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Middle Managers' Sensemaking and Interorganizational Change Initiation: Translation Spaces and Editing Practices

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ABSTRACT *In fast changing environments, middle managers regularly have to participate in interorganizational sensemaking work in order to deal with issues of industry-wide significance. The research is grounded on an empirical study of a cross-sector study group, bringing together middle managers from five large French public works and civil engineering firms who are examining issues related to the adoption of a shared digital mock-up that will reconfigure the sector. The article identifies four translation spaces in which these middle managers make sense of this design technology through a set of editing practices. The article ends by discussing the dynamic of these translation spaces and the need to better understand middle managers' editing practices when they are making sense of change across organizational boundaries.*

KEY WORDS: Middle managers' sensemaking, translation spaces, editing practices, interorganizational change, digital mock-up, public works and civil engineering sector

Introduction

Middle managers' sensemaking work during organizational change has received significant study over the years (Balogun & Johnson, 2004; Beck & Plowman, 2009; Besson & Mahieu, 2011; Hope, 2010; Huy, 2011; Rouleau & Balogun, 2011; Smith, Plowman, & Duchon, 2010). In a fast moving environment characterized by a high level of ambiguity and complexity between organizational frontiers and industry boundaries, there is a growing interest in better understanding

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how middle managers make sense of change when they are involved in transversal or interorganizational collaborations (Balogun, Gleadle, Hope Hailey, & Willmott, 2005; Frow, Marginson, & Ogden, 2005; Ghorbal-Blal, 2011; Rouleau, 2005). In particular, middle managers' sensemaking work in the critical initiation of an interorganizational change has not been adequately described and understood. Moreover, recent studies on middle managers emphasize the importance of looking at language use to better understand their sensemaking work (Besson & Mahieu, 2011; Nielsen, 2009; Rouleau, 2005; Rouleau & Balogun, 2011; Thomas, Sargent, & Hardy, 2011; Vickers & Fox, 2010). Consequently, this article is interested in looking at the discursive character of middle managers' sensemaking work at the interorganizational level, which has so far remained significantly understudied.

This article addresses this issue by drawing on the translation model (Czarniawska & Sevon, 1996; Morris & Lancaster, 2006; Pipan & Czarniawska, 2010; Sahlin-Andersson, 1996; Sahlin & Wedlin, 2008; Zilber, 2006). Translation studies investigate how ideas travel from one context to another and are transformed from one language to another through a set of editing rules (Sahlin-Andersson, 1996; Sahlin & Wedlin, 2008). Until now these studies have considered translation as an undifferentiated process portraying the travel of ideas across institutional or national borders or within organizational boundaries (Boxenbaum, 2006; Dobosz-Bourne & Kostera, 2007; Zilber, 2006). Moreover, the explanations provided are generally focused on the differences between the original idea and its translation. As a result, very little is known about what occurs when the editing rules are performed in practice (Bartel & Garud, 2009; Morris & Lancaster, 2006; Nielsen & Jensen, 2011). By studying how middle managers make sense of change at the interorganizational level, we propose a multiple and differentiated view of translation and explore how translation is done in practice.

The article analyses the Communic Group,[1] a French study group composed of five middle managers and their collaborators from leading firms in the public works and civil engineering sector (Malavergne, 2010). The Communic Group was formed with the objective to examine the organizational challenges and business benefits of adopting a three-dimensional (3D) design software for the public works and civil engineering sector. The analysis of this case reveals the existence of four 'translation spaces' that were central in the way middle managers initiated this inter-organizational change by making sense of the new technology. These four translation spaces are: intensive working sessions, industrial visits, writing sessions and organizational meetings and talks. The article explores the dynamic of these translation spaces and their translating or editing practices. The term translation space refers to an activity zone between two contexts wherein a message around a source to be translated is authored to reach a specific audience. Editing practices correspond to the practices performed in a translation space and related to editing rules (Sahlin-Andersson, 1996).

This study makes three sets of contributions. First, the article provides empirical evidence about middle managers' sensemaking work at the interorganizational level (Balogun et al., 2005; Frow et al., 2005; Ghorbal-Blal, 2011; Rouleau, 2005). It also advances the comprehension of their roles and contributions by

studying a specific set of middle managers (Woolridge, Schmid, & Floyd, 2008) and by looking at their communication activities (Besson & Mahieu, 2011; Nielsen, 2009; Rouleau & Balogun, 2011; Thomas et al., 2011; Vickers & Fox, 2010). Second, the article advances translation studies by approaching translation as a complex and dynamic phenomenon, by looking at different 'spaces of translation' and by proposing a set of 'editing practices' through which sensemaking work is accomplished across organizational boundaries (Hardy & Maguire, 2010; Sahlin-Andersson, 1996; Sahlin & Wedlin, 2008). Third, the article also contributes to advance the view of interorganizational sensemaking and sensegiving (Corvellec & Risberg, 2007; Maguire, Hardy, & Lawrence, 2004; Werle & Seidl, 2012). The article provides a situated view of sensemaking as translation which results from communication activities accomplished at different levels and in multiple directions.

The remainder of this article is structured as follows. First is an overview of the existing research on middle managers' sensemaking work. Second, we propose our view of interorganizational sensemaking as translation. Third, we introduce our case study and explain our methods of data collection and analysis. Fourth, we present our findings. Fifth, we discuss the results and present our contributions.

Middle Managers, Sensemaking and Interorganizational Change

Since the end of the nineties, there is a growing body of research exploring middle managers' sensemaking work and contributions (Balogun, 2003, 2006; Balogun & Johnson, 2004; Beck & Plowman, 2009; Besson & Mahieu, 2011; Dutton, Ashford, O'Neill, & Lawrence, 2001; Hope, 2010; Huy, 2011; Rouleau & Balogun, 2011; Smith et al., 2010). These studies describe the ways middle managers create (Balogun, 2003; Balogun & Johnson, 2004; Huy, 2002), negotiate (Hoon, 2007; Thomas et al., 2011) and diffuse (Huy, 2011; Ling, Floyd, & Baldridge, 2005; Rouleau, 2005; Smith et al., 2010) meaning in organizational change. Based on the Weickian notion of sensemaking and sensegiving, these studies look at how middle managers interpret information and knowledge about a change and make it meaningful for others. Most research on middle managers' sensemaking work has until now been largely focused on downward investigating (Balogun & Johnson, 2004, 2005; Beck & Plowman, 2009; Nielsen, 2009; Smith et al., 2010) and upward sensemaking (Dutton et al., 2001; Ling et al., 2005; Vickers & Fox, 2010) or a combination of both (Floyd & Lane, 2000; Raes, Heijltjes, Glunk, & Roe, 2011).

In middle manager sensemaking research, there is a growing interest in exploring middle managers' sensemaking and sensegiving activities in their collateral relations with colleagues in various functions and business units or at the organizational interface (Balogun et al., 2005; Frow et al., 2005; Ghorbal-Blal, 2011; Rouleau, 2005). For example, Frow et al. (2005) investigated how multi-project teams involving middle managers and accountants interpret and share their knowledge of change in order to balance the fixed control system targets and the flexible needs to pursue strategic initiatives. Balogun et al. (2005) studied the boundary-spanning practices of individuals acting as change agents to implement

boundary-shaking change initiatives across a multinational's business units. Ghorbal-Blal (2011) suggested that the success of expansion strategy in the hotel industry largely depends on the capacity of middle managers in charge of project development to sell the project to a set of external contacts comprising real-estate development companies, individual and institutional investors, company owners and government.

In order to improve the competitive positioning of organizations, promote innovation and deal with issues that exceed the changing scope and capacities of single organizations, middle managers have to take part in collaborative interorganizational projects. For example, middle managers are currently invited to participate in open-innovation projects (e.g. Gasson, 2006), or in the experience of knowledge transfer related to the adoption or the standardization of managerial ideas and technological tools (e.g. Cranefield & Yoong, 2007). They are also involved in strategic partnerships (e.g. Clarke & Fuller, 2011), in economic development projects (e.g. Corvellec & Risberg, 2007) or in working groups dealing with major socio-economic problems such as climate change, energy and so on (Werle & Seidl, 2012). In all these cross-sector collaborations, middle managers have to define, negotiate and even enact new meanings through their multiple interactions with different internal and external stakeholders. However, little attention has been paid to date about the ways middle managers make sense of change across organizations or at the interorganizational level. This is the focus of the article.

Until now, middle managers' sensemaking and sensegiving has mainly been viewed as a symbolic and collective process that contributes to cyclically frame and reframe existing narratives or knowledge structures according to new cues from the environment in order to facilitate change implementation (Balogun & Johnson, 2004; Balogun, Pye, & Hodgkinson, 2008; Beck & Plowman, 2009; Hope, 2010). Drawing on a case study of restructuring in a UK privatized utility, Balogun and Johnson (2004, 2005) identified a sensemaking development pattern: before the change, there is a shared understanding that is followed by a period of clustered sensemaking. At the end of the change period, the understanding of the organization is, to some extent, recomposed. Beck and Plowman (2009) examined the role of middle managers in unusual events and concluded that middle managers encourage divergence in interpretations across hierarchical levels during early stages of the change while they tend to blend and synthesize divergent interpretations during later stages. Thus, these studies on middle managers' sensemaking describe the complex ongoing patterns of shared understanding, decomposition and recomposition through which middle managers undertake to support and reframe for others the interpretations of the change intent.

In line with Westley's seminal article published in 1990 (Westley, 1990) on middle manager strategic conversations, recent studies highlight the importance of language use in middle manager sensemaking research (Besson & Mahieu, 2011; Nielsen, 2009; Rouleau, 2005; Rouleau & Balogun, 2011; Thomas et al., 2011; Vickers & Fox, 2010). Instead of looking at sensemaking patterns over time, these works show that sensemaking is empirically grounded in the discrete talk and actions of multiple actors in meetings and conversations. For example, Thomas et al. (2011) identified a set of communicative practices that are part of the communicative interactions in which meanings around a customer-oriented

change are debated, contested and/or agreed upon by participants. Rouleau and Balogun (2011, p. 953) examined a set of discursive activities and developed a framework showing that two situated, but interlinked, discursive activities, 'performing the conversation' and 'setting the scene', are key to the accomplishment of middle manager sensemaking. While a focus on the narration of the change story over time shows how the pattern of cognition and action impacts meaning, focusing on language when studying middle managers' sensemaking activities helps to better understand the situated construction of meaning (Bryant & Stensaker, 2011).

The mediating position of middle managers working at the interorganizational level is complex since their sensemaking work has to be done with different internal and external stakeholders. At this level, interpretations are multiple, shifting and evolving over time (Hardy & Maguire, 2010). Moreover, the discursive aspect of middle managers' sensemaking and sensegiving work is critical when located at the interorganizational level. As Hardy, Lawrence, and Grant (2005) noted, effective interorganizational collaboration depends on the conversations among participants and how they relate to wider discourses in which the collaboration takes place. In order to deal with the heterogeneous and discursive character of middle managers' interorganizational sensemaking work, we propose to investigate it through the translation lens.

Interorganizational Sensemaking as Translation

In the last ten years, the translation model has been widely diffused in management and organization studies in the context of explaining change (Boxenbaum, 2006; Lamertz & Heugens, 2009; Pipan & Czarniawska, 2010; Zilber, 2006). Drawing on the Latourian actor-network theory, the notion of translation is generally viewed as the movement of an entity – whether it is a technology, a conceptual frame or a management tool and so on – in space and time or the transport of ideas related to this entity and its ongoing transformation (Callon, 1980; Latour, 1986). The Scandinavian Institutionalists school (Creed, Scully, & Austin, 2002; Czarniawska & Sevon, 1996; Sahlin-Andersson, 1996) emphasized the idea that translation refers to the travel and transformation of meanings from one context to another and from one language to another. The translation model is based on the idea that a translation begins when T, a translator, transforms A – the source to be translated – into B – the target of the translation – in a local context. The model involves first selecting an idea, a pattern or an object to be translated, then disembedding this source from one context and re-embedding it in another (Morris & Lancaster, 2006).

Sahlin-Andersson (1996) has suggested that the translation process follows three steps that are governed by different editing or translating rules: context, logic and formulation rules (see also Sahlin & Wedlin, 2008). A translation begins by presenting in general and abstract terms the new ideas to be translated. This is followed by a period of relabeling in which rationalized explanations are proposed. Finally, the new ideas are packaged in order to clarify the causes and effects that will stabilize a certain development. From broad context-making to specific action logics, the translation process is performed to convince others

and attract their attention to the path followed during the travel and transformation of the source of the translation. According to Sahlin-Andersson (1996, pp. 78–79), 'the distance between the source of the model and the imitating organization forms a space for translating, filling in and interpreting the model in various ways' (also quoted by Zilber, 2006, p. 283).

Despite the recent burgeoning interest in translation studies in the management and organizational change literature, two gaps need to be addressed. The first gap concerns the fact that translation studies tend to investigate only one 'translation space' at a time as though translation occurs in a single undifferentiated space. Until now, the model has mainly been used to portray the travel of ideas across institutional (Lamertz & Heugens, 2009; Zilber, 2006) or national (Boxenbaum, 2006; Czarniawska, 2011; Nielsen & Jensen, 2011) borders or within organizational boundaries (Bartel & Garud, 2009; Dobosz-Bourne & Kostera, 2007; Morris & Lancaster, 2006). For example, Zilber (2006) examined the differences in the reconstruction of broad institutional frameworks in high tech firms. She studied the transportation of mythical representations from Israeli society to local organizations. Boxenbaum (2006) explored how a group of Danish business actors translated the American practice of diversity management into a novel managerial practice in Denmark. In this case, the translation occurred between two distinct countries. Dobosz-Bourne and Kostera (2007) examined the top management translation of a total quality management programme to the employees in two different locations. Here, the translation unfolded in a top-down direction throughout the same organization.

However, when a translation takes place at the interorganizational level, multiple and differentiated translation spaces are at play. For example, Czarniawska (2002, 2009) studied the planning activities in a city and showed that the plans needed to be negotiated and translated in different ways and at different times according to whom the city managers had to work with. Therefore, the planning work differed depending on whether the message needed to be understood by politicians, engineers and subordinates or by media and so on. When participants from different organizations are collaborating together, they have to gather information in multiple directions from various contexts (organization, collaborative group, stakeholders) and disseminate it to other various contexts (organization, collaborative group, stakeholders). In the process, the source to be translated travels through multiple and differentiated translation spaces, i.e. through multiple activity zones between two contexts whereby diverse messages around the source to be translated are authored to reach distinct audiences. Since exploration of the translation model to investigate change at the interorganizational level is only beginning (Hardy & Maguire, 2010; Maguire & Hardy, 2009; Plesner & Horst, 2012), there is a need to better understand sensemaking work across organizational boundaries, taking into account the multiple and differentiated translation spaces in which it is accomplished.

The second gap in translation studies concerns the tendency to overemphasize the results of the transformations or the general dynamics by which the translation is achieved, to the detriment of the translation practices involved during the change process (Bartel & Garud, 2009; Dobosz-Bourne & Kostera, 2007; Nielsen & Jensen, 2011; Plesner & Horst, 2012; Zilber, 2006). When studying

the transformations of rational myths around the high-tech economic bubble in local organizations, Zilber (2006) focused on the idea that these generic rational myths are translated into specific ones in relation to material fluctuations over time and depending on the dynamics of local institutional spheres. However, she does not explain how these rational myths are used and transformed by actors from the local high tech firms. In their comparative study of two multinational subsidiaries located in different countries, Nielsen and Jensen (2011) showed the contrasting learning outcomes resulting from the implementation of similar production plans designed by headquarters. In the same vein, their article is mainly devoted to explaining these differences by the divergent organizational and institutional contexts in which local participation took place instead of showing what local managers did and said when implementing the plan. Morris and Lancaster (2006) examined the translation of the lean production model from the manufacturing to the construction industry. While they concentrated their attention on the role of recipients during the translation, they nevertheless focused their explanation on showing the differences between the original idea and the translated ones. There is a need to explore what is happening during the translation when T, as an individual or a collective actor, is translating ideas from one world to another or, put differently, what is happening when editing rules are performed.

In fact, translation studies have under-examined the way translation is done in practice. As previously discussed in the presentation of recent research on middle managers, the discursive aspect plays an important role in meaning making. Surprisingly, even though the translation model is premised on the linguistic metaphor, very few studies have looked at the discursive dimension of the translation process. By investigating how individual translation acts can change a macro discourse, Maguire and Hardy (2009, p. 149) were the first authors to combine translation and discourse to examine the deinstitutionalization of DDT. Hardy and Maguire (2010) also explored the discursive processes whereby field-configuring events lead to institutional change. In their studies, they concentrated on investigating the production, distribution and consumption of texts and narratives to explain the transformation of meanings related to the adoption of the Stockholm Convention on persistent pollutants. From a different point of view, Mueller and Whittle (2011) proposed a micro-perspective of translation as a discursive process. They analysed a variety of linguistic devices skilfully employed by two change champions to translate the new quality programme during the interactional sequence between change sellers and recipients in a UK public–private partnership. While the former studies focused on the transformations of meta-narratives regarding the source to be translated, the latter accentuated the translators' discursive skills and practices during the translation process. Both aspects are important to better understand how translation is achieved in practice. Therefore, the article adopts an integrative point of view and proposes to investigate translation or editing practices by being attentive to what middle managers 'say' and 'do' in order to transform the central narratives related to the source to be translated.

This study focuses on these gaps in order to advance our understanding of how middle managers make sense of change at the organizational interface and

examines the two following research questions: how are the translation spaces in which middle managers make sense of change at the interorganizational level related to one another and how do they evolve over time? Which editing practices do middle managers use in these translation spaces?

Method

Research Context

This article is based on the Communic Group, a French interorganizational study group formed with the objective to examine the organizational challenges and business benefits of adopting a 3D design software platform for the public works and civil engineering sector. Public works and civil engineering involve the design and production of linear infrastructure (roads, tunnels, railways), engineering structures (bridges, viaducts) and major construction works (nuclear power plants, stadiums, large towers). The introduction of a 3D software platform would allow simultaneously integrating in real time a variety of data about a given construction project, thus requiring the actors to work concurrently or simultaneously rather than sequentially as is currently the case (Boland, Lyytinen, & Yoo, 2007; Gal, Lyytinen, & Yoo, 2008). Given the fact that in this sector each project is unique, the software platform is still a vision and many questions remain unanswered. To go through the process of investing in a new design tool that will involve organizational change, French public works and civil engineering firms have to be convinced of its advantages and better informed about the consequences of implementing it.

In this context, five middle managers trained in French 'higher engineering schools' and currently working in the leading public works and civil engineering companies in France (two engineering firms – Egis and Setec TPI – and three constructors firms – Bouygues TP, Eiffage TP and Vinci Construction) decided to launch an interorganizational study group named the Communic Group. Subsidized by the French National Research Agency ANR, the group's founders agreed upon a three-year project aimed at producing three deliverables that describe their work and provide recommendations for sectorial stakeholders and software publishers.

Research Design

To examine through the translation lens how middle managers make sense of an interorganizational change, a longitudinal case-study design was set up (Yin, 2003). The Communic Group case was convenient for two reasons. First, this interorganizational study group arose from middle managers' initiatives. Even though the middle managers invited various colleagues and experts to periodically join the Group, the five middle managers who coordinated the Group's activities were present from when the Group was set up to its final phase. Second, this study group became involved at the initiation stage of an interorganizational change, which is a crucial step in translation (Czarniawska, 2009). These middle managers are neither formulating nor implementing an interorganizational change; they are

at the stage of establishing the claims or 'problematizations' (Maguire & Hardy, 2009) that will eventually permit the change.

Data Collection

The first author of this article attended most of the 127 meetings, received copies of all documents and records of decisions, and had access to the collaborative work website. Most of the data concerned observations made while the group was monitored in vivo, ensuring that practices could be observed and described in detail (Hardy, Philipps, & Lawrence, 2003). Audio or video recordings were made of all meetings attended by the researcher and/or his colleagues (three researchers and two post-doctoral students). As there were several hundred hours of recordings stored, only around half of these were transcribed, based on whether they were considered to be particularly relevant for advancing the analysis. Last, individual interviews (10) and a lot of informal discussions were conducted in addition to the meetings (with audio recordings being made).

Data Analysis

Data were analysed by relying on methods used in translation studies (Hardy & Maguire, 2010; Maguire & Hardy, 2009; Morris & Lancaster, 2006; Zilber, 2006) for handling different sorts of qualitative data. Three stages of analysis were involved. First, a thick description of the case was generated in order to provide a global comprehension of the Communic Group activities by drawing mainly on the observations, documents and website. In reconstituting the Group's history, we saw that discussions related to narratives or issues associated with the digital mock-up recurred over and over. In addition, these discussions were more intense at certain moments than others and they evolved over time. For example, the discussion around software interoperability (the need for a shared and standardized data model between firms participating in a project) was a constant preoccupation in the study group. However, it culminated when the middle managers were writing the deliverables. Therefore, we pay particular attention to these discussions or central narratives, as Hardy and Maguire (2010) would say.

Second, the reconstitution of the study group's history also provided multiple indications of notable shifts in the members' communication activities. For example, they organized group meetings and industrial visits, and they were present in trade fairs and trade press. Thus, we undertook a more systematic analysis of these activities by looking for 'which audiences' and 'through which discussions' these middle managers tried to make sense of the future technological change in the sector. This analysis identified four distinct translation spaces in which the ideas around the digital mock-up travelled from one context to another. Through intensive working sessions, middle managers put together their specific knowledge of the digital mock-up (from the firm to the Group). They also organized industrial visits to firms of other sectors in which the digital mock-up had already been implemented (from other sectors to the Group). In writing sessions, they mainly framed their message to the software

editors, governmental agencies and sectorial stakeholders (from the Group to the sector). Finally, each member of the Group periodically held organizational meetings with superiors and subordinates from their firms regarding the introduction of the digital mock-up in the firm (from the Group to the firm).

Third, we redistributed the data mainly from videos and interviews into these four translation spaces. By open coding, we then identified the recurring editing practices that allowed middle managers to move from one register to another in order to make sense of the interorganizational change. Drawing on Rouleau and Balogun (2011), we built a repertoire of 'what middle managers were saying and doing' in order to transform the meaning around the digital mock-up. The constitution of this repertoire in turn enabled us to identify a set of editing practices that middle managers drew on as they attempted to make sense of the new software platform through the Communic Group. While we were able to identify several practices, we concentrated the analysis on the ones that were chiefly related to the main discussions or central narratives identified in the first stage analysis. The ideas contained in this article have been validated by participants and by the first author's co-researchers who were periodically invited to observe the Communic Group's meetings in the context of the French National Research Agency ANR research project.

Translation Spaces and Editing Practices

As previously indicated, Communic Group middle managers were intervening in four translation spaces characterized by specific communication activities: 'intensive working sessions', 'industrial visits', 'writing sessions' and 'organizational meetings and talks'. The main discussion pervading the translation space described is first introduced. Then, representative editing practices through which middle managers make sense of the interorganizational change are presented. Finally, a conclusion on the translation accomplished terminates the translation space presentation. Figure 1 provides an overview of the findings.

Intensive Working Sessions

An important part of the work performed by Communic Group middle managers took place during periodic meetings, the length of which varied from one to three days throughout the duration of the study group. In these intensive working sessions, middle managers shared their experience of managing linear infrastructure works in their organization in order to construct a common vision of a civil engineering project. In this way, they developed a common and general discourse on the functioning of the interrelations between public works and civil engineering firms that need to be understood by all the group members while being valid for other stakeholders.

One of the key topics of these sessions had to do with the nature of an advanced 3D model as an object-based software. Instead of working with a list of 2D plans as has traditionally been the case, the digital mock-up involves breaking down an infrastructure project (e.g. road, bridge or railway) into 'objects', that is to say into its elementary components so that information can be attached to each component.

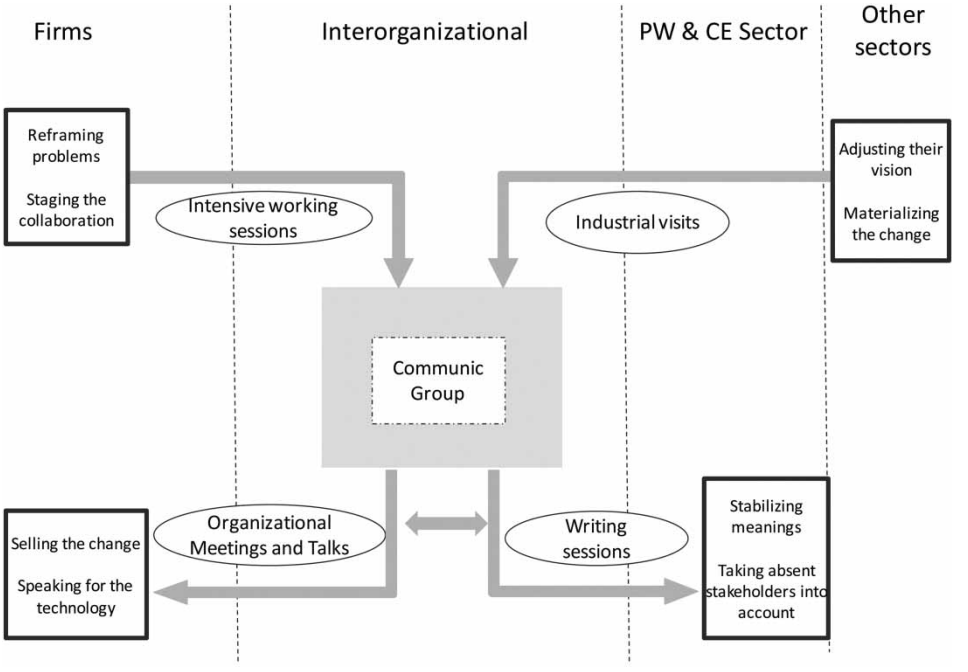

Figure 1. Translation spaces and editing practices.

Hence, the Group had to choose how these breakdowns should be done (by type of structure, by occupation, etc.) and what level of detail was required. However, there was no clear and shared understanding of this object mode of thinking for structuring the model that will underlie the future digital mock-up. In order to deal with this technological issue, the middle managers in these intensive working sessions were reframing problems and staging the discussions around the new design technology.

Reframing problems. During these intensive working sessions, these middle managers engaged in a variety of problem-solving activities regarding the linkage of virtual geometry to real-time databases. These conceptual exercises required a constant effort to frame and reframe the problems through a collective formulation and reformulation of the terms in which various issues relating to the 3D technology were expressed. For example, the discussions around the 'object mode of thinking' central to the digital mock-up are particularly representative of this constant reformulation process. The following lines present three comments extracted from different meetings on this issue and show how the meanings around this question evolved over time.

First, they asked themselves: what is an object in the digital mock-up? This question occupied a lot of time and was recurrently broached, even when it was not on the agenda. At the start of the study group, the question was asked in the perspective of the relationship between the representation (in the mock-up) and

the reality (the physical object itself) and of the relevance of establishing or not this correspondence in the future digital mock-up. The following excerpts taken from a working session illustrate this questioning.

> Does an object in the model have to correspond to something real? A physical object? (. . .)
>
> To build the model by assembling objects, should we think in terms of functions (restoration, interchange, foundations, finishing layer, etc.) or specialized professions (earthworks, drainage, structural engineering)? (. . .)
>
> If we are talking about physical objects, then an object can be either the entire section of the highway or the small bolt that secures the door handle on the toll booth. (Meeting, 20 June 2007)

Then, they agreed to break down the infrastructure projects by type of structure. Thus, the questioning evolved to focus on the transformation of an object in the digital mock-up. In the following comment taken from a working session that took place two months later, the questioning about the nature of the object was changing. They were now asking themselves, 'When an object changes over time, is it still the same object?'

> The project can be divided into objects classified by type of structure. But then there is a spatial conflict, for example on highway A28, do we need to distinguish between the current restoration of the RN138 road and its future restoration? It seems necessary at least to distinguish between existing objects, temporary objects and future objects. (Meeting, 8 August 2007)

Finally, they arrived at a more elaborate and functional answer to their original question. A highway covers several tens of kilometres and includes a large number of objects to be modelled, complicating the processing of the information related to the construction of this highway. In order to facilitate comprehension of the digital model for the multiple and different users (engineers, contractors, subcontractors and so on), the group members proposed to structure it into five levels of objects for handling any infrastructure projects and established hierarchized links between these levels. In a later meeting, one middle manager said:

> I like this distinction between five levels of objects, it obliges us to define every object according to five levels and to provide parallel attributes and properties. (. . .)
>
> We will go from the validation of paper plans to the validation of the objects or object attributes that make up the digital mock-up. (. . .)
>
> The digital mock-up should enable us to manage the validation of objects and their relationships, to include the concepts of time, phasing and scheduling, and to respect confidentiality, which is not possible with the paper plan. (Meeting, 12 November 2007)

By regrouping the objects into hierarchical levels, they were able to integrate the implications in terms of project management and business relations.

By constantly reframing the nature of the object in 3D digital software, the group members adjusted their different positions little by little and reformulated the collective position about what the digital mock-up should be for the public works and civil engineering sector. This reformulation of complex issues allowed these middle managers simultaneously to make sense of the new digital mock-up and to build a consensus around how it should technically be presented to the sector's stakeholders.

Staging the discussions. To generate a common discourse and facilitate collaboration, these middle managers also developed a chain of activities involving other colleagues and specialists and they used real infrastructure projects and highway plans to build their vision of the digital mock-up for the sector. In so doing, they were staging the discussions in the sense that they structured or 'staged a context' (Corvellec & Risberg, 2007; Rouleau & Balogun, 2011) that would provide the resources and knowledge needed to achieve their objectives.

For three years, around 50 people were involved on a more or less temporary basis in the Communic Group. Some of the middle managers invited new collaborators to become involved in the Communic Group and some of these provided invaluable assistance. Others instead recruited young collaborators who had the advantage of being used to the new technologies and who became involved in the search for solutions and technical demonstrations. Periodically, project leaders or specialists on specific questions were also invited, either for a particular event or for a few sessions. One of the engineering firms agreed to delegate a technical director as chief project manager for Communic.

During these intensive working sessions, the members tried to experiment with the functioning of the new technology. To make their discussions on the object-based paradigm more concrete, they simulated the construction of a highway that had already been built by participating companies to see how the exchange of data could be done. Several meetings were held to choose the road section that would be the central actor in the scenario. While at the start, they had chosen a 50 kilometre section of highway, the experiment was conducted on less than one kilometre. This experiment was organized using the language of the theatre (everyone had a scenario and scenes to play) to help the actors better understand the meaning of the discussions concerning the introduction of the digital mock-up and the object-based paradigm in the public works and civil engineering sector. Thus, the experiment constituted a 'staging' that, by soliciting each person's experience, increased the wealth of the discussions.

By constantly reframing problems and by staging their discussions, these middle managers were translating their experience into the Communic Group by disconnecting it from the original context and re-embedding this knowledge in the study group context. Thus, they familiarized themselves with the object-based paradigm typical of the 3D design technology. All agreed in saying that the familiarization with this paradigm was one of the most important inputs for Communic Group members even though at this stage they were firmly convinced that 'the digital mock-up would be here in twenty years'.

Industrial Visits

The Communic Group members conducted industrial visits ranging from a half-day to one day in four companies belonging to other industries (automobile, aerospace and two in shipbuilding) that had already implemented the design software platform. The visits took place at the midway point in the Communic Group process and were completed in six months. The middle managers took advantage of these visits to include other engineers and specialists from their firms and from the sector. Between 10 and 15 persons accompanied them during these visits.

The main discussion in this translation space concerned the impact of the implementation of the 3D model-based software on civil engineering work and management. In fact, the new technology will transform collaboration between the various design professions as well as inter-firm collaboration in the construction projects. For the moment, engineers and project managers in this sector use plans, make their calculations and sequentially control the worksites. Until the industrial visits, Communic Group middle managers had mainly worked to develop a 'theoretical' vision of the digital mock-up based on their generic knowledge of the computer-aided design tools and their deep understanding of their sector. The industrial visits allowed them to adjust their vision of the digital mock-up and to rationalize the change through the accounts of implementation told by the managers they met.

Adjusting their vision. While most other engineering disciplines were already using the digital mock-up, that was not the case for civil engineering. Before the industrial visits, Communic members frequently justified this fact by saying 'each highway is unique because it is set on a particular piece of ground. This is why the digital mock-up is difficult to apply in our field' (Meeting, 12 January 2007). Also, the digital mock-up was viewed mainly as a 3D design and visualization tool that enhanced relations with clients. After the visits, it was seen mainly as a tool enabling cooperation between the companies participating in a construction project and as a project management tool.

Additionally, many concrete details recounted by the managers they met proved to be meaningful for the Communic Group middle managers. For example, they realized that building an aeroplane, even though it is a finished and standardized object, is not that easy and that each plane, even in the same series, is not identical to the others, as they had imagined. As one of them said: 'We clearly saw at (aviation firm name) that each aircraft had its own digital mock-up; we will have the same thing with each highway section' (Meeting, 23 April 2008). Hence, they had to adjust their vision around the difficulties of using the digital mock-up in their sector due to its specificity. Finally, they understood that they had 'to learn to make choices' because 'too much information kills information' (industrial visit in the aviation firm). On one hand, they saw through the experience of others that it was useless to go too deeply into detail at the risk of being stuck with a mountain of data that made processing it more difficult. On the other hand, it allowed them to question the type of data to share with the other companies without also sharing their own specific know-how.

Rationalizing the change. During these visits, the Communic Group middle managers met other managers and discussed common concerns related to their management function. For example, the managers and the engineers they met unreservedly explained the doubts and the difficulties they had when introducing the digital mock-up in their firms. A large part of these discussions had to do with the difficulties of introducing inter-firm design work as well as the transformations inherent to the work of project leaders.

The introduction of the digital mock-up requires reviewing the way collaborative work is organized. At (aviation firm name), for example, the meetings about 'clashes' were a way to manage the difficulties that arose between the firms involved in the same project during introduction of the digital mock-up. Throughout the implementation, each designer first tried to solve a potential problem with another designer as soon as it was located. If they were unable to solve the problem or if they discovered that it was more widespread, they informed the project leader. When several incidents were reported for a given area of a plane, the project leader called a meeting to try to solve the problems of coordination in the exchange of data. According to the aviation firm managers, there were several such meetings every week during the first year of introduction of the digital mock-up. Subsequently, fewer meetings were required. On several occasions, the Communic Group middle managers returned to this example in their discussions about the organizational consequences of introducing the digital mock-up in the public works and civil engineering sector.

At most of the industrial sites visited, the middle managers were met by technical directors and learned the importance of upper management support of the digital mock-up to facilitate its introduction. They also learned that the work of internal project leaders had to be revised. Additionally, one of the managers they met described at length the arduous task required of him, supervising the design office managers. They therefore had to completely revise their methods of managing and controlling the work around the digital mock-up. In this translation space, middle managers were translating the lessons related by managers from other sectors to their own sector. In these industrial visits, they were dealing with two different worlds at the same time, their own and that of the managers they met. By synthesizing the two worlds, they readjusted their vision and rationalized or concretized what it means to introduce a digital mock-up in terms of organization and control of the work. Although the industrial visits were postponed for several months, they had a beneficial effect on the group. Everyone agreed that these industrial visits were productive for the Communic Group. They allowed members to see the need for the big firms to develop together a common digital mock-up model in order to facilitate its implementation. After the visits, they felt that the introduction of the digital mock-up was not as far off as they had thought at the beginning ('in 10 years, it will be here!').

Writing Sessions

In the writing sessions, middle managers were translating the outcome of their discussions for the public works and civil engineering sector. These writing sessions began in October 2009 and ended in December 2010. Communic Group members

produced three 'deliverables'. Among them, Document L3 is central to the Communic Group's work. Addressing technical issues from both strategic and operational perspectives, this document is specifically intended for software editors and other stakeholders in the sector (e.g. government agencies and municipalities, contractors and so on).

The main focus of the third deliverable concerns computer gateways for data sharing and interoperability. In the public works and civil engineering sector, a multitude of data needs to be put together around each project. Each company uses different sets and formats of data and the challenges consist in finding ways of assembling the data obtained via different kinds of technological solutions. In this translation space, middle managers were stabilizing the shared understanding of the future technology that they built over the three years of their participation in the Communic Group. Moreover, when assembling the content of the deliverables, they constantly took the absent stakeholders into account.

Stabilizing meaning. When writing down in the deliverables the recommendations previously ratified in meetings and committees, some discussions surprisingly resurfaced, as though the interpretations of the general position still differed. Group members thus spent time checking with one another to assess whether they all had interpreted the recommendations in the same way. Even though this process was time consuming, they took the time needed to alleviate the divergent interpretations. The following excerpt about data saving and relations between different project members illustrates this situation.

> So guys, I didn't believe that after all the discussions we had on the object we would still be here! For me it was clear, we had agreed!
>
> On the other hand it's better than having let through a formulation that helped us advance for a while but eventually contained discrepancies. Well are we going to write this stuff?
>
> To summarize, if we say: the object will be geo-localizable, it's the object's attributes that are inheritable, there will be a creator name (professionals who use the software) and the creator must approve all changes to the object. Does everyone agree? (Name of a colleague) are you with us? This will need to be discussed again at the next steering committee meeting, to really convey this discussion we just had (in a working group) and see if everyone agrees. (Meeting, 7 July 2010)

In fact, these interactions that seemed unnecessary at this point in the process allowed them to fine-tune the stabilization of their understanding about how they envisioned the digital mock-up for the sector. In this excerpt, they were stabilizing their comprehension of the main contractor's responsibility in a project. While they all agreed that the digital mock-up would strengthen the connections between different types of engineers and building professions, they remained uncertain about whether the new technology would foster closer collaboration across different companies.

One of the sensitive issues in these discussions was the question of the companies' responsibility in the projects. As of 2007, Communic members had begun to think about this question as is shown in this excerpt from an intensive working session:

> We should impose what is called in other software programs 'validity gates,' where everyone is asked to actually and formally validate a particular step. This would oblige everyone to carefully read the version being validated, even if they have not followed all the modification steps, otherwise we risk spending all our time constantly reading and rereading lists of modifications. (Meeting, 12 May 2007)

Then in 2008, the managers had taken a stand on this issue:

> We have to store all the modifications, all the creations with an author name. We have to be able to retrace what everyone did. (Meeting, 31 November 2008)

When writing the document, they again questioned this point. In the French version of deliverable three, the researchers find the following sentence:

> The project leader ensures the survival of the data, that is to say its accessibility for several decades.' (Communic, 2010b, p. 26, our translation)

Far from calling into question what was said and approved in the preceding steps, by revisiting the themes already discussed they were making sure that everyone had understood the same thing. Also, these conversations during the writing sessions allowed them to clarify proposals and rules that the Group hoped to see implemented in future. At the same time, as these proposals and rules would then be made public and therefore likely be discussed by others in the sector, in agreeing to re-discuss and readjust their claims, they also prepared themselves to better defend their viewpoints when discussing them with external stakeholders.

Taking absent stakeholders into account. These middle managers used the same cooperative mode to write a text as they do to construct a bridge or highway. They worked as if they were on a 'construction site' where each participant accomplished the task allocated to him/her for a period, without any coordination, and then returned to the group to coordinate and validate. Consequently, in the writing sessions, they were mainly specifying, adjusting and realigning the textual tasks accomplished during the whole process.

To make these textual changes, they constantly referred to the various stakeholders, the target audience for the text under review. On several occasions, they asked: 'What will such-and-such a person understand or not understand if we say things in that way?' For example, one middle manager expressed himself as follows:

> We mustn't forget to produce documents that are clear to the subcontractors, since we often overlook them and then afterwards they complain because of a lack of coherence .... (Meeting, 30 September 2009)

In another meeting, his colleague said:

> I wonder about the use . . . who is going to read it? Do we target the first-level customers, in which case we can afford to be quite concise, or on the other hand if we are writing to the other construction company and design partners, we will need a more detailed document because they will need to understand our approach. If this is so we must then give everything we have written in full. (Meeting, 17 March 2010)

There was also a debate around whether or not all the deliverables should be translated in English.

When the Communic Group was assembling the information contained in deliverable three, software editors were amongst the most important intended audiences. The companies in the sector already possess a number of software programmes specific to each profession, and some of these programmes are in-house creations. Software publishers will have to create or adapt programmes to enable use of the digital mock-up. The stakes are high for the companies as two orientations are possible: software publishers will either propose a unique and integrated model to which the companies must adjust or they will develop new versions of the existing programmes to facilitate their interoperability. Without directly stating so, all the positions taken argued for the second option and aimed to persuade software publishers to choose this approach.

Constantly taking into account the stakeholders from the sector and making them symbolically (of course not physically) 'present' in their discussions, is far from being an anecdotic communication technique. This transportation in space and time allowed the Communic Group members to intersubjectively share their practical knowledge of the stakeholders in order to better frame their message and thus strengthen their chances of gaining acceptance from the targeted audiences. In performing the stakeholders' presence, they increased their chance of advancing the development of the digital mock-up in their sector.

By stabilizing the shared understanding of the future technology and constantly taking intended audiences into account when deciding on the deliverables' content, these middle managers were translating the digital mock-up from the Communic Group to the sector. When presenting their recommendations they used the expression the 'Communic model' which implies that they had indeed moved from one frame of meaning to another, from a source model to a local model. Additionally, when the working group met in these writing sessions, the general feeling was now the following: 'We cannot escape the fact that the digital mock-up will be here in five years!'

Organizational Meetings and Talks

The Communic Group's middle managers could not be engaged for three years in an interorganizational study group investigating an issue of sector-wide significance without carrying part of the message they were building together to their own firm. In participating in collaborative work, they expected to be able to increase the capacities of their own organizations to deal with the issue

collectively studied. Therefore, their meetings with their colleagues, subordinates and superiors in each of their organizations were occasions for translating what they had learned and conceived in the Group into arguments and actions adapted to the context of their own company. This translation process was subtle and occurred more or less openly throughout the study group's tenure and became more obvious towards the end of the three-year term.

The structuration of the public works and civil engineering sector has historically been based on a clear institutionalized separation between construction and engineering firms. Since the 1990s, this separation is less and less clear given the leveraged buy-outs and the creation of large groups necessitated by global competition. The digital mock-up introduction will accentuate the blurring between construction and engineering firms. In this context, the reinvention of the business models in this sector is at stake. In this translation space, each middle manager undertook specific actions in light of the digital mock-up introduction. More specifically, speaking for the technology to colleagues and subordinates and selling the change to upper management were the most important translation practices accomplished by middle managers.

Speaking for the technology. Middle managers had to prepare their colleagues and project leaders for the introduction of the digital mock-up. As one middle manager said:

> It's the culture that has to be changed . . . What we need for it to work, is not to say: 'We'll save two Euros,' it's to show some examples where it works to make them want to try it. In fact, we must not push people, we must encourage them to go toward this technology. (Interview, 19 November 2008)

And this encouragement was done by making the technology an actant, an agent of change in itself.

The Communic Group members developed the habit of speaking for the digital mock-up. For example, when expressing their vision on the technology, rather than speaking on their own behalf, they tended to anthropomorphize the technology. In the following sentence, this is what one middle manager was doing when he said:

> 'Oh, not at all! This is not what the digital mock-up is requesting, the file formats must be directly in a neutral format. (Meeting, 12 June 2009)

While they recognized it as an actant according to Latour's definition, they also became its spokesperson. They spoke on its behalf and expressed its requirements and needs. This is also what another middle manager was doing when he spoke to his colleagues of the changes that this technology would bring:

> As soon as I feel that the ground is favourable, I explain to them that the digital mock-up will change our ways of working, the digital mock-up needs us to adapt! (Meeting, 1 June 2010)

And this adaptation would be necessary to maintain their company's competiveness. As a middle manager commented:

> We want to get the digital mock-ups to talk to each other, the engineering model and the construction model . . . in fact it is a dialogue between humans but via digital objects which will allow us to evolve in how we do things. (Interview, 19 November 2008)

By making themselves the spokespersons for the technology and emphasizing its advantages (quality, fewer delays, better coordination of actors, etc.) they seemed more concerned by the firm's technological progress than by its economic development, which sparked the interest of colleagues and project leaders. Moreover, they also set up different internal technology watch activities in order to make people who were interested in the digital mock-up speak for the technology in their firms. In one of the construction firms, the introduction of the digital mock-up was part of the technological strategy presented on the company website, potential solutions were tested by collaborators and hypotheses were explored via participation in various European research projects. Another construction firm assigned tasks to young engineers, assisted by trainees, to explore parts of the development of the digital mock-up in the near future while yet another developed a training module with a simulation in 3D for the very delicate bridge building parts. Other firms (one engineering firm and one construction firm) had outside firms develop solutions to increase the interoperability of some of their software. The results of these efforts were presented and discussed in the various meetings and committees of these organizations.

Selling the change. The industrial visits having confirmed the importance of involving company directors for a successful introduction of the new design technology, each middle manager had to find arguments and set up actions for selling the change to their superiors. As a middle manager said:

> Every time I can talk about it to a member of the executive committee, I do so. (Interview, 30 October 2008)

In Communic Group meetings, the importance of convincing senior management recurred often in conversations. And the costs seemed to be a major argument for selling change to their superiors even though the middle managers' technological experience told them something else. The following conversation between four middle managers is illustrative of these conversations about selling the change to their superiors.

> It is really important that we can say something about costs, because the first thing our managers are going to ask us is that: how much it will enable us to save on a project?
>
> I don't agree with divulging the savings, it is always the same, you have to declare huge savings to convince them and afterwards you have to keep to them . . . and that

> is something else. Take the example of IT in the companies: no-one can currently say how much it saves, there is absolutely no certainty that we have saved anything, things are just done differently.
>
> Yes that's right, we will gain in reliability, in quality, particularly for maintenance, maybe also in being able to preserve the versions offered to the customer, in evaluating the modifications requested by the customer, but ultimately not in cost.
>
> We should shorten the project time anyway, otherwise it's not worth it. (Meeting, 8 October 2009)

As they were convinced that their superiors would not commit to this change unless they had a clear vision of the return on investment, they seriously thought about the costs of the digital mock-up. Each member individually evaluated these costs, as 'expert assessment', and presented to the others a cost-reduction curve according to implementation stage. In all cases, the costs were higher at the start and decreased over time. This exercise allowed them to collectively build a rational argument around the costs, which they could then use to sell the digital mock-up to their superiors. The result of this reflection is found in deliverable one (Communic, 2010a, pp. 38–42).

Nevertheless, each middle manager adapted their selling argument according to their company's strategic priorities. For example, one middle manager's key selling argument was linked to the possibilities of the digital mock-up for facilitating international development, a strategic axis of his construction firm. This middle manager was also involved in a European study group that was considering the international standards to develop for design technologies, which facilitated his selling of the technological change within the company. The middle manager from one of the engineering firms created a five-person research unit that, in parallel with the Communic Group, studied how the firm could establish the new digital mock-up. This allowed him not only to 'translate' the digital mock-up locally but also to adapt his selling arguments to his engineering firm's business context.

In this translation space, the middle managers were preparing the arrival of the new technology that is central to the renewal of the business models of these firms. When the Communic Group's activities concluded, the results of translating the digital mock-up seemed more apparent in some firms than in others. For all of them however, there was no real choice to do otherwise. In the new globalized and competitive context, engineering firms have to be more innovative than ever while construction firms need to develop their engineering capabilities. At the conclusion of the Communic Group's work, everyone was convinced: 'The digital mock-up is already here, it arrived through the clients and through architecture!'

Discussion

This article examines middle managers' sensemaking work at the interorganizational level and seeks to explore the two following research questions: how are

the translation spaces in which middle managers make sense of change at the interorganizational level related to one another and how do they evolve over time? Which editing practices do middle managers use in these translation spaces? The analysis reveals the existence of four translation spaces that were central to the way middle managers from the Communic Group made sense of the new design technology. Table 1 synthesizes the findings. After explaining how middle managers made sense of a new design technology, we will develop the contributions of the article.

Not only are the translation spaces multiple and differentiated – each of these translation spaces had its own logic – they also constitute an interdependent dynamic of meaning transformation from one context to another. Put differently, what happens in one translation space impacts what happens in another. For example, by inviting collaborators and project leaders from their firms to periodically participate in the intensive working sessions, the middle managers helped familiarize them with the new design technology. In so doing, they facilitated the conversations around the introduction of the digital mock-up in organizational meetings and talks. The same phenomenon was at play during the industrial visits. By inviting other engineers and specialists from their firms to take part in these visits, they helped demystify the problems related to the implementation of the

Table 1. The dynamic of translation spaces in the Communic Group case

Translation spaces	Translators	Audience (from one context to another)	Discussions (from one universe to another)	Editing practices
Intensive working sessions	Middle managers as individual translators	From personal experience in firms to the Communic Group	From a theoretical view of the digital model to the sectorial application	– Reframing problems – Staging the discussions
Industrial visits	Middle managers as collective translator	From the other sectors to the Communic Group	From implementation in each collaborating firm to a common digital mock-up	– Adjusting the vision – Rationalizing the change
Writing sessions	Middle managers as collective translator	From the Communic Group to the industrial sector	From rigid to flexible software interoperability	– Stabilizing meaning – Taking absent stakeholders into account
Organizational meetings and talks	Middle managers as individual translators	From the Communic Group to the company	From traditional to innovative technologic strategy	– Speaking for the technology – Selling the change

digital mock-up for civil engineering work and management. While writing the deliverables, Communic Group middle managers regularly evoked the highway construction simulation as well as the industrial visits to justify the adjustments required to the discourse built around the digital mock-up. Even the specific operational procedures in each firm affected what went on in the Communic Group's intensive working sessions. For example, the introduction of a research unit related to the digital mock-up in one of the engineering firms fed the discussions during the experiment conducted in the intensive working sessions.

Furthermore, middle managers as translators were important elements of the translation spaces dynamic. The case study demonstrates that they made sense of the change either as individual or as collective translators. In the translation spaces in which the firm context was present (intensive working sessions and organizational meetings and talks), they acted individually, while in the environment-oriented translation space (industrial visits and writing sessions), they acted collectively. According to Boxenbaum (2006), individual preference regarding the idea to be translated is of major importance in the early stage of a translation. In the Communic case, the similarity of the middle managers' life trajectory alleviated their divergent interests. Although at the beginning, they did not all know one another, they shared a certain number of characteristics that facilitated the collaboration. They are all engineers who graduated from higher engineering schools in France, they each have more than 30 years of experience and they all moved up the ranks before becoming technical directors.

The multiple translations from one discursive universe to another made it possible to propose some guidelines about what the digital mock-up should be for the French public works and civil engineering sector. As Plesner and Horst (2012) suggested in their study of 3D digital model assemblages in the building industry, these guidelines bridge a set of technical issues (mainly discussed in intensive working and writing sessions) and sectorial issues (mainly discussed in industrial visits and organizational meetings and talks). The Communic model proposes to structure the digital model in five hierarchical levels and militates in favour of remaining flexible in terms of software interoperability so as to maintain the existing equilibrium between purchased and in-house softwares. While the Communic members converged towards a common digital mock-up to facilitate inter-firm collaboration, they simultaneously developed different solutions within their firms that contribute to redesigning the business model between engineers and constructors for the whole sector.

In each translation space, the middle managers carried out specific editing or translating practices. To some extent, these editing practices might be grouped in two subsets echoing the interpretation and action notions that are central to sensemaking (Gioia & Chittipeddi, 1991). The editing practices named 'reframing problems', 'adjusting the vision', 'stabilizing meanings' and 'speaking for the technology' all have to do with the ways middle managers understand, interpret and create sense, for the Communic Group and for others, of the new design technology that is entering the sector. The editing practices called 'staging the discussions', 'rationalizing the change', 'taking absent stakeholders into account' and 'selling the change' refer to what is done to set up a favourable context in which to translate meaning. These middle managers were not just selecting

ideas and building relevant arguments around the new digital mock-up, they were also acting in order to interest multiple audiences (Hardy & Maguire, 2010). Besides the main audiences targeted in each translation space, they periodically invited engineers, informatics specialists, researchers, managers, software publishers, governmental agents and so on in order to inform them and engage them in their own agenda around the new design technology.

Beyond the fact that these translation spaces are structured separately, albeit interdependently, they are also temporally sequential (Figure 2). Even though intensive working sessions were held throughout the Communic Group's tenure, they were particularly important during the first phase of its existence. At that time, middle managers were familiarizing themselves with the object-oriented paradigm and creating a common discourse around the new design technology.

The industrial visits constituted a turning point in the study group work in the sense that they allowed middle managers to appropriate the change so as to create a more precise and realistic vision of the organizational impacts of introducing the digital mock-up. This phase was also important for them because they discussed concerns typical of mediation work performed by middle managers. With the production of the deliverables for the sector, the writing sessions were the final phase of the translation. This sequential temporality, while it followed the editing rules concerning context, formulation and logic proposed by Sahlin-Andersson (1996; see also Sahlin & Wedlin, 2008), was not so linear. For example, the experiment involving a highway already constructed intersected with the beginning of the writing sessions. Even though middle managers regularly transferred what

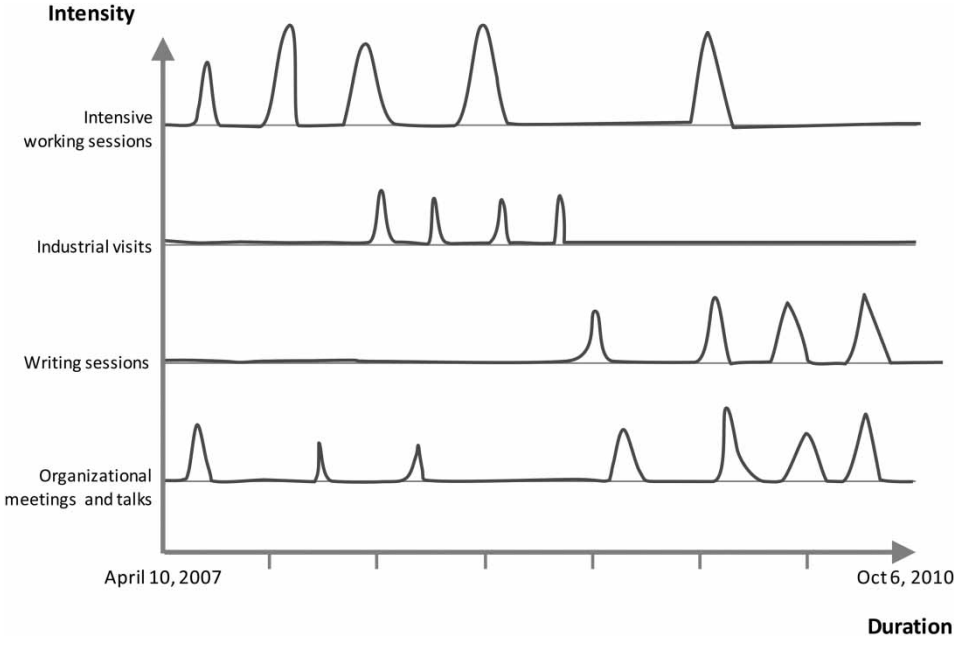

Figure 2. Translation spaces and their temporal sequencing.

they had learned in their firm during the Communic Group's tenure, it became more important towards the end of the study group.

Contributions

This article proposes three sets of contributions. First, the article enriches the literature on middle managers. It provides empirical evidence about middle managers' sensemaking and sensegiving activities at the organizational interface (Balogun et al., 2005; Frow et al., 2005; Ghorbal-Blal, 2011; Rouleau, 2005). To the knowledge of the authors, it is one of the first articles exploring middle managers' sensemaking work in cross-sector collaborations. Moreover, the article targets a specific type of middle managers that has been understudied. Communic Group middle managers largely differ from the middle managers in traditional studies in which they are generally defined by their intermediate hierarchical position (Balogun, 2003; Balogun & Johnson, 2004; Dutton et al., 2001; Floyd & Lane, 2000). Middle managers in this study are dealing with the technological development of their firm. Nowadays, middle managers form a pluralistic group and according to Woolridge et al. (2008) include mid-level professionals, functional line managers and project-based executives. The mediating capacities that define middle managers reside in their access to top management coupled with their knowledge of operations (Woolridge et al., 2008). The article shows that their communication activities are complex and confirms the importance of studying multidirectional mediation roles carried out with colleagues, subordinates, superiors and external stakeholders in order to advance research on these types of middle managers (Rouleau & Balogun, 2011).

The article also enhances the knowledge of middle managers' role as translators, which has already been mentioned in the literature (Cranefield & Yoong, 2007; Fauré & Rouleau, 2011; Rouleau, 2005). As Fauré and Rouleau (2011, p. 180) suggested, 'the strategic role of middle managers as translators between heterogeneous stakeholders is becoming more and more important in many industries and has so far been underexplored'. The article's findings highlight this role. By inscribing the middle managers' communication activities in the central narratives related to the digital mock-up, the article proposes an integrative view that contributes to the recent middle manager research on language use (Besson & Mahieu, 2011; Nielsen, 2009; Rouleau & Balogun, 2011; Thomas et al., 2011; Vickers & Fox, 2010).

Second, the article contributes to translation studies in respect to explaining management and organizational change (Boxenbaum, 2006; Lamertz & Heugens, 2009; Zilber, 2006). The analysis provides a complex and dynamic view of the translation process by looking at different translation spaces and by proposing a set of editing practices. First mentioned by Sahlin-Andersson (1996), the notion of translation space has been defined as a distance interval between two points. Of course, distance between the source domain and its reproduction in a local context matters, as Morris and Lancaster (2006) showed. However, a space is rather an area or a region containing different entities related to one another and having characteristics or properties that obey a specific logic. The notion of translation space used in this article echoes the 'discursive

space' proposed by Hardy and Maguire (2010) in the sense that it contains multiple voices or actors and provides specific interpretations of the circulating discourses. However, it differs on the fact that in discursive spaces, these voices are engaged in struggles regarding text production, distribution and consumption. While a vision of power underlies the notion of discursive space, the notion of translation space instead carries a vision of the travel and transformation of meaning specific to translation studies. Of course, power is important in translation but translation is basically a matter of meaning-making involving senders and receivers or editors and audiences and of the transformation of an idea. The notion of 'editing infrastructure' recently proposed by Sahlin and Wedlin (2008) appears to be closer to the view even though it has not been fully developed by these authors.

The article also provides a deeper comprehension of the way translation is done in practice. The set of editing or translation practices found allows one to better understand how the 'editing rules' proposed by Sahlin-Andersson (1996) are put into action by the translators in order to restrict and direct the translation (context, formulation and logic rules). By reframing problems and staging their discussions, Communic Group middle managers were editing rules concerning context. These two editing practices allowed them to transpose their abstract and general knowledge into the Communic Group. The industrial visits allowed them to enter a period of relabeling in which rationalized formulations were proposed. By readjusting their vision and rationalizing the change, they put into practice the editing rules concerning formulation and thus they concretized what it means to introduce a digital mock-up in their sector. In writing sessions, they packaged the new ideas and edited the rules concerning logic by stabilizing the shared understanding of the future technology and constantly taking the intended audiences into account.

Regarding the practices of speaking for the technology and selling the change, these editing practices contributed to 'recontextualize' in each firm the design technology. While the first translation stage proposed by Sahlin-Andersson (1996) concerns decontextualization rules, there is no stage for the recontextualization of the idea to be translated. Therefore, the authors suggest the existence of a fourth set of editing rules having to do with recontextualization and more broadly with implementation. Of course, these editing practices were transversal to the previous editing rules but they became stronger towards the end of the translation (Figure 2), which means that they are an important part of the whole translation process.

Third, by drawing on the translation lens, the article contributes to advance the view of interorganizational sensemaking and sensegiving (Corvellec & Risberg, 2007; Maguire et al., 2004; Werle & Seidl, 2012). First, sensemaking and sensegiving have traditionally been viewed in management and organization studies as if there was a group of people – mainly managers or middle managers – who developed cues for others in order to explain the changing reality. The article rather proposes a practice view of sensemaking and sensegiving that has to do with developing and communicating ideas instead of defining and transmitting them. Moreover, sensemaking and sensegiving are less a matter of making meaning to influence others than interacting with various audiences in order to gain their support and engaging them. More specifically, research shows how

participants in interorganizational collaboration built their audiences as they built their vision of the digital mock-up by inviting engineers to their meetings, by organizing industrial visits and so on. In this sense, observations advance recent findings related to the management of meaning in practice (Bryant & Stensaker, 2011; Rouleau & Balogun, 2011; Thomas et al., 2011). Second, the article advances knowledge of interorganizational sensemaking, which tends to propose evolving patterns of shared understanding transformation (Corvellec & Risberg, 2007; Maguire et al., 2004; Werle & Seidl, 2012). By drawing on the notions of translation spaces and editing practices, we show how interorganizational sensemaking involves multiple 'scenes' and needs to be accomplished through different communicational activities such as meetings, talks, texts and so on. To regard the Communic Group activities only in terms of a sensemaking pattern would be insufficient. This pattern is less the result of a linear and sequential meaning transformation than the result of communicational activities accomplished at different levels and in multiple directions. Also, unforeseeable changes were always occurring in the environment and were constantly modifying the context, such that while implementation of the mock-up was originally thought to be 20 years away, it was almost a reality by the end of the Group's study. In addition, literature on interorganizational sensemaking generally considers that assembling an array of arguments and establishing a stable coalition are two sets of activities that are critical for efficiently managing interorganizational relationships and change (Maguire et al., 2004). The findings refine this observation by explaining through which practices actors assemble their arguments and build coalitions when working at the interorganizational level. The focus on editing practices when studying middle managers' sensemaking work at the interorganizational helps to better understand the situated construction and diffusion of meaning.

Conclusion

This article raises a number of issues for future research on middle managers engaged in interorganizational sensemaking. More research is needed in order to better understand the skills, and in particular the discursive skills, middle managers draw on when they are performing their role of translators across organizational boundaries. Further research investigating in more depth the process of successful or unsuccessful translation activities and editing practices would be relevant in order to confirm and nuance the findings of the study. Specifically, more empirical evidence is needed to confirm the existence of a fourth set of editing rules (Sahlin-Andersson, 1996; Sahlin & Wedlin, 2008) and to enrich comprehension of the translation spaces' interdependent dynamic. Finally, future research should contribute to develop the view of interorganizational sensemaking as translation and focus more attention on the practices through which it is accomplished.

This study also has a number of implications for practitioners, including CEOs and senior managers and middle managers, particularly those involved with technological innovation and development. The study shows that various issues arise from the involvement of key persons such as middle managers, as they are required to act at the border of different levels simultaneously. It is therefore

essential for them to ensure that they will have adequate time and support to fully engage themselves in different translation spaces, and that they have the appropriate discursive skills and experience related to communication of complex ideas. In this case, the fact that they were from the same sector with a similar background certainly helped to make the experience a success. In addition, the involvement of a team of experts and project managers around the middle managers was essential not only for helping to balance the skills required in this type of inter-organizational work but also for helping to produce a common discourse around the change and preparing the dissemination of new ideas throughout the organization.

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Note

1. COMMUNIC: *COllaboration par la Maquette Multi-Usage Numérique et l'Ingénierie Concourante* (Collaboration with a Multi-Use Mock-Up and Concurrent Engineering), English version available at http://communic.fr/projet_anr_communic.htm

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