Transition between temporary organizations: Dimensions enabling economies of recombination

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Abstract

Economies of recombination (ER) are seen as a way for firms to capitalize on previous knowledge creation, but the process that enables them to be accessed by firms is not clear in the literature. To date, temporary organization (TO) theory has focused on the process through the 'transition' concept via two units of analysis: within the project, and from a TO to a permanent organization (PO). Based on 67 interviews with inter-organizational project managers and four clusters, this research paper explores the factors influencing the transition process from one TO to another TO. Results identify eleven factors separated into three dimensions favoring or hampering this process: a structural dimension, which emerges from the first TO; the conjunctural dimension, which has a transversal effect throughout the transition; and the interstitial dimension, which is specifically highlighted between two TOs. We contribute to temporary organization theory by enlarging the scope of the transition concept and by identifying how clustered firms can jointly benefit from ER.

Keywords

Transition – Temporary organization – Dimensions – Project Management – Economies of recombination.

1. Introduction

In 2005, the French government introduced a new industrial policy aimed at developing France's innovative capabilities through collaborative projects that "bring together workers from different organisations and employers" (Calamel *et al*., 2012: 48) in order to "promot[e] partnerships between companies, higher education hubs and research units on a regional or interregional scale around innovative projects" (Brette & Chappoz, 2007). Through this public policy, the underlying idea was to generate localized ecosystems of innovation encouraging triple helix linkages (Leydesdorff & Meyer, 2006; Ruuska & Teigland, 2009; Sarpong *et al*., 2017) whereby research laboratories, universities and firms work together. Seventy-one competitiveness clusters were certified by the government and located in designated territories where resources and skills were of particular interest to industrial agglomeration economies. Several of these competitiveness clusters overlap within a single territory, leading to a complex geography where human, organizational and institutional resources meet in order to carry out projects (Grabher & Ibert, 2011). This configuration shapes project ecologies encompassing "social layers on multiple scales, from the micro level of interpersonal networks to the meso level of intra- and inter-organizational collaboration to the macro level of wider institutional settings" (*ibid*: 176).

In this complex geography, Cluster Coordination Units (CCUs) supervise a cluster's strategy implementation. In particular, they must ensure that collaborative research and development (R&D) projects are generated. One way of achieving this goal is by relying on the results of a first project in order to develop a new one. We define this transition process from a temporary organization (TO) (Lundin & Söderholm, 1995) to another as the ability of project partners to collectively rely on knowledge created during a first TO in order to reuse it in a second TO. Previous research on inter-project learning has often focused either on individuals as the enablers of knowledge learning (*e.g*.: Almeida & Soares, 2014; Swan *et al*., 2010; Zhao *et al*.,

2015), or has taken a technological perspective, whereby information and communication technologies (ICT) are used to codify and store knowledge (*e.g.*: Cacciatori *et al*., 2011; Newell, 2004; Newell *et al*., 2006). As such, the literature on inter-project learning usually adopts a sender/receiver perspective on learning (Hartmann & Dorée, 2015) where communication channels are designed to generate, capture and transfer knowledge between projects or to the permanent organization (PO) (Newell *et al*., 2006; Scarbrough *et al*., 2004; Zhao *et al*., 2015). Learning at the inter-organizational level helps prevent risks created by time pressure which hinder the creativity of project teams (Khedhaouria *et al*., 2017). However, to achieve this ultimate learning capacity, project partners will need to rely on previously generated knowledge in order to access economies of recombination (ER), defined as, "the ability to balance the contradictory demands of offering a problem-specific solution to the client and yet, at the same time, to reuse and sediment project knowledge into 'modules' that can be recombined in subsequent or related projects" (Grabher, 2004a: 110). ER consider knowledge both as the output from a first TO and as an input for pursuing similar kinds of projects (Whitley, 2006).

To study the TO transition process, we adopt a multi-level approach, as recommended by Lundin *et al*. (2015) and Sydow & Braun (2018). Hence, despite our primary unit of analysis being the transition process between two TOs, we also integrate the 'below' level (the organizations collaborating in the project), as well as the 'above' level (the cluster that certifies the project), as context-related elements. A contextual view of projects is fundamental; projects must be considered in their contemporary social and spatial context and not as phenomena isolated from their history (Grabher & Ibert, 2011). In addition, "institutions such as conventions, norms, and regulations provide critical ingredients" (Grabher, 2002b) to understand relationships between partners. This requires the integration of environmental context elements within our study for a better understanding of the necessary dimensions that facilitate the transition process.

The dimensions influencing this transition process from one TO to another have not been studied before. Hence, this paper tackles two issues related to the transition. Firstly, how the transition process can be operationalized between two TOs. Past research has mostly focused on the transition between a TO and a PO to understand "whether and how knowledge and learning within TOs becomes subsequently sedimented into the wider PO" (Burke & Morley, 2016: 1245). This is the case in Burström & Jacobsson's (2012) study, which extended the initial scope of Lundin & Söderholm's (1995) intra-project perspective. Focusing our attention specifically on the transition between TOs as the main unit of analysis should help better understand its development over time. Secondly, the literature does not provide a set of dimensions that facilitate or restrict this transition process. It mostly considers factors influencing knowledge transfer or inter-project learning from the TO to the PO (Akhavan & Zahedi, 2014; Bakker, Cambré *et al*., 2011; Swan *et al*., 2010) or to another TO through the PO (Cacciatori *et al*., 2011; Ebers & Maurer, 2016; Hartmann & Dorée, 2015; Landaeta, 2008; Newell, 2004; Newell *et al*., 2006; Newell & Edelman, 2008; Zhao *et al*., 2015). Therefore, two research questions stem from this gap: 1) What dimensions enable or restrict the transition process between temporary organizations? 2) To what extent do these dimensions contribute to achieving economies of recombination? The answer to these questions will help us better understand economies of recombination. At the inter-organizational level, knowledge capitalization processes are often hard to put in place since value created in collaborative settings can often be difficult to establish: knowledge being intangible, the contribution of each member can be hard to estimate.

This paper is structured as follows. We first review the literature around the transition concept, the modes of governance at the inter-organizational level that support knowledge learning and the differences and complementarities between inter-project learning and ER. We then explain how this study was conducted and how data was collected and analyzed. We illustrate our

findings through examples gathered from 30 different collaborative projects, highlighting three different dimensions (structural, conjunctural and interstitial) and the systemic effect these dimensions have on each other. Finally, we discuss our results, pointing out our research limitations as well as future research perspectives. We explain how we contribute to temporary organization theory by providing dimensions that enable organizations engaged in collaborative projects to access ER, thus facilitating knowledge reuse in new projects.

2. Literature review

2.1. The concept of transition

Since Goodman & Goodman's (1976) work, a project has been considered to be time-limited and is defined as "a temporary organization to which resources are assigned to undertake a unique, novel and transient endeavor managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change" (Turner & Müller, 2003: 7). Bakker (2010: 468) considers projects as "a set of organizational actors working together on a complex task over a limited period of time". This definition has the same characteristics that Lundin & Söderholm (1995) developed within the theory of TO. They describe projects as being motivated by the need to realize precise actions to reach an immediate goal and to which they attribute four characteristics: (1) time - the project being defined by a temporal period; (2) tasks and actions that have to be realized to reach the project objectives; (3) the project team; and (4) the transition between 'before' and 'after' the termination of the project. In the same vein, Ahern *et al*. (2014) explain how projects such as TOs should be considered "modes of organizing and learning that involve life cycles (time and transition), synonymous organizing and learning (task and context) and team" (*ibid*.: 1427). From this perspective, knowledge appears as a central key element within a project and is considered strategic to ensuring all project members can capitalize on it.

Within his review of the literature relating to TOs, Bakker (2010: 471) switches the concept from transition to context, as he considers that "relatively little literature (…) could be matched within Lundin and Söderholm's (1995, pp. 442-444) description of this concept". The author justifies his choice in reference to Grabher's (2002a, 2004b: 1492) claim that TOs are "inextricably interwoven with an organizational and social context". Grounding a TO within its context would facilitate the distinction between temporary and permanent forms: since "what is short and what is long is rather arbitrary and context-dependent" (Bakker *et al*., 2016: 1708), context provides elements to situate the organization within a time-frame, and in comparison with "more permanent organizational structures, institutions, and networks in which it is embedded" (*ibid*.). In this study, we will consider this context at two levels: [1] the POs in which the TO is embedded and which are collaborating (firms, universities and research laboratories) in a triple-helix dynamic, and [2] the wider social context that French clusters represent. At the same time, we retain the original concept of transition as initially proposed by Lundin & Söderholm (1995: 443) where it "refer[s] to the actual transformation in terms of the distinctive change between 'before' and 'after', or it can refer to possible (or desirable) perceptions of the transformation or change among project participants".

This transition concept has been further developed by Burström & Jacobsson (2012) in the context of inter-organizational projects to understand what happens during the transition process from the TO to the PO. They highlight the spatial character of this process that has "boundary-shaping turnaround" and state that is has "five different outputs: attitudinal turnaround, function fine-tuning, operational fine-tuning, strategic fine-tuning and strategic turnaround" (*ibid*.: 416). Those outcomes are both context-related and situated ("what actually goes on") and the authors recommend developing further studies on this process in large project settings. Still at the inter-organizational level, Sydow & Braun (2018) highlight how complex the transition becomes in inter-organizational settings, as it not only takes place within one

parent organization but applies to all organizations involved in the project. One complexity this research is confronted with relates to what the literature calls “organizational amnesia” (Burke & Morley, 2016; Grabher, 2004b; Grabher & Ibert, 2011). Indeed, given their transient nature, projects “tend to forget quickly” because learning based on “knowledge that is accumulated in the course of a project is at risk of being dispersed as soon as the project team is dissolved and members are assigned to a different task, another team, a new deadline” (Grabher, 2004b: 1492). Governance at the inter-organizational level (e.g., networks or clusters) is thus required to grant opportunities for longer-term knowledge sedimentation (Bakker, Knoben *et al*., 2011).

2.2. Network governance and inter/intra organizational project structures

French clusters are broadly based on Porter's (2000) concept of clusters as a geographical concentration of connected industries and institutions from suppliers to universities to government agencies, that interact collaboratively and competitively in a particular field. Interestingly, French clusters differ from Porter’s in two main ways: they have (1) a top-down structural approach (Fromhold-Eisebith & Eisebith, 2005) initiated by government; (2) an autonomous network administrative organization (NAO) (Provan & Kenis, 2007), i.e., a cluster coordination unit (CCU) where a permanent management board is responsible for defining and implementing cluster strategy. As companies can no longer single-handedly support all resources required to innovate, they collaborate with new partners to create value jointly (Bakker, Knoben *et al*., 2011; Sydow & Braun, 2018). This reshapes the modern architecture of value chains or networks based on blurred organizational boundaries (Sydow & Braun, 2018) requiring new modes of collaboration that challenge the governance of TOs at the inter-organizational level.

Governance at the inter-organizational level differs from hierarchies found in POs but also from market transactions (*ibid*.), since it operates at the network level. Provan & Kenis (2007)

distinguish between three forms of network governance: the *participant-governed network* where no separate and unique governance entity is designated; the *lead organization-governed network* structured through a more centralized approach and usually found in vertical networks; and the *network administrative organization* where "a separate administrative entity is set up specifically to govern the network and its activities" (*ibid*.: 236). Provan & Kenis (2007) compare the effectiveness of each form through four key predictors: the level of trust among network members; the number of participants which increases the potential relationships that can occur as the network grows; the goal consensus and domain similarity that ensure a better performance in case of conflict between members; and the need for network-level competencies to coordinate members' tasks. Whilst the authors emphasize the importance of network governance to enhance learning, they do not specify to what extent each of the three modes of governance facilitate or hinder learning.

Although Grabher (2002a: 210) does not study clusters specifically, he notes that "local agencies might also be devoted to facilitate a transformation of episodic project collaboration into more enduring project networks". According to him, a network governance could help "increase the 'systemness' of collaborative patterns". In these cluster contexts, Hibbert *et al*. (2010) look to the degree of centralization (authority) and a disconnection or lack of a collective sense of purpose (anomie) that stifles knowledge transfer and development of a cluster's collaborative potential. These barriers to learning can be overcome when the TO is socially embedded, comprising both relational embeddedness (shared understandings and relations) as well as structural embeddedness (the pattern of interactions) (Burke & Morley, 2016). In addition, TOs suffer from a form of dependence vis-à-vis resources provided by one or several POs (Bakker *et al*., 2009). For Burke & Morley (2016: 1245), this leads TOs to engender a form of tension between the desire for autonomy and embeddedness, since the TO "focuses on

immediate task and performance demands, and tends to neglect the value of sedimenting knowledge accumulated in the wider organization".

2.3. Economies of recombination and inter-project learning: differences and complementarities

Even though Grabher (2002a, 2004a, 2004b) switches from the initial concept of Lundin & Söderholm (1995) to the concept of 'context', he also provides a definition of what he calls "economies of recombination". He defines these as the ability to "reuse and sediment project knowledge into 'modules' that can be recombined in subsequent or related projects" (Grabher, 2004a: 110). As such, ER allow a firm to engage in "a process of moving from first-of-its-kind projects to the execution of portfolios of related projects" (*ibid*.). Grabher (2004a) illustrates them through his case study of the software ecology in Munich where firms can use computer codes, algorithms, and know-how initially developed for a specific client for other applications. Grabher & Thiel (2015: 330) further explain that ER allow organizations to capitalize on development (knowledge creation) and project's capabilities for application in new projects. Project capabilities are acquired by firms when they handle subsequent and related projects (Grabher, 2004b). They are considered operational capabilities since they include activities and structures required to manage the project through its life-cycle (front-end to back-end) (Davies & Brady, 2016: 316). As such they are high level routines allowing learning because they are "highly patterned, repetitious, or quasi-repetitious, founded in part in tacit knowledge – and the specificity of objectives" (Winter, 2003: 990).

Learning is defined as "the change in knowledge and the change in knowing, which involves (…) changes in cognition and changes in behavior" (Vera *et al*., 2011: 157). It is considered a process composed of several practices, generally studied at the individual or team level, including knowledge generation, capture and transfer from a TO to the PO, and often relying

on ICT-based mechanisms (Newell *et al*., 2006; Scarbrough *et al*., 2004; Zhao *et al*., 2015). Considered to be a flow, knowledge transfer is an integral part of the learning process (Easterby-Smith & Prieto, 2008; Scarbrough *et al*., 2004). Consequently, knowledge transfer research also adopts a sender/receiver unit of analysis (the relations between teams, cognitive capacities, mobilized tools, *etc*.) to allow an effective transfer towards the PO and to ensure learning (Newell *et al*., 2006; Swan *et al*., 2010; Zhao *et al*., 2015). This unit of analysis is one of the differences that distinguishes knowledge transfer from ER. The latter considers knowledge both as the output from a first TO and serving as an input used in related projects (Whitley, 2006) – a brick in the wall of technological development will necessarily be reused, which "means that to some extent it will be possible to achieve a solution by a recombination of existing components" (Ibert, 2004: 1541). We consider this knowledge re-use as the major difference between ER and knowledge transfer. Knowledge transfer can thus be conceived as a pre-requisite for ER. Once knowledge transfer is effective, ER will imply "a deliberate interruption of habit patterns" that will happen through "*improvisation*" (Grabher, 2002c: 252) and "*bricolage"*: "the creation of novel combinations of familiar elements and by-products from previous projects" (Grabher, 2004a :110). Grabher (2004a: 110) provides another characteristic of ER that determines the difference compared to knowledge transfer. It is that they have a much wider "scope for reuse in the sense of 'utility' (by enhancing intelligibility, availability and ease of modification) and/or 'variability' of code (by boosting adaptability and portability to different application contexts".

Moreover, ER also differ slightly from learning. Scarbrough *et al*. (2004: 493) explain how the learning process and knowledge are "intertwined in an iterative, mutually reinforced process. While learning (the process) produces new knowledge (the content), knowledge impacts future learning. In short, there is widespread recognition that learning is usefully viewed as a process that is both a source of new knowledge and yet is shaped by prior knowledge". Scarbrough *et*

al. (2004) seek to determine the components of this "iterative, mutually reinforced process" that allows the organization to absorb the project's newly created knowledge. This topic is closely related to our research. However, our analysis concentrates on a slightly different process inasmuch as we do not consider the absorption of knowledge into the PO, but directly into a new TO. Consequently, in this study, we will consider only the scope of ER (how knowledge is reused in a subsequent TO) and not the entire learning process that also includes how knowledge can be embedded within routines and practices at the organizational level (Vera *et al*., 2011). To the best of our knowledge, no research has studied this transition between TO processes before. Therefore, we investigate closely related research areas such as inter-project learning and knowledge transfer in order to extend the factors they highlight to the TO transition process.

2.4. Factors facilitating or hampering the project-based learning process

The project management literature provides a range of factors when reflecting upon knowledge transfer from one project to the organization, or to understand how a project can learn from a previous one. Many studies highlight the relational context of the collaboration as being necessary (trust, common objectives, commitment, relationships, *etc*.) (Bakker, Cambré, *et al*., 2011; Bakker, Knoben, *et al*., 2011; Hartmann & Dorée, 2015; Zhao *et al*., 2015). Other studies point out the need to evaluate knowledge characteristics in terms of their nature (tacit or explicit) (Newell *et al*., 2006; Newell & Edelman, 2008; von Zedtwitz, 2002), availability (Swan *et al*., 2010) or contextualization (Cummings & Teng, 2003) to make sure the adapted tools (ICT-based mechanisms) will be used (Bresnen *et al*., 2003; Lindner & Wald, 2011; Newell, 2004; Newell *et al*., 2006). The members of the TO must also take into consideration the knowledge strategy deployed by each PO included in the project (Akhavan & Zahedi, 2014), as well as each partner's interests and priorities (Cummings & Teng, 2003), their nature and cultural context (*e.g.*: Bresnen *et al*., 2003; Landaeta, 2008; Newell & Edelman, 2008). The

characteristics of the project in terms of objectives (Bresnen *et al*., 2003; Hartmann & Dorée, 2015; Landaeta, 2008), complexity and degree of innovation (Cacciatori *et al*., 2011; Landaeta, 2008) are also thought to affect knowledge transfer to the PO and learning through post-project reviews (von Zedtwitz, 2002). In addition, the project's transient nature leads one to take into consideration the time required to transfer knowledge (Bakker, Cambré, *et al*., 2011), as some transfer urgency may occur as the project approaches its cut-off date (Newell, 2004). Finally, Cacciatori *et al*. (2011) underline how the project's environment affects knowledge transfer through institutionalized and administrative regulations.

It appears that the literature identifies several types of factors that typify the learning process between a TO and a PO (Bakker, Cambré, *et al*., 2011; Bakker, Knoben, *et al*., 2011; Cacciatori *et al*., 2011; Hartmann & Dorée, 2015; Swan *et al*., 2010). However, previous research has only considered the factors that influence knowledge transfer and inter-project learning without looking at how the construction process of the second project is conditioned by the first project's outcomes in terms of access to ER (Grabher, 2004a). We summarize knowledge transfer and inter-project learning factors in Table 1.

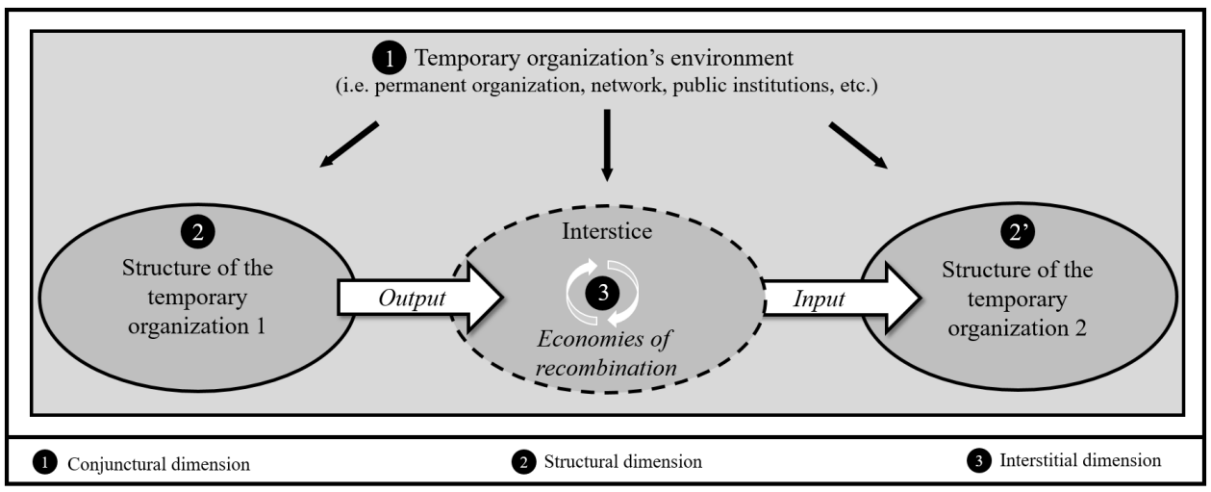
Table 1: Inter-project learning factors

Dimensions	Factors	Authors
Collaboration	Motivation, relational and cognition embeddedness, absorptive capacity, skills and capabilities, communication, networks and information flows, objectives, relational context (organizational, physical, knowledge and norm distances), activity context, experience of project team members, orientation toward project goals, project-overarching ambitions, level of effort of knowledge transfer from sender and receiver, informal networks, sender/receiver motivation, social interaction, extent of project members' commitment to individual projects, project team context, source and recipient teams' transfer and absorptive capacity, relationships	Bakker, Cambré *et al*. (2011) Bakker, Knoben *et al*. (2011) Bresnen *et al*. (2003) Cummings & Teng (2003) Hartmann & Dorée (2015) Landaeta (2008) Lindner & Wald (2011) Newell & Edelman (2008) Newell (2004) Newell *et al*. (2006) Swan *et al*. (2010) Zhao *et al*. (2015)
Knowledge	Outputs, knowledge embeddedness, potential for articulation, knowledge codification, timeliness of shared knowledge, tacit knowledge, source and recipient teams' knowledge governance efforts	Bresnen *et al*. (2003) Cacciatori *et al*. (2011) Newell & Edelman (2008) Newell (2004) Newell *et al*. (2006) Zhao *et al*. (2015)
Environment	Institutionalized regulation, administrative regulation	Cacciatori *et al*. (2011)

Partners' interest	Project priority	Cummings & Teng (2003)
Innovation	Product innovativeness, developmental trajectories, connection between projects, task complexity, scope of the projects, project tasks, similarity between two projects	Cacciatori *et al*. (2011) Hartmann & Dorée (2015) Landaeta (2008) Swan *et al*. (2010) Zhao *et al*. (2015)
Nature of Partner	Organizational structure, cultural context and climate for change, learning culture, organizational setting, norms, project size, management commitment, maturity PM-methodology, institutionalization multi-PM/KM, experience accumulation, professional boundaries, relative number of projects undertaken by project members, project tools and competencies available within the wider organization	Bresnen *et al*. (2003) Cummings & Teng (2003) Landaeta (2008) Lindner & Wald (2011) Newell & Edelman (2008) Newell (2004) Swan *et al*. (2010)
Time	Temporal embeddedness, time urgency of source project, time urgency of recipient project	Bakker, Cambré *et al*. (2011) Bakker, Knoben *et al*. (2011) Zhao *et al*. (2015)
IT	Technological mechanisms, tools, system storage, IT infrastructure / network, ICT	Bresnen *et al*. (2003) Hartmann & Dorée (2015) Lindner & Wald (2011) Newell (2004) Newell *et al*. (2006)

To conclude, we propose Figure 1, which schematically shows how the transition between two TOs can be considered. The structural characteristics of the first TO, as well as its outputs, should lead to ER during the interstice between two TOs. The consideration of conjunctural elements (the TO's general environment and the POs) must also be considered in order to reach a multi-level understanding of the transition process phenomenon and to what extent it can enable ER, considered here as the ability of project partners to collectively rely on knowledge created during a first TO in order to reuse it in a second TO.

Figure 1: Transition process between two temporary organizations enabling economies of recombination



3. Research methodology

3.1. Data collection

To contextualize the process of transition between TO, we conducted our research (from 2013 to 2015) within four French clusters that exhibit different characteristics (Table 2). They were selected based on a theoretical sampling using the following criteria that serve the purposes of our specific study (Morgan, 2008): different sectors and nature of the industry, number of collaborative R&D projects funded, distribution, type and number of members. Among the 67 semi-structured interviews conducted, 13 of them were with CCU human resources personnel (interviews 49 to 61, Appendix A). These meetings had two objectives. Firstly, to learn about the specificities of the cluster and the support mechanisms proposed by the CCU in terms of the transition process between TO. Secondly, to identify, together with the CCUs, the projects that had undergone a transition. Since these NAOs assist projects throughout their life cycle, they have a complete history of all the projects carried out in their field since the creation of the French clusters in 2005. Thus, the secondary data collected (Table 2), and particularly the project notebooks and sheets, made it possible to identify the projects that had led to the initiation of a second project. To fully explore the transition process phenomenon, we collected data in relation to two scenarios proposed by Miles *et al*. (2013: 36): (1) projects that were typical and representative of the French clusters' labelling criteria, which had led to transition towards a second project, and (2) 'negative' instances – projects that had ended without transition to a new project. The selected projects also respected the definition given by Brette & Chappoz (2007: 391) that considers a collaborative R&D project that brings together partners of a different nature (laboratory, SME, major group, university, etc.).

Table 2: Secondary data sources (up to 2015)

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Sector	Mechanics	Micro & Nanotechnologies	Renewable Energies	Textile
Industry	Traditional	High-tech	High-tech	Traditional
Members	156	300	182	119
% SMEs	36%	66%	58%	62%
CCU Human Resources	8	18	7	9
Financed projects	152	233	165	132
Public investments	€319M	€754M	€500M	€236M
Evaluation in 2012	Effective	Very effective	Very effective	Very effective
ECEI Label[1]	Silver (until 2014)	Gold	Silver (until 2014)	Gold
Secondary data				
Press releases	**6** (2014)	**9** (from 2012 to 2015)	**33** (from 2009 to 2014)	**20** (from 2009 to 2015)
Projects and product notebooks		**5** (from 2013 to 2015)	**2** (2014)	
Newsletters	**14** (from 2010 to 2015)		**12** (from 2014 to 2016)	**71** (from 2009 to 2016)
Activity reports		**5** (from 2006 to 2010)	**3** (from 2012 to 2014)	**3** (2010, 2011, 2014 & 2015)
Downloadable project sheets	**104** (from 2005 to 2013)		*Only available online*	*Only available online*
Internet website	Yes	Yes	Yes	Yes
Project data	More than 100 project forms, 3 laboratory notebooks from 3 different projects, more than 100 summary project sheets.			

Regarding the interviews with people directly involved in collaborative R&D projects, they were carried out by following a line of inquiry that included three categories of questions with specific objectives (Table 3).

Table 3: Line of inquiry and underlying objectives

Interview themes	Categories of questions	Objectives
Contextualization questions	Interviewees' backgrounds	Puts the interviewee at ease.
	Organization presentation: research strategy, previously realized collaborative projects	Study the 'below' level by collecting information on previous research.
	Cluster membership and advantages: meeting participation	Study the 'above' level to understand how a CCU's actions affect the transition.
Project description and structure	Origins, number and nature of partners, duration, funding, governance, difficulties encountered, etc.	Provides information on how the project unfolded, its structure and the elements that could explain why the transition took place (or not).
Project outcomes	Project continuation (or not), major factors facilitating or hampering this transition, configuration of the new project (partners)	Presents the elements that favored or hampered the transition as well as the form of this transition (data not used in this article).

[1] The European Cluster Excellence Initiative (ECEI) label attests to the quality of cluster management after an audit of their practices. Three different labels are issued: bronze, silver or gold.

The third part of the interview specifically aimed to identify how the project led to the establishment of a second collaborative R&D project (or not). Through these interviews, we gathered the description of 30 projects (Appendix A). Among these, 17 experienced a transition process (as defined in our study), while the remaining 13 were closed and did not lead to a new collaborative R&D project.

In addition to the 67 in-depth semi-structured interviews we conducted (Table 4), we attended five workshops, organized by cluster 4, as non-participatory observers. These 'valorization workshops' aimed to present the project's main results to a wide audience (members of the cluster as well as other organizations interested in the project topic). The idea underlying these meetings was to arouse interest amongst participants in order to develop new collaborative projects based on the results presented. We attended these meetings in order to understand interactions with other stakeholders interested in the subject developed in a first project, as well as to understand the role of the environment in facilitating the transition process, and more specifically, the role of CCUs. This data has been beneficial in allowing us to consider another point of view of the interaction between the project and the higher and lower levels, i.e., cluster and organization.

Table 4: Primary data sources

	Individuals
Network Administrative Organizations (NAO)	13
Regional Development Agency (RDA)[2]	5
Large Company	11
Research Organizations	13
Universities	6
Small and Medium-sized Enterprises (SMEs)	18
Restitution session	1
Non-participant observations	5
Total	67 + 5
Total length of recording	92h05m
Average duration of interviews only	71 minutes

3.2. Data analysis

With interviewees' approval, all meetings were recorded, kept anonymous and confidential, transcribed and synthesized. We established a chronological map of events that occurred during each project. These syntheses were based on the description provided by interviewees during section 2 and 3 of our interview guidelines. The charts, for which an example is provided by Appendix B, identify several levels: the partners, the project and the cluster. They were systematically established in order to fit with our aim of studying the transition process as the unit of analysis, through a multi-level perspective (Lundin *et al*., 2015; Sydow & Braun, 2018). Analytically, therefore, the 'cases' in this study are 17 instances of transition between TOs and 13 instances of TO without transition. For some projects, we also integrated other stakeholders (such as RDAs) when their role in the process was deemed essential by interviewees. At the bottom of each chart, we added the factors referring to all three dimensions that could be linked to all events and color-coded them according to their positive or negative impact. Once all of these graphical syntheses were completed, we observed patterns among the occurrences that

[2] Regional Development Agencies (RDA) are organizations that bring together local economic actors to define strategies and actions adapted to each territory. They were solicited to better understand how they support (financially or through specific mechanisms) collaborative R&D projects.

appeared throughout the projects' life cycles and transition processes, which led us to divide them into different dimensions that are described in the results section. These three dimensions appeared relevant to encompassing the transition process. We then separated each dimension into smaller factors characterizing each dimension. We followed a similar analytical process concerning the interview transcripts. We used a coding table developed by following Saldaña's (2012) instructions on life cycle coding and applied a simultaneous coding method (Miles *et al*., 2013: 81). 358 verbatims were coded with this method, which was used only when the interviewees pointed to interactions between two or more elements that had an impact on the transition. We carried out the coding process using QSR NVivo 11. The coding table (Appendix C) evolved iteratively throughout the data gathering period.

The fully processed data was then analyzed by using matrix encoding proposed by QSR NVivo 11. When using this function in QSR NVivo 11, we made a choice as to which data to extract to interpret our results. We opted for the number of coded units. This allows us to identify occurrences where interaction between the two factors has occurred. Compared with the table highlighting the number of sources that evoke this interaction, similarities in the data appear and thus have no influence on the interpretation of the tables by the researcher. In addition, the use of the 'characteristics' function for the analyzed sources was necessary. Interviews were assigned to a 'transition' characteristic (when the interviewee presented the follow-up of the project) or to 'no transition' when the interlocutor indicated that no follow-up had occurred. When assigning these characteristics within NVivo, the software is then able to show in the matrix all characteristics at once, or each of them separately.

4. Results

Based on the descriptions from the 30 collaborative projects we collected, we identify three dimensions that facilitate or hamper the transition process between TOs. The main unit of

analysis relates to this transition. We focus on this period between two projects (interstitial dimension) to understand how the structure of the first TO (structural dimension) and its external environment (conjunctural dimension) affects its development. We first describe each dimension and their constituent factors. We then illustrate the systemic effect that can occur between factors.

4.1. Structural dimension

This dimension includes factors affecting the structure of the collaborative project. A factor is defined as structural when its influence is directly linked to the structure of the project in terms of configuration of human relations (project team, relationships between members) and the formalization of the project in its technological (temporal scope) and legal aspects (consortium agreement).

Collaboration: how the collaboration between the partners unfolded over the duration of the project is important as it represents the working atmosphere within the project and the development of trust between partners. The construction of trust (or lack thereof) will influence the willingness of the project participants to engage again in a second project. It is "*the human relationships that can get established during the project, and we usually realize quite early if we get along well or not. If it is not natural, it is best not to insist any further*" (Project Manager, SME). A lack of trust can also be a cause for the withdrawal of a partner who could be essential to continuing the research within a second project.

Nature of the partners: At least two major issues are at stake concerning this factor. Firstly, the nature of a partner (SME, research laboratory, large firm) usually defines the type of resources the organization can invest in the project and its expectations regarding project objectives and participation in a second project. Secondly, there is the partners' expertise and its place within the value chain of the project. Sometimes, a "*selection, among the partners of the first project,*

is carried out to select the most relevant ones and to focus on a particular technical aspect during the second project" (Project Manager, Research Laboratory). It can be interesting and valuable for the initial partners to integrate foreign partners in order to be "*more attractive vis-à-vis funding institutions*" (Project Manager, Research Laboratory).

Temporal scope: The nature of the innovation in a project can be directly linked to the temporal objectives of each partner. Indeed, in the case of SMEs, the main idea underlying this type of strategic alliance is to be able to provide their customers with new products or services based on the newly created and acquired knowledge from the project. Time is often of critical importance for SMEs. This factor has to be seen in relation to the Technology Readiness Level (TRL) scale (Mankins, 1995). If the project is of a more fundamental nature (level 1 to 5), the partners will more easily be able to set up a second project intended to commercialize a product (level 6 to 9). Therefore, the partners need to ensure that the second project has a real innovation potential because "*a project can be financed only if there is a technological potential, the project has to result in a real innovation thanks to the second collaboration*" (General Director, cluster 2).

Consortium agreement: During a collaborative project, the partners establish a consortium agreement wherein each organization specifies the knowledge they bring to the table. This legal document also provides information about the intellectual properties of the knowledge created during the collaboration. Hence, it contains information about background, sideground, foreground and postground knowledge (Gassmann & Bader, 2006). Partners should establish this document as soon as possible to avoid potential conflicts that could endanger a good relationship and that could lead to situations such as the one described in the following comment: "*the two big firms of the project had a lot of difficulties agreeing on the consortium agreement. The jurists, on both sides, were very firm in their positions and thus unable to find*

and advance on common ground, which slowed down the project progress" (Innovative Project Manager, Large Company). This type of situation can taint relationships between partners.

4.2. Conjunctural dimension

This dimension refers to factors whose sources are exogenous to the project. This would include a PO's specific strategies, the territorial anchoring of a cluster, institutions that finance collaborative projects, as well as strategies implemented at the national level. They have a transversal impact on the transition: they influence the characteristics of both TOs. Therefore, this dimension is associated with the 'below' and 'above' levels that provide context-related elements for our central unit of analysis, the transition between TOs.

Partner's interest: This factor highlights the interest of each partner on a bigger scale. It implies strategic decision-making and level of priority accorded to a project within each organization. Indeed, some partners may want to allocate resources (financial or human) to projects that are considered strategic and in which they see several benefits: "*here is the triple interest I can see in pursuing a project: to innovate, to strengthen the existing partnership with other manufacturers, or even customers, as well as to discover new potential partners, and then to establish a link with schools and talented young people who often come to carry out missions at our plant*" (Production & Innovation Manager, SME). The importance given to customers and suppliers may provide an opportunity for organizations to engage in new collaborations with these stakeholders in order to further develop the new knowledge they acquired from the first TO.

Funding: How the project will be funded is particularly important for SMEs, which do not have the same resources at their disposal as major groups or research laboratories. To fund projects, organizations rely on call for projects. At the end of a first project, if a consortium wishes to apply for a call and can meet the criteria, there is a higher chance of being funded. If this is not

the case, the partners may have difficulties finding their own financial resources to develop research. Depending on the funding institution targeted by partners, they may be in a good position to get funding for a second project due to being well situated on the TRL scale: "*We have a lot of ANR[3] projects, which are rather exploratory projects. These ANR projects can lead to slightly larger projects. They can be funded either by funding institutions such as ADEME[3] or FUI[3] that fund essentially exploitation-type projects*" (Cluster 3, Communication & Valorization Manager).

Environment: This factor refers to the ecosystem the TO is embedded in. The CCU's actions and support will greatly impact the transition toward a new collaboration, notably through the organization of a 'valorization workshop' at the end of a project. The goal of these workshops is to "*present the different results and to build with you [attendees] the next steps of this project. We think that on the basis of these results, we could build something new that could interest you*" (Project Manager, NAO Cluster 4). The environment factor also encompasses the importance given to customers and suppliers in the organization's innovation strategy. If an organization engages in a collaborative project without reflecting upon its direct customer needs, it may end up developing a technological solution that does not have any market opportunities.

Lobbying policies: The lobbying policy factor implies that public institutions (either governmental or financial) will affect the issue of transition. In some instances, such as Project #3, the government may have an interest in a specific industry they want to develop. They might launch special call for projects that are designed to fit the proposal submitted by a particular consortium: "*They [the funding institution] waited until we were sufficiently advanced on our reflection about the second project so that the call for projects would match*

[3] French funding institutions: National Research Agency (ANR); Agency for Environment and Energy Management (ADEME); Unique Interdepartmental Fund (FUI).

what we could present (…). After a year and a half, we started to feel comfortable, so they released their call for projects" (Innovative Project Manager, Large Firm). Within our data corpus, this factor does not have a very high level of occurrence. Moreover, when interviewees mentioned it, they did so in a private manner.

4.3. Interstitial dimension

This dimension includes factors situated specifically between two TOs. These factors cannot be considered either as specific to the project structure (structural dimension) or as dependent on its environment (conjunctural dimension). These are mainly elements that exist in the interstice between the two TOs: the initiation process of the second TO, as well as the time required for this new set-up. This gap is the main unit of analysis of our article, since it is when the output knowledge from TO 1 serves as the input for TO 2 that the transition process occurs and thus, economies of recombination are enabled.

Time: Time is considered a successful factor when it allows partners to further develop their ideas about the second project and build a stronger application for submission to a funding institution. However, time can also become a risk factor that restrains the transition if a long period separates the end of the first project and the beginning of the second. Indeed, the relationship between the partners may suffer from this long period, as cited here: "*a gap gradually widened between us [the partners] as time passed by at the end of the project*" (Research-engineer, SME), and the interest of each partner in the development of the project may decrease. Moreover, as identified by Tzabbar *et al*. (2013), the time an organization takes to integrate the knowledge from an R&D alliance will depend on its previous experiences and repeated collaborations with its partners.

Knowledge: Knowledge as part of the interstitial dimension relates to knowledge that needs to be capitalized on. It is perceived here as the output of the first TO that will be reused within the

boundaries of the second TO in order to "*create thematic bridges (…) by stating* '*we could extend this knowledge, we could reuse it, and we could answer another problematic that we did not consider at the start of the first collaboration'. That's how knowledge networks are woven, like a cobweb*" (Engineer, Research Laboratory).

Project initiation: The project initiation is often considered "*very time consuming. On the European side, we have the same difficulty. They [the projects] are very tough to set-up. French projects are already tough, but as soon as you go up to the European level, it gets tougher*" (Researcher, Research Laboratory). Funding institutions request different application styles for the proposals they want partners to submit. Hence, there is no generic blueprint partners can follow for this particular early stage of the project. Nevertheless, it is important that partners' relationships remain as strong as possible during this stage of the project, as it involves important strategic decisions concerning potential new stakeholders who were not necessarily involved during the first collaboration.

4.4. Systemic effects between factors

Using QSR NVivo 11 and the matrix-coding query to analyze the simultaneous coding applied to the primary data of our corpus, we were able to determine that factors had systemic effects. These effects can have three different outcomes: (1) the impact of the factors gets stronger if they are combined with one another; (2) one factor can trigger another; (3) one factor can erase the effect of another. Furthermore, these effects can be impacted positively and negatively, leading to situations where either a virtuous or vicious circle is set up. For example, in one project we encountered, the project leader, a research organization, had "*other projects that were the priority. If we had dedicated time, or funding, we could have devoted time to other development for [project's name]. But as the drafting phase of the project set-up requires a lot*

of writing time and proofreading… So that's where we failed at the end of the project" (Research, Research Organization).

Two salient points can be identified through Table 5. Firstly, the lobbying factor is the least interactive factor of our list. As mentioned earlier (Section 4.2), it is also the factor that was least mentioned during our interviews. However, several project descriptions reveal how this particular factor can drive a transition, since institutions that finance projects can specifically build their call for projects to ensure projects they consider strategic have maximum chances of success. Secondly, the 'nature of the partners' factor produces systemic effects on all other factors. This reflects the concerns and interests of State policies to involve structurally different actors in the collaborative projects.

Table 5: Number of interactions between factors in the entire data corpus

		Structural				Conjunctural				Interstitial			
		Collaboration	Nature of partners	Temporal scope	CA	Funding	Environment	Lobbying	Partners'interests	Time	Knowledge	Project initiation	Frequency
Struct.	Collaboration		22	2	11	1	0	0	6	1	11	0	54
	Nature of partners	22		3	11	1	1	1	11	7	11	1	69
	Temporal scope	2	3		1	2	0	0	1	0	2	1	12
	Consortium agreement	11	11	1		0	1	0	6	0	15	2	47
Conj.	Funding	1	1	2	0		2	4	6	5	2	1	24
	Environment	0	1	0	1	2		0	2	0	3	0	9
	Lobbying	0	1	0	0	4	0		0	0	0	2	7
	Partners' interest	6	11	1	6	6	2	0		3	10	4	49
Inter.	Time	1	7	0	0	5	0	0	3		1	2	19
	Knowledge	11	11	2	15	2	3	0	10	1		0	55
	Project initiation	0	1	1	2	1	0	2	4	2	0		13

Table 6 and 7 below break down the occurrences of factors according to whether the systemic effect allowed the project to make a transition or not.

Table 6: Number of interactions between factors leading to a transition

		Structural				Conjunctural				Interstitial			
		Collaboration	Nature of partners	Temporal scope	CA	Funding	Environment	Lobbying	Partners' interest	Time	Knowledge	Project initiation	Frequency
Struct.	Collaboration		17	2	7	1	0	0	5	1	3	0	36
	Nature of partners	17		3	1	1	1	1	9	4	3	1	41
	Temporal scope	2	3		1	2	0	0	1	0	2	1	12
	Consortium agreement	7	1	1		0	1	0	6	0	3	2	21
Conj.	Funding	1	1	2	0		2	3	5	0	2	1	17
	Environment	0	1	0	1	2		0	2	0	3	0	9
	Lobbying	0	1	0	0	3	0		0	0	0	2	7
	Partners' interest	5	9	1	6	5	2	0		3	1	3	35
Inter.	Time	1	4	0	0	0	0	0	3		1	0	9
	Knowledge	3	3	2	3	2	3	0	1	1		0	18
	Project initiation	0	1	1	2	1	0	2	3	0	0		10

Table 7: Number of interactions between factors leading to no transition

		Structural				Conjunctural				Interstitial			
		Collaboration	Nature of partners	Temporal scope	CA	Funding	Environment	Lobbying	Partners' interest	Time	Knowledge	Project initiation	Frequency
Struct.	Collaboration		5	0	4	0	0	0	1	0	8	0	18
	Nature of partners	5		0	10	0	0	0	2	3	8	0	28
	Temporal scope	0	0		0	0	0	0	0	0	0	0	0
	Consortium agreement	4	10	0		0	0	0	0	0	12	0	26
Conj.	Funding	0	0	0	0		0	1	1	5	0	0	7
	Environment	0	0	0	0	0		0	0	0	0	0	0
	Lobbying	0	0	0	0	1	0		0	0	0	0	0
	Partners' interest	1	2	0	0	1	0	0		0	9	1	14
Inter.	Time	0	3	0	0	5	0	0	0		0	2	10
	Knowledge	8	8	0	12	0	0	0	9	0		0	37
	Project initiation	0	0	0	0	0	0	0	1	2	0		3

Each highlighted case (green for a transition, red for no transition, and orange for extreme frequencies) underline the importance of the interaction. They are considered in comparison to the number of occurrences of each cell provided in Table 5.

Based on these tables, several assumptions can be made. When comparing the total occurrences of each interaction, it would seem the interaction of factors leading to a transition include:

‘collaboration’ and ‘partners’ interest’. This result from Table 6 differs from Table 5, where the ‘nature of partners’ had the highest number of occurrences. It is important to underline, however, that the combination of ‘collaboration’ with ‘nature of partners’ shows the highest number of occurrences in our empirical evidence. This can be explained, for example, by situations where the relationship between partners is harmonious and where everyone finds their place in view of the complementarities established from the beginning of the project: “*it is clear that from the first project, which was not necessarily a success in terms of knowledge creation, that we still built a network of complementary partners, people who got to know each other, who worked together, appreciated each other, and this allowed us to establish another project, which was financially much larger than the first*” (University Professor).

Concerning the factors that hamper the transition process, one stands out very clearly in our analysis: knowledge. Combinations such as ‘knowledge’ and ‘consortium agreement’ highlight how difficult it can be for partners, throughout the project life cycle and at its termination, to determine who created the knowledge, who owns it now and how others may reuse it. This problem is often related to the project itself, where, “*like any new business, solar energy was perceived as the new Eldorado. What blocked further development was how to deal with the IP* [intellectual properties] *issues, and especially how to negotiate the exploitation of the knowledge at the end of the project to further develop it*” (Technical Manager, SME).

Below are two examples of projects where the interaction between factors led to the success (project #03) or failure (project #13) of the transition. The example of project #3 (its chart representation is shown in Appendix B) shows how factors occurred successively. The maturity level of the technology (**temporal scope**) developed during the first project produced new **knowledge**. However, knowledge was not mature enough because of the conflicts the partners encountered while building the **consortium agreement**. Their ordeal was mainly due to the **nature of two partners,** in that they were competing with each other, and this seriously affected

the **collaborative** atmosphere during the first project. Nevertheless, the innovation being pursued was of national importance (**environment**), so it led to a national funding institution launching a call for projects (**lobbying**). Three partners from the project were involved in the construction of the project set-up and were successful in seeking to gain the **interest** of an important actor in the electricity sector. The **initiation** of the project took a long **time** due to administrative issues, but the partners had the support of funding institutions that would ensure **funding** for the second project.

Another example shows how a succession of factors led to the non-transition of project #13. In this case, four factors are identified as having stopped any further development. Since the theme of the project did not fully engage **the partners' interest,** priority was given to other projects, thus **time** allocated by the general management of each organization was limited. As a result, the drafting phase required to **set up** another project was not possible, so the project could not be submitted to a funding institution. Therefore, without **funding**, no further development could be initiated. Despite factors that had positive effects (e.g., a very harmonious **collaborative atmosphere** and new **knowledge** created with improvements envisioned), the transition process could not be activated.

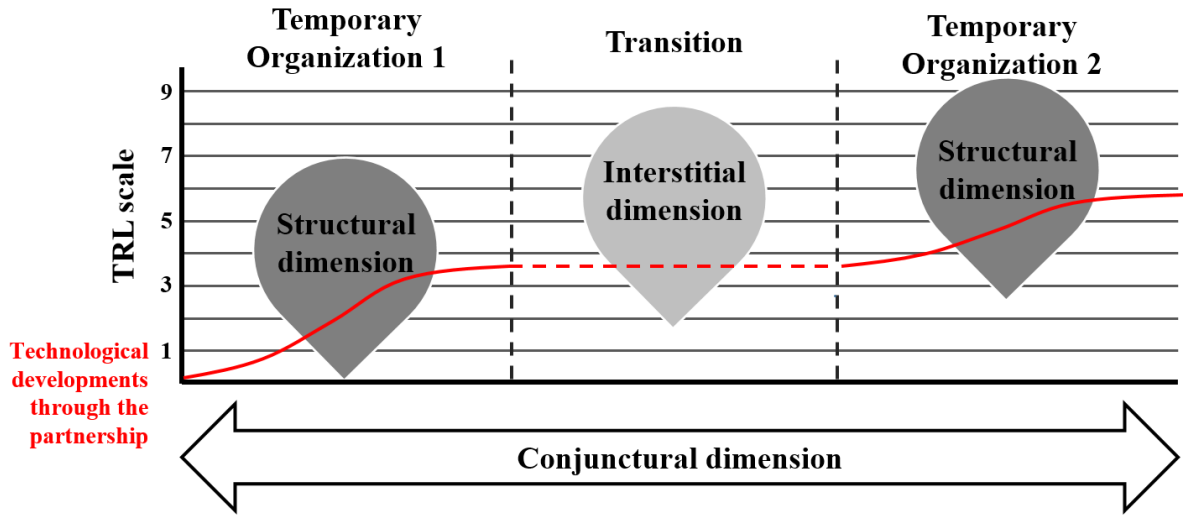
5. Discussion of the findings

The findings of this research reveal the crucial role of three dimensions that favor the process of transition between TOs, which itself generates ER. We discuss these results compared to previous studies in relation to three aspects: temporary organization theory (thereby reaffirming the merits of the transition concept); implications regarding knowledge transfer and learning factors in light of our findings on ER; and finally, how these results feed into debates on network governance and the project management literature.

5.1. The transition concept

Previous research on the concept of transition has focused on the intra-project level (Lundin & Söderholm, 1995) or has widened its scope to include the relation between the TO and PO (Burström & Jacobsson, 2012). Our study extends the scope of the transition concept still further to identify how it can be operationalized between two TOs, allowing partners to access ER (Grabher, 2004a; Whitley, 2006). To that effect, results show how three dimensions (structural, interstitial and conjunctural) affect the transition process between two TOs. Through the graphical syntheses we establish for each project, we observe patterns in the dimensions' evolution over time. For the 17 projects that experienced a transition, the trend consists of a succession of the three dimensions, as illustrated in Figure 2. This represents a generic form of TO transition and reveals how the three dimensions succeed one another over time. While the conjunctural dimension intervenes at any time during the project, this is not the case for the structural dimension, which relates directly to the project structure. Once the project is set up, this structure can change but should not affect its goals. Finally, factors in the interstitial dimension are considered only during the trading zone, i.e., the amount of time partners will allocate to setting up the new project and to the output knowledge requiring further development to serve as input for the second collaboration.

Figure 2: Succession of the three dimensions



On the other hand, concerning the 13 project charts that did not experience a transition process, no pattern can be identified when considering the behavior of the different dimensions. However, we note that while the structural dimension should have facilitated the transition process for these projects (given the positive presence of the factors in the project), it seems to be the absence of the interstitial and conjunctural dimensions that hinders the operationalization of the process. The recurring absence in the graphs of certain factors related to these two dimensions make it possible to grasp their importance. The absence of factors such as the time allocated to initiate a new project and the search for new funding are consistent with Bakker *et al.*'s (2009) findings on TO dependence on resources provided by the PO. Therefore, this dependency relationship holds back the sedimentation of knowledge, as emphasized by Burke & Morley (2016), ultimately hindering ER.

While this transition process is closely related to resources provided by the PO, this implies strong links between the concept of transition and the other three pillars of TO theory (team, time and task) (Lundin & Söderholm, 1995). Therefore, this research shows the importance of the concept of transition, even though Grabher (2002a, 2004a, 2004b) and Bakker (2010) suggested replacing it with the concept of 'context'. Rather than a substitution, our results show

how the transition concept acts as a support element for the other pillars. The latter are common to all partners of the collaboration, complexifying the transition process (Sydow & Braun, 2018) since, during the transition, they are split between the different POs involved in the process. The team is dissolved (Grabher, 2004b), but whether it is reconstituted with the same structure or modified to include new skills will depend on the technical specifications required for the tasks to be carried out by the second TO. The literature emphasizes that members of a TO should favor a task focus in order to achieve the project's goals, rather than adopting a relationship focus due to time limitations (Bakker, 2010; Lundin & Söderholm, 1995). For a TO aiming to achieve a pre-determined and limited objective, anticipating future interactions between partners beyond the imminent deadline is not necessary. On the other hand, in the context of a TO whose team has decided that, in time, a second TO will have to be established in order to further develop knowledge, the creation of stronger relationships between members belonging to different POs is fundamental. This is all the more crucial to limiting risks relating to IP rights that will necessarily influence the partners' ability to benefit from ER. This relationship focus within the TO can be achieved through formal as well as informal governance mechanisms.

5.2. Effectiveness of network governance forms

The governance of inter-organizational TOs is complex as it encompasses several distinct organizations (Sydow & Braun, 2018). Hibbert *et al.*'s (2010) study highlights authority and anomie as barriers to collective learning within clusters. Our study provides information as to how interference from a higher organizational echelon such as the CCUs (acting as NAOs, Provan & Kenis, 2007) can facilitate the occurrence of ER. As part of the conjunctural dimension (environmental factor), the CCU makes it possible to unite all the members of the cluster in order to encourage trust between a large number of participants and generate a collective goal. It is also able to establish links with outside entities in order to enlarge the

opportunities for ER. Provan & Kenis' (2007) key predictors also apply in the context of NAO facilitating the transition process. However, we observe that socialization mechanisms can act as an additional predictor of effectiveness of network governance forms in enabling ER. By establishing meetings and spaces for interaction and sharing, project partners will be able to promote the results obtained during the TO to other members of the network. By offering to organize these events, CCUs provide informal mechanisms to build relationships within the cluster and thus sediment knowledge with greater continuity. These actions then combine with formal mechanisms identified in the literature as part of the contractualization of the relationships. These two formal and informal aspects of a relationship are highlighted as being equivalent by Sydow & Braun (2018). In our case, this combination makes it possible to maintain links between members of the TO as well as between members of the cluster.

A counterpoint to these social mechanisms that strengthen links between partners should, however, be mentioned: the risk of collaborating only with partners with whom links have already been established. CCUs must ensure that such situations are not too recurrent. Although such pre-established links allow the transition process between TOs, the risk is that partners might limit themselves through shared convictions vis-à-vis technological strategies to be developed. They may seek to avoid the risk of destabilization and thus limit interaction with parties internal or external to the TO that could contradict their established ways of thinking. The group therefore isolates itself and works within a closed loop (Katz & Allen, 1982). Governance by the NAOs must therefore be careful to stimulate new encounters and dissolve links (Arikan, 2009) that may no longer be fertile for ER.

5.3. Knowledge transfer and learning factors leading to economies of recombination

Our research also contributes to the literature on knowledge transfer and learning. Factors identified in the context of knowledge transfer from the TO to the PO, or in cross-project

learning, are also required for the transition between two TOs. This means *collaboration* between partners (Akhavan & Zahedi, 2014; Swärd, 2016; Zhao *et al*., 2015), the partners' motivation to continue their efforts (*partners' interest*) (Bakker, Cambré *et al*., 2011; Ko *et al*., 2005; Newell, 2004), their strategic interests (*partners' interest*) (Akhavan & Zahedi, 2014; Lindner & Wald, 2011), project governance (*collaboration*) (Cacciatori *et al*., 2011; Sanderson, 2012), the characteristics and capacities of both transmitters and receivers (*nature of the partners*) (Bresnen *et al*., 2003; Ko *et al*., 2005; Landaeta, 2008; Newell & Edelman, 2008), the characteristics of the knowledge (Swan *et al*., 2010; Szulanski, 1996) and its contextualization in relation to a particular task (knowledge) (Lewis *et al*., 2005), and temporal constraints (*time*) (Bakker, Cambré *et al*., 2011; Newell, 2004). However, our research also highlights four factors necessary to the transition concept that were not considered by previous research on knowledge transfer and learning: *consortium agreement, funding, project set-up* and *lobbying*.

It should be noted that some factors highlighted in the literature are missing from our study. This is the case for factors relating to IT tools. For example, storage tools (Akhavan & Zahedi, 2014; Lindner & Wald, 2011), communication systems within the collaboration (Lindner & Wald, 2011; Newell *et al*., 2006; Newell, 2004), and knowledge integration mechanisms within POs (Bresnen *et al*., 2003; Cacciatori *et al*., 2011) were not mentioned during the interviews we conducted. We can provide a temporal explanation for this absence. When a collaborative project is terminated, project members may stop using their previous collaborative tools in favor of their organizational one(s). Thus, during the transition between two sequential TOs, partners will not necessarily share the same tools. Since our unit of analysis did not consider the specific tools of each PO, we could not determine whether or not IT tools had any effect on the transition process. Likewise, factors relating to the number of projects in progress (Landaeta, 2008; Swan *et al*., 2010) were not mentioned, although they are linked to learning routines in which

interactions between individuals contribute to better knowledge recombination (Dyer & Nobeoka, 2000).

Our study aims to go further than other research on key success factors relating to knowledge transfer and learning. Indeed, we provide a dynamic perspective of these factors by seeking to determine the systemic relationships between them. However, limits inherent to qualitative studies prevent us from revealing the real causalities behind these systemic effects. To do so, the use of a Qualitative Comparative Analysis (QCA) could be used to help uncover the impact of the dimensions presented in this research. The QCA method has already been used in research studying knowledge transfer in projects and is gaining more attention as a tool to study how factors combine into configurations of conditions necessary to or sufficient for certain outcomes (Bakker, Cambré *et al*., 2011). A QCA analysis might therefore illustrate more precisely the patterns leading to a (non) transition between TOs and how ERs are enabled through this process.

Concretely, ER manifest (1) through modules that are drawn from a first TO and reused in a second, or (2) through artefacts and socialization mechanisms (e.g., valorization workshops) developed at the cluster level. Examples of such artefacts include the mapping of rare know-how offered by the textile cluster, while the energy cluster developed a database of 'orphan patents' (patents that are not exploited) that could be used to identify new projects based on the technologies they protect by combining them with results from recent projects. This is in line with Grabher's (2002a) explanation that the upper level (i.e. clusters) "provide cognitive preconditions for converting latent pools into productive resources for collaboration by uncovering complementarities". Concerning the reutilization of module, this may imply that the first TO has developed a functional prototype which will then be tested under conditions as yet not fully developed. In the case of project #03, this prototype concerned lithium-ion batteries

deployed on a smart-grid network service that was still in its early stage of development in France.

Our results provide additional evidence of ER applied to new sectors. While previous research explored sectors such as advertising (Grabher, 2002c, 2004a, 2004b), entertainment (Grabher & Thiel, 2015) and software (Grabher, 2002a, 2004a, 2004b; Ibert, 2004) to investigate ER, our study investigates four others, including two traditional industries (mechanical and textiles). While our results regarding ER are consistent with prior studies, our main contribution in this regard relates to the identification of two different means of achieving ER. Firstly, at the project and organization levels, our observations complete Grabher's (2004a) description of project knowledge sedimented into 'modules' that are reused in subsequent or related projects. The second mean was only partially explained by Grabher (2002a: 210) when he considered local agencies as a potential catalyst for ER. Our results show how socialization mechanisms (valorization workshops) provided by CCUs, as well as the artefacts they develop (patents and rare knowledge databases), are functionally dedicated to the task of enabling ER.

6. Conclusion

This research highlights how three dimensions (structural, interstitial and conjunctural) are articulated and enable or restrict the transition process between TOs. By combining the effects of the 11 factors found within these three dimensions, we believe that our results can help project managers better anticipate how to capitalize on the results from a first TO and thus benefit from ER during a second TO. Results from a first TO serve as a basis for developing new knowledge in a second TO. This article also suggests that organizations which support these collaborative projects and their governance (CCUs / NAOs) take steps to encourage the development of new R&D projects. Thus, via our theoretical contributions to TO theory, we have been able to put forward two practical contributions. We shed light on how ER can be

activated at and via several levels. Firstly, at the project level, ER are activated by ensuring the development of a new TO. Secondly, ER are created within organizations, which can capitalize on a project's results and add this knowledge to their existing portfolio of products and services. Thirdly, ER are activated via NAOs, who put in place socialization and coordination mechanisms to promote interactions between network members, thus ensuring the continuity of collaborative projects and generating new opportunities for collaboration.

In terms of the limitations of our research, the qualitative research protocol that was designed cannot provide indications as to the specific influence of some factors upon the others. To better understand their implications, we suggest the development of a new quantitative research design. Quantitative measures should be able to identify the weight of each factor on the transition process and allow the development of a maturity scale. This scale could help project partners to identify their chances of success when transitioning to a new collaboration. Moreover, this type of research protocol could help develop a measurement scale for ER. New research is currently being pursued on this type of evaluation method to help firms evaluate their intangible assets (Osinski *et al.*, 2017). It could also be used to measure the benefits firms can expect from ER at an intra-organizational level.

Another limitation of this work relates to its inability to provide clues concerning the type of projects that arise from the transition process. Rondeaux *et al.* (2009) offer a taxonomy of four scenarios of a transition between two collaborative projects (end of the journey, internal development, new subjects, and logic of continuity) without providing any empirical evidence to support it. Further research should investigate and validate those scenarios, as well as cross-referencing them with the factors we highlight in this paper. This would provide project managers with tangible clues in order to head towards a specific transition.

Finally, our research only provides examples of ER accessed through the TO transition process of collaborative R&D projects labeled by one of the three types of networks highlighted by Provan & Kenis (2007). It would be beneficial to examine their occurrences in the settings of Participant-Governed Networks and Lead Organization-Governed Networks to assess the impact of the governance forms on the nature and number of ER a firm can benefit from. Analyzing their occurrence in New Product Development (NPD) in POs could also lead to complementary results at an intra-organizational level, where governance mechanisms differ from those at the inter-organizational level. In addition, by adopting a resource-based view rather than the temporary organization theory, future research could help understand how actors within TOs are adapting, integrating and reconfiguring internal and external organizational skills, resources and functional competencies in order to develop a second TO.

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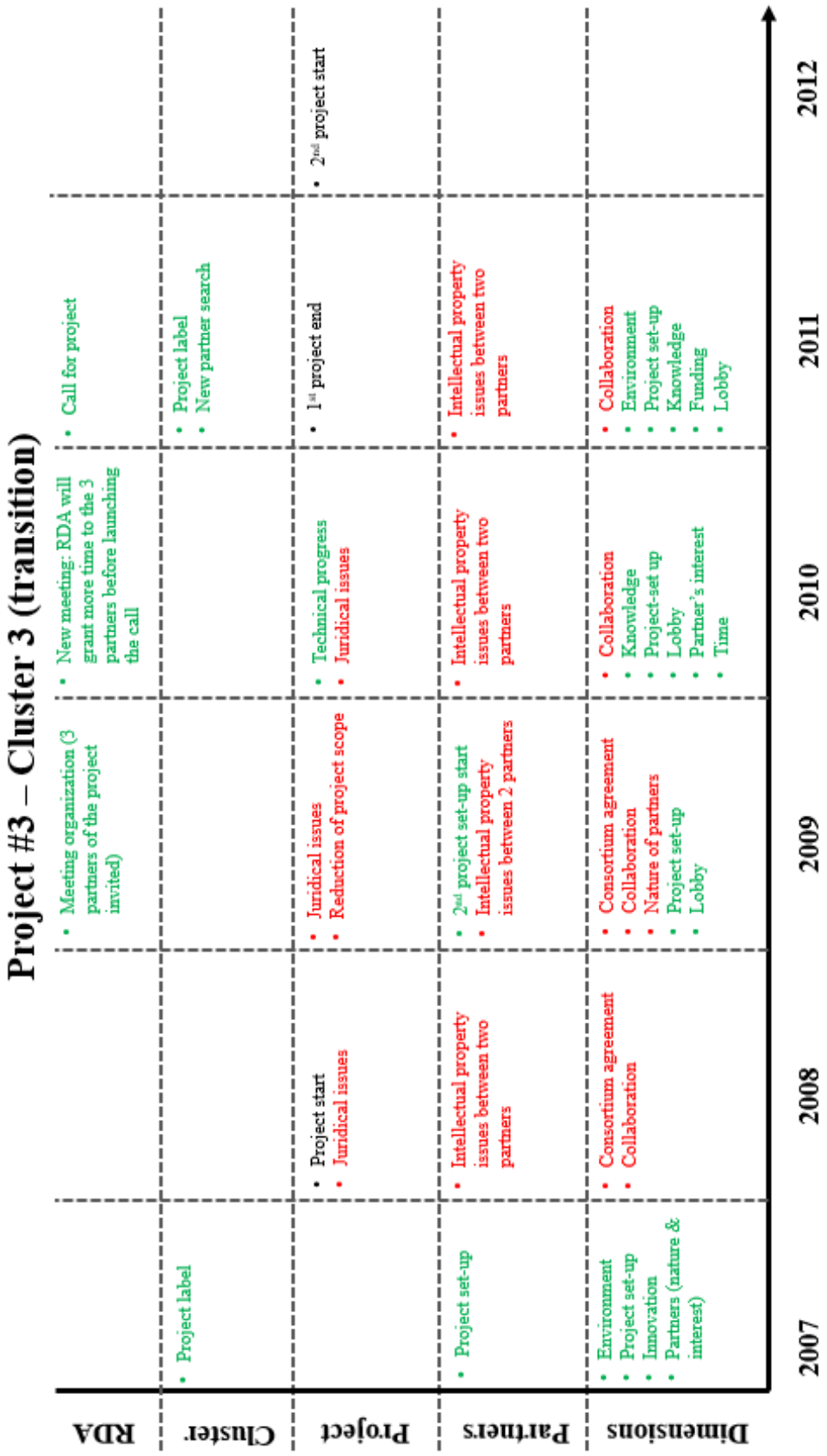
Appendix A: Detailed interviews list

N°	Structure	Function	Project	Cluster	Duration	Channel	Pages
1	LC	Technical manager	#01	Tex	80	Interview	41
2	LC	R&D manager			70	Phone	27
3	SME	Innovative project manager			60	Interview	45
4	SME	Innovative project manager			60	Interview	49
5	SME	R&D project manager			45	Interview	32
6	SME	CEO			90	Interview	52
7	SME	Innovative project manager			60	Interview	26
8	LC	Innovative project manager	#2	Energy	60	Interview	31
9	RO	Researcher			65	Interview	34
10	RO	Project manager			30	Phone	15
11	LC	Innovative project manager	#03	Energy	140	Interview	66
12	RO	Engineer			120	Interview	58
13	SME	R&D manager			70	Interview	32
14	Univ.	Professor	#04	Textile	35	Phone	14
15	RO	Researcher	#05	Textile	70	Interview	30
16	SME	Technical manager	#06	Energy	120	Interview	52
17	RO	Researcher	#07	Energy	45	Skype	22
18	LC	Technical manager	#08	MNT	20	Phone	7
19	RO	R&D manager			35	Phone	14
20	SME	CEO	#09	Mec	80	Interview	22
21	LC	R&D manager	#10	Textile	120	Interview*	4**
22	LC	R&D manager	#11	Textile	15	Phone	5
23	RO	Researcher	#12	Mec	70	Interview	37
24	SME	Production & Innovation manager	#13	Energy	90	Interview	44
25	SME	CEO			180	Interview	70
26	LC	Innovative project manager	#14	Energy	20	Phone	9
27	Univ.	Professor	#15	Mec	40	Phone	20
28	LC	Engineer	#16	Mec	35	Phone	17
29	SME	Innovative project manager			60	Interview	39
30	RO	Researcher	#17	Energy	40	Phone	20
31	SME	Consultant	#18	MNT	30	Phone	10
32	LC	General director	#19	Energy	85	Interview*	4**
33	RO	Researcher	#20	MNT	75	Interview	40
34	RO	Researcher	#21	Mec	85	Interview	34
35	Univ.	Professor	#22	Energy	30	Phone	15
36	SME	CEO	#23	Textile	45	Phone	19
37	RO	Engineer	#24	MNT	80	Interview	34
38	Univ.	Professor			60	Phone	27
39	RO	Researcher	#25	Textile	70	Interview	31
40	LC	R&D manager			75	Interview	33

41	SME	Innovative project manager	#26	Mec	180	Interview	59
42	Univ.	Ph.D. candidate			75	Interview	35
43	SME	Project manager	#27	Energy	80	Interview	37
44	Univ.	Professor	#28	Mec	50	Interview	29
45	RO	Researcher			45	Interview	18
46	SME	Innovation manager Purchase manager	#29	MNT	120	Interview	59
47	SME	CEO	#30	Energy	70	Phone	29
48	SME	Project manager			45	Phone	17
49	NAO	General director	***	Mec	65	Interview	28
50	NAO	Regional federator	***		45	Phone	22
51	NAO	General director 1	***	MNT	45	Interview	18
52	NAO	General director 2	***		45	Interview	18
53	NAO	General director	***	Energy	60	Interview	31
54	NAO	Communication & Valorization manager	***		55	Interview	32
55	NAO	General director	***	Textile	50	Interview	25
56	NAO	Program manager	***		60	Interview	26
57	NAO	General director Project manager	***		160	Interview	7**
58	NAO	General director	***		90	Interview	46
59	NAO	Project manager 1	***		130	Interview	34
60	NAO	Project manager 2	***		55	Interview	34
61	NAO	Workshop manager	***		55	Interview	31
62	NAO	General director General director	***	Mec Textile	165	Interview/ **Restitution**	19**
63	RDA	Regional federator	***		90	Interview	42
64	RDA	Sector manager	***		65	Interview*	6
65	RDA	City's director of economic development	***		50	Interview	25
66	RDA	Regional director of economic development	***		55	Interview	27
67	RDA	Innovation business manager	***		50	Interview	28
			Total:		**4715 minutes**		**1963 pages**

NAO: Network Administrative Organizations; RDA: Regional Development Agency; LC: Large company; RO: Research Organizations; Univ.: Universities; SME: Small and Medium Enterprises; Mec: mechanical industry; MNT: Micro- & Nanotechnology industry; Energy: renewable energies industry; Tex: textile industry.
** interviewee did not want to be recorded.*
*** no available recording, only a synthesis based on notes taken by the researcher.*
**** NAO & RDA do not take part in collaborative projects.*

Appendix B: Example from a synthesis of a project's events



Text in green highlights the events that have a positive impact on the project, while red underline negative impacts.

Appendix C: Coding table of the factors facilitating inter-project learning

Themes	Nodes	Authors
Factors	Collaboration	Bakker *et al*. (2011) Ko *et al*. (2005) Swan *et al*. (2010) Zhao *et al*. (2015)
	Knowledge	Bakker *et al.* (2011) Cacciatori *et al.* (2011) Hartmann & Dorée (2015) Swan *et al.* (2010) Zhao *et al.* (2015)
	Environment	Szulanski (1996) Newell (2004)
	Partners' interest	Bakker *et al.* (2011) Cummings & Teng (2003) Hartmann & Dorée (2015) Ko *et al.* (2005) Swan *et al.* (2010)
	Innovation	Cacciatori *et al*. (2011) Hartmann & Dorée (2015) Lewis *et al*. (2005)
	Nature of partners	Akhavan & Zahedi (2014) Bakker *et al*. (2011) Bresnen *et al*. (2003)
	Time	Bakker (2010) Lundin & Söderholm (1995)
	Funding	**Inductive approach**
	Project initiation	**Inductive approach**
	Consortium agreement	**Inductive approach**
	Lobbying	**Inductive approach**
Levels	Partners	**Inductive approach**
	Project	**Inductive approach**
	Cluster	**Inductive approach**
	Other	**Inductive approach**