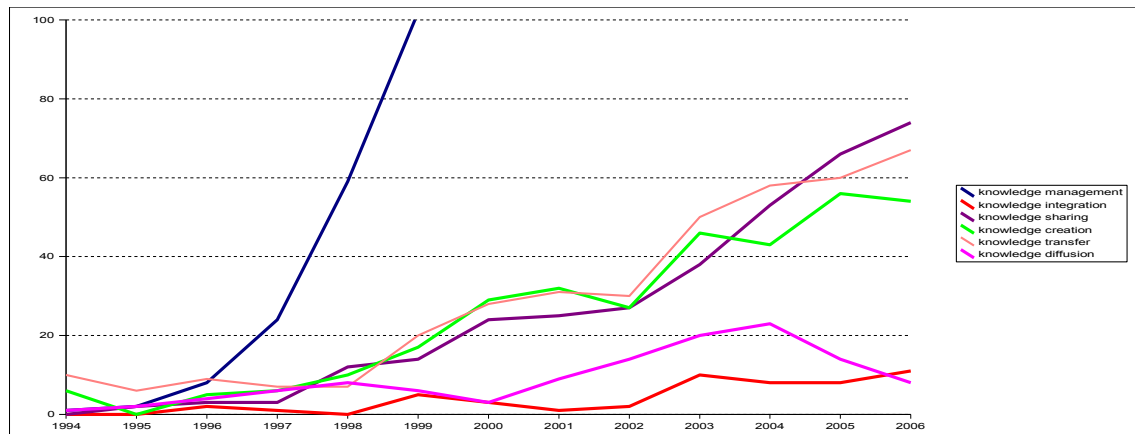


figure 2.1. Bibliometric evolution of knowledge management concepts (1994-2006)

The diagram shows that the use of the different knowledge management concepts increased significantly during the period. The use of the general concept of knowledge management is the most frequent in the scientific literature (it rapidly rises to over 100 articles per year, reaching 215 articles in 2006).

We notice that the use of knowledge integration is not very frequent as yet but this is not indicative of its relevance for future academic research. In a first point, we attempt to clarify the concept of knowledge integration and thereafter we explore the project as a specific occasion for knowledge integration.

## 2.1 Apprehending the notion of knowledge integration.

Grant's findings on knowledge integration capability (1996) appear as a reference in strategic management literature. Adopting a Resource-Based View, Grant emphasises the importance of knowledge integration as a source of competitive advantage. Our research indirectly mobilizes Grant results: Grant studies integration at an

organizational level whereas our research mainly focuses on a micro-level analysis, at the level of the individual. Much research focuses on the organizational level: "We simply do not get to know how actors or actor constellations, their interactions, and their embeddedness in social contexts constitute knowledge processes in general and knowledge integration in particular" (Becker-Ritterspach, 2006, p.4). We also only focus on internal integration; we do not study integration of external knowledge which is important especially in small-size firms (Jetter & al., 2006).

### 2.1.1 Definition of knowledge integration.

What is knowledge integration? First of all, we have to refer to the general concept of integration which has frequently been used in organizational literature (Lawrence and Lorsch, 1967; Barki and Pinsonneault, 2005). Organizational theory, strategic management, operations management or information systems have developed their own approach of the notion of integration.

Our definition lays on the knowledge management literature.

Grant (1996) deals with “combinative capabilities” (Kogut and Zander, 1992): it is the recombination of existing knowledge. Thus, it constitutes the first dimension of integration: creation of new knowledge from existing knowledge. This dimension differentiates knowledge integration from knowledge sharing as Okhuysen and Eisenhardt (2002, p.383) said: “*Knowledge sharing (i.e. individuals identify and communicate their uniquely held information) and knowledge integration (i.e. several individuals combine their information to create new knowledge)*”. So, knowledge integration can be defined as both knowledge sharing and knowledge creation; when two people confer, they share knowledge which affects their previous knowledge and contributes to the creation of new knowledge, through new knowledge integration. Knowledge sharing is a starting point for knowledge creation and knowledge integration. As a consequence, knowledge integration can be viewed as a cumulative process.

The second dimension of knowledge integration is organizational institutionalization of new shared and created knowledge. Huang and Newell (2003) define knowledge integration as “*an ongoing collective process of constructing, articulating and redefining shared beliefs through the social interaction of organizational members*”. This second dimension is not systematically developed in literature but we believe it to be significant because institutionalization is evidence of the reality and effectiveness of knowledge integration.

Finally, we define knowledge integration as a process of social interactions among individuals leading to the combination of existing know-

ledge and the creation of new shared organizational knowledge. Knowledge integration is a temporally-oriented dynamic process. This process is made up of social interactions based on informal communication, written communication, documents, meetings... These interactions contribute to knowledge sharing and knowledge combination, with a common meaning and understanding of this knowledge (“*shared agreements*”, Nonaka, 1994). In a second step, these interactions contribute to new knowledge creation which is organizationally shared, that is to say institutionalized (Inkpen and Dinur, 1998).

### **2.1.2 A multi-level perspective of knowledge integration.**

What is the nature and realization of the knowledge integration process? Knowledge management literature identifies individual, collective, organizational and inter-organizational knowledge. So, what is the impact of this multi-level analysis on knowledge integration?

Quoting Inkpen and Dinur (1998, p.456): “*The transformation occurs in a dynamic process involving various organizational levels and carriers of knowledge. Specific learning processes are at work at each level. At the individual level, the critical process is interpreting and sense making; at the group level, it is integrating; and at the organizational level, it is integrating and institutionalizing (Inkpen and Crossan, 1995)*”. These different levels of analysis imply several steps in the global knowledge integration process. It is therefore interesting to study how these different steps occur and how they combine. Carlile and Reberich (2003) view knowledge integration as a cycle and distinguish three phases: storage / retrieval / transformation. They underline the importance

of the path dependent nature of knowledge integration.

Moreover, the characteristic of complexity can be mobilized to study the nature of the knowledge integration process: *“From an organizational point of view, the complexity of integrating knowledge increases as the number of dependencies between different groups or specialized domains increases to produce a product or service”* (Carlile and Reberich, 2003). Organizational dispersion of knowledge may increase the complexity of the knowledge integration process (Becker, 2001) but also increase knowledge diversity and innovative knowledge integration (Sherif *et al.*, 2006).

To conclude, knowledge integration is viewed as a dynamic and cumulative process (path dependency) which implies several levels (individual, collective and organizational) characterized by complexity, interdependencies and the nature of knowledge. We now focus on a specific knowledge integration context: a cross-functional project.

## **2.2 Project as knowledge integration opportunity.**

Projects can be viewed as specific opportunities for knowledge integration. They can be defined as a collective creation, organized in time and space, to respond to a demand (Garel, Giard and Midler, 2004). The main particularities of a project are the followings: a project is (1) a global objective to accomplish a need; (2) specific, singular, non repetitive; (3) combinative and multi-disciplinary; (4) uncertain; (5) time constrained; (6) influenced by exogeneous variables.

Projects success literature emphasises the role of communication, implication, management control, conflict solving, coordination and participation as the main variables which influence an in-

tra-project process (Aladwani, 2002). However the author does not identify any major studies considering knowledge management as a major determinant of the project process (except Hoopes and Postrel, 1999).

Literature shows that cooperation, and especially project, is an important opportunity for knowledge creation and diffusion (von Krogh and Roos, 1996; Alavi and Tiwana, 2002) through the interactions of ideas. Project characteristics influence knowledge creation: constrained timing enables people to become involved quickly and major tasks to be accomplished directly. Nevertheless, knowledge sharing may be more superficial. A project is a constellation of actors with specific expertise and varied knowledge and experiences who do not know each other beforehand. Specific structures of the project are meeting places to share and create organizational knowledge and facilitate geographical proximity. The project enables the sharing of both tacit and explicit knowledge by facilitating close relationships and interactions between actors (von Krogh and Roos, 1996; Fong, 2003). All these characteristics make a project a specific opportunity to integrate diversified knowledge in the organization.

Huang and Newell (2003) underline three major roles in cross-functional project teams: creativity and innovation (new product development, for example); collective negotiation to obtain a consensus (management of conflicts of interests); strategic change management (new implementation for information, for example). The projects concern the whole organization with a high degree of complexity and are unique. In this context, several challenges have to be met to achieve knowledge integration. Members of project teams have varied and specific knowledge and competences; thus, project

teams have access to cross-functional knowledge but also have to solve integration problems due to multiple perspectives. The other challenge is to obtain enough support from the actors in order to build a collective identity to reduce political conflicts.

As a consequence, we need to understand knowledge integration dynamics inside the cross-functional project team but also outside the team with other actors in the organization. Understanding both mechanisms is a priority if organizations want to be able to transfer their experience to other projects. Based on this literature review, our conceptual framework of knowledge integration in a project team is summarized in Figure 2.

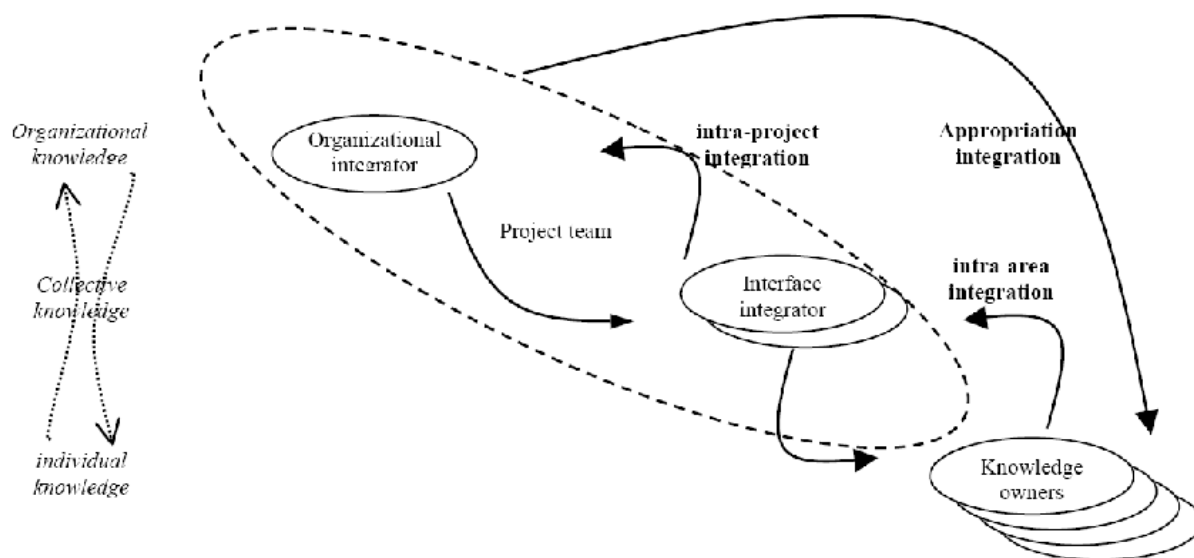


figure 2: Knowledge integration process in a project team.

This figure represents the cyclical nature of the different constituent phases of the integration process. Integration was defined above as a social process of interactions between individuals; thus it implies frequent contacts between individual holders of specific knowledge and project team members in order to share and exchange this knowledge. The interactions help to achieve knowledge combination and new knowledge creation and finally, institutionalization of new created knowledge in the organization. This model provides an initial explanation for our research objective: understand how to achieve the knowledge integration process in a cross-functional project context.

Intra-area integration phase allows individual holders of specific knowledge to create value by integrating knowledge in groups (Okhuysen and Eisenhardt, 2002). It is the transformation of individual, specialized, dispersed and sometimes tacit knowledge into collective knowledge “held” by a person, called the interface integrator. To complete this phase, it is necessary to identify individual knowledge holders in the services or functions of the organization. The interface integrator’s role is to facilitate knowledge sharing and exchange; he spans the boundary in this case and helps to cross hierarchical and expertise barriers between people (Fong, 2003). The recognition of project value can also facilitate the creation of collective knowledge and the

integration of individuals' knowledge (Huang and Newell, 2003). At the opposite, several factors, such as a lack of familiarity between people, different languages or physical distance may limit knowledge diffusion, creation and thus knowledge integration, hence the potential role of social capital.

The second step is the intra-project integration which creates a common meaning and a collective interpretation of the different collective knowledge held by the interface integrators, leading to institutionalization at the organizational level (Inkpen and Dinur, 1998). The authors give us some examples of intra-project integration: new product development, the board of directors where each person represents a function for achieving strategic choices, and so on... Intra-area integration and intra-project integration may occur at the same time. As an organization is a distributed knowledge system, intra-project integration requires cross-functional knowledge. The project team is the organizational integrator and plays the role of mediator of the collective knowledge held by the interface integrator. The project team is different from the individuals and has no memory and thus the collective knowledge of the team is socially shared by the individuals in the team (Weick and Roberts, 1993). Efficient intra-project integration requires recognition of the individual holders of knowledge and expertise and handling of intensive exchanges and frequent interactions between individuals.

The last step of the process is appropriation-integration. Effective institutionalisation of organizational knowledge takes place at this point. The aim of this phase is to achieve the sharing of organizational knowledge created in the project team by individuals; as a consequence, their individual knowledge is modified. The interface

integrators, who already play an important role during the first step of the cycle, may once again be boundary spanners and help to spread new organizational knowledge over firm's members. For example, they may answer people's questions and so favour appropriation-integration.

These three phases make up the whole knowledge integration process cycle. A few research highlights the role of social capital in understanding this process (Nahapiet and Ghoshal, 1998; Huang and Newell, 2003). The following part of our research focuses on this concept in order to understand how the knowledge integration process works in a project team.

### 3 SOCIAL CAPITAL, A LEVER FOR KNOWLEDGE INTEGRATION?

#### 3.1 Social capital theory, a focus on social networks in organizations.

Historically, social capital has been used by anthropologists to study the nuclear family, individuals in social communities or problems linked to collective action. More recently, management literature has mobilized this concept. The research of Adler and Kwon (2002), who review social capital from a theoretical point of view, is particularly noteworthy. Among the numerous definitions of social capital, we select Nahapiet and Ghoshal's one: "... *as the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Social capital thus comprises both the network and the assets that may be mobilized through that network*" (1998, p243). Hence, we consider social capital as the resource resulting from social relationships which is available to individuals or to organizational units within a firm.

The literature analyses social capital effects on a micro-level (attributes of individuals) and also on a macro-level (attributes of communities and networks). Researchers have paid less attention to the organizational level with the exception of Nahapiet and Ghoshal (1998) or Leana and van Buren (1999) who considered social capital as a common resource held by individuals and the organization. Relatively little research has tried to understand the combination of these two levels of analysis (Oh *et al.*, 2006). Maurer and Ebers (2006) explain that few things are known about the development of social capital, the factors which influence this development process and the implications for performance.

The main contribution of Nahapiet and Ghoshal (1998) is to provide a better understanding of the concept. They define social capital as a multi-dimensional construct, based on structural, cognitive and relational dimensions: (1) The structural dimension refers to the connections between the actors, links, network, density and hierarchical structure; (2) The relational dimension describes the types of relationships between people (trust, respect...): *“The relational dimension is associated with building trust; developing norms for interaction; setting expectations and obligations of its members; and creating a distinctive identity of the community with which members associate”* (Sherif *et al.*, 2006); (3) The cognitive dimension refers to resources from shared representation and interpretation and a common language between people. Interactions facilitate the development of a common sensemaking, with a shared language for example. These three dimensions will be used to operationalize our own research, specifically to link them with knowledge integration.

### 3.2 Social capital and knowledge integration.

Nahapiet and Ghoshal (1998) explore the role of social capital in the creation of intellectual capital, defined as knowledge and knowing, and underline the respective influence of social capital and intellectual capital. Following the authors, we have found relatively little empirical work on social capital in our literature review. The work of McLure and Faraj (2005) on the links between social capital and knowledge contribution is noteworthy, as it adds some individual-based variables, such as motivation to the seminal work of Nahapiet and Ghoshal. Chiu *et al.* (2006) use social capital to explain knowledge sharing in virtual communities. Sherif *et al.* (2006) study the links between social capital and knowledge creation and transfer in consulting firms using a qualitative methodology. Some research uses the three dimensions of social capital separately to explain the variables studied (Chiu *et al.*, 2006); other works look at the influence between these three dimensions (Tsai et Ghoshal, 1998). Finally, other papers use only the global concept of social capital but do not distinguish the three dimensions (Yli-Renko, 2002).

The literature review shows the importance of the work of Newell, Tansley and Huang (2004). These authors study the influence of social capital on knowledge integration in a project team, using a qualitative methodology. Their main finding is that the members of the project team need to create strong ties with others to share common objectives and meanings. One other result is the use of the social capital of group members to access dispersed organizational knowledge to achieve the objectives of the project. It is the use of both the bridging and bonding views that ensure the coherence between



team members to effectively integrate knowledge.

This literature review helps us to answer to our research questions: How does the knowledge integration process operate during a project? What are the role and the influence of social capital on the knowledge integration process during a project?

To achieve these objectives, we mobilize the dimensions of social capital defined by Nahapiet and Ghoshal (1998). The authors show that the three dimensions of social capital influence knowledge combination and exchange which constitute two phases of the integration process. Okhuysen and Eisenhardt (2002) find that knowledge specialization influences knowledge integration. Becker (2001) shows the difficulties in managing dispersed knowledge in the organization; critical knowledge is not always used by team members because people are not acquainted with each other and because of different sensemaking or languages, or physical distance. These factors cross the structural, cognitive and relational dimensions of social capital. These three dimensions influence knowledge integration positively (Chiu *et al.*, 2006). Social capital plays an important role in the knowledge integration process (Newell *et al.*, 2004). We can now put forward our first research proposition:

**Proposition 1:** The three dimensions of social capital –structural, cognitive, relational- influence knowledge integration process during an IS project.

Knowledge is organizationally dispersed; it creates uncertainty and information asymmetries which increase the complexity of the knowledge integration process. To ensure efficient knowledge integration, communication channels are useful as Becker (2001, p.1041) shows: “*The idea is to create ‘information channels’ (Nahapiet and Ghoshal, 1998, p.252) like social relationships through which knowledge can be acquired*”. Social capital is a type of communication channel which creates links between individual’s and each other’s knowledge.

**Proposition 2:** Social capital influences complex knowledge integration positively in an IS project.

We define knowledge integration as a dynamic cycle, a non-linear process. In the same way Carlile and Reberich (2003) show the path-dependent nature of knowledge. Thus knowledge integration is dialectic and complex: social capital is created and developed through knowledge integration, and on the other hand, social capital influence knowledge integration positively. Therefore, knowledge integration is a cumulative and path-dependent process.

**Proposition 3:** Social capital is influenced by the knowledge integration process in an IS project.

Figure 3 is a synthesis of these research propositions. This figure is an adaptation of the model of Nahapiet and Ghoshal revised in the light of our literature review. The different arrows represent the research propositions developed above.

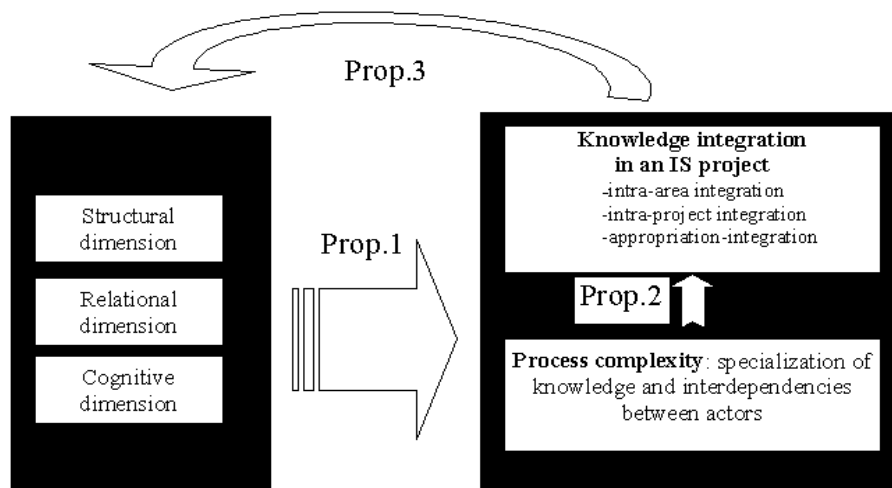


Figure 3. Influence of social capital on knowledge integration in a IS project.

The literature review shows that there is a link between social capital and knowledge creation and sharing or integration. Most of the studies underline a positive link between these two concepts. However some authors have also underlined that the relation between social capital and knowledge integration could be negative. Common norms in a team or a company (the relational dimension of social capital) provide a fertile context for knowledge creation but could also establish rigidities (Leonard-Barton, 1995). Maurer and Ebers (2006) study how social capital can facilitate organizational adaptation but also impede it: “*The cases illustrate how specific features of a firm’s social capital can turn from important drivers of successful firm development into core rigidities (Leonard-Barton, 1992) that contribute to inertia (Hannan and Freeman, 1984) and compromise firms’ performance*” (p.263). They show that the three di-

mensions of social capital are linked to a relational lock-in and a cognitive lock-in which lead to social capital inertia. We need to take these characteristics into account in our research. The last part of the paper offers an empirical investigation through two case studies of this theoretical framework.

## 4 AN EXPLORATORY STUDY OF KNOWLEDGE INTEGRATION DURING I.S. PROJECTS.

Our research method is based on qualitative investigations (Yin, 1994) based on two longitudinal case studies (see table 1). We present the companies where the case studies were carried out (4.1.) and then perform an in-depth analysis of the role of social capital during these projects (4.2.). Finally, we discuss our research propositions and draw conclusions (4.3).

Methodological choice	Qualitative method based on two longitudinal real-time case studies, one started at the launch of the project, the second in the implementation phase. The cases are still in progress.
Methodological justification	In-depth investigation. Understanding the cyclical and processual nature of knowledge integration. Minimizing many biases caused by actors' rationalization. Understanding the historical and contextual dimensions of the process studied.
Data collection	For the first case, seven semi-structured interviews (based on an interview guide), observations and internal documentations, such as the intranet, and papers (more than one hundred pages). Participation in twelve meetings over one year. For the second case, nine semi-structured interviews (based on an interview guide), internal documentation such as the intranet. Recording and transcription of the interviews in both cases.
Data analysis	Use of a qualitative data analysis technique (Miles and Huberman, 1994) including content analysis and the use of NVIVO 7 software. Coding the interviews with twelve codes to identify and describe social capital, knowledge integration and the context of the project. Creation of matrices to analyse the relationships between all the variables.

Table 1. Research method.

#### 4.1 “Future Project” and “Phenix Project”, two similar IT projects in SMEs<sup>1</sup>.

The case studies took place in two French SMEs (named FirstCorp and SecondCorp), both operating in the service sector. The companies have been selected due to their similar characteristics: same sector of activity (even if they are not direct competitors), similar number of customers, a similar turn-over and about one hundred employees. For several years, both firms have been facing a more and more competitive environment but they have experienced an important growth rate shown by a large increase in the number of customers and consequently in the number of employees. Nevertheless, the causes of the growth are different: the number of FirstCorp customers have risen progressively (about 15% annually) reflecting its appropriate business strategy; however, SecondCorp faced several business difficulties at the beginning of the 2000's and merged with another firm in 2005, changing its strategic position and adopting a new board of directors in 2006.

<sup>1</sup> The names of the companies and of the IT projects are kept anonymous.

Both top managements believe that transforming the structure and the organization will enable them to increase their market shares, to improve the quality of service and to cope with their changing environment. Transforming the information system is thus one of the ways to ensure the match between the firms and their environments.

At FirstCorp, the board of directors began discussions about the evolution of the information system in 2005. This included the identification of priorities and future improvements and then the assessment of the impact of a global information system change. The previous information system was based on separate and independent tools which created difficulties in the spreading of information. As the financial director of the company is also in charge of the information system, he was appointed project manager. He appointed a project team including nine members of the firm: four people are members of the board of directors and five others work in the different departments of the company. These cross-functional representatives possess administrative or technical skills.

At SecondCorp, improving the information system is an old idea but it was made possible only

after the merger and the arrival of the new CEO. Before 2006, the information system was really poor, business applications were split and there was no IS department. To carry out the project quickly, the project team was voluntarily limited. Four persons were member of the team: the new CEO, the head of the new IS department, one users' representative from the operational centre and an external project manager who just graduated (after ten years of work experience) and was first hired as a trainee. We can notice that the CEO had no real operational involvement as a member of the project team.

The two projects were only managed by using internal resources. For example, no external IS consultant was hired. It was the first time that these firms had had to deal with this type of cross-functional project, involving technological and organizational dimensions. The projects can therefore be described as both strategic and vital, due to the necessity of an adaptation of the companies' structures according to the growth of their businesses.

#### 4.1.1 The main characteristics of "Future Project" at FirstCorp.

At FirstCorp, the pace of the project was quite slow, allowing an evolution of the project's goals. Indeed, after a couple of months, it became apparent that the scope of the project was not only technological (information systems) but also organizational (organizational processes) for which information technologies are only the material support. The project was described as strategic by the team members. As a consequence, the composition of the project team evolved over the first months of the project. In particular, two members of the board of directors joined the team after the beginning of the project. The initial project members realized that

the involvement of the top management was important due to the widespread implications of the project for the whole organization. Despite this viewpoint, some of the top managers didn't systematically participate in meetings. The project team meets each month and no one works full time on it.

A breakdown of the different tasks carried out by the project team leads us to distinguish three important phases in this project: 1. analysis of the existing information system; 2. reflection on the strategic objectives of the company and the underlying processes; 3. renewal and evolution of the information system. Currently, FirstCorp is processing phases 1 and 2 (see table 2).

August 2005	Board of directors decides to launch a project on the information system of FirstCorp. Financial director is in charge of the project
November 2005	First meeting of the project team
Nov 2005 to March 2006	Analysis of the existing information system
Nov 2005 to June 2006	Project team members interview employees in each department to identify the existing system, the processes and potential evolutions
January 2006	Three new members join the project team (one from the operational centre, two from the board of directors).
January to October 2006	Analysis of the strategic objectives of the company and identification of the underlying processes
October 2006 to mid-2007	Discussion of the best information solution to meet the strategic objectives while taking into account organizational processes. Meetings with IS providers.

Table 2. General timetable of Future Project.

#### 4.1.2 The main characteristics of "Phenix Project" at SecondCorp.

SecondCorp's new top management wanted to quickly obtain concrete results. As a consequence, the choice of adopting an Enterprise

Resource Planning (ERP) software was made at the launch of the project in January 2006. The search for a software provider specializing in the activity of SecondCorp therefore became one of the priorities of the project team for several months. The project manager performed a quick analysis of the existing information system to define the mission statements. These terms of reference were sent to a dozen software vendors specializing in the sector and a short list of five providers was established in March 2006. After several steps of process selection, one provider was chosen at the end of April 2006. Several selection criteria were taken into account, including the price, the adaptability and the experience of the software provider.

The project team met each week, if necessary with the board of directors. The aim of the project team was the implementation and use of several software modules in September 2006. This goal was only partly achieved. For example, the first module implemented is dedicated to customers' management; it was effectively running in September, but employees still had to work with the old customer information system due to bugs in the new system and the time required to correct them to adapt the new system to the firm's specificities. During this period the relations between SecondCorp and the provider encountered some tensions. Finally, the delays to implement the ERP may force the project to last until end 2008.

January 2006	Launch of the <i>Phenix Project</i> and appointment of the project team
January to March 2006	Writing the mission statement and selection of 5 potential providers
March 2006	Publishing twice a month of a Phenix information newsletter for the employees
March to April 2006	In-depth analysis of each vendor's offer and selection of 3 and then 1 final provider.
September 2006	Implementation of the first software module. Information meeting for the employees to show the new information system functionalities.
January 2007	Postponement of the implementation of the modules dedicated to human resources management and communication. End of the newsletter edition (information is now published in the firm's general news bulletin).

Tableau 3. General timetable of Phenix Project.

#### 4.1.3 How the knowledge integration processes occur during the two projects.

Both projects have lasted for several months and are still ongoing in mid-2007. As a consequence, the third phase of the integration process could only be partially observed: this phase has been ongoing at SecondCorp since last September but FirstCorp is still in the second phase of the process. The effective institutionalisation of organizational knowledge can only take place through the implementation of the new information system: the organizational knowledge created by the work of the project team impacts each person involved in the use of the information system.

The two first phases are therefore the main steps studied in this research and we partially study the last step. Based on empirical investigations, we now explain how they take place at FirstCorp and SecondCorp.

The first step of the integration process, intra-area integration, refers to the link between individual and collective knowledge. The goal of the

process is to identify and collect the dispersed knowledge existing throughout the organization.

At FirstCorp, this step was managed by members of the project team representing each department in the company. This decentralized way of operating was considered by the project team as the best manner to access the specialized and individual knowledge spread throughout the company. The relevance of the knowledge collected was then optimized: the proximity of each representative to his colleagues reduced possible human biases, allowing more accurate information. The methods used during this phase were multiple, depending on the department concerned. Sometimes, it was only a series of informal discussions: *“We had to list the software used in the company. I went and saw my colleagues [from the IS department] and said: “Let’s do it” (a member of the information department); sometimes when the knowledge involved was spread among many people, the representative has to organize a more formal meeting, lasting several hours. Sometimes, it seemed better if the representative was not the head of department: “My boss doesn’t really know about daily tasks, the specific software we use... So I think it was important that someone who’s a regular user was part of [the project team]” (a member of a support department). This step is of paramount importance because its success is a condition for the success of the whole integration process. It mobilized a large number of people in the firm: “It’s true that it was time consuming because each representative of an area had to hold discussions with her team to find out how things really worked” (a member of the information department).*

At SecondCorp, the intra-area integration process occurs in a close manner. There were discussions to collect individual knowledge and

create collective knowledge, but it was more time concentrated: a series of interviews were conducted by the project manager with the head of the different departments and sometimes their assistants. Conducting these interviews helped to write the terms of reference for the potential providers and to evaluate users’ expectations. Except for the project team and the board of directors, no one in the firm was really involved in the project until the ERP vendor was chosen and the implementation has started. At this moment, new *ad-hoc* interviews were conducted to deal with the technical and organizational dilemmas of implementation: *“It’s important to have in each department someone who possesses the knowledge and who is able to transfer it to the members of the team project”* (a member of a support service). The intra-area integration phase may be analysed as a support for the intra-project integration process which remains the central step and is carried out at the same time.

In both case studies, intra-area integration led to the creation of collective knowledge at the level of the project team, from individual dispersed knowledge.

The aim of the second phase of the integration process, intra-project integration, is to produce organizational knowledge from collective knowledge created through intra-area integration. This phase took place within the project team through interactions with the interface integrators.

In both companies, the intra-project integration has a great impact on the content of the exchanges inside each department. SecondCorp deals with intra-project integration through the analysis of the main processes in the company. The project manager (the external trainee hired in January) described and formalized the 3 main

processes of the company on the basis of the previous interviews made in the intra-area integration phase, i.e using the collective knowledge created. Compared to FirstCorp, this phase concentrated on only three processes which were considered to be the key ones (due to time constraints). Complementarities in the competences and knowledge of the members of the team project helped to ensure intra-project integration. Their different past professional experiences and the diversity of their functions were important in the transformation of collective knowledge into organizational knowledge: *“I haven’t the same experience and I haven’t thought to ask these types of questions; it’s interesting to work together”* (a member of the project team). After the formalization of the processes, there was feedback to the individuals through the validation of the content of the interviews. One important step here was the validation of all main decisions by the board of directors. Moreover, one specific characteristic of the intra-project integration at SecondCorp was the participation of the IS vendor in this process. This external provider also interviewed people to collect knowledge about the activities and about the processes and worked closely with the project team. One result of this phase is that some processes and knowledge appeared to be critical even if they were not identified as key at the beginning of the project.

At FirstCorp, this level of integration was achieved through a business process modeling method. During the first monthly meetings, the team project identified about 10 key processes in the firm, considered to be strategic processes. As a consequence, the exchanges at the individual level took place in order to de-construct these processes, in other words, to accurately describe the way they really function. To do this, a global framework to describe the processes was built by

one of the employees, member of the operational center: this person has the particularity to possess some expertise in information systems. The experience of each person in the firm concerning work tasks then had to be included in larger processes, which were more abstract. As a member of the board of directors says: *“They know what a [bill] is, but a process, it’s cross-functional. You need a new way of thinking. And what is the difference between a task, a sub-task, a process and so on... it’s not obvious at all”*. This work was sometimes an opportunity to underline differences between how one process should be carried out and how it actually functioned. The result of these decentralized exchanges was summarized and reported to the project team via report notes. It was then collated, when necessary: *“Effectively, there was a document concerning processes that was incremented during each meeting [of the project team] with the results obtained about each process”* (a member of the board of directors). Moreover, software dedicated to process analysis was used, but only to describe the existing situation of the firm. To precisely describe three strategic processes, three pairs of trainees were hired (they were students in a business school with an information systems specialization) for a two-month internship. They interviewed people to help formalize the work processes and use the process modeling software.

The last phase in the integration process is integration-appropriation. The aim of the integration-appropriation phase is to institutionalize the organizational knowledge created on the basis of the two previous phases and to spread it to the individuals. This last phase has taken place at SecondCorp since September 2006. On the basis of the intra-project integration and the creation of organizational knowledge, the project team and the IS provider have built a new information

system and are beginning to implement it in two departments of the firm. To succeed in this implementation, the project team is using communication tools such as general meetings with all the employees, specific meetings with the employees of the departments concerned, a project newsletter, informal discussions and also training. All these tools are helping to spread and institutionalize the new knowledge that was created. The integration-appropriation phase is mainly based on feedback between the individual users of the new information systems and the IS provider, through the project manager who centralizes all questions and requests. Users are playing a key role in this last phase of the integration process because “they are the knowledge owners of how to perform a process at SecondCorp and it is necessary to have people who know the activity in an operational way to implement the new system” (a member of an administrative department). This phase will probably finish at the end of 2008; it is the longest phase in the project at SecondCorp.

Generally, the modalities used by the two projects to achieve their goals were mainly based on numerous direct person-to-person interactions. The result of the projects was highly structured, with notes of each meeting and a detailed description of the main processes of the firm. It also appeared that the first two phases of integration were closely intertwined and not sequential, leading to the project progress: “I have the feeling that people progressively share a base of common knowledge. People have diverse profiles [...]. Some of them previously experienced working on IS in their professional life. But now, we have succeeded in sharing something common. [...] The dynamics is interesting. There was no break, but the group progressively consolidated content and shared common things” (a member of the board of directors at FirstCorp). We can also notice the central role of a gatekeeper in the knowledge flows during the project (at SecondCorp).

As a synthesis, figure 4 distinguishes the different phases of the knowledge integration process in the two projects.

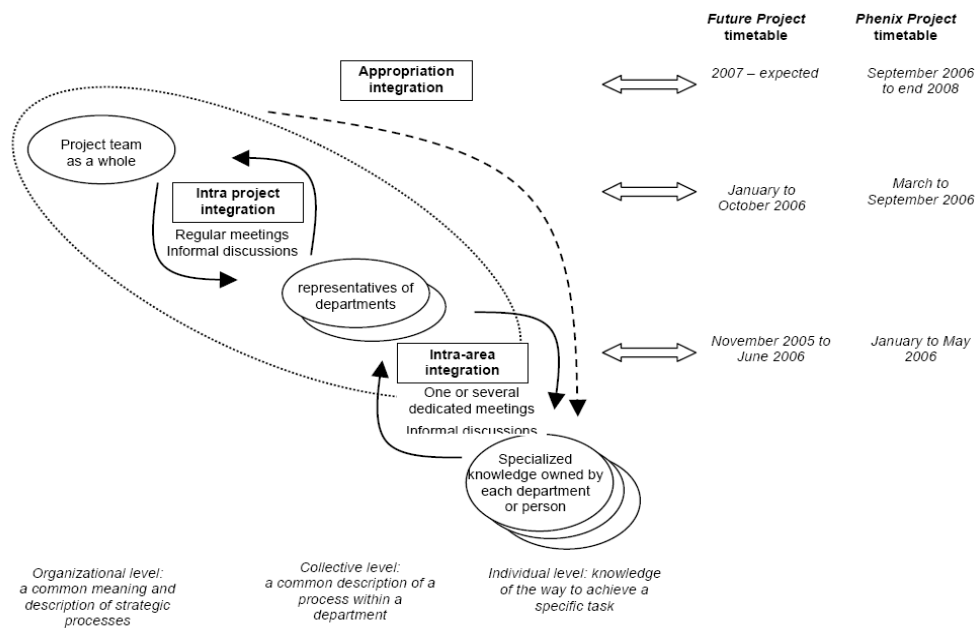


Figure 4. The compared knowledge integration processes during the two projects.



## 4.2 Empirical identification of social capital through its three dimensions.

### 4.2.1 The structural dimension in the Future and Phenix Projects: Weak interactions in the organizations and two types of leaders.

We will analyse the structural dimension through the intensity of the interactions between the actors and through the actors' centrality (table 4).

In *Future Project*, interactions evolved in a differentiated manner: informal interactions were high when formal interactions were less intense; for example between June and July 2006 when official meetings stopped. Members of the project manager and the board of directors (except one) thought that the project's pace was adequate. For them, it was necessary to take time to develop this project. Moreover there were several other projects in the company they had to deal with and it was difficult to mobilize everybody on several projects at the same time. Globally, all the members of the project team thought that the intensity of the interactions, both formal and informal, is very low. These interactions were exclusively located in the project team. Outside of the team, nobody in the firm was really aware or involved in the project, except their participation in one or two meetings during the intra-area integration phase.

In comparison, in *Phenix Project*, the frequency of interactions was roughly continuous during the project: intensity was very high inside the project team and very low in the organization. The only interactions outside the project team were conducted by the project manager. Distinguishing elements between the two cases were the pace of the project and the organizational context: the pace was very high in *Phenix Project* and there was no other main project conducted at the same time. Employees were more involved in the project because it already reached the last phase (appropriation-integration). Nevertheless, there were no more spontaneous interactions between departments.

In *Future Project*, the analysis of the actors' centrality showed that during formal interactions (meetings), one of the project team member became the real project's leader due to his knowledge and skills in information systems. He lead most of the meetings. In this context, the official project manager remained mainly a coordinator and a facilitator. The centrality of these two people was acknowledged by all the project members. In *Phenix Project*, the central actor is the project manager who also played the role of an internal consultant due to his professional past experience. His hiring to conduct this project with 'an external look' also explains his high centrality. The centrality of the three other project members was similar, but not as strong as the project manager's centrality.

Structural dimension	Characteristics at FirstCorp	Characteristics at SecondCorp
<b>Interactions intensity</b>	<p>Formal interactions (monthly meetings of the project team, electronic and written documentation, meeting notes) and informal interactions (between the different departments and the IS department).</p> <p>Project participants view that the Future Project is taking shape too slowly and that interactions are insufficient: <i>“I regret that we cannot hold more than one meeting per month; it’s not enough to obtain concrete results” (**)</i></p>	<p>Formal interactions (weekly meetings of the project team, written documentation) and informal interactions within the project team: <i>“We are a small team; we work together daily” (*)</i>.</p> <p>A very low level of interactions between the departments of the organization: <i>“We work alone [...]. We do not collaborate with the other departments” (*)</i>.</p> <p>Numerous interactions initiated by the project manager are not spontaneous.</p>
<b>Actors centrality<sup>2</sup></b>	<p>Dual centrality of two actors during the project: the official project manager (the financial director in charge of the project) and another member of the project team (IS expert from the operational centre) playing the role of an internal consultant: <i>“I frequently used to consult him [the internal consultant] because he was the one leading the meetings; [the project manager] deals with reports” (*)</i>.</p>	<p>One central actor : the official project manager; Medium centrality of the three other members of the project team.</p> <p>A key role in the interactions played by the project manager who centralizes all communication flows between the different departments, the project team and the IT supplier. The centrality of this person is high during the three steps of the integration project.</p>

Table 4. The structural dimension of social capital within the projects<sup>3</sup>.

#### 4.2.2 The relational dimension in Future and Phenix Projects: high levels of identification, contradictions in trust and reciprocity.

We estimated the relational dimension using trust, reciprocity and identification with the project (table 5).

<sup>2</sup> Completing the content analysis, centrality has also been measured with a counting of the names of the project’s actors mentioned during the interviews.

<sup>3</sup> Sources of the quotes (valid for all the following tables) : (\*) : a member of a support department ; (\*\*) : a member of the information department ; (\*\*\*) : a member of the board of directors.

Relational dimension	Characteristics at FirstCorp	Characteristics at SecondCorp
<b>Trust</b>	<p>Climate of trust inside the project team (no retention of information, friendly atmosphere between the members): <i>“The project works well; there is no tension between us”</i> (*).</p> <p>People know each other very well because of the small size of the company; moreover, project management is a habitual feature of FirstCorp: <i>“There is a professional and constructive spirit; there’s a good climate”</i> (***)).</p>	<p>Climate of trust inside the project team even if one member is new in the company: <i>“We have a good team with high motivation”</i> (*).</p> <p>Trust is almost not evocated during the interviews; participants work separately in each department; it’s the first cross-functional organizational project.</p>
<b>Reciprocity and support between the actors</b>	<p>High level of reciprocity and support which might be explained as a compensation of the weak interactions. Reciprocity is partly linked to the content of the project: <i>“[The internal consultant] helps us to identify and describe the organizational process in our department”</i> (***)).</p> <p>Reciprocity also means valuing the work of other departments and the willingness to accept each person’s areas of activity; mutual adjustment between actors from different departments: <i>“I talk to the head of another department to be sure that this problem is relevant to my area and that I don’t take a part of his job”</i> (**).</p>	<p>A very low level of reciprocity and support except inside the project team. Lack of reciprocity is at the image of the low level of interactions in the whole organization: <i>“SecondCorp is an old company; people work separately with some preserved areas”</i> (**).</p> <p>Lack of communication between the departments in the organization: <i>“there was a state in the state in our company [...] There were a lot of difficulties in the communication”</i> (**). Some departments work in complete autonomy.</p>
<b>Identification</b>	<p>Identification occurred for many participants: even if interactions were weak, they did not affect the interest in or the knowledge of this project. The global opinion of all the participants was positive. Nevertheless, several members were a bit sceptical due to ill-defined project: <i>“We are not sure that this project will be finished one day”</i> (***) and <i>“It’s a confusing period and a complicated one too”</i> (**).</p> <p>The participants were interested in the project because it enabled them to develop a global view of the organization, to acquire new knowledge and to enrich their professional experience: <i>“The project is interesting because we can develop a more global vision beyond our daily work in our own department. We think about the future of the company”</i> (*).</p>	<p>Identification occurred for all participants: even if reciprocity and interactions outside of the project team were weak, they did not influence the interest in this project : <i>“the climate is favourable to change, we build our organization on success”</i> (***)).</p> <p>Identification was facilitated by the name, the logo, the newsletter, and also by the high involvement of the top manager. All the participants were positive. Nevertheless, several members were a bit sceptical and threatened due to the difficulties of implementation of the new software and to the change in their work or function: <i>“I’m conscious that we will work better with the new system but there are a lot of bugs”</i> (*).</p> <p>A very high level of identification from the members of the project team; they work full time on the project since 18 months.</p>

Table 5. The relational dimension of social capital within the projects.

The main differences in the both cases are in terms of trust and reciprocity. Trust reached a high level during *Future Project*. In the same way, reciprocity and support between the project actors were important, especially at the beginning of the project and between June and July 2006 when the evolution of the project is unclear for most of the participants. For example,

when someone needed an explanation on methodology or on information system vocabulary, everyone was ready to help. So trust and reciprocity are evolving but high in *Future Project*. On the contrary, trust wasn't mentioned during interviews about *Phenix Project* and there was a lack of reciprocity due to the structural organization of the company and to its history: separate departments that don't collaborate, old structure, no project management inside the firm.

Identification was very high in both projects. In the first case, the participants were interested in the project but they were also expecting concrete results, inducing a lack of confidence in the next phases of the project. This attitude was underlined by a high level of absenteeism at meetings and more informal interactions outside the official monthly meetings. Paradoxically, the official project manager was satisfied with the project's development and thought that every participant shared his view. All participants agreed on the strategic importance of the *Future Project* for the company; as in *Phenix Project*. In this second case, participants were very positive towards the project, with a very high involvement of the project team and the CEO. Some actors were threatened by the coming changes in their work but were convinced themselves of the necessity of this change.

#### **4.2.3 The cognitive dimension in Future and Phenix Projects: common language and shared values.**

Two characteristics define the cognitive dimension of social capital: language and shared values (table 6).

In terms of common language, we outlined several major differences between the two cases. In

*Future Project*, the participants had some difficulties to develop and use a common language. With the progress of the project, these problems were becoming less frequent and the participants created a common language during the intra-project integration phase. The official monthly meetings were important in achieving this, due to the role of the project manager and the informal leader as animators. In *Phenix Project*, the creation of a common language was in the mind of the team members since the beginning of the project. To achieve this objective, they found and used a specific name and a logo to help everybody to identify to the project; moreover, they published twice a month a project journal. So, there was a common language during all the project phases. To conclude on this point, we can add that differences between the both cases could be explained by the fact that *Phenix Project* was in an advanced phase of the process (appropriation-integration), compared to *Future Project*; so time helped to build a common language and it was easier to involve people in a more concrete period of time.

The other important dimension is the shared values between the actors: there was a lack of common history between participants on this subject in both organizations. In *Future Project*, the small size of the company was the reason why each participant knew the others in the project very well. Shared values were more important in the whole company than in the project team in FirstCorp. On the contrary, in SecondCorp, shared values were important inside the project team but not in the whole organization, due to the structural separate activities in the departments. The CEO was the only person to mention the importance of shared values in the company, not the other actors interviewed.

Cognitive dimension	Characteristics at FirstCorp	Characteristics at SecondCorp
Language	<p>Difficulties in developing and using a common language in the project. The differences in participants' profiles can explain this, even if they shared a common corporate culture and a common goal in the project. None of the participants were able to name the project properly.</p> <p>Some actors considered there was a common language understood by everybody: <i>"the information system vocabulary wasn't Greek to me"</i> (***)). But some participants considered that it was difficult for everybody to understand technical language and information system methodology: <i>"I had difficulties identifying what a process is and the difference between a process and an activity"</i> (*)</p>	<p>Apparently, there were few difficulties to develop and use a common language in the project due to the clear identification of the project (name and logo) and the publishing of the project information bulletin twice a month: <i>"the purpose of the project newsletter is to explain the different steps of the project, the vocabulary, the content of change"</i> (**).</p> <p>The few difficulties mainly came from unshared vision (for example between different departments) and not from a lack of common language.</p>
Shared values	<p>Weak past history and past experience in terms of system culture inside the company: its activity is not directly linked to the use of new technologies.</p> <p>First participation in such IS project for all the members of the project team: <i>"We don't have an information system culture in our company. We are discovering this. Somebody with experience knows the methodology and knows what a process is"</i> (***)).</p>	<p>No past experience in this company on such a global organizational project: <i>"It's the first major project in the company, before it was project only between two departments"</i> (*). It's paradoxical because 75% of the employees work in this company since more than 15 years.</p> <p>Two out of four members of the project team have a common professional experience. The third one has just been hired to lead the project. The last one is the new CEO who took up his post at the beginning of the project. After several months, the shared values were important inside the project team.</p>

Table 6. The cognitive dimension of social capital within the projects.

### 4.3 Discussing the effective role of social capital to integrate knowledge during cross-functional projects.

We now discuss the three research propositions which result from our conceptual framework. The first proposition is that social capital influences the knowledge integration process through its three dimensions: structural, cognitive and relational. Previously, we have shown in both case studies that the structural dimension exists during the projects with a low level of intensity of interactions and central actors: the internal consultant and the official project manager in the first case and the official project manager in the

second case. The relational dimension also occurred during the projects with strong identification with the projects and a climate of trust only in the first case. Finally, the cognitive dimension was also present in both projects; but we found some contradictions. In the first case, cognitive dimension has evolved during the project with an increase in the shared language and the presence of common shared values in the whole organization and in the project team. In the second case, a common language is shared by all actors but shared values took place only inside the project team not in the whole firm. Together, these three dimensions of social capital favor exchanges of existing knowledge between indi-

viduals: facilitating exchanges through a common language (cognitive dimension) and strong identification to the project (relational dimension). The three dimensions also influence and favor the creation of new collective knowledge in the project team by the individuals' exchanges (structural dimension) and the climate of trust (relational dimension). Consequently, we can say that the three dimensions of social capital have had a positive impact on the knowledge integration process during this project and favored the knowledge integration cycle. This confirms previous results (Newell, Tansley and Huang, 2004), while applying them for the specific context of organizational cross-functional projects. Our analysis also shows that the three dimensions of social capital have to be considered as a whole simultaneously and not one by one, because there are interactions between dimensions. For example, in *Future Project*, the evolution of the intensity of interactions (structural dimension) and the identification with the project (relational dimension) co-evolved during the project progress; identification with the project is more ambiguous when the intensity of the interactions is the lowest (June and July 2006). On the contrary, identification with the project is very clear and positive at the beginning of the project when the structural dimension has a strong impact on the knowledge integration process. In *Phenix Project*, we have shown that the intensity of interactions in the organization (structural dimension) was very low and at the same time, there was no reciprocity and no trust (relational dimension) between the departments in the organization due to the vertical structure and the departments' separate way of working. We can also link these characteristics with the lack of common shared values (cognitive dimension) in the organization. These results confirm literature which considers social capital as a

whole with interactions between each dimension (Tsai and Ghoshal, 1998). Moreover, depending on the phase of the knowledge integration process, the three dimensions do not have the same influence. Our first case study shows that the structural dimension is particularly important during the phase of intra-project integration while the cognitive dimension is important during both intra-project integration and intra-area integration. In the second case study, identification (relational dimension) and shared language (cognitive dimension) are important during both intra-project integration and intra-area integration. Structural dimension is important during the three phases of the process. To conclude on this point, we can say that the three dimensions are necessary to create the resource of social capital, which influence the integration knowledge process.

Our second research proposition concerns the role of the social capital in a complex integration process. Globally in both case studies, the environment of the companies and the internal organizations are becoming more and more complex due to the increasing number of customers, intense competition and the need to adapt the internal organizations of the companies to this period of growth. It makes the individuals' knowledge more and more confined and specialized and thus increases the complexity of the knowledge integration process (Becker, 2001). Social capital facilitates management of the complexity of the project with creating or reinforcing communication channels: for example when people share common experience and common values, it is easier to deal with dispersed knowledge held by a lot of individuals in several departments.

In *Future Project*, the interviews show that the complexity of the knowledge integration process

did not appear to the participants at the beginning of the project; they were not aware of the complexity of the project when it started. They became conscious of it after several months working in the project team, especially between the two phases of intra-area integration and intra-project integration. The actors said they found it very difficult to deal with the transition between these two phases of the knowledge integration process. Sometimes, it was difficult for them to link the individual level, for example in their own department, and the collective level in the project team: “*After several months, they understand that it was not as easy as they thought at the beginning*” (a member of a support department). In *Phenix Project*, the complexity of the knowledge integration process was not directly mentioned by the actors. It did not appear to be a problem for them; one possible explanation is the very high pace of the project (only 6 months to conduct intra-area integration and intra-project integration). Compared to *Future Project*, there was no transition period between these two first phases of the knowledge integration process: in *Phenix Project*, both phases occurred at the same time and not successively.

The last proposition, introducing a feed-back effect (Nahapiet and Ghoshal, 1998), is that social capital is influenced by the knowledge integration process. According to our case studies, the actors agree that the knowledge integration process has only a limited impact on their relationships, for example. So, our third research proposition is only partially confirmed. We can explain this by the fact that, in *Future Project*, the relationships between the members of the project team are strictly professional. Participants get to know their colleagues' work and the whole organization better, but they do not get to know the individuals themselves better. The project meetings were not the opportunity to create or

reinforce personal links between people. In *Phenix Project*, the knowledge integration process has had no impact on the relational dimension of the social capital (trust, reciprocity and identification didn't evolve consequently to this integration process). We can notice some consequences on the structural dimension and on the cognitive dimension. Interviews underline an improvement in the quality of the communication between the departments with less individualistic behaviours (intensity of the interactions was higher at the end of the project); moreover, this project was a unique opportunity to create shared values through this common experience of a global organizational project, which was the first experience of this type in the organization and helped actors to better know and understand each other in the whole organization: “*I was very positively surprised by the behaviour of this colleague; it was a good surprise*” (a member of the board of directors).

The other explanation is the small size of the companies (between one and two hundred employees) which implies that all the members of the project team already knew each other before the project. In the second case study, most of the employees have been long in the firm. In the first case study, the employees are used to participating in project in this company: social capital existed before the beginning of the new project. In the two projects, reciprocity and trust - parts of the relational dimension - were not important in the interviews. On the contrary, the cognitive dimension (common language and shared experience) was very present in the whole organization. It is also worth pointing out that these projects are the first in which all the department managers have worked together and, through it, they have acquired a global understanding and vision of the organization. Finally, the contexts of the organizations (history, val-

ues, small size) explain the partial influence of the knowledge integration process on social capital.

## 5 CONCLUSION.

Dealing with knowledge management is often ignored during project realization. This absence constitutes a lack to the understanding of what makes a project successful. The objectives of this paper were twofold. First, it aimed to focus on the evolution of knowledge during projects by distinguishing three steps in the process of knowledge integration: intra-area integration (which refers to the gathering of individual knowledge to create collective knowledge), intra-project integration (defined as the creation of organizational knowledge on the basis of collective knowledge owned by the project team) and appropriation-integration (institutionalization of the new organizational knowledge among the individual members of the organization). The second aim of this paper was to improve our understanding of the influence of social capital on the integration process in a cross-functional project, in particular the role of each dimension of social capital (structural, relational, cognitive), and the effect of social capital on the complex integration process. We applied this conceptual framework to an investigation of two cases of SMEs aiming to improve their information systems. The gathering of qualitative data lasted more than one year, as it followed the evolution of these ongoing organizational projects. A qualitative analysis of data was performed, with a content analysis using Nvivo 7 software.

In both case studies, the two first parts of the knowledge integration process (intra-area integration and intra-project integration) are closely intertwined. We only partially study the integration-appropriation phase in the second case be-

cause it has not started yet in the first case. The formal aspects of the projects (mainly meetings of the project teams and meetings within each department) enabled the firms to produce several written documents (meeting notes, processes descriptions) showing the progress of the projects. Nevertheless, several events parallel to the formal aspects, such as the emergence of a project leader in the first case or one-to-one discussions, showed that there was room for more informal aspects during project development. The social capital of the project team members became a resource within the teams and also inside the companies. The appropriation-integration phase in the second case confirms the influence of social capital dimensions in the integration process.

The results of this investigation do not enable us to identify specific roles for the three dimensions of social capital during knowledge integration phases: the common influence of the three dimensions of the social capital plays a role in the integration knowledge cycle. Moreover, this role appears to be important since the knowledge integration process is complex. The growing specialization of tasks in the companies is confining knowledge and the existence of social capital enables links to be forged in order to pool it when the projects require. Finally, we can conclude that social capital is positively influenced by the knowledge integration process, even if in these cases this influence was moderate.

We only investigated two ongoing exploratory cases of information system projects in SMEs. We therefore do not claim that our observations of knowledge integration processes can be generalised to other contexts. Further research is needed to determine how our findings (concerning, for instance, the interactions of the three



sub-processes of knowledge integration) should be amended to account for different situations such as projects in large companies or projects made up of virtual teams (Alavi and Tiwana, 2002). However we consider that this research constitutes an interesting contribution to the notion of knowledge integration and a useful framework for understanding the role of social capital in knowledge management.

Finally, we wish to stress an important area for future research. Our case studies showed that social capital transformed the manner in which knowledge integration took place, mainly based on face-to-face interactions in small organizations. As information technologies were moderately used to communicate between close colleagues, they did not form the main focus of our study and we did not directly investigate the possible changes in the communication channels during the projects. Building up the conceptual understanding of such relationships between social capital and IT use and documenting them through detailed empirical studies constitutes a promising area for research in the field of knowledge management.

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