Coordination Problems in Knowledge Transfer
A Case Study of Inter-Organizational Projects

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Abstract: When multiple organizations are involved in a heritage management project, the coordination of actions is complex and can affect the knowledge transfer process. This paper contributes a systematic and empirical study of the dynamics of coordination activities inside a knowledge transfer process in heritage management activities. Using the information-processing view of coordination, we explore the following question: what kinds of coordination issues affect effective coordination of knowledge transfer in inter-organizational projects? The discussion is supported by a case study in the architectural heritage domain. We reveal that there are many coordination issues that affect the mutual understanding between actors, limiting information exchange and knowledge transfer. These issues uncover a gap between the conception and use of ICTs that support coordination, and a lack of understanding about how ICT usage affects the knowledge transfer process. Thus, a socio-material perspective about relationship between people and coordination technologies could improve knowledge transfer performance.

1 INTRODUCTION

A fundamental goal in knowledge management (KM) is to share knowledge between actors (people, departments, organizations). Accordingly, one of the key factors behind successful management of inter-organizational knowledge transfer projects is effective coordination between different actors and activities involved.

In this paper, knowledge refers to information possessed in the mind of individuals: it is personalized information related to facts, procedures, concepts, interpretations, ideas, observations, and judgments (Alavi and Leidner, 2001). However, this individual perspective may take into account a social perspective that conceives knowledge as a collective construction grounded on mutual understanding between individuals, based on the sharing and transfer process, and supported by technology. In this sense, knowledge is constituted and reconstituted through practice, which makes it highly situated, contextualized and volatile (Orlikowski, 2002). This indicates that the way knowledge is applied in practice is what should determine how to manage it. According to Alavi and Leidner (2001) KM is defined as a dynamic and continuous set of processes and practices embedded in individuals, as well as in groups and infrastructure.

Knowledge management is not strictly limited within organizational boundaries, but its scope includes knowledge transfer between organizations, which adds more complexity to it (Reich, Gemino and Sauer, 2014). Knowledge transfer has become a useful organizational strategy within inter-organizational projects for value creation or sustainable competitive advantage; however, this kind of strategy is extremely difficult to manage, and its failure rate is high (Fang, Yang and Hsu, 2013). Coordination issues may explain such difficulties and failures.

This study explores the relationship between coordination and knowledge transfer from an information-processing (IP) view, which defines coordination as the act of managing interdependencies between activities (Malone and Crowston, 1990). The connection between IP and coordination is based on the understanding that as the amount of uncertainty increases, organizations adopt coordination mechanisms which allow them to handle more information effectively (Galbraith, 1974). As such, coordination mechanisms are usually considered in terms of their information processing properties. An organization can thus either reduce the amount of information that is processed or increase its capacity to handle more information. Thus, the challenge for organizational design is to devise the fit

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between the information processing needs and capabilities in order to obtain optimal performance. To do so, the key is to identify the dependencies and coordination mechanisms that can unlock such redesign (Malone and Crowston, 1994; Malone et al., 1999).

Knowledge transfer in an organization is strongly influenced by how dependencies are managed. Thus, coordination practices support interactions and relationships between actors enabling their common understanding. Relations enhance information processing capacity, which enables knowledge transfer through these relationships (Van Wijk, Jansen and Lyles, 2008). In this sense, relations can allow access to information, but knowledge cannot be transferred if the receiver is unable to process the information it receives, due to bounded rationality. Bounded rationality means that individual or group rationality depict the limited access to information and the limited computational capacities of the unit. In brief, above it has been argued that the I-P view of coordination, is based on organizational design and bounded rationality. It has also been claimed that this view is favorable for studies of coordination in knowledge transfer.

In this paper, a qualitative in-depth case study (Yin, 2009) was carried out, aimed at identifying and exploring such coordination issues in practice. The case study corresponds to Iberoamerican Historical Heritage Network – RedPHI, which is constituted by seven universities specialized in material architectural heritage management. The study explores a multinational project focused on specialized knowledge transfer and exchange among universities to enrich expert's knowledge and support decision-making in public and private institutions which are interested in getting involved in activities including rehabilitation, conservation or protection of historical heritage. RedPHI is an academic, international and collaborative network based on projects that imply multidisciplinary work of diverse experts, who can be distributed across different geographical locations and time zones and whose work is mediated by ICT.

Data on RedPHI projects was collected and analyzed in order to identify the set of interdependencies between activities connected to architectural heritage knowledge transfer. A deeper exploration through interviews with key RedPHI members enabled identifying and mapping the available coordination mechanisms to manage each interdependency.

The purpose of the case study was not only to identify the match between interdependencies and coordination mechanisms, but also to determine the usage level and the selection criteria for the coordination mechanisms to manage each interdependency with the intent to interpret those findings. Specifically, this paper identifies empirical coordination issues within inter-organizational knowledge transfer projects. Based on previous studies, this paper was guided by the following research question: *what kinds of coordination issues affect effective coordination of the knowledge transfer in inter-organizational projects?* Coordination issues are not associated to the mechanism per se, but to the coordination logic applied to select it within the available portfolio, according to characteristic of each interdependency as well as situated and contextualized factors. This paper reveals new insights about how coordination actions can be understood in alternative ways to match mechanisms with interdependencies, focusing on how people conceive and use ICT tools for coordination practices, and how these practices can alter the knowledge transfer process in inter-organizational projects.

The rest of the paper is structured as follows. Section two describes related research, section three presents the research method, and section four outlines the findings. Section five contains discussion and finally section six present conclusions, limitations and future research.

2 RELATED RESEARCH

Inter-organizational knowledge transfer means the process through which organizational actors – teams, units, or organizations – exchange, apply and are influenced by the experience and knowledge of others (Argote and Ingram, 2000). The extent of such influence depends on mutual understanding between actors, which is promoted by personal contact, intensive socialization and strategies for overcoming psychological barriers related to willingness to share knowledge. This means that the knowledge transfer process is associated with the ability to address some questions, such as 'what', 'when', 'who', and 'how' the knowledge would be transferred and how the transfer process must be coordinated so that the organization creates value.

When multiple organizations are involved in a KM transfer project, complexity increases and the difficulty in coordinating activities grows. Relatively little research has examined specifically the challenges of coordination in an inter-organizational context, specifically when this coordination may

involve multiple heterogeneous actors from distinct disciplines, organizations, work methodologies, geographic locations and across time zones (Cummings et al., 2013).

In the information-processing (IP) view, coordination is the act of managing inter-dependencies between activities performed to achieve a goal (Malone and Crowston, 1990). All coordination processes include actors performing interdependent activities. Interdependencies refer to goal-relevant relationships between activities; if there is no dependence, there is nothing to coordinate. Interdependencies generate incremental IP needs, but when interdependency is higher, a coordination mechanism can facilitate or affect the IP capability of the organization.

Coordination provides various benefits to KM, for example, integrating the embedded knowledge between individuals (Grant, 1996), facilitating the knowledge transfer (Malone and Crowston, 1994), reducing uncertainty and complexity in knowledge activities, generating cohesiveness and synergies for the efficient execution of tasks, increasing interactive behaviors, improving the exchange of information, reducing complexity in routine communication tasks, and optimizing decision-making, among others.

From the IP view, interdependencies are classified as resource flow, fit and sharing (Malone et al., 1999). Flow dependencies occur when an activity produces a resource that is used by other activity, fit dependencies arise when multiple activities produce a single resource and sharing dependencies occur when multiple activities use the same resource. From this point of view, the type of interdependence within a task determines the mode of coordination deployed (Grant, 1996).

In the IP view, coordination mechanisms can be classified as: standards, mediation and mutual adjustment (Galbraith, 1974; Thompson, 1967; March and Simon, 1958). Standard-based mechanisms are considered an a priori specification of codified guidelines, action programs and specific goals (March and Simon, 1958; Thompson, 1967) where the verbal communication and the interaction among actors are not necessary (Galbraith, 1974). Mediation-based mechanisms involve a third actor typically located at a higher level that act as mediator between two organizational units (González, 2010). Mutual adjustment mechanisms are based on the expected reciprocal communica-tion between actors (Thompson, 1967). Unlike standards-based mechanisms, communication and interaction is achieved through personal channels between peers, superior officer, or groups in both scheduled and unscheduled meetings (Van de Ven, Delbecq and Koenig Jr, 1976). The choice of mechanisms from each category needs to match information processing needs, and therefore coordination requirements depend on factors such as complexity, uncertainty and ambiguity.

Existing research on coordination has covered the use and impact of individual coordination mechanisms (Dietrich, 2007). The utilization of distinct coordination mechanisms is explained through task complexity, task uncertainty (Galbraith, 1974) and ambiguity (Simonin, 1999). Complexity means the number of interrelated elements or sub-systems within the systems and the interdependency between them (Thompson, 1967). As such, some coordination mechanism have been used to deal with complexity, i.e. informal and formal coordination, direct communitarian interaction and IT tools as personalized databases, search tools, specialized software systems, social networking, among others.

Uncertainty is the difference between the amount of information required to perform the task and the amount of information already possessed by the organization (Galbraith, 1974). In order to deal with task uncertainly some coordination mechanisms have been applied, i.e. labor division as role assignment, division of labor, ground rules and routines and communication as phone, email, conferencing and liaison person, coordinator, schedule, group meeting and steering group, among others. Ambiguity refers to lack of understanding between actors during knowledge transfer (Simonin, 1999) which has been managed through labor division and task assignment as coordination mechanisms.

Existing research on coordination has revealed a large number of coordination mechanisms through which coordination actions take place in international R&D projects (Reger, 1999) and outsourced software development projects (Sabherwal, 2003). In these two examples, sixty coordination mechanisms were identified from literature reviews. In addition, most of the current studies on coordination in KM fail to provide a realistic picture on actual coordination behavior, because their aim is focused on identifying interdependencies and coordination mechanisms in theory and then to validate these through empirical work. Therefore, the aim of our study is to respond to this lack of empirical and inductive knowledge about coordination in practice and to provide new information about knowledge transfer inter-dependencies in the context of inter-organizational knowledge transfer projects.

3 RESEARCH METHOD

A case study was selected as the research method in this study. The focus of the case study was exploratory but with future intervention prospect that goes beyond empirical validation of existing theory (Yin, 2009) and development of new theory from empirical data (Eisenhardt, 1989). The case study is aimed at identifying empirical coordination problems in KM projects that are subsequently transformed into design requirements, which, together with coordination theory and complementary theories, become inputs for the future artifact design that could solve those coordination problems identified in practice.

In this case study, the research question is exploratory in nature and requires the researcher to acquire in-depth contextual understanding, in order to provide an answer for the question. In addition, this study focuses on a contemporary phenomenon, and the researcher has had no control over the behavioral events of the study. According to Yin (2009), this conditions argue for the use of case study research. Several reasons explain this choice (Eisenhardt, 1989; Yin, 2009).

First, because this study is aimed at supporting the findings on interdependencies and coordination mechanisms on actual patterns of behavior. Second, the phenomenon was not understood sufficiently enough to employ a survey study. The case study strategy enabled the incremental understanding on the coordination phenomenon during the study. In addition, the case study method was seen as an appropriate strategy to study complex phenomenon in which there are more variables of interest than data points.

Additionally, case study strategy has been specifically set to identify coordination mechanisms portfolios in KM (Dietrich, 2007). Thus, the case study was considered as the appropriate strategy for the purposes of this study as well. The focus of examination in this study, coordination in inter-organizational knowledge transfer projects, fulfills the above mentioned criteria and characteristics of case study research.

The case study corresponds to the Iberoamerican Historical Heritage Network – RedPHI, which was constituted in 2011 by seven universities working in material architectural heritage management. The network involves highly tacit knowledge of experts from diverse disciplines with diverse understanding and experience levels converging in developing highly complex tasks. RedPHI projects are supported by a knowledge management system which has been developed through collaborative work of software engineers and heritage experts from each university.

In this case study, the unit of analysis corresponds to heritage management projects including consultancy, research and professional services. Data collection was done from 2014 to 2015 in two different moments with different outcomes. The first moment was aimed at exploring KM particularities in RedPHI, and it included a case study protocol to ensure outcome reliability. KM capabilities theory (Gold, Malhotra and Segars, 2001; Choi and Lee, 2003) was used to guide case exploration and to ensure external validity, as well as including multiple and triangulated sources of evidence (Eisenhardt, 1989) including informal meetings, semi-structured interviews and documents to get construct validity.

Data collected is related to creation and operation of RedPHI projects developed inside the case study and individual experiences of heritage experts. All data collected was saved in a data base to ensure traceability of findings. Data analysis was carried out through structural codification process (Miles and Huberman, 1994), this process was tested in quality and functionality until reaching 90% of recode consistencies. Codes were structured and defined according KM capabilities theory (Gold, Malhotra and Segars, 2001; Choi and Lee, 2003) and they were adjusted as the coding process progressed. Coding process were stopped when categories reached saturation. Case study analysis included pattern-matching logic (Yin, 2009).

As a result of the first moment, a set of interdependencies regarding to material archite-ctural heritage management were identified in the RedPHI project. This showed opportunities to explore in-depth coordination activities behavior, specifically about the role of coordination in RedPHI projects, thus a second moment started. A new literature review was needed to gain understanding about coordination theory and its application within inter-organizational KM projects. With this theoretical focus, a set of four interviews (90 minutes each one, with semi-structured questions) was used to identify the coordination mechanisms portfolio to manage each interdependency identified in the first moment. Later, a matrix of relationships between interdependencies and mechanisms was built.

As a result of second moment, selection criteria for coordination mechanisms in RedPHI were identified. This allowed going beyond the simple relationship between mechanisms and interdependencies, as it was possible to explore in-depth the arguments underlying the decisions of coordination in the case study, which in turn, uncovered several coordination problems.

4 FINDINGS

In this section, the outcomes of the first moment in the case study are presented. Relationships between interdependencies and coordination mechanisms were identified, a matrix of those matching is depicted in Table 1. Two flow interdependencies were identified in the case study, one corresponds to the level of formalization of work (f1), which refers to the set of rules and procedures that have been established or followed to manage information and validate the results of previous activities; accordingly, as formalization increases, the project is better equipped to deal with previously identified interdependencies, but at the same time it adds complexity in deal with the information processing needs of the rules and procedures themselves. The other interdependency is related to the task assessment (f2) and it refers to activities and project outcomes that should be evaluated periodically to determine information quality and quantity before processing it, which is aimed at avoiding uncertainty and ambiguity during subsequent activities.

In addition, eight fit dependencies were identified in the study case. On the one hand, there are ontological and epistemological differences (a1) among actors, with respect to some specific concepts that can change completely during the project course, mainly because experts have different conceptual perspectives based on different references and experience levels, but in some cases those differences also emerge when disciplinary areas and schools of thought are different. It is problematic because task ambiguity increases as more conceptual perspectives are involved in a project.

There are also many working methods (a2) depending on the different disciplines, experiences and IP skills of the experts and institutions in which they work, which is embodied in different interpretation approaches but also increases activity complexity. Additionally, tasks in RedPHI projects are highly complex because they often include multiple organizations, departments, groups and individuals (a3) each of these with different specialties and different approaches, but with the challenge of integrating their knowledge into a single final product.

Complexity increases even more when heritage management projects involve not only the work of architects and experts in the patrimonial scope, but also from other disciplines (a4), such as civil engineers, electrical engineers, anthropologists, social workers, or lawyers, introducing ambiguity that can affect the knowledge integration in the final product. In addition, some projects involve experts or technical teams which are distributed across geographic locations and across time zones (a5) and include asynchronous activities and communication complexity. Some projects are more complex because they require the participation of different types of organizations (a6) which are not academic institutions, for example institutes of cultural heritage, culture ministries, local government, private owners, among others, which handle specialized information and have various functions and interests.

Furthermore, another fit interdependency is centralization in decision-making (a7) that refers to the extent to which the right to make decisions and evaluate activities is concentrated in the project leader; however, some projects include decentralization of decision-making as a consequence of the distribution of authority among team members depending their experience. Often, lack of participation in the decision-making process can affect common understanding among experts, this ambiguity may cause a reduction in the knowledge transfer and production of creative solutions. Finally, relationships based on hierarchy, leadership, culture and trust (a8) determine the agility of information exchange, and the expert's willingness to share their knowledge during the different project phases, but also it is able to increase project complexity due to those factors depending on human psychology.

Finally, four sharing resources interdependencies were found in the case study. Some projects can include information or activities developed by non-Spanish speaking actors, thus avoiding task ambiguity, translation support and skills for foreign languages (s1) are required.

Also when the project information comes from different information systems, and these in turn are operated by different institutions which increase task complexity so that information systems need to be interoperable (s2) to enable information exchange and data sharing. In this sense, often information systems are highly situated in its organizational context (s3) and usually analysis of the same information is made by different stakeholders, which leads to different interpretations which in turn produces task ambiguity when all interpretations have to be integrated in a final product. In other cases, adaptability of the information systems (s4) is complex, therefore generic functional specifications must be used by the experts for adapting generic information to carry out specialized tasks. A large portfolio of coordination mechanisms is used to manage all the interdependencies identified in the case study. To manage flow interdependencies,

Table 1: Interdependencies and coordination mechanisms in the case study.

		f1	f2	a1	a2	a3	a4	a5	a6	a7	a8	s1	s2	s3	s4
STANDARD	Policies	3,P, F		3		3			2						
	Work documents	2			2					2		1			
	Work programs / Plan	3									2				
MEDIATION	Coordination committees		1	2,P			P		1		2			1	
	Technical Informs / Report	1							2						
	Programmed / Projects evaluation		1		2	3	3		F		1				
	Hierarchies			3,P						2					
	Authority		1	3	1		1		1,P	1	2		2	1	
	Experts community		3						2		2	2			
	Labor division by discipline	1	1	2			1								
	Project web site	2	F			F									
	Web page														1
	Blog					2									
	Web services (translator)											2,F			
	Web services (GIS)												2		
	Software (office suite)												2		2
	Web search system				3,F										2
	Knowledge portal	F													
	Cloud computing							2,P	1						3
MUTUAL ADJUSTMENT	Experts mobility					3									
	Common values / norms			3											
	Job rotation		3								3				
	Education / personnel development		3	F							F		1		
	Discussion / debate			P	2				1					2	
	Seminars / workshop			F					F						
	Face-to-face meetings		1	1	1	2	2		1						
	Wikis				P										
	Instant messaging					1					1				
	e-mail		2		3	1	2		1			1			
	Phone call										1				
	Video Conference			3		1,F		1							

standards-based mechanisms such as policies, working documents, work plans and work programs are used. Also, some mediation-based mechanisms such as technical reports and informs, work subgroups divided by aspect, expert communities, authority levels, project websites and coordination committees are applied. In addition, mutual adjustment mechanisms include job rotation, education and personal development, face-to-face meetings and email.

With regards to fit interdependencies, findings include standards-based mechanisms, such as manuals, working documents or policies. Also involves mediation-based mechanisms involve hierarchies, authority levels, program and project evaluation, search systems, blogs, communities of experts or cloud computing. In addition, mutual adjustment mechanisms identified include norms and values, face meetings, discussion and debate, wikis, email, instant messaging, video conferencing and mobile telephony.

Sharing interdependencies involve only one standard-based mechanism, namely working documents, while mediation-based mechanisms used are expert communities, online translation services, geographic information system, office suites, systems consulting and cloud computing, among others. Finally, mutual adjustment mechanisms used to manage interdependencies are email, education and personal development, and discussion and debate.

The purpose of the case study was not only to identify coordination mechanisms used to manage each interdependency, but also determine the extent to which a mechanism is chosen within the portfolio

and with what selection criteria. The match between coordination mechanisms and interdependencies is depicted in Table 1, including a ranking of use of the mechanism in the interdependence in which it is applied. This rank is represented on a scale from 1 (frequently used) to 3 (rarely used). Additionally, the letter "P" indicates that the mechanism was used in the past, and the letter "F" indicates that the mechanism may be used in the future, as intended by the interviewees. These two labels are useful to analyze the possible evolution of coordination mechanisms, but this is out of the scope of this research paper.

Choosing coordination mechanisms for interdependency management depends largely on project specifications, number of actors, type of contract (agreement, formal contract), type of contracting institution (public, private, university), type of project (consulting, research), among other factors. Also, matching mechanisms to interdependencies rests on variables associated to information and knowledge characteristics, i.e. information quantity, nature of the information (public, private), characteristics of information (size, order), or information type (documents, drawings, multimedia).

Finally, the use of ICT tools for coordination depends on factors such as the complexity of the technological tools, actor's knowledge about the tool, actor's skills for using tools, project resources to acquire specialized knowledge about a particular tool, as well as the language between actors and the trust they have in the use of technological tools.

5 DISCUSSION

Different coordination issues were identified in the case study regarding the role of coordination in knowledge transfer. Coordination complexity increases as project tasks are managed through labor division and knowledge specialization. In some cases, task complexity is high when conceptual differences between architects arise, but it is even higher when the project requires other disciplines, such as civil and electric engineering, social work, anthropology, or law. In some cases, a project manager chooses coordination mechanisms to integrate specialized knowledge focusing on information quality and quantity to satisfy project requirements. Moreover, selection of coordination mechanisms is an entirely non-rational process guided by team member's experience. Often, prior use of coordination mechanisms is the main argument for selection, and thus situational factors in a new project are omitted and do not change the coordination mechanism entirely decisions.

Some coordination mechanism are preferred for most of the interdependencies i.e. face-to-face meetings, which is not a problem per se because mechanisms can be ubiquitous, but not all mechanisms are cognitively feasible or applicable in all problems. For instance, face-to-face meetings are obviously problematic when staff is not on location or when many people are involved in the meeting, then actors turn to face meetings with small groups, but this hinders knowledge transfer between all stakeholders.

In this sense, when ontological differences emerge during the project, face-to-face meetings are the first coordination mechanism used, if consensus is not achieved, labor division is applied, but if the conceptual differences persist the project manager determines unilaterally the ontological principles. Even though thesaurus and glossaries could enable a common understanding, they are rarely used because interpretation, exploration and added value are limited according to interviewees. From this point of view, testing the power of different coordination mechanisms in a project is difficult and could risk task performance.

Often actors will use the same coordination mechanisms regardless of task changes during the course of a project. The set is only modified due to client requirements, such as permissions, file formats and formal contracts. Dynamic selection of mechanisms was not found inside or between projects so that task complexity is managed with a static set of mechanisms. This behavior increases task uncertainty, because information-processing (IP) needs are not supported. In addition, combination and permutation of coordination mechanisms available is not considered a way to reduce task complexity, uncertainty or ambiguity; this shows a rigid decision-making structure in project coordination.

Furthermore, the cost of coordination mechanisms is one of the most important factors to decide how to coordinate knowledge transfer in the heritage domain, but to select the least costly mechanism could affect the IP capabilities of the project team. For example, most of the RedPHI interdependencies could be managed more efficiently through ICT mechanisms, but heritage experts are adverse to technology-based coordination because it is considered unsteady and their use is assumed to require special skills that not all stakeholders have, which implies more cost beforehand in terms of the time and money required for learning and the interference it has with day-to-day practices.

Moreover, understandings and using (or enacting) a particular tool is often ineffective and contextual. For instance, for RedPHI a wiki was developed as a collaborative working environment but only the designer knew how it worked and the mechanism was transformed into a document repository alone. In addition, if a coordination mechanism is not correctly configured and maintained it can affect the effectiveness of knowledge transfer, i.e. a technical committee is preferred for solving technical concerns or conceptual divergences; however, in some cases not all stakeholders participate on the discussion increasing further ambiguity.

Familiarity, availability, confidence, experience, natural and routine use, upgrade facilities are criteria for selecting a set of ICT that supports coordination activities. However, the portfolio of ICT is so extensive that each actor uses different technologies, in different ways, at different times and with different people. This observation shows that selecting tools is highly situated and contextualized and can alter the mutual understanding between actors, limiting the information exchange and the creation and transfer of knowledge. Limitations occur due to people with established norms of use, types of computer-mediated interactions that work for them, and familiar patterns of communication.

To deal with the divergence in ICT usage, actors look for a common denominator of tools, or force actors to learn a new technology or new actors must adjust to the structural properties of ICTs that preexist in the project. Nevertheless, the common denominator can be reduced in excess and eventually become insufficient to transfer the amount of knowledge and information that the project requires. In addition, actors minimize information exchange to avoid learning new tools, due to resource availability.

The problems exposed in the last paragraphs, uncover a gap between the conception and use of ICTs that support coordination, and a lack of understanding about how this gap affects the knowledge transfer process. This issue exceeds the scope of the mainstream IP view of coordination, because coordination problems in knowledge transfer are not a matter of information quantity or IP capacity, but a relationship between people and coordination technologies. This point at overcoming techno-centric view of coordination, which has been widely studied, and suggests a socio-material perspective as alternative to improve knowledge transfer.

The socio-material perspective of KM recognizes that knowledge is not attributable to a single component, such as a specific technology or infrastructure, but the constitutive entanglement of the social and the material in everyday life (Orlikowski, 2007; Orlikowski and Scott, 2008). According to Orlikowski (2007) entanglement indicates that the relationship between people and technology is not reciprocal but inextricable related — there is no social that is not also material, and no material that is not also social.

In this sense, humans are constituted through relations of materiality (bodies, objects, technology), which in turn are produced through human practices (Orlikowski, 2007). Such relationships can represent a high-level understanding of knowledge transfer, where the ontological separation between source-receiver and technology is surpassed by a relational ontology that dissolves analytical boundaries between technologies and humans because it considers them as inherently inseparable. According to Orlikowski (2007), socio-material practices act as mediators of work, but also set up organizational realities that require further exploration.

6 CONCLUSIONS

Coordination in heritage domain knowledge transfer is a complex task and, at the same time, is under-researched. As coordination practices improve, it is to be expected that this may result in more effective are expected to increase architectonic heritage conservation. This study aimed at identifying empirical coordination issues within inter-organizational knowledge transfer projects in the architectonic heritage domain. The research question was addressed through an exploratory case study with an interpretative approach. Interdependencies and coordination mechanisms were identified with an inductive perspective following the information-processing (IP) view and some coordination issues were revealed. Those issues are not associated to the mechanisms per se, but with the situated and contextualized selection of coordination technologies within a large portfolio. Accordingly, the relationship between people and technology determines the coordination characteristics for knowledge transfer.

Our findings are based on one case study and, therefore, by definition, only meet to a limited extent the criterion of generalizability. Further research needs to be conducted in other domains. In particular, our findings reveal a need to rethink the implications of coordination in inter-organizational knowledge transfer projects. Specifically, the case study exploration was made following the IP view of coordination; however, findings suggest that coordination issues could be addressed through a

socio-material perspective. Our initial definition, drawn from the literature, presented KM as "a dynamic and continuous set of processes and practices embedded in individuals, as well as in groups and infrastructure" (Alavi and Leidner, 2001). However, as our study has shown, attention to the detail of coordination practices suggests that this definition may conceal a multitude of socio-material views that can extend understanding about how coordination can support knowledge transfer, enhancing heritage management projects. Further research exploring such socio-material views may better address the interplay between coordination and knowledge transfer process.

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