

Learning Dynamics across Boundaries of IS Context: A Structural perspective to Support Knowledge Management

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Article abstract

This paper seeks to analyze the extent to which organizations can learn in an Information System (IS) context by focusing on the relationship between projects and communities of practice. Adopting a theoretical framework combining the social learning literature (Lave, 1991; Wenger, 1998; Orlikowski, 2002) and a structural approach (Giddens, 1984), we used an ethnographic study to examine two contrasting learning dynamics in the IS Department of a multinational car manufacturer. Our findings highlight embeddedness and facilitating and inhibiting factors in learning process. Our discussion suggests an integrated knowledge management perspective (Pawlowski, Robey, 2004; Levine, Xin, 2007; Srikantiah et al., 2010).

Learning Dynamics across Boundaries of IS Context: a Structural perspective to Support Knowledge Management¹



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RÉSUMÉ

Dans cet article nous analysons comment les organisations apprennent dans un contexte en Systèmes d'Information, où projets et communautés de pratique interagissent. Notre cadre conceptuel combine la littérature en apprentissage social (Lave, 1991; Wenger, 1998, Orlikowski, 2002) et l'approche structurationniste (Giddens, 1984). L'étude ethnographique utilisée permet d'analyser deux dynamiques d'apprentissage contrastées dans la Direction des Systèmes d'Information d'un constructeur automobile en France. Nos résultats soulignent les attributs encastrés des connaissances ainsi que les facteurs facilitateurs et inhibiteurs du processus d'apprentissage collectif. Notre discussion suggère une perspective intégrée du management des connaissances (Pawlowski, Robey, 2004; Levina, Xin, 2007, Srikanthiah et al., 2010).

Mots clés : dynamique d'apprentissage, équipe projet, communauté de pratique, frontières sociales, contexte SI, management des connaissances.

ABSTRACT

This paper seeks to analyze the extent to which organizations can learn in an Information System (IS) context by focusing on the relationship between projects and communities of practice. Adopting a theoretical framework combining the social learning literature (Lave, 1991; Wenger, 1998, Orlikowski, 2002) and a structural approach (Giddens, 1984), we used an ethnographic study to examine two contrasting learning dynamics in the IS Department of a multinational car manufacturer. Our findings highlight embeddedness and facilitating and inhibiting factors in learning process. Our discussion suggests an integrated knowledge management perspective (Pawlowski, Robey, 2004; Levine, Xin, 2007, Srikanthiah et al., 2010).

Keywords: Learning dynamics, project team, communities of practice, social boundaries, IS context, knowledge management.

RESUMEN

En el presente trabajo analizamos cómo las organizaciones aprenden en un contexto de Sistemas de Información donde proyectos y comunidades de práctica interactúan. Para hacerlo, combinamos la literatura en aprendizaje social (Lave, 1991; Wenger, 1998, Orlikowski, 2002) y la teoría estructuralista (Giddens, 1984). El estudio etnográfico utilizado permite analizar dos dinámicas contrastadas de aprendizaje en un fabricante de automóviles en Francia. Nuestros resultados muestran atributos de los conocimientos así como factores facilitadores e inhibidores de aprendizaje colectivo. Nuestra discusión sugiere una perspectiva integrada de la gestión de los conocimientos (Pawlowski, Robey, 2004; Levine, Xin, 2007, Srikanthiah et al., 2010).

Palabras claves: dinámica de aprendizaje, equipo de proyecto, comunidad de práctica, fronteras sociales, contexto SI, gestión de los conocimientos.

Different perspectives in contemporary knowledge management research recognize the contextualized character of knowledge and indicate that people and their practices cannot be isolated from embedded work contexts (Cook, Brown, 1999). Knowledge is acquired and created by the participation of individuals in different work situations (Lave, 1991) and their ability to enact actionable practice in specific contexts (Orlikowski, 2002). However, this contextualized character also makes knowledge transfer difficult, (Sulanski, 1996). A misunderstanding of the ways in which knowledge is “sticky to the context” and how practices may be shaped within the work context persists (Hsiao et al, 2006). As this lack of understanding could impede future knowledge management research, recent literature has tried to combine exploration of knowledge attributes and the effects of the work context on knowledge management problems (Hsiao et al, 2006). Specific focus is placed on the role of communities of practice in embedded learning

dynamics. The organizational structure of the firm (rules, resources) remains virtually unexplored, despite the insights it provides regarding embeddedness in knowledge management systems.

In fact, the challenge for a knowledge system is to ensure the complementary association between hierarchical and community mechanisms to create a continuous organizational learning process (Cohendet, Diani, 2003). In light of this analytical gap, we seek to examine the knowledge production process (knowing) in a work project context, taking into account structural and cognitive factors that influence embedded practices and organizational learning. The aim is to study embeddedness in its recursive dynamic between the local level of action and the global level of the organization. Our main interest lies in the specific work context of information systems (IS), from the point of view of IT workers (Pawlowski, Robey, 2004; Levina, Xin, 2007).

1. The author would like to thank three anonymous reviewers for their detailed feedback on the manuscript.

Considered in our research as knowledge brokers (Brown, Duguid, 1991; Pawlowski, Robey, 2004)², we are particularly interested in IT project managers and the effects of their practice within recursive learning dynamics. Their relationship with IT project stakeholders requires the gradual development of sensemaking (Weick, 1990) and the integration of social capital (Deltour, Roussel, 2010) with respect to the ambiguous situations that emerge during a project implementation (Daft and Weick, 1994, Swanson and Ramiller, 1997). These IT professionals influence the dissemination, exploitation and creation of knowledge about both IT (technological choice, IT implementation and technical aspects) and business practices (IT appropriation, advantages and functional aspects of IT, effects in users' practices) across the boundaries that separate work units within organizations (Pawlowski, Robey, 2004). Their activities within IT projects, including the most technical ones, incorporate an important tacit element and a lot of "bricolage" (Ciborra, 1992) that is rarely captured by knowledge management systems. Similarly, project structures imposed by IS Departments (management tools, processes, methodologies) are often insufficient to create tangible routines or generate reference points for collective action within projects, and more widely within organizations in an IS context (Castro Gonçalves et al., 2007, Catro Gonçalves, 2010). That is why IT project managers often need to develop learning dynamics outside the projects' organizational boundaries to deal with this context of continual change. The challenge is to integrate, in a limited time and with fewer resources, several fields of practices (Bourdieu, 1998) in the project and widely in the project policy in order to reinforce the management project maturity of the company.

For an exhaustive analysis of knowledge transfer and reuse, projects need to be viewed in terms of a spanned activity in their relationship with the ongoing activities, norms and practices operating in the rest of the organization (Scarborough et al. 2004). This study suggests extending analyses to more informal interaction situations within IS contexts, which feature distinctive rules and resources (Giddens, 1984) and determine other knowledge and social boundaries.

The present paper explores **how can IS Departments learn from local IT Project Managers' dynamics by focusing on the recursive relationship between project, community of practice and their structure.**

By rendering intelligible the local strategies developed by IT project managers to help them manage the complexity of their work context, we analyze embedded learning situations generated in their daily practice through the organizational and social boundaries of projects and communities of practice. The idea is to offer the knowledge management field a complementary understanding about how boundary

spanning mechanisms can become enacted in local practices and global structures.

Our paper summarizes firstly two social learning approaches (Lave, 1991; Wenger, 1998, Orlikowski, 2002) that can help us analyze these learning dynamics more clearly: the project-based learning perspective and the practice-based learning perspective. These approaches offer distinctive responses to the theoretical gaps in knowledge management studies in an IS context. This literature allows us to construct a bimodal and multi-level analytical framework based on a structural approach (Giddens, 1984). Secondly, we present our empirical approach and our analysis of two embedded cases from an IS Department of a multinational car manufacturer. Finally, we discuss the findings of this research, focusing on the effects of the two contrasting learning dynamics that emerge in the same work context. Through this embedded view of knowledge transfer and exploration, we highlight facilitating and inhibiting factors that influence learning dynamics in order to fuel the development of knowledge management approaches within the particular work context of IS.

Theoretical background

LEARNING DYNAMICS ACROSS KNOWLEDGE AND SOCIAL BOUNDARIES

This research fits into the current literature on the management of learning situations (Cohen 1998). Researchers consider knowledge is not only carried by individuals but also by technical systems (databases, IT solutions, machines), management rules and values (Leonard-Barton 1995), mobilized in spanned but distinctive work groups (Montgomery, Oliver, 2007). Individual behaviour can be affected differently by social and cognitive structures (March, Olsen, 1976) within the same organization. In fact, the nature of a group's boundaries influences the ability of its members to influence other members and groups (Hernes, 2004). It is therefore important to distinguish between socially constructed hierarchical groups and autonomous communities when studying organizational learning (Cohendet, Diani, 2003).

Some social learning approaches (Lave, 1991; Orlikowski, 2002) highlight the learning impact on organizations when, as a hierarchical group, project team members go beyond knowledge boundaries (Carlile, 2002) and learning boundaries (Scarborough et al, 2004). These boundary perspectives respectively take into account the different knowledge attributes in projects and the ability to transfer learning between projects and other organizational units, thus contributing to the study of boundary-spanned activities (Montgomery and Oliver, 2007).

2. The authors define knowledge brokers as people who participate in multiple formal and informal communities in order to facilitate the transfer of knowledge among them.

Two theoretical perspectives have proved particularly useful in understanding learning dynamics across boundaries in an IS context: the project-based learning perspective and the practice-based learning perspective. These theoretical lenses can reflect the “sites of difference”³ (Abbott, 1995) found in project teams and communities of practice participating in local and broader learning dynamics in IS Departments.

SOCIAL BOUNDARIES AND LEARNING DYNAMICS FROM A PROJECT-BASED PERSPECTIVE

The project-based learning perspective explores the horizontal dimension of projects in order to highlight the capacity of these organizational units to support acquisition and knowledge creation across functions (Carlile, 2002), within projects (Ayas and Zeniuk, 2001), and between projects and other organization units (Scarbrough et al, 2004).

Project teams are supported by cross-sector disciplines and a canonical mechanism since they are regulated by a hierarchical authority (Cohendet, Diani, 2003) and temporally bounded task-setting. Learning within projects depends on the relationship between participants and their adherence to the projects in question (Hatchuel, 1992). More broadly, it indicates a cooperation device founded on the understanding of different perspectives of action in order to achieve a pre-determined common goal.

The project is thus a boundary spanning activity (Scabought et al, 2004), where social boundaries are based on a prescribed area of interaction made up of formalized rules that structure membership, discourse, participation, temporal dimensions and authority structures. In this work context, project managers coordinate project teams (IT workers' boundaries) and stakeholders (users' boundaries), and encourage cooperation at different levels of interaction in order to complete their project. They are boundary spanners (Levina, Vaast, 2005) in the meaning that their role is to encourage the sharing of expertise by linking two or more groups of people separated by location, hierarchy, or function. The cooperation through these different boundaries is both the process and the result of an individual, collective and organizational learning dynamic, based on interaction between those involved. In order to promote this cooperation, project managers need to apply their capacity to enact “actionable practice” in different situations (Orlikowski, 2002). They often create a new emergent field in practice to create combined knowledge from different groups (Levina, Vaast, 2005). This capacity to enact is based on three types of cognitive knowledge: device (technical knowledge), procedural (process, methods, rules for action) and strategic knowledge (decision-making) (Gott et al, 1993). This knowledge is not always as present as desired in the rules

and resources imposed or allocated by the IS Department for their ongoing projects. Project teams can transform it through the “learning-by-doing” dynamic that can be created more informally according to the project situations. Such practices within projects are heterogeneous, and sharing knowledge within groups like communities of practice can reinforce this capacity.

The integration of different sets of knowledge in these ephemeral units and the diffusion produced by them in organizations are largely discussed in the project-based perspective but researches partially respond to the limits concerning the accumulation or the deposition of knowledge in a more long term. Considering that project working practices have their own logic of action (Hansen, 2002, Brenen et al., 2004), we first suggest that the strengthening of the practice-based perspective can help us to better understand embedded practices from IT project workers in a more informal and long term viewpoint.

SOCIAL BOUNDARIES AND LEARNING DYNAMICS FROM A PRACTICE-BASED PERSPECTIVE

Situational theory offers a general framework for analyzing activities located and organized in a social context. Lave (1991) for example, is interested in knowledge acquisition in situations or “*situational social practices*”. Taking this work as a starting point, Wenger (1998) conceptualizes communities of practice (CoP). This theorization is anchored in the idea that learning takes place in a privileged way via interactions between individuals confronted with the same tasks and strongly engaged in the same field of knowing. This theorization proposes a social perspective for learning by taking the relations between organizational knowledge and collective action into account. Wenger shows how members of a CoP deal with ambiguous situations and institutional tension in their daily routines, how they create sense (the individual aspect) and negotiate meaning (the collective aspect) in practice. Wenger suggests that learning emerges from practice and continuously evolving routines in daily activities. Practice constitutes a support for collective memory and contributes to creating the frames of interpretation required to achieve tasks.

These autonomous communities are founded on voluntary membership according to certain values, norms and collectively shared interests. Discourse, coordination and learning are structured in this area of interaction via identity. The most “dramatic knowledge creation” is likely to occur in this kind of group (Cohendet, Diani, 2003). Communities of practice tend to stabilize individual commitment in uncertain contexts and update cooperative forms, depending on a situation's specificities. The duality between “*the participation of actors*” and “*reification of practices*” is central to

3. Abbotts (1995) suggests that shared cognitions and social constructions respectively represent symbolic and social boundaries that distinguish one group from another.

this regulation process. The participation of CoP members is revealed through the exchange of ideas and information, the discussion of problems and discovery of new solutions, the shared evaluation of new work situations, etc. These interactions continuously build shared practice, which reflects the collective learning of the CoP members, and the relations and identities that individuals develop. The informal and spontaneous character of the CoP supports the interactions facilitated by the shared history that their members experience in a work context. The common knowledge that they progressively create generates a shared repertory that supports the routines in the CoP and knowledge transfer. However, it is important to create complementarity between CoP and other more traditional coordination mechanisms (Cohendet, Diani, 2003) in order to avoid the risk of failure in the CoP, such as exclusion or deviation from organizational rules (Castro Gonçalves, 2007). The practice-based learning perspective underlines the embedded nature of knowledge and the notion of identity in practice.

We shall now turn to how these informal and emergent organizations interacts with more formal, ephemeral and prescribed organizations such as IT projects and how this level of action can interact with the structure level of organizations.

DEVELOPING A BIMODAL AND MULTI-LEVEL VISION OF LEARNING DYNAMICS

Our emphasis on the complementarity of projects and communities of practice helps us understand how embedded learning dynamics are absorbed by organizations. At present, research that focuses on one or other of these groups' properties fails to provide a representative view of the complexity of organizational learning (Bootz, 2009, Scabrough et al, 2004). As argued Bresnen et al. (2004), structuration theory helps to conceptualize the introduction of new practices in organizations in which decentralization and diversity of practice are the norm.

To construct a theoretical framework that dynamically combines both perspectives of the learning process, we refer to Giddens' (1984) concept of duality of structure, a concept incorporated in the theory of structuration. This rich and multi-faceted social theory is compatible with the vision of the world advanced by Wenger, and places the study of the dynamics between the project and CoP within a broader organizational level.

The concept of structural duality provides insights into the recursive articulation between structure (rules and resources) and collective action (social interactions) in accordance with a relationship that facilitates or restricts learning in groups. In structuration theory, interactions between the participants and the social structures become indivisible. The structure enables action which is reproduced simultaneously in the interactions between individuals. It is thus the means and the result of the action, which it organizes in a

recursive way. For Groleau (2000), rules and resources make it possible to connect technical and social aspects of the system and approach dimensions associated with power. Actually rules can be interpretative (rules of signification) and normative (regulate the legitimization of actions) and resources are constituted in one hand from power relationships (resources of domination) and in another hand from economic aspects (Giddens (1984).

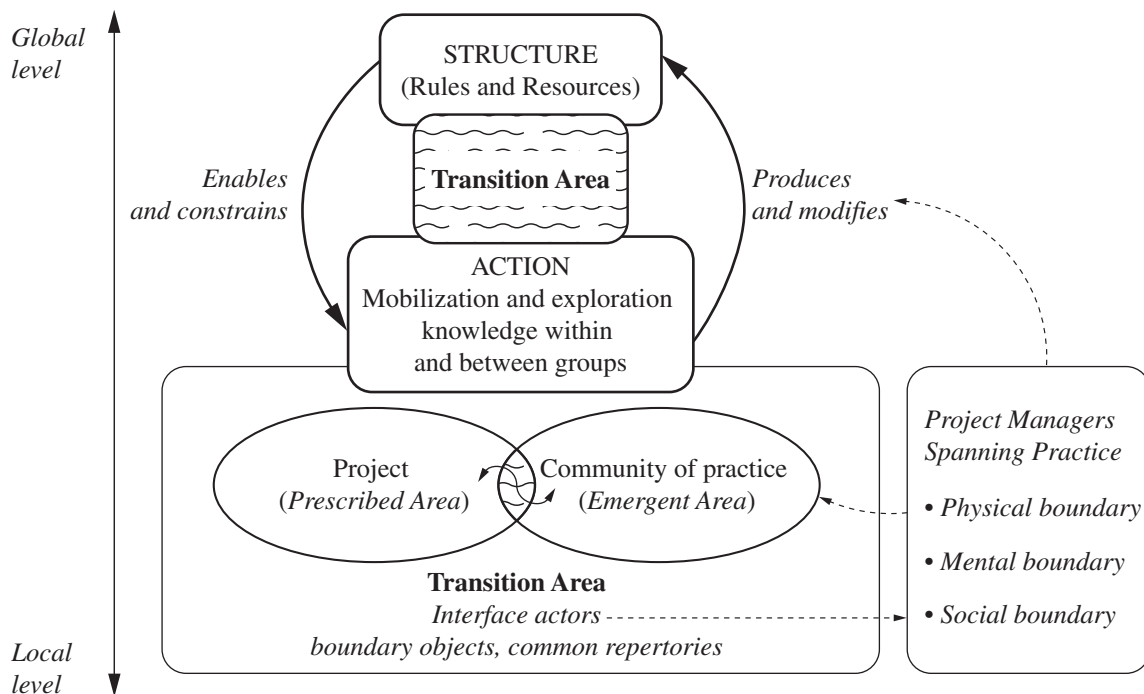
Rules and resources are the product of a mobilization and knowledge creation process (Romelaer, 1998), which is shaped by the blending of individual interactions at local level and by the structure at global level. This dynamic between action and structure brings to the fore the capacity of rules and resources to entitle and force action (Giddens, 1984). Collective learning develops in accordance with this dynamic and the reflexive movement between the two levels, as a continuum.

The level of action within this conceptual framework is bimodal. Rules and resources are transformed by the mobilization and exploration of knowledge in daily practice, and by participation in the project mode and in the CoP mode. The project is regarded as a prescribed area of interaction and CoP as an emergent area of interaction insofar as it is not defined by the organization but by the various informal interactions that occur within it. We take IT projects as point of entry for empirical observations of CoP, which can be relatively difficult to locate within the organization. The link between the two operating modes is formed by a transitory area where the interface actors, the common boundary objects and shared repertoires circulate. These elements ensure intermediation between the two operating modes and, more broadly, learning between IT projects that crosses three invisible boundaries (Hernes, 2004): mental boundaries (ideas and concepts linked to technologies), physical boundaries (rules of action in projects) and social boundaries (representation of practices and professions linked to identity). While these invisible boundaries can be considered as distinguishing attributes of knowledge, they also enable us to explore the relationship system between this knowledge and the structures in which it occurs.

The duality of structure concept enables the micro-social level to be determined in its daily activity. This study examines the way in which IT project managers mobilize and explore knowledge across boundaries. By their daily transformation of rules and resources, they develop a learning dynamic in the recursive relationship between the project, the CoP and the IS Department structure. This organizational dynamic is illustrated in figure 1. This reading of learning dynamics takes the evolution of individuals (project manager) into account within the "sites of difference" (Abott, 1995) that distinguish both groups (project and CoP) and organizational change. This interactional analysis raises key questions linked to both cooperation and coordination between distinctive work groups, and the role of representations and collective beliefs in the creation of knowledge production and transfer situations (Cohendet, Diani, 2003). Our goal is

FIGURE 1

The learning dynamic through the interaction between project, community of practice and the organizational structure



to provide knowledge management perspectives with a multi-level and integrated approach that associates networking activities through invisible boundaries, learning effects and organizational change.

Methodology

The findings reported in this paper are based on a qualitative analysis of an embedded case founded on two IT projects that interact with the same community of practice in the IS Department located in France of a multinational car manufacturer. In order to define the perimeter of our study in the company and construct our methodological approach, we followed the tradition of research mobilising practice theory (Wenger, 1998; Orlikowski, 2002; Levina, Vaast, 2005; Rouleau, 2006). Indeed, our presence during 6 months (4 days a week) in the IS Department allowed us to develop an ethnographic investigation (Golden-Biddle and Locke, 1993) based on direct empirical observations of what people do, what people say and with whom they interact daily. Our objective was to understand learning dynamics as a social phenomenon in its natural context through an in-depth analysis of one case study (Royer and Zarlowski, 2001). Thereby, we negotiated a privileged access to this field with the top management of the IS Department. Our researcher status was known from actors observed during the immersion phase in the company but our role as project management assistant, was predominant during daily formal interactions (project

meetings, formal presentations, working in co-presence) and informal interactions (coffee break, lunchtime, informal meetings) with actors related to the projects (project managers, IT experts, top management, project clients, consultants, work colleagues, suppliers and hierarchical managers). This role was sufficient to legitimate our presence in the organization as a “co-worker” without influencing the practices of actors in a significant way. In fact, we were in charge of peripheral tasks (organize meetings, search forms, read documents, etc.) related to one of the projects analysed. As demonstrated by researches from practice theory field, this interpretative approach is substantive to gain familiarity with the context and to capture collaborative processes in emergence and the circulation of tacit knowledge, particularly those that are embedded in actors’ subjective dimensions of practice (Gherardi, 2010).

A spanned sample was constructed progressively by observing and mapping the social interactions of both IT Project Managers regarding their practice during the implementation of their projects. The people network analysis offers a rich understanding about individuals, groups and organizations relations (Angot, Josserant, 1999). First, we set up the work context of the **Hosting Website Project** (goal, stakeholders, technologies, rules, informal relationships, etc.), thereby identifying the connection with the work context of the **Converging Configurators Project** (same strategic goal from users, same client, the first IT

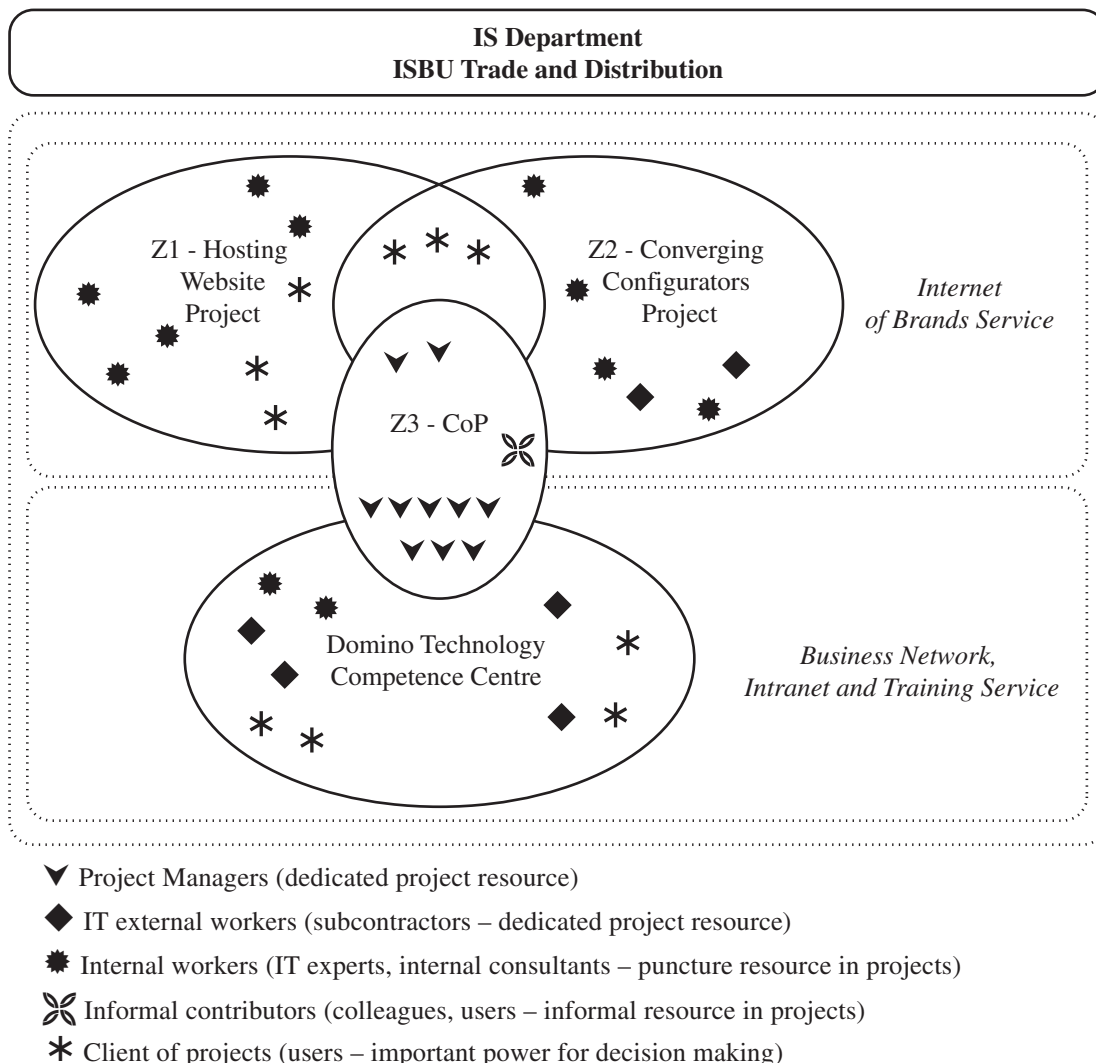
Project Manager is the person in charge of the Project Manager of this project) and with a **community of practice composed of project managers** (both IT Project Managers are members of this CoP) that emerged in a technological competence centre. These formal and informal units composed three interaction zones (Z1, Z2 and Z3 respectively) observed in this research. These zones comprise the different actors involved with the IT Project Managers, including the sample of 8 IT Project Managers from the CoP. 10 Project Managers were in the centre of our observations (8 from the CoP and 2 from the both IT projects). The figure 2 shows the spanned character that represents the richness of the sample.

The investigation of these interaction zones was guided by a general list of topics drawn from the literature areas reviewed earlier (see figure 1). We carried out a detailed *in situ* observation to capture the narration of practices in

different situations related to the projects (Rouleau, 2006) and share the project teams' routine. Every daily observation (actions, discourses, interactions, behaviour) was recorded in a notebook. We enjoyed the flexibility of the ethnographical approach to combine different data collection tools. Our participant and continuous observation was completed with two individual semi-structured interviews with each Project Manager (20 interviews in total at the beginning and the middle of the observation period) and a collective semi-structured interview with the 10 Project Managers members of the community of practice (at the end of the observation period). Individual interviews were approximately one hour and a half in length and the collective ones were 3 hours. All interviews were tape-recorded and transcribed. The main themes used in interview guidelines were: the features of projects, the difficulties and solutions implemented (goals, stakeholders, management, contextual situations, human resources mobilised, experience and knowledge developed,

FIGURE 2

A Spanned Sample through boundaries of projects and a community of practice



artefacts created/explored), the features of the community of practice (members, role of the members, knowledge, routines, history, artefacts created/explored, link with the projects, IS Department support), the perception of the structure IS Department (strategy, rules, resources, culture, managerial tools, relationship with hierarchical people). Background data, including the relevant organizational and project context, were also consulted. This combined data collection method facilitates the emergence of new insights and enhance the external validity of the research.

As well, our research design allows us to vary strategies of interpretation (Royer and Zarlowski, 2001). We structured chronologically the huge volume of data into a monograph according to the categories required in qualitative research (Pettigrew, 1992): the content, the context and the process. By using the guidelines from grounded theory (Glaser, Strauss, 1967), we refined data analysis through an iterative co-evolvement between examinations of data and development of theoretical interpretations. In exploring the embedded practices related to the two different projects, we were able to create maximisation and minimisation tactics of many factors by identifying similarities and differences through the learning dynamics analysed (Glaser & Strauss, 1967). The replication logic applied to these different zones of interactions ensures the external validity of theorization (Eisenhardt, 1989). The opportunities to verify the plausibility of our interpretations responded to the criteria of credibility and authenticity of qualitative research (Miles, Huberman 1994). In addition, the focus on the social dimension and processes offered an in-depth account of knowing in practice (Orlikowski, 2002) and responded to the need to design methodologies to explore work contradictions (Engeström, 2006).

The Empirical Perspective: observing practice and structure in the IS Department

THE IS DEPARTMENT CONTEXT THROUGH ORGANIZATIONAL CONTRADICTIONS

Attached to the “Innovation Quality Department”, the IS Department is expected to contribute to the company’s innovation and strategy by managing evolutions in IS for all of the international group’s activities.

The introduction of “new IT” led to a certain number of changes in the IS Department: internalization of IT projects, growth of IT developments, significant customer demands, and challenging new knowledge and skills. To meet these needs and to facilitate the development of business knowledge for the IT workers, a new organization was deployed in 2000. The IS Department has been organized in IS Business Units (ISBU). The greatest number of the 1000 IT workers of the IS Department has been regrouped according to the 5 business units (BU) from the French car manufacturer: Product and

Process, Industrial Manufacturing, Human Resources Management and Purchasing, Finance Corporation, Trade and Distribution. The two IT projects and the community of practice we studied were located in 2 of the 3 different units located at the ISBU Trade and Distribution. The IT projects were located in the “Internet of Brands Service” and the CoP was located in the “Business Network, Intranet and Training Service”. The third unit was “Marketing and CRM Service”.

Other complementary actions were deployed in line with this organizational structure in order to reinforce the project management policy and standardise practices within IT projects. The IS Department tried to encourage the internal development of skills and control the complexity of data-processing projects by stepping up its formal rules via an increase in the number of validation and follow-up stages in the project process. This made the process linear and required considerable formalization of the activities carried out during the projects. Various actions were implemented to this end: creation of standard forms to fill in (specifying the technical and functional project information details), creation of partnership contracts between the various participants (specifying the role of each participant involved in the project and the stages to be respected), putting the documents produced at the time of the projects online, creation of a consultation body and quality methods aimed at coordinating the teams in the course of the project and at re-utilizing the successes of preceding projects. While these step may at times appear difficult to follow, they were designed to be adaptable to all the projects developed in the IS Department. Training focused on these rules was obligatory for all new project managers. In this context, internal quality consultants acted as the guarantor of rules and the use of activity-formalization tools.

All of these actions adopted by the IS Department therefore reinforced IT project boundaries. On the other hand, project teams needed a more flexible context to work in so as to appropriate new technologies and practice. The community of practice thus emerged from these work contradictions. Different knowledge management initiatives based on a social perspective of knowledge transfer were introduced by the hierarchy (work groups focused on integrating new IT, presentation of projects developing specific technologies, reporting meetings...). These initiatives centred more on the new technologies (device knowledge) rather than on the evolution of project practice (strategic knowledge) and IS Department rules and resources (procedural knowledge) required. Most of the knowledge centre’s interaction with actors in an IS context failed to be seriously taken into account. The community of practice represented a pool of other forms of knowledge for IT project managers.

THE EMERGENCE OF AN IT COMMUNITY OF PRACTICE

A community of practice was identified within this strongly formalized and hierarchically arranged context, which was at the origin of a Lotus Notes technology skills hub (called

Domino Competence Center) created on the initiative of one manager. This formal unit was created in the beginning of organizational change in the IS Department. The manager brought the participants together on a project platform, seeking the transfer of old to new technologies using an external consultant with a brief to take part in the IT projects and to transfer this technology knowledge. The organizational unit adopted a “*learning by doing*” approach insofar as its objective was to develop Lotus Notes skills via the implementation of the projects. The unit, initially composed of 15 Project Managers, (including the 10 that we studied) was characterized by freedom of its members to organize themselves autonomously and to exchange information and knowledge about ongoing projects. Distinctive operation rules and routines were gradually created in the IS Department. External consultants and internal IT experts participated punctually on the daily life of this unit, during the implementation of various IT projects.

As the IS Department gradually developed the technological skills required, the Project Managers joined other departments. Five of them left for other departments located in other sites in the Paris Region and in the same building, eight of them integrated the “Business Network, Intranet and Training Service”, and two others (Pierre and Françoise) joined the “Internet of Brands Service”. For those that stayed in the same building, in spite of the group’s spread throughout the organization, informal meetings and rituals that had been developed continued to take place during breaks, at coffee machines, during meals and in offices. Their common history thus created a social link that went beyond the formal boundaries of the skills hub, and a community of practice (CoP) was born. This change led to an evolution in the knowledge field of its members, which was extended to Internet technologies. Subjects of discussion covered technological developments, the project’s implementation, and evolutions in the IS Department and IT fields in general.

The specific language developed by the group indicated their membership. In fact, newcomers to the IS Department, external consultants and internal IT Experts often felt excluded from the informal meetings.

This informal group thus bore all the hallmarks of a community of practice: a common history created during the creation of the skills hub, common knowledge which is that of the context and the integration of Internet technologies framework, the shared repertory inherent to a specific language, and daily ritual.

Before piloting the “Website Hosting Project” in the “Internet of Brands Service”, Pierre had played an important role in this organizational unit’s development. He was a principal founding participant and was also the only one with prior experience of Lotus Notes technology. In line with the hub coordinator’s aim to support skills development by socialization, he shared and developed the team spirit. In sharing his knowledge spontaneously, he encouraged sharing between the other people involved in the project, and also

built legitimacy among the other newcomers. After leaving the hub, he continued to take part in the CoP’s informal meetings.

The Converging Configuration Technologies Project Manager, Françoise, was recruited to develop an IT project within the hub. She was directly linked to the CoP members, and she gradually adopted the CoP’s language and routines until she was fully integrated. In spite of her subsequent move to Internet of Brands Service to pilot this project, she also remained a member of the CoP.

The CoP thus included the Project Managers of both the IT projects studied. We shall now present the dynamics created within each project and their interaction with the CoP and the structural level of the IS Department.

Analysing reflexive learning dynamic through spanned zones of interaction

Both internet projects studied were part of the implementation of the global strategy of the IS Department that aimed to centralize and mutualise IT resources. The idea was to control the technological heterogeneity generated by multiple local website developments within the corporate site and international subsidiaries. A workgroup program was created at the same time as the launch of both projects. The program was to define an “implementing and user charter” stipulating the rules (technology choice, billing to internal users, uses, obtaining licences, etc.) for web technology adoption. Sometimes the internet project served as a “learning reservoir” for the workgroups, offering representative situations in terms of new web technology adoption. Sometimes the projects were restricted by rules when it was formalized prior to certain activities in the project. As mentioned the responsible of the program, because of the time-lag in the two structures’ activities, the workgroups were rarely in a position to offer new knowledge to internet projects giving a feeling of practices evolution not controlled.

“They go on faster than us! We say that we will host a web site with specific characteristics, but the day after the web site won’t be the same!” (verbatim from the responsible of the workgroup program).

The Website Hosting Project and the Converging Configurators Project had the same clients (represented by managers from 5 headquarters’ Business Departments: Internet Projects Department, Export Department, European Department, African Department and Asian Department). The learning challenge to the IS Department was disregarded by the project’s client. For them, IT project teams must be able to respond to their strategy: master and implement IT developments allowing them to centralise and better determine sales policies and communication actions implemented by international subsidiaries.

Both projects were launched at the same time and had initially the same lead time (6 months). However, they had

their own context (goals, technologies, stakeholders). Therefore we present and analyse each zone of interactions related to each project separately, followed by a discussion where we offer a comparative analytical overview.

ZONE 1: LEARNING DYNAMICS IN THE WEBSITE HOSTING PROJECT AREA OF INTERACTION (Z1)

AN EMBEDDED IS WORK CONTEXT FOCUSED ON SOCIAL INTERACTION COMPLEXITY

The aim of Website Hosting Project was to host all the international subsidiaries websites of the company (approximately a hundred) within the corporate IT infrastructure. The decision to carry out this project was taken during an informal meeting between the CEO and the CIO. Because of this atypical origin, different situations became sources of ambiguity in the project and highlight the needs in terms of knowledge management within this work context:

- Poor interactions across multiple boundaries at the local/global level: Pierre was the only resource entirely devoted to the project. The Internal Consultant and the Technical Manager in charge of the workgroups program, were punctual resources officially allocated by the IS Department. In addition, Pierre was in contact with a wide range of participants in corporate and subsidiary companies who were not entirely dedicated to the project (at the head offices: the User Project Manager and the five Business Managers, at each of the hundred subsidiaries concerned: the CEO, the marketing director, the webmaster and the web agency). In consequence of these multi-stakeholders with different perceptions of the project and the IS Department activities, Pierre had difficulties to cross these multiple boundaries and persuade others of the interest of the project. This factor negatively affected the horizontal cooperation and the collective sensemaking within the project.
- Deviant use of a boundary object in the prescribed area: project implementation was based on a primary study that underestimated the cost and the effects of the project within the organization. The different participants gradually discovered the technological⁴ and organizational⁵ complexity during the project's implementation, and the clients refused the excessive modifications in terms of cost, time and quality. This situation gave the IS Department a poor image within the company. The participants tended to use the study as a boundary-object to put pressure on Pierre in line with a formal customer/supplier relationship at the local level.

4. One set of results of the IT workgroup program showed the incompatibility between different technologies used on the subsidiaries websites and the difficulty to integrate them in the existing corporate IT infrastructure. They recommended phasing out some websites in order to change the technology used.

- A nominated boundary spanner without resources: the undervaluation of resources for the project intensified the IS Department's problem in terms of legitimacy, especially for Pierre. He had neither the autonomy, nor the authority needed to pursue the project. In accordance with the project management policy, Pierre had to formalize in reports all his actions in detail in order to validate them with the clients. However, respecting the rules did not help him manage the difficulties involved in producing and obtaining the resources needed for the project's implementation (technical and functional knowledge about websites and more widely about web technologies, website hosting skills, information about marketing constraints in the subsidiaries using websites, etc).

These ambiguous situations highlight the complexity of the IT work context in catalyzing interaction between the different actors through boundaries. We will now show how Pierre attempted to mobilize knowledge and transform rules and resources to overcome the problems of cooperation between the participants in Z1.

Enacting knowledge from practice and transforming Resources and Rules: a learning dynamic focused on a formalization mode

Three main factors influenced the mobilization and exploration of knowledge in the prescribed area:

- Given the absence of a project team, the project's implementation was marked by the strong individual "responsibilisation" of Pierre. The other non-dedicated participants did not respect the task schedules or provide the information required. However, the rules were formalized, widely disseminated and presented as a condition of the project's success. This led to project delays and mutual incomprehension between the different stakeholders. New project management tools were then implemented by the internal consultant in order to control the quality of the project⁶. The exploration of this procedural knowledge did not enable Pierre to develop cooperation and new coordination rules.
- Pierre used the monthly meetings to present the project's progress so as to raise the participants' awareness of the difficulties linked to technological incompatibilities and non-cooperation aspects.

"I try to make them understand [*the stakeholders of the project*] this project represents the development of a new activity within the IS Departement.

5. For example: rules of invoicing the hosting, the signing or the breaking of technology license, the rules of website management and technological choices.

6. We referred to risk management tools, progress reports and a cost control tool to assess the number of days worked within the project.

We have never been a web site hoster. If the clients don't collaborate, we can not develop the necessary knowledge allowing us to carry out the project!" (verbatim from Pierre).

These meetings were intended to create a collective interpretation of the project and to transfer devices and strategic knowledge. However, they were perceived as opportunities to justify the project's delay. In addition, the meetings with the IS Department participants took place separately from the project's customer participants. This curbed the stakeholders' cohesion and failed to promote knowledge exploration. In addition, Pierre was unable to increase his legitimacy to mobilize the resources required.

- The project's formalized structure became a "guide-rail" for the roles initially described in the project tools. The roles remained rooted and did not allow for any adaptation to the project's frequent changes. Pierre frequently acted to increase his legitimacy with regard to his customers but this did not reduce the tension. He decided to reinforce the IS Department's project policy rules and requested the participation of the top management to support his decision. He tried to achieve legitimacy by reinforcing practices that were already recognized as forms of action.

In this constraining context which led to numerous problems between the participants, Pierre tried to bring new knowledge out of the boundaries of the prescribed area of the project. Two main actions illustrate this attempt in the emergent area:

- During the annual meeting between the webmasters from the different subsidiaries, Pierre had access to many devices and a great deal of strategic knowledge about websites and subsidiaries work context. By presenting the project's difficulties, he indirectly grabbed the participants' interest. As the webmasters expressed their interest in more cooperation in the project's implementation, the project manager decided to invite them to the project meetings. However, the functional department managers refused to accept this new coordination and cooperation rule. They felt that the webmasters should not take part in decisions concerning the subsidiary companies' technological choices and their confidential business activities.
- Pierre frequently took part in the CoP. However, he was unable to mobilize resources within this informal unit because the members were not familiar with the specific context of his project. Pierre had more experience than the other CoP members. He often transferred new knowledge rather than mobilizing it. The learning dynamic between the project and the CoP could not be observed in this field of interaction but took place more widely in the collective action of the IS Department. By sharing the stories of their projects,

the members of the CoP offered Pierre new points of reference concerning the practice of IT Project Managers.

We now turn to the analysis of the second case.

ZONE 2: LEARNING DYNAMICS IN THE AREA OF INTERACTION IN THE CONVERGING CONFIGURATORS PROJECT (Z2)

AN EMBEDDED IS WORK CONTEXT COMPLEXITY FOCUSED ON MUTUAL RECOGNITION OF LACK OF KNOWLEDGE

The aim of this IT project was to merge two different configurators in a unique IT solution. This web technology allows website users to configure a car (color, design, accessories, etc.) and simulate its finance by the company. The French car manufacture could then offer its potential clients the option to personify their car before buying it. The "French configurator" and the "English configurator" had a good performance record and functional complementarities. However the technologies used had different properties. The head offices of the three business Departments (Export Department, European Department and Internet Project Department) therefore wanted to merge them and then integrate them into the international subsidiaries' websites. Subsidiaries in 23 countries would implement the unique configurator subsequently.

Sources of ambiguity in this IT work context included mainly the lack of knowledge within the project team and the privileged relationship between Françoise and her hierarchical responsible, Pierre:

- Rich interactions across multiple boundaries at the local level: The project team included Françoise as IS Department Project Manager, an IT Internal Expert and an External Consultant engaged by the project's client. While the role of the consultant was to provide strategic knowledge about the business company and to specify the project requirements, the expert was there to provide general Internet technology knowledge. In addition, the IT workgroup program was mobilized to put forward proposals for the project's development. The IT project team firstly faced the difficulty of making the project expectations explicit, notably the implementation of the design features. It was only the second IT project that the young Project Manager had been in charge of. She needed to develop device knowledge (Internet technologies, configurators, integration within existent IS, technical aspects, etc.), procedural knowledge (rules to ensure coordination, agreement processes for operation set-ups, the functional department's operating mode) and strategic knowledge (evolution of project requirements, mobilization of resources) to carry through the Converging Configurators Project. Thirdly, the Technical Expert had little experience of the configurator technologies, and the

External Consultant's knowledge was insufficient to define the project requirements.

The project team therefore operated via experimentation through an intense communication process across boundaries at the local level. While the project team members progressively discovered the technical specificities of both technologies, they came up with proposals to implement a unique IT solution. This situation generated coordination problems and misunderstanding of the proposals put forward, but also indicated the mutual recognition of the team's lack of knowledge.

- An autonomous nominated boundary spanner: The affinity between Françoise and Pierre individuals went beyond their hierarchical relationship. Pierre allowed Françoise to adapt the formal project management policy to her strategic view in order to deal with conflicting relationships between business managers. As said Françoise, this autonomy offered her more flexibility within the project and motivated her to look for new resources by relational actions:

"It's advantageous passing through my hierarchical responsible before contacting other people because he's a person who encourages his teams and it can avoid certain misunderstandings related to the implicit rules from relational actions" (verbatim from Françoise).

The adaptation developed encouraged Françoise to deviate rules from the project management policy from the IS Department. As we will show below, this initiative created ambiguous situations with the Business Managers.

Enacting knowledge from practice and transforming Resources and Rules: a learning dynamic focused on a socialization mode

The mobilization and exploration of knowledge in this interaction area is marked by an intense spanned activity between the prescribed area and the emergent area. Françoise's ability to seize emergent opportunities within and across the project boundaries allowed this interaction. She privileged socialization within the team (meetings to validate actions or to discuss the project process, informal discussions) rather than the formalized mode imposed by the IS Department.

Given the lack of knowledge within the project team, this strategy created cohesion based on mutual trust. However, this was not enough to develop the knowledge needed. Françoise therefore called on a colleague who was on the boundary of the CoP. He did not take part in the informal discussions as frequently as the other CoP members, but he was recognized as a member and shared their common references. He had already carried out a project based on the configurator technology. In addition to sharing stories about their respective projects, Françoise questioned him or consulted him about technical and managerial aspects regarding the evolutions or the difficulties encountered during the

project's implementation. The trust the other team members placed in her enabled her to combine this knowledge with the existent knowledge within the team with total autonomy.

In fact, in one situation, when the project was running behind schedule, she deviated from certain IDS project policy rules in order to speed up the project. Formalization of actions on the required forms was neither very regular nor very detailed. Moreover, she did not validate them systematically as was normally required. This deviation regarding the rules is the expression of a "defensive position" in a context of change (Abbott, 1995). Françoise created new rules and put more focus on a cooperative logic instead of the "client/supplier logic" embodied by the project policy.

Instead of the positive results of spanned local learning to the Converging Configurators Project, the learning dynamic is partially established at the local/global level. The trust between Françoise and her line manager gave her greater autonomy and boosted her ability to explore device-related, procedural and strategic knowledge across the boundaries of her work context. The CoP had a key role in the collective action as it improved the IT project performance. Françoise increased the number of formal meetings as she went along which allowed her to gather and combine new knowledge. These face-to-face interactions represented "interpretation occasions" allowing her to construct with her team a new field joining IT and business knowledge. Paradoxically, her autonomy also caused tension with the business managers. The repeated interactions were misinterpreted by business managers because of formalization. With the client's increased mistrust towards the IS Department because of the Hosting Website Project delays, the clients were wary of the knowledge that had been gathered and the implementation of the Converging Configurator Project, and they criticized Françoise for not respecting the formalization and validation stages during the project. Boundary Objects created *a posteriori* by the project team had power legitimacy over clients of project.

Discussion: perspectives for knowledge management from two contrasting learning dynamics in an embedded IS work context

The present study offers an exploratory account of learning in organizations through a comparative analysis of two spanned zones of interaction in an IS Department. In spite of having the same structure in the organizational context and empirical similarities between the projects, the structural approach and the social boundary perspective provided us with two contrasting learning dynamics. The signification and legitimization processes are different according to the degree of domination aspects in projects. The practice-based lens is useful to understand project-based situations and structures in organizations. The findings show how Project Managers develop their social work context by mobilising knowledge through physical, mental and social boundaries

(Gott et al, 1993). The analysis of the recursive relationship at the local level of action and the global level of structures allows us to identify facilitating and inhibiting factors in the learning process and contribute to re-thinking the convergence between IT project management governance (Lindkvist, 2004) and knowledge management (Srikantaiah, et al., 2010).

Renewing technologies structures activities in IS context but IT project governance should integrate strongly relational dimension (networking, collaborative relationships) through rules and resources allowing the signification and the legitimization of new practices in order to facilitate the circulation and the accumulation of knowledge in organisations. This approach consists to take into account technologies as social artefacts (Orlikowski, 2002) in management practices and policies. We turn now to the specificity of these rules and resources and their effects.

AUTONOMY AND LEGITIMACY AS FACILITATING FACTORS TO EXPLORE KNOWLEDGE THROUGH BOUNDARIES IN AN IS CONTEXT

The first zone illustrates a “learning process by reaction and formalization” and shows how the project managers found it difficult to overcome social boundaries. The resource of domination used by the project client through a highly formalized relationship reduced the Project Manager’s autonomy. Artefacts mobilized within the project (contract, forms, planning tools, reports and written accounts) reinforced the physical boundaries and limited the Project Manager’s capacity to mobilize strategic knowledge within and without the prescribed area. His lack of autonomy and the negative IS Department representation from the Business Managers were inhibiting factors in the learning process and reinforced the constrictive character of the structure with regards to action. The imbalance of the rules of authority with the rules of coordination and cooperation created a vicious circle: the tenser the situations, the more they were formalized, and the more formalization there was, the tenser the situations became between the participants. Signification process is than inhibited (Giddens, 1984).

The various factors that impacted on Pierre’s practice created an imbalance between the physical, mental and social boundaries, the former being reinforced to the detriment of the other two. The social boundaries became impermeable, despite the numerous interactions between actors. The clients’ supremacy kept the Project Manager from crossing physical boundaries to mobilize new resources. The organizational rigidities of the IS Department generated the opposite effect. Top management only reacted when the project situation become extremely tense and action would otherwise have been blocked. They thus restored the project’s progress by imposing the limited and fragmented participation of the stakeholders.

The learning process was thus triggered “by force” in reaction to the Project Manager’s mobilization of knowledge. The effects of domination avoid the process “disembedding” and “re-embedding” knowledge (Giddens, 1990), “it sticks where practice is not shared” (Brown and Duguid 2001). Actually, Knowledge creation remained nested at project manager level. In this case, the CoP provided moral support in terms of professional identity and IT Project Manager practice in the context of continual IS Department change. However, this knowledge creation was not enough to ensure good project performance. The project finished one year late. Globally, the IS Department top management team became aware of the impact of the work context’s specific features on the project performance. The organizational learning generated from this local dynamic led to the creation of a new rule (now IT project managers are physically placed in business department during the project implementation) and a new resource (a technical transitory platform,⁷ created during the implementation of the “Website Hosting Project”, could be widely used as a new IS Department artefact.

The second zone illustrates a “learning process by emergent cooperation”, and shows the Project Manager’s ability to overcome project boundaries to mobilize knowledge in the CoP. Physical, mental and social boundaries are crossed by the boundary spanner to mobilize and create new resources for the project. Despite the domination effect formulated by the customers, the Project Manager seized emergent learning opportunities, integrated new device-related, procedural and strategic knowledge into the project, and thus sped up the latter. The colleague “adopted” by the Project Manager became an interface actor to transfer knowledge across the CoP and IT project boundaries. This learning dynamic, facilitated by the IT Project Manager’s autonomy, made the mental, physical and social boundaries permeable. She used her legitimacy with project team members and her hierarchical manager to promote knowledge exploration within the project. The experimentation applied by the project team helped them to resolve adverse issues in the project performance, in spite of having less experience than the other project manager. Paradoxically, the IS Department tended to reinforce its structural rigidities.

Both zones of interaction show the importance of the co-construction of boundary objects through local/global level in order to become artefacts in practice and recognised by the structure. Legitimizing *a posteriori* a boundary object created in practice in the prescribed area or in the emergence area, or within the transition area (between both areas) is hardest, in particular if boundary spanners have not the support of top management in the structure level.

Table 1 presents the learning outcomes, the knowledge attributes generated and the facilitating/inhibiting factors identified in each learning dynamic.

7. This technical space allows integrating temporary IT in test phase, before the phase of industrialization when IT is definitively installed in existing IS.

TABLE 1
Analyzing two Learning Dynamics across IS Department Boundaries:
Recapitulative Findings of the Research

Learning dynamics	Learning outcomes	Attributes of knowledge generated	Facilitating factors	Inhibiting factors	IT project performance
Learning process by reaction and formalization	Reinforcement of formal project boundaries Strong permeability of learning at project manager level	Knowledge negotiation at the expense of technical and innovative knowledge (role of IS Department and IT project manager)	Active “troubleshooter” with wider organizational legitimacy Legitimacy of the project manager in the CoP	Project manager’s lack of autonomy	↓
Learning process by emergent cooperation	Deviation of formal rules in the structure (IS Department) Knowledge transfer across IS Department boundaries	Technical and management knowledge	Autonomy of the project manager in the project Legitimacy of the project manager in the CoP Availability of knowledge about ongoing project in the CoP	Sanctions by the structure (top management)	↗

FOR AN INTEGRATED SOCIAL PERSPECTIVE TO SUPPORT KNOWLEDGE MANAGEMENT IN AN IS CONTEXT

The analysis we put forward offers better insights into the impact of the IS work context’s complexities in daily IT project team practice. This perspective can fuel knowledge management systems based on social approaches in order to better incorporate the facilitating and inhibiting factors of the learning dynamic. Rather than create a separate system, it implies improving integration in the organization’s daily operations through the existing coordination and cooperation mechanisms. It is essential to take a critical look at organizational rigidities and project management policy to avoid the vicious circle whereby the more ambiguous the situation, the more formalization is reinforced, thereby inhibiting broader learning dynamics based on cooperation. The instrumentation of “socialization spaces” or “interpretative spaces” (Weick, 1990) as resources for learning is a prior condition to enhancing shared cognition and positively transforming local rules. This work context requires the negotiation of procedural knowledge in order to restore the permeability of social boundaries and construct the cooperative relationship needed to successfully complete a project on time.

In a context of permanent change, knowledge management systems can help develop the identity, culture and global structure of companies. This challenge can not be achieved with a knowledge management system focused

only on a codification approach (Mansour, Gaha, 2009). Three potential starting points could be developed. Firstly, the knowledge system should to work on the IS Department’s legitimacy with respect to business departments. The project team made too much effort at local level regarding the evolution of the perception of IS Department and this affected the performance of the IT projects. It should to be managed by another entity.

Secondly, we also need to be aware of certain deviations in project management. Companies may be tempted to allocate fewer human resources solely dedicated to certain projects. There is a trend towards “splitting” the work context, leading to the fragmentation of collective learning. When a project manager only works with actors assigned to complete tasks on a “one-off” basis, there is less opportunity to develop collective learning.

Finally, the knowledge system should to develop an ongoing search for a balance between the project, CoP and the organizational structure, with a special attention to project managers such as knowledge workers (Horibes, 1999). This relationship, constructed by project managers, has a positive impact on project performance. Our study shows that the creation of informal resources and rules conditions the construction of local strategies by IT project teams. It implies a coordination mechanism that encourages network activities, particularly with informal communities. Top management

can then play an active role as a “knowledge ambassador” in order to help problematic IT project situations be dealt with successfully. By making the organizational structure more flexible, they can ensure the porosity of boundaries and the exploration of new knowledge within and between projects and also in relation with informal communities. These points are worth exploring in more depth to improve integrated knowledge management system structure and define a more organic project management policy (Koskine, 2004). With regard to future research, we suggest that the investigation of power factors in the integration of embeddedness in organizational learning dynamics is a useful avenue to follow.

Conclusion

The present paper offers an integrative approach to examine learning dynamics in the recursive relationship between project, community of practice and organizational structure. Literature in Knowledge Management underlines the interest for integrative approaches (Carlile, 2004; Montgomery, Oliver, 2007). By combining social perspectives focused on project-based learning, practice-based learning and boundary literature, our findings highlight embeddedness and knowledge attributes in IS work contexts. We showed the positive effect of communities of practice, as a repertory of specific knowledge, on the performance of projects implemented in an environment of fast-paced technological change.

By taking into account the practice of IT Project Managers as boundary spanners, our findings emphasize the role of power in a more global learning process. The autonomy and legitimacy of IT Managers and the formalization degree of the structure clearly affect the permeability of boundaries in recursive learning dynamics. This perspective suggests the need to broaden embedded analysis from the local level of action to the global level of the organizational structure. The structural approach allows us to examine the transition from one level to another and provides a multi-level and non-linear research design. However, the dialectical tensions between extreme poles such as formal/informal, local/global, individual/collective are integrated in the deeper analysis of two contrasting learning dynamics through mental, physical and social boundaries.

Thus, we have responded to the call by scholars for more empirical research on boundaries (Montgomery, Oliver, 2007) in order to contribute to the KM literature focused on the emergence of boundary spanning competence in practice (Levina, Vaast 2005). As we underlined with managerial recommendations in the discussion, the facilitating and inhibiting factors identified can be further developed for an integrated social perspective of knowledge management. Our findings should be confirmed by further research in other areas where knowledge acquisition is required to keep up technological change.

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