UNIVERSITÉ DU QUÉBEC À MONTRÉAL

THE ROLE OF STRUCTURING EPISODES
IN THE DEVELOPMENT OF COMPLEX PROJECTS

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TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

RÉSUMÉ

La thèse proposée répond à une question importante pour le domaine de la gestion de projet, à savoir comment les organisations des projets évoluent dans le temps. Nous nous inspirons de la théorie de la structuration, de la théorie de l'acteur-réseau, et de la littérature sur le changement organisationnel et les organisations de projet pour développer un cadre théorique initial. Nous proposons une nouvelle perspective relationnelle sur la structure du projet, en considérant les projets comme des réseaux complexes de connexions cognitives et volitives. Ensuite, on distingue entre les éléments visibles et cachés, pour obtenir un cadre avec quatre strates de connexions, supportés, respectivement, par des représentations implicites, des représentations explicites, des intérêts spontanés et des intérêts régularisés. Inspiré par le modèle de l'équilibre ponctué et par l'idée d'épisodes tels que vus par Luhmann, nous soutenons que la transformation des projets combine de longues périodes de stabilité relative avec des courtes périodes de changement significatif. Nous proposons donc le concept d'épisode de structuration pour expliquer ces transformations spectaculaires. D'abord ce concept est défini comme le processus de transition d'une forme existante de l'organisation des activités du projet à une nouvelle forme, à la suite de la réponse des participants aux événements internes et externes. Les épisodes de structuration sont générés soit par des représentations implicites en collision soit par des intérêts spontanés divergents face à ces événements.

Ces concepts et ces distinctions ont servi de guide pour aborder le terrain, pour collecter et analyser les données. Nous avons adopté une approche inductive et nos données sont recueillies dans 18 grands projets, de l'Amérique du Nord et de l'Europe, et dans trois industries: les constructions d'infrastructure, les systèmes d'information et de communication, et les bio- pharmaceutiques. Nous avons mené plus de 53 entretiens en face-à-face et nous avons recueilli une quantité importante et variée de documents et d'autres données secondaires.

Nous avons identifié une grande variété de connexions volitionnelles et cognitives, qui, selon nos observations, ne sont pas complètement statiques au fil du temps. Cela nous a inspiré pour proposer le concept de traduction, qui correspond aux petites transformations horizontales à l'intérieur des strates, pour nous aider à expliquer l'évolution du réseau des connexions cognitives et volitives du projet durant les périodes de stabilité. Nous suggérons que ce réseau a la capacité d'intégrer les petits changements et la plupart des défis qui se produisent sur le cycle de vie du projet.

Cependant, à certains moments, des événements déclencheurs dépassent un certain seuil et des transformations plus dramatiques de la structure du projet sont nécessaires. Nous avons nommé ces épisodes des épisodes de structuration.

Enfin, nous avons trouvé que les épisodes de structuration se déroulent en suivant huit patterns temporels, en fonction de la strate où l'événement déclencheur a été généré et en fonction de la complexité de la transformation. Nous discutons le concept d'un épisode échoué et nous expliquons le rôle de l'épisode dans l'évolution de l'organisation à travers le cycle de vie du projet. Nous proposons également une vision plus dynamique de l'organisation de projet en tant que séquence d'épisodes de structuration.

Mots clés: épisodes de structuration, évolution du projet, perspective relationnelle, traductions, événements déclencheurs

ABSTRACT

The proposed thesis addresses an important issue for the field of project management, namely how project organizations evolve over time. We use insights from structuration theory, actor-network theory, organizational change and project management literature to develop an initial guiding framework to approach our data. We propose a new, relational perspective on the project structure, seeing projects as complex networks of cognitive and volitional connections. We further distinguish between visible and hidden elements, to obtain a framework with four strata: implicit representations, explicit representations, regularized interests and spontaneous interests. Inspired by the punctuated equilibrium model and Luhmann's idea of episodes, we argue that transformation in projects combine long periods of relative stability and short periods of significant change. We propose the concept of structuring episodes to explain these dramatic transformations and initially define it as the process of transition from an existing form of organizing project activities to a new one, as a result of participants' response to internal and external impulses. Such structuring episodes result either from colliding implicit representations or from divergent spontaneous interests in the face of these events.

These concepts and distinctions served as a guide for approaching the field, collecting and analysing the data. We adopted an inductive approach and collected data in 18 large projects, from North America and Europe, in three industries: infrastructure construction, information and communication systems, and bio-pharmaceuticals. We conducted 53 face-to-face interviews and collected an important amount and variety of documents and other secondary data.

We identified a large variety of volitional and cognitive connections, which, we observed, are not completely static over time. This inspired us to propose the concept of translation, or the small unidirectional transition between or within strata, to help us explain the evolution of the project network of cognitive and volitional connections during stable periods. We suggest that this network has the ability to incorporate small changes and address most of the challenges that occur over the project lifecycle. However, at times, triggering events overcome a certain threshold and more dramatic transformations of the project structure are required, the so-called structuring episodes.

Finally, we found that structuring episodes unfold following eight patterns, depending on the stratum where the triggering event was generated and on the complexity of

transformation. We discuss the concept of a failed episode, as well as explain the role of the episode in the evolution of the project organization over its entire lifecycle. This enables us to propose a more dynamic view of project organizations as sequences of structuring episodes.

INTRODUCTION

Projects have become a frequent form of organizing activities in many industries (Davies and Hobday, 2005; Lundin and Söderholm, 1995; Ruigrok *et al.*, 1999; Whitley, 2006; etc.), as many companies shift from a traditional functional form of developing new activities to projects. In response to this change, an increasing number of researchers have focused on analyzing different aspects of project development, trying to explain how projects can be better planned and managed to efficiently reach their goals. Despite the various issues with interest for both theory and practice that have been addressed, few prior studies have provided a convincing account of how projects actually evolve during their life cycle. This thesis advances a new perspective, which builds on a relational view of the project structure and proposes the concept of structuring episode, as the core element of project evolution.

The idea of this thesis first came from empirical observations. While studying several large projects, we noticed that, for example, in one case, almost half-way through project implementation the project leader was changed and the new leader came with a completely different perspective to manage the project. He shifted from a democratic decision-making approach to a highly centralized, almost dictatorial approach, in which decisions were all taken by the largest participant organization. The project organizational chart was completely changed, by putting in place fewer and more hermetically separated departments. Relations between actors changed accordingly. Project scope was frozen and demands for future changes refused. The first thought that came to our mind was: why did project actors decide to make such a major change so late in the project? Why did they not continue with the old structure? We first saw

it as a unique event, but we later noticed more than one similar episode within the same project and tens of others in the projects under study, which led us to the idea that project evolution in time is more than simple implementation; it is a series of transformations.

We sought inspiration in a range of theories on organization science. From the project management literature, in particular the temporary organization approach, we took the general view of the project structure as being limited in time and evolving independently from that of the parent organizations (London and Siva, 2011; Lundin and Söderholm, 1995; Floricel *et al.*, 2011a). The flexibility perspective inspired us a dynamic perspective on the project structure (Collyer and Warren, 2009; Pitsis *et al.*, 2003), while the risk and uncertainty perspectives drew attention on the type of events that could affect the smooth project evolution (Hällgren 2009; Jensen *et al.*, 2006; Kendrick, 2003). The interorganizational project perspective, with its roots in strategic alliances and social network theory, highlighted the role of interorganizational relations and the challenges managers face in projects involving multiple organizations (Lehtiranta, 2014; Ruuska *et al*, 2011). This also inspired the level of our analysis, as we focus on relations between participant organizations or their project teams, but look at how these relations work out via concrete interactions between individual actors, intertwined with, and sometimes structured by, material objects.

Going forward, we tried to understand how the project structure actually looks like. We then relied on insights from two fundamental sociological theories, namely actor-network theory (Callon, 1986; Latour, 1997) and structuration theory (Feldman and Pentland, 2003; Giddens, 1984) and their later developments to distinguish between the two main forces that affect organizational development and processes: the network of actors' interests and representations about the project. We refined the distinction along the visible/hidden dimensions of these forces (Brown and Duguid, 2011; Goffman, 1969; Polanyi, 1966). This way, we obtained a four-stratum framework with

implicit and explicit representations and regularized and spontaneous interests. The two theories also provided useful indications regarding the way in which project structure evolves over time, how it goes through minor and major changes and what kind of events launches transformations in each case.

Finally, as we attempted to study transformation processes, we looked at several organizational change theories and, inspired by the sporadic occurrence of events from our initial observations, we adapted the punctuated equilibrium model to explain how projects evolve through their life cycle (Gersick, 1991). In this sense, we proposed the concept of structuring episodes to explain periods of significant change that punctuate long periods of relative stability. The punctuated equilibrium theory also drew our attention to the role that the differential strength and inertia of the various aspects that characterize the relations between project actors. This led us to a preliminary definition of structuring episodes as *the processes of transition from an existing form of organizing project activities to a new one, as a result of participants' reconfiguring of their relations in response to internal or external forces.*

We initially approached the field with the intention of studying major transformations in projects and the events that generate them. Because the phenomenon of interest is rarely studied and the perspective used to illuminate it is relatively new, we adopted a semi-grounded inductive approach, which aims to build new theory from data whose collection and analysis had been initially guided by an existing theory (Glaser and Strauss, 1967; Russell Bernard and Ryan, 2010). We aligned with more recent developments of the grounded theory approach that include reading the literature as part of the method (Corbin and Strauss, 2008; Dey, 1999). This enabled us to narrow the field of observation, while still remaining open to what real-life data have to say, or in other words, to how project organizations evolve over time in reality, when they face challenging unexpected events or major restructuration decisions. As the research advanced and our ideas became clearer (following some preliminary analyses, for

example suggesting types of events that could generate episodes), we refined the interview guide (see the difference between those presented in the Appendix A and B) and collected more specific data.

We rely on data collected in the context of 18 large projects, in North America and Europe, in three industries: infrastructure, IT/IS and bio-pharmaceuticals. We conducted 53 face-to-face interviews and collected a vast amount of secondary data, such as internal documents from interviewees; projects and participant organizations websites, reports, press releases, etc.; general and specialized media; and so on. We refined the theory in an iterative process of data analysis and comparisons with similar and conflicting literatures (Eisenhardt, 1989; Yin, 2009).

The 18 cases helped us provide preliminary answers to most of the initial questions, and these answers sometimes provide significant additions on top of theoretical expectations. In this sense, we observed that the project configuration of volitional and cognitive connections is not completely frozen; these elements evolve even during stable periods. To explain this evolution, we introduced the concept of translation and defined it as the small unidirectional transition between or within strata. We discovered 10 types of translations that are used to incorporate small changes and maintain a relatively stable project structure.

However, at times, events overcome the capacity of the structure to smoothly integrate them, and then major alterations of the existing configuration of relations are required. These were the above-mentioned structuring episodes and we discovered 4 pairs of matching patterns that govern their development, in each pair one pattern for episodes that generate in the stratum of implicit representations and one that generates in the stratum of spontaneous interests. Inspired by the new concept of translations, we further defined structuring episodes as series of translations that develop in a coherent manner. This definition also enabled us explain why certain seemingly similar

triggering events do not always lead to structuring episodes and, more generally, why some major transformations fail, sometimes dragging the whole project with them. Finally, at the project level, we noticed certain relations between episodes and proposed a new perspective of projects as sequences of structuring episodes.

With this theoretical and empirical study, we aim to produce several contributions. The first and foremost contribution is to the project management domain, an increasingly important, but still under developed area. Despite the omnipresence of projects in the economic and social life, research in this domain is still insubstantial as compared to its potential and need (Blomquist *et al.*, 2010; Floricel *et al.*, 2013; Winter *et al.*, 2006). We seek to expand the current body of knowledge by addressing a crucial issue to project management, namely how projects evolve over time and how managers cope with this transformation.

In this sense, we introduce the new concepts of translations and structuring episodes to explain the project evolution during both periods of stability and active change. We also propose a new perspective that sees projects as complex networks of cognitive and volitional connections. Since it tries to identify the real motives behind disruptive initiatives or unexpected collisions, we think this distinction will help scholars and managers alike to better understand where triggering events generate, and so how they can be avoided or managed once they occur.

We develop relevant theory, which builds on and is supported by evidence related to 18 complex projects. Moreover, we hope that our theory may eventually lead to a new understanding of the relation between project planning and execution, which would see events not as undesirable threats, but as normal occurrences that result in improvements to the project and its organization. In doing this, we expect to help putting on a more solid theoretical ground the project management perspective that argues for treating the project as a flexible, rather than a rigid, plan-driven organization.

As a contribution for practitioners, we hope that the results of this research would eventually lead to the development of a series of principles for managing structuring episodes, which would complement the current recommendations for the initial planning of structural elements such as setting up teams, properly allocating resources, predicting future risks and so on.

We structured the thesis as follows. Chapter 1 reviews the main theoretical sources that influenced our research journey. We start with an extensive review of the project management literature and explain the evolution of thinking in this domain and what elements from each school inspired our perspective. In the second part of the chapter, after a brief review of major organizational change theories, we focus on two sociological theories, namely structuration theory and actor-network theory, which provided the basis of our theoretical development in conceiving a new perspective on the project structure, on its evolution, as well as on the events that challenge the smooth project evolution.

In Chapter 2, we present the theoretical framework that we developed to guide us in collecting and organizing our data. We start by introducing our view of projects as complex networks of volitional and cognitive connections. After a second distinction between visible and hidden connections, we end up with a framework with four strata: implicit representations, explicit representations, spontaneous interests and regularized interests. In the subsequent sections, we present the punctuated equilibrium model and Luhmann's idea of episodes, which inspired our perspective on project major transformations. We continue with a brief presentation of the concept of triggering event, which launches structuring episodes, our last theoretical suggestion.

Chapter 3 presents some methodological considerations. We explain why we adopted an inductive, semi-grounded perspective and its benefits. We also present details about

our data collection and analysis processes, as well as some tools that we used. We end the chapter with some details regarding the measures we took to ensure a high-quality and objective data analysis process.
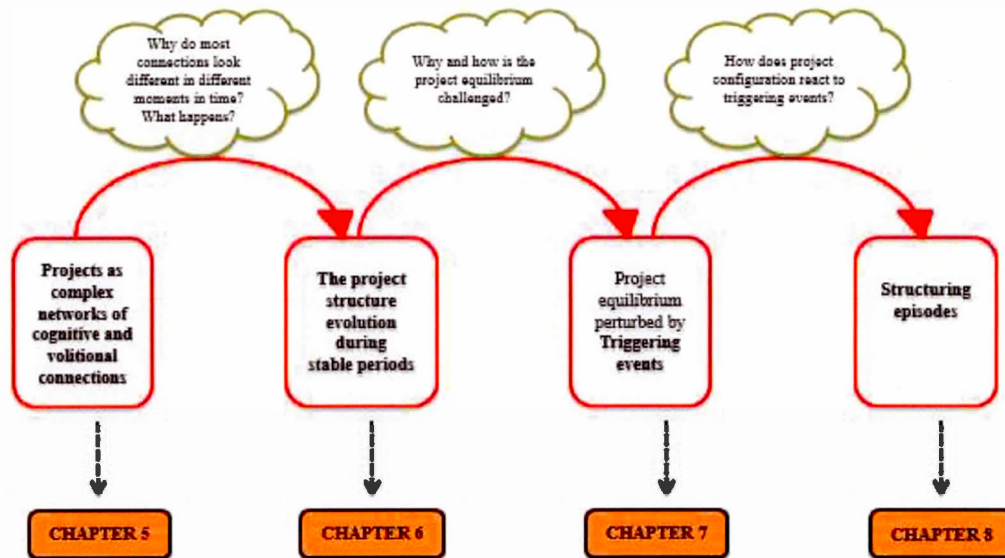
Figure 1 Graphic representation of the structure and relation between empirical chapters in this thesis

Chapters 4, 5, 6 and 7 present our empirical findings (see Figure 1). In Chapter 4, we provide detailed evidence of cognitive and volitional connections from the projects we studied. In Chapter 5, we describe the project evolution during stable periods and introduce the concept of translation to help us understand this continuous organizational morphing. We then present each of the ten translations we identified in projects and discuss the role of each translation and some basic characteristics. In Chapter 6, we present the triggering events we found in projects and elaborate on their

role and conditions of existence. Finally, Chapter 7 addresses the core concept of this thesis, the structuring episodes. We present the 10 phases and four patterns of development we identified in projects as well as some interesting observations and conclusions. We particularly elaborate on the ideas of failed episodes and projects as sequences of structuring episodes.

The last chapter concludes this thesis. It starts with a brief reminder of the main findings, followed by a more general presentation of our conclusions. We highlight our contributions to both theory and practice, and end with a short discussion regarding the limitations of our thesis and some ideas for future research.

CHAPTER I

LITERATURE REVIEW

This chapter reviews the current state of the project management literature that addresses similar research questions and introduces our main sources of fundamental theoretical inspiration. Firstly, we review the project management literature on transformations that take place during the project life cycle. We present different perspectives in project management and explain the main ideas and concepts that inspired us. Secondly, we use insights from two fundamental sociological theories – structuration theory (STR) and actor-network theory (ANT) that helped us theorize key aspects of project structure and structuring processes (i.e. how change occurs and is managed). These prior research findings and conceptual ideas helped us build a new theoretical representation of project structuring processes. This theoretical framework, which provided a basis for our empirical research, will be presented in the next chapter. In that chapter, we also revisit some specific aspects of the prior contributions that inspired our framework.

1.1 Project management and project evolution

This thesis focuses on understanding the evolution of temporary organizations. Projects are one of the most commonly encountered temporary organizations. However, the organizational or, to be more precise, the social aspect of projects has only recently

become a central topic in project research (Packendorff, 1995). But even before this organizational turn in the understanding of projects, a rich literature addressed planning and management aspects related to project change. This literature provided a first source of inspiration in building our theoretical framework, by helping us conceptualize project-related events, processes and technical constraints. In describing this literature, we trace the evolution of the project management thinking as a sequence of schools which gradually moved away from the traditional view of project management as the planned execution of a technical task toward the incorporation of risk, uncertainty and flexibility in projects. We conclude this section by reviewing, first, the research that sees projects as temporary organizations and emphasizes the inertia and other obstacles that result from the social nature of projects, and, second, the research that sees projects as networks of teams or organizations, and emphasize the difficulties stemming from geographic, capability and cultural distance, and from contractual interfaces.

1.1.1 The traditional perspective

The traditional approach considers projects as a set of planned activities that transform goals into artifacts (Kendrick, 2003; King and Cleland, 1988; Turner and Cochrane, 1993). In the conceptual stage, the project idea is clearly defined and all relevant details that may enable the project team to successfully develop the project are analyzed and allotted in activities, resources and schedule, which eventually constitute the ideal path to be followed. The role of all subsequent phases is to transform the initial idea into the desired output, following this ideal path. Milestones are put in place to objectively evaluate, based on past experience and industry best practices, whether the project follows this ideal path. Within extensive risk management sessions, team members, often assisted by external experts, try to forecast all future threats and elaborate a clear mitigation strategy for each case. Afterwards, project leaders aim to minimize or even

eliminate deviations from the initially established plan. In this context, the planning phase is crucial for project performance (King and Cleland, 1988; Meyer and Utterback, 1995), because all important decisions at the strategic level are taken in this moment (Slevin and Pinto, 1987; Turner and Cochrane, 1993). They key assumptions of this approach include rational decision, as a function of sponsors' goals and of the available knowledge, expressed as expected probability distributions of activity cost and duration as well as market and technical performance (Floricel *et al.*, 2013). But what is more important for our purposes is the attention that project management and related disciplines paid to time, stressing activity scheduling and approaches such as critical path to give scheduling a similarly rational appearance. Of course, the time in question is assumed to be objective and regular like to one measured by a clock (Bluedorn and Denhardt, 1988). But the critical path method, for instance, appears to, at least, differentiate the subjective value of time in different activities, depending on whether they are on or off the critical path.

The weak point of this approach is that unexpected events do occur and sometimes have a significant impact on projects (Hällgren, 2007; Williams, 2005). One well-known example is the Berlin Brandenburg Airport construction project initially envisioned as a showcase for Germany. After being delayed for years and already now costing five times more than its original budget, it has become a white elephant and its success is now highly arguable. The main unexpected event – fire safety and smoke exhaust systems failure – could have actually been expected and perhaps avoided. As the resources necessary to cope with the crisis were not available, a series of delays due to poor construction planning, management, execution and corruption has started, which drastically worsened the consequences of the unexpected event. Another example is the Ring Rail Line/ Kehärata connecting Helsinki-Vantaa Airport to the Helsinki commuter rail network. Its opening date has been eventually pushed back to July 2015 due to the unexpected need to re-design and reinforce the airport station tunnel to withstand the acidic products of glycol decay by bacteria within the ground.

Due to these events, projects are often forced to deviate from their initial path and sometimes even fail (Dvir and Lechler, 2004; Koskela and Howell, 2002). Flyvbjerg (2014, p. 10) offers a long list of megaprojects that suffered huge cost overruns, starting with the Suez Canal, the Scottish Parliament Building, the Sydney Opera House, Montreal Summer Olympics and the Concorde Supersonic Aeroplane, which all ended up costing over 1,000% more than the initial estimates. Facing this reality, researchers suggested that even extreme measures, such as "killing" a project before completion might be a valid option (Boehm, 2000; Keil and Montealegre, 2001). This is a current practice in the pharmaceutical industry, where multiple drug development projects compete in their early stages of development, but only few, the most promising ones are selected to be completed (Girotra *et al.* 2007). Large infrastructure projects are different, because they are more visible and under public scrutiny, but even in their case the "killing" option should be considered, especially in the early stages of development, in which sunk costs are not as high. Persisting to invest in what looks to be a black hole could not only lead to a failed project, but could also cause major financial problems for the financial backers of the project. However, project managers hesitate to take or recommend this kind of extreme measures, fearing that they will be seen as personal and organizational failures. On the other hand, in the IT industry, Boehm (2000) argues that actually most often such decisions are not the result of poor project management processes, but are motivated by factors such as lack of resources, goal definition, planning issues, or lack of stakeholders' involvement. However, most projects continue and more or less successfully deal with these surprises and we aim to shed light on the conditions in which these events occur and on the processes developed to cope with these occurrences.

Unexpected events are usually seen as having a negative impact on projects, due to their unexpected occurrence and the uncertainty associated with their influence on the eventual project performance. Projects are developed according to the initial plan and

everything that may deviate them is considered unwelcome. But some events have a positive nature (Ahola *et al.*, 2011; Lechler *et al.*, 2012). Internally, pleasant surprises may come from teams that finish their work earlier than expected, a great general attitude and collaboration between actors, solutions that are functional after a low number of iterations, and so on. The external environment could also offer positive events when new laws and regulations favor the project in a certain way, such as lower taxes or a new immigration policy that facilitates project access to foreign workers. Similarly, the project could take advantage of the decreasing prices for construction materials, fuel, software and other necessary devices. Some other positive events could be seen as opportunities for the project to increase participants' satisfaction, offer a more evolved, more innovative or more complete technical solution, enlarge project scope, etc. In this case, following the initial plan rigidly could prevent the project and the parent organization from exploiting these favorable situations (Giezen, 2012). Project managers need to examine and take into account these opportunities as attentively as they look at the negative elements in the project context (Lechler *et al.*, 2012).

The research on the way projects could deal with such positive and negative occurrences bears many similarities with the "decision" and "design" schools of strategy (Mintzberg and Lampel, 1999) by seeking to identify project activities and forms that decrease the chances of occurrence of such events and their impact on the project. In turn, this approach can be subdivided in three directions. A first school of thought focuses on specific potential events, termed risks, and proposes concrete identification processes, preventive measures and response strategies that help avoid such events or contain their effects (Cooke Davies, 2002; De Bakker *et al.*, 2010; Kendrick, 2003; Wallace *et al.*, 2004). A second direction focuses on uncertainty, seen as the potential for downward or upward variation of project success that can stem from a combination of multiple factors and events due to insufficient knowledge about the relevant factors and processes. This direction focuses on the knowledge production

aspect of project decisions and activities as a way to reduce uncertainty (Shenhar, 2001) and on ways to reduce project complexity as the main source of uncertainty (Giezen, 2012). The third direction assumes that managers have a limited ability to anticipate events (Jani, 2011; Kutsch and Maylor, 2011) or that some are simply impossible to predict (Piperca and Floricel, 2012). This direction focuses on identifying flexible processes and forms that enable projects to cope with any unanticipated event (Floricel and Miller, 2001; Lenfle, 2011; Pich *et al.*, 2002).

1.1.2 The event anticipation perspective

Many researchers in this vein focus on identifying and categorizing risks, namely potential events with negative consequences for a project. For example, Kendrick (2003) studied various sources of risks and classified them according to their main impact on the project into risks related to scope, schedule or resources. The project scope could suffer changes due to evolving requirements, specifications added later or unforeseen dependencies. The scope could also be affected by defects, as results of hardware or software failures, or subcomponent incompatibilities and deficiencies. Market and confidentiality risks were also included in this category. Schedule risks are mainly related with delays (e.g. in delivering parts or subprojects, decisions delays or lack of information), dependencies on other projects, and erroneous estimates. Finally, resource risks are related with money, outsourcing that could involve delays, late starts and turnover, and people. People are a major source of risks due to staff leaving the project permanently or temporarily, people not fully dedicated to the project, lack of motivation, and interpersonal conflict.

In turn, Wallace *et al.* (2004) classified risks according to their origin, by distinguishing risks related to the social subsystem, technical subsystem, and project management. The social subsystem risk comes from the people and groups involved in the project

development and refers to their interests, commitment, resistance to change, and so on. The technical subsystem risk is related to the artifact that is built, which sometimes have unclear or evolving requirements. The project development process, its coordination and management generate the third main source of risks, the project management risks. Sharma and his colleagues (Sharma *et al.*, 2011) add to this classification the project dependability. While analyzing risk dimensions in the Indian software industry, they found four critical risk categories: the software requirement specification variability, team composition, control processes, and dependability, with the first category having the most significant impact on the project performance.

Other authors draw attention to sources of risks that are usually overlooked in projects (Marcelino-Sadaba *et al.*, 2014), like macro-economic factors – recession, inflation, etc. (Ren and Lin, 1996) or particular risk dimensions in specific contexts and industries, such as the oil industry (Stinchcombe and Heimer, 1985), infrastructure (Aritua *et al.*, 2011; Doloi *et al.*, 2012) or IT (Holzmann and Spiegler, 2011). For example, in the IT industry requirements change frequently, so associated risks are common and need to be given special attention (Fu *et al.*, 2012). On their side, Aritua *et al.* (2011) identified 14 risks, some specific for public infrastructure projects developed in programs. The Indian construction projects have their own particular factors that cause delays, such as: unclear project scope and improper planning; inefficient site management, coordination and communication; inadequate contract and lack of commitment (Doloi *et al.,* 2012). These are somewhat different from the factors causing delays in Iranian gas pipeline projects with unrealistic project duration, land expropriation and obtaining permits standing out along with the more common issues related to selection and payments to contractors, suppliers' deliveries, or changing of orders (Fallahnejad, 2013).

Regional or national contexts are also important and with the recent popularity of developing projects overseas or in international partnerships, organizations need to pay

attention to local characteristics and develop a specific capability named cultural intelligence (Yitmen, 2013). Unexpected events occur in such projects because the project management fails to understand cognitive-cultural, normative or regulative institutions on the local context (Orr and Scott, 2008). With a similar perspective, Steffey and Anantatmula (2011) develop a method of radial risk mapping to asses risks in international projects, enlisting a large variety of risks grouped in four categories: virtual, cultural, political and regional. Virtual risks are associated, among others with communication, number of countries involved, management experience and time zones. Regional risks could come from the crime rate and other safety issues, local weather and housing particularities. Cultural risks are due to the trust level between partners, economic culture, and number of regions or languages. Finally, political risks are related with governments' desire and support for the project, relationships between project management and the local governments, government stability or unrest, and laws and regulations.

Familiarity with local specificities help project managers not only avoid or better deal with threats, but also benefit from opportunities. For example, Loo *et al.* (2013) looked at external risks that could be encountered by international companies developing projects in the Gulf Cooperation Council states. In the existing literature, they had identified seven categories of risks, related with political, social, cultural, economic, legal, logistics and natural contexts. However, the systematic analysis revealed that, in this region, some of these factors are actually positive, due to local governments' policies to massively invest in domestic growth and encourage local presence and activities of big foreign corporations.

A substream of the risk anticipation approach recognizes that some risks emerge during the project and focuses on the "early warning" system that could help managers detect events before they actually occur (Kappelman *et al.*, 2006; Keil and Montealegre, 2001). Nikander and Eloranta (1997) noticed that few events happen suddenly, a large

majority resulting from cumulative processes. Therefore, the authors sought to identify early warning signals and signs that could help managers react promptly to avoid or minimize the impact of what could become a major threatening event. Keil and Montealegre (2001) argue that, in order to benefit from this system and save resources and sometimes the whole project, project managers need to follow a four-stage reaction process: problem recognition, re-examining the present course of action, searching for alternative courses of action, and implementing an exit strategy. For example, the early warnings system will help only if higher hierarchical levels recognize a signal as being significant and consequently take immediate action.

Researchers in the risk anticipation vein also looked to improve other risk-related activities, such as risk analysis, risk allocation, risk management, etc. For example, Pollack-Johnson and Liberatore (2005) developed a scenario analysis tool to improve the risk management process for projects with significant level of uncertainty. Nasirzadeh *et al.* (2014) proposed a new method to allocate project cost risk between owner and contractors, with the optimum as a point where the overall project cost is minimized. Locatelli and Mancini (2010) used a framework called SHAMPU (Chapman and Ward, 2003) to quantify the impact of risks and provide possible mitigation actions in megaprojects. Taking into account elements that are usually overlooked in projects, Marcelino-Sadaba *et al.* (2014) proposed a new project risk management methodology with specific indicators, extensive risk checklists, and recommended actions. Similarly, Loo *et al.* (2013) developed their own external risk breakdown structure to identify and respond to external risks in a systematic manner.

Finally, risk anticipation researchers focused on the conditions that could improve the risk management processes. Among the reasons that prevent project managers from using these processes tools, the lack of time to apply such techniques, the lack of information regarding various aspects of the risk, and the lack of project sponsors' understanding of the cost of the process that may or may not eventually lead to some

difficult-to-quantify benefits (Kutsch and Hall, 2010; Lyons and Skitmore, 2004; Tummala *et al.*, 1997). A proper risk management process involves time, money and expertise that may not be available in all projects. Even when budgets and time are adequate, project managers find difficult to explain the process rationale to various project sponsors that are more inclined to address real, as opposed to potential, and clear, as opposed to unclear, costs (Royer, 2000). One last problem is risk ownership (Kutsch and Hall, 2009; Ward and Chapman, 1991). If the areas of responsibility are not clearly delimited, participants may think or perceive certain risks as being somebody else's responsibility and therefore they may not be preoccupied to prevent or intervene in specific cases.

The risk anticipation research helped incorporate in our theoretical framework a richer understanding of the nature of events, in particular of their various sources and of the different impacts that they can have on project activities. These contributions also sensitized us to the fact that the onset of events is a process that can take many forms, and its temporal profile affects the ability to detect the event and the moment when it occurs. However, the anticipation of concrete risks is not always possible. In a context of novelty the relevant knowledge and the related anticipatory capacity may lacking (Shenhar, 1991). Moreover, in dynamic environments, constant changes make prediction of future risks quite challenging (Sommer and Loch, 2004). This may explain the seemingly paradoxical finding that risk management practices are less used in projects with a high level of uncertainty and dynamism (Besner and Hobbs, 2012). Finally, the events that affect a project can be very numerous, which may warrant paying attention to minimizing the impact of the overall variability of outcomes rather than attending to each particular event. The ways of dealing with uncertainty are discussed in the next subsection.

1.1.3 The uncertainty reduction perspective

Uncertainty can be defined as the lack of knowledge that would enable to anticipate future evolutions. Higher uncertainty can result from novelty, in particular the presence of more radical technical innovation or of new customers, or from complexity, namely the number of interrelated elements in the project (Shenhar, 2001). It usually results in a higher variance of the anticipated distribution of project outcomes, which means that project sponsors may have to bear a significant escalation of costs or important losses, but could also benefit from higher than expected gains. Atkinson *et al.* (2006) suggest other angles in addition to uncertainty in estimates, namely uncertainty related with other parties, or uncertainty associated with stages in the project lifecycle. Jensen *et al.* (2006) also distinguish three types of uncertainty: operational or related to the internal logic of the project, interactional or related with the relationships with the stakeholders, and institutional or related with the norms and values.

One important conclusion of the stream of research on project uncertainty is that the sequence of activities in the project should be designed by considering its ability to produce uncertainty-reducing knowledge (Boehm, 1988; Sauser, 2006; Shenhar, 2001). For example, Shenhar (2001) suggests that uncertainty increases, on the one hand, along four levels of technological novelty and, on the other hand, along three levels of system complexity (assembly, system and array). He also suggests that in projects with higher uncertainty a higher number of iterations take place before a functioning technical solution is developed. Likewise, a larger number of iterations are needed in projects that commercialize radical innovations, which face higher market uncertainty (Leifer *et al.*, 2000).

Other scholars, such as Thomke (1998) and Pich *et al.* (2002) argue that depending on the level and type of uncertainty a project experiences during its lifecycle, and of the

cost of trials and the quality of information they produce, a strategy of performing several trials in parallel could be more beneficial than an iterative trial and error approach.

A related process-based approach for managing uncertainty is based on the real option approach (Trigeorgis, 1995). In this approach, a relatively small investment, acquiring the option, prepares the ground for quickly investing in a full-fledged project when uncertainty subsides. Proponents of this approach suggest that the value of holding an option increases in situations of higher uncertainty (Huchzermeier and Loch, 2001). In this sense, McGrath and MacMillan (2000) investigated in detail the conditions, namely expected revenues, competitive response as well as development and commercialization costs, which increase or decrease the value of holding an option in high-uncertainty innovation projects.

Finally, reducing project complexity, for example by freezing the scope, would also reduce uncertainty (Giezen, 2012). Client requirements often change and new events occur in all projects, but clearly defining the scope from the planning phase and then refusing to adopt any modifications all along project lifecycle has the major advantage of developing the project in a familiar environment, since all details, conditions, specifications and requirements are known up front. Giezen (2012) studied the Rotterdam metro expansion project and attributed project success to managers' decisions to reduce complexity. The rigid approach enabled project managers to eventually finish the project, but this came at the expense of missing some opportunities: the project became too simple, future improvements (e.g. adding a new stop) will be extremely complex and expensive, and broader project performance (e.g. land use development) is regarded as being rather poor.

This approach brings project processes to the fore, and puts even more emphasis on their temporal aspect, even though it still espouses an objective time perspective.

Moreover, it sees knowledge not as a fixed endowment but as a resource that can be actively produced in the course of project activities, provided that the necessary cost and time are spent. Of course, knowledge is modeled as an imperfect representation of an objective reality. Most models distil project knowledge into a unique parameter, an overall degree of truth that has a similarly global uncertainty-reducing effect (see for example Krishnan *et al.*, 1997). But several researchers found that even the best risk anticipation and uncertainty reduction efforts cannot eliminate the arrival of totally unexpected events (Floricel and Miller, 2001; Pich et al., 2002). The contributions that followed from this finding are discussed in the next subsection.

1.1.4 The flexibility perspective

The new focus on unexpected events and the increased attention to environmental dynamics and turbulence, which constantly generate genuinely novel circumstances that cast doubt on initial planning assumptions, led to a new approach in project management that calls for more flexible planning and a new relation with change (Collyer *et al.*, 2010; Koskela and Howell, 2002, MacCormack *et al.*, 2001; Williams, 2005). The traditional four phases in the project lifecycle are not that distinct anymore; in particular, planning and execution intermingle in response to increasing complexity and unpredictability (Leybourne and Sainter, 2012). Even more iterations are used between phases, while project activities are less formalized and more flexible to integrate new requirements and unexpected events.

Ford and Bhargav (2006) support this perspective by concluding that more detailed resource allocation reduces project flexibility and by showing that resulting rigid structures lead to less successful projects in unpredictable environments. Williams (2005) goes even further by arguing that, especially in large and complex projects, it is actually counterproductive to allocate in detail resources in the planning phase, when

information regarding future situations is still limited Projects that adapt to the frequent changes in the external environment, rather than rigidly protecting the initial plan have higher performance.

Reviewing previous research, Collyer and Warren (2009) identified several strategies to manage projects in dynamic environments: environment manipulation, where project leaders reject changes and freeze project scope; specific planning approaches, in which the most suitable for dynamic environments are less detailed plans in the initial stage; scope control, where the project flexibility is increased by breaking the project down in several smaller subprojects; controlled experimentation, in which only promising initiatives are further developed; lifecycle strategies that focus on iterations; management control, in which belief systems and interactive control can supplement the traditional diagnostic control; develop an appropriate culture and communication strategies, which emphasize faster, more open and less formal collaboration; and using a more informal and participatory leadership style.

In a similar approach, Sommer and Loch (2004) argued for the benefit of having a flexible structure in dynamic environments and proposed two types of strategies that projects can apply to adapt to the frequent changes: learning and selectionism. Learning is a trial-and-error strategy. When facing unexpected events, the project team can imagine new and creative solutions to adapt to the new reality. Selectionism is a parallel-trial strategy. In this case, unpredictable events are solved by proposing several responses and by choosing the one that seems to work the best. By relying on variables such as the level of unpredictable uncertainty, the level of complexity, and the cost of each strategy, researchers found out that learning is preferable in most cases.

Another stream of research analyzed the change itself and its relation with project performance. For example, Dvir and Lechler (2004) examined the impact of three elements on the project success: the quality of planning, in terms of schedule, budget

and scope; goal changes that occurred during project execution; and plan changes, which were defined as changes that would affect only the plan and not the project goal. They found that each category of changes has a stronger impact on project performance than the quality of planning, and the cumulative effect of changes makes planning efforts even less significant. In this sense, the authors recommend project managers to focus on adapting to and managing changes, rather than maintaining unmodified an initial plan that can easily become obsolete. Eventually, if the new reality jeopardizes project performance, managers could decide to adjust project scope correspondingly.

DeChurch and Haas (2008) go further and distinguish between three types of planning: deliberate, contingency and reactive. Deliberate planning is what is usually understood by "planning" and would be the main course of action. In order to prepare for surprises and future changes, planners usually add some back-up plans or secondary courses of action, which are presented under the name of contingency planning. Finally, the response to these surprises could be formulated as reactive planning or adjustments of the existing plan to the new requirements or conditions. The authors analyzed team effectiveness in relation with each type of planning and conclude that the reactive adjustment plays the most important role, followed by the contingency planning.

The need to change the initial plan because of unexpected events, was also addressed by researchers that are concerned with project contract design. The main issue they address is finding a way for contract parties to share the burden of unpredictable costs and risks. Von Branconi and Loch (2004) found eight levers that managers can use to optimize the contract: technical specifications, price, payment terms, schedule, performance guarantees, warranties, limitation of liability, and securities. In a similar note, Oliveira Cruz and Cunha Marques (2013) argue that flexibility in contracts could be either strategic, tactical or operational, and located within individual actors or at the intersection between them, the so-called interdependent flexibility. Contracts are one valuable tool to deal with uncertainty and they should be designed to incorporate future

changes at a reasonable cost. However, high uncertainty means that there will still be aspects not covered in the formal agreements, because managers tend to use templates of contracts as provided by the parent organization, which are mal-adapted to the reality of each specific project (Nysten-Haarala *et al.*, 2010). This observation determined Badenfelt (2011) to suggest a broader range of solutions to deal with incomplete contracts, which he grouped in four strategies: assuring financial incentives, building long-term relationships, introducing change clauses, and clearly specifying the contract duration.

In the context of searching for flexible structures practitioners, especially those from the software industry, led the way in proposing agile project management methods (Highsmith and Cockburn, 2001; Schwaber, 2004; Sutherland *et al.*, 2009; Womack and Jones, 1996). The agile methods are highly iterative and very open to incorporate later technical changes. Among the most known methods are Scrum are Extreme Programming. For example, in the Scrum method (Schwaber, 2004; Sutherland, 2001), the goal is defined gradually and the product is built in small increments, deliverable at the end of each sprint (i.e. the smaller part in which the project is divided). The project is redefined in each sprint planning meeting that is held at the beginning of sprint cycle. Since then, new agile methods or refinements to existing ones have been proposed regularly, see for example the Iterative and Visual Project Management Method - IVPM2, developed based on case studies and an extensive literature review (Collyer *et al.*, 2010).

Information system practitioners were among the first to argue for more flexibility (Boehm, 1988), because they were used to deal with clients that require late design modifications or with the constant emergence of opportunities and threats that call for different solutions than those put in place at the beginning of the project. Rather than reacting rigidly, managers that adopt such methods are more open to negotiation and change. The plan becomes a moving reference point that is adjusted frequently,

sometimes every week. In this context, even the traditional performance measures (i.e. on time, on budget, and initial goal achieved) are not appropriate since all these elements evolve over time with new changes and requirements.

Other types of projects, such as infrastructure construction have followed this trend, but more slowly and not as radically, because the nature of the artifacts they produce is less amenable to such frequent changes (Davies *et al.*, 2009). In spite of the fact that it has not been widely accepted yet, there are projects even in the infrastructure industry that are planned with a high level of flexibility. For example, Pitsis *et al.* (2003) talk about the "future perfect strategy" for unique projects with unpredictable possible future problems.

Moreover, some researchers argue for adopting an agile planning approach in all industries as being the best solution to minimize project's struggles with unknowns in dynamic environments (Conforto *et al.*, 2014). Already, project managers use elements of agile methods, such as creating the plan collaboratively and updating it on a weekly basis, but even more elements should be adapted to specificities of each industries. However, Conforto *et al.* (2014) acknowledge the existence of certain barriers that need to be overcome: superficial involvement of suppliers and clients, restriction to collocate all team members in large projects, difficulties in creating large multidisciplinary teams with all competences involved, and so on.

In this context, seeing value in combining the benefits of both perspectives, a third stream of researchers argued for a mixed approach (Koppenjan *et al.*, 2011; Miller and Olleros, 2000; Osipova and Ericksson, 2013). Traditional planning, which emphasizes control and predictability is useful to focus resources, avoid unnecessary changes, and manage identified risks. Flexible planning, which emphasizes adaptation is needed to deal with unexpected events and unavoidable changes. Hartogh and Westerveld (2010) identified elements of both extremes in a wide number of projects. Other researchers

proposed specific combinations of traditional and agile planning methods (i.e. rigurozity and flexibility), such as mathematical modelling and SCRUM (Jahr, 2014). Geraldi (2008) suggests that the two extremes could work fine for different projects. Using a combination of levels of flexibility and complexity, she builds a map to assess this match and mismatch with four regions or organizational archetypes: (1) the creative-reflective archetype is appropriate in cases of high levels of flexibility and complexity; (2) the mechanic-structured archetype could be best used when both flexibility and complexity are low; (3) the chaotification of order archetype is recommended for cases with high flexibility and low complexity; and (4) the bureaucratisation of chaos archetype in high-complexity, low-flexibility situations.

The flexibility perspective brings to the fore the conditions required for acting in the face of unexpected events. It drew our attention to a large number of elements, ranging from technical architectures and activity sequences to resources and capabilities. But even the flexible perspective shares with those discussed previously a focus on the technical aspects of project planning and task management. Research in this stream shares a vision of project participants and objects as an inert and malleable substance that higher-level managers can manipulate as they please and that will behave in rather predictable ways. These contributions tend to ignore social actors that play a key role in initiating action and advancing change and the fact that these actors are bound by many different types of physical, cognitive, communicational and other kinds of social relations. Surprisingly, practitioner-driven approaches, in particular Scrum, pay more attention to the fact that identifying events, learning, and maintaining flexibility depends on organizing and motivating people. But their theoretical approach fails to ground recommendations in an understanding of the situated motives behind participants' action, of their passions, envy, interests, and so on. Generally speaking, all three perspectives reviewed so far see projects as objective, deterministic and dependent structures, which limits their capacity to explain the processes that occur in projects, in particular their difficulties in responding to unexpected events. Another

school in project management tried to address these limitations – the project as organization perspective, which is discussed in the next subsection.

1.1.5 Projects as organizations perspective

The adoption of the project as organization perspective represents a major shift in project management thinking (Hobday, 2000; Lundin and Söderholm, 1995). Projects are no longer seen only as vehicles to reach a certain goal, completely subordinated to sponsoring organizations' systems of relations, routines and practices, but are conceptualized as developing their own social structure that acquires a degree of economy and evolves over time as new participants enter the project (Floricel *et al*, 2011a; Pitsis *et al.*, 2003; Söderholm, 2008).

One distinctive characteristic of project organizations is their temporary nature. Lundin and Söderholm (1995) used 4 elements to distinguish temporary from perennial organizations: time, tasks, team, and transition. In this sense, a project is a time-limited organization that exists only because it fulfils a task, in other words, the project activities. A team is designated to do that task. A project represents a transition between the moments before and after the completion of this task. At the same time, project participants experience a transition between a collection of individuals and a team.

As opposed to the previously discussed perspectives, the project as organization view suggests that projects are shaped by different forces. Its structure complies with institutional requirements rather than being designed to reduce uncertainty or complexity (Dille and Söderlund, 2011). Traditional planning tools have additional roles, such as building a distinct identity and a shared representation, which later influence participants' actions and expectations (De Bakker *et al.*, 2012). For example, risk management is not only a tool to identify risks and suggest ways to cope with them,

but has the role of defining relationships between participant actors as well as bringing them all on the same page, creating a common understanding and perception of the problem (De Bakker *et al.*, 2011). Naturally, managers' focus shifts from monitoring and following procedures towards developing and maintaining relationships, with the immediate implication that different managerial abilities are required (Alderman and Ivory, 2011). In general, in temporary organizations, interpersonal coordination through networks and social mechanisms replaces formal authority that characterizes the coordination style in perennial organizations (Beckhy, 2006).

Not only are they built and look differently, but projects are organizations that evolve independently. In response to environmental pressures, they develop their own strategies, different from those of their parent organization (Vuori *et al.*, 2013). The parent organization still influences project development, but it becomes just one important factor among others, such as: customers, competitors, suppliers, technology, legislation, or the broad economic environment. All these other stakeholders' interests as well as internal participant actors' behavior and individual choices shape the project structure (Alderman and Ivory, 2011; Leufkens and Noorderhaven, 2011). New, specific routines and procedures could also be developed, for example when, under time pressure, managers use informal ways to manage deviations (Hällgren and Maaninen-Olsson, 2009). Project organizations even have what is called a reflexive capability that helps them deal with new, complex circumstances (London and Siva, 2011). London and Siva (2011) developed a tool to measure this reflexive capability that they considered has three key dimensions: awareness or the capability to understand the situation, responsiveness or the ability to be open and supportive to changes when needed, and adaptability or capacity to adapt changeable principles based on individual and organizational values, culture and procedures.

Project leaders should accept change as a natural presence in project life and prepare projects to incorporate the impact of unexpected events. One way to do this would be

to build, from the planning phase, a structure that will later enable the project to adequately react to unexpected events and uncertainty (Floricel *et al.*, 2011a, Floricel and Miller, 2001; Verganti, 1999). For example, Floricel *et al.* (2011a) found that an appropriate response capacity of projects is characterized by a high level of three component dimensions, namely the cohesion between participants, the flexibility of the project structure, and the resources that can be accessed, redistributed or created by the project team. Even though the project structure is still defined in the planning phase, this is expected to evolve during project execution, especially as result of unexpected occurrences, and its main role is to facilitate project adaptation to the new reality and to enable project leaders to easily incorporate later modifications.

Other researchers came to similar conclusions. Geraldi *et al.* (2010) also analyzed responses to unexpected events and found out that successful responses were based on a combination of three capabilities: responsive organizational structure, good interpersonal relationships, and competent individuals. On their side, Brady and Davies (2014) suggested that temporary organizations face two types of complexity, namely structural and dynamic. Structural complexity comes from the static components and their distribution within project structure, such as system hierarchy and interdependence among components, stakeholders' relationships, socio-political complexity, and cultural differences. Dynamic complexity is associated with the ongoing change of relationships among partners and subsystems, which could be the result of market and technological uncertainty, pacing and urgency, interdependencies among components, and so on. In order to successfully manage complexity, managers need, among others, to adopt a collaborative behavior and focus on maintaining good relationships with clients, and to be innovative and adaptive. Generally, a more dynamic (as opposed to static) structure is better equipped to address unexpected events (Hällgren, 2009).

While the human factor became important in the study of project organizations (Leybourne, 2007), a new stream of research (i.e. project as practice) took it even further and called for studying what participants are actually doing in projects rather than seeking normative refinements to the project planning principles (Blomquist *et al.*, 2010; Cicmil *et al.*, 2006). They joined the increasing number of researchers that have argued lately for the need of a practice approach in social sciences (Schatzki *et al.*, 2001) and strategy (Jarzabkowski and Spee, 2009; Johnson *et al.*, 2007; Johnson *et al.*, 2003), asking for a micro-level analysis and a focus on the activities that managers actually perform, rather than on structural elements. In this way, practitioners could directly benefit from research findings and the gap between theory and practice will be significantly reduced.

This perspective suggests that the organizational tissue of projects emerges from the interplay of three elements: praxis, practices and practitioners (Blomquist *et al.*, 2010; Whittington, 2006). Praxis is the actual activity the project team does, such as daily tasks, meetings, discussions, site reviews, and so on. Practice is the set of routines, norms, rules, and procedures specific to a certain domain or organization that guide the practitioner's behavior. In line with the Structuration theory, we can say that the structure (practice) shapes the action (praxis) which further changes the current structure. Finally, practitioners are the social actors that perform the activity, namely project managers, team members, consultants, etc. These actors could also be groups of practitioners, such as project management team, contractors, regulatory organizations, and so on (Jarzabkowski and Spee, 2009).

Among others, the practice lens enabled Söderholm (2008) to analyze how project managers deal with unexpected events during project execution. He identified three types of unexpected events, namely re-openings, revisions and fine tuning, and found four ways in which project organizations deal with them: (1) innovative action approach, which assumes the flexibility of the structure, requires a creative and

experienced managerial team, and proposes radical new solutions; (2) extensive meetings approach, which still assumes flexibility, but aims for small incremental changes; (3) detachment strategies approach, that tries to minimize the effect of unpredictable events by isolating them and applying local changes; and (4) re-negotiating project conditions with stakeholders, in order to change either the input (involved resources) or the output (results, time limits) as a result of the presence of these unexpected events.

In a similar fashion, Hällgren and Maaninen-Ollson (2005) discovered that deviations are managed according to four tactics: evident solution, controlled solution, diffuse solution and development solution, depending on the type of knowledge that is needed (exploitative or explorative) and the previous experience or familiarity with the type of deviation (high or repetitive and low or unique).

Hällgren and Wilson (2011) also identified four general responses to manage organizational crises and five practices used during these responses. As opposed to the examples above, which propose concurrent strategies that each works best in specific circumstances, Hällgren and Wilson suggest a sequence of four responses (i.e. mobilization, prioritization, normalization and responsibility) that could be found in any type of crises situations. Managers would start with a mobilization of participants, making sure everybody understands there is a crisis and is willing to participate. Then they prioritize the important tasks, reorganize activities and reallocate resources. Once the crisis is over, things get back to normal. Finally, the responsibility related with each activity is rearranged. Five organizational practices were found to be associated with these responses: the initial call, maintenance of relative calmness, assessment of situation and assignment of responsibility, temporary permanency and crises response teams, and debriefings.

The project as temporary organization literature helped us uncover a multitude of factors and processes that have been neglected by the research streams discussed previously and which have, in our opinion, an even stronger impact on the ability of projects to respond to unexpected events. From this perspective we derived our emphasis on a wide range of relations between project participants and a focus on how these relations are broken, maintained or rebuilt in the processes of project organizing, in particular when responding to unexpected events. In turn, the practice view inspired us, first, to have a fresh look at the processes that occur in projects, a view as detailed and as unencumbered by preconceptions as possible given the nature of our theoretical framework and data. But because of its focus on projects that happen inside organizations and on the influence of host organization practices and structures such as project offices, as well as because of the micro-level perspective and the narrow time range that is often used by proponents of the practice view, this stream of research can miss some important determinants of project response that are reviewed in the next section.

1.1.6 The interorganizational project

The last perspective that influenced this research was the multi-organizational project view (Alderman and Ivory, 2011; Artto and Kujala, 2008; Leufkens and Noorderhaven, 2011; Ruuska *et al.*, 2011). With projects becoming more and more popular (Whitley, 2006), firms adapted their strategies to develop new economic activities. On the relationship firm-project, Artto and Kujala (2008) distinguished between: management of a project, where one firm manages one project; management of a project-based firm, where one firm manages multiple projects; management of a project network, where multiple firms jointly manage one project; and management of a business network, where multiple firms manage multiple projects. This thesis studies large projects, most of whom were developed jointly by multiple stakeholders, so the management of a

project network provided many useful ideas regarding how structuring events could occur and how they are managed.

Multi-organization projects are very common, especially for large projects, where companies need a large amount of resources, a wide range of expertise, but also to share the high risk associated with large investments. Moreover, they are appealing to stakeholders, because large projects enable them to push the technological boundaries (engineers, designers, users), to be associated with something visible and with numerous potential users (politicians), and to get important revenues for executing large work packages (contractors, suppliers, consultants, etc.) or investing in the production of large artifacts (investors, bankers, developers) (Flyvbjerg, 2014).

However, as opposed to traditional hierarchic organization, multi-organizational projects have specific issues due to the presence of multiple stakeholders with sensibly equal power. This is a major source of risks and unexpected events, since each participant has its own interests (Lehtiranta, 2014) and faces the traditional social dilemma to stay aligned with the project common interest or pursue its own interest for possibly bigger gains (Leufkens and Noorderhaven, 2011). Managing relationships between participants becomes critical (Lehtiranta, 2014; Ruuska *et al*, 2011). Contracts, partnering sessions and other planning tools are useful, but not sufficient in maintaining a good level of collaboration all along the project lifecycle, since conflicts may arise even later due to various reasons (Calamel *et al.*, 2012). Therefore, the project management team needs to develop a relational competence in order to keep all participant organizations aligned with the project goal (Pauget and Wald, 2013).

1.2 Two sociological theories: Structuration theory and Actor-Network theory

In this section, we present two sociological theories, namely structuration theory and actor-network theory, which enabled us to more clearly identify and define the key elements of project structuring as well as better understand how the resulting organizational tissue is later challenged by turbulent events and how the subsequent transformation actually takes place. But in order to provide a background that would highlight the insights that these theories provided us, we start with a very brief review of the main theories of organizational structure and, particularly, change. Then we present each fundamental theory in its initial form along with later developments. We end this section by identifying the common as well as complementary elements related to change that helped us develop the theoretical framework detailed in the next chapter.

1.2.1 Standard views of structure and change

The dominant view of ongoing organizational structure combines functionalism with an open-system, contingent-adaptation view (Burns and Stalker, 1961; Thompson, 1967). In this view, organizational structure is a set of mostly formal relations imposed upon organizational members by the requirements of their environment (Duncan, 1972; Pfeffer and Salancik, 1978; Thompson, 1967). These relations concern mostly the differentiation and integration of their tasks as week as decision authority, in particular for task and resource allocation (Dougherty, 2001; Galbraith, 1973; Lawrence and Lorsch, 1968). Such structures can be designed by dominant actors ('strategists') (Andrews, 1965; Chandler, 1962; Child, 1972); or emerge from actors' collective efforts to find functional communication and coordination arrangements (Stinchcombe, 1990); or be imposed by the external environment, either by the adoption or imitation of "institutionalized" models (Meyer and Rowan, 1977), often via coercive or normative pressures (DiMaggio and Powell, 1984), or by the outright elimination of ill

adapted organizations (Hannan and Freeman, 1977). The strategist-designed variant of this view is implicitly adopted by scholars concerned with project planning, in particular with the design of responsibility charts and of contractual arrangements between participants.

A consequence of this view is a view of structure as a set of constraints externally imposed on the vast majority of organization members. Another consequence is that structure represents a functional architecture, but also a point of equilibrium between competing demands. Given the complexity of these demands and the imperfect knowledge with which actors, including designers, operate, a different functional structure is quite difficult to find and the outcome of changing the current structure is uncertain. Moreover, working within this structure, organizational actors develop vested interests and taken-for-granted interaction routines, which increases even more the inertia of the structure (Selznick, 1947; Weick, 1978). All these factors point towards a corollary of interest for our theorizing, namely the assumption that structural change is an exceptional state for organizations, having disruptive effects for its activities (Henderson and Clark, 1990; Tushman and Anderson, 1986), and requiring significant efforts if it is to be implemented in a deliberate manner (Huy, 2001).

The emphasis on the stability or equilibrium of organizational structures has led to the widespread adoption by organization theorists of Lewin's (1951) view of change consisting of three stages: unfreeze the current structure, move elements into a new configuration, and refreeze the new structure. Weick and Quinn (1999) call this family of theories the episodic change model, and argue that its proponents see change as an "occasional interruption or divergence from equilibrium" (p. 366). For most organization development theorists such change requires an external, goal-directed intervention (by another 'strategist' of sorts). But this 'revolutionary' view of change also has many affinities with the punctuated equilibrium model that appears to

characterize many non-goal directed processes in the physical, biological and social realms (Gersick, 1991).

Our proximate inspiration for the term structuring episode comes from the work of Luhmann (1995), which belongs to the broad class of models discussed above. Luhmann (1995) argues that social structure consists of communicational ties between actors, which result in a coupling of their actions through language and shared significations. He espouses a functionalist vision of the organization, but one that is not directed by external goals and rather emphasizes self-referential processes at the expense of the adaptation to external environment. In other words, communications, including those about organizational boundaries, refer to and interpret any external signal with respect to the organizational system itself and its internal goal of self-reproduction. Because they need a stable language and signification in the course of normal self-reproducing operation, actors cannot adjust their communicational coupling in the course of this kind of operation. Hence, episodes are special moments during which normal operations and communications are suspended, enabling organizational actors to discuss adjustments to their communication couplings (Hendry and Seidl, 2003; Hernes, 2007).

Of course, episodic change has recently been questioned by a flurry of "continuous change" views, which see organizations as normally being unstable and far from equilibrium (Dooley and Van de Ven, 1999; Weick and Quinn, 1999). One, almost trivial, category includes lifecycle theories that see change as a largely deterministic pattern of evolution driven by intrinsic mechanisms (Helfat and Peteraf, 2003; Kazanjian, 1988; Van de Ven and Poole, 1995; Vohora et al., 2004). A consonant view is also held by many project management theorists, except that the latter see the project life cycle as a deliberate, goal-driven sequence traced by planners and later developed by managers (Krishnan and Ulrich, 2001). But even research that adopts a project-as-organization point of view cannot neglect the fact that project organizations constantly

unfold, as participants and activities succeed each other, and can grow in size by orders of magnitude in a relatively short time. Hence, the project organization cannot be seen as equally routinized and inertial as an ongoing organization; some level of continuous change is intrinsic in the nature of projects.

This need to incorporate continuous change in any model of project organization fits well with other theories that see change as a permanent and normal state of affairs in the world, including in ongoing organizations (Hernes, 2007). For example Cooper (2005: 1689) argues that 'relationality' is a defining feature of human agency, which implies "the continuous work of connecting and disconnecting in a fluctuating network of existential events." This view questions the stability and inertia of organizational structures. From a similar perspective, Tsoukas and Chia (2002) theorize organizing as an outcome of ongoing 'becoming' processes, which begin with interactions between actors, and accomplish the "reweaving of actors' webs of beliefs and habits of action to accommodate new experiences obtained through interactions" (p. 567). In turn, Weick and Quinn (1999) argue that strategists can intervene in such ongoing change by first revealing (freezing) current patterns of change, then rebalancing contributing processes and finally unleashing (unfreezing) the new patterns of change.

Our framework of project structuring and change episodes incorporates both continuous and episodic change. We rely, among others, on some of the contributions discussed in this subsection to explain both inertia and self-organizing change. But our framework attempts to integrate these insights, often based on contradictory assumptions, using a parsimonious set of fundamental concepts. While the framework is original, it is useful, before we present it in the next section, to review in some degree of detail the two fundamental sociological theories that had the strongest influence on it. These theories caught our attention because they have a view of structure that depends on the decentralized action of social actors. However, they conceptualize actors and social relations in distinct ways, and highlight different consequences in

terms of organizational influence on action and inertia. They also provide contrasting perspectives on the origin, continuity and nature of organizational change, which helped us identify mechanisms that can explain the variety of complex patterns of change that we observed empirically.

1.2.2 Structuration theory

Structuration theory (STR) affirms that social actors do not act in completely independent ways, but are conditioned by the set of rules and resources that govern the social system to which they belong (Giddens, 1982, 1984; Gulati, 1995). In turn, their action shapes the structure which will further condition actors' action; in fact, unlike in the more standard views discussed above, social structure does not exist outside the actions that reproduce it. Thus, structure has a dual nature, being both the medium of action and the outcome of that action. Despite the restrictive conditions, social actors have capability or intentionality, meaning that they could act in different ways, and knowledgeability or conscious (discursive consciousness) and unconscious (practical consciousness) knowledge with regard to society. However, actors have only limited information about the context of their action (i.e. unacknowledged conditions of action) and can predict the consequences of their action only to a certain extent (i.e. unintended consequences of action). Structural change is in part the result of these unintended consequences of action; this type of change usually has a smaller magnitude and occurs more frequently. Alternatively change can result from the intersection with other structures that have a very different set of rules and routines; this change is more radical, but also less frequent.

Giddens (1984) considers that social life can be regarded as a collection of distinguishable episodes. He proposes this view to facilitate the comparison of different forms of institutional change. The main aspects of an episode are: origin (where the

episode generates); type (in both senses the depth and the width of change the episode involves); momentum (the rapidity of change); and trajectory (the direction of change). However, episodes could be compared only to a limited extent, due to the particularity of each context in which these episodes occur, and to the influence of human knowledgeability on social change.

The use of structuration theory in theorizing organizational issues went in two main directions. Scholars preoccupied with fundamental theoretical concerns focused on combining STR with other theories that were already used to explain organizational phenomena: social network theory (Gulati and Gargiulo, 1999; Gulati, 1995), institutional theory (Barley and Tolbert, 1997), practice view (Orlikowski and Yates, 2002), actor-network theory and routines theory (Pentland and Feldman, 2007), and so on. For example, Barley and Tolbert (1997) noticed that the institutional theory had been focused on empirical developments that neglected how institutions are fundamentally formed and modified, while the structuration theory had remained at a very abstract level with few empirical applications. They argue that combining the two theories would solve limitations of both and enabled them to further refine and advance. Similarly, proponents of the practice perspective argued that a micro-look at daily ongoing activities could make STR more empirically relevant and, among others, help researchers understand temporal aspects in organization research (Orlikowski and Yates, 2002).

The interplay between structure and action was also used to explain the evolution of interorganizational networks of alliances (Gulati and Gargiulo, 1999; Gulati, 1995). In this sense, organizations are embedded in a network of alliances that dramatically influence their choice of a new partner. With the entrance of each new partner into the network, the structure of that network suffers a noticeable change. This new structure will differently affect the organization's selection of future allies. At a more general level, we can say that is a mutual consecutive influence between social structures and

organizational actions. However, more recently, some researchers argued that the organization's individual interest has to be taken into account when analyzing alliance networks formation (Greve et al., 2013). These networks are actually not that stable, and organizations could as well leave the alliance if they are attracted by better opportunities in competitive alliances, for example when there is a better-matching alternative.

The other stream of research used STR on its own to explain various aspects of organizational life: knowledge use (Hargadon and Fanelli, 2002), communicative actions (Orlikowski and Yates, 1994), organizational change (Howard-Grenville, 2005; Yates *et al.*, 1999), routines (D'Adderio, 2014; Feldman and Pentland, 2003; Labatut *et al.*, 2012), and especially the role of technology (Barley, 1986; Orlikowski, 2000). For example, using a STR perspective, Hargadon and Fanelli (2002) distinguished between latent aspects of knowledge (i.e. its structural dimension), which have the potential to generate new, innovative organizational actions, and empirical aspects of knowledge (i.e. its action dimension) or actions that are actually performed, and replicated in daily organizational activities. Organizational communicative actions were found to evolve in a similar manner (Orlikowski and Yates, 1994). The genre repertoire or the set of types of communicative actions (i.e. genres) guides the employees' use of communicative actions in their daily activities. In turn, the repertoire is shaped by their decisions to change the frequency to which a certain genre is used or even the composition of the repertoire, by adding or renouncing to use a certain genre.

One major development in the direction of continuous change came with the routines theory (D'Adderio, 2014; Feldman and Pentland, 2003; Pentland and Feldman, 2007). Feldman and Pentland (see, for example 2003) challenged the traditional understanding of routines as sources of stability and inertia and proposed a change-generating dimension of routines, their so-called performative aspect. Thus, routines could also generate change, due to reflexivity, the individuals' characteristic that enable them to

perform actions in a particular way, which could be different from the way in which that action has been performed before. The performative aspect of routines includes specific actions, performed by specific people, in specific conditions. At the same time, routines have an ostensive dimension that is more abstract and accounts for the stability and predictability that routines bring to organizational activities. The ostensive dimension could be found in either explicit forms, such as procedures, or implicit, taken-for-granted norms. The interplay between the two aspects follow a similar STR logic: the ostensive aspects guide individuals' actions, while these actions are performed (i.e. performative aspect) in a way that either reproduce or change certain ostensive aspects. Through repeated use or performance, the change later becomes a stable characteristic of the routine and part of its ostensive dimension. From this perspective, change could be either episodic or continuous, depending on which aspects (performative or ostensive) of the routine prevail in certain moments. In order to understand change, one has to look at the specific circumstances that generated it.

Howard-Grenville (2005) supported this view and emphasized the agency aspect to explain change in routines. In this sense, the organizational context acts as a guiding structure that influences the way in which routines are performed. However, individuals and groups have their own interests and understandings of the situation, so they sometime perform actions in a novel, innovative way, which leads to modifications of the initial routines.

Another major development came from the special attention given to the influence of technology on actions and structures (Barley, 1986; Orlikowski, 2000). People interact with technologies and, as a consequence, enact structures that, in turn, shape their way of using that technology. In his famous paper, Barley (1986), explained how the introduction of a new technology, the CT scanner, changed the way people work and interact in two different radiology departments.

Orlikowski (2000) adopted a similar perspective and found that structures change with the movement of people from inside to outside, from outside to inside, and from newcomer to full participant. Participants may experience changes in awareness, knowledge, power, motivation, or context, which lead to a change in their habits and way of interacting with that technology. These new ways of dealing with technology shape a different structure. Orlikowski (2000) identified three possible types of consequences of social actions: inertia, which involves reinforcement and the preservation of the status quo; application, which implies reinforcement and refinement of the status quo; and change, associated with the transformation of the status quo. The findings suggest that only changes at the structure level are generated by the unintended consequences of actors' actions, whereas changes related with technology or work practices are usually a conscious result of these actions. In other perspectives on organizational change, Yates *et al.* (1999) talk about explicit and implicit structuring, depending on which kind of change is involved, conscious or unconscious change, respectively, and Bartunek and Franzak (1988) distinguish between first order change, or improvements within the current structure, and second order change, or discontinuous shifts in structures.

While physical characteristics of technologies play a certain role, their social aspect was seen as particularly important to explain organizational actions and change. Reviewing two decades of research on the topic, Leonardi and Barley (2010) found five distinguishable perspectives, depending on the social phenomena they study and the processes they use to explain how the construction occur: (1) perception – this perspective looks at attitudes, beliefs and values and uses the social influence mechanism to explain technology-related change; (2) the interpretation perspective focuses on schemas and frames and suggest that technology is constructed through transference; (3) appropriation – scholars within this perspective explain mainly patterns of deviation and conformity using intra-group interactions; (4) enactment – this view looks at work practices and how they change in the interaction with

technology, due to situated improvisations; (5) alignment – intergroup interactions are used to explain roles and relationships. They end the review arguing for more attention to materiality and power in organization theory.

This last development, that highlights the role of technology in shaping organizational activities, eventually led to a new school of thought – sociomateriality (Leonardi, 2012; Orlikowski, 2009; Orlikowski and Scott, 2008). Analyzing papers that took into account the role of technology in organizations, Orlikowski and Scott (2008) distinguish between two streams: one that sees humans, organizations and technology as separated, independent entities with their own specific characteristics, and the other that sees them as interdependent systems that influence and shape each other. Drawing on the latter perspective, that has its roots in STR and social constructivism, Orlikowski and Scott (2008) proposed the concept of sociomateriality, arguing that the social and technical dimensions of organizational life can be best understood if studied together.

The role of non-human actors, here technology, and of agency and reflexivity in changing stable structures were increasingly taken into account in later developments of the structuration theory. However, these elements are central in the actor-network theory, the other main source of inspiration for our theoretical framework.

1.2.3 Actor-network theory

The actor-network theory (ANT) was first developed by the sociologists Michel Callon, Bruno Latour and John Law (Callon, 1986; Latour, 1997; Latour and Woolgar, 1979; Law, 1992, 1994). In this perspective, the focal point is the interactions between actors involved in the social life, because these interactions are the elements that actually constitute both social life and actors themselves. In this sense, participants could be either human or non-human and are defined through the heterogeneous

network of their relations (Law, 1992), hence the actor-network name. For example, one person is identified not only in relation with his or her body, but also considering his familial relations, educational and work background, actual job, friends, car, clothes, and so on. If any of these elements would be different, then he will be a different person. Similarly with non-human actors, a car is a network of roles played by its body, engine, wheels, mirrors, lights, driver, mechanic, and so on. Nothing exists beyond the network, elements are either connected, so part of the network, or non-existent (Latour, 1997).

In order to simplify the relation with certain network elements and avoid dealing with large complexity, successful networks are consolidated, the so called punctualization. Networks that are punctualized are perceived as black boxes. Taking the same example, the car is a transportation vehicle and the usual drivers are not concerned with any other detail until the car breaks. In that moment, they become aware of the existence of a whole network beyond that car: breaks, all component elements of the engine, the need to periodically change certain parts of the car, and so on. The equilibrium in consolidated networks is still precarious, as the car can break anytime under the action of various elements.

Actor-networks have preferences and tend to prioritize certain relations, depending on their own momentary interests. In order to overcome this centrifugal force, participants adopt various ordering strategies, such as translation (Callon, 1986). Callon describes 4 moments of translation in the effort to impose a definition of the situation on other participants: (1) problematisation, where project leaders, for example, define the problem in a certain way and try to convince other participants to accept the same definition or obligatory passage point; (2) interessement, where certain roles are assigned to each actor-network who is convinced to accept the role through force, seduction, or solicitation; (3) enrolment, where participants are persuaded to play the assigned role, again through various means: physical violence, seduction, transaction,

or consent without discussion; finally, (4) mobilization of allies, where project leaders ensure that representatives of different collectivities involved in the translation process are indeed listened and followed by their collectivity.

Callon's model and especially the idea of translation and mobilization of allies has been used in numerous studies since then (see, for example, Blackburn, 2002; Missonier and Loufrani-Fedida, 2014; Sage *et al.*, 2011; Tryggestad et al., 2013). Project manager's main role is to develop and maintain relationships with different actors and so build convergent projects, where obligatory passage points are recognized and accepted by participants (Aldeman and Ivory, 2011). These participant actors could be as diverse as: project team members, sponsoring organizations, steering groups, users, and many others, commonly identified as project stakeholders. They all could pull the project apart and, with its emphasis on actors and their role in the project, an ANT approach helps managers focus on this important source of project disturbances (Blackburn, 2002). An ANT perspective is even preferable to social network theory, because it sees stakeholders' relationships in their true color, namely dynamic, changing and emerging, and because it accentuates the importance of improving actors' involvement (Missonier and Loufrani-Fedida, 2014).

The key role of nonhuman actors has been another idea highly applied to better understand, among others, strategic planning (Bryson *et al.*, 2012), project failure (Tryggestad *et al.*, 2013), new software implementation (Pollack *et al.*, 2013), project complexity (Sage *et al.*, 2011), relationship with stakeholders (Blackburn, 2002), and so on. For instance, project management processes were found to be managers' important allies in maintaining relationships with stakeholders, since they offer a framework and means to regularize and improve interaction (Blackburn, 2002).

Nonhuman and human actors have an equally important role when conceiving and managing a project. In an ANT perspective, the strategic plan could be seen as a

complex network of actors and ideas (Bryson *et al.*, 2012). All these component elements interact and impact the project planning and development. Similarly, project complexities are generated and managed by and with the help of both human and nonhuman actors (Sage *et al.*, 2011). For example, the success or failure of a new software implementation could not be explained only by looking at the humans involved in the process, as the software itself provides critical limitations (Pollack *et al.*, 2013). Moreover, nonhuman actors indirectly involved in the project could lead to its failure as well. Tryggestad *et al.* (2013) presents the case of a construction project that had to be stopped because it would destroy the habitat of a protected species (i.e. the moor frogs). An activist organization, the Society for Nature Conservation intervened and succeeded in convincing the regulatory authorities to stop the project.

Let us now look at the various insights the two theories can provide to facilitate the analysis and the understanding of project evolution, the occurrence of triggering events, and the development of structuring episodes. Combining them is not something new, Pentland and Feldman (2007) explicitly drawing on concepts from structuration theory, actor-network theory and routines theory when proposing the concept of narrative network to describe information and communication technologies in use. As already mentioned above, several other researchers also relied on insights from both theories, especially along the lines of the role of technology vs. the role of nonhuman actors in organizational change as well as the role of agency in changing seemingly stable structures.

1.2.4 Comparing and combining the two theories to explain project evolution

Both theories focus on actions and relations between actors to define the social structure, rather than on external elements. They both see the structure as evolving rather than static, through the continuous action of participants. The episodic

representation of the social life can be applied in both cases. There is also a similar approach to avoid complexity and simplify relations and actions, through routinization (STR) and punctualization (ANT). However, while in the STR equilibrium is a natural state, in ANT equilibrium is precarious and depends on actors' self-centered actions.

In the structuration theory perspective, actors are primarily unconsciously driven by structures and they tend to reproduce them. This is why, internally, changes can come only from the unintended consequences of actors' actions. When an unexpected event occurs and the usual path cannot be followed anymore, actors open the black box, namely the stratification model of action (Giddens, 1984): they think about the reason for which they act in a specific way, explain and reflect upon their actions. Actors have knowledgeability, but this is bounded by both unacknowledged conditions of action and unintended consequences of action.

In the actor-network perspective, actors consciously choose their action. However, the richness of information that exists in society determines actors to build certain shortcuts, the so-called punctualized objects, similar to the routinization process in STR. As opposed to STR, where social actors tend to repetitively follow the existing paths without questioning them once agreed on their rationale (because these actors are able to rationally explain, if asked, the reason for which they act in a certain way and how they act exactly), in ANT, actors are more driven by their own interest, urges and desires (or potentialities, for non-human actors) and are ready to change the path as soon as another one seems more attractive or as soon as interactions with different actors seem more attractive than those that have shaped the actors' behavior until that moment.

In STR, change is less intentional and more reactive to intersections with different structures, for example. Actors change only if they must change, because the current structure cannot incorporate the impulses generated by the intersecting structures. On

the contrary, in ANT, change is implicit, because all actor-networks are continuously following their own interest and can be easily distracted.

Table 1.1 A comparative look at structuration theory and actor-network theory

Elements	Structuration theory	Actor-network theory
Focal point	Interplay between structure and action	Interactions between actor-networks
Actant	Humans	Human or non-human actor-networks
Intentionality	Actors have capability, but act routinely; reflexivity	Actor-networks are driven by self-interest
Role of the context	Important, it conditions actors' actions	Completely subordinate to actors' self-centered actions
Social structure	Stable and profound; tendency towards routinization	A temporary effect in precarious equilibrium; tendency towards dissipation
Strategy of dealing with complexity	Routinization	Punctualization / network consolidation
Source of structuring	Internally, from unintended consequences of actors' actions or reflexivity; externally, from intersection with other different structures	Actors follow their own interest
Change	Usually reactive, actors change when they have no other option; sometimes might come from reflexivity	Implicit, actors can be easily distracted and restructure their relations
Episode	Certain rules and routines are adjusted	The actor-network re-arranges its priorities
Role of practice	Action that shape the structure	Interactions that define actor-networks
Role in understanding structuring episodes	Explain how some triggering events occur and how subsequent structuring episodes actually develop	Explain how some triggering events occur and how subsequent structuring episodes actually develop

In STR, internal sources, through unintended consequences of previous actions, generate mainly small transformations of the project structure. External sources, such as interactions with other structures can generate either major or minor changes, depending on the depth of this interaction and on the difference between the two systems. The ANT does not distinguish between small and large changes, but the source is always the actors' egocentric actions. For a summarized comparison, see table 2.1. We use insights from both theories to build the theoretical model that will be presented in the next chapter. STR and ANT offer a complementary perspective that could help better understand how triggering events occur in large projects and how the subsequent structuring episodes actually develop.

1.3 Brief summary of existing perspectives

In this chapter, we looked at the previous literature and their limitations in explaining major transformations in large project organizations. We started with the existing perspectives in project management, which we grouped in five schools, according to our topic of interest: traditional, event anticipation, uncertainty reduction, flexibility, and projects as organizations. We identified their limits in adopting a dynamic perspective that could more adequately explain how major transformations actually take place in projects, as well as in going for the deeper understanding of these processes and their generating events. In spite of their limitations, these project management schools provided several useful ideas for this thesis. While not fully identifying with any of the schools in project management, we combined complementary insights regarding project structure and its evolution during the project lifecycle. In this sense, we adopted the view that, regardless of the effort put in the planning phase, unexpected events do occur and they affect projects irreversibly. However, in order to successfully deal with later unforeseen occurrences, the

anticipatory measures that seek to increase the flexibility responsiveness and adaptability of the project structure are not sufficient. Because projects are distinct temporary organizations, affected by complex and autonomous structuring processes which have unintended consequences, the planers' and strategists ability to channel and control their response to events is limited. Therefore we believe that it is important to deepen our understanding of these processes, both in how they lead to the emergence of an organizational tissue in projects and in how they affect the evolution of project organizations in response to unexpected events. We consider the human factor, with its unpredictable nature, critical in these processes, but we also believe that understanding them requires a deeper and more systematic grasp of the social and material relations between project participants of their dynamics.

Therefore, as recommended by Floricel *et al*. (2014) and others, we answered to recent calls to use insights from broader organizational theories in project management. In this sense, we sought inspiration in several sociological theories, such as structuration theory, actor-network theory and Luhmann's systemic view as well as in recent perspectives on organizational change. While incurring certain limitations, they provided us with useful insights that will enable us to build a coherent perspective on transformations in major project organizations, as it will be explained in more detail in the next chapter. For example, Luhmann's idea of episodes (1995) and the punctuated equilibrium model (Gersick, 1991) inspired the core concept of this thesis, namely the structuring episode. At the same time, elements from structuration theory and ANT guided our effort to build a new representation of the project structure that would provide a deeper understanding of the elements involved in major transformations.

The following chapter explains how we used these sources of inspiration in more detail.

CHAPTER II

A NEW PERSPECTIVE ON THE TEMPORARY ORGANIZATION STRUCTURE AND ITS EVOLUTION

In this chapter, we introduce the theoretical framework that guided us in collecting and analyzing our data. The theoretical development presented in this section grew out of our reflection regarding current theories of organizational change, and their limited ability to account for the frequency and diversity of patterns of major transformations occurring in complex temporary organizations. This reflection led us to realize that the specific nature of project organizations, which emerge from interactions between ad hoc participants and grow as well as change continuously in the course of project planning and execution, would benefit from a relational view of organization and from a richer theorizing of the emergence and change of underlying relations.

As a result of this reflection and drawing upon some existing organization theories, we begin this chapter by proposing a new four-strata framework for temporary organization, which emphasizes cognitive and, respectively, volitional connections between project participants. The four-strata framework results from the distinction we propose for each type of connection between, on the one hand, connections that rely on factors that are internal to organizational actors, namely implicit representations and spontaneous interests, and, on the other hand, connections that are expressed in the project social arena as explicit representations and regularized interests.

This theorization of connections enables us to define project organizations as evolving networks in which actors are connected simultaneously by various types of representational and volitional relations. These relations vary in terms of strength and durability; some of them are quite ephemeral, while others are fragile with respect to various events that occur in projects. The overall nexus of multidimensional relations is able to support and respond to a range of smaller deviations and events, but it cannot deal with major events. When confronted with major events, the configuration of relations undergoes significant transformations and a new configuration of relations emerges. In the second part of the chapter, inspired by the punctuated equilibrium theory, we suggest that these major transformations occur episodically and we introduce the new concept of "structuring episodes" to explain these revolutionary transformations.

In the third part of the chapter, we explain that major transformations are generated by triggering events and, after a brief literature review, we elaborate on how these events could look like in our perspective, where they could occur, and why they could lead to structuring episodes as opposed to regular structure adaptations. We end the chapter with some considerations on structuring episodes.

2.1 A New Perspective on the Project Structure

In this section, we present our new perspective on understanding the project structure. Drawing on various existing theories, but being particularly inspired by structuration and actor-network theories, we distinguish between the network of actors' representations about the project and the network of their interests in the project. We further refine this framework by highlighting hidden and apparent elements that constitute this structure, to end with a new model of the project structure that consists

of four strata: implicit representations, explicit representations, regularized interests, and spontaneous interests.

2.1.1 Organizations as Networks of Actors' Representations and Interests

We see the social structure of projects as a heterogeneous set of relations between actors. Inspired by a long line of theorists in philosophy, sociology and organization science (Blumer, 1969; Callon, 1986; Cullen et al, 2000; Giddens, 1984; Levinthal and Rerup, 2006; Nietzsche, 2000; Schopenhauer, 1966), we make a first distinction between the two main forces that govern the development of any human and, in particular, any organizational activity, namely volition, or the network of actors' interests that compose a project, and representation, or the network of cognitive connections.

Dichotomies mind-body or spiritual-material have long been present in most of the world's religions and philosophical schools. Social sciences followed the trend. Some schools of thought such as cognitivists in psychology, symbolic interactionists in sociology and decision-making theorists in organization sciences, gave primacy to the mind, with its ability to construct a representation of the world, and to the rational aspects of human action. Others, such as behaviourists in psychology and conflict theorists in sociology and organization science, focused on the material, instinctual and emotional aspects of human and nonhuman actors. Inspired by Schopenhauer (1966), in the following, we use the term volition (or "will") to designate the material, biological and instinctual aspects of human actors, such as urges, desires, affinities and pathologies. Likewise, we use 'representation' to designate the cognitive aspects, including mental frames, tacit knowledge and routines but also external representations, such as plans and procedures. While the "dualism" tradition attempts to separate the two aspects (Descartes, 2003), we argue that they are intertwined in

social actors and organizational life; they equally hamper or facilitate organizational activities. Schopenhauer (1966) argues that volition and representation are two facets of the same coin. Nietzsche (2000) concurs, by suggesting that social actors have both Apollonian and Dionysian drives to act; put otherwise, they act, based on reason and logical thinking as well as on emotions and instincts. Even Descartes (2003) agrees that mind and body continuously interact and influence each other.

In our perspective, the volitional side is the result of natural selection, which is imprinted in actors via biological mechanisms and their emotional and action-drive correlates. In its natural expression, volition includes all spontaneous impulses, affects, desires and urges of any social actor. While this side of human actors is totally subsumed to the forces present in the physical and biological reality, in its social and organizational manifestations it appears as the realm of free will, self-determination and power. For example, it is the driver behind managers taking decisions based on instinctual logic, gut feelings (Damasio, 1994) and apparently incomprehensible rationale (Taylor, 2006).

Evolution imprints in most living beings a certain representation of their world, which in its primitive forms is as simple as the 'image' of a single molecule that can be ingested. More advanced species have the ability to form and update through learning a much more complex image of the external world. But, it is important to note that this representation is constructed via biological and cognitive processes and serves the goal of survival in the world. In human societies, representations are also socially constructed; they are a sort of illusions transferred and instilled from one generation to the next (Berger and Luckman, 1966). In our framework, representations are the result of actors' cognitive process of perceiving and interpreting the world. In the organizational life, these representations could take the form of categorizations, routines, procedures, scripts, drawings or any other elements that are used by participants to portray other actors, the project and its context.

In recent years, other organization science scholars have acknowledged the omnipresence of this duality in organizational activities. For instance, Zbaracki and Bergen (2010) identified both cognitive and motivational aspects incorporated in truces, while Marengo and Pasquali (2012) found that principals face both conflicting interests and diverging cognitive visions and, in order to deal with them, appeal to either existing structures and routines or incentives and authority. Finally, analyzing trust and commitment in alliances, Cullen *et al.* (2000) argue for the equal importance of both hard or rational and soft or emotional aspects in starting and maintaining an alliance. Actors would choose their partners not only for rational reasons, but also if they feel they could trust them and believe their partners will make everything in their power to make the alliance work.

The two aspects are intertwined because representations are constructions produced by a cognitive apparatus that is evolutionarily attuned to align with the lines of force present in nature. In turn, cognitive outcomes, such as calculations regarding an actor's interests and the best way to attain them or rules for behaviour expressed in social norms, can amplify, tame or delay satisfaction for certain volitional urges. These two interrelated aspects are present at all time in organizational actors, but at some moments one of them may take precedence over the other. We will use this differential expression to account for the unexpected durability or fragility of project organizations, as well as for the complexity and variety of patterns in the structuring episodes.

2.1.2 Apparent and Hidden Elements of the Structure

A second distinction we make is between the apparent and hidden elements of the structure (Brown and Duguid, 2001; Polanyi, 1966). Some elements are more visible, or exposed in the social arena (Goffman, 1969), where all participant actors but also

external observers could see them. This kind of connection is many-to-many, and, because of this, it abstracts from many specifics of actors and project elements. These connections establish, for example, a primary course of action (DeChurch and Haas, 2008) and represent a reference point that guides participants in the development of their respective activities or in solving later misunderstandings and conflicts. Other relations are internal to social actors, and define their connection to specific organizational elements such as an object or task, or to another actor or local group of actors; most other actors in a project are unaware of these connections. They remain hidden during project development, and unveil only in critical moments, as we can see below.

With the representational and volitional aspect and with the further division into apparent and hidden relations we obtain the four strata that compose our framework, which we call, respectively, implicit representations, explicit representations, regularized interests and spontaneous interests (see Figure 2.1).
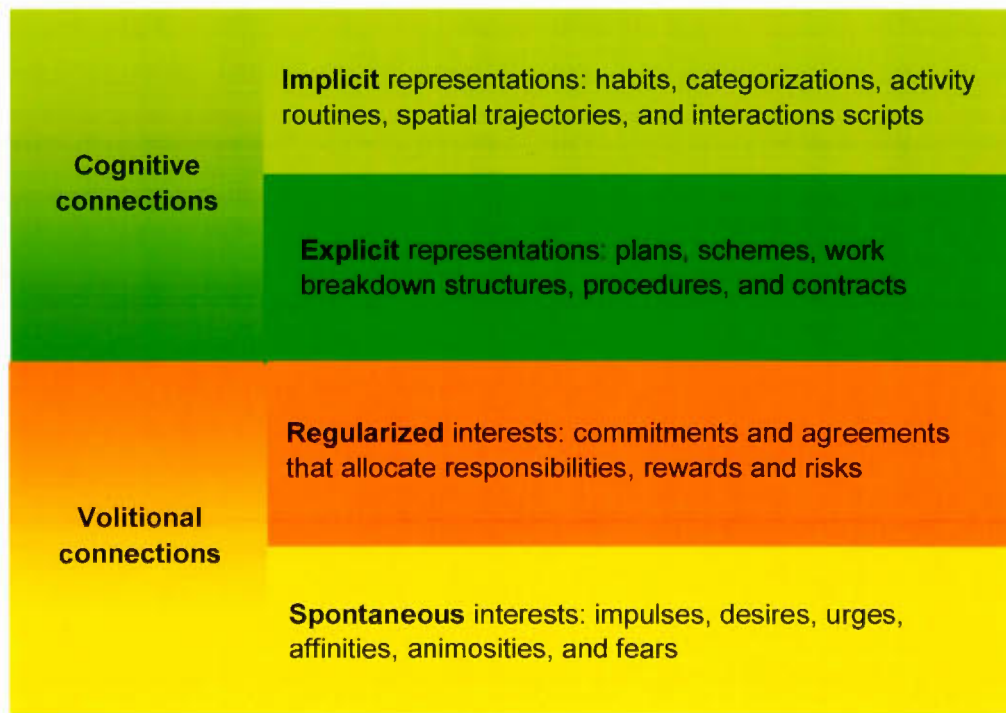
Figure 2.1 A new perspective on the project structure – the project as a network of cognitive and volitional connections

Explicit and implicit representations

The implicit representations are a set of hidden cognitive connections, such as categorizations, activity routines, spatial trajectories, interactions scripts, beliefs, and habits (Feldman and Pentland, 2003; Giddens, 1984). They are intensively used by social actors to lower the complexity of everyday organizational life and activities. They subtly guide actors' actions, so these do not need to reflect upon each and every step and decision that has to be taken.

There are two main groups of implicit representations: pre-project and project-specific implicit representations. Actors join the project with a set of their own pre-project representations and these are cognitive connections developed during prior activities (Nysten-Haarala *et al.*, 2010; Prencipe and Tell, 2001). Organizations have their own routines and habits about how to perform a certain action, how to interpret a specific technical drawing or how to communicate with other participants. In new circumstances, actors will still tend to use them and this might sometimes come in conflict with other actors' pre-project implicit representations, as we will discuss below. At the same time, during project lifecycle, actors also develop project-specific implicit representations that are their interpretation of project explicit elements. These are expressions of a situated understanding (Lave and Wenger, 1991) regarding how to collaborate with specific partners, how to perform specific activities in particular contexts, and how to read a specific scheme made by a certain actor.

Explicit representations could be seen as explicit projections of the project goals, form and benefits, as well as of interaction patterns, such as procedures, rules, principles, contracts, work breakdown structures, organizational charts, etc. (Levi-Strauss, 2008; Weick and Roberts, 1993). They go beyond defining responsibilities and allocating resources, and aim to develop agreement among participants (Okhuysen and Bechky, 2009). They are meant to synchronize perceptions and so build a shared interpretation about the project and its corresponding activities (Bartunek, 1984; De Bakker *et al.*, 2011; Pilbeam, 2013). This shared understanding is more successful if all relevant actors participate in its conception (Weick and Roberts, 1993). Explicit representations are ultimately the public compromise of actors' understanding or interpretation of reality, negotiated among different cognitive systems. They could be either formal, such as a project organization chart, or informal, such as mutually agreed interpretations or socially accepted reputations (Bachmann and Inkpen, 2011).

Explicit representations could be further interpreted in different ways by social actors (Orlikowski, 1992). For instance, an electrical diagram might specify all component elements, but might be less clear with regard to certain technical specifications, such as manufacturing procedures, rated data, or materials to be used to build these components. Similarly, unless clearly specified, delivery dates and accepted quality of deliveries might be interpreted in very different ways by the supplier and the client. For these reasons, a high level of details is sometimes used in contracts, which limits the diversity of possible interpretations (Badenfelt, 2011; Von Branconi and Loch, 2004).

Considering that implicit representations are actors' own interpretations of the project reality, they have a strong tacit component and so are difficult to understand by other partners. Project managers build explicit representations to facilitate collaboration and coordination (Valentine and Edmonson, 2014) and to connect activities across space and time (Floricel *et al.*, 2011b). Due to these explicit elements, knowledge can flow easily between different actors (Brown and Duguid, 2001; Dogherty, 1992) with positive effects on the end result.

Implicit representations have cognitive legitimacy (Suchman, 1995), so actors will tend to use them and impose the use of their own implicit representation to other actors. That is why explicit representations need to be built to have also an integratory role and prevent the use of individual actors' inapplicable implicit representations that could later come in conflict (Heimeriks *et al.*, 2012). Failing to achieve this integration could have a major impact on the project goal and development, as we can see in the last part of this chapter.

Spontaneous and regularized interests

The actors' volition is naturally in the form of what we call spontaneous interests, such as impulses, urges, desires, but also affinities, animosities and fears. Feelings and emotions influence actors' behavior, sometimes decisions being made on the basis that organizations and individuals feel or believe the others will behave with good will (Becker, 1960; Damasio, 1994; Johnson *et al.*, 1996; Mowday *et al.*, 1982). In general, previous research has found that rational and emotional aspects are equally present in organizational life (Kramer, 1999; Moorman *et al.*, 1993). Although this topic is less often mentioned in the literature, charisma, physical attraction, greed, and even disease, including mental illness, can be the source of attachment to other participants, to objects and to the project itself. The literature in social network and alliance formation shows that similar motives can be extended to inter-organizational relations. . Organizations have been found to select their collaborators not only for rational reasons, but also because they feel they can trust them and they believe their partners will be committed to the alliance (Cullen *et al.*, 2000). Organizations also prefer partners that are strong or prestigious (Eisenhardt and Schoonhoven, 1996; Stuart, 1998), that have a similar status (Chung *et al.*, 2000), with whom are compatible (Brouthers *et al.*, 1995), to whom would be proud to cooperate (Cullen *et al.*, 2000), or that have a collaborative culture (Brouthers *et al.*, 1995). For these reasons, they often prefer to collaborate with prior partners whom they know they can trust (Gulati, 1995).

Spontaneous interests often lead to seemingly irrational behavior, for instance when actors neglect to follow the traditional, well-developed and widely-accepted recommendations and ways of action. This is beneficial in dynamic or uncertain environments, since it generates creative ideas and solutions to new and complex problems (Brady and Davies, 2014; Obstfeld, 2012), but could also produce misunderstandings and conflicts since the partners do not expect such unpredictable behavior (Rowley and Moldoveanu, 2003; Werder, 2011).

A project brings together organizational actors with a large diversity of spontaneous interests and all try to satisfy their desires and impose their own interests: project management team, parent organization, other departments within the parent organization, contractors and subcontractors, clients, regulatory authorities, local and national authorities, local community, activists and other groups of interest, scientific community, media, general public, and other actors that may somehow have an interest in the project. All these actors are aligned and kept under control through regularized interests, understood as mutual agreements that allocate responsibility, rewards and risks (Lenfle and Loch, 2010). Regularized interests are not always formal and can take the form of commitments or mutual unofficial agreements.

The regularized elements enable project managers to interest and enroll participant organizations and to mobilize the support of sponsors and other players (Blackburn, 2002; Callon, 1986). This implies that actors will not be distracted by other networks of interest or by other competing relations within their network, and will stay aligned with the project and contribute to its success. For example, contractors will assign their best teams to the focal project rather than to other projects in which they are involved and, when facing challenges, will stay close and put all their effort toward the interest of the project rather than seek to maximize own gains.

Different tools and strategies are used to build and strengthen these regularized elements, such as partnering sessions (Aarseth et al., 2012; Ross, 2009), contracting strategies (Hällgren, 2007; Von Branconi and Loch, 2004), or joint risk management sessions (De Bakker et al., 2012; Osipova and Eriksson, 2013). For instance, contracts ensure that the two parties will both act in the interest of the project owners and will satisfactorily collaborate in the face of future challenges (Floricel and Lampel, 1998; Von Branconi and Loch, 2004). Joint risk management sessions define relations and allocate responsibilities between actors, while integrating different interests and

perspectives (De Bakker *et al.*, 2012). Partnering sessions link actors at different levels, develop trust and friendship, and transform weak ties into strong ties (Ross, 2009).

Project formation

This distinction between hidden and visible elements enables us, among others, to explain how projects are initiated. A project is not a chaotic collection of representations and interests of participant social actors, but all these elements are (and have to be) brought into a temporary equilibrium by project managers. Social actors have their own spontaneous interests. In order to have a project, the project initiators have to bring all these spontaneous interests together and align them with a common goal – the project goal or, in a richer perspective, with a part of this common goal (or build a coalition – Callon, 1986). The project then results from the complex conjunction of these interests. To ensure certain stability and project support, they regularize these interests in formal or informal agreements and commitments (build punctualized objects in ANT terms).

Similarly, each actor can be seen as belonging to a network of cognitive connections with its own representations of the organizational reality (for example, the set of routines and procedures about how to develop certain activities that the actor bring from the organization from which she originates). When building a project, project initiators have to also take all existing implicit routines of different participants that will be further involved in the project and bring them together under a common agreed and visible form (Weick and Roberts, 1993), for instance, an explicit framework of procedures to be applied in that project. These forms shape future project-specific activities, which in turn are repeatedly reproduced and routinized until they become taken for granted (Feldman and Pentland, 2003; Giddens, 1984; Rerup and Feldman, 2011).

In a sense, building a project is similar with creating boundary objects (Carlile, 2002; Di Marco *et al.*, 2012; Spee and Jarzabkowski, 2009), because ultimately the project lies at the intersection of multiple cognitive systems and divergent interests. Project initiators create explicit representations and regularized elements to establish bridges between conflicting views and promote a common language and understanding. These elements facilitate later coordination and allow actors to understand their role, position and responsibilities within the project structure (Scarbrough *et al.*, 2015).

2.1.3 The role of the four strata

In projects, the anchor is the visible part of the structure. Projects are temporary organizations, constituted more or less on an ad-hoc basis. Therefore, they need time to develop specific implicit cognitive connections and spontaneous affinities with project elements and with other participants. This is why the common aspects accepted by all actors, namely the visible elements, guide the project development, participants' actions, and mutual relations.

Because projects experience a high turnover of involved actors as they advance in planning and further into implementation, we see the implicit side of cognitive connections as playing a role that is less inertial than that suggested by structuration theory (Giddens, 1984). The main role of the mutual categorizations and routines that emerge from the relatively brief span of interactions between participants is to separate their paths (Floricel *et al.*, 2011b) and so to guide actors to act in non-colliding ways. These implicit representations will fade into oblivion or will be reshaped by the unintended consequences of participants' actions as the network grows (Feldman and Pentland, 2003; Giddens, 1984), but also by the intersections with new cognitive systems, as actors will join or leave the project (Giddens, 1984; Hanisch and Wald,

2011). As much as possible, participants tend to follow the tentative paths and only react when collisions become unavoidable. However, in our view, explicit representations have the strongest stabilizing impact in projects. Our argument differs from the ones found in institutionalization theories, which argue that only representations that become taken for granted can ensure stability in organizations. In projects, the fixity of explicit representations ensure that participants can continue to work efficiently instead of continually renegotiating agreements and plans. Because of the reasons explained above, there is simply not enough time for action routinizing based on repeated interactions to achieve a similarly comprehensive coordination and agreement between participants. Hence, participants have an interest in maintaining explicit representations unchanged, with the exception of their unfolding into increasingly detailed forms during project development and planning activities. Actors will resent changing these representations if no major problem appears and will continue to follow the guidance offered by these representations. In doing so, they force other actors to do the same thing, because otherwise this will lead to conflicts. This amounts to a sort of reinforcing mechanism that keeps the representations, and the organizational networks they connect, stable.

On the other hand, we suggest that the spontaneous side of volitional connections is more unstable. In theorizing these connections, we were inspired by actor-network theory, which sees actors as continuously distracted by other connections, actors and opportunities, and argues that maintaining the organizational network requires a constant effort to co-interest and motivate all actors (Latour, 1997; Law, 1994). In discussing the volition stratum, we interpret this theory as insisting on the creation of material conditions and stimuli, as opposed to cognitive frames, that attract and bind participants to the project. For spontaneous volition, maintaining the network relies on dyadic attraction and repulsion that results from creating such conditions. Given the changes in actor composition, the competing stimuli and the continuing change in

actors' urges, the effort required for maintaining the stability of the network is very high.

In order to prevent actors from leaving the network or from acting opportunistically against the interests of the project, actors also build regularized elements that emphasize control (Lenfle and Loch, 2010). Concretely, in projects, they may consist of formal agreements and commitments that translate in material elements such as fences, designated paths and surveillance systems, with differential rights to access areas, to verify the completion of tasks, and to effect inputs into information systems, such as approvals and payments. For reasons that are similar to those presented for explicit representations, organizational actors have an interest to maintain the stability of these regularized interests. It is difficult to find a network configuration that strikes a balance between key actors' interests, let alone one in which these interests become interlocking. Therefore, within certain limits, key actors may develop a vested interest in maintaining the balance that has been found, which ensures a certain stability of the network of regularized interests. However, researchers have also found that, as opposed to perennial organizations, in temporary organizations the relational coordination through networks and social mechanisms has to complement the formal authority (Beckhy, 2006). Moreover, when facing challenges, the network of organizational actors will collaborate better if they managed to develop a specific project relational identity (Clark *et al.*, 2010; Hogg *et al.*, 2012).

However, aberrant and opportunistic behavior is inherent, for example, because participants seek to optimize results for their own organization rather than the project (De Man and Roijakkers, 2009) and because their cognitive frames often change and collide. These observations raise the question: how does the project structure deal with these constant challenges? The focus of this thesis is to answer this question. With this aim in mind we propose the concept of structuring episode, which will be explained in the following sections of this chapter.

2.2 The Expected Project Evolution

In this section, we present our perspective on the project evolution during its lifecycle. Inspired by the punctuated equilibrium model, we introduce the concept of structuring episode to explain the short revolutionary transformations that punctuate the long stable periods of incremental adaptation of the project structure. We also use insights from structuration theory and actor-network theory to build on the four-stratum model introduced in the previous section.

2.2.1 Organizational change – continuous or/and revolutionary

We argue that the project structure is not static, but dynamic and evolving, because it must adapt to new realities. The need to change is real and has to be taken into account to reach greater performance. The fact that the relational framework we presented in the previous section includes elements that instill different degrees of stabilization in the project network enables us to seek inspiration in the punctuated equilibrium theory to combine perspectives on organizational change that claim this could be either continuous (Barley and Tolbert, 1997; Brown and Eisenhardt, 1997; Rindova and Kotha, 2001) or revolutionary (Kuhn, 1970; Lewin, 1951; Meyer, 1982).

Previous research has argued that the natural state of organizations is ongoing change, since organizations need to continuously adapt to transformations in their environment as well as incorporate new experiences and knowledge created through actors' mutual interactions (Tsoukas and Chia, 2002). In the project management discipline, flexibility and projects as organizations perspectives have particularly supported this view arguing that the project structure needs to be constantly renegotiated among actors as

new participants join the project or existing actors change their role (Sommer and Loch, 2004; Sutherland *et al.*, 2009; Verganti, 1999). This view is in agreement with actor-network theory, in which networks change as they are maintained (except for black-boxed networks). Some interpretations of structuration theory could also be included here, since theorists saw organizations in continuous morphing as structures are shaped and reshaped with every actor's action (Feldman and Pentland, 2003; Rindova and Kotha, 2001).

Another stream of research suggested that change is sporadic and results from organizations' adaptation to turbulent events (Meyer, 1982; Staw *et al.*, 1981; Piperca and Floricel, 2012). Especially in project management, with its emphasis on planning and controlling for deviations, change occurs only when the existing project structure is challenged by a force too powerful to be ignored (Beckhy and Okhuysen, 2011; Hällgren and Maaninen-Olsson, 2009). Most theories of organizational institutionalization, including the traditional understanding of structuration theory (Barley, 1986; Giddens, 1984), would support such views.

However, other researchers claimed that organizational change could be either continuous or episodic, depending on which cognitive concepts or structural relations are involved in the process (Mitchel, 2014). Continuous change entails refinements of the status quo and generally a stable and recognizable structure, while episodic change involves a significant transformation of the status quo and a shift in structures (Bartunek and Franzak, 1988; Orlikowski, 2000). The routine theory scholars used the level of inertia displayed by routines to explain the distinction, strongly inertial structures being associated with a more continuous change and innovative ones with episodic change (D'Adderio, 2014; Feldman and Pentland, 2003). In their turn, Orlikowski and Hoffman (1997) related the two models of change with the type of environment: the episodic change as described by Lewin (1952) is a planned change and is appropriate for stable organizations and environments; on the contrary, the

ongoing change is improvisational and more appropriate for dynamic environments. Finally, the two types of change were also found to follow a different logic, the episodic change employing the Lewin's unfreeze-transform-refreeze model, as opposed to the freeze-rebalance-unfreeze used in the continuous change (Weick and Quinn, 1999).

In this study, we mainly rely on a modified punctuated equilibrium model to explain how project structures evolve over time (Ambos and Birkinshaw, 2010; Ballinger and Rockman, 2010; Gersick, 1991; Sloan and Oliver, 2013). The traditional punctuated equilibrium model suggests that long stable periods in which same activities, relations and routines are reproduced are suddenly interrupted by demands to readjust the project structure and incorporate the impulses generated by various internal or external forces. Our equivalent of the equilibrium period is a period of what we call controlled unfolding in which bounded change takes place continuously. Controlled unfolding refers essentially to the 'waterfall' increase in the detail of explicit representations and the appending of new actors to the regularized volition assemblage, together with the interactions that follow from these explicit elements. The bounded continuous change that accompanies this controlled unfolding refers to the limited mutual adjustments in interactions routines and in the dyadic attraction-repulsion relations which enable the project organization to overcome a host of relatively minor events and problems that it encounters on an ongoing base.

On the other hand, challenging events require more important changes that may be in conflict with the current system of explicit representations and regularized volition. Such events sometimes launch periods of revolutionary change that lead to a significant restructuring of these explicit relations. The inertial mechanisms described above make such major transformations relatively rare, which makes our model very similar to a punctuated equilibrium pattern.

We find that both structuration theory and actor-network theory are compatible with the punctuated equilibrium model, so we use insights from both theories in our endeavor to explain the evolution of temporary organizations. As presented in the previous section, we find the more inertial mechanisms depicted in Structuration theory as a great source of inspiration to understand how the network of actors' cognitive connections evolves and this could be particularly applicable during stable periods (see also London and Siva, 2011). We suggest that similar mechanisms apply during revolutionary periods, transformations in the cognitive network being more inertial and reactive, and tending toward equilibrium. In turn, we use the higher level of agency assumed in the Actor-network theory as a base of our explanation regarding how the network of volitional connections evolves. Radical changes would also unfold following a more active and hectic pattern.

We suggest that extraordinary incidents launch revolutionary periods and we call them triggering events. In this sense, during stable periods, implicit representations separate trajectories and spontaneous interests, although changing all the time, are in a relative equilibrium, being kept under control through regularized elements. The triggering event perturbs the smooth operation of routines and generates clashes between different cognitive systems that eventually lead to major transformations in the project structure. Similarly, at times, interests are expressed with such a power that overcomes a certain threshold and only significant transformations of the status-quo would keep the actors aligned and interested in the project.

2.2.2 Episodes as Expressions of Organizational Change

Social actors prefer structural stability and clarity in order to be able to work – build, design, operate (Swartz, 2008). They pay less attention to structural influences and shortcomings until facing a problem that reveals new aspects that draw their attention.

To deal with the problem, they activate specific change-making activities. Inspired by the previous literature, we see major project transformations as occurring in episodes (Gersick, 1991; Hendry and Seidl, 2003; Luhmann, 1995; Miller and Olleros, 2001). Therefore, we define the structuring episode as *the process of transition from an existing form of organizing project activities to a new one, as a result of participants' response to internal or external forces.*

In stable periods, routines work as intended (non-intersecting trajectories) and spontaneous interests are aligned with a common goal or parts of it. The project is not completely frozen, it still evolves, but only in increments, through small adjustments, because the project structure has the ability to incorporate all the necessary modifications. Structuring episodes occur when, at certain moments in time, the impulse generated by a triggering event overcome the capacity of the current structure to absorb it. For example, such an event could be an unexpected technical malfunction that requires major interventions – a critical technical element has to be replaced, in consequence the work on that subproject has to stop, new additional resources are needed, along with new agreements between parties to clarify responsibilities, and so on.

The idea of episode was inspired by the work of the German sociologist Niklas Luhmann (1995), in the sense of an exceptional period in the organizational life when different rules and routines apply and the organization takes its time to reflect on the situation and initiate change (see also section 1.2.1). The idea was later adapted to describe the decision-making process during strategy workshops and led to the concept of strategic episode (Hendry and Seidl, 2003; Jarzabkowski and Seidl, 2008; Johnson *et al.*, 2010). Giddens (1984) also used the concept of episode to depict the emergence of a functional structure, while other scholars also highlighted the role of episodes in organizational change (Michel, 2014; Miller and Lessard, 2001; Miller and Olleros, 2001).

In the last section of this chapter, we will discuss the concept of structuring episode in more detail, but first we focus on understanding the event that triggers this revolutionary transformation.

2.3 Triggering events

In this subchapter, we briefly review the existing literature on turbulent events, presenting the main types of events that have been found to affect organizations and projects. We use insights from the structuration theory, actor-network theory and project management literature to explain the locus of generation and the logic of occurrence of these events. We suggest that triggering events are expressions of colliding implicit representations or divergent spontaneous interests that overcome a certain threshold beyond which the existing project structure cannot incorporate challenges anymore and a structuring process is required.

2.3.1 Triggering events in the literature

Turbulent events have been a major concern in organization studies, since they can lead to major losses and the affected organization has to react in a way that might completely change its strategy, system of routines, partnerships, competitive advantages, markets, etc. Depending on the angle of analysis researchers have called them: crises (Hwang and Lichtenthal, 2000; Kahn *et al.*, 2013), anchoring events (Ballinger and Rockmann, 2010), mega events (Tilcsik and Marquis, 2013), field-configuring events (Hardy and Macguire, 2010; Schüssler *et al.*, 2014), critical events or incidents (Ahola *et al.*, 2011; Chandler, 2014; Sloan and Oliver, 2013), unexpected events (Geraldi *et al.* 2010; Piperca and Floricel, 2012; Söderholm, 2008), surprises (Beckhy and Okhyusen, 2011),

or precipitating influences (Power and Reid, 2005). The occurrence of these events could vary from the very rare mega-events and natural disasters (see for example Tilcsik and Marquis, 2013) or field-configuring events (Schüssler *et al.*, 2014) to the extremely high frequency of critical events that can occur in projects developed in extreme environments (Aubry *et al.*, 2010; Hällgren and Maaninen-Olson, 2009).

Previous research has adopted different approaches regarding what typology of events is more relevant for theory and useful for practitioners. Some researchers focused on the impact of events distinguishing between local, when one event affects one activity or sub-project, and global impact, when its effect propagates at the level of the entire organization (Yates *et al.*, 1997). In project management, Thamhain (2013) further refined the global impact, differentiating between events that affect sub-projects, the whole project, or the project and the whole parent organization. Other researchers looked at the mode of occurrence: abrupt events occur suddenly, while cumulative events become stringent in time (Hällgren, 2009; Hwang and Lichtenthal, 2000). Yet others analyzed the locus of generation, identifying exogenous events that regard for example technology, economical situation, market, or institutions, and endogenous events that are related with management, capabilities, strategy, resources, culture or power (Liguori, 2012; Piperca and Floricel, 2012; Vuori et al, 2013).

In project management, turbulent events required an even greater deal of attention. A whole subdomain, risk management, was dedicated to predicting and preparing for turbulences. Theoreticians and practitioners alike focused on understanding them by looking at the component elements of the project structure that could be affected. For instance, events may affect the project scope, schedule or resources (Kendrick, 2003) or the product, the process or people involved (Wallace *et al.*, 2004). As more and more projects became larger and more complex, two other perspectives emerged. The first regards the multi-organizational aspect in projects (see also section 1.1.6) and suggests that events could also be predicted and understood by looking at actors and their mutual

relations, for instance project team, contractors, top management, other projects or departments within the parent organization, partners, etc. (Aaltonen *et al.*, 2010; Artto *et al.*, 2008). The second refers to the international aspect of projects and draws attention to local conditions and cultural and national differences (Orr and Scott, 2008; Steffey and Anantatmula, 2011). Finally, other researchers discuss the level of predictability of unexpected events, arguing that some although predicted had a higher impact than initially previewed, others could have been predicted but were not, while a third category were virtually unpredictable (Piperca and Floricel, 2012).

We draw on this literature, but also on insights from structuration theory and actor-network theory to explain our perspective on the events that trigger revolutionary transformations of the project structure. We suggest that these events could generate mainly in the two hidden strata as expressions of either colliding implicit representations or diverging spontaneous interests (see Figure 2.2 and 2.3). We present our rationale in the following sections.

2.3.2 Events as colliding implicit routines

As opposed to perennial organizations, temporary organizations experience a different logic of action and evolution. In perennial organizations, visible elements co-exist with specific hidden elements. The latter enrich and strengthen the former and the organization becomes a homogenous whole. For instance, work procedures are understood and applied through associated work routines, which, in turn, are refined over time to correct misunderstandings and illuminate unclear aspects. On the contrary, in temporary organizations, specific implicit representations are scarce, since they need time to develop and in the time-limited organizations this is often impossible (Engwall and Westling, 2004; Hanisch and Wald, 2011). In large projects, that last several years, implicit representations have more time to develop, but they are continuously

challenged since actors join or leave the project, as their participation is only temporary. Moreover, actors cannot integrally use, for example, routines developed in previous projects or inherited from their parent organizations, as each project is unique in terms of goals, participants and activities (Hanisch and Wald, 2011; Hobday, 2000). In consequence, the implicit representation stratum would be composed of occasionally colliding elements that continuously need to readjust to ensure a smooth development of activities.

While the project structure has the ability to incorporate small frictions between actors' different interpretations and representations of project goals, schedule and activities, at times differences are substantial. Representations do not play their role to separate trajectories anymore and the collision overcomes a certain threshold beyond which significant transformations of the current structure are required (See Figure 2.2). This usually involves changes in the network of explicit representations, but could also irradiate to affect the network of volitional connections.
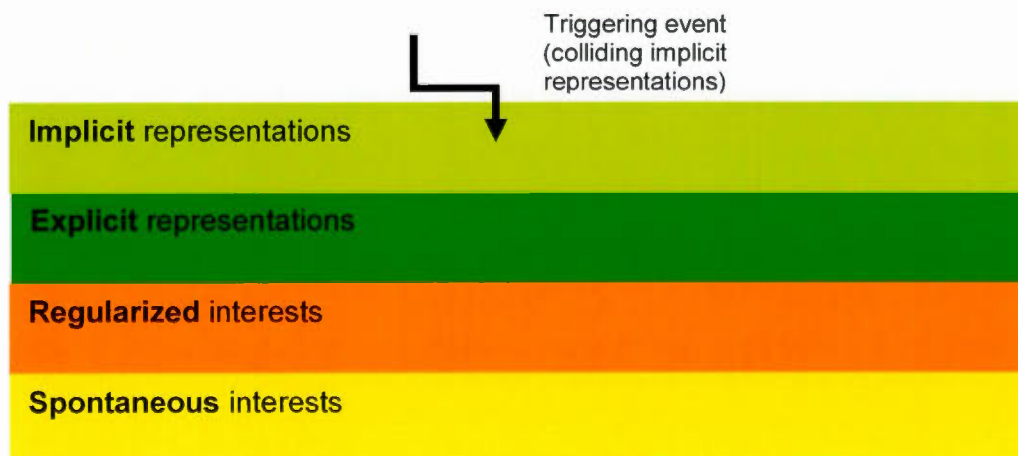
Figure 2.2 Triggering events as colliding implicit representations

Where could these major collisions generate? In the existing literature, we identified three main sources: colliding actors' pre-project representations, conflictual interpretations of project-specific representations, and emerging conflicts between implicit representations. Firstly, as mentioned before, actors tend to keep and use the implicit representations with which they are familiar (Ruuska and Brady, 2011) or that were suggested or imposed by their parent organization (Andersen *et al.*, 2009; Rees-Caldwell and Pinnington, 2013; Vuori *et al.*, 2013), but which might not be adapted to the particularities of the new project (Burchel and Gilden, 2008; Nysten-Haarala *et al.*,2010; Power and Reid, 2005). Moreover, these implicit representations may not be compatible with other participants' pre-project implicit representations (Artto *et al.*, 2008; Levina and Orlikowski, 2009; Orr and Scott, 2008; Schmidt and Tannenbaum, 2000).

Secondly, project-specific representations may also come in conflict, as actors understand and apply them in different ways. This type of implicit representations is built around project-specific explicit representations. Despite efforts to synchronize understanding and perception (Ross, 2009), actors would still interpret them in their own specific way (Aaltonen et al, 2010; Dionysiou and Tsoukas, 2013; Tukiainen *et al.*, 2010; Weick and Roberts, 1993), which might generate contradictory implicit representations.

These first two types of colliding representations are conflictual from the first moment they are used in the project, but the conflict might become obvious only later on when, at one point in time, they actually prevent actors performing their tasks. The third category of events regards implicit representations that might be compatible initially, but evolve into becoming (more) conflictual, due to actors' reflexivity and unintended consequences of their actions (Feldman and Pentland, 2003; Giddens, 1984; Orlikowski, 2000; Weick and Roberts, 1993). Although subject to a high level of inertia, each action is performed in a slightly different manner and, if the deviation

from the initial form reaches a certain point, this could also lead to collisions and even structuring episodes (Howard-Grenville, 2005; Howard-Grenville *et al.*, 2011).

2.3.3 Events as divergent spontaneous interests

The project management team aims to align actors' different interests with the project goal and puts in place regularized elements to better connect actors to the project (Hogg *et al.*, 2012; Sloan and Oliver, 2013). Moreover, through different mechanisms, such as partnering sessions or risk sharing approaches, the project management also intends to motivate participants and so create spontaneous interests that would push for the project (Floricel *et al.*, 2011a; Meng and Gallagher, 2012). However, actors have a tendency toward maximizing their own gains and choosing the relational configurations that advantage them the most (Emirbayer and Mische, 1998; Granovetter, 1973; Latour, 1997; Law, 2004; Malhotra and Gino, 2011).

Despite the various attempts to make participants share a common interest in the project, their focus is ontologically different. Previous literature have identified divergent interests between the project and: the parent company (Hobday, 2000; Vuori *et al.*, 2013); future client (Cooke Davies, 2002; Savolainen *et al.*, 2012); contractors, subcontractors, or suppliers (Aaltonen *et al.*, 2010; Artto *et al.*, 2008); local stakeholders in international projects (Aaltonen *et al.*, 2010; Gibson and Gibbs, 2006; Kraemer *et al.*, 2013); or community activists (Van Wijk *et al.*, 2013). For example, project owners and project managers have different interests, as they focus more on the strategic versus operational success of the project, respectively (Atkinson *et al.*, 2006; Cooke-Davis, 2002; Krane *et al.*, 2012; Samset, 2003; Ward and Chapman, 2008). The owners have a long-term vision and are not only interested on a successful project development, but also on its subsequent sustainability and ultimately exploitation revenues. Moreover, the project is often just one step on a broader strategy of the

company to enter new markets, develop new relations or products, and so on. On the other hand, project managers are primarily looking to finish on time, on budget, and achieving the initial goal. They first want to be able to successfully hand over the project to its sponsors, since are rarely involved in the subsequent operations and maintenance. For example, in IT/IS often companies externalize software development projects to other companies (Savolainen *et al.*, 2012).

During stable periods, regularized elements manage to keep under control actors' tendency toward opportunism, through either adhesive or coercive cohesion (Floricel *et al.*, 2011a; Floricel and Lampel, 1998; Meng and Gallagher, 2012; Vaaland and Håkansson, 2003). However, at times, certain interests are manifested in a way that overcomes the ability of the project relational structure to accommodate them (Frooman, 1999; Mitchell *et al.*, 1997), which entails a reconfiguration of actors' volitional connections (see Figure 2.3). For example, this could occur when one actor has enough power, legitimacy and urgency to impose its will (Mitchell *et al.*, 1997).

Implicit representations

Explicit representations

Regularized interests

Spontaneous interests

Triggering event
(divergent
spontaneous interests)
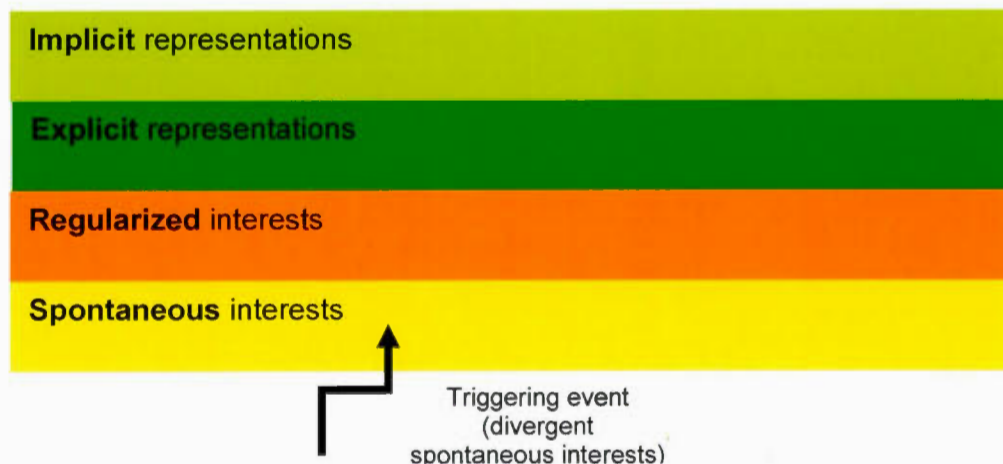
Figure 2.3 Triggering events as divergent spontaneous interests

There is a variety of spontaneous interests that could launch structuring episodes. For example, some initial spontaneous interests are not aligned properly, because they were genuinely overlooked or purposefully ignored (Werder, 2011). The project might function well for a while, but at one point in time, the changing context may make these interests too conflictual, or the affected actors, too insistent to be ignored. Moreover, existing or new actors might express new interests or desires (Emirbayer and Mische, 1998; Latour, 1997; Werder, 2011). Social actors are continuously distracted by alternative connections in their relational network (Ahuja *et al.*, 2012; Greve *et al.*, 2013; Latour, 1997) and those with appealing competing options will be difficult to realign (Malhotra and Gino, 2011).

Colliding implicit representations and divergent spontaneous interests that overwhelm the project structure ability to incorporate them lead to revolutionary transformations that occur in what we called "structuring episodes". In the next section we present several characteristics of these episodes.

2.4 Structuring episodes

In this section, we elaborate on the concept of structuring episode, suggesting a preliminary model to represent the episode as well as its relationship with our new perspective on the project structure. We also propose some characteristics that will guide us in the later process of data collection and analysis.

2.4.1 A Preliminary Model of the Structuring Episode

The episode is launched by a triggering event. These are perturbations of a system in (dynamic) equilibrium. In the stable state, the explicit representations and regularized

interests are sufficient to ensure the smooth operation of routines and the beneficial convergence of spontaneous urges. An external event that precludes actors from implicitly following the routines brings in a new concept that disrupts the cognitive coherence of the explicit representation. A strongly expressed, new or aberrant urge (including those expressed by new actors) disrupts the legitimacy (or the lock in) of the network of interests. In both cases adjustments are needed.

But events become important and transformations revolutionary only if they are brought into the explicit arena (Mead, 1932; Obstfeld, 2012; Zbaracki and Bergen, 2010). Latent conflicts become overt and actors aware of them (Deetz *et al.*, 2000; Semetko and Valkenburg, 2000). Being exposed, the respective networks of cognitive or volitional connections become less taken-for-granted and additional conflicts might be revealed (Lanzara, 2009).

We use a preliminary model of the structuring episode (see Figures 2.4; 2.5; and 2.6) to help us focus our data collection and analysis process (Eisenhardt, 1989). In order to benefit from the richness of qualitative data, we keep this model as simple as possible, suggesting that, like any process, the structuring episode could be represented as having three phases: the initiation phase, the transition phase, and the concluding phase (see also Hendry and Seidl, 2003). During the initiation phase, the questioning of relations triggered by colliding representations or divergent spontaneous interests 'moves' to the social arena (the two central strata) and a broader swath of the current structure is questioned. In the transition phase, explicit elements need to be modified or added to rebalance the project structure. This implies a highly iterative process (Vuori *et al.*, 2013), since the solution has to be negotiated with all relevant stakeholders (Vaast and Levina, 2006) and has to be compatible with the existing cognitive and volitional set of connections. Once involved actors reach an agreement, the new connections are presented over the whole structure (Gersick, 1991). The episode ends in the stabilization phase, when the new connections are integrated,

interests realigned and representations re-interpreted. The resulting structure will reach a new temporary equilibrium (Jarzabkowski and Seidl, 2008).
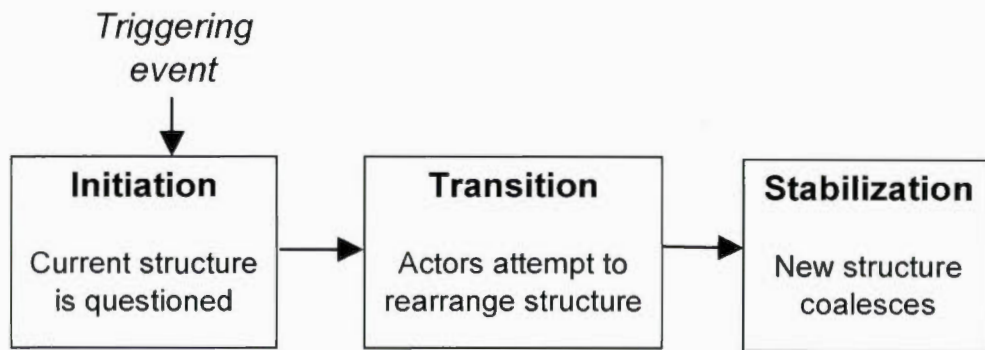
Figure 2.4 A preliminary model of the structuring episode
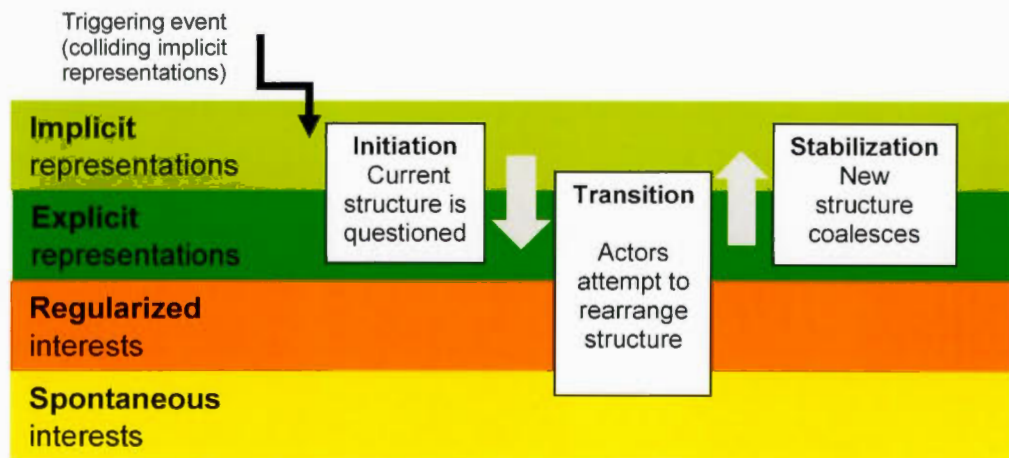
Figure 2.5 The structuring episode generated by colliding representations
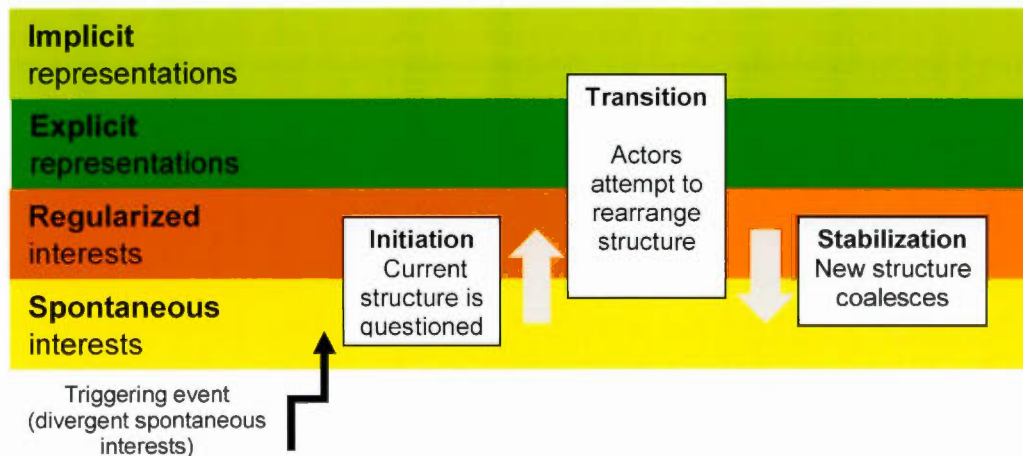
Figure 2.6 The structuring episode generated by divergent interests

2.4.2 Attributes of Structuring Episodes

Although inspired by Luhmann (1995) and Hendry and Seidl (2003), we understand the episode in a broader sense, for example including the stabilization phase when actors actually perform actions that reflect their acceptance and harmonized understanding. For this reason, the episode in our perspective has no obvious ending and cannot be easily distinguishable by external observers. Moreover, we highlight the difference between structures before and after the episode, and not between outside and inside the episode. This is supported by the argument that in projects, the anchor is the explicit part of the structure, and not the implicit one. In our perspective, we actually combine the Giddensian understanding of an episode as a specific stage in the structure development with the actor-network theory view as a translation (Callon, 1986).

Several characteristics of the structuring episode need to be highlighted. First, in a structuring episode, the transformation involves both apparent and hidden structural

elements (Gersick, 1991). Second, while the triggering event plays the key role in the existence of a structuring episode, this might also determine the unfolding pattern of episodes, depending on its entry points: as spontaneous interests manifested with significant strength or as colliding implicit representations. Third, it would be interesting to see if different events generate different patterns of episodes. Fourth, the episode is not an episode unless all phases are covered, including the final rebalancing and realignment.

In a more quantitative way, the episode could be analyzed in close relation with the different project structure strata involved in the process of transformation. In this sense we propose the concept of episode length, namely the number of stratum transitions that occur in the process. This can eventually become an empirical and practical measure for the intensity of organizational restructuring. A close concept could be that of episode depth, defined as the number of different strata that are involved in the development of each episode. In relation to the project lifecycle, we could also observe when episodes are more frequent or when they have a higher impact on the project structure.

In sum, a structuring episode occurs when a triggering event questions, in several possible ways, the stable project structure and this structure is not able to properly address the event. We postulated that there are two main entrance points, corresponding to the more fragile elements of the project structure, the implicit-representations and spontaneous-interests strata. Thus, in the former case, different actors' representations collide, resulting in conflicting routines and intersecting trajectories that are brought in the social arena and have to be resolved, by modifying or establishing other explicit representations with regard to those elements that perturb the relatively stable structure. In the latter case, spontaneous interests are manifested in an unequivocal and decisive manner – the nonaligned interests become stronger cumulated with the limited power

of regularized elements to realign them. Again, the process 'moves' to the social arena, as new agreements are required between project participants. Therefore, in the initial phase, the focus moves towards the central part of the framework (or the central part of Figures 2.5 and 2.6). The transition phase will be developed mainly there. In the stabilization phase, the focus will move back, towards the extreme (high and low) parts of the figure. At the end of the episode, the project returns to an equilibrium state: the explicit representations are internalized through repeated application; or the new agreement is accepted by all parties involved and their interest is realigned with the project goal. In consequence, we argue that the transformation of project organizations is a complex process, which involves changes at both apparent and hidden levels.

Specific research questions

Following the guidance of the above framework, we focused our effort around major transformations in large project organizations, trying to understand how these are generated (the here-called triggering events), how they evolve (the structuring episodes per se) as well as how the overall project structure is affected by or deals with such situations. Giving the particularity of our perspective, we mainly looked at the interfaces between different actors, keeping a broad understanding on what could be included as a connecting element at each of the representation or interest level.

More precisely, we entered the field with the following specific questions in mind:

- What is a structuring episode? What are the underlying stages of an episode?
- How is the episode triggered?
- How does the project structure evolve over stable periods?

- How do structuring episodes reshape complex projects? How do various episodes follow each other or intertwine to produce the overall evolution of a project?

The next chapter presents several methodological considerations regarding the process of data collection and analysis. The following chapters present the results of these analyses, structured around the key dimensions of this thesis: an illustration of the new representation of the project structure and its evolution, the triggering event, patterns of structuring episodes and their impact at the project level.

CHAPTER III

METHODOLOGY

In this chapter, we present our methodological approach and describe in detail the data collection and data analysis processes and the tools we used. We end with some quality concerns, where we mention a set of activities that we performed to ensure a higher quality and objectivity of the data analysis process and its output.

3.1 Research strategies

This thesis focuses on project organizations, with their underlying structural elements, in order to understand two processes. Our proximate interest, at the micro level, is the unfolding of structuring episodes. But on a broader level, we attempt to explain how projects evolve during both stable and dynamic change periods, how episodes reshape projects, how structuring episodes condition subsequent episodes and how project leaders manage projects through structuring episodes. These topics require a rich description and deep understanding of the forces at play in various aspects of project organization. Therefore, from the beginning, our preference went to qualitative methods.

The more specific methodological perspective we adopted is theory-building from multiple cases. Theory-building methods are preferred to theory-testing when phenomena under study are relatively unknown (Corbin and Strauss, 2008; Eisenhardt, 1989). Moreover, they are recommended when studying complex processes and aiming to discover meanings and patterns of action (Barley and Kunda, 2001; Langley, 1999; Symon and Cassel, 1998).

At the same time, the multi-case perspective, as opposed to single-case studies, increases the transferability of results and the practical usefulness of findings (Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Yin 2009). The emerging theory is validated in cross-case comparisons, which makes it more likely that it will retain its relevance and transferability in different industries and project contexts.

The unit of analysis is the structuring episode. It has to be noted that our main intent was to document the most important transformations in each project and, based on that, to elaborate a theory of project evolution. We did not aim to list all events that occurred in these projects. In this sense, we preferred to discuss the same events and episodes with different interviewees in order to find more details and a variety of points of view, that would help us better understand the transformation. Moreover, in most cases we invited our interlocutors to express their own opinions about which events were more significant and had a higher impact on the project organization.

3.2 Data collection

We collected data on 18 large projects, from three industries, in Europe and North America. The rationale behind selecting these particular cases has more dimensions. First, a theory-based sample strategy was used to ensure the variety of cases (Miles and Huberman, 1994; Patton, 2002). Floricel and Dougherty (2007) identified three

knowledge-reproduction cycles across most industrial sectors, namely science-technology coevolution, technology-recombination and experience-accumulation. These endogenous and self-sustaining cycles influence the nature and dynamics of innovation in the respective sectors, which creates very different strategic environments for the companies working in this sector. This, in turn, shapes the parameters within which projects in these sectors have to be developed and executed. All things equal, projects face different time pressures, numbers of unexpected events as well as levels of resource munificence. As a result, we chose to concentrate on one emblematic industrial sector for each cycle, respectively, bio-pharmaceutical, digital products and systems, and infrastructure. Second, our sampling was influenced by our goal to study more than 4-10 cases, the number recommended by Eisenhardt (1989) for multi-case studies, to ensure that we reach a certain level of saturation for our rather numerous conceptual categories (Johnson et al., 2007). Third, we sought to have several projects in each industry to be able to test the theory both within and between sectors (Eisenhardt, 1989; Yin, 2009). Finally, the availability of top project managers and the convenience of their location played a role, because our financial and time resources were limited. A list with all cases, the industry to which they belong, the number of interviewees and other details are provided in Table 3.1.

There were several issues in selecting both projects and participants. Given the nature of phenomena under study (i.e. structuring episodes and project management) respondents needed to have a good perspective about the project and as much as possible to have been participated in all project stages. In order to ensure both well-informed and distinct perspectives, which enable a sort of triangulation, we aimed to interview the leaders of the core project management teams in each project, as well as the project managers of contractors or other partners involved in the project. The latter criterion proved to be more problematic. Large projects, especially in the infrastructure sector could last over a decade and people rarely stay on the same position for that long. There was a case in which the project manager had been retired for several months, but

still kindly accepted to participate, and many others where project managers had changed jobs either within the same or in a different company. We tried to address this issue by interviewing whenever available more than one person in each project and thus having multiple recollections of the stages that had taken place sometimes years before the interviews. However, in certain cases this was not possible due to the unavailability of respondents. Moreover, in two cases (PharmaS and EnergyTP), projects could not be completed for different reasons and respondents were reluctant to discuss about unsuccessful past activities. In EnergyTP, we had had an interview scheduled with the project manager from the partner company, but the respondent cancelled it at the last moment, as his company had just applied for bankruptcy protection.

At the same time, we needed a complete picture of each case, to capture multiple structuring episodes, to observe their outcome, and whether the project team used the same strategy to cope with subsequent challenges or tried something new. Therefore, we aimed to study projects already finished or close to completion. On the other hand, interviews deal with participants' memory and perceptions and time is always a threat. In long projects, there is a risk that respondents may not remember all relevant information. However, focusing only on structuring episodes that led to significant project transformations diminished this risk, as important events are easier to recall by participants.

We used mainly two sources of data: semi-structured interviews and archives. We conducted between 1 and 8 interviews per case, for a total of 53, with high-level members of the project team, such as project managers, coordinators of sub-projects, leaders of contractors' teams, and so on. The targeted respondents were initially approached by phone and then by electronic-mail. Those open to find out more about this research were provided with an introductory letter, containing a brief presentation of the research team, the research idea and solicitation of an interview guaranteeing

anonymity and confidentiality. Finally, those who agreed to participate received the interview guide and the confidentiality agreement before the actual meeting. We were fortunate to have a very good response rate, around 50% of the people approached accepted to take part in our research. Out of more than fifty people that confirmed, only one cancelled the appointment at the last minute and another one that was uncertain about his availability could not eventually meet us. Fortunately, in both cases, we had arranged other interviews in the same period and in the same city.

All interviews were face-to-face, lasted between 1 and 2 hours and were conducted at a location at the interviewee's convenience, usually his or her office, to increase their comfort, but also, in most cases, to give us the opportunity to have some basic observations of the project site. All but one were digitally recorded. Also the interviewer(s) took notes during the interview and especially copied (photocopied, or even took pictures of) the respondent's explanatory drawings. For the interview that was not taped at the respondent's request, interviewers took more detailed notes and one of them elaborated a verbatim-like copy of discussions that was refined and validated by the other interviewer. Eventually all interviews were transcribed and the verbatim copy compared one more time with the audio file.

Table 3.1. Short description of projects

Project name	Industrial sector	Location	Scope	Duration	Budget* [million CAD]	Number of interviewees
InfraR	Infrastructure – transportation	Europe	New high-speed railroad	16 years, including pre-planning phase 14 years from the moment the project was officially approved (initially planned for 10 years)	2,400	2
InfraST	Infrastructure	Europe	Replace the old railway central station	15 years, including pre-planning phase 12 years from the moment the project was officially approved	500	4
TerminalE	Infrastructure – airport	Europe	Airport expansion	22 years, including pre-planning phase 10 years from the moment the project was officially approved	8,000	6
TerminalS	Infrastructure – airport	North America	Replace the old terminal with a new one	12 years, including pre-planning phase 10 years from the moment the project was officially approved (5 years for each of the phases 1 and 2)	412	2
TerminalL	Infrastructure – airport	North America	New airport terminal building	12 years from the moment the project was officially approved	4,677	6
EnergyEx	Infrastructure – energy	North America	New extraction and processing facilities	15 years, including pre-planning phase 12 years from the moment the project was officially approved (5 years Phase 1 and 7 years Phase 2)	10,000	3
EnergyTP	Infrastructure – energy	North America	New storage and transportation facilities	Initially planned for 2 years Later delayed to 3 years Eventually shut down and put in preservation	140	1
EnergyH	Infrastructure – energy	North America	New energy plant	6 years all together Finished 3 months ahead of time	1,300	6

	Sector	Region	Description	Duration	Budget	
InfraS	Infrastructure – roads	North America	Urban street rehabilitation	3 years The actual construction phase was initially planned for 22 months, but soon reduced to 13 months under pressure of local businesses; Finished on time	31	2
DigitA	Digital – telecom	Europe	New version of an existing telecom application	17 months Initially planned for 15 months, but ended up with 6 weeks delays and one activity postponed for a future project	24	2
DigitS	Digital – telecom	Europe	New telecom system	20 months (4 months initially)	12	2
DigitMIS	Digital – IS	Europe	New pharma MIS	5 years (3 years initially)	N/A	2
DigitPTIS	Digital – IS	North America	New public transportation IS	8 years (initially planned for less than 5 years – 26 months delay)	217	8
DigitBIS	Digital – IS	North America	New bank IS	8 years	125	3
PharmaA	Bio-pharmaceuticals	Europe	New drug development	8 years since the molecule seemed promising and a larger scale project was approved	200 for year 2010**	1
PharmaS	Bio-pharmaceuticals	Europe	New drug development stopped	Stopped after 3 years	N/A**	1
PharmaB	Bio-pharmaceuticals	Europe	New biotech product development	3 years	60†**	1
PharmaNA	Bio-pharmaceuticals	North America	Biotech product initial development	12 years (approvals in other countries and Phase 4 tests still ongoing at the time of the interview)	N/A**	1

* The budget was originally in different currencies, but for an easier comparison, we expressed it here in Canadian dollars. When calculating the equivalency, we used the exchange rate as of February 20, 2016.

** In bio-pharmaceutical projects, the budget was calculated for each next one or two years and no clear figures were available at the date of the interview. However, we introduced the values available, to give a general idea about the project size.

The other major type of data came from written documents. We used various sources such as:

- the official website of the project, the website of the sponsoring company(ies) and of the main contractors: general and specific information regarding the project, in form of brochures, flyers, annual and financial reports, press releases, strategic or master plans, white papers, etc.

- internal documents, such as presentations, internal project-related documents and other material provided by respondents;

- articles in journals, magazines, newspapers;

- project users' forums of discussions;

- other specialized or general sources.

We applied a triangulation logic when using these sources and for contradictory findings we tried to look for more information. Moreover, the collection methods overlapped and interesting or controversial project aspects could be brought into discussion during subsequent interviews.

3.3 Data analysis

In our data analysis activities we were guided by the basic principles of theory-building from multi-case studies approach (Corbin and Strauss, 2008; Eisenhardt, 1989; Miles and Huberman, 1994). In line with this literature, we developed the following activities: wrote case narratives, represented episodes in theory-driven constructs, elaborated data-driven constructs to better understand and classify episodes, compared within and across episodes, produced new theoretical insights, and compared and contrasted those with the extant literature. The whole process was highly iterative (see the quality sub-section).

Typically for inductive studies, the first step is to build individual case narratives for each project (Brown and Eisenhardt, 1997). This provided us with a better overall picture of each case, the context in which structuring events happen, and a chronology of these events (Langley, 1999). While interviews were always the primary source of data, documents were particularly useful in this step by offering a greater level of details and a clearer chronological representation. These reports were also sent to respondents in exchange for their time and effort. They included a description of the key structuring episodes identified in each case. The respondents' feed-back was an additional tool in validating the researcher's interpretation.

Second, we aimed to fully benefit from the advantages of visual representations (Langley, 1999), so we elaborated several elements to help us during the analysis process. We first elaborated detailed chronology tables that would provide us an overall visual representation of the structured information about the case, while still containing a significant amount of detail. We also created figures to represent the project timeline with project phases, milestones, events and episodes, so that we have triggering events and structuring episodes placed, in order, on this timeline. This helped us identify temporal patterns such as agglomerations of episodes. One such example could be found in Figure 3.1. We also had summarizing tables of each project, across key dimensions, for quick reference and inter-projects comparisons. Finally, we drew pictures to represent all main organizational actors involved, to have a clear visual description of participants and of relationships among them.

We also grouped data around initial theoretical constructs, here around cognitive and volitional connections, which enabled us not only to illustrate the initial framework (see Chapter 4 of the current thesis), but also to discover certain small transformations all along project life cycle. Further detailing these small changes in terms of connections involved in each case eventually led us to the new concept of translations, to explain project evolution during stable periods (see Chapter 5).
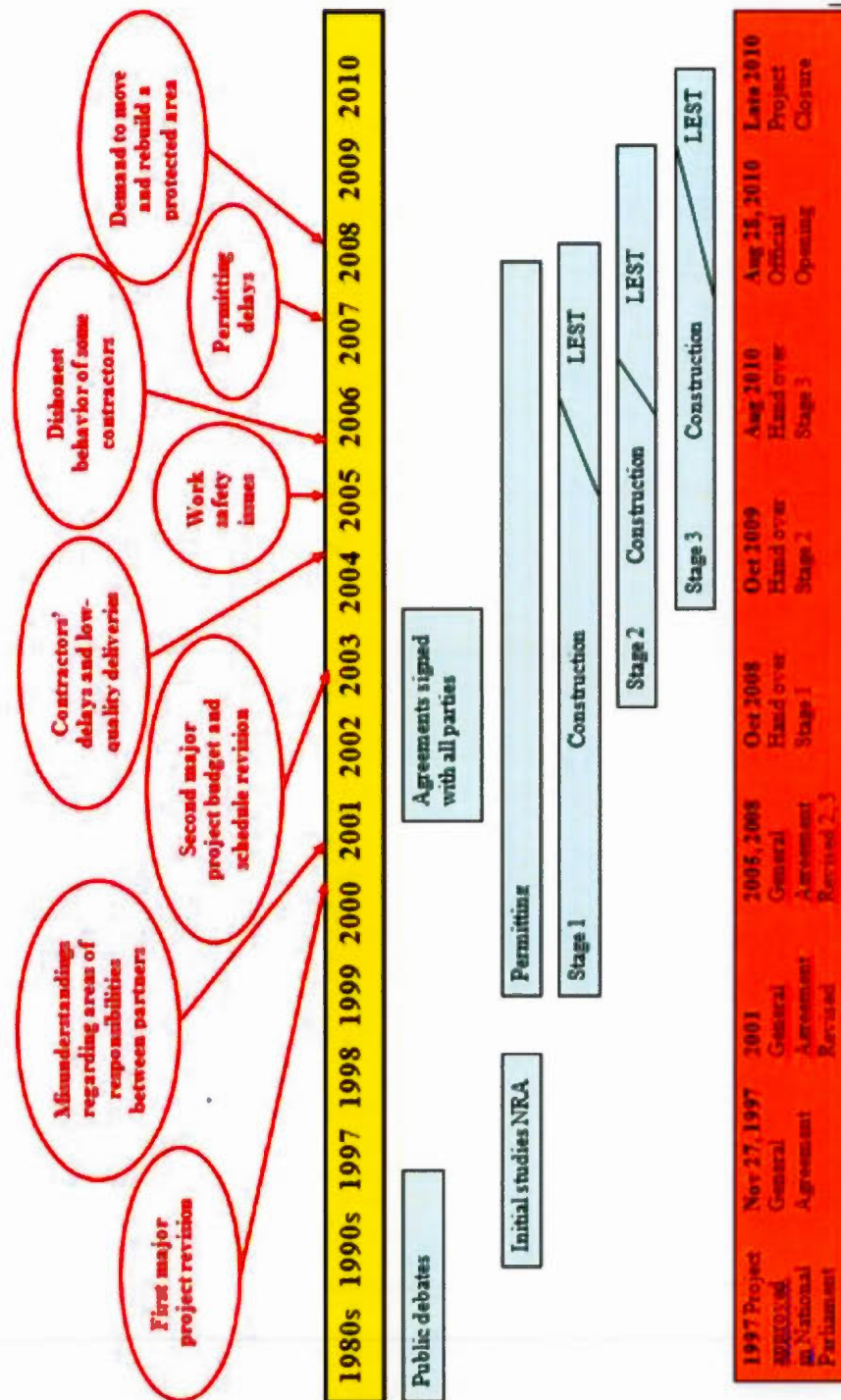
Figure 3.1 Main stages, milestones and structuring episodes – InfraR project

Before going further it is important to clarify two more aspects, namely the kind of revolutionary transformations that we considered, and how we distinguished revolutionary change from smaller transformations.

For the first aspect, we decided to look at all kinds of transformations as long as they were revolutionary. For example, Orlikowski and Hoffman (1997) identified three types of change: anticipated or changes that where planned and prepared by the project management team to significantly improve existing structure; emergent or changes that occurred after an accumulation of stressors; and opportunistic or change that was generated by turbulent events (see also Yates *et al.*, 1999). In a similar approach, Bartunek *et al.* (2011) emphasized the active-or-reactive dimension, distinguishing between planned change (e.g. managerial decisions) and reactive change that is developed in response to events. In the end, we considered all types: planned decisions, emergent calls for change as well as reactions to turbulent events.

This leads to the latter question, what is a revolutionary transformation? While keeping an open-mind, we took some hints from the existing literature to help us in focusing our effort. First, we relied on the interviewees' personal perception, asking them to identify several transformations that they considered more important during the project lifecycle (Sloan and Oliver, 2013). Second, we looked for changes that affected deep structures (Gersick, 1991) or a wide range of cognitive and volitional connections (Romanelli and Tushman, 1994), and implied a shift in structures (Bartunek and Franzak, 1988), paradigm (Kuhn, 1970) or existing archetype (Liguori, 2012). For example, in line with Liguori (2012), we considered incremental transformation the modifications of project structure that are consistent with the existing pattern of cognitive and volitional connections, and revolutionary change the transformations that involves shifting to a new pattern of connections.

At the episode level, we aimed to identify similarities and differences between episodes, with the ultimate goal of understanding this new concept and identifying patterns of structuring episodes. In this sense, we started by collecting all data related to each episode and prepare a detailed narrative, considering the chronological but also relational aspects of the episode unfolding. We then organized data in line with the theory-driven constructs, namely building figures with main structuring or structuring-like episodes, distinguishing between their three main components (i.e. the moment of initiation, the process of transition and the outcome), on the one hand, but also between elements that could be included in each of the four strata (i.e. forms of implicit and explicit representations, and spontaneous and regularized interests), on the other hand (see Chapter 2). A special attention was given to identify the implicit representations and spontaneous interests, which have not a widely accepted form at the project level. However, these elements are easily observable by those actors directly involved in the connection or affected by the other party's decision. In any case, while explicit representations and regularized interests could also be identify from documents, for the hidden elements, we mainly relied on data collected via interviews.

To understand the way in which the transition from the current to a new status quo actually happens, we further analyzed each episode in detail. We elaborated short summaries of these descriptions, but also visual representations with post-its (see Figure 3.2). This also enabled us to observe potentially-interesting aspects in each episode, which formed the basis for building data-inspired constructs.

We started this in-depth analysis with the best documented episodes and moved on until we reached a theoretical saturation. The constructs were constantly refined and validated in comparisons within and across groups, at different levels, namely episodes and projects, to recognize repetitive patterns and intriguing contrasts (Barley 1986; Eisenhardt, 1989). This strategy allowed us to eventually unveil the mechanism of development in each of the 8 patterns of episodes we identified, and so elaborate a

theory regarding the new concept of structuring episodes. The remaining episodes were used to further test the theory against other 'real' examples. This strategy enabled us to make good use of even less-well documented episodes or of the cases where only one interviewee was available for discussion and that could be in danger of offering a biased perspective of that particular actor. In this way we managed to maintain in our data sample the bio-pharmaceutical sector and the only two cases of completely failed projects (all cases with only one interview each), as well as some particular episodes that would have been otherwise ignored. The theory was finally refined and validated in relation with extant research. The last step was a new look at the projects with this new theoretical approach to seek a final confirmation from the raw data that we collected.

3.4 Quality concerns

In qualitative research and particularly theory-building approach, there are multiple concerns related to the objectivity of researcher, validity or credibility of constructs, generalizability or transferability of findings, and applicability of the new theory (Bryman and Bell, 2011; Lincoln and Guba, 1985; Miles and Huberman, 1994; Yin, 2009). We already mentioned some of the measures we took to increase the quality of this research. Inspired by previous researchers (Corbin and Strauss, 2008; Miles and Huberman, 1994; Patton 2002), in the following part of this chapter, we summarize some of the strategies that helped us develop a high-quality data analysis process and elaborate a valid theory.

The credibility of qualitative studies could be increased by using triangulation, appealing to respondent validation, and relying on good research practice (see, for example, Lincoln and Guba, 1985). First, we have focused on using triangulation, whenever possible. In this sense, for each project, we used multiple types of data

sources (e.g. interviews and documents), we tried to have more than one respondent and more than one source of documents, but also more than one interviewer. This helped us capturing different points of view and developing a better understanding of the phenomenon under study. We treated the cases with only one respondent more carefully, recognizing their limitations and using them only to later corroborate and test the findings inspired by well-documented cases. Second, when sending the case report, we asked participants to validate our interpretations at different stages and/or the final results. While some were not available for detailed feedback, some manifested interest and read our report and even participated at one academic presentation. Third, all along the research process we were guided by the recommendations of best researchers in the field, some of which have been cited in this thesis. The data selection and analysis process was also described in the previous sections and aimed to follow the best practices in doing qualitative research in social sciences. For example, we developed a highly iterative process of data analysis at every stage: raw data, theory-driven constructs, interpretations, data-driven theoretical insights, comparison to extant research, and elaboration of new theory. Besides the within and across groups comparisons, the data-inspired constructs were tested by going back to the initial description of the episode and sometimes even to the verbatim copies of interviews. This ongoing re-examination of data led to numerous improvements of the constructs and final results and further details are provided in each respective section.

Regarding transferability of the research findings, as explained at the beginning of this chapter, we tried to have a sufficient number of cases to cover a wider variety of contexts and industries (Eisenhardt, 1989). However, we also paid attention to providing a 'thick-er description' of the research process (Geertz, 1973), so that readers can judge for themselves if findings can be transferred to other contexts. For example, apart from the explanations provided in this chapter, we also included a detailed and maybe tedious Chapter 4, which we find useful to illustrate an intermediary phase in

our analysis – the identification of different forms of implicit representations, explicit representations, spontaneous interests and regularized interests.

Finally, we aimed to ensure an appropriate level of dependability and confirmability by using some elements that could resemble an audit approach. In this sense, we asked for advice from colleagues and more senior researchers on both data collection and analysis steps as well as resulting theory. Also, we relied on reviews and comments on academic papers and presentations built on ideas from this thesis.

With regard to ethical issues, the research was conducted respecting ethical principles of University of Quebec in Montreal. Respondents' anonymity and confidentiality of information were a major concern. We prepared and shared confidentiality agreements with all our interviewees.

Figure 3.2 Example of visual representation of the structuring episode concepts – initial stages of analysis
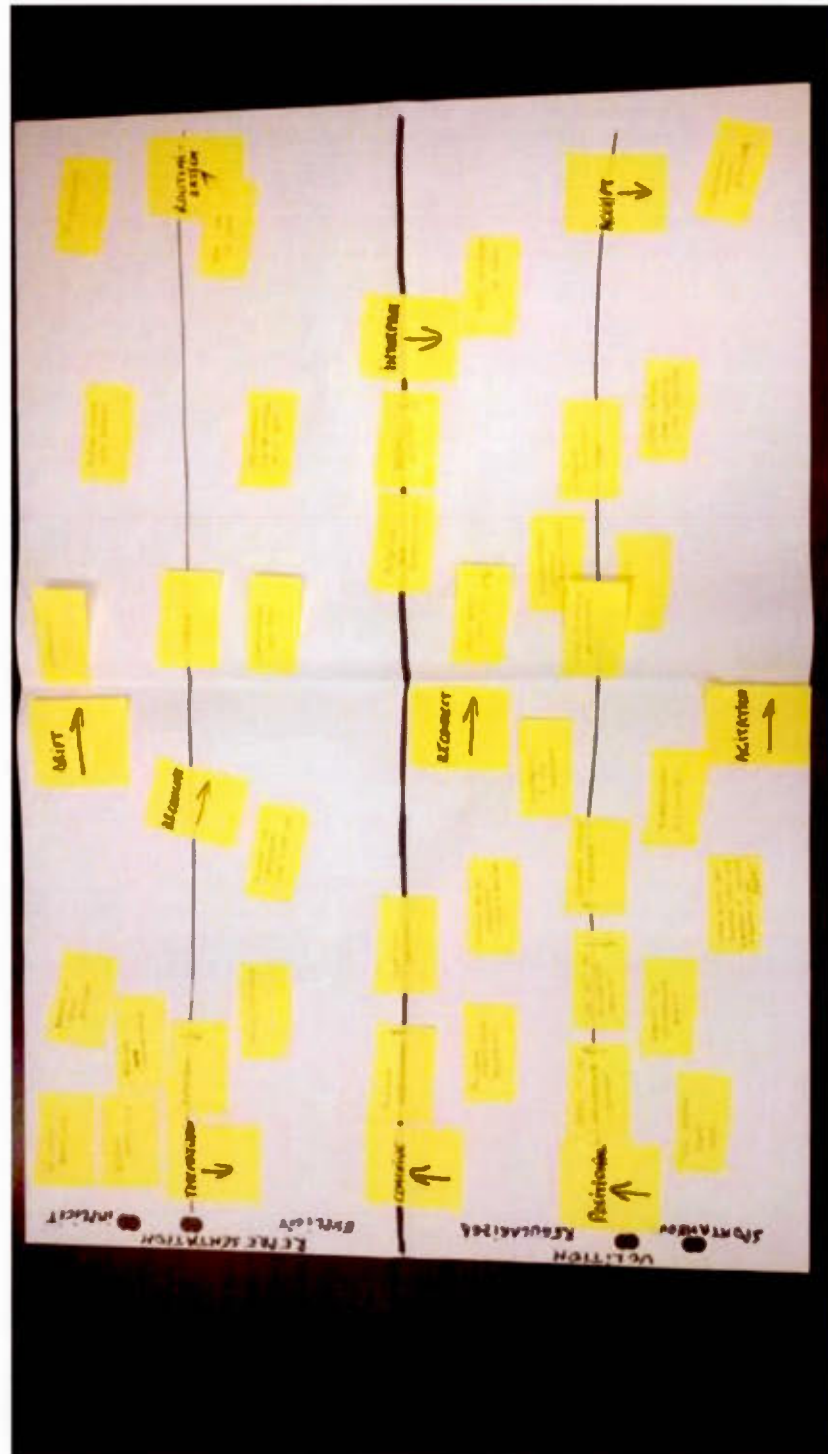
CHAPTER IV

TEMPORARY ORGANIZATIONS AS COMPLEX NETWORKS OF VOLITIONAL AND COGNITIVE CONNECTIONS

In this chapter, we use examples from data collected in 18 complex projects to illustrate our new four-stratum framework. We bring empirical evidence of the coexistence of cognitive and volitional connections in temporary organizations and of the role played by the hidden versus apparent elements in their development.

Numerous organizations and project teams were involved in developing the 18 above-mentioned projects, so we had the chance to observe how these were embedded in a vast network of connections, both cognitive and volitional. Face-to-face interviews and various documents helped us unveil the project configuration of connections and a part of this picture is presented in this chapter.

4.1 Explicit Representations

We have identified a wide range of explicit representations that were used in these projects, such as plans, drawings, schemes, budgets, schedules, contracts, procedures, work breakdown structures, organizational charts, and so on. We will not insist on the common forms, but will provide examples of representations that were very specific to certain projects, in order to illustrate the range of explicit representations. We also

suggest ways in which these representations connect actors, even though actors may not perceive connections as their primary role. Some of these representations were involved in certain transformations, as we present later in Chapter 5 and 7.

We begin by discussing the organizational role of explicit representations, which can be essentially divided in two. The first role was to create convergent interpretations and eventually a common base of understanding for the project, its elements and activities. This helped hold the project organization together. The second role was to separate and coordinate the actions of various project participants. This helped separate participants and ensure that they do not interfere with each other. But, as it will be explained in the next section, this kind of representation provided only limited, incipient guidance, which had to be complemented by the development of implicit representations.

A ubiquitous type of explicit representations depicted the finality of the project, for example the artefact that it intends to create. This finality was pictured to social actors in more or less detailed drawings, prototypes, models, etc. For example, all airport projects used detailed artistic or architectural renderings to show how the future terminal would look and this led to a clearer understanding of the overall goal. Sometimes representations had their own nicknames, such as "champagne glasses" for the initial design of the railway station and its surroundings in the project InfraST, which shows a strong presence and awareness of particularities in the mind of participant actors. This suggests that certain representations helped increase the convergence of participant goals, and that some of them become 'actants' in their own right, by triggering emotional reactions, such as attraction, desires or irony.

But in some cases, such as one prototype for project DigitS, such explicit representations created confusion and delays, because the solution development process considered only the work procedures and environmental conditions of the project leader's parent company and country of origin, and disregarded cultural, market

and geographical specificities of other locations where the solution would be implemented. In other words, explicit representations could create negative feelings and rejection, as illustrated by the following citation from project DigitS:

> *"(...) le directeur de projet était véritablement quelqu'un de [DigitS] et beaucoup plus à l'aise sur le fait d'éprouver un prototype en [Location of Headquarters - country]. Donc le prototype a été fait sur l'image d'un site en [Location of Headquarters - country] et pas à l'international. C'était une technique de compression, on va faire vite, on va valider ça, on va valider le prototype et puis on va déployer. Seulement ça se révélait être une grosse, grosse bêtise. Parce que le réseau natif en [Location of Headquarters - country], un réseau de [DigitS] qui n'est pas le même à l'international. Donc c'est pas les mêmes éléments de configurations. Et quand on est passé au déploiement à l'international en s'étant dit qu'on avait passé la phase de prototype, ça marchait pas. C'était pas bon les câbles, c'était pas bon la configuration, les applications du client ne passait pas et donc on a eu pas mal de soucis que je pourrais vous énumérer."* (Interviewee 1, DigitS)

The same external representations were used to depict the agreed interpretation of the intended form of the project between key participants, such as the client, the designer-engineer and the construction manager. For example, participants in project TerminalS used what they called 30/60/90 drawings, namely drawings with a 30%, 60% or 90% level of detail depiction. The three above-mentioned actors would discuss requirements, and as the plan gets clearer and more detailed, a drawing with a higher level of detail – 30%, 60% or 90% – was used to picture the output of this agreement.

In public projects, stakeholders could relate to and actually participate in developing a network of project representations through their interpretations, opinions, comments and questions regarding these external representations. For instance, TerminalE project went through a long public scrutiny that ended up with a list of conditions – another form of representation – that project planners had to take into account before developing the project.

> *"The planning inquiry for [TerminalE] started in the 90s, 1995 I think, and went on for 4 years, longest planning inquiry in British history. Ultimately, I think it was in 1999 the inquiry ended, that's the public inquiry where people can offer objections and have them heard and put up alternatives. Then the planning inspector, the inspector that has heard the inquiry then writes it up, it took him a couple of years to write his report. So his report was issued, I think it was in 2001 and at that point, the inspector made some recommendations and the government has to confirm those recommendations. There were also some outstanding issues. So we had to do some further work, in fact. The government then issued a consent but with some conditions (...) that you have to clear before you are allowed to start constructions. So we cleared some further conditions and that then allowed us to start construction."* (Interviewee 6, TerminalE)

The form of external representations, as opposed to their content, also played a role in minimizing the risk of conflicting interpretations and misunderstandings. For example, in the project TerminalL the software Primavera was preferred because most contractors were used to it:

> *"On our scheduling sheet, (...) we insisted on Primavera, not that Primavera is any different, they're all fine, (...) they all work! We insisted on it, because we wanted to be able to have those people communicate with each other. We picked Primavera because the [Transit Commission], was insisting that their customers use it, their consultants use it, so ... And here, in [city name], most of the big construction firms and the consulting firms that we were dealing with were familiar with Primavera because of the [Transit Commission] requirement. So, that just helped, because you know, there's no big educational exercise, you're trying to avoid being a burden. And so, we insisted on that. And these three levels, the master schedule and their program manager schedule, and then the project manager schedules, (...) they would communicate back and forth for the roll up"* (Interviewee 1, TerminalL)

Likewise, some explicit representation forms were preferred over others for their simplicity and clarity. The TerminalL project team used simple visual schedules as opposed to more complex diagrams or critical path representations for subcontractors at the operational level, to overcome cultural and language barriers and facilitate the understanding of schedules and sequences of activities:

"We did use a lot of visual schedules. Again, you know, some guy that was born in Portugal. He's got a great technical education, he's really good at doing tiles or floors, but he doesn't know anything about critical path, diagrams, nor that he cares ... he's gonna work on his package ... So we did a lot of schedules, forget about all the fancy CPM diagrams, ... showing a computer simulation, we need you in here at this particular time, and we want the floor done on this fashion, and work from that, and give them things that they can stick in, get a visual image and then tie that to a calendar in their minds and ... magic! It worked really well, again, we found that a very effective tool." (Interviewee 1, TerminalL)

The second role of explicit representations, separation and coordination (Floricel et al., 2011b), also transpires in the two above quotes referring to the TerminalL project. By understanding when their turn to act will come, participants can avoid interfering with the work of others. A more radical separation can be illustrated by the project InfraST, which was developed by two partners, each with its own part resulting in two almost independent projects. The project design drawing used a color code to emphasize this separation:

"The project [InfraST] is the blue and the red and the yellow parts. (...) The yellow part is done by the [name of partner I], the blue part is done by [name of partner 2], and ... yeah, there is always a place where we meet each other and that's in the red part." (Interviewee 4, InfraST)

The quotes presented above also suggest that the form of external representations was also different along several dimensions, such as the level of detail, visibility, the use of colors etc. Another important distinction is that not all explicit representations, even those that played a crucial structuring role, were formal. For example, collocated teams of software developers in project DigitA created a wall with post-its that contained questions about and solutions to some of the technical issues they encountered, while teams in DigitBIS, which were located in three different sites in the same city, created an informal working database with the same purpose. An even more interesting example is the project DigitPTIS, in which, after a leadership change, the new project

manager formulated a set of five principles and shared it with the whole project team. This created a new fundamental understanding of the project as a frozen-goal entity that would not accept any further modifications.

> *"C'est là qu'on a mis des principes, [nom du nouveau directeur] a mis des principes directeurs. Et ils sont sur le mur derrière vous. Ils disent, un moment donné, le compte est gelé et toute addition sera dans une phase deux. Donc on en est là vraiment à gérer que toute addition aille dans une phase deux."* (Interviewee 2, DigitPTIS)

Although common to all projects, some types of explicit representations had different levels of detail in various sectors. For example, construction and IT/IS projects had detailed budgets and schedules for the whole project lifecycle, while pharmaceutical projects, in which the outcome and the pace had a higher level of uncertainty, decided upon their budgets and schedules annually or biennially:

> *"And what we usually try to do is ... a more exact detailed planning for the next 2 years, to have really a good view, also with respect to resources and budget for the upcoming 2 years. And then, for the longer term only, to define the big expensive things a bit more in detail, but for the rest we keep off in the generic plan, because you need to adjust this anyway over time, when you get your new data."* [Interviewee 1, PharmaS]

Finally, the way representations were used strategically (Goffman, 1969) also differed. For example, the five principles used by the new leader of the DigitPTIS project were openly and conspicuously posted, and strongly promoted to all participants. When some participants wanted to add new requirements to the project, the leader staunchly defended the principles by going to the highest level executives and threatening to resign if the principles were not respected. In other projects the visibility differentiated between participants in order to achieve certain strategic goals. An interesting example comes from the use of explicit representations in a way that includes an additional buffer toward project performance. These representations would not correspond to

reality, but would be presented in a way that creates the illusion of reality for the rest of the project team. For instance, the project manager of TerminalL shared a budget with the rest of the team that included the usual 15% contingencies expected in the industry, but kept secret the additional 15% management reserves of which only he and the financial director were aware. In this way, the other project participants would put in an extra-effort to stay within this known budget.

> *"(...) if the architects know that it is ... the management reserves were such and such. They want to spend it to get into architectural digest. If construction manager knows it, you know, he's gonna pass the trades you're gonna do, you know, he's not gonna fight with the trades same ways you don't have any money, right? (...) so I make two points: (1) you want to have large management reserves; and (2) you don't want anybody to know that you have that reserve... 'cause they would have spent it for you."* (Interviewee 1, TerminalL)

On the contrary, the project director of TerminalS shared the actual planned schedule with his team and contractors, but publicly advanced a date that was six months later, to ensure that the organization fulfills its promises to the public and its clients.

> *"Quand... l'entrepreneur général est arrivé en poste, on nous a dit... – Le projet, on pense qu'on peut livrer le... je pense c'est le 1er septembre... Moi, j'ai dit – Okay... On va livrer le... avril 2004. Tout le monde... tout le monde pensait que la date était avril 2004. On a livré le 12 octobre 2003... à toutes fins pratiques... tout le monde pensait qu'on était six mois plus tôt que prévu."*
> (Interviewee 2, TerminalS)

For external observers, the visibility of explicit representations had different levels. While internal projects, such as DigitA, DigitS or PharmaB were virtually invisible for outsiders, the infrastructure projects, that were seriously affecting local communities, made themselves more visible to the public. For example, project InfraS set up a special communication office and periodically printed brochures and flyers to keep locals updated with the advancement of the project and how future step would specifically

affect their daily life: noise level, which part of the street will be closed, relocated bus stops, delivery options for local businesses, etc.

In sum, in line or not with the intentions of their creators, explicit representations appear to connect participants as visible stimuli that attract, repulse and direct other actors, and, especially, as vehicles for the construction and sharing of meaning, as well as by setting up virtual boundaries in time and space between project participants and their actions. Their structuring influence may vary. While some representations, such as agreements and explicit management principles, stay fixed for some time, others seem to evolve, either by becoming more detailed or by changing in significant ways. Project actors can also strategically influence the resulting relations, by changing the form, the level of detail and the degree openness of the representations that they create and control.

4.2 Implicit representations

In their turn, implicit representations were generally hidden to other actors and only became obvious when colliding with other implicit representations. We identified two main categories of implicit representations in our projects: pre-project implicit representations that actors had developed through their participation in previous projects and activities and by force of habit kept using during the focal project; and project-specific implicit representations, which actors developed during project lifecycle, through repeated interactions with other participants and the local interpretation, application and understanding of project explicit representations.

Pre-project implicit representations came in forms of specific work routines and habits related to project management processes (scheduling, budgeting, controlling, allocating roles and responsibilities, etc.), but also to specific work activities, or to collaboration

and information sharing with other participants. For instance, project teams and subteams involved in activities they had done in the past, re-applied the same work routines. Project management teams of EnergyEX, EnergyTP, EnergyH, InfraS, PharmaA, PharmaS and DigitA had the experience of developing similar projects within the parent company, so re-applied same old planning routines. In all projects, teams and subteams of contractors that were performing similar tasks, re-used work routines they had used before.

The use of pre-project implicit representations was acceptable as long as this did not interfere with the smooth project development. For example, the project management team of TerminalL imposed to their contractors and subcontractors the use of software Primavera for scheduling activities, but in certain cases they accepted some subcontractors using their old scheduling routines:

> *"Down here with the threads, some of them used Primavera, like electrical contractors, 'cause it's a very controlled environment, they're very sophisticated, but the guys doing tiles or floors, they scheduled on the back of the cigarette package, so they wake up in the morning, they come in so, we were much more flexible here..."* (Interviewee 1, TerminalL)

However, this habitual replication (Emirbayer and Mische, 1998) was sometimes inadequate, since it failed to consider the new project specific settings and the new actors or collaborators. Project DigitPTIS experienced major incompatibilities between deliveries of the two main contractors, because each contractor had its own work style and they did not communicate at all to overcome these differences. Some contractors in InfraR and EnergyH came with their own work safety routines, which were not acceptable in those projects and the management team had to intervene to make them raise the level of safety. Another example is one project team in PharmaNA who took its routines in applying tests on patients in a different country and encounter difficulties in collaborating with local companies and patients. Similarly, plumbing contractors in

Project InfraR realized that they cannot use their work routines when dealing with very old technology and had to develop specific routines (in this sense see also Barley, 1986).

The second main category of implicit representations consists of those representations that were developed specifically while working and collaborating in the project, often as an internalization of project explicit representations. Actors' background and experience played a key role and so the project was represented differently in the mind of electrical, mechanical, IT or construction contractors. For example, in the TerminalE project, representatives of the main airline that would use the future terminal, IT contractors, and the construction manager each understood the project priorities, its schedule and corresponding flexibility in their own way, which eventually led to delays and a major technical problem in the opening day.

Sometimes, even simple and apparently clear standards were interpreted differently by different contractors, such as in project EnergyTP:

> "For instance, if the specifications say: "it has fire protection to... such and such a standard." Well... then when people come together, and say: "Well, I might dispute what that standard means ... The way we interpret that standard may be different than the way the engineering company did or the way [name of the project owner] does..."" (Interviewee 1, EnergyTP)

When explicit representations had an insufficient level of clarity, affected actors interpreted them either by extrapolating their past experience, such as in project InfraR and TerminalE, or in a way that is more advantageous for the respective actor, such as in DigitA and DigitBIS. One of the two partner organizations in InfraR supposed to be responsible only for the planning part of the project and future operations, and allow its partner to take the lead for project development. But, since in previous projects this partner was used to manage all the way through the project lifecycle, it interpreted the

actual demarcation of areas of responsibilities in a way that enabled them to interfere in the decision-making process. On the other hand, unclear tasks allocation allowed two key members of the project management team of DigitA to only assume responsibility for tasks each considered a priority for his position, leaving some tasks unfulfilled.

The language spoken and the culture of origin were other elements that affected interpretation of explicit representations in international teams. One special case was the project DigitPTIS, where although the project management team and the main contractor spoke the same language, the cultural differences between the two countries of origin played a very important role and led to misunderstandings and different interpretations of similar concepts:

> *"Il y avait effectivement cette langue-là à laquelle on ne faisait pas attention parce que c'est notre langue. Dès le début, on ne faisait pas attention. Quand je vous parle, je me dis que si vous n'êtes pas habitués en français, je ne suis pas sûr ... je vais peut-être vous le répéter (...) Alors qu'avec eux, on n'avait pas cette garde-là qu'on aurait avec un anglophone. (...) Avec le temps, on les a connus et on s'est aperçu que des fois on utilisait le même mot. Si c'était un mot inconnu, il demandait ce que ça voulait dire mais si c'était un mot qu'il utilise aussi, lui il pense qu'il sait ce que ça veut dire. Des fois ce n'est pas pareil du tout."* (Interviewee 3, DigitPTIS)

As opposed to the abstract explicit representations (Floricel *et al.*, 2013b), implicit representations had a more concrete role in daily activities, so actors used them to perform their work routines, communicate and collaborate. At the same time, while explicit elements symbolized a shared representation of the project goal, procedures and areas of responsibility, implicit representations were particular to each actor, being situated interpretations of their tasks, relations and environment. There were two main types of implicit representations, as the interplay between project ephemerality and actors' seemingly repetitive attributions led to the co-existence of both pre-project and project-specific implicit representations.

4.3 Regularized interests

Actors' spontaneous interests were aligned with the project goal through a series of elements that we call regularized interests. These were agreements and commitments that would motivate actors to stay together and work for the same goal. We identified a wide range of approaches to achieve this alignment, which emphasized either coercive or adhesive aspects (see also Floricel *et al.*, 2011a).

Coercive elements were used to forcefully convince actors to stay aligned when they had divergent tendencies. In some cases, such as EnergyTP, EnergyH, DigitS and DigitPTIS, this approach was adopted at the project level and roles and responsibilities were very clearly allocated. EnergyH and DigitPTIS even required additional guarantees – security deposits – to ensure contractors would behave as expected. Their project management teams coped with any attempts to deviate by evoking these coercive elements.

> *"Dans le contrat du barrage, (...) il y avait un dépôt de quelques millions de dollars pour garantir. Il aurait pu dire « Bon, je laisse mon dépôt là, et je me retire s'ils ne sont pas d'accord », sinon ils sont obligés de réaliser le contrat (...) c'est un gros levier ... "* (Interviewee 1, EnergyH)

> *"J'ai les cordons de la bourse. Quand le rôle d'intégrateur n'est pas joué à mon goût, j'arrête de payer. J'arrête de payer les deux. «Money talks!»."* (Interviewee 2, DigitPTIS)

In other cases, this approach was used only for some parts of the project or to ensure cohesion of some of the actors. For example, TerminalL and EnergyEX used fixed-price contracts for small sub-projects with low risk and clear specifications, while InfraR and TerminalS switched to this type of approach only in the second part of the project, when they realized this would suit better their needs.

Coercive elements were also present in projects in less formal ways, such as political influence or market position. Project owners that have enough power or a dominant market position could easily dictate their conditions and keep smaller actors aligned under the threat of no future collaborations, such as in EnergyH or DigitPTIS. However, this was a two-way street, as these contractors were also interested in maintaining good relations with their biggest client. Moreover, in projects that adopted a more collaborative approach, smaller companies were proud to be associated with the prestige of being involved in the largest project in the area (TerminalS) or in projects with great visibility (InfraST, TerminalE or DigitBIS).

> *"Les gens voulaient travailler sur ce projet-là ... Les gens voulaient la visibilité que ce projet-là apporterait... voulaient mettre ça sur leur résumé ... leur CV... Alors, la qualité de la main d'oeuvre qu'on a eue... le workmanship était... très, très impressionnant. Il y avait une fierté ... à travailler sur ce projet-là ..."*
> (Interviewee 2, TerminalS)

Other projects emphasized a collaborative or adhesive approach, considering coercion only as the last means of realigning. These projects used special agreements to enrol actors and to build stronger ties to the project than to their respective parent companies. Project TerminalE is an excellent example:

> *"Interestingly, at the core of our project is the [TerminalE] agreement; the way in which we took the commercial risk but this was therefore a behavioral contract not a transactional contract. Most contracts are transactions; we'll give you some money if you give us this, this was about developing the right relationships so you could put anything into this behaviorally and it was very interesting. (...) This requires a mature way of working; it requires people to form what we called integrated teams. So you couldn't see the architect and maybe the engineer, and clans, and the contractor, the specialist contractor, the systems guys and maybe the commercial guys. We're all 1 team. We took off our company cap badges and we all operated as a single integrated team. At the center of the [TerminalE] agreement was this notion of how you win certainty through the brief, you deliver things through integrated teams and you build up a level of trust."* (Interviewee 6, TerminalE)

Projects TerminalL and TerminalS used partnering approaches to develop a similar sense of community which helped later, when facing threatening situations.

> *"So, partnering I think had a great contribution to setting up some of those communication and relational ... relations that we were talking about earlier. Plus, the lifespan of the project helps, because people, over a period of time, start to understand, you know, how to react with each other. So, the partnering then structured some of the communications. And the partnering was done by the [project owner], or initiated by the [project owner], at various levels. There is a partnering amongst their own stakeholders, there is a partnering amongst the contractors, and it was then partnering bringing all of us together and identifying sources of communications, sources of issues, sources of how to escalate."* (Interviewee 5, TerminalL)

If not ample partnering sessions, all projects used at least other common means to ensure a high level of commitment. Whenever possible, teams were collocated to facilitate development of friendly relationships and improve communication and information sharing on both formal and informal channels. When not collocated, such as in DigitA that used two international teams to help the core project team, the leaders organized weekly meetings at convenient times, encouraged frequent email exchange, and sent senior members of the core team to mentor the other teams located overseas. Similarly, members of the core team in EnergyH paid weekly visits at the construction site to communicate with contractors and subcontractors and made themselves available through phone calls, emails and videoconferences whenever needed. In general, in all projects, managers organized frequent meetings – weekly for sub-teams or multi-teams and monthly at the strategic level with representatives of all major actors involved, such as in DigitPTIS, EnergyEX, InfraR or DigitBIS.

Another way to motivate actors to work for the interest of the project and ignore possible distractions was to involve them in planning and strategic decisions and constantly inform them about significant changes and challenges. The projects that built airport terminals involved the airlines operating there in the planning phase, so

their spontaneous interest were incorporated from the beginning. Most projects involved the future operator or client for similar reasons. Projects InfraST, InfraR, InfraS, EnergyH and EnergyEX reached out to local communities and took into account their desires. Projects DigitPTIS, DigitMIS and DigitBIS invited representatives of other departments within the parent organization to provide their input.

Developers of large projects in remote areas had troubles finding local contractors large enough to carry on the allocated tasks and had to convince non-local companies to join. In order to co-interest these actors, they offered special work conditions (EnergyEX) or more advantageous contracts (project InfraR). For instance, project management team of EnergyEX took several decisions in this sense: they used off-site construction of small modules, so those contractors would not need to move their teams in the remote area; for those that had to be in the area, they built a whole village with attractive housing and leisure facilities and proposed a fly in / fly out approach that would allow teams to spend 20 days working on the site and the remaining 10 days of the month at home, with their families.

> *"We try to build stuff outside and bring it complete, almost all, so that we limit the number of people at the site. (...) We build up modules (...) that you can put on a truck and transport them to site. So for this mine project, we are building something like 350 modules and for the Upgrader project, we are building about 600 modules. We build them in big cities such as [name of the cities] and then, put them on the truck. And when they come to site, it is like a Lego set, you just put them on top of each other, hook them up, weld them... This is one way of ensuring that we mitigate the risks of finding people to go to this remote area in the hardship."* (Interviewee 1, EnergyEX)

All projects used a combination of adhesive and coercive regularized interests to align the participant actors. In some cases, the approach moved from adhesive to coercive, such as in DigitPTIS, TerminalS, PharmaA or InfraR, as new project conditions and unfortunate past experience recommended it. For example, the project management of

InfraR assumed contractors would behave in good will, so initially opted for a high level of autonomy, but later realized more control is needed to keep actors interested:

> *"Then... we have another thing that we saw... (...) the contractors, they have the self-check that they have done... the right thing and they have done it correctly. And we... we see that, after some years or so, that this doesn't work as well ... the contractors are taking too easy on this fact, so we had to put in some of our own staff to check them ... to help them ... to check themselves."* (Interviewee 1, InfraR)

In fewer cases a coercive approach became more adhesive, such as in DigitMIS, where the project management coped with the significant opposition to the project by encouraging discussions between different departments, organizing meetings to explain the project goals and details, and using project supporters to mediate between the project team and the affected departments.

We found both cohesive and adhesive elements in all projects. Some projects preferred one approach over the other, but they all used all types of elements to align actors maintain their interest in the project. Between the two extreme forms, we also found intermediary types of regularized interests, for example when actors had a certain level of influence and some leverages to use it, but could not fully impose their will in all circumstances. Somehow unexpected, we noticed that some of these elements were not actually used as intended, such as powerful coercive elements being completely ignored or used only as a last means, as well as strong adhesive elements completely failing to align one or more actors.

4.4 Spontaneous Interests

Actors' spontaneous interests are always present and are continually involved in forming ties based on direct, materially-conditioned attraction and repulsion. Most of

the time, project-relevant interests remain regularized, as actors respect agreements and commitments. However, despite project participants' continuous effort to maintain these commitments, spontaneous interests push actors to reconsider their commitments, cut old ties and form new ones, all of which sometimes triggers significant restructuring processes. In this section, we briefly present examples of situations when spontaneous interests pushed actors outside the framework of regularized interests. We leave for the next chapter a more detailed discussion of those instances that led to small transformations or even major structuring episodes.

Actors express affinities and animosities during project development, preferring to collaborate with certain partners and wishing to avoid others. We encountered many examples of animosities between certain contractors in InfraR and TerminalL, between the project management and the main airline in TerminalE, between the main contractor and local unions in EnergyH, between different members and groups of the management team in TerminalS, DigitS and EnergyH, between contractors and the project management team in EnergyEX and DigitPTIS, between certain partners in DigitPTIS, between the project team and different departments of the parent organization in DigitMIS, DigitBIS and PharmaS, and so on. Most animosities were solved during project development, although this sometimes involved firing or moving on a different position the leaders of those contractors' project teams involved in the conflict. One particular case is the project TerminalS, which was developed in two phases and the owner, trying to avoid conflicts within the project management team adopted a completely different approach in the second phase, which, indeed led to a very harmonious collaboration within the team, but to major animosities between the project management team and the main contractor.

> *"We had a site supervisor with [the main contractor] that... I wasn't very impressed with... He never step foot outside of the trailer... He was never on site. And for me, a site supervisor should be on site... He spent his entire time going through the drawings... trying to find errors and omissions from the*

designers... in order to make claims for changes, for making money. And I used to joke - Are you getting a percentage... of these? Is that why you are so ... I am really outspoken. I am known to be outspoken. I will call a spade to spade." (Interviewee 1, TerminalS)

Animosities could sometimes arise from unsatisfied demands of actors with strong ties. One interviewee explains the issue of ignoring spontaneous interests of colleagues to whom he had worked in the past within the parent organization:

"C'est une entreprise très relationnelle. Tout le monde se connaît. Il y a un chef d'opération qui peut m'appeler avec qui j'ai déjà travaillé. Peu importe si je suis rendu quatre niveaux en haut, il va m'appeler en haut : «[Interviewee's name], peux-tu me faire ça?». C'est comme ça ici. C'est correct pour faire du transport mais pas pour faire des projets parce que dans les projets, (...) il y a tellement de variables dans l'équation. Tu as huit, dix variables, ça prend dix équations pour résoudre ça donc ça devient bien complexe. On ne peut pas répondre à tout le monde. Et là les gens quand on ne leur répond pas, ils pensent qu'on leur en veut. Ils pensent qu'on est fâché, qu'on ne les aime plus." (Interviewee 2, DigitPTIS)

Affinities were also present in most projects, actors enjoying collaborating with specific teams and individuals. The above-mentioned owner of TerminalS hand-picked the members of the project management team and certain contractors for the second phase of development:

"[The owner] actually saw what happened in phase I... and they kind of hand-picked who they wanted for phase II. (...) In phase II, the airport decided that the only... project manager they wanted for phase II terminal building was [project manager name]. And so they went to... the board of directors... and were able to put forward an argument... I don't know what that argument was, but they were able to put forward... an argument to the board of directors... and get approval from the board of directors... to award the project management phase II to [project manager name]. So, they knew who they wanted... in phase II. And even though the civil... was publicly tendered... they knew they wanted it to go [contractor name] and they wanted [contractor's project manager name]. And they got [contractor's project manager name]. So it was more... hand-picked for phase II." (Interview 1, TerminalS)

TerminalE were particularly successful in building adhesive volitional connections, which in turn generated spontaneous interests to align and collaborate with other actors in the project. These ties actually stayed with them even after the end of the project:

> *"But I would say anyone now; I bumped into a man in the street the other day that I hadn't seen in ... I don't know how many years, but he worked in [TerminalE]. The first thing we do is embrace. There is a camaraderie associated with having worked on the project which I think [the project owner] engendered among us and encouraged which I have never seen on another project."* (Interviewee 3, TerminalE)

Other spontaneous interests were manifestations of actors preferring a certain level of comfort when realizing their assigned tasks. In InfraR and EnergyH, certain contractors tried to cut corners and compromise the task performance, aiming to put less effort while receiving the same payment. Several departments of the parent organization in DigitMIS opposed the project fearing the higher level of control this would bring. Unions and some departments of the partner organizations in DigitPTIS were also reluctant, fearing the project implementation would involve their requalification and acquiring of new skills. Finally, project sub-teams in DigitBIS took advantage of the less clear allocation of a certain work package and avoided it for being too difficult and requiring specific knowledge and expertise.

Spontaneous interests are manifested because different actors, functions or departments have different goals. For example, since they are paid according to their sales, the marketing teams focus on selling. The solution that would be implemented by project DigitBIS was sold way before being ready, which caused a major project restructuring to compromise with the timeline mentioned in that transaction. In the project PharmaB, many discussions occurred between the marketing team and the legal team, the marketing team aiming to embellish the product to an extent the legal team could not agree, since it was going beyond its actual characteristics.

"Oui, en terme de malentendu, c'était contrôle réglementaire et marketing sur les différentes clés que l'on mettait sur la boite notamment et dans certaines brochures marketing. Donc en général le marketing essaie de pousser au plus loin possible les revendications jusqu'à ce que le réglementaire dise non, ça on n'a pas le droit de le dire parce que ..., donc il y a le marketing qui revient à la charge oui mais ça on le voit dans d'autres produits qui l'ont fait passer, donc qu'est-ce qu'on ne pourrait pas essayer pour le faire passer comme ça. Donc ça été un petit peu un jeu de ping-pong entre les deux, jusqu'au lancement du produit même après durant les différentes campagnes marketing, pour essayer que le marketing fasse passer ses idées et donc derrière avec la modération du réglementaire qui dit non, ça on ne peut pas le faire."
(Interviewee 1, PharmaB)

Certain actors expressed desires to develop their tasks in a particular manner and refused to comply with the project requirements of delivering a workable solution within the timeframe allocated for the task. One of the DigitA team leader insisted of being perfect regardless the time used, when this was not expected:

"In the initial phase of the project, last summer, also one of the team leaders and corresponding team created some frustration because they went outside the borders of their responsibility. (...) they were changing things that were not necessary to reach the required function. Because they had the ... the system manager involved is one of these persons who wants to make it right, so what did to ... become a nice-looking solution and finds it very hard to compromise or ... finds it very hard to find the right compromise. So, he can propose 100 compromises, but then he goes for the optimal solution from a long-term perspective and we not ... I mean, even if we had a fairly long project here, we needed to deliver, (...) we had quite some stress in many areas, so we couldn't waste effort, so ... on things that were not necessary to change. So, in that team, and due to the team leader that was a bit the same type of person, too flexible in areas where flexibility was not needed, I mean, improving things that didn't need improvement." (Interviewee 1, DigitA)

Some spontaneous interests were left unaligned with the project goal and respective actors manifested them during project development. This was particularly the case of social activists that were fighting for the preservation of the initial destination of the

construction site in project InfraMC, of environmental activists in EnergyEX that were opposing all projects in the oil industry for generating pollution, and of environmentalists that were opposed to certain parts of the project InfraB for negatively affecting a bird habitat in one protected area.

Another example of spontaneous interests left partly unaligned is the attempt of one of the partner organizations to impose its point of view and lead in project DigitPTIS. This partner had tried before to initiate a similar project with no success and saw it as a matter of pride and prestige. For these reasons, they had tried to get the lead in the focal project as well, but were unsuccessful. During project development they manifested different interests that made the project director accuse them of sabotaging the project:

> *"Oui, il y a un agenda caché, que je vous ai mentionné au tout début de la rencontre, à savoir que, je soupçonnais le [partner #2] de faire en sorte qu'ils pourraient se réjouir d'un échec du projet. C'est très dur ce que je dis, mais je l'ai dit à tout le monde. Je l'ai dit au conseil d'administration de la [partner #1], aux directeurs généraux, dont le président directeur de la [partner #2] qui était là, en disant « Vous souhaitez que ça ne marche pas, pour faire la preuve que vous êtes seul capable de faire des projets régionaux. »"* (Interviewee 1, DigitPTIS)

Finally, several actors manifested spontaneous interests to increase their financial advantages in the project. Blue-collar workers unions threatened the EnergyH project so they can get more work load, while local businesses demanded more financial compensations from InfraS for disturbances of their regular activities. Some contractors demanded higher penalties to be paid by the project owner when changes were required, such as in EnergyH, InfraR or EnergyEX. As also mentioned above, the main contractor for the second phase of development of project TerminalS even hunted for unclear specifications and mistakes that would involve costly changes.

We observed a wide variety of spontaneous interests with a high level of volatility, which is in line with our presumptions inspired by the actor-network theory – any connection that defines the actor-network could tempt him to join a different coalition of interests. We found that actors manifested spontaneous interests as a result of their affiliation with specific parent organizations, departments, professions, or of their specific roles in the project, but also as a reaction to mutual connections with other project actors. Being neglected or improperly aligned led to the same result. Finally, actors manifested specific desires and interests simply because they aim to get a privileged position and recognition with minimum effort.

In conclusion, understanding the project structure as a network of cognitive and volitional connections enabled us to unveil the key elements that compose a project, make the project recognizable, and fuel actors' actions and interactions. We found evidence that the four strata coexist within all projects. We also found that each type of connection could take a wide variety of forms although resulting in similar roles for the development of the project.

The two visible strata consist of elements that were purposefully built for the project, taking into account the specific goal, context, and actors involved. The two hidden strata include a combination of pre-project and project-specific implicit representations or convergent and divergent spontaneous interests, respectively. When joining the project, actors bring work routines, interaction scripts and categorizations from their prior connections, experience and background. Symmetrically, they also import interests aligned with these prior connections, for example parent organizations' regularized goals. On top of those, they also develop specific implicit representations to reflect their own interpretation of the project explicit elements, as well as aligned spontaneous interests as a result of their commitment to the project interests.

However, we noticed that these interests and representations are not completely identical over time. They actually change with the advancement of the project during its lifecycle, as a result of actors' quotidian actions and interactions, but also in response to major conflicts and collisions. We consider the first two categories as expected adjustments in temporary organizations, so treated them as the smooth evolution of the project structure during stable periods. We label them translations and discuss them in detail, in the next chapter (Chapter 5). The third category involves dramatic alterations of the project configuration of cognitive and volitional connections, or what we call structuring episodes in our theoretical framework and this is discussed in the subsequent chapters of this thesis.

CHAPTER V

THE EVOLUTION OF THE PROJECT STRUCTURE
DURING STABLE PERIODS

As explained in Chapter 2, we distinguish between stable and revolutionary periods in the project lifecycle. While the revolutionary transformations will be discussed in the following chapters, we focus here on shedding light on the nature of cognitive and social interactions during stable periods. Giving their temporary and unique nature, projects, as opposed to organizations, go through continuous renegotiations of relations and interpretations between participants. The project structure is not entirely frozen over a certain period of time, but rather stable, with only small changes and adjustments that occur on a continuous basis. Generally, the existing structure has the ability to absorb disruption through various mechanisms, which we call translations – the specific transitions that occur within or between strata. We identified ten such translations: drift, re-conceptualization, re-attaching, agitation, thematization, positioning, routinization, acceptance, conceiving, and interpretation (Figure 5.1).

The idea of translations emerged during initial stages of analysis. We observed many examples of cognitive and volitional connections that changed over time, but were considered as normal occurrences in the project participants' daily life. We decided to analyse them into more detail and realised they are simple, one-step transitions, with generally clear generating factors, direction of change, and final results. On the contrary, structuring episodes involve ambiguity, many connections that need to be

reset, and unclear direction of change as each step during transformation process has to be thoroughly negotiated, sometimes even with actors not directly involved. After several iterations between concepts of stability, change and episode, on the one hand, and data, on the other, we developed the concept of translation to explain these incremental adaptations of the project structure.

In this section, we first present each of these translations in more detail and conclude with a short discussion about our observations and reflections regarding the equilibrium and minor transformations that occur during stable periods.

5.1 Drift - Implicit representations to implicit representations

This translation occurs exclusively in the stratum of implicit representations as a result of small collisions between different actors' implicit representations and leads to refinements and readjustments of these representations. Exclusively means that implicit representations are both inputs and outputs in this translation. Actors almost unnoticeably modify their initial implicit representations to synchronize them with representations with which these come in conflict. In consequence, no new implicit representations are created, only existing ones are refined. It also means that the collision is solved discretely, without modifying other explicit cognitive or volitional connections, and without taking the matter into the project social arena. These other types of collisions will be discussed later, in the thematization section – for small collisions – and in the triggering event chapter – for major collisions that involved structuring episodes.
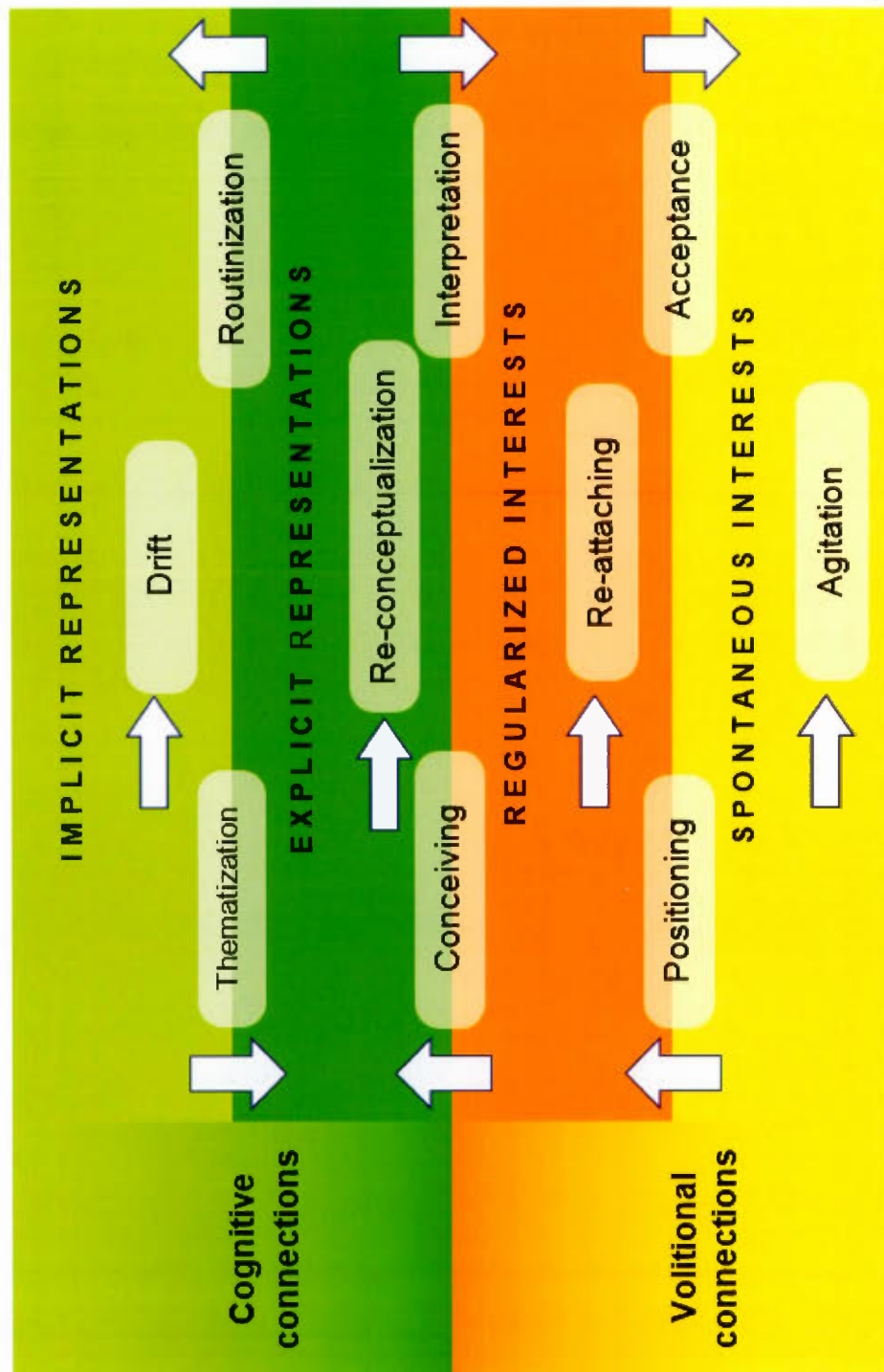
Figure 5.1 The evolution of the project structure during stable periods – small adjustments through translations

We observed frequent collisions between both pre-project representations and representations developed specifically during project lifecycle. For example, when collaborating on specific tasks, two sub-teams from different participant organizations had to change their work routines to better fit each other's style, such as in projects DigitA, EnergyEX or InfraR. Teams from different departments of the parent organization had to also adapt and work together in PharmaS, DigitS and DigitMIS. The project DigitBIS included in the project team 50% external consultants who were gradually adjusting their routines to not collide with those of the owner's team.

Projects that were developed in an innovative manner particularly experienced collisions between actors' pre-project routines and habits and the new reality. Projects EnergyEX and TerminalL adopted a modular approach to shorten the project schedule, but not all contractors and designers were used to it. For example, the engineering contractor in EnergyEX had to constantly adapt its routines to comply with the project construction approach.

> *"Those guys that are doing the engineering... They are used to do engineering the classical way, which is ... you do drawings, you buy the pump and the switch gear ... you send the two together to the site which is this building, you build it together. But now, we are doing it differently ... we are building modules ... So, I don't want to send it directly ... I want to build those Lego sets. So, those have to finish earlier because when I finish them, then I take them to site. This guy who does the design is not used to finishing things earlier because he does the conceptual design first, and he does the basic design... and... he buys the equipment, he gets ... information from the pump manufacturer ... After he gets the information from the pump manufacturer, he can build the foundation design ... and so on. And before ... he gets all this information ... he is too late to give that information to the module fabricator ... So, what happens... there is delay. So, they had to adapt, they had to change their way ... of doing things. And fabricating those, I told you, 1000 modules that we needed ... (...) this happened several times."* (Interviewee 1, EnergyEX)

Sometimes, old routines and habits could not be applied in new projects and even routines developed in certain sub-projects or initial stages of the same project were

inadequate in other parts of the project or in its later stages. This could be understood as a cognitive dissonance between actors' understanding of old explicit connections and the emerging project reality (see Ambos and Birkinshaw, 2010). Projects DigitBIS and DigitPTIS aimed to introduce an information system that was already in use in other countries and organizations. In this sense, the project management teams decided to involve individuals and contractors that had participated in similar projects and benefit from their experience and expertise. While the technical solution itself could be broadly replicated, their work routines and habits of communication had to be continuously adjusted.

Project specific implicit representations were also a source of collisions, since actors often understood explicit elements in different and conflicting ways (see Tukiainen *et al.*, 2010). For instance, in projects like EnergyTP, EnergyH, TerminalS or DigitPTIS, contractors, suppliers and the project management had several conflicting understandings of technical specifications for certain sub-projects, but these were solved after several rounds of discussions. The main contractor and one supplier in EnergyH had different understandings of requirements and different routines to realize sluicing gates and they only synchronized after meetings and discussions:

> *"Il y a eu ... disons des conflits, si on veut dire du côté du fournisseur de vannes, mais ça ne veux pas dire qu'il n'était pas bon. Il y avait une certaine... donc compréhension entre les deux, entre nous et eux (...) Ils voulaient faire à leur façon, puis nous on avait notre façon, on leur avait donné une certaine conception, ils voulaient changer ça, il y a eu des discussions, ils n'arrivaient pas livrer je ne sais quoi qu'est-ce que c'est... quel était leur problème, mais ça a causé un peu de friction de ce côté-là.(...) Mais tout ça se règle avec les discussions et les réunions. "* (Interviewee 6, EnergyH)

These different interpretations were facilitated by insufficiently detailed explicit elements. In project EnergyTP, unclear designs allowed specific interpretations of the main actors involved:

" [...] the document just talks about the standard... with interpretations... So... we have got to resolve this. So, I mean, in the perfect world, you would like to add your engineering advance to great percentage to complete a full design. So then, you can have a rally... on whole set up... design drawing you could attach to the contract to the extent that... To get the project going, to get even the engineering underway, you start a contract... You will be doing it on kind of design basis... not full drawings. So then, you leave... opportunities for misunderstandings or disputes around... specific specifications..."
(Interviewee 1, EnergyTP)

Projects with multinational or multicultural teams and contractors, such as InfraR, EnergyEX, EnergyH, DigitA, DigitPTIS, DigitS, DigitBIS, PharmaA and PharmaS, struggled with conflicting understandings and routines in performing even usual tasks. Regular meetings, teams collocations, visits of project management team members to each site and frequent discussions helped harmonizing routines and, in general, avoiding major transformations of the project configuration.

We observed that, in temporary organizations, most implicit representations collide because they are incompatible with each other from their conception and not because they become incompatible during project development. Most routines and habits are inherited from parent organizations or, in general, from past experience and they are rarely compatible. Moreover, implicit representations developed during project lifecycle could also collide with some of these pre-project representations. We also observed that the way in which actors refine their implicit representations is very similar with the logic suggested by the structuration theory and routine theory scholars. Stability is needed and highly valued in projects (Becker, 2004; Swartz, 2008), so actors make an effort to maintain the status quo by quickly adjusting their cognitive connections with as little impact on the project configuration as possible (see also Heaphy, 2013; Howard-Grenville *et al.,* 2011). In this sense, they use their capacity to reflect upon actions and upon different environmental conditions, and so perform tasks

slightly differently, in a way that would avoid future collisions with other routines (Feldman and Pentland, 2003; Giddens, 1984; London and Siva, 2011). As a result, routines re-take their role of separating trajectories, re-become non-intersecting and non-conflicting.

5.2 Reconceptualization – Explicit representations to explicit representations

We call reconceptualization the translation that occurs exclusively in the stratum of explicit representations and so involves only this kind of project connections. The project paradigm of development does not change (Liguori, 2012), but its visible elements become more and more detailed and new cognitive connections are explicitly added as the project goes through different phases. This translation corresponds to some extent to the understanding of the traditional school in project management of a project development as a technical task (King and Cleland, 1988; Slevin and Pinto, 1987).

As the project advances, its plan becomes more and more detailed and the final goal clearer. As we already mentioned in the previous chapter, in the initial phase of TerminalS, the architects sequentially elaborated drawings with 30%, 60% and 90% level of details, as the client requirements became more concrete and the final idea clearer. Similarly, the team of DigitA only later fully defined the scope of the project:

> *"When we start the project, we know about 60-70% of the scope and then, we fill it up as we go. Now, it's a bit different 5.0 was a bit different in the sense that we had some three major interoperability things to do, which meant that the scope was fairly full, at least for the first 6 months. But then, we did have some small changes at the end, or additions at the end."* (Interviewee 1, DigitA)

In the case of pharmaceutical projects, if initial tests are successful, in later stages the future drug is tested on more people, with different aims (i.e. ideal dosage, efficacy, safety, etc.), and in multiple countries. Eventually, the official application is prepared and submitted to different regulatory authorities. Sometimes, the project scope is adjusted according to tests results, such as in PharmaNA who had to narrow down the scope as the drug proved to work in less therapeutical areas than initially expected.

Projects often use specific explicit elements such as milestones and toll gates to certify the completion of certain stages. For example, project DigitA used toll gates to confirm completion and product codes to assert product quality:

> *"So, we have toll gates, we have, in some cases, milestones, etc., but at [DigitA] here I would say that we have the toll gates, and then you have a number of product codes. And the product codes, that states, I mean, the ... not the readiness but the quality ... the progress and the quality of the product. And then you have a product code that is called PRA, product ready for acceptance, I think it stands for if you spell it out. And ... so... and PRA is a ... you do an assessment and you assess basically that everything is done, in terms of testing. (...) So, PRA is an important, I would say, milestone for the project."*
> (Interviewee 2, DigitA)

Modular projects are a particular case of reconceptualization as more than one sub-project advances at a time, so multiple explicit representations are enriched in parallel. In our sample, airport projects constructed not only the terminal building, but also a parking garage, streets and bridges, a new runway, and other additional facilities, such as a control tower in TerminalE. All these subprojects were somewhat overlapped, so explicit representations were used to both track down subprojects advancement and to situate actors in the bigger picture of the overall project. Similarly, project InfraR included the construction of the railway station, of an interconnected metro station, of a parking garage, and the fitting out of the surrounding area. Energy projects, InfraR and DigitS could also be included here.

To conclude, this translation occurs naturally, as the project advances during its lifecycle. Due to the high environmental uncertainty, scope ambiguity and inevitable surprises (Beckhy and Okhyusen, 2011; Floricel, 2008; Jensen *et al.*, 2006), explicit representations are developed gradually. In time, completion procedures are added to development procedures, which in turn were added to planning procedures. Work packages are formulated and awarded at different moments in time, as the financing becomes available and activity deadlines approach.

5.3 (Re)attaching – Regularized interests to regularized interests

This translation occurs exclusively in the stratum of regularized interests and aims to connect new actors and re-connect existing ones. The functioning mechanism is very similar to that explained above for reconceptualization. As the project advances, actors change their roles and new actors come on board. Project managers build regularized elements to motivate them to commit, convince them to stay aligned, and discourage them to seek better alternatives among their other connections.

Not all needed actors are attached to the project network of interests from the initial stages. We observed that, in general, the project is driven through the planning phase by a coalition of members of the management team, client representatives, experts in specific domains, and representatives of several functions within the parent organization. Large infrastructure projects may also involve designers and sometimes a construction manager. Other teams, contractors, subcontractors, suppliers, etc. are only connected in later stages, as they join the project to help with its fulfillment. For instance, project TerminalL first involved the architect team because they needed to clarify the project interest in terms of cost estimates and detailed solution. It then attached the project management consultant to help with project coordination, contracting, scheduling, controlling and so on. Construction manager organizations for

different subprojects – terminal building, central utilities plant, parking garage – came on board gradually after that, with the design builder for the infield subproject joining last. All other subcontractors and suppliers were connected subsequently, as needed.

Some projects are implemented in multiple locations, so local actors are aligned progressively. Project DigitS aimed to implement a new telecom system in tens of different international locations, and it did that sequentially, so local teams and collaborators came on board gradually. The new high-speed railroad in InfraR was built over 190 km and included the refitting of seven railway stations along the way. The project managers split the construction in four relatively autonomous sub-projects and although these overlapped to some extent, they awarded work packages at different moments in time.

PharmaA planned to develop a new drug that would be sold internationally. Once the initial tests showed its potential, the project team moved to an international scale and did more tests in multiple international locations to confirm its efficacy and safety on different ethnic groups. After receiving positive results, they applied for approvals to several regulatory authorities. In this sense, the management team gradually built more regularized elements, as new clinics, laboratories, patients or legal advisory teams joined the project.

We observed that often the process of reattaching takes place at the political and volitional level and is developed in parallel with the process of reconceptualization, which takes place at the cognitive and technical level. As the project goes through its lifecycle, new visible elements are created to reflect decreasing ambiguity and new actors become involved and others withdraw, as they take on or complete their assigned tasks. Reattaching means expanding the coalition that would adequately support project completion.

5.4 Agitation - Spontaneous interests to spontaneous interests

The network of actors' spontaneous interests is rather unstable, actors are in a state of restlessness and manifest new, often diverging interests. Some of these spontaneous interests could lead to major changes and we will discuss these in the next chapter. Some others are taken to the project social arena and lead to the creation of new regularized elements or modification of existing ones, in order to align the newly displayed spontaneous interests; we named that translation positioning and discuss it in a later section in this chapter. In our view, agitation refers to spontaneous interests that are manifested at one point in time and then either completely abandoned or temporarily disregarded.

Actors could exhibit spontaneous interests, but some are simply ignored by the project management team or by the other actors. Encouraged by the initial success in imposing some of their interests, when they managed to significantly shorten the project InfraS schedule (this episode will be discussed later in this thesis), the association of local businesses repeatedly asked for more advantages, all along project lifecycle, in order to compensate for the disturbance of their daily activities. Although some claims were taken into account, most of them, such as tax exemptions or a further shortening of the schedule, were either not under the jurisdiction of the project team or considered unreasonable by the project management.

> *"C'est sûr que eux autres [les commerçants], y... criaient tout le temps... y voulaient qu'on baisse leur taxe... C'était leur inquiétude ... La première chose qu'y nous disaient - Mais nous, on était pas là pour ça... On était là pour les aider à passer à travers le chantier..."* (Interviewee 2, InfraS)

> *"On disait tout le temps... ces réunions là sont là pour tout ce qui touche le technique... Moi, tout ce qui était technique, j'avais aucun problème... Quand y venait le temps de nous demander... de... de pas payer de taxes, de pas payer*

des choses comme ça... Y arrivaient, nous le demandaient ... Mais on pouvait jamais rien faire... Ça, c'est d'ordre plus politique. C'est pas au point de vue technique qu'on peut répondre ... (...) Ça, ça devenait pénible parce que à chaque mois, y nous revenaient avec ça mais nous, on pouvait pas rien faire. (...) On avait beau leur expliquer... C'est un aspect qu'on touche pas... les exemptions de taxes" (Interviewee 1, InfraS)

Another example could be that of groups opposing projects in the oil and gas industry (EnergyEX) or the construction of new hydroelectric power plants (EnergyH). They manifested their disproval, but the project management ignored the demands, considering that projects had been properly planned – for instance, project EnergyEX even won an award from a prestigious non-profit organization for being the most environmental friendly project in the oil industry of the year. One final example in this category comes from the project DigitPTIS, where one partner unsuccessfully tried to get more power and impose its view on several different occasions.

Some spontaneous interests were manifested, but their impact on the project was negligible. Different animosities determined three project managers to leave the project TerminalS, one by one, but a member of the management team was always able to fill in. Similarly, leadership changes in EnergyH insignificantly affected the overall project development. First, the project director quit EnergyH to pursue his career at a higher level and the site manager smoothly replaced him. Hoping to be the new site manager, one of the sub-project managers was not happy with the person actually chosen and purposefully started to be less collaborative and assumed responsibility out of his designated area. The new project management team ended up deciding to replace him before the project would suffer any negative consequences.

"Ce gars-là avait déjà été chef chantier, sur un autre projet plus petit, et il aurait voulu être chef chantier, il avait un tempérament qui faisait qu'il avait de la difficulté à accepter de ne pas avoir été nommé chef chantier. Donc, souvent l'information qui partait de chez lui et qui montait là, c'était problématique, ce n'était pas tout à fait transparent (...) Bien, le plus gros

point, c'est que lui, il aurait voulu avoir la job de lui, et il gérait ses entrepreneurs et sa façon de faire avec son équipe, parce qu'il y a plein de monde en dessous, d'une façon qui ne plaisait pas au chef chantier. Il avait beau lui dire « Non, non, ne fais pas ça comme cela », ça ne se corrigeait jamais. Ça faisait quelques fois que le directeur avait averti ce monsieur-là (...) Donc, moi je suis allé le rencontrer. Mais avant, j'ai parlé à mon boss, en disant « Là lui, je le sors de là, j'ai un plan pour le relocaliser à telle place. » Je suis allé le rencontrer et je l'ai sorti du chantier. On en a mis un autre à la place."
(Intreviewee 2, EnergyH)

In the projects InfraR and DigitBIS unclear performance criteria allowed some contractors to behave opportunistically and deliver products and services below the expected quality and with short delays, but this also had a minimal impact at the project level. Signs and panels were vandalized over one night by unknown individuals, but the development of project InfraS was not perturbed.

Another mechanism to translate spontaneous interests is by referring to the corresponding regularized elements that were put in place to prevent exactly that kind of behavior. Contractors could often manifest their financial interests and make money claims but, when the agreement is clear, the project manager could easily realign them, such as in projects EnergyH, DigitPTIS, InfraS or TerminalS. For example, facing an unexpected situation, the main contractor of EnergyH had to acquire a particular technology to be able to continue its work. An agreement was reached, regarding the extra work load and the associated financial compensation. On top of that, to make sure no additional issues occurred and to also motivate the contractor, the project manager agreed with purchasing additional tools, as reserves. Despite that, later on, the main contractor still asked for a re-evaluation of the agreement, but the project manager was able to refuse it based on the revised regularized elements governing their relationship.

Tensions, animosities or pride were also kept under control with the help of regularized elements. Divergent interests and personal animosities affected collaboration within the core team of TerminalS, but partnering sessions helped improve some of the

relationships. Others did not change, but contractual agreements and project manager's coordination managed to impose a decent level of collaboration, in spite of personal animosities. Similarly, the project manager of PharmaS coped with regular attempts of different functional teams to assume a more important role in the project on the basis of their scientific primacy, by referring to the initial agreement and by using her coordination skills to balance all teams influence.

Finally, in a few cases, actors willingly renounced manifesting their spontaneous interests, because the motivation to work for the project and the friendly ties with other actors were stronger than their divergent interest. This is how some contractors overcame their conflicts in projects TerminalL and TerminalE or how teams dealt with problematic deliveries in DigitA, DigitBIS and EnergyEX. Similarly, the project manager of DigitS changed his mind about quitting his position within the project, despite strong dissensions with the representatives of the owner and the client organizations.

In conclusion, agitation refers to spontaneous interests that actors manifest at one point in time, but with no significant impact on the project. This happens because actors do not have sufficient power on that matter to impose their will, exhibit the interest but do not act in consequence, or simply change their mind regarding the manifestation of their desires or regarding the moment in which these desires are displayed (see Mitchell *et al.*, 1997, but also Ross, 2009 and Sloan and Oliver, 2013). Our findings are in line with previous perspectives, such as actor-network theory and stakeholder theory, with regard to the existence and exhibition of diverging spontaneous interests and with regard to the limited impact on the project – because actors fail to gather a coalition to support their claims (Callon, 1986) or do not have the required power, legitimacy or urgency to reach their goal (Mitchell *et al.*, 1997).

5.5 Thematization - Implicit representations to explicit representations

Thematization is the process of translating implicit representations to explicit representations. This occurs when certain colliding routines or habits can be (re-)separated and harmonized only by building corresponding explicit elements that would (better) define the cognitive connection. Thematization could lead to either creation of new explicit connections that have been previously missing or to the modification of existing ones that have been unclear or incomplete.

Planning activities involve many thematization processes, as different pre-project implicit representations need to be harmonized. The final design is a compromise between perspectives of many different functions and actors. Sometimes, even within the same domain, actors can have diverse practices to which they find difficult to renounce. One interviewee explained the struggle of dealing with two engineering teams in designing a solution for one subproject in TerminalE:

> *"The other problem with something like bomb-blast doors is you get a lot of very technical engineers talking to each other (...) A lot of engineering is about opinion: "- I'll use a factor of 1.2!", "- Oh no, I never use that, I use 1.35!", "- And what's that based on?", "- Well, it's just what we use!" (...) But, then you've got to get them in the room and they do talk a very strange language. "- What does that mean? Explain that! Okay, you want a decision on that, can we do that?" "-No, you can't do that because ..." "- Well, somewhere in the middle we have to get some agreement here!" (...) So, I think the people had to get in the room and say right, you know, explain to one another what you're talking about and honestly a lot of it I couldn't understand. But, you can understand that you are getting to a point where a decision needs to be made if there is some agreement and we're not leaving this room until this is sorted out. And people with laptops are showing each other graphs and: "- Do you now agree? Well, write down that you both now agree that that's okay! On a very detailed level!"* (Interviewee 5, TerminalE)

Other activities could be seen as thematizations as well. For instance, risk management sessions are a way to put together different actors' implicit representations about future

uncertainty and threatening events, and so build a common explicit representation of this future. While all projects carried on risk management activities, large infrastructure projects were particularly careful with these exercises and involved not only members of the project core team and representatives of different functions and contractors, but also external experts.

One other type of thematization was generated by the collision between actors' pre-project representations about how certain activities are done and the project specific implicit representations regarding how these activities were actually developed. This collision required later changes in explicit representations such as procedures, budget or schedule to harmonize the plan with the new project reality. In projects EnergyEX and TerminalE, the initial plan did not take into account details of certain activities, so the budget of those activities needed to be later adjusted. The number of people needed in one subproject in EnergyH was also under estimated, so the plan incorporated some changes in team distribution, composition and schedule of activities. Conflicting understanding of the railway station design between the architect team and the main constructor in InfraST resulted in budget increases. Tests required to validate some technical solutions took more time in DigitBIS and in consequence the schedule and order of related activities were changed.

Sometimes, these small adjustments of explicit representations went in a positive direction for the project. Some contractors used specific work routines that allowed them to deliver their work packages earlier than previewed, such as in InfraR or EnergyTP:

> *"On the detailed construction, there was a particular crew or particular contractor that was... that had a better productivity than we planned... And that opened an opportunity to change the schedule and moved them on to something else, you know..."* (Interviewee 1, EnergyTP)

Similarly, the innovative work style of the steel contractor in TerminalE helped them work faster and involved design and schedule changes:

> *"For reinforcement, for instance, they had this business of using roll mats for reinforcement, pre-fabricating the reinforcement, putting it on the truck and taking it across the road and then pouring it. The business of erecting steel was much quicker. There were changes in design as a consequence."* (Intreviewee 2, TerminalE)

In some projects, new explicit representations were created as a result of colliding implicit representations. For example, the temporary-changed traffic and parking rules in InfraS, as well as rules of safe circulation on the construction site were understood differently by contractors working on the site and the public and local businesses. This confusion was solved by installing additional road signs and a more clear traffic signalization. In a similar manner, new communication and information sharing procedures were created between certain teams in projects DigitBIS and TerminalE after initial incompatible work styles.

Sometimes the thematization was refused by one of the actors involved, and the project management had to intervene to (re)synchronize representations. For example, incompatible communication routines between one designing team and the team representing the future operator of TerminalL were fixed only after the issue escalated to the level of project manager and the vice-president of operations, respectively. The initial attempts made by the teams directly involved did not lead to any solution, and only after the involvement of higher hierarchies new communication protocols were put in place.

Considering the two main types of implicit representations that co-exist in projects, thematization could be generated by collisions between different pre-project representations, between project-specific representations, or between pre-project and

project-specific representations. These collisions have a higher magnitude and could not be solved through fine re-adjustments within the stratum of implicit representations, so they had to go through a drift-like translation. In order to be re-synchronized, actors need to take them into the project social arena, invite public awareness, and create explicit elements that would standardize solutions for those specific issues. A somewhat similar mechanism was theorized by Nonaka (1994) as externalization. In his view, in order to transform tacit knowledge into explicit knowledge, actors organize meetings and in "meaningful" discussions "reveal hidden tacit knowledge that is otherwise hard to communicate" (p. 20). While the motivation and development are different, we retain the idea of public discussions to create explicit elements that are understood by the concerned actors in a similar manner. At the same time, the idea of creating a social representation out of actors' implicit representations is in line with the literature on sensemaking (Gioia and Chittipeddi, 1991; Weick, 1979).

Finally, we observed that this translation is also a form of moving from concrete to abstract or more general frameworks, for example, to generate a general procedure that would solve specific work problems (see also Floricel *et al.*, 2011b).

5.6 Routinization - Explicit representations to implicit representations

Routinization is the process of translating explicit representations to implicit representations, so the opposite of the previously-presented thematization. As a result, project-specific implicit representations are created or modified.

Actors applied their pre-existing cognitive frameworks to give sense to new explicit representations (see Gioia and Chittipeddi, 1991). The diversity of these frameworks led to a diversity of interpretations, sometimes conflicting. Differences were observed

between actors that belong to different countries, organizations, departments, professions, and between actors with different roles in the project. The German construction contractor in project EnergyH interpreted the distribution of roles and areas of responsibilities in a way in which he was used to from his native country, but which came in conflict with the understanding of Canadian subcontractors and workers unions. Similarly, in project InfraR, quality of deliveries, responsibilities and communication protocols were understood and applied differently by Italian contractors, German contractors and Swedish project management.

Interpreting technical specifications and even standards often led to disputes in projects TerminalS, EnergyTP, EnergyEX, EnergyH, DigitPTIS, DigitBIS or PharmaB. As one interviewee explained:

> *"For instance, if the specifications say: "it has fire protection to... such and such a standard." Well... then when people come together, and say: "Well, I might dispute what that standard means ... The way we interpret that standard may be different than the way the engineering company did or the way [name of the project owner] does..."'"* (Interviewee 1, EnergyTP)

However, more often than not, routinization leads to rather compatible implicit representations. And as successful synchronizations are to be replicated, routinization could also take the form of what has been called learning in the previous literature (Bresman, 2013; Bresman and Zellmer-Bruhn, 2013; Prencipe and Tell, 2001; Shepherd *et al.*, 2011). At various moments during project lifecycle, certain actors – usually the project management team – organizes learning exercises, so that lessons become implicit – or internalized in Nonaka's terms (Nonaka, 1994). These learning sessions usually take place either after significant crises or between major phases. For instance, after tests revealed that the new drug provokes kidney toxicity, the PharmaS project management team gather together representatives of different disciplines and departments to better understand the causes of this toxicity and its implications for

future research. Director of project TerminalS organized a learning exercise after the software for access doors malfunctioned in the opening day of the first phase of the project. In DigitBIS, the sub-project manager responsible with IT solutions encouraged several small learning sessions for her teams to share solutions to common technical issues. Finally, project managers of EnergyEX and TerminalS organized ample learning sessions at the end of the first phase of their projects, so misunderstandings, conflicts and mistakes would be avoided in the subsequent phases.

This learning could also happen on a more regular basis, for example when actors learn to collaborate and communicate with each other. This was the case in InfraR, when only after more than a year the collaboration with regulatory authorities became smoother:

> *"And to some extent they were inexperienced, they could not take the decision. And that took more time, and for a project that has to pay for its rents it's a bad thing. Time is crucial always in projects. But, after a couple of years they got, let's say, comfortable with the documents we sent in, they had confidence in our studies and so on. So, then they could take quick decisions, and that moved the project forward."* (Interviewee 2, InfraR)

On the other hand, changing roles within the project hampers the process of learning and requires the development of different collaboration and work routines. In project TerminalS, the project manager and the construction manager consultant could not keep their collaboration routines developed during the first phase of the project as the role of the consultant changed. As the contractual approach changed from a flexible cost-plus contract to a rigid lump-sum, the consultant lost its active role and coordinating capabilities and became more like an external advisor. In consequence, the project manager could not have the same level of collaboration when unexpected events occurred and often had to deal directly with the contractor.

Finally, our results suggest that explicit representations have to be salient to involve a process of routinization. If not, actors simply ignore them and use implicit representations with which they are more comfortable – replicate their old routines (Feldman and Pentland, 2003; Giddens, 1984). For example, the project DigitPTIS prepared a boundary team to synchronize representations of the two main contractors in order to encourage and coordinate their communication. However, during the first years of project lifecycle, the project management disregarded the importance of this team, the contractor responsible for the role neglected its responsibilities, and the two contractors followed their work routines and limited communication with each other, which created major incompatibility issues and delays.

In conclusion, we observed that project-specific implicit representations grow around explicit elements, through the process of routinization. The result could take different forms, because different social actors understand explicit representations differently (see Tukiainen *et al.*, 2010). We found similarities with the processes of learning (Bresman, 2013; Prencipe and Tell, 2001; Shepherd *et al.*, 2011), internalization (Nonaka, 1994), and sensegiving (Gioia and Chittipeddi, 1991; Rouleau, 2005).

Moreover, we observed that often routinization and thematization come in pairs, since the explicit representations created through thematization have to be applied and understood in a harmonized way to eventually solve the conflict that led to the initial thematization. Symmetrically, colliding project-specific implicit representations resulting from routinization are sometimes synchronized through the process of thematization.

5.7 Positioning – Spontaneous interests to regularized interests

We call positioning the translation of spontaneous interests to regularized interests. Actors manifest new desires, affinities or animosities and require new agreements that would satisfy them. The existing regularized elements cannot keep them aligned or else the translation would have taken the form of what we described above as agitation. Hence, new agreements are elaborated or the existing ones are amended.

Sometimes actors considered that the initial agreement did not include all their desires, so they ask for this agreement to be revisited. For instance, after a successful, but temporary equilibrium, the association of local businesses demanded the InfraS project team to facilitate daily deliveries to their stores. The project re-aligned them by organizing temporary areas for deliveries and providing small delivery trucks. However, the most common case of this type of positioning is when clients or owners ask for new desires to be fulfilled by the developing project, so agreements need to be adjusted accordingly. For example, clients of DigitPTIS and DigitA, as well as the future operating team of the interrelated project in EnergyTP constantly asked for new technical specifications to be added to the final solution and in consequence financial, time or other aspects of the initial agreements were modified to reflect these changes.

> *"But then it ended up in a series of conversations around specification changes... And often, their new operating people would want to have something (...) But, we have got ... to think of all the implications, all the cost implications, the schedule implications ... Because it is not only... you just change one valve... You change construction and schedules... (...) Well... in the final analysis... the commercial contract... reasonably... not only protected [EnergyTP] interest..., but also was a fairly solid basis for renegotiations with the customer, when the customer was in a vastly changed circumstance."*
> (Interviewee 1, EnergyTP)

New interests regarding design could satisfactorily be taken into account due to the initial fairly-made agreement between the project team and the architects in TerminalL:

"One thing I would say is that in our negotiations and our initial development of our ..., not only scope, but our method of working with the clients, at the outset, to some degree we agreed which is (...) we agreed the types of things that would be additional services. So that, at least we had vehicles to make what I think, [the project manager] who you yesterday met, would call a win-win situation. You know, the goal was that ... they get you to build a good building and that we could do a good job professionally and that we could get paid reasonably, not unreasonably and not, you know, too little." (Interviewee 6, TerminalL)

Other actors felt their interests as a distinct group were not taken into account when the project was initiated. This was usually the case of future users or operators, and of actors indirectly affected by the project output. In project DigitPTIS, the new information system would affect different groups working at the owner organizations: bus drivers, metro operators, marketing and sales teams, maintenance and IT, etc. While some would be able to adapt with minimum training, many blue collar groups and particularly maintenance teams and bus drivers were concerned their positions would become obsolete or they do not have the skills required for the new positions. The project team organized sessions to explain the new system and some additional activities were added to offer sufficient training. In order to convince the skeptical union members, both contractors were involved in information and training sessions and one even invited some union representatives at their production facilities. The effort paid off and the groups were eventually fully co-interested in the project.

"Faut pas oublier on est dans un environnement syndiqué; il y a trois syndicats différents, trois accréditations syndicales différentes. C'et très fort, c'est très très très très fort. (...) Même si le syndicat a dit c'est bon, ils représentent un certain nombre d'individu, on s'entend il est supposé tout les représenter mais bon il y a ceux qui adhèrent et il y a ceux qui adhèrent pas. Et puis il faut essayer de faire que ce soit un petit peu plus vendeur, nous on avait organisé de présenter le véhicule à tout le monde donc on l'a présenté ici aux chauffeurs, on avait un horaire, ici aux employés on a laissé le véhicule ici en avant-midi, les gens allait durant la pause, et puis on avait des gens dans le véhicule pour expliquer comment ça allait fonctionner, on a fait les autres centres

d'exploitations, on a fait tout les terminus qu'on appelle, puis on l'a mis dans les terminus pour le présenter à la clientèle, pour que les gens puissent aller voir, ça va ressembler à quoi, comment ça va marcher. Donc a fait ça, on a fait aussi des présentations dans des salles de chauffeurs, avant même que tout les véhicules soient équipés, on leurs a présenté comment ça allait s'installer, on a présenté les équipements, c'étais nouveau ça aussi, il n'avait pas l'habitude. (...) Vraiment ça été profitable, quand on dit que c'est payant mais là oui, ça été payant. À deux reprises on est allé dans les salles de chauffeurs avec des montages spéciaux, des banderoles qu'on avait fait faire, on organisait tout un kiosque, on répondait aux questions ... " (Interviewee 7, DigitPTIS)

Animosities between project participants sometimes reached the level where, in order to be solved, they had to be taken into the project social arena and relationships significantly redefined. Often this meant the actor that could not be realigned was removed from the project, such as leaders of certain project teams in EnergyH, DigitPTIS and DigitA. Others actors refused realignment in the new conditions and left themselves, such as two successive project managers in TerminalS after personal conflicts with the client representative. The most prominent case involved several contractors' teams in the roads and bridges subproject in TerminalL. In order to solve the conflict, the project manager involved an external professional mediator who successfully coordinated all actors re-alignment. Some more problematic leaders of contractors' teams were replaced from the project.

"In the ground side, particularly building the roads, we were at a point where we were going to fail. We were going to fail, we were going to end up in court, we were not gonna have our roads, it was really a mess. And everybody was pointing at everybody else, it was really falling apart. He [the external professional mediator] came in, got the original participants, I mean, high level people, presidents of the companies, we sat in around for two days, and he rescued it. I mean, it was amazing! I went away shaking my head. He turned it around what was a definite failure, because he had some very strange techniques ... He had some of the project officers, some of the juniors in, and he make them sit in a chair looking out the window and then just that went all the frustrations, with their presidents sitting and listening. We had that for two days and afterwards, it was interesting ... four people were fired immediately, and these things ... you know, when you heard all the frustrations from all sides

and everybody sat there ... The guy had this skills as an intervener, as a facilitator to use these tools. He was magic. I became a convert. He saved us. We would have sunk. 'Cause everybody, of course the senior people on each of the company was backing their own guys and, you know, listening to these stories... What we really need was to come back and say: "remember that we all agreed we would gonna build that? Now listen to what these people have to say! You guys, you didn't get to where you are in these companies by being fools. You listen to what they're saying and then we need us around this table we've got to solve this or is gonna go in a tank" And everybody agreed that it was gonna go in a tank, and it was magic." (Interviewee 1, TerminalL)

Actors constantly manifest spontaneous interests and as some become important, enter the explicit arena and need to be discussed. We could say that interests translated through the mechanism of positioning are powerful enough to reach the project social arena and to be taken into considerations by other actors (Mitchell *et al.*, 1997; Werder, 2011). Most are easily solved by adjusting existing agreements and commitments or by elaborating new ones. However, we observed that, in some cases, actors preferred to dis-connect and leave the project – similar with the exit strategy presented by Hirschman (1978).

5.8 Acceptance - Regularized interests to spontaneous interests

The opposite translation to positioning is acceptance and regards the mechanisms that actually keep actors aligned. Acceptance translates regularized interests to spontaneous interests or, in other words, channels their material impulses toward supporting the project coalition by discouraging divergent interests and by cultivating affinities and adhesions.

We found two main mechanisms to gain and maintain actors' acceptance: one emphasizes collaboration, strong ties and voluntariness and so focuses on building adhesive connections; the other appeals to power, hierarchy, weak ties and directions

and therefore favours coercive connections (Brady and Davies, 2014; Granovetter, 1973; Levina and Orlikowski, 2009; Ruuska *et al.*, 2011). We noticed that most projects used a combination of coercive and adhesive connections, although some had a preference toward one or the other.

Coercive connections oblige actors to stay aligned with the project goal. Rigid contracts, penalties, market position, political influence or hierarchical ties were all used to force actors to behave a certain way. We identified coercive mechanisms in all projects, used either at the project level or at least in some parts or phases of the project. They were preferred for their simplicity, such as in the second phase of TerminalS or some subprojects in TerminalL and EnergyEX, and their efficiency in aligning actors, such as in EnergyH, EnergyTP, DigitS, and the second part of DigitPTIS. For example, they were great in speeding the decision making process by imposing the powerful actor's interest.

However, sometimes the results were the opposite of those expected. For instance, project managers of DigitPTIS and EnergyH emphasized this kind of connections and ended up imposing technical requirements against contractors' will and advice. As a consequence, some requirements could not be eventually incorporated, but generated frustration and required additional effort to realign:

> *"Ils ont modifié un câble, nous, on a un câble entre la console du chauffeur et la BPE qu'on livre d'une façon. Eux ils nous ont dit non non non, il faut que ton connecteur en bas soit à 90 degrés. On a fait redesign ça sur une pièce de plastique, c'est pas simple, du gros plastique industriel. Là maintenant il est à 90 degrés, ils sont contents. Mais là ce qui arrive c'est que vu qu'il est à 90 degrés, ça mis un affaiblissement dans la gaine et là la gaine se met à sortir et ça, ils nous ont dit c'est un défaut systématique. On l'a rejeté ça pas été trop long. Si vous aviez pris notre câble standard, ça ferait pas ça."* (Interviewee 8, DigitPTIS)

Actors maneuvering coercive elements, could even intervene in bilateral relationships and impose their will. In EnergyH, contractors' mutual relationships were not only governed by their own interests and affinities, but also by the project management's will. Conflicts were often solved in this way and externally imposed solutions had to be accepted and applied. Similarly, higher hierarchies intervened and realigned different functional teams within DigitBIS, PharmaS, PharmaR and DigitS.

One particular way of using coercion was to have a strong control of the network of connections and disconnect certain actors to diminish their influence. In project DigitPTIS, the project manager reduced the number of connections through which partners or teams could bypass the chain of command and impose their spontaneous interests. He built closed teams that would only communicate top-down, and forbade any other communication with the exterior. The project manager himself had to respect the established relational configuration:

> "Un exemple, ici, il y a une salle de tests, moi, encore aujourd'hui, je n'ai pas le droit de rentrer. C'est juste les gens de tests qui pouvaient rentrer. Parce que sinon, tout le monde serait rentré et là «Tu pourrais tu me faire ça?». Ce qui fait qu'on a utilisé une technique qui n'est pas habituelle: la force des silos. (...) Il n'y avait pas de collaboration, on avait édicté, on avait presque interdit la collaboration." (Interviewee 2, DigitPTIS)

On the other hand, adhesive connections emphasized voluntary commitment, friendship and collaboration. In order to align the actors, the mechanism involved weakening actors' links with their parent organization and strengthening connections with the project organization. Project subteams would not be representatives of various organizations anymore, but part of one united team. The project interest would become primordial as opposed to their organization interests, so their spontaneous energy would be use to fuel the smooth project development. Project TerminalE is a great example of successful adhesive connections that lasted even beyond project lifecycle (see section 4.3), but other projects also managed to create spontaneous adhesion, at

least in some parts or phases of their development, such as TerminalS, TerminalL or InfraR.

However, since projects are ephemeral, but the parent organization will continue to exist even after project completion, this mechanism was not without flaws. This issue was particularly problematic in matrix organizations with two sets of powerful connections in parallel: one within the project and one within the department, such as in projects DigitA, PharmaS and PharmaR. Project leaders and their teams had to also consider their future beyond project lifecycle, and cultivate connections within the parent organization. This limited their independency in taking decisions in the interest of the project. The project manager of DigitPTIS explains this struggle and his advantage as he planned to retire after project completion, so not being concerned with the struggle:

> *"Je suis supposé prendre ma retraite dans 2 ans. Donc j'attends que le projet se termine et je quitte. C'est un avantage d'ailleurs. (...) Quand tu es quelqu'un de l'interne et que tu retournes à ton ancien poste ou que tu restes dans l'entreprise, ça devient un moment donné difficile. Tu penses à ta carrière, il faut que tu te protèges. Souvent, tu n'iras pas au maximum de ce que tu devrais peut-être. Pas l'effort que tu ne mettras pas mais amener la solution ou amener le projet où tu penses qu'il doit aller. Moi, on a conçu. C'est notre bébé. (...) Et après ça je m'en vais. Moi je ne retourne pas dans les autres opérations. Ça me donne une liberté que d'autres n'ont pas nécessairement parce qu'ils m'aiment ou qu'ils ne m'aiment pas, je m'en fous. On m'a choisi pour ça aussi."* (Interviewee 3, DigitPTIS)

From our observations, we can conclude that coercive connections assumed the limited temporality of project organizations, so focused on building elements only strong enough to keep actors aligned for the duration of their involvement in the project. On the contrary, adhesive elements aimed to build open-ended connections, which would extrapolate to future periods, contexts and situations.

Similarly with the thematization – routinization pair, positioning and acceptance also come together. Through positioning, actors express new interests, desires, fears, affinities or animosities and new agreements and commitments are necessary to incorporate them. However, actors are re-aligned only after they accept the newly built visible connecting elements, so only after a process of acceptance also takes place. On the other hand, regularized elements that are not able to keep the actors committed and aligned, lead sometimes to positioning, as these need to be modified, or new agreements put in place.

5.9 Conceiving – Volitional connections to cognitive connections

Conceiving is the translation of volitional connections to cognitive connections. Actors project certain representations of the project according to their own interests and this could lead to the formation of new project-specific representations or to the alteration of existing representations as actors' interests change or are manifested.

In all projects, we observed numerous examples of representations being built to reflect actors' affinities, animosities, desires and interests. For instance, the team that initially worked on the drug developed in PharmaA later sold the idea to a large pharmaceutical company, but desired to keep autonomy in their activities and also selling rights for certain countries; the contract as well as later communication protocols and work procedures reflected their requirements. In Project InfraST, one actor refused to share responsibility for a part of the project in which he had no expertise, so the project scheme clearly showed this separation:

> *"The project [InfraST] is the blue and the red and the yellow parts. (...) The yellow part is done by the [name of partner 1], the blue part is done by [name*

of partner 2], and ... yeah, there is always a place where we meet each other and that's in the red part." (Interviewee 4, InfraST)

Competing interests could reflect in competing representations of the future project. The initial design of project InfraST reflected project initiators' pride of being recognized as parents of a monumental and spectacular artifact, despite the unrealistic budget and complexity. The local politicians from opposition parties express their concern with the project magnitude and, when elected, imposed their own will on developing smaller projects which was later reflected on the new design of InfraST.

> *"The City wants to make ... big central station, nice central station. They see things happening in the city, they want to ... put real estate in it, they want to have a nice area in the city (...) We're the first stop coming from South, it was a pride to make it ... This is [city name]. (...) He [the local opposition leader] was looking at that plan also, from the City, and he said it was megalomaniac, it was too far away of ... of the reality. And there were elections here, in the city, and he came to rule and then it was over with that plan."* (Interviewee 2, InfraST)

> *"He [the opposition leader] won the elections. And his party was against projects, great big projects. So, when they were in the government of [city name], in 2002, projects like that were ... cut (...) It was a political item from them, during the elections, to stop huge projects. We have the word 'megalomane', that was the word [the opposition leader] used ... So, the other party, are the ... the Labor party, he put them on the side by calling them: "that's the party that ... all those megalomane projects". That was his political strategy"* [Interviewee 1, InfraST]

Moreover, we noticed that actors could use cognitive connections to justify and even sugarcoat their will and emotions. We identified such translations from the initial stages of project planning, when actors built elaborate representations to sell the idea to project sponsors, but purposefully underestimate the resources needed, such as in DigitPTIS and DigitS, overestimate the economic or social advantages, such as in InfraR and InfraST, or minimize the risks, like in EnergyH. Similar translations could occur later on, when actors try to impose their will in subtle ways. The project manager

of InfraR was not esthetically pleased with the initial design of the railway station roof top and chose to subtly suggest an alternative design:

> *"It was the original design, the glass was colored ... glass it was colored with red, it was colored with yellow, it was colored with orange ... and it was ... you could see the colors, but also the projection of the colors, so also the platforms would be yellow, orange, and red, etc. It was ... [sighing] ok, it was approved design, but personally, it was terrible! So, I always told our architect: "do you really like your design?" "Yeah, it's very nice!" But, [sighing] I was thinking ...ahh ... this unbelievable ... two and a half hectares, more than 20 000 sq. meters of colored glass over here, waaw, that's not good! So, that was another ... yeah ... challenge for me, but that moment I decided to ... make a mock-up, yeah, and you see ... a very big one, with the colored glass. And, there was nobody who was saying at the time: "waaw, beautiful is this!" All people were: "what is this yellow, red ..." So ... First, I had the challenge to change the design and secondly I had the challenge to integrate the solar system. And that was exactly the match, because due to the solar system the architect was prepared to abandon, his ideas. So, and now, which you see now, if you go outside, you see more white and grey and dark colors. It is not colored, it is white, grey, it's ... yeah ... I think, it's better now."* (Interviewee 4, InfraST)

In conclusion, some elements in their network of interests could lead actors to create new project representations. Agreements and commitments often have a corresponding cognitive form which could be later adjusted as actors' interests evolve. The opposite is also true, and come as a translation that we call interpretation and discuss it in the next section.

5.10 Interpretation – Cognitive connections to volitional connections

Actors transform cognitive connections into volitional connections through 'interpretation'. This translation results into stimuli to interest actors in the project and preserve their alignment. New agreements are concluded or the existing ones are adapted to incorporate the project specific construed representations.

Certain representations could be interpreted as attributing roles and ordering non-hierarchized actors. The actors' volitional connections would then be tributary to dependencies established through schedules, plans or order of activities. Sometimes, the result of such interpretations contradicts the existing agreement and actors need to be realigned. For example, in project TerminalE, unclear areas of responsibility in a particular subproject could only be solved by informally subordinating the first-tier supplier to the second-tier supplier that was doing most of the work in that subproject.

Adjusting existing representations for various reasons could also affect actors' interests and involvement. For example, in project TerminalE, delays of various construction teams and late requirements of the main airline delayed the overall schedule, so the communication infrastructure work package was partly shrunk and partly postponed. In this way, the communication contractor's interests and desires were vastly ignored. As many technical solutions could not be sufficiently tested neither operators properly trained, major communication system issues affected the perceived project success, which, in turn, demotivated the contractor for the rest of its involvement in the project.

> *"We started [TerminalE] with a vision, everyone bought into the vision that we were doing something unique and [the project owner] had advertised to everyone how they were almost a hero in being part of the project. When [the terminal] opened and it failed on the first day and people were celebrating that night the celebrations were slightly tempered with 'I can't believe that happened.' Everyone who existed from March onward through the remediation project, it certainly took the wind out of them, it took the shine and polish off of what they had made strides for years to do. That had a big impact on the guys."*
> (Interviewee 4, TerminalE)

Project representations could appear in light of actors' will as either attractive or dreaded stimuli. This relates to our distinction between coercive and adhesive regularized elements, see sections 4.3 and 5.8 of this thesis. In this sense, team building workshops, partnering sessions or communication protocols that favour collaboration

all motivate actors to stay aligned and work as a team, such as in TerminalL, TerminalE or DigitBIS. On the contrary, multiple levels of hierarchy, segregated silos and numerous means of strict control forcefully position actors within the project, such as in EnergyH or DigitPTIS.

Conceiving and interpretation form the third pair of opposite translations, along with thematization/routinization and positioning/acceptance. Analogously, we noticed an interplay between cognitive and volitional connections (see also Bercovitz and Tyler, 2014). Project specific representations are translated into stimuli to align actors with the project interest, and, in turn, actors' interests shape project specific representations accordingly. We go beyond dualistic views presented in chapter 2 and suggest that the rational and material realms are in close relation and mutually influenced each other (Damasio, 2006; Descartes, 2003; Nietzsche, 2000).

5.11 Discussion

The analysis of our initial four-stratum framework in the context of 18 real-life projects enabled us to suggest that the project network of volitional and cognitive connections goes through a continuous redefinition. The four strata have specific mechanisms to deal with and incorporate smaller changes and weaker impulses, while keeping the same connecting paradigm (Kuhn, 1962; Liguori, 2012). For instance, new actors' interests are aligned without a significant alteration of the regularized elements stratum, in other words without affecting existing agreements.

Translations occur in response to missing, unclear or conflicting cognitive and volitional connections. Actors fill in the void by creating, for example, project-specific implicit representations to understand project explicit elements. Small collisions between work routines lead to a better definition of either actors' implicit

representations or project explicit representations. Slightly divergent interests realign in response to either stronger connections to the project goal or to guiding regularized elements. When not possible, new agreements and commitments are formed or existing ones are amended. The actors' alignment is successful if they accept the project goal as one of their own goals. In this case, actors direct their spontaneous impulses toward supporting this goal and marginalize impulses that remain unaligned.

Giving their time-limited aspect, projects do not develop a wide range of specific implicit representations. However, the routinization translation is particularly useful in scrutinizing the compatibility of newly created or modified explicit representations against existing representations. Most incompatibilities, even between explicit elements, become evident only when activities are performed in a routinized manner.

We observed that translations could happen at various moments in time, with a variable frequency, and in different forms. They could be initiated by any actor involved or affected by the project. However, we noticed that the project management team plays a central role in these processes, as it coordinates project development and tries to maintain a certain stability of its structure. For instance, the project management team coordinates the expected (re)conceptualization and (re)attaching processes associated with the integration of new actors that join activities all along project lifecycle. It also encourages or sometimes forces thematization and positioning to solve subtle conflicts. In general, giving its central position within the network of project connections, the management team is or tries to get involved in all types of translations to ensure a smooth project development.

We also noticed that the elements in the visible strata are often correlated, as actors project their interests in form of project representations and interpret existing representations in terms of stimuli aligned with their interests. Often new elements are added to the two strata in a coordinated way, especially when new actors join the

project and both their volitional and cognitive frameworks are synchronized with the project structure. The two strata together compose the project social arena, a coherent project image as it could be seen by external and internal actors.

The important observation is that all these translations are actively happening during stable periods. They could be seen as means to release tension and lower the number of radical transformations, by not allowing conflicts to escalate. However, at times, the project structure is overwhelmed by certain impulses and, major alterations on multiple strata are required. We call these radical periods structuring episodes and see them as sequences of multiple translations that unfold in a coherent manner. We discuss them in detail in Chapter 7, but first, in Chapter 6 we elaborate on the type and role of triggering events in launching structuring episodes.

CHAPTER VI

TRIGGERING EVENTS

Our research results appears to suggest that the project configuration of cognitive and volitional connections is stable for most of the project lifecycle and has the ability to cope with most conflicts and misunderstandings that occur naturally in a project. However, we also found that, at times, these conflicts overcome a certain threshold and the project configuration of relations needs to change at a more profound level to be able to incorporate them. In this chapter we focus on the triggering events that lead to these major transformations. The triggering events that we observed were mainly in the form of colliding implicit representations or of divergent interests. Therefore, we discuss these two types of events in more detail in the following sections. We end the chapter we some observations regarding the two type of events and what distinguish them from regular events.

6.1 Introduction

Triggering events did occur and experienced practitioners expected surprises ...:

> *"I don't think you should ever go into any major project like this thinking that nothing's gonna happen, something's gonna happen."* (Interviewee 2, TerminalL)

But some of them were virtually unpredictable ...:

> *"Stuff like that just mentioned it happened in [TerminalL], I don't think that anybody other than a fortune teller could've come up with those ... type of events"* (Interviewee 2, TerminalL)

This observation emphasizes the importance of our topic: it is a real issue, present in all projects, and theoreticians and practitioners alike would tremendously benefit from better understanding when and where such events appear and how managers could successfully cope with them. In this sub-chapter we discuss the first issue – the triggering events that perturb the smooth project development and their locus of generation.

We identified a total of 98 structuring episodes in all 18 projects, so 98 triggering events that generated them (see Table 6.1). We found between 2 and 14 triggering events in each project. The airport development project TerminalE was by far the most challenged, with 14 events, while two bio-pharmaceutical projects (PharmaS and PharmaB), one digital (DigitMIS) and two infrastructure projects (InfraS and EnergyTP) had the smoothest evolution. It is interesting to note that the smooth evolution did not mean performance, since EnergyTP and PharmaS were actually closed, for different reasons, before completion. At the same time, the early closure might explain the lower number of challenges, since these two projects did not complete their lifecycle. However, the main purpose of this research was to understand major transformations and not list all significant changes, so discussions about number of events and comparisons between industries are merely orienting and presented more with the purpose of offering a description of the data we collected.

Table 6.1. Triggering events in projects

Project name	Industrial sector	Location	Number of colliding implicit representations	Number of divergent interests	Total Number of Events
InfraR	Infrastructure – transportation	Europe	2	5	7
InfraST	Infrastructure – construction	Europe	6	3	9
InfraS	Infrastructure – roads	North America	1	2	3
TerminalE	Infrastructure – airport	Europe	6	8	14
TerminalS	Infrastructure – airport	North America	3	1	4
TerminalL	Infrastructure – airport	North America	1	5	6
EnergyEx	Infrastructure – energy	North America	3	3	6
EnergyTP	Infrastructure – energy	North America	0	3	3
EnergyH	Infrastructure – energy	North America	6	1	7
Total	*Infrastructure*		*28*	*31*	*59*
DigitA	Digital – telecom	Europe	3	2	5
DigitS	Digital – telecom	Europe	3	2	5
DigitMIS	Digital – IS	Europe	1	2	3
DigitPTIS	Digital – IS	North America	4	3	7
DigitBIS	Digital – IS	North America	3	3	6
Total	*Digital*		*14*	*12*	*26*
PharmaA	Bio-pharmaceuticals	Europe	4	1	5
PharmaS	Bio-pharmaceuticals	Europe	2	0	2
PharmaB	Bio-pharmaceuticals	Europe	2	0	2
PharmaNA	Bio-pharmaceuticals	North America	3	1	4
Total	*Pharmaceuticals*		*11*	*2*	*13*
Total	All projects		53	45	98

We distinguished between events provoked by collisions of implicit representations and those provoked by divergent spontaneous interests. The former type occurred 28 times in nine infrastructure projects, 14 times in five digital projects, and 11 times in

four bio-pharmaceutical projects. In comparison, events provoked by divergent interests occurred an approximately similar number of times in infrastructure and digital projects, 31 and 12 times, respectively, but much less often in pharmaceutical projects – only twice. This might be explained through the stronger regulatory constraints that shape the project development process in the biotechnological and pharmaceutical sectors. Looking at the project level, digital projects had a rather similar number of events generated by either colliding representations or divergent interests, while in most infrastructure projects only one type predominated. Of course, as explained above, in all bio-pharmaceutical projects most events resulted from implicit representation issues.

In the next two sections we discuss each of these two types of events in more detail. We end the chapter with some concluding observations.

6.2 Events as Colliding Implicit Representations

The first type of triggering events occurred in the form of colliding implicit representations (see some examples in Table 6.2 and a full list in Appendix C). Different actors' assumed or developed implicit representations were not compatible with other actors' representations or with the actual project context and simple translations were insufficient to synchronize them. In the 18 projects, we identified a total of 53 colliding representations that led to structuring episodes.

The most common event was caused by discrepancies between project planners' initial representation of the future project and the later project reality. One first sub-category regards an accumulation of stressors that together formed the event that at one point launched a major project structure transformation. There was no particular activity that lasted too long, cost significantly more or encountered particular complexity, but

multiple such situations that amassed and determined the project management team to alter the configuration of project relations. We found such examples in InfraR, TerminalE, EnergyEX, DigitA, DigitS, DigitPTIS and DigitMIS.

The second sub-category occurred frequently in infrastructure projects as result of project planners misinterpreting or minimizing the impact of harsh soil conditions. The hydro-electrical plant in EnergyEX was built in an area that had been known for its soil instability and sandy texture. Other companies had considered developing similar projects there, but renounced after seeing the feasibility tests results. EnergyH was approved in spite of all these warnings, but ended up going through six different structuring episodes generated by inappropriate soil conditions that perturbed digging the intake channel, vibro-compacting the base of the dam or threaten the construction teams' security when boulders detached and fell on the site. InfraST also had to deal with three different events related to the vast amount of underground water in the construction site that generated complications with regards to the isolation of underground foundation and facilities. In their turn, EnergyEX planners overlooked the network configuration of small rivers and creeks and faced a major risk of water contamination.

A third sub-category regards the inaccurate initial representation of the legislative environment. For instance, PharmaNA was taken by surprise by specific national testing rules in one of its international sites. Similarly, TerminalS could not rehabilitate and so use the old fir beams to decorate the new terminal because the rehabilitation would be done in a mill located abroad and the transfer of beams would be subject to bilateral trade regulations and quotas.

Other projects in the area could also generate events, as project managers could not predict their evolution or could not properly understand their own explicit representations. For example, EnergyEX was competing for the same workforce with

several other large projects in the area, so planned to reach its peak use of workers between peaks of other projects. However, one of these projects was delayed, so the two peaks ended up coinciding. The construction of the metro station subproject in InfraST unexpectedly interfered with a smaller construction project, as the latter projected a horizontal foundation for its building and so overlapping the two construction areas. Even the unexpected configuration and technology of piping and sewage system in project InfraS could be included in this category. The municipality had outdated plans that revealed a very different image than what construction teams found on the site, so initial digging plans and work routines could not be used as planned.

The higher technical complexity of the artifact or service developed in the project is another source of this type of events. Project management teams of DigitBIS and DigitA realized only later in the project that the new technical solutions would require new development platforms. Researchers in PharmaNA discovered after a series of tests that the initial dose formulation is inaccurate and needs to be increased 10 times. PharmaS team identified adverse reactions to the drug in a certain ethnic group and later a high risk of kidney toxicity, which eventually led to project closure. On the contrary, PharmaA team eventually benefitted from this type of events, as they realized the drug could work for the treatment of other, related diseases that were not envisioned initially.

The rules in the environment could change independent of the project evolution. For example the September 11, 2001 terrorist attacks generated a lot of concerns regarding airport security, so the national and international legislation changed accordingly. National agencies were created to recommend specific measures and oversee their implementation. As a consequence, all three terminal projects that we studied, which had been designed before the attacks, had to revisit their understanding of appropriate airport security measures. In the same category, we could include changes in the parent

organizations' strategy. For instance, project PharmaB was affected by its owner's decision to switch to a preservatives-free policy, as the initial drug formulation included preservatives.

Conflicting understandings of project explicit representations was another major source of triggering events. In these cases, two or more actors interpret explicit elements in conflicting ways and so they cannot perform their activities until the conflict is solved. For instance, the two partner organization in InfraR, as well as two contractors in TerminalE went through repeated misunderstandings regarding areas of responsibility, which accumulated and demanded a significant reconfiguration of relations. The two partners in InfraST chose to carry on activities as two separate sub-projects, but each developed its own understanding of the sequence of activities and sub-projects dependencies, which led to multiple conflicts and misunderstandings.

Other collisions occurred between implicit representations developed by the project management team and other external or internal actors. In project PharmaA, public communication protocols were understood differently by the international project team and one national development team. One press release generated a huge scandal, as it was interpreted by the international media in light of international communication protocols, not taking into account national particularities. Project DigitBIS was developed independently by its owner, but the implementation of certain information systems had to be coordinated at the industry level, with other similar projects. The project owners had their own perspectives on the implementation schedule, and DigitBIS ended up being delayed as other projects were not ready to switch to the new system. A more complex situation occurred in project InfraST. The construction budget set up by the project team was translated by architects into an actually more expensive design. Further, the interested contractors had their own perception of the detailed design, so made offers that were almost twice as big as the allocated budget.

In certain cases, regulatory authorities and project management teams understood project outputs differently. For instance, in project PharmaA, regulatory authorities delayed drug approval asking for more tests and clearer explanations, despite their advisory council voting for approval in majority. In a separate case, same authorities delayed approval of the change in the PharmaA drug application method with no clear justification.

Other actors involved in the project could also have conflicting interpretations of the explicit elements set up in the project. In TerminalE, the control tower design and technical specifications meant different things for designers and construction contractors, so eventually construction modules were not compatible because of inappropriate tolerances. In another example, the two main contractors in DigitPTIS delivered technical solutions with major incompatibilities, because they were coming from a different background and using different procedures and even different measurement systems.

> *"Donc nos équipes sont allées en France, eux sont venus ici et là, il y a quelque chose de bien important, peut-être que pour vous ce ne sera pas évident de comprendre, ce n'est pas parce qu'on parle la même langue qu'on se comprend. Je suis très sérieux. Notre culture est beaucoup plus près de celle des Américains. Elle est beaucoup plus éloignée de celle des Français et c'est un peu un leurre de penser qu'on va se comprendre parce qu'on parle la même langue. En fait, leur culture est tout à fait différente de la nôtre et en plus, au niveau ingénierie et tout ça, ce ne sont pas les mêmes façons de mesurer. On n'a pas les mêmes standards. Nous, on est en Amérique, on respecte les standards américains : l'épaisseur des cartes, le temps de réponse, ... Pour eux, ce n'est pas la même chose."* (Interviewee 2, DigitPTIS)

Table 6.2 Examples of triggering events

Type of event	Examples of collisions/conflicts	Example of events
Colliding implicit representations		Project planner's inaccurate representation of project surroundings – difficulties to dig the intake channel due to soil texture (EnergyH)
	Representation of the future project context	Project planner's inaccurate representation of project surroundings – water contamination risk (EnergyEX)
		Inaccurate representation regarding requirements for performing tests in one specific country (PharmaNA)
		Project designers' inaccurate representation of project surroundings – the foundation position of a neighboring building (InfraST)
		National and international legislation change in terms of airports security (TerminalL, TerminalS, TerminalE)
Planner vs. reality	Representation of the future artifact	Drug seems promising for the treatment of other, related diseases that were not envisioned initially (PharmaA)
		In order to avoid future technical issues of compatibility, the project management decides to change the development platform (DigitA, DigitBIS)
Actor vs. actor	Understanding of explicit representations	Repeated misunderstandings regarding areas of responsibilities between the two partner organizations (InfraR)
		Colliding public communication protocols between the international team and one national team (PharmaA)
		Colliding representations regarding construction cost between project management team, architects and possible bidders (InfraST)
		Regulatory authorities delay drug approval (PharmaA)
		Designers and construction contractor colliding representations of the control tower design (TerminalE)

Divergent spontaneous interests	Old interests initially aligned in an inappropriate way; desires never fulfilled	Responsible teams ignore and avoid a specific work package due to its difficulty (DigitBIS)
		Conflicts unions – main contractor regarding work conditions and roles in the project (EnergyH)
		Environmental activists, supported by the court, impose their demand to rebuild the protected area affected by the construction of the railway (InfraR)
		One utility company suddenly decides to improve its pipelines infrastructure when the street was almost fully rehabilitated (InfraS)
		One team from the marketing department attracts a new major client for the parent organization by promising access to the new IS for an unrealistic date (DigitBIS)
Actor vs. project	New divergent interests	The main airline to use the future terminal demands major design changes to better fit its needs (TerminalE, TerminalL)
		The client requires prioritization of certain sites (DigitS)
		The new leader imposes a completely new vision regarding project development (DigitPTIS)
		The newly hired client's operations team demands major changes in technical specifications (EnergyTP)
Actor vs. actor	Changing interests and new attractions	The client goes bankrupt and demands project closure and preservation (EnergyTP)
		The main airline using the airport files for bankruptcy and cannot participate anymore in fitting its allocated space (TerminalL)
		Regulatory authorities suddenly reverse their initial decision regarding passengers flows design demanding a more conservative separation (TerminalL)

6.3 Events as Divergent Spontaneous Interests

The second type of triggering events occurred when actors manifested divergent spontaneous interests that could not be ignored, forcefully marginalized or smoothly realigned through the correspondent translations, so a more complex transformation of the project relational network had to be implemented. We identified 45 cases of divergent spontaneous interests that led to structuring episodes (see some examples in Table 6.2 and a full list in Appendix C).

In spite of the project management team's initial effort to align spontaneous interests of all actors and motivate them to support the project goal, some interests remained unaligned because actors never fully consent with all agreements details or because they simply manifest new desires as new alternative connections attract them. In consequence, we distinguish between events generated by actors displaying new interests and by actors re-affirming interests that were not appropriately aligned.

Some actors were never fully satisfied with their role in the project or with the nature of some of their connections. The project manager of DigitA and the technical coordinator had disputes over certain responsibilities, each considering his other roles more important, so refusing to assume responsibility for those under dispute. Two teams in DigitBIS were also refusing certain tasks, this time because they considered them too difficult, so they preferred to avoid taking charge. The two unions in EnergyH were not satisfied with the initial agreement with the construction contractor, so threatened with going on strike and sabotaging project construction and demanded renegotiations.

Actors in the immediate external environment (Piperca and Floricel, 2012), namely those affected by the project but not directly involved, were often left unaligned. In

order to avoid future challenges, project managers made efforts to align external actors, but sometimes these interests were too divergent, so remained unaligned. Even so, project development could advance until the actor became too powerful or managed to gather a powerful coalition to impose its demands (Mitchell *et al.*, 1997). For example, the political opposition did not agree with the initial design of InfraST and after winning elections restarted the design and planning process. Likewise, in InfraR, environmental activists managed to impose their demand of preserving a protected area only after they won the case in court, so an official order was issued in this sense. The project manager of InfraST managed to impose his will in a more subtle way. The original impulse was a personal dislike of the railway station roof colors and design. In order to change this design and gather a coalition to support his demand, the manager built up an alternative, more socially acceptable argument and promoted the idea of implementing a solar system on the roof top.

Another way to impose their never-aligned interest was to simply act disregarding the consequences on the project. During the planning phase, the project management of InfraS contacted all utilities companies operating in the area inviting them to synchronize planned interventions on their respective infrastructures, planning to limit the negative impact of construction on the local area, as well as to increase the life of the pavement and other surface finishes. In spite of these precautions, one utility company decided to have maintenance interventions on its own infrastructure only when the project was close to completion, to the great dissatisfaction of all project team, local residents and businesses, tourists and general public. Similarly, representatives from all departments were involved in project DigitBIS, so they could express their own demands, but also learn about the project details and evolution. However, at one point, one marketing team attracted a large client promising that the technical solution developed in the project would be available much sooner than actually planned. Under pressure from higher hierarchies, who wanted to keep the new client, the project team had to re-plan the whole subsequent project development.

Internal actors often reacted the same way. We found multiple examples of contractors behaving opportunistically, trying to cut corners to maximize their advantages. Projects InfraR and EnergyEX each went through three different structuring episodes because of contractors' aberrant behavior. Projects TerminalE and DigitBIS encountered similar problems with their suppliers. Even owner organizations could behave opportunistically toward their partners, such as in InfraST and EnergyTP, when decisions regarding their part of the projects where taken ignoring interrelated subprojects.

Actors could also have or develop new interests that diverge from the project goal. For instance, project clients or users constantly have new demands. While most of these demands could be smoothly incorporated through translations, as we explained in the previous chapter, some imply more radical reconfigurations, such as the client's site prioritization demands in DigitS or client's interrelated project rescheduling in EnergyTP. The main client airlines that would use TerminalE and TerminalL generated several events in each project when asking for design changes or for more influence in taking decisions and even for constructing facilities that will be theirs for exclusive use.

New actors' will was usually aligned through re-attaching processes and did not involve major changes of other actors' agreements and commitments. However, we found three instances in which the new actor did not accept to simply integrate in the existing network of connections and managed to impose its will. In each TerminalE and DigitPTIS, a new project leader came with a very different style, while in EnergyTP, the newly hired operations team had its own demands regarding technical specifications of the transport and storage facilities.

Actors' interests and their nature could change during project lifecycle, independently of their involvement in the project. In actor-network theory terms, we could say that

actors are attracted by other, more promising connections in their network (Law, 2004; Latour, 1987), such as more appealing projects or alternative action paths that would ensure their survival in difficult situations. For instance, the main airline filed for bankruptcy and preferred to channel its limited resources toward survival rather than fulfill its obligations in the project TerminalL. For similar reasons, the client of EnergyTP could not honor the initial agreement. A different way of survival occurred in projects InfraR and TerminalL. After an initial courageous and innovative decision, regulatory authorities changed their mind and decided to ask for the more traditional separation of the passengers' flows in TerminalL, thinking that this avoids future complications. Similarly, unsure which is the right decision and not willing to take major risks, environmental authorities significantly delayed the permitting process for a sub-project in InfraR, repeatedly asking for additional studies and explanations.

6.4 Discussions

What distinguishes triggering events from regular events is their capacity to challenge and significantly transform the current organizational structure. This capacity is, in fact, contingent upon the state of this structure at the time when events appear. Events that triggered structuring episodes looked similar with other events that occurred in different projects, or even within the same project. For the latter, usually, the existing project configuration could successfully incorporate their effects. But, from time to time, some events encountered imperfect or inexistent connections and the only possible reaction was a major project change.

Moreover, we argue that our perspective is more relevant in understanding the source of triggering events in temporary organizations, since it looks at the actual motives that generated them. Events that seem similar, such as regulatory authorities' decisions, technical incompatibilities or leadership changes, have sometimes a different logic of

development. For instance, although most projects changed their leaders several times, only three such changes led to structuring events. And even though all three new arrivals coincided with the beginning of a structuring episode, the actual triggering event was different. In one case (InfraR), the episode was a natural occurrence, since it was triggered by discrepancies between initial planner representation of the future project and the later reality. The change would have happened anyway. In the other two cases (TerminalE and DigitPTIS), the episode was mainly generated by the new leaders' initiatives of imposing their will and bringing major changes to the existing network of connections. Without their specific arrival, the episode might not have happened, especially in TerminalE, where the previous project development was positive and "on track".

We found that all events worked through processes in the hidden strata, which we see, contrary to many other researchers, as the more fragile and volatile parts of the project structure. Why not in the visible strata? First, because the project is built coherently, usually the same project management team overseeing the development of visible elements. On the contrary, despite the guiding role of visible connections, hidden elements are still specific to each actor, so a lack of unitary interpretation and unquestioned acceptance are highly possible. Second, because visible elements are … visible, so possible conflicts with existing elements could be easily pointed out from initial phases of negotiations and elaboration. Of course, hidden elements could be seen only by actors in the immediate proximity and they become more visible exactly when interfering with others, so already generating conflicts. A smooth project development could make the whole structure similar to a "black-box", only the results being visible and not the mechanisms to reach them. Third, because colliding explicit representations and conflicting agreements would not really harm or prevent actors from performing their activities unless they are applied in their letter, not their spirit. Moreover, actors would not question an abstract element until a more concrete collision happens.

In the next chapter, we finally turn to discussing the major transformations that occur as result of triggering events, which we called structuring episodes.

CHAPTER VII

STRUCTURING EPISODES

In this chapter we discuss the processes of major transformation of the configuration of cognitive and volitional connections in a project, which we called structuring episodes. We identified four pairs of matching patterns of episode unfolding. Each pair consists in one pattern for each locus of generation of triggering events, namely one for triggering events originating in the stratum of implicit representations and the other for events originating in the stratum of spontaneous interests. We present each of these patterns in turn and discuss their specific characteristics, but, at the same time, we also highlight the main differences between them. We then discuss the idea of failed episodes and explain why seemingly similar events only sometimes lead to structuring episodes and what prevents certain processes of major transformation to develop or be implemented in the end. Finally, we propose a project-level perspective that includes episodes as the key lens to understand project evolution and so regards projects as sequences of structuring episodes.

7.1 Introduction

As explained in the previous section, we identified 98 structuring episodes in the 18 projects we studied. Based on our interviewees' responses, we initially listed 112

episodes, but eliminated a part of them during analysis. In some cases, we realized they did not involve major transformations, for example some being mentioned only because of their significant emotional impact, such as one casualty during construction in TerminalE or a key member leaving the project management team of DigitA due to a terminal illness. In other cases, we did not have sufficient information to understand how the triggering event occurred, how the structuring process unfolded, or how the final stabilization took place. For example, in TerminalS one event that seemed like a triggering event had just happened (or better said had just moved to the project social arena – see further in this chapter) the day before the interview, so the process of transformation just started. Of course, eventually it might have not evolved in a structuring episode, for different reasons, as we will explain later in this chapter, when we discuss the concept of failed episodes. Or it might have simply been a smaller issue than initially perceived, as explained by one interviewee:

> *"There is a tendency, especially with technical problems ... in these kinds of things ... so, there is a tendency to overreact. So, someone says: 'It is a problem!' ... 'Is it big or small?' ... 'It is big!' And you tend to think ... like... 'this is a fatal flaw ... we never ... we can't finish the construction of the plant' ... Or ... 'we won't start it up!' ... Or whatever, a huge problem! Usually ... once you look at it more carefully, and study it ... you know what it is ... it is not as big a problem as you first thought (...) You know, the world is going to end, it is terrible ... it is a huge problem. Then ... it turned out to be ... not that bad..."* (Interviewee 2, EnergyEX)

We developed our concept of structuring episode through repeated iterations between theory, data and emerging analytical concepts. We decided to approach the data with a very basic guidance from the theory and therefore construct new concepts based mostly on our observations of real-life situations of major transformations. As explained in chapter 2, the episode was initially represented as a basic three-stage process and the project structure as a network of connections between participants. Our preliminary definition of the episode was *the process of transition from an existing form of*

organizing project activities to a new one, as a result of participants' response to internal or external forces.

We started by building up narratives of each episode, which allowed us to have a detailed picture of each transformation. We then placed inside the four-stratum framework all the cognitive and volitional connections of different kinds that we identified in each episode (see Figure 3.2). After several iterations, we incorporated the new concept of translations and started representing episodes in relation with the translations that take place during its development. In consequence, we refined the episode definition by adding the understanding as *a series of translations that unfolds in a coherent manner*. In this way, we were able to distinguish 10 phases through which structuring episodes could go. Moreover, starting to picture different episodes from the perspective of these phases led us to a new visual representation of the episode. In the first instance, we ended up with around 40 different pictures of episodes, as we found many details we considered worth highlighting. However, after several more iterations, comparisons and analyses, some patterns stood out. We identified four pairs of matching patterns: progressive enrichment, bouncing resolution, open-box attraction and contagious development.

The view of episodes as complex processes of transformation that go through series of translations in a coherent manner emphasizes the magnitude and complexity of the transformation. More explicitly, the existing project configuration of connections needs multiple related translations to deal with certain colliding representations or divergent interests and this eventually lead to a significant alteration of this configuration.

7.2 Phases in the Development of Structuring Episodes

The systematic approach described above enabled us to conclude that all episodes go through certain necessary steps, which could be metaphorically associated with Callon's obligatory passage points (Callon, 1986). Two of these steps are found in all episode patterns that we identified, and both of these steps require involved actors' convergence toward a common focus, understanding or vision. These two steps are particularly important in structuring episodes, hence we start our discussion with them. Later, we present the other steps or phases (some present in all episodes, some missing in certain cases) that define simple or more complex episode patterns.

The initiation step

The first such step occur in the beginning of the episode and regards the passage from relations in the implicit strata to the explicit strata or from bilateral connections to the project social arena. This passage takes place through either thematization or positioning - see chapter 5 for a detailed description of each of these translations – depending on the stratum to which the triggering event is associated. Thus, we observed that cognitive events, or colliding implicit representations, move to the social arena through thematization, as the explicit element needs to be modified or sometimes built anew. In other words, a more abstract connection is needed to solve daily concrete issues that prevent actors from performing their activities. On the other hand, divergent spontaneous interests become exposed on the social arena through the mechanism of positioning, when actors manifest their interests, signal their intent to achieve satisfaction and other affected actors take notice and consent to revisit existing agreements.

The omnipresence of this step seems to result from the fact that, for a structuring episode to occur, the conflict has to become visible and exposed to those affected. In this way, all involved actors are aware of the fact that there is a conflict and agree that

this is an issue that has to be solved. Failing to reach consensus in noticing the issue prevents the episode from unfolding, perhaps with the unintended consequence that the supressed conflict could become even more acute. For example, in project InfraST, the team of architects produced a railway station design they considered could be built within the allocated budget. Preliminary engineering analyses of the project management team and their consultants, suggested the construction would actually exceed the budget, but architects refused to significantly modify their design, arguing for the beauty of their design "as it is" and contesting the accuracy of estimations. Failing to reach a common understanding, the project management had no choice but invite bids for the whole work package. Interested bidders made offers significantly above the allocated budget, so the whole bidding process was considered a failure. The management then went back to the team of architects and, this time, they all became aware of the existence of a problem, namely that the design is more expensive than they thought, and of the fact that serious adjustments are necessary in order to solve the problem. The actual episode started only at this point, once all actors involved consented to the common understanding that their respective station design representations are colliding.

> *"And, of course, in the period from April 2008 until November 2008, in which we had a lot of negotiations with our contractors, before they did the bid, we learned a lot about ... make it simpler, yeah? Only the architect, every time our contractor said: "can I make this design simpler, because ... it reduces the price", our architect say: "no, I don't like this, I like my design. (...) So, in November 2008, we had 3 bids ... 3 bids ... of 3 contactors. And the lowest bid was say the 190 and our budget was 130. So, we had a big problem."* (Interviewee 4, InfraST)

The stabilization step

The second omnipresent step, which usually takes place at the opposite extremity of an episode, regards the ending of the episode or the stabilization phase. Once the necessary

visible elements are adjusted, the newly formed connections begin to be considered reasonable and appropriate by all actors involved. For explicit representations, through the process of routinization, actors need to harmonize their understanding of the new elements with existing implicit representations. In the case of new regularized agreements, through the process of acceptance, actors willingly or forcefully realign their divergent spontaneous interests with the newly delimited boundaries of appropriate behavior. If this step fails, the whole episode could fail. However, in most cases an extra-iteration is taken, meaning the episode goes back in the social arena and further re-adjust corresponding visible elements. For example, in project DigitA, the software platform had to be change, but the new one still had major technical incompatibilities, so the project team had to add certain features and redo multiple tests.

Other episodes go through multiple strata, so additional mandatory steps are required. In order to align certain interests, cognitive elements also need to be redesigned, and, vice versa, in order to restructure explicit representations, interests need to be regularized in a different way. For example, in project InfraR, environmentalist groups' demanded that the construction of the railway should not affect a protected area. This demand could not be solved only by re-aligning the protestors with the project, as these did not accept to realign unless the area is preserved. On the other hand, the project team did not agree to change the path of the railway. The realignment was achieved only after activities for rebuilding the protected area were included in the project. Moreover, as the initial rebuilding proposal did not work, the conceiving/interpretation steps had to be retaken. Similarly, in PharmaA, colliding representations about the drug specifications and tests to ensure safety between the project team and regulatory authorities could not be solved exclusively at the cognitive level, but additional impulses from impatient investors had to be coped with, and new explicit representations interpreted in such ways that would keep investors motivated to back up the project.

The omnipresence of this step stems from the fact that, to carry on with project development and implementation activities, participants need to appropriate or at least make look like they adopted the new configuration of relations, and channel their repetitive activities and interactions accordingly.

By looking at the translations that take place during episodes, we identified 10 phases through which the episode develops. Not all episodes go through all these phases, the simpler episodes going through fewer phases, but all episodes that we studied involved a minimum of seven phases. It should be noted that the phases are not always sequential, actually they often overlap, and moreover, some phases could occur more than once during structuring processes.

Phase 1 The collision or conflict

This is the [mandatory] first step of any episode. Implicit representations of different actors collide or spontaneous interests diverging from what other actors perceive as a stance that advances the project are manifested. We explained this step in more detail in Chapter 6, when discussed the triggering events. The condition for the episode to continue is for the event to overcome a certain threshold. For the implicit representation stratum, this means that the collision between implicit elements is too strong to be solved through habitual drift and requires a redefinition of explicit elements. For the spontaneous interests stratum, the divergence cannot be considered simple agitation, because it is too powerful to be ignored or controlled with existing agreements, so corresponding regularized elements need to be renegotiated.

Phase 2 Moving into the project social arena

As explained above, the episode could develop only if the conflict that generated it is taken to the social arena and discussed there. At the same time, actors involved have to

be aware of the necessity of these discussions and consent to participate. For example, when one marketing team attracted a large client for the parent organization after promising that the new information system would be functional at a date much earlier than the DigitBIS project team initially planned, the first reaction of the project management was to refuse to even take into consideration the event. But, because the parent organization would greatly benefit from working with such a large client, the parent organization management pressured the project manager to consider the context change and do everything in their power to shorten the schedule. In this phase, the condition for the episode to continue is that a simple redefinition of explicit representations, or a renegotiation of existing agreements are not sufficient (otherwise it would be a simple thematization or positioning translation), so more complex steps are required.

Phase 3 Revisiting existing visible elements

During this mandatory phase, existing explicit representations and regularized interests are discussed and gaps between corresponding visible and hidden elements identified. The actors try to better understand the collision, its roots, if it is real or just exaggerated (see the above example), and even check if they can ignore it or not. For example, in EnergyEX, when the project management team became aware that there will be an imminent risk to contaminate the water, they first checked if the risk is real, but also what the agreement with regulatory authorities said, to understand the extent to which they were compelled to prevent this risk, and whether it was possible, instead, to assume the possible consequences of an eventual contamination. After this preliminary analysis, the condition for the episode to continue is that actors agree with the existence of a real complex tension in the network of connections between them, which needs to be solved.

Phase 4 Looking for ways to build or refine visible connections

This phase is, again, encountered in all episodes we studied. Once the conflict is understood, actors start looking for solutions, to build new explicit representations or configurations of regularized interests or to adjust existing ones, in a way that would both solve the initial conflict, but also would not interfere with the existing network of connections. In other words, the new connections have to be harmoniously integrated into the existing configuration. For example, redefining areas of responsibilities in InfraR had to take into account existing agreements and roles, but also actors' desires and capabilities. Sometimes, the solution is not that obvious, so some episodes go to the next phase …

Phase 5 Going beyond the initial conflict

More complex conflicts require special solutions. They might have consequences beyond the immediate area or actors considered initially, and irradiate to other parts of the project – especially for interconnected sub-projects – or affect actors that are not involved directly in the conflict. This phase could only be found in complex episodes. For example, very expensive solutions, such as building an isolating wall using a special method in InfraST, appeared to require a significant budget increase, which had to be approved by the project sponsors. Similarly, implementing ideas that were not in the initial plan, such as a solar system on the roof top of the railway station built in the same InfraST, requires the cooptation of new sponsors or supporters. Some other times, rebuilding connections might require attracting external experts to help find a solution or even new actors to help with implementation, or even bringing on board new stakeholders that are affected by the implementation and have to accept it. For example, when sediments polluted the river where EnergyH was building its hydro-electric plant, their impact on the project construction was negligible, but two municipalities in the neighborhood were in danger of losing access to potable water for several weeks, as the river was their main source. Not only that the two local communities had to be

(re)aligned, but another actor was brought on board, to build a new water treatment facility for these communities and ensure their uninterrupted access to potable water.

Phase 6 New input in the project social arena

This is another "optional" phase, as not all episodes go through it. The impulse is related or at least generated like a side effect by the main conflict. It could take two main forms: an additional conflict or actor's manifestation of his or her interest that joins and deepens the initial conflict; or an additional conflict generated by the resolution of the initial conflict, in other words, the solution does not harmoniously integrate in the existing configuration of connections. For the former case, the additional actor that joins the 'episode', one example comes from EnergyH. The unexpected river bed shape demanded an innovative solution. External experts were involved and the main contractor assumed a more important role and had its agreement renegotiated. Although not directly involved in the issue, one contractor took advantage of the "open black box" and also demanded a renegotiation of its agreement. One example for the latter, additional actors involved or affected by the solution prepared to solve the initial conflict, is how the project management team in PharmaS dealt with the results of certain tests. In one country, they discovered that one ethnic group reacts differently to the drug, so they had to connect not only with that group of patients, but also with the national health authorities from that country, as well as with the management of the parent organization, since the project could have faced premature closure. Somewhere in between voluntary unexpected involvement and collateral victim of the episode is the case of the client in DigitS. As the prototype technical solution failed when attempted to be implemented on international sites, delays were accumulating, so the project client started to put pressure on the team to speed up and solve the technical incompatibilities faster.

Phase 7 Consequences for the future

Another optional phase, although most episodes go through it, at least in a very informal way, regards situated learning. This takes place mostly at the cognitive level and involves reflecting, analyzing, learning and sharing. For instance, in projects DigitBIS and DigitA, technical teams set up a database with solutions for the various technical problems encountered, so that other members of the team could benefit from that even during that same project. In EnergyEX and TerminalS, the project management was careful to address the deeper cause of some of the conflicts they had in the first phase of the project and avoid similar connections in the second phase.

Phase 8 New visible elements in place

Another mandatory phase occurs when new visible cognitive and volitional connections are formed or existing ones modified. New explicit representations and regularized interests reshape the project configuration of relations. Most of the time the visible elements are closely connected to the hidden elements that generated the conflict, but sometimes additional visible elements are refined to either strengthen the effect of the episode or simply unintentionally. For example, when the project management team of PharmaS learned about potential kidney toxicity of the drug, team members first tried to find a solution to solve it, but as the risk seemed real and unreasonably high, they decided to close the project. At that point, very different visible elements had to be built – those associated with project closure. In general, failing to build appropriate visible elements, might eventually repeat the initial conflict and the whole episode. For instance, in the DigitS project, the strategic but completely unrealistic initial plan, had to be soon revised, but because of extremely high pressures from both the parent organization and its client, who would use the system, the initial conflict was only partly solved. This later led to two additional, yet similar conflicts and therefore to new transformations.

Phase 9 Going back behind the stage

Most of the episode takes place in the social arena, but it fully ends only by going back in the hidden strata. As explained above, the new interest or representation has to be accepted by actors and also to become compatible with the existing configuration of connections. If not fully compatible, the solution might be rejected immediately or, if the conflict is more subtle, it could lead to accumulation of tensions and later generate a full episode. For example, in project DigitPTIS, the resolution of the episode triggered by technical incompatibilities between deliveries of the two main contractors left one of the contractors unsatisfied. Tensions accumulated and eventually led to a new episode, a major conflict between diverging interests of this contractor and the project management team.

Phase 10 New hidden elements developed

The ultimate result of the episode is to develop new implicit representations that solve the initial conflict and / or spontaneous interests that are realigned.

By observing episodes going through sequences of translations, phases and obligatory steps, we were able to identify eight patterns of episodes, four for each main type of triggering event. Each pattern starting in the stratum of implicit representations has a matching pattern that starts in the stratum of spontaneous interests, with a similar logic of development. We could say that we actually have four pairs of matching patterns. In the following section we present these patterns.

7.3 Patterns of Structuring Episodes

As explained, we identified 4 pairs of matching patterns of structuring episodes: progressive enrichment, bouncing resolution, open-box attraction and contagious development. In order to distinguish between these patterns, we proposed two additional measures, namely episode depth and breadth. The episode depth accounts for the number of relational strata which the episodes affects, some episodes being limited to two strata – the conflict and its resolution stays within the same type of connections, cognitive or volitional, respectively – while some others involving all four types of connections. The other measure is the episode breadth, which accounts for the number of actors in the network or of issues beyond the initial local conflicting area that are touched by the episode. In simpler cases, only one conflict occurs and is solved, while in others the initial collision generates additional collisions and or attracts additional actors in the conflict.

Progressive enrichment

This pattern usually involves a simple, straightforward episode, with a minimum of iterations and no additional actors involved or affected (see Figure 7.1.a and 7.1.b). The episode unfolds in two strata, either the two cognitive or the two volitional strata. It is the result of either colliding representations or conflicting interests of two actors or of discrepancies between initial projection of the future plan and the later reality. The only part of the episode that could vary significantly is the formation of new visible elements. Thus, it is usually shorter for simple re-attachment or re-conceptualization; it could have a medium length, if it involves a double re-conceptualization or re-attaching, specifically when not only the corresponding visible elements are discussed and modified, but also some additional elements; and it could be longer, when actors also think about the future and elaborate procedures that would be used in subsequent phases or other subprojects.

This pattern was particularly encountered in the form of colliding implicit representations, we identified no less than 15 such occurrences. For example, in TerminalS, in the initial design, architects proposed to incorporate a part of the old wood from a WWII hangar that was being demolished. The plan was built around re-using this wood, after it is refinished. But this representation of the project team came in conflict with the reality of the project context. The work supposed to be done at a local mill, but no mill in the area was properly equipped to work with beams of that size. One option briefly considered was to send them to British Columbia and then return them, but the cost was prohibitive. They eventually found a mill in the New York State that was prepared to sand down the beams. However, following negotiations with the owner of the mill, the project team was warned that the wood would be subject to the Softwood Lumber Trade agreement between Canada and the US, because it was cut less than 100 years ago. Therefore, they realized that the time required to obtain the necessary approvals was unrealistic, given the project schedule. In the end, the project team decided to reuse wood only for architectural elements, and to buy new wood for structural elements. The unused wood pieces were offered for sale.

We can notice here that after the initial collision, the actors move the discussions in the project social arena and revisit the explicit elements put in place, in this case the solutions to re-use the old fir beams. Giving the circumstances, they consider several options to solve the collision, but the clear legislation and time limitations make them adopt a different approach. They end up 're-conceptualizing' or changing the existing explicit representations to adapt to the new reality, more precisely they elaborate a new plan regarding the structural wood elements in the new terminal. The new explicit element (the new plan) is then shared with the actors involved and correspondently 'routinized' to become the new guiding connecting element. Eventually, actors develop implicit representations regarding the new use of the old beams and the use of new structural elements.
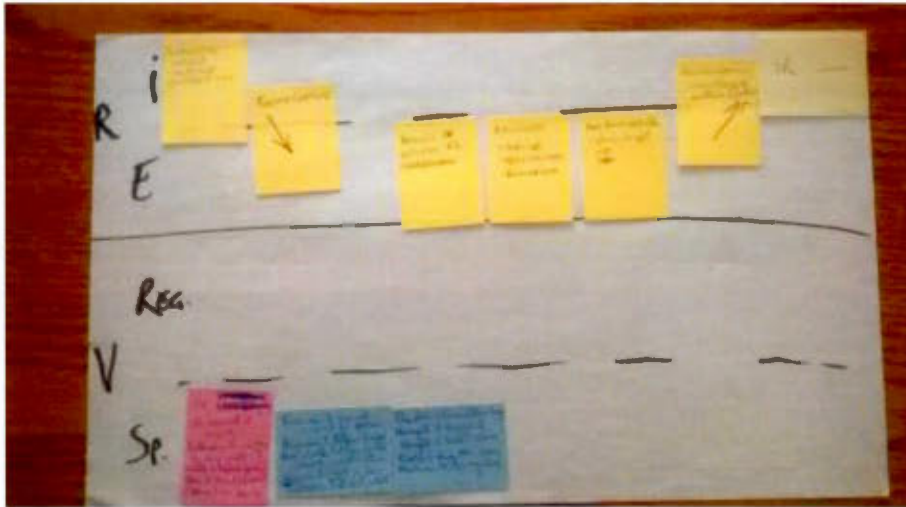
Figure 7.1.a Example of a progressive enrichment pattern – generated in the implicit representations stratum
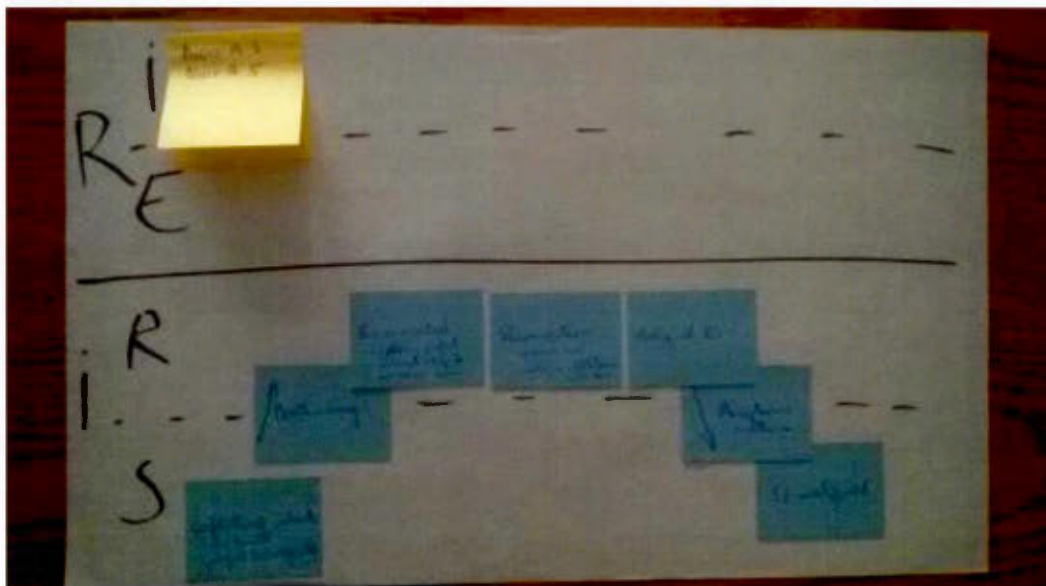

Figure 7.1.b Example of a progressive enrichment pattern – generated in the spontaneous interests stratum

Bouncing resolution

The core characteristic of this pattern is that the first explicit representations or regularized interests created or modified are rejected by the existing network of connections, so the routinization or acceptance part of the episode fails (see Figure 7.2). This is usually because they do not fully solve the initial conflict or because are incompatible with other connections in the network, like unintended consequences in Giddens' terms (Giddens, 1984). As a consequence, the episode returns in the social arena and actors look for new solutions and refine the just-built visible elements. The iteration creation-rejection-refinement could happen several times, like in a trial-and-error exercise, before an appropriate resolution is found.

For example, the initial plan of project InfraR was particularly optimistic in terms of budget, time and human resources needed to complete the project. New reflection and comparisons with other similar projects show that the budget needs to be significantly increase and the deadline postponed with two years. The collision between expectations and reality proved significant enough to involve a major re-planning exercise. In this circumstances, the project management team brings the collision into the project social arena and aims to elaborate a new, more realistic plan, so a new explicit representation. They start by questioning the existing explicit representations directly related to the collision, such as those related to the budget, human resource and timeline. A complex analysis and negotiation process follows. The project team manages to propose a new plan, but the 'routinization' process fails due to additional conflicts with the reality – delays in obtaining permits accumulate and more time is needed to complete the project. Moreover, the project organizational structure seem to be no longer appropriate for the new size of the team and the new deadline, and so generates new cognitive collisions that invite a re-evaluation of these additional explicit representations. A new plan is generated and implicit representations are built according to this.
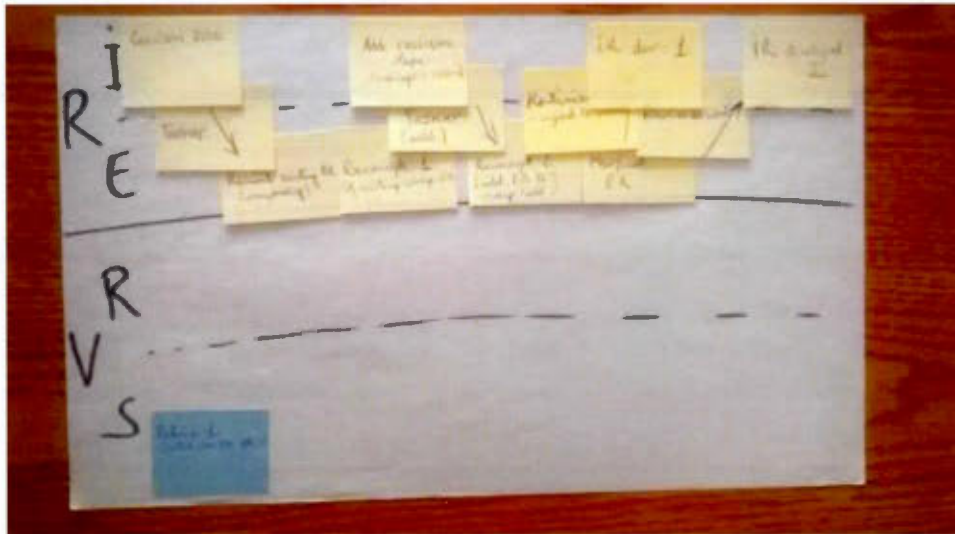
Figure 7.2 Example of a bouncing resolution pattern – generated in the implicit representations stratum

Open-box attraction

This pattern supposes the voluntary involvement of additional actors (see Figure 7.3). Once the black-box is open and the episode moves into the explicit arena, additional actors express their own interests or become aware of their own representations of the project that (also) come in conflict with some of the existing elements. Inputs come in the form of additional and unasked for inputs to reconceptualization or re-attaching. The reason behind these pattern is that actors either have their own issues that they want to solve and take advantage of the open box, or they want to see the episode unfolding in a certain way and so try to push for a specific solution or simply for a fast resolution.

The project DigitMIS aimed to introduce a new information system to help the operations of a large European pharmaceutical company. As it is often the case with change projects, employees were reluctant to adopt the new system, particularly criticizing it for promoting a very strict evaluation of their work hours, which was considered incompatible to the nature of work – research. The divergent spontaneous interests manifested frequently with a wide range of departments opposing the change. The moved the issue in the project social arena by demanding a re-evaluation of the newly proposed regularized elements (the scope of the MIS project). The project team attempted to 'attach' or 're-attach' departments with divergent interests, but with limited success. An additional actor stepped in, the senior management of the company, who had a clear interest in implementing the project and tried, via a combination of better explaining the final goal and pressuring department heads to force 'acceptance'. While this intervention reached a certain level of interest alignment, a majority of employees were still not convinced with the new changes. Eventually, the financial department realized the advantages for their work in having such MIS, so voluntarily stepped in to help increase the acceptance of project goals by the regular employees. The combining effort of these actors that intervened in different moments eventually led to a full acceptance and alignment of spontaneous interests between different departments, the project team and the management team.

Figure 7.3 Example of an open-box attraction pattern – generated in the implicit representations stratum

Contagious development

This pattern represents the most complex type of episode, which goes through multiple iterations, in all four strata, and usually involves multiple actors (see Figure 7.4.a and 7.4.b). Additional actors are usually affected, and not only those producing the episode. Often, this could take the form of external actors invited to join for their expertise. However, simply using external experts does not create an episode. The transformation becomes major only if these experts have particular requirements or when the attaching of additional contractors redefines the configuration of the rest of the network.

Figure 7.4.a Example of a contagious development pattern – generated in the implicit representations stratum

Figure 7.4.b Example of a contagious development pattern – generated in the spontaneous interests stratum

For example, the project InfraR was building a railroad that would cross a protected area. The project management team recognized the issue and tried to find alternative routes, but all of them proved non-feasible economically. The regulatory authorities delayed approvals until certain conditions were met, but eventually agreed with the project. However, environmentalist groups were still protesting, so the project management team invite them for consultations and discussions. In the light of our framework, we can say that the environmentalists positioned themselves related to the project and the project team moved the issue in the social arena and attempted to (re-)attach them. The connections between them were revisited and several rounds of negotiations were unsuccessfully carried on. Eventually, all attempts to align them failed. Not having enough power to impose their interests, environmentalists involved the juridical power and took the matter to the Court – this could be considered as a second positioning. The Court agrees and oblige the project to rebuild the protected area. This moves the matter into the cognitive arena, where explicit and implicit representations about the project become involved. The plan needs to be changed, new activities introduced (the rebuilding of the area), additional actors with their own implicit representations and spontaneous interests are involved, namely the experts to advise the rebuilt and the contractor that would execute it. The initial proposal is rejected by the Court, so new reconceptualization and re-attachment activities are needed. The second proposal is accepted by both the Court and environmentalist groups and the subsequent acceptance is successful. We can notice in this project a frequent move between strata, following reluctance of acceptance from environmentalists and later the Court, but also due to the several proposal that had to be done before spontaneous interests are finally aligned and new implicit representations built.

7.4 Failed episodes

First, we need to mention that by failed episodes, we understand those episodes that could not be completed, as a process, for different reasons explained below, which usually resulting in actors becoming stuck at a certain step (or necessary translation) during their development. We do not discuss the appropriateness of transformation. As a matter of fact, episodes that did not address the real conflicts that generated them or that did not find or implement proper connections to solve those conflicts will often lead to other, similar episodes, building up to a cumulative effect. This latter kind of collapse or nonfulfillment will be discussed in the last section of this chapter, when we raise to the project level and focus on the relationship between episodes.

In order to be considered a structuring episode, an episode has to go through all the obligatory phases otherwise either there is no re-structuring or this is not accepted by the actors involved. If at any steps fails, it has to either go through an additional iteration or even start over.

We identified several reasons for which episodes failed: actors fail to impose them on the project public agenda, external actors intervene successfully to block the restructuring, no major change occurs but only small adjustments in the style of a translation, and the solution implementation fails.

The most common case of failure is the situation in which episodes do not have the chance to start, or in other words, actors do not manage to move them into the project social arena. This was the case in InfraST. The two main partners decided to develop the project as two autonomous, although interrelated projects. When one actor experienced delays in its activities, the partner's interrelated project was affected, but had no other choice than adapt. This situation occurred several times during the project lifecycle and sometimes the effect was significant, but none of the partners took the

initiative to move it to the social arena and propose to revisit the existing connections, accepting the status quo.

Sometimes actors fail in their attempt to manifest their interests strongly enough for them to be taken into the social arena. Alternatively, we can say that the regularized element held and the actor had no real leverages to impose its positioning. For example, in project EnergyEX, after significant changes in role, activities and connections with other actors, the main contractor demanded renegotiation of the existing agreement. The project manager refused to discuss, referring to the regularized elements in place, some freshly updated after the major restructuring we mentioned above.

In the other stratum, failing to convince actors to thematize has similar results. We already gave the example with architects refusing thematization in the first instance in InfraST. However, the project manager convinced them to thematize in the second attempt. We found another thematization in two steps in EnergyEX, when the project team initially hoped to be able to ignore the water contamination risk, only taking it into consideration after initial analyses that proved it real. In another example we already gave, the project management team of DigitBIS initially rejected the marketing team's attempt to position and only accepted to "start the episode" when the higher management from the parent organization intervened and obliged them to do so.

Sometimes, external actors manage to intervene successfully and on time. This is the case when, for example, budget increases are approved with no or few conditions by the sponsor, such as in EnergyEX, all IT/IS projects and partly in EnergyEX, EnergyH and InfraST. In these cases, the project configuration of connections remained stable and no major alterations of the explicit representations or regularized interests were necessary any longer. For example, projects DigitBIS and DigitPTIS had a priority status within their parent organizations and so managed to attract the best resources and in the amount required.

In other cases, the conflict either looked more significant at the beginning than it actually was, such as the technical incompatibilities in EnergyEX (see the quote we provided above), or the existing structure of relations managed to solve it at the very last minute, such as the conflict between several teams of contractors in TerminalL. Although tensions accumulated and it looked like they would end up in court, the intervention of the partnering consultant clarified the roles of each team and instead of major restructurings, only some project leaders of contractors' teams were removed and the project could continue smoothly.

Finally, if the change fails to be implemented, then there is no episode. In InfraR, the project leader took into consideration one last major revision of the project plan, but although the process started and the plan was ready to be altered, the leader realized that they might still manage to finish the project in the initial conditions, so cancelled the "episode". The only serious impact was at the psychological level, as people felt the pressure back on their shoulders:

> *"And to unleash the hand from 2011 and get it back to 2010, that was difficult ... issue, because psychologically, people when you have given them another year, and taking away that year from them, again, that is not easy. (...) they had the pressure lifted from them, but now we get back the pressure again. And we had to tell them over and over and over again: 'it's 2010 that is final date, forget 2011!'"* (Interviewee 2, InfraR)

7.5 Projects as Sequences of Structuring Episodes

During our interplay between data and emerging concepts, we noticed that some episodes neglected the real conflicts that generated them or insufficiently reconfigured the network of connections. This led to other episodes and in some cases we even observed a cumulative effect, meaning certain connections were reset only after several

similar challenges. These observations inspired us the concept of sequences of structuring episodes, and a perspective that understands project evolution through the lenses of structuring episodes.

For instance, we observed the cumulative effect in the InfraR project, with episodes 3, 4 and 5. First, contractors in one subproject organized their activities in a way and a pace for their convenience, rather than what other participants in the project expected from them. This way, they accumulated delays and provided low-quality deliveries. Contractors in charge of interrelated work packages responded in a similar way, and the whole subproject was seriously affected. The project management team stepped in to realign them, but contractors were blaming each other and no clear responsibility could be attributed. When revisiting existing agreements, the project manager discovered that many details were ambiguous and they had no real leverages to realign them. The conflict was solved locally and the agreement remained the same. In a different subproject, the blasting contractor also behaved opportunistically and, trying to save money and effort, was using low-quality explosive, in a lower quantity than necessary, and inappropriate procedures. This led to high safety risks on the site, since many explosive packages did not explode and could have blasted anytime. In what we called the fourth structuring episode, the project manager succeeded in realigning the contractor, making him change his approach. Finally, the fifth episode was triggered by the dishonest behavior of certain contractors who adopted a very loose stance with regard to control and expenses. Again, the project management intervened and realigned them, but, as in the other two cases, it could only prevent them from further manifesting divergent interests in the future, but could not make them accountable for the past events. However, this time, the project manager decided to go to the deeper source of the conflict and change the connecting paradigm toward clearer details, more control and levers to use to make contractors accountable for similar aberrant behavior.

In other projects, episodes that did not solve the initial conflict properly allowed other similar episodes to occur later in the project. For example, the conflict between the two main contractors in the DigitPTIS project was not solved to the full satisfaction of one of the contractors, and this generated another episode, this time with a huge conflict between this contractor and the project management team. Similarly, colliding representations regarding a technical solution in InfraST were solved only partially in the first instance, by finding an innovative solution to the conflict. However, the solution was not fully compatible with the existing network of connections, and this led to another episode when the time came to implement the new solution.

Somewhat related with the cases presented above, we also observed 'repetitive' episodes or similar unrelated episodes. In each case, the project management focused on addressing the event rather than the type of the conflict. We did not observe a cumulative effect and neither these episodes influenced each other directly, but a more global solution might have helped avoiding other similar episodes. We relate this with the idea of learning in projects that we discussed in a previous section. Such is the case in EnergyEX with three unrelated cases in which three different contractors delivered inappropriate-quality parts.

One final observation that inspired the project-as-a-sequence-of-structuring-episodes perspective was with projects in which all or most episodes happened to correct only one major conflict, in this sense looking like a unitary picture, like the project existed (also) to adjust one unique issue. Projects EnergyH, DigitPTIS and DigitS are great examples of such cases. For instance, in DigitS, all episodes occurred as a result of the big discrepancies between the project director's representation of the future project and reality. Having a clear strategic motivation to attract the client in any conditions and then develop a long-term relation, the project director proposed a project with very unrealistic characteristics, especially with regard to the schedule. The first episode attempted to fix this initial conflict and move the project from a strategic perspective

to one closer to reality and so a compromise solution was found. But this was nothing more than a compromise, the final implicit representations created were not fully compatible with reality either. In consequence, the second episode occur, to solve the compromised solution at the technical level (and also additional translations for smaller incompatibilities). The third and the fifth episodes were other attempts to further lower the initial discrepancy that could not be solved by the compromise solution from the first episode. The fourth episode also came as a consequence of that initial strategic plan.

In conclusion, new episodes will occur when the stabilization phase of previous episodes is not done properly and the solution does not solve the conflict, does not solve the deep roots or the real motives of the conflict, or it solves it but creates new conflicts due to its incompatibility with the existing configuration of cognitive or volitional connections.

CONCLUSION

Our academic journey finally came to an end. In this chapter, we briefly review the main findings of this thesis and present some final observations and conclusions. We further explain the importance of our topic and highlight contributions to both theory and practice. We end with the limitations of our thesis, which we see as opportunities for future research.

Thesis summary

The goal of our thesis was to explain how projects evolve during their lifecycle. Inspired by previous theories, we distinguish between stable and active change periods and develop two sets of concepts to explain transformation in each of these periods. For stable periods, we proposed the concept of translations, or the unidirectional transition within or between strata, that enabled us to show how the project network configuration of cognitive and volitional connections integrates a multitude of small collisions or divergent impulses.

We also suggested that, at times, the ability of this structure to maintain stability is temporarily overcome by triggering events that require more significant transformations. We answer our third research question in Chapter 6, by elaborating a typology of triggering events and discussing their influence over projects. We called the moments of active change that these events generate structuring episodes and saw them as collections of multiple translations that develop in a coherent manner.

Depending on the translations involved and the number of iterations, we distinguish between four pairs of matching patterns of episode unfolding, namely progressive enrichment, bouncing resolution, open-box attraction and contagious development. This helps us addressing the first research question, by offering an initial understanding of the new concept we proposed - structuring episodes.

The usefulness of our initial distinction between volition-representation and tacit-explicit is supported by our results, suggesting that it enables us to make refined qualitative distinctions between various episode patterns and to uncover other interesting aspects of the nature of project organizations and processes. This element, along with the concepts of translation and structuring episodes provide an answer to our third research question that aimed to understand how the project structure evolves over time.

During our analyses, we observed a relationship between certain episodes. Since the episode does not end with a perfect solution to the conflict that generated it, but just with a functional one, when this is not appropriate or compatible with other existing connections, generates other episodes (see also Garud and Karnoe, 2003). This eventually inspired us the idea of projects as a sequence of structuring episodes, as a series of transformations, which should also be seen as an attempt to answer the fourth research question.

Structuring episodes often have an impact that goes beyond the area which directly affected. Sometimes cognitive or volitional connections change at the level of the whole project, not just locally, such as the contracting approach in InfraR after cumulative episodes pointing out toward a more profound conflict in this sense. It was also the case in DigitA, EnergyEX or DigitPTIS, in all cases their perspective of connecting to other participants changing beyond specific people or contractors. We also observed an impact at the organization level, such as in DigitA, where the parent

organization changed the procedure of developing future projects; at the industry level, for example in EnergyH, where the contractor produced an innovative technical solution to solve a specific conflict; or even at the political level, such as in InfraST, whose initial "megalomaniac" design helped local opposition to win elections and come to power.

Our notions of translation and patterns of episodes have some correspondence in previous research (Greenwood and Hinings, 1988; Laughlin, 1991). For example, Greenwood and Hinings (1988) discuss four tracks of strategic change, distinguishing between inertia, aborted excursions, reorientations, and unresolved excursions. As the name suggests, the first two involve no change or failed attempt to change, respectively, which are not covered in our study. However, the forth type suggest that change happens, but the eventual re-coupling fails, something similar to our finding about failed episodes and corrective episodes that are needed to solve the partial equilibrium reached after initial related episodes. The third type of change suggested by the above mentioned authors further distinguish between linear progression, oscillations and delayed. The first two types have certain similarities to our progressive enrichment and bouncing resolution patterns, while the delayed idea is included in our view of repeated sequence of phases within an episode.

Contributions for theory and practice

With this thesis, we aimed to make several contributions for both theory and practice. We first contribute to the field of project management. We focused on large, complex interorganizational projects that are very well known for finishing over budget and with serious delays. Despite the significant effort to minimize such risks, unexpected events still occur and the impact is still disastrous. We hope that our new perspective would have a valuable contribution to the topic by drawing attention to the actual reasons for

which events occur. Moreover, by relating episodes and discovering a certain causality between them, we hope to help project managers avoid incomplete resolutions of episodes. By more carefully examining the episode unfolding as well as its deep roots, they could avoid future similar perturbances.

By distinguishing between hidden and visible elements of the project structure, we also draw attention to the more unstable and fragile structures of temporary organizations (as opposed to perennial organizations), since some parts (for instance implicit representations) are only defined later during project development. This also suggests that a very different logic of change applies to organizations and projects and so contributes to recent calls in the field for developing a more specific theory for project management.

In more general terms, the concept of episodes enables us to advance a more dynamic approach to project management, which sees the project as a series of transformations, a series of structuring episodes. Rather than focusing on controlling and punishing deviations from the initial plans, project management becomes steering the sequence of structuring episodes and the transformations that occur in each episode

Results reported in this thesis also contribute to the process view of project organizations, and of organizations in general. At one level, the punctuated equilibrium model that we adopted to describe the evolution of the project organization, and from which the focus on structuring episodes emerged, aims to supersede the teleological, deviation-controlling view of this evolution implicit in the project management field (Floricel and Piperca, 2016). Instead, these results encourage us to argue, that project organizations combine periods of more controlled yet continuous and not totally goal-directed unfolding with more turbulent periods of revolutionary change. Our results regarding their overall evolution suggest that project organizations go through several major restructuring over the entire project lifecycle. Possibly, each of these episodes

brings the organization to a higher qualitative level with regard to the internal complexity of its network of relations, and hence of its ability to address environmental demands and other unexpected developments. Our empirically grounded theorizing of triggering events and of dynamic patterns within episodes shed light on the conditions and mechanisms (or internal logics) that produce the non-linear dynamics of such revolutionary changes (Dooley and Van de Ven, 1999; Van de Ven and Poole, 1995). But even more importantly, our theory and empirical research into the nature of relations that form and maintain the project organization, and our grounded theorizing of the translations that accommodate fluctuations without triggering episodes provide support for a view of project organizations aligned with the 'process ontologies' for which events and processes are the essential constituents of our world. (Hernes, 2007). In particular, our results support arguments by scholars such as Tsoukas and Chia (2002) that continual becoming is the normal state of an organization, and that it requires constant interactions to maintain and reweave some events into its underlying tissue of processes. Hence, even in periods of controlled unfolding, the constant jockeying and translation (in the ANT sense) of actors' will, together with the constant drift and readjustment of implicit representations and tacit routines, as well as the one-step, unidirectional shifts from implicit to explicit strata, are all part of the continuous reweaving of project organizations.

Our study also makes a contribution to the practice view on project management and on organizations in general, although we deliberately avoided associating this study with the practice literature because we started with a theoretical framework that is not a standard one in practice research, because our main interest was in more inclusive patterns and because we lacked the kind of observational data that are typical for practice research. But our results can also be interpreted as suggesting, for example, that the structuring episode is a concatenation of concrete local activities, some of which are inspired by accepted practice in the parent organization or in the broader organizational field, while others are the result of ad-hoc problem solving and

interactions. These practices build or reweave relations between participants and are intertwined with material objects that preexist or are being made in the course of the project. In particular, the translations that we identified can be a source of inspiration for practice studies, as each reveal, for example, the approaches that practitioners use to stimulate recognition of an issue and bring it into the public arena in ways that do not stall the project. Transitions towards the outer strata in our framework , may reveal, in turn, how practitioners use objects, notably representations on external supports, or surveillance systems that help regularize actors volition, in order to recreate and maintain the network of relations in a project organization. Further research using a practice perspective can attempt to study these practices using a more micro and observational lens. On a broader level, our study can help bridge the gap between the more philosophically grounded and overall pattern-oriented process view of organizations and the practice view, with its more eclectic and closer perspective that attempts to isolate actions that weave the social tissue in order to understand their nature.

Limitations of current study and ideas for future research

The current study has certain limitations that come from the novelty of the idea under study, methodological approach, limited access to data, and scarcity of resources that could be employed. These are all related to some extent and hopefully future studies will help address at least some of these limitations. As explained in the methodology chapter (see subchapter 3.4 Quality concerns), we tried to manage some of these limitations by ensuring a high-quality level of data collection and analysis process. Despite our effort, some concerns remained.

The novelty of the idea required an exploratory study, which provided clear benefits, but also offered only a narrow understanding of the phenomenon. We focused on

explaining what type of events generate structuring episodes and how these episodes look, but more needs to be done regarding the effect of these episodes at the project level. The projects-as-sequence-of-structuring-episodes idea seems exciting and promising, but our study merely proposed the concept and offered only a limited analysis. Future studies could focus on this topic as their primary concern and unveil other key elements of project evolution.

Similarly, the failed episode idea only emerged in the later stages of the analysis, so our proposed explanations are very limited and should be seen more like an attempt to open the discussions on this topic. Future research could look into more detail at the differences between seemingly similar events that generate or not episodes and why this happens, as well as at the other causes that could occur during episode development.

A particular concern were episodes that were less-well documented and cases where only one interviewee was available for discussions. Regarding the episodes, we simply dropped most of those that had an insufficient level of details, because they could not provide an adequate level of quality of information to be used in the analysis. Moreover, not being mentioned by more than one respondent or not being discussed in depth during the interview could also mean that those episodes were considered to lead to less significant transformations in those respective projects. On the other hand, the cases with one interviewee were all kept in the final analysis and this could be one of the limitations of our research that should be addressed in a future study. We were aware of this concern and treated these cases with precautions, for example by only using them to corroborate and test the patterns generated following the analyses of "detail-rich" episodes and cases (as explained in the methodology section – Chapter 3 of the current thesis). The decision to include these cases allowed us to analyze an extra sector (bio-pharmaceuticals), but also to look into the only two failed projects from our sample (PharmaS and EnergyTP).

Another related issue was the unbalanced representation of the three sectors in our sample. Although some IT/IS projects are very well documented and provided extremely useful insights, the infrastructure/construction type of projects dominated. At the pattern level we did not observe a preference for certain types of episodes in any of the industries, but we acknowledged this limitation and refrained from going into detail with regards to cross-industry comparisons (apart from triggering event discussion – see Chapter 6). This is another, associated limitation of our study.

In light of these observations, we propose that future research should look in more depth into the IS/IT, but particularly the bio-pharmaceutical sectors and improve the understanding of structuring episodes and their triggering events. This will also allow comparisons between knowledge sectors and potentially highlight particularities of each knowledge culture. At a broader level, a future quantitative study could help generalizing some of these findings.

Finally, future research could also use the 4-stratum framework and/or the structuring episode concept and apply it in different contexts and to different types of organizations. For example, different types of projects could be compared using these perspectives or other types of organizational processes could be analyzed using the proposed 4-stratum framework.

APPENDIX A

THE INTERVIEW GUIDE IN ENGLISH AND FRENCH

Issues for discussion

A. Planning

1. Please briefly describe **the context and the intended output** (artifact, process, system, technology) of this project. Where did the project idea originate and how was it defined?

2. How the project was **initially structured** in terms of scope, team members, participants, schedule, budget, supervision, contracts etc.? How was this structure developed?

3. What were the **major uncertainties** that you deemed capable of affecting the success of the project? How did you plan to resolve these uncertainties?

B. Execution

4. Please describe the **activities realized** during the project in terms of major phases, participants, milestones etc. How did the project scope evolve during these activities?

5. How did the project **organization grow and evolve** during these activities? Please discuss the difference between initial plans and the actual organization during the peak of activity.

6. Please describe the **patterns of collaboration** between project participants. How did they help each other? What were the contents, channels, and pace of their communications?

7. Please describe the typical **misunderstandings and conflicts** that occurred during these activities. What were their sources?

C. Flexibility

8. What were the major **unexpected events** (negative or positive) that affected this project? How did you learn about them?

9. What was the **initial reaction** of the project team to these events? How did these events impact the relations between various project participants?

10. What was the **eventual response** of the project to these events? How was this response developed? What encouraged or obstructed the creativity of the project team?

11. How did you obtain the **additional resources** needed to react to these events? What helped or hampered your efforts to obtain these resources?

12. What **changes** did you have to make to the organizational and contractual **structure** of the project in order to respond to these events? What precluded your intended changes?

13. What was the **ultimate impact** of these events on the project?

D. Outcomes

14. What did you **learn from this project** about preventing negative events and exploiting positive events? How did this learning influence your project management approach?

15. How would you characterize the **project performance** in terms of:
    a. budget and schedule?
    b. technical success?
    c. sales and financial return?
    d. strategic advances for your organization?

Guide d'entrevue semi-dirigée

La planification

1. S'il vous plaît, décrivez-nous brièvement **le contexte et l'output** envisagé par ce projet (artefact, processus, système, technologie). D'où provenait l'idée du projet d'origine et comment fut-elle définie?

2. Comment le projet a été **structuré** en termes de responsabilités, de membres de l'équipe centrale, de participants externes, de calendrier, de budget, de supervision, de contrats, etc.? Comment cette structure a-t-elle été élaborée?

3. Quelles sont les **principales incertitudes** qui vous pensiez susceptibles d'affecter la réussite du projet? Comment aviez-vous prévu de résoudre ces incertitudes?

L'exécution

4. Pouvez-vous décrire les **activités réalisées** au cours du projet en termes de grandes étapes et des participants? Comment l'envergure du projet a-t-elle évolué au cours de ces activités?

5. Comment **l'organisation du projet a évolué** au cours de ces activités? Quelles sont les principales différences entre les plans initiaux et l'organisation réelle des activités?

6. Pouvez-vous décrire les **modes de collaboration** entre les participants au projet. Comment se sont-ils aidés les uns les autres? Quels étaient les contenus, les moyens et le rythme de leurs communications?

7. Quels types de **malentendus** et de **conflits** ont eu lieu au cours de ces activités? Quelles sont leurs sources typiques?

La flexibilité

8. Quels ont été les principaux **événements inattendus** (positifs ou négatifs) qui ont touché ce projet? Comment en avez-vous pris connaissance?

9. Quelle a été la **première réaction** de l'équipe du projet à ces événements? Comment ces événements ont-ils influencé les relations entre les différents participants au projet?

10. Quelle a été la **réponse définitive** du projet à ces événements? Comment cette réponse a-t-elle été développée? Qu'est-ce qui a encouragé ou, au contraire, fait obstacle à la créativité de l'équipe du projet?

11. Comment avez-vous obtenu les **ressources supplémentaires** nécessaires pour réagir à ces événements? Qu'est-ce qui a facilité ou entravé les efforts visant à obtenir ces ressources?

12. Quels **changements** avez-vous eu à faire à la structure organisationnelle et contractuelle du projet afin de répondre à ces événements? Qu'est-ce qui vous a freiné dans ces changements?

13. Quel est **l'impact final** de ces événements sur le projet?

Les résultats

14. Qu'avez-vous **appris de ce projet** tant sur la prévention des événements négatifs que de l'exploitation des événements positifs? Comment cet apprentissage a influencé votre approche de la gestion de projet?

15. Comment caractérisiez-vous la **performance** des projets en termes de:
    a. respect du budget et des échéances?
    b. réussite technique?
    c. ventes et rentabilité financière?
    d. avancées stratégiques pour votre organisation?

APPENDIX B

THE REFINED INTERVIEW GUIDE – ENGLISH

ISSUES FOR DISCUSSIONS

A. Planning

1. Please briefly describe **the context** in which **the project idea** emerged. Who proposed the project? What was its main **justification**? How did promoters draw support and co-opt other participants?

2. Who were the main **stakeholders that opposed** the project? What were their arguments? What actions were carried out to overcome their resistance?

3. How the project was **initially structured** in terms of scope, team members, participants, schedule, budget, supervision, contracts etc.? What was the role of your organization?

B. Execution

4. Please describe the **activities realized** during the project in terms of major phases, participants, milestones etc.

5. What **significant changes** of the project initial plan occurred during these activities? Who promoted these changes? How were these changes accomplished?

6. Please describe the **patterns of collaboration** between project participants. What were the typical **misunderstandings and conflicts** that occurred during these activities? What were their sources?

7. What were the major **unexpected events** (negative or positive) that affected this project? How did you learn about them?

C. Structuring – for each structuring episode

8. What **event or situation triggered** the process of restructuring? What was the **initial reaction** of the project team to this event?

9. How did participants realize that organizational **change was needed**?

10. How was the **eventual response** developed? What alternative responses were taken into consideration? What encouraged or obstructed the creativity of the project team?

11. What **analyses, deliberations and debates** between participants occurred? What conflicts took place? How did the main actors change their position during this restructuring process? How eventual changes to the project organization and other elements were agreed and implemented?

12. How were obtained the **additional resources** needed to implement these changes? What helped or hampered your efforts to obtain these resources?

13. What was the **ultimate impact** of this change on the project and on the relations between various project participants?

D. Outcomes

14. How would you characterize the **project performance** in terms of budget and schedule? Technical success? Sales and financial return? Strategic advances for your organization?

APPENDIX C

LIST OF TRIGGERING EVENTS
THAT LED TO STRUCTURING EPISODES

NB: The events are sorted by project and presented in chronological order.

Project InfraR
1. Project management team's optimistic initial representation regarding the project plan and the resources needed to reach the project goal
2. Repeated misunderstandings regarding areas of responsibilities between the two partners
3. Contractors' aberrant behavior leads to delays and low-quality deliveries.
4. Blasting contractor cuts corners and generates work safety issues
5. Dishonest behavior of some contractors regarding control issues
6. Conflicting interests between project initiators and regulatory authorities regarding the railway route in one protected area
7. Environmental activists, supported by the court, impose their demand to rebuild the protected area affected by the construction of the railway

Project InfraST
1. Conflicting interests regarding the project design between the local politicians
2. Project designers' inaccurate representation of project surroundings – the foundation position of a neighboring building
3. The three partners dispute their representations of the project idea and sequence of activities
4. The project planners underestimate the complexity of project surroundings – solutions to isolate the metro station
5. The project planners underestimate the complexity of project surroundings – the construction of the freezing wall
6. Project designers' inaccurate representation of project surroundings – water leakage in the metro station and the pavement sinking
7. Colliding representations regarding construction cost between project management team, architects and possible bidders
8. One partner change the activity sequence for its part of the project to better suit its needs and interests
9. Disliking the current design, one project manager proposes to implement a solar system in the railway station roof

Project InfraS

1. In order to minimize the project impact on their activities, the association of local businesses ask for a dramatic compression of the project schedule
2. Incompatibilities between outdated technologies and contemporaneous work routines
3. One utility company suddenly decides to improve its pipelines infrastructure when the street was almost fully rehabilitated

Project TerminalE

1. External actors impose their will on the future project design
2. Conflicting interests between project team, environmental groups and governmental agencies regarding an existing river diversion
3. The project client demands design changes to lower project cost
4. The main airline using the airport demands major design changes to adapt to single terminal occupancy
5. A new leader comes with a different vision regarding project development
6. One contractor requires design changes to accommodate his construction routines
7. Misunderstandings regarding areas of responsibility between contractors
8. Project management team's inaccurate representation of the project costs and schedule – the construction of the second satellite building
9. Designers' inaccurate representation of the control tower design
10. Contractor cuts corners so deliveries of inappropriate quality – auxiliary car park
11. National and international legislation changes in terms of airport security
12. The main airline requires last-minute changes of design and specifications
13. Project planners' inaccurate initial representation of the project schedule
14. Information system contractor's inaccurate representations regarding baggage system operation

Project TerminalS

1. National and international legislation changes in terms of airport security
2. Information system contractor's inaccurate representations regarding security system operation
3. Project management team's underestimation of issues regarding reusing old fir beams
4. Supplier do not follow the initial design and delivers boarding bridges with technical issues

Project TerminalL

1. The main airline requires a major change of design to better fit its interests

2. Regulatory authorities suddenly reverse their decision regarding passenger flow design
3. The two main airlines using the airport merge and demand changes to accommodate their new needs
4. National and international legislation changes in terms of airport security
5. The main airline using the airport fills in for bankruptcy and cannot participate anymore in fitting its allocated space
6. Main airline demands more involvement in one subproject – to have more influence regarding specifications of the hangar and conveyors it will use exclusively

Project EnergyEX
1. Construction manager consultant's errors in estimating project costs
2. Supplier gain a contract too large for its capacities and therefore delivers valves of inappropriate quality
3. Supplier cuts corners in the manufacturing process and delivers metal rings of inappropriate quality
4. Project planner's inaccurate representation of work force availability.
5. Project planner's inaccurate representation of project surroundings – water contamination risk
6. Supplier cuts corners in the manufacturing process and delivers pressure vessels of inappropriate quality

Project EnergyTP
1. The client reschedules interrelated project (first delays commencement date and then slow down construction
2. The client demands major changes in technical specifications
3. The client goes bankrupt and demands project closure and preservation

Project EnergyH
1. Project planner's inaccurate representation of project surroundings – unexpected river bed shape
2. Project planner's inaccurate representation of project surroundings – difficulties to dig the intake channel due to soil texture
3. Project planner's inaccurate representation of project surroundings – difficulties in vibro-compacting the base of the dam
4. Conflicts unions – main contractor regarding work conditions and roles in the project
5. Project planner's inaccurate representation of project surroundings – difficulties to dig through a granite block
6. Project planner's inaccurate representation of project surroundings – one boulder detaches and falls on the construction site

7. Project planner's inaccurate representation of project surroundings – sediments in the river

Project DigitA
1. Project planner inaccurate initial representation regarding human resource
2. In order to avoid future technical issues of compatibility, the project management decides to change the development platform
3. One team and its leader are perfectionists and delay the delivery of their work package
4. Conflicting interests in assuming responsibilities between the project manager and technical coordinator
5. Project planner inaccurate initial representation regarding schedule

Project DigitS
1. Strategic planning assumes an unrealistic schedule
2. The prototype solution has major incompatibility issues when used in international sites
3. Inaccurate initial representation of the project schedule
4. The client requires prioritization of certain sites
5. Inaccurate representation of the project schedule after the first re-planning

Project DigitPTIS
1. Major technical incompatibilities between deliveries of the two main suppliers
2. Major conflicts between the project management and the main contractor's project team
3. The new leader imposes a completely new vision regarding project development
4. One partner requires renegotiation of its agreement with the main contractor
5. Project planner's inaccurate representation of the project schedule
6. Project planner's inaccurate representation regarding the complexity of the payment mode technical specifications
7. Technical issues with deliveries once the operations start

Project DigitMIS
1. Future users oppose to certain features of the new information system
2. The project management team build a support coalition to convince reluctant departments
3. Project planners' inaccurate representation of the project schedule and implementation complexity

Project DigitBIS
1. In order to avoid future technical issues of compatibility, the project management decides to change the development platform

2. The new IT function manager imposes her vision regarding the utility of a quality management process to be integrated in the project
3. One supplier delivers a software program with many technical issues and does not inform the project team
4. One team from the marketing department attracts a new major client for the parent organization by promising access to the new IS for an unrealistic date
5. Responsible teams ignore and avoid a specific work package due to its difficulty
6. Schedule coordinating issues with similar projects of other banks regarding the date of switching to a new technical standard, at the national level

Project PharmaA
1. The main stakeholder takes over the project from the initial development team
2. Drug seems promising for treatment of other, related diseases
3. Regulatory authorities delay drug approval
4. Regulatory authorities delay approval of the change in the drug application method
5. Colliding public communication protocols between the international team and the initial development team

Project PharmaB
1. The parent company switches to a preservatives-free policy
2. Inaccurate labels colors

Project PharmaS
1. Inaccurate initial representations regarding patients' reaction to the drug in one country
2. Inaccurate initial representations regarding kidney toxicity

Project PharmaNA
1. Inaccurate initial representation regarding the pool of volunteers that would fit the requirements for testing the drug
2. Inaccurate representation regarding requirements for performing tests in one specific country
3. Inaccurate initial dose formulation
4. The parent company sells a less-promising competing project

REFERENCES

Aaltonen, K., and Kujala, J. (2010). A project lifecycle perspective on stakeholder influence strategies in global projects. *Scandinavian Journal of Management,* 26, 381–397.

Aarseth, W., Andersen, B., Ahola, T., and Jergeas, G. (2012). Practical difficulties encountered in attempting to implement a partnering approach. *International Journal of Managing Projects in Business,* 5(2), 266-284.

Ahola, T., Artto, K., and Kujala, J. (2011). Managing project uncertainty: Critical incidents in multi-firm project networks. Presented at the *IRNOP conference,* June 19-22, Montreal, Canada.

Ahuja, G., Soda, G., and Zaheer, A. (2012). The genesis and dynamics of organizational networks. *Organization Science,* 23(2), 434-448.

Alderman, N., and Ivory, C. (2011). Translation and convergence in projects: An organizational perspective on project success. *Project Management Journal,* 42(5), 17-30.

Ambos, T. C., and Birkinshaw, J. (2010). How do new ventures evolve? An inductive study of archetype changes in science-based ventures. *Organization Science,* 21(6), 1125-1140.

Andersen, E. S., Dysvik, A., and Vaagaasar, A. L. (2009). Organizational rationality and project management. *International Journal of Managing Projects in Business,* 2(4), 479-498.

Aritua, B., Smith, N. J., and Bower, D. (2011). What risks are common to or amplified in programmes: Evidence from UK public sector infrastructure schemes. *International Journal of Project Management,* 29(3), 303-312.

Artto, K., Kujala, J., Dietrich, P., and Martinsuo, M. (2008). What is project strategy? *International Journal of Project Management,* 26(1), 4-12.

Atkinson, R., Crawford, L., and Ward, S. (2006). Fundamental uncertainties in projects and the scope of project management. *International Journal of Project Management, 24*(8), 687-698.

Aubry, M., Lievre, P. And Hobbs, B. (2010). Project management in extreme environments – guest editorial. *Project Management Journal*, vol. 41 (3): pp. 2-3.

Bachmann, R., and Inkpen, A. C. (2011). Understanding institutional-based trust building processes in inter-organizational relationships. *Organization Studies, 32*(2), 281-301.

Badenfelt, U. (2011). Fixing the contract after the contract is fixed: A study of incomplete contracts in IT and construction projects. *International Journal of Project Management, 29,* 568–576.

Ballinger, G. A., and Rockmann, K. W. (2010). Chutes versus ladders: Anchoring events and a punctuated-equilibrium perspective on social exchange relationships. *Academy of Management Review, 35*(3), 373-391.

Barley, S. R. (1986). Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly,* 78-108.

Barley, S. R., and Kunda, G. (2001). Bringing work back in. *Organization Science, 12*(1), 76-95.

Barley, S. R., and Tolbert, P. S. (1997). Institutionalization and structuration: Studying the links between action and institution. *Organization Studies,* 18(1), 93-117.

Bartunek, J. M. (1984). Changing interpretive schemes and organizational restructuring: The example of a religious order. *Administrative Science Quarterly,* 29(3), 355-372.

Bartunek, J. M., and Franzak, F. J. (1988). The effects of organizational restructuring on frames of reference and cooperation. *Journal of Management,* 14(4), 579-592.

Bartunek, J. M., Balogun, J., and Do, B. (2011). Considering planned change anew: Stretching large group interventions strategically, emotionally, and meaningfully. *The Academy of Management Annals, 5*(1), 1-52.

Bechky, B. A., and Okhuysen, G. A. (2011). Expecting the unexpected? How SWAT officers and film crews handle surprises. *Academy of Management Journal, 54*(2), 239-261.

Becker, H. S. (1960). Notes on the concept of commitment. *American Journal of Sociology, 66,* 32–40.

Beckhy, B.A. (2006). Gaffers, gofers, and grips: Role-based coordination in temporary organizations. *Organization Science,* 17(1), 3-21.

Bercovitz, J. E., and Tyler, B. B. (2014). Who I am and how I contract: The effect of contractors' roles on the evolution of contract structure in university–industry research agreements. *Organization Science, 25*(6), 1840-1859.

Berger, P. L., and Luckmann., T. (1966). *The social construction of reality: A treatise in the sociology of knowledge.*

Besner, C., and Hobbs, B. (2012). The paradox of risk management; a project management practice perspective. *International Journal of Managing Projects in Business, 5*(2), 230-247.

Blackburn S. (2002). The project manager and the project-network. *International Journal of Project Management,* 20, 199–204.

Blomquist, T., Hällgren, M., Nilsson, A., and Söderholm, A. (2010). Project-as-Practice: In search of project management research that matters. *Project Management Journal,* 41, 5-16.

Bluedorn, A. C., and Denhardt, R. B. (1988). Time and organizations. *Journal of Management, 14*(2), 299-320.

Blumer, H. (1969). *Symbolic Interactionism; Perspective and Method.* Englewood Cliffs, NJ: Prentice-Hall.

Boehm, B. (1988). A spiral model of software development and enhancement. *IEEE Computer,* 21(5), 61–72.

Boehm, B. (2000). Project termination doesn't equal project failure. *Computer,* 33(9), 94-96.

Brady, T., and Davies, A. (2014). Managing structuring and dynamic complexity: A tale of two projects. *Project Management Journal,* 45(4), 21-38.

Bresman, H. (2013). Changing routines: A process model of vicarious group learning in pharmaceutical R&D. *Academy of Management Journal, 56*(1), 35-61.

Bresman, H., and Zellmer-Bruhn, M. (2013). The structural context of team learning: Effects of organizational and team structure on internal and external learning. *Organization Science, 24*(4), 1120-1139.

Brouthers, K. D., Brouthers, L. E., and Wilkinson, T. J. (1995). Strategic alliances: Choose your partners. *Long range planning, 28*(3), 2-25.

Brown, J. S., and Duguid, P. (1991). Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organization Science,* 2(1), 40-57.

Brown, S. L., and Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly,* 42, 1-34.

Bryman, A., and Bell, E. (2011). *Business Research Methods* (3rd ed). New York: Oxford University Press.

Bryson, J. M., Crosby, B. C., and Bryson, J. K. (2012). Understanding strategic planning and the formulation and implementation of strategic plans as a way of knowing: The contributions of actor-network theory. *International Public Management Journal,* 12(2), 172–207.

Burchell, R., and Gilden, A. (2008). Measuring cultural perceptions of western project managers operating in the Asian region: Application of a cultural model. *Management Decision,* 27(7), 1052–1065.

Burns, T. E., and Stalker, G. M. (1961). The management of innovation. *University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.*

Calamel, L., Defélix, C., Picq, T., and Retour, D. (2012). Inter-organisational projects in French innovation clusters: The construction of collaboration. *International Journal of Project Management,* 30(1), 48-59.

Callon, M. (1986). Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc Bay. In Law J. (ed.), *Power, Action and Belief. A New Sociology of Knowledge?* Routledge and Kegan Paul, London.

Carlile, P. R. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization Science,* 13(4), 442-455.

Chandler, A. D. (1962). Strategy and structure: Chapters in the history of the American enterprise. *Massachusetts Institute of Technology Cambridge.*

Chandler, D. (2014). Organizational susceptibility to institutional complexity: Critical events driving the adoption and implementation of the ethics and compliance officer position. *Organization Science,* 25(6), 1722-1743.

Chapman, C. B., and Ward, S. C. (2003). *Project Risk Management: Processes, Techniques and Insights* (2nd ed.). Chichester: John Wiley & Sons.

Child, J. (1972). Organizational structure, environment and performance: The role of strategic choice. *Sociology,* 6(1), 1-22.

Chung, S. A., Singh, H., and Lee, K. (2000). Complementarity, status similarity and social capital as drivers of alliance formation. *Strategic management journal,* 21(1), 1-22.

Cicmil, S., Williams, T., Thomas, J., and Hodgson, D. (2006). Rethinking project management: Researching the actuality of projects. *International Journal of Project Management,* 24, 675–686.

Clark, S. M., Gioia, D. A., Ketchen Jr., D. J., and Thomas, J. B. (2010). Transitional identity as a facilitator of organizational identity change during a merger. *Administrative Science Quarterly,* 55(3), 397-438.

Collyer, S., and Warren, C. M. J. (2009). Project management approaches for dynamic environments. *International Journal of Project Management,* 27, 355–364.

Collyer, S., Warren, C., Hemsley, B., and Stevens, C. (2010). Aim, fire, aim – Project planning styles in dynamic environments. *Project Management Journal,* 41(4), 108-121.

Conforto, E. C., Salum, F., Amaral, D. C., da Silva, S. L., and Magnanini de Almeida, L. F. (2014). Can agile project management be adopted by industries other than software development? *Project Management Journal,* 45(3), 21-34.

Cooke Davies, T. (2002). The real success factors on projects. *International Journal of Project Management,* 20, 185–190.

Cooper, C. L. (2005). The future of work: careers, stress and well-being. *Career Development International, 10*(5), 396-399.

Corbin, J., and Strauss, A. (1994). *Grounded theory methodology. Handbook of qualitative research.*

Corbin, J., and Strauss, A. (2008). *Basis of qualitative research.* (3rd ed.). Thousand Oaks, CA: Sage.

Cullen, J. B., Johnson, J. L., and Sakano, T. (2000). Success through commitment and trust: The soft side of strategic alliance management. *Journal of World Business, 35*(3), 223-240.

D'Adderio, L. (2014). The replication dilemma unravelled: How organizations enact multiple goals in routine transfer. *Organization Science, 25*(5), 1325-1350.

Damasio, A. (1994). *Descartes' Error: Emotion, Reason, and the Human Brain.* Putnam Publishing.

Davies, A., Gann, D., and Douglas, T. (2009). Innovation in megaprojects: Systems integration at London Heathrow Terminal 5. *California Management Review,* 51(2), 101-125.

Davies, A., and Hobday, M. (2005). *The business of projects: managing innovation in complex products and systems.* New York: Cambridge University Press.

De Bakker, K., Boonstra, A., and Wortmann, H. (2010). Does risk management contribute to IT project success? A meta-analysis of empirical evidence. *International Journal of Project Management,* 28(5), 493-503.

De Bakker, K., Boonstra, A., and Wortmann, H. (2011). Risk management affecting IS/IT project success through communicative action. *Project Management Journal,* 42(3), 75-90.

De Bakker, K., Boonstra, A., and Wortmann, H. (2012). Risk managements' communicative effects influencing IT project success. *International Journal of Project Management,* 30, 444–457.

De Man, A., and Roijakkers, N., (2009). Alliance governance: Balancing control and trust in dealing with risk. *Long Range Planning,* 42(1), 75–95.

DeChurch, L. A., and Haas, C. D. (2008). Examining team planning through an episodic lens Effects of deliberate, contingency, and reactive planning on team effectiveness. *Small Group Research,* 39(5), 542-568.

Deetz, S. A., Tracy, S. J., and Simpson, J. L. (2000). *Leading organizations. Through Transition.* London, Thousand Oaks: Sage.

Descartes, R. (2003). *Treatise of Man.* Amherst, New York: Prometheus Books.

Dey, I. (1999). *Grounding Grounded Theory: Guidelines for Qualitative Inquiry.* San Diego, CA: Academic Press.

Di Marco, M. K., Alin, P., and Taylor, J. E. (2012). Exploring negotiations through boundary objects in global design project networks. *Project Management Journal*, 43(3), 24-39.

Dille, T., and Söderlund, J. (2011). Managing inter-institutional projects: The significance of isochronism, timing norms and temporal misfits. *International Journal of Project Management*, 29(4), 480-490.

DiMaggio, P., and Powell, W. (1984). Institutional isomorphism and structural conformity. Paper presented at the *American Sociological Association meetings*, San Antonio, Texas.

Dionysiou, D. D., and Tsoukas, H. (2013). Understanding the (re)creation of routines from within: A symbolic interactionist perspective. *Academy of Management Review*, 38(2), 181-205.

Doloi, H., Sawhney, A., Iyer, K.C., and Rentala, S. (2012). Analysing factors affecting delays in Indian construction projects. *International Journal of Project Management*, 30 (4), 479-489.

Dooley, K. J., and Van de Ven, A. H. (1999). Explaining complex organizational dynamics. *Organization Science*, 10(3), 358-372.

Dougherty, D. (2001). Reimagining the differentiation and integration of work for sustained product innovation. *Organization Science*, *12*(5), 612-631.

Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 17, 313-327.

Dvir, D., and Lechler, T. (2004). Plans are nothing, changing plans is everything: the impact of changes on project success. *Research Policy*, 33, 1-15.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532-550.

Eisenhardt, K. M., and Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25-32.

Eisenhardt, K. M., and Schoonhoven, C. B. (1996). Resource-based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms. *Organization Science,* 7(2), 136-150.

Emirbayer, M., and Mische, A. (1998). What is Agency? *American Journal of Sociology,* 103(4), 962-1023.

Engwall, M., and Westling, G. (2004). Peripety in an R&D drama: capturing a turnaround in project dynamics. *Organization Studies, 25*(9), 1557-1578.

Fallahnejad, M. H. (2013). Delay causes in Iran gas pipeline projects. *International Journal of Project Management,* 31(1), 136-146.

Feldman, M. S., and Pentland, B. T. (2003). Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly,* 48(1), 94-118.

Floricel, S. (2008). Understanding the dynamics of strategic risks and resources in innovative ventures. *International Journal of Entrepreneurship and Innovation Management,* 8(4), 472-487.

Floricel, S., and Dougherty, D. (2007). Where do games of innovation come from? Explaining the persistence of dynamic innovation patterns. *International Journal of Innovation Management,* 11(1), 65-91.

Floricel, S., and Lampel, J. (1998). Innovative Contractual Structures for Inter-organizational Systems. *International Journal of Technology Management,* 16 (1/2/3), 193-206.

Floricel, S., and Miller, R. (2001). Strategizing for anticipated risks and turbulence in large-scale engineering projects. *International Journal of Project Management,* 19, 445-455.

Floricel, S. and Piperca, S. (2016). Project Management between Will and Representation. *Project Management Journal* (forthcoming).

Floricel, S., Banik, M., and Piperca, S. (2013). The triple helix of project management research: theory building, qualitative understanding and quantitative corroboration. In: N. Drouin, R. Muller, and S. Sankaran (Eds.) *Novel*

Approaches to Organizational Project Management Research: Translational and Transformational. Copenhagen Business School Press.

Floricel, S., Bonneau, C., Aubry, M., and Sergi, V. (20140. Extending project management research: Insights from social theories. *International Journal of Project Management,* 32(7), 1091-1107.

Floricel, S., Michela, J., George, M., and Bonneau, L. (2011b). *Refining the Knowledge Production Plan: Knowledge Representations in Innovation Projects.* Newtown Square, PA: Project Management Institute.

Floricel, S., Piperca, S., and Banik, M. (2011a). *Increasing project flexibility: The Response Capacity of Complex Projects.* Newtown Square, PA: Project Management Institute.

Flyvbjerg, B. (2014). What you should know about megaprojects and why: An overview. *Project Management Journal,* 45(2), 6-19.

Ford, D. N., and Bhargav, S. (2006). Project management quality and the value of flexible strategies. *Engineering, Construction and Architectural Management,* 13(3), 275-289.

Frooman, J. (1999). Stakeholder influence strategies. *The Academy of Management Review,* 24(2), 191-205.

Fu, Y., Li, M., and Chen, F. (2012). Impact propagation and risk assessment of requirement changes for software development projects based on design structure matrix. *International Journal of Project Management,* 30, 363–373.

Galbraith, J. R. (1973). *Designing complex organizations.* Reading, MA: Addison-Wesley.

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. In: C. Geertz, *The Interpretation of Cultures.* New York: Basic Books.

Geraldi, J. G., (2008). The balance between order and chaos in multi-project firms: A conceptual model. *International Journal of Project Management,* 26, 348–356.

Geraldi, J. G., Lee-Kelley, L., and Kutsch, E. (2010). The Titanic sunk, so what? Project manager response to unexpected events. *International Journal of Project Management*, Volume 28, Issue 6, 547-558.

Gersick, C. J. G. (1991). Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm. *The Academy of Management Review*, 16(1), 10-36.

Gibson, C. B., and Gibbs, J. L. (2006). Unpacking the concept of virtuality: The effects of geographic dispersion, electronic dependence, dynamic structure, and national diversity on team innovation. *Administrative Science Quarterly*, 51(3), 451-495.

Giddens, A. (1982). *Profiles and Critiques in Social Theory*. University of California Press, Berkeley and Los Angeles.

Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. University of California Press, Berkeley and Los Angeles.

Giezen, M. (2012). Keeping it simple? A case study into the advantages and disadvantages of reducing complexity in mega project planning. *International Journal of Project Management*, 30, 781–790.

Gioia, D. A., and Chittipeddi, K. (1991). Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal*, 12(6), 433-448.

Girotra, K., Terwiesch, C., and Ulrich, K.T. (2007). Valuing R&D projects in a portfolio: Evidence from the pharmaceutical industry. *Management Science*, 53(9), 1452-1466.

Glaser, B. G., and Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine Publishing Company.

Goffman, E. (1969). *The Presentation of Self in Everyday Life*. London Allen Lane: The Penguin Press.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 1360-1380.

Greenwood, R. and Hinings, C.R. (1988). Organizational design types, tracks and the dynamics of strategic change. *Organization Studies*, 9(3): 293-316.

Greve, H.R., Mitsuhashi, H., and Baum, J.A.C. (2013). Greener pastures: Outside options and strategic alliance withdrawal. *Organization Science,* 24(1), 79-98.

Gulati, R. (1995). Social structure and alliance formation patterns: A longitudinal analysis. *Administrative Science Quarterly,* 619-652.

Gulati, R., and Gargiulo, M. (1999). Where do interorganizational networks come from? *American Journal of Sociology,* 104(5), 1439-93.

Hällgren, M. (2007). Beyond the point of no return: On the management of deviations. *International Journal of Project Management,* 25, 773-780.

Hällgren, M. (2009). Mechanisms of deviations: observations of projects in practice. *International Journal of Managing Projects in Business,* 2, 611-625.

Hällgren, M., and Maaninen-Olson, E. (2009). Deviations and the breakdown of project management principles. *International Journal of Managing Projects in Business,* 2(1), 53-69.

Hällgren, M., and Maaninen-Olsson, E. (2005). Deviations, ambiguity and uncertainty in a project-intensive organization. *Project Management Journal,* 36, 17-26.

Hällgren, M., and Wilson, T. L. (2011). Opportunities for learning from crises in projects. *International Journal of Managing Projects in Business,* 4(2), 196-217.

Hanisch, B., and Wald, A. (2011). A project management research framework integrating multiple theoretical perspectives and influencing factors. *Project Management Journal,* 42 (3), 4-22.

Hannan, M. T., and Freeman, J. (1977). The population ecology of organizations. *American Journal of Sociology*, 929-964.

Hardy, C., and Maguire, S. (2010). Discourse, field-configuring events, and change in organizations and institutional fields: Narratives of DDT and the Stockholm convention. *Academy of Management Journal,* 53(6), 1365-1392.

Hargadon, A., and Fanelli, A. (2002). Action and possibility: Reconciling dual perspectives of knowledge in organizations. *Organization Science,* 13(3), 290-302.

Hartogh, M., and Westerveld, E., (2010). *Playing with Complexity: Management and Organisation of Large Infrastructure Projects*. AT Osborne, Baarn.

Heaphy, E. D. (2013). Repairing breaches with rules: Maintaining institutions in the face of everyday disruptions. *Organization Science*, 24, 1291–1315.

Heimeriks, K. H., Schijven, M., and Gates, S. (2012). Manifestations of higher-order routines: The underlying mechanisms of deliberate learning in the context of postacquisition integration. *Academy of Management Journal,* 55(3), 703-726.

Helfat, C. E., and Peteraf, M. A. (2003). The dynamic resource-based view: capability lifecycles. *Strategic Management Journal*, *24*(10), 997-1010.

Henderson, R. M., and Clark, K. B. (1990). Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*, 9-30.

Hendry, J., and Seidl, D. (2003). The structure and significance of strategic episodes: Social systems theory and the routine practices of strategic change. *Journal of Management Studies,* 40(1), 175-196.

Hernes, T. (2007). *Understanding organization as process: Theory for a tangled world.* London, UK: Routledge.

Highsmith, J., and Cockburn, A. (2001). Agile software development: The business of innovation. *Computer,* 34(9), 120-127.

Hirschman, A. O. (1978). Exit, voice, and the state. *World Politics,* 31(01), 90-107.

Hobday, M. (2000). The project-based organisation: an ideal form for managing complex products and systems? *Research Policy*, 29(7), 871-893.

Hobday, M., Davies, A., and Prencipe, A. (2005). Systems integration: a core capability of the modern corporation. *Industrial and Corporate Change,* 14(6), 1109-114.

Hogg, M. A., van Knippenberg, D., and Rast III, D. E. (2012). Intergroup leadership in organizations: Leading across group and organizational boundaries. *Academy of Management Review,* 37(2), 232-255.

Holzmann, V., and Spiegler, I. (2011). Developing risk breakdown structure for information technology organizations. *International Journal of Project Management,* 29(5), 537-546.

Howard-Grenville, J. (2005). The persistence of flexible organizational routines: The role of agency and organizational context. *Organization Science,* 16, 618-636.

Howard-Grenville, J., Golden-Biddle, K., Irwin, J., and Mao, J. (2011). Liminality as cultural process for cultural change. *Organization Science,* *22*(2), 522-539.

Huchzermeier, A., and Loch, C. H. (2001). Project management under risk: Using the real options approach to evaluate flexibility in R&D. *Management Science,* 47(1), 85-101.

Huy, N. Q. (2001). Time, temporal capability, and planned change. *Academy of Management Review,* 26(4), 601-623.

Hwang, P., and Lichtenthal, J. D. (2000). Anatomy of organizational crises. *Journal of Contingencies and Crisis Management,* 8, 129-40.

Jahr, M. (2014). A hybrid approach to quantitative software project scheduling within agile frameworks. *Project Management Journal,* 45(3), 35-45

Jani, A. (2011). Escalation of commitment in troubled IT projects: Influence of project risk factors and self-efficacy on the perception of risk and the commitment to a failing project. *International Journal of Project Management,* 29 (7), 934-945.

Jarzabkowski, P., and Seidl, D. (2008). The role of meetings in the social practice of strategy, *Organization Studies,* 29(11), 1391-1426.

Jarzabkowski, P., and Spee, A. P. (2009). Strategy-as-practice: A review and future directions for the field. *International Journal of Management Reviews*, 11, 69–95.

Jensen, C., Johansson, S., and Löfström, M. (2006). Project relationships – A model for analyzing interactional uncertainty. *International Journal of Project Management*, 24, 4–12.

Johnson, G., Langley, A., Melin, L., and Whittington, R. (2007). *Strategy as Practice: Research Directions and Resources*. Cambridge, UK: Cambridge University Press.

Johnson, G., Melin, L., and Whittington, R. (2003). Micro strategy and strategizing: towards an activity-based view, *Journal of Management Studies*, 40(1), 3-22.

Johnson, G., Prashantham, S., Floyd, S. W., and Bourque, N. (2010). The ritualization of strategy workshops. *Organization Studies*, 31(12), 1589-1618.

Johnson, J. L., Cullen, J. B., Sakano, T., and Takenouchi, H. (1996). Setting the stage for trust and strategic integration in Japanese-US cooperative alliances. *Journal of International Business Studies*, 981-1004.

Kahn, W. A., Barton, M. A., and Fellows, S. (2013). Organizational crises and the disturbance of relational systems. *Academy of Management Review*, 38(3), 377-396.

Kappelman, L. A., McKeeman, R., and Zhang, L. (2006). Early warning signs of IT project failure: The dominant dozen, *Information Systems Management*, 23(4), 31-36.

Kazanjian, R. K. (1988). Relation of dominant problems to stages of growth in technology-based new ventures. *Academy of Management Journal*, 31(2), 257-279.

Keil, M., and Montealegre, R. (2001). Cutting your losses: Extricating your organization when a big project goes awry. *MIT Sloan Management Review*, 41(3), 55–68.

Kendrick, T. (2003). *Identifying and Managing Project Risk*. AMACOM, New York, NY, US.

King, W. R., and Cleland, D. I. (1988). Life–cycle management. In: Cleland, D. J., King, W.R. (Eds.), *Project Management Handbook*. Van Nostrand Reinhold, New York.

Koppenjan, J., Veenemanb, W., Van der Voortb, H., ten Heuvelhof, E., and Leijtenb, M. (2011). Competing management approaches in large engineering projects: The Dutch RandstadRail project. *International Journal of Project Management*, 29, 740–750.

Koskela, L., and Howell, G. (2002). The underlying theory of project management is obsolete. In: *The PMI Research Conference*, June 2002, Seattle, Washington.

Kraemer, R., Whiteman, G., and Banerjee, B. (2013). Conflict and astroturfing in Niyamgiri: The importance of National Advocacy Networks in anti-corporate social movements. *Organization Studies*, 34(5-6), 823-852.

Kramer, R. M. (1999). Trust and distrust in organizations: Emerging perspectives, enduring questions. *Annual Review of Psychology*, 50, 569 –598.

Krane, H. P., Olsson, N. O., and Rolstadås, A. (2012). How project manager–project owner interaction can work within and influence project risk management. *Project Management Journal*, 43(2), 54-67.

Krishnan, V., and Ulrich, K. T. (2001). Product development decisions: A review of the literature. *Management Science*, 47(1), 1-21.

Krishnan, V., Eppinger, S. D., and Whitney, D. E. (1997). A model based framework to overlap product development activities. *Management Science*, 43(4), 437-451.

Kuhn, T. S. (1970). *The Structure of Scientific Revolutions*. Enlarged (2nd ed.). University of Chicago Press.

Kutsch, E, and Hall, M. (2009). The rational choice of not applying project risk management in information technology projects. *Project Management Journal*, 40(3), 72-81.

Kutsch, E., and Hall, M. (2010). Deliberate ignorance in project risk management. *International Journal of Project Management,* 28(3), 245-255.

Kutsch, E., and Maylor, H. (2011). Risk and error in IS/IT projects: going beyond process. *International Journal of Project Organisation and Management,* 3(2), 107 – 126.

Labatut, J, Aggeri, F., and Girard, N. (2012). Discipline and change: How technologies and organizational routines interact in new practice creation. *Organization Studies,* 33(1), 39-69.

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review,* 24(4), 691-710.

Lanzara, G. F. (2009). Reshaping practice across media: Material mediation, medium specificity and practical knowledge in judicial work. *Organization Studies,* 30, 1369-1390.

Latour, B. (1997). *On actor-network theory - A few clarifications.* Soziale Welt, 1997.

Latour, B., and Woolgar, S. (1979). *Laboratory Life: the Social Construction of Scientific Facts.* Sage, Beverly Hills; reprinted, Princeton University Press, Princeton, 1986.

Laughlin, R.C. (1991). Environmental disturbances and organizational transitions and transformations: Some alternative models. *Organization Studies,* 12(2): 109-132.

Lave, J., and Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge University Press.

Law, J. (1992). Notes on the theory of the actor-network: Ordering, strategy and heterogeneity. *Systems Practice,* 5(4), 379-393.

Law, J. (1994). *Organizing Modernity.* Blackwell Publishers, Oxford, UK and Cambridge, USA.

Lawrence, P. R., and Lorsch, J. W. (1969). *Developing Organizations: Diagnosis and Action.* Reading, MA: Addison-Wesley Publishing Company.

Lechler, T. G., Edington, B. H., and Gao, T. (2012). Challenging classic project management: Turning project uncertainties into business opportunities. *Project Management Journal*, 43(6), 59-69.

Lehtiranta, L. (2014). Risk perceptions and approaches in multi-organizations: A research review 2000–2012. *International Journal of Project Management*, 32(4), 640-653.

Leifer, R., O'Connor, G.C. and Rice, M. (2001). Implementing radical innovation in mature firms: The role of hubs. *Academy of Management Executive*, 15(3), 102-113.

Lenfle, S. (2011). The strategy of parallel approaches in projects with unforeseeable uncertainty: The Manhattan case in retrospect. *International Journal of Project Management*, 29(4), 359-373.

Lenfle, S., and Loch, C. H. (2010). Lost roots: how project management came to emphasize control over flexibility and novelty. *California Management Review*, 53(1), 32–55.

Leonardi, P. M. (2012). Materiality, Sociomateriality, and Socio-Technical Systems: What Do These Terms Mean? How are They Related? Do We Need Them? In: P. M. Leonardi, B. A. Nardi, and J. Kallinikos (Eds.), *Materiality and Organizing: Social Interaction in a Technological World*. Oxford: Oxford University Press.

Leonardi, P. M., and Barley, S. R. (2010). What's under construction here? Social action, materiality and power in constructivist studies of technology and organizing. *The Academy of Management Annals*, 4(1), 1-51.

Leufkens, A. S., and Noorderhaven, N. G. (2011). Learning to collaborate in multi-organizational projects. *International Journal of Project Management*, 29(4), 432-441.

Levina, N., and Orlikowski, W.J. (2009). Understanding shifting power relations within and across organizations: A critical genre analysis. *Academy of Management Journal*, 52(4), 672-703.

Levinthal, D., and Rerup, C. (2006). Crossing an apparent chasm: Bridging mindful and less-mindful perspectives on organizational learning. *Organization Science,* 17(4), 502-513.

Lévi-Strauss, C. (2008). *Structural anthropology.* Basic Books.

Lewin, K. (1951). *Field theory in social science.* New York: Harper.

Leybourne, S. A. (2007). The changing bias of project management research: A consideration of the literatures and an application of extant theory. *Project Management Journal,* 38(1), 61-73.

Leybourne, S.A., and Sainter, P. (2012). Advancing project management: Authenticating the shift from process to "nuanced" project-based management in the ambidextrous organization. *Project Management Journal,* 43(6), 5-15.

Liguori, M. (2012). The supremacy of the sequence: Key elements and dimensions in the process of change. *Organization Studies,* 33(4), 507-539.

Lincoln, Y. S., and Guba, E. G. (1985). *Naturalistic Inquiry.* Beverly Hills, CA: Sage.

Locatelli, G. and Mancini, M. (2010). Risk management in a mega-project: the Universal EXPO 2015 case. *International Journal of Project Organisation and Management,* 2(3), 236 – 253.

London, K., and Siva, J. P. S. (2011). The role of reflexive capability in relation to intellectual capital on multi- international partnerships. *International Journal of Project Management,* 29, 846–855.

Loo, S. C., Abdul-Rahman, H., and Wang, C. (2013). Managing external risks for international architectural, engineering, and construction (AEC) firms operating in Gulf Cooperation Council (GCC) states. *Project Management Journal,* 44(5), 70–88.

Luhmann, N. (1995). *Social systems.* Stanford University Press.

Lundin, R. A., and Söderholm, A. (1995). A theory of the temporary organization. *Scandinavian Journal of Management,* 11(4), 437-455.

Lyons, T., and Skitmore, M. (2004). Project risk management in the Queensland engineering construction industry: a survey. *International Journal of Project Management, 22*(1), 51-61.

MacCormack, A., Verganti, R., and Iansiti M. (2001). Developing products on "internet time": The anatomy of a flexible development process. *Management Science,* 47(1), 133–150.

Malhotra, D., and Gino, F. (2011). The pursuit of power corrupts: How investing in outside options motivates opportunism in relationships. *Administrative Science Quarterly,* 56(4), 559-592.

Marcelino-Sádaba, S., Pérez-Ezcurdia, A., Echeverría Lazcano, A. M., and Villanueva, P. (2014). Project risk management methodology for small firms. *International Journal of Project Management,* 32(2), 327-340.

Marengo, L. and Pasquali, C. (2012). How to get what you want when you do not know what you want: A model of incentives, organizational structure, and learning. *Organization Science,* 23(5), 1298-1310.

McGrath, R. G., and MacMillan, I. C. (2000). Assessing technology projects using real options reasoning. *Research Technology Management,* 43(4), 35-49.

Mead, G.H. (1932). *The Philosophy of the Present.* Chicago: University of Chicago Press.

Meng, X., and Gallagher, B. (2012). The impact of incentive mechanisms on project performance. *International Journal of Project Management,* 30(3), 352-362.

Meyer, A. D. (1982). Adapting to environmental jolts. *Administrative Science Quarterly,* 27(4), 515-537.

Meyer, J. W., and Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology,* 83(2), 340-363.

Meyer, M., and Utterback, J.M. (1995). Product development cycle time and commercial success. *IEEE Transactions on Engineering Management,* 42, 297–304.

Michel, A. (2014). The mutual constitution of persons and organizations: An ontological perspective on organizational change. *Organization Science,* 25(4), 1082-1110.

Miles, M. B., and Huberman, A. M. (1994). *Qualitative Data Analysis* (2nd ed.). Thousands Oaks, CA: Sage.

Miller, R., and Olleros, X. (2000). Project Shaping as a Competitive Advantage. In: Miller, R., Lessard, D. (Eds.), *The Strategic Management of Large Engineering Projects: Shaping Institutions, Risks and Management.* MIT Press, Boston Mass.

Mintzberg, H., and Lampel, J. (1999). Reflecting on the strategy process. *Sloan Management Review,* 40(3), 21-30.

Missonier, S., and Loufrani-Fedida, S. (2014). Stakeholder analysis and engagement in projects: From stakeholder relational perspective to stakeholder relational ontology. *International Journal of Project Management,* 32(7), 1108-1122.

Mitchell, R. K., Agle, B. R., and Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Academy of Management Review,* 2(4), 853-86.

Moorman, C., Deshpande, R., and Zaltman, G. (1993). Factors affecting trust in market research relationships. *Journal of Marketing,* 57, 81–101.

Mowday, R. T., Porter, L. W., and Steers, R. (1982). *Employee-organization linkages: The psychology of commitment, absenteeism, and turnover.* New York: Academic Press.

Nasirzadeh, F., Khanzadi, M., and Rezaie, M. (2014). Dynamic modeling of the quantitative risk allocation in construction projects. *International Journal of Project Management,* 32(3), 442-451.

Nietzsche, F. W. (2000). *The Birth of Tragedy.* Oxford, UK: Oxford University Press [original version published in 1872].

Nikander, I. O., and Eloranta, E. (1997). Preliminary signals and early warnings in industrial investment projects. *International Journal of Project Management,* 15(6), 371-376.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*(1), 14-37.

Nysten-Haarala, S., Lee, N., and Lehto, J. (2010). Flexibility in contract terms and contracting processes. *International Journal of Managing Projects in Business,* 3(3), 462-478.

Obstfeld, D. (2012). Creative projects: A less routine approach toward getting new things done. *Organization Science,* 23(6), 1571-1592.

Okhuysen, G.A., and Bechky, B.A. (2009). Coordination in organizations: An integrative perspective. *The Academy of Management Annals,* 3(1), 463-502.

Oliveira Cruz, C., and Cunha Marques, R. (2013). Flexible contracts to cope with uncertainty in public–private partnerships. *International Journal of Project Management,* 31(3), 473-483.

Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science, 3*(3), 398-427.

Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science,* 11(4), 404-428.

Orlikowski, W.J. and Scott, S.V. (2008). 10 sociomateriality: Challenging the separation of technology, work and organization. *The Academy of Management Annals,* 2(1), 433-474.

Orlikowski, W. J., and Yates J.-A. (1994). Genre repertoire: The structuring of communicative practices in organizations. *Administrative Science Quarterly,* 39(4), 541-574.

Orlikowski, W. J., and Yates J.-A. (2002). It's about time: Temporal structuring in organizations. *Organization Science,* 13(6), 684-700.

Orlikowski, W., and Hoffman, D. (1997). *An Improvisational Model for Change Management: The Case of Groupware Technologies. Inventing the Organizations of the 21st Century.* MIT: Boston.

Orlikowski, W.J. (2009). The sociomateriality of organisational life: considering technology in management research. *Cambridge Journal of Economics,* 34, 125-141.

Orr, R., and Scott, W. R. (2008). Institutional exceptions on global projects: a process model. *Journal of International Business Studies,* 39(4), 562-588.

Osipova, E., and Eriksson, P. E. (2013). Balancing control and flexibility in joint risk management: Lessons learned from two construction projects. *International Journal of Project Management,* 31(3), 391-399.

Packendorff, J. (1995). Inquiring into the temporary organization: new directions for project management research. *Scandinavian Journal of Management,* 11(4), 319-333.

Parkhe, A. (1998). Understanding trust in international alliances. *Journal of World Business,* 33(3), 219-240.

Patton, M. (2002). *Qualitative Research and Evaluation Methods* (3rd ed.). Thousand Oaks, CA: Sage.

Pauget, B., and Wald, A. (2013). Relational competence in complex temporary organizations: The case of a French hospital construction project network. *International Journal of Project Management,* 31(2), 200-211.

Pentland, B., and Feldman, M. (2007). Narrative networks: Patterns of technology and organization. *Organization Science,* 18, 781-795.

Pfeffer, J. S., and Salancik, G. (1978). *The external control of organizations: a resource dependence perspective.* New York.

Pich, M. T., Loch, C. H., and De Meyer, A. (2002). On uncertainty, ambiguity, and complexity in project management. *Management Science,* 48(8), 1008-1023.

Pilbeam, C. J. (2013). Coordinating temporary organizations in international development through social and temporal embeddedness. *International Journal of Project Management,* 31(2), 190-199.

Piperca, S., and Floricel, S. (2012). A typology of unexpected events in complex projects. *International Journal of Managing Projects in Business,* 5(2), 248 – 265.

Pitsis, T. S., Clegg, S. R., Marosszeky, M., and Rura-Polley, T. (2003). Constructing the Olympic dream: A future perfect strategy of project management. *Organization Science,* 14, 574-590.

Polanyi, M. (1966). *The Tacit Dimension.* Peter Smith: Gloucester.

Pollack, J., Costello, K., and Sankaran, S. (2013). Applying Actor–Network Theory as a sensemaking framework for complex organisational change programs. *International Journal of Project Management,* 31(8), 1118-1128.

Pollack-Johnson, B., and Liberatore, M.J. (2005). Project planning under uncertainty using scenario analysis. *Project Management Journal,* 36(1), 15-26.

Power, B., and Reid, G. C. (2005). Flexibility, firm-specific turbulence and the performance of the long-lived small firm. *Review of Industrial Organization,* 26, 415-443.

Rees-Caldwell, K., and Pinnington, A. H. (2013). National culture differences in project management: Comparing British and Arab project managers' perceptions of different planning areas. *International Journal of Project Management,* 31(2), 212-227.

Ren, H., and Lin, S. S. (1996). The UK construction industry under cyclical high inflation, high interest rates and recession. *International Journal of Project Management,* 14 (5), 301–305.

Rerup, C., and Feldman, M. S. (2011). Routines as a source of change in organizational schemata: The role of trial-and-error learning. *Academy of Management Journal,* 54(3), 577-610.

Rindova, V. P., and Kotha, S. (2001). Continuous "morphing": Competing through dynamic capabilities, form, and function. *Academy of Management Journal,* 44(6), 1263-1280.

Romanelli, E., and Tushman, M. L. (1994). Organizational transformation as punctuated equilibrium: An empirical test. *Academy of Management Journal* 37(5), 1141-1166.

Ross, D. (2009). The use of partnering as a conflict prevention method in large-scale urban projects in Canada. *International Journal of Managing Projects in Business,* 2(3), 401-418.

Rouleau, L. (2005). Micro-practices of strategic sensemaking and sensegiving: How middle managers interpret and sell change every day. *Journal of Management Studies,* 42(7), 1413-1441.

Rowley, T.J., and Moldoveanu, M. (2003). When will stakeholder groups act? An interest- and identity-based model of stakeholder group mobilization. *Academy of Management Review,* 28(2), 204-19.

Royer, P.S. (2000). Risk management: The undiscovered dimension of project management. *Project Management Journal,* 31(1), 6-13.

Ruigrok, W., Pettigrew, A., Peck, S., and Whittington, R. (1999). Corporate restructuring and new forms of organizing: Evidence from Europe. *Management International Review,* 39(Special Issue), 41-64.

Russell Bernard, H., and Ryan, G.W. (2010). *Analyzing Qualitative Data: Systematic Approaches.* Thousand Oaks, CA: SAGE.

Ruuska, I., Ahola, T., Artto, K., Locatelli, G., and Mancini, M. (2011). A new governance approach for multi-firm projects: Lessons from Olkiluoto 3 and Flamanville 3 nuclear power plant projects. *International Journal of Project Management,* 29(6), 647-660.

Ruuska, I., and Brady, T. (2011). Implementing the replication strategy in uncertain and complex investments projects. *International Journal of Project Management,* 29, 422–431.

Sage, D., Dainty, A., and Brookes, N. (2011). How actor-network theories can help in understanding project complexities. *International Journal of Managing Projects in Business,* 4(2), 274-293.

Samset, K. (2003). *Project evaluation: Making Investments Succeed.* Trondheim, Norway: Tapir Academic Press.

Sauser, B. (2006). Toward mission assurance: A framework for systems engineering management. *Systems Engineering,* 9(3), 213-227.

Savolainen, P., Ahonen, J. J., and Richardson, I. (2012). Software development project success and failure from the supplier's perspective: A systematic literature review. *International Journal of Project Management,* 30, 458–469.

Scarbrough, H, Panourgias, N. S., and Nandhakumar, J. (2015). Developing a relational view of the organizing role of objects: A study of the innovation process in computer games. *Organization Studies,* 36(2), 197-220.

Schatzki T. R., Knorr Cetina, K., and von Savigny, E., (eds.). (2001). *The Practice Turn in Contemporary Theory.* London, U.K: Routledge.

Schmidt, W. H., and Tannenbaum, R. (2000). *Management of differences. Harvard Business Review on Negotiation and Conflict Resolution.* Boston, MA: Harvard Business School Publishing, 1-26.

Schopenhauer, A. (1966). *The World as Will and Representation,* New York: EF Payne.

Schüssler, E., Rüling, C. C., and Wittneben, B. B. (2014). On melting summits: The limitations of field-configuring events as catalysts of change in transnational climate policy. *Academy of Management Journal,* 57(1), 140-171.

Schwaber, K. (2004). *Agile Project Management with Scrum.* Redmond, WA: Microsoft Press.

Selznick, P. (1948). Foundations of the Theory of Organization. *American Sociological Review,* 13(1), 25-35.

Semetko, H. A., and Valkenburg, P. M. (2000). Framing European politics: A content analysis of press and television news. *Journal of Communication, 50,* 93-109.

Sharma, A., Sengupta, S., and Gupta, A. (2011). Exploring risk dimensions in the Indian software industry. *Project Management Journal, 42*(5), 78-91.

Shenhar, A. (1991). *Project management style and technological uncertainty (part 1): From low-to high-tech.* Project Management Institute.

Shenhar, A. J. (2001). One size does not fit all projects: Exploring classical contingency domains. *Management Science, 47*(3), 395-414.

Shepherd, D. A., Patzelt, H., and Wolfe, M. (2011). Moving forward from project failure: Negative emotions, affective commitment, and learning from the experience. *Academy of Management Journal, 54*(6), 1229-1259.

Slevin, D. P., and Pinto, J. K. (1987). Balancing strategy and tactics in project implementation. *Sloan Management Review*, Fall: 33-41.

Sloan, P., and Oliver, D. (2013). Building trust in multi-stakeholder partnerships: Critical emotional incidents and practices of engagement. *Organization Studies, 34*(12), 1835-1868.

Söderholm, A. (2008). Project management of unexpected events. *International Journal of Project Management*, 26(1), 80-86.

Sommer, S. C., and Loch, C. H. (2004). Selectionism and learning in projects with complexity and unforeseeable uncertainty. *Management Science, 50*(10), 1334-1347.

Spee, A. P., and Jarzabkowski, P. (2009). Strategy tools as boundary objects. *Strategic Organization, 7,* 223–232.

Staw, B. M., Sandelands, L. E., and Dutton, J. E. (1981). Threat rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly*, 26(4), 501-524.

Steffey, R.W., and Anantatmula, V.S. (2011). International project proposal analysis: Risk assessment using radial maps. *Project Management Journal,* 42(3), 62-74.

Stinchcombe, A. L. (1990). *Information and Organizations.* (Vol. 19), Berkeley: University of California Press.

Stinchcombe, A. L., and Heimer, C. A. (1985). *Organization Theory and Project Management – Administering Uncertainty in the Norwegian Offshore Oil.* Norwegian University Press, Oslo, Norway.

Stuart, T. E. (1998). Network positions and propensities to collaborate: An investigation of strategic alliance formation in a high-technology industry. *Administrative Science Quarterly,* 43(3), 668-698.

Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review,* 20(3), 571-610.

Sutherland, J. (2001). Agile can scale: Inventing and reinventing SCRUM in five companies. *IT Journal,* 14(12), 5-11.

Sutherland, J., Schoonheim, G., and Rijk, M. (2009). Fully distributed scrum: Replicating local productivity and quality with offshore teams. Proceedings of the *42nd Hawaii International Conference on System Sciences,* Big Island, HI: 1-8 .

Swartz, S.M. (2008). Managerial perceptions of project stability. *Project Management Journal,* 39(4), 17-32.

Symon, G., and Cassel, C. (1998). *Qualitative Methods and Analysis in Organizational Research. A Practical Guide.* London: Sage.

Taylor, H. (2006). Risk management and problem resolution strategies for IT projects: Prescription and practice. *Project Management Journal,* 37(5), 49-63.

Thamhain, H. (2013). Managing risks in complex projects. *Project Management Journal,* 44(2), 20-35.

Thomke, S. H. (1998). Managing experimentation in the design of new products. *Management Science*, 44(6), 743-762.

Thompson, J. D. (1967). *Organizations in Action*. New York: McGraw-Hill.

Tilcsik, A., and Marquis, C. (2013). Punctuated generosity How mega-events and natural disasters affect corporate philanthropy in U.S. communities. *Administrative Science Quarterly*, 58(1), 111-148.

Trigeorgis, L. (1995). *Real options in capital investment: Models, strategies, and applications*. Greenwood Publishing Group.

Tryggestad, K., Justesen, L., and Mouritsen, J. (2013). Project temporalities: How frogs can become stakeholders. *International Journal of Managing Projects in Business*, 6(1), 69-87.

Tsoukas, H. and Chia, R. (2002). On organizational becoming: Rethinking organizational change. *Organization Science*, 13(5), 567-582.

Tukiainen, S., Aaltonen, K., and Murtonen, M. (2010). Coping with an unexpected event: Project managers' contrasting sensemaking in a stakeholder conflict in China. *International Journal of Managing Projects in Business*, 3(3), 526-543.

Tummala, R. V. M, Leung, H. M, Burchett, J. F., and Leung, Y. H. (1997). Practices, barriers and benefits of using risk management approaches in selected Hong Kong industries. *International Journal of Project Management*, 15, 297-323.

Turner, J. R., and Cochrane, R. A. (1993). Goals-and-methods matrix: coping with projects with ill defined goals and/or methods of achieving them. *International Journal of Project Management*, 11, 93–102.

Tushman, M. L., and Anderson, P. (1986). Technological discontinuities and organizational environments. *Administrative Science Quarterly*, 31(3), 439-465.

Vaaland, T. I., and Håkansson, H. (2003). Exploring interorganizational conflict in complex projects. *Industrial Marketing Management*, 32, 127–138.

Vaast, E., and Levina, N. (2006). Multiple faces of codification: Organizational redesign in an IT organization. *Organization Science,* 17(2), 191-201.

Valentine, M. A., and Edmondson, A. C. (2014). Team scaffolds: How mesolevel structures enable role-based coordination in temporary groups. *Organization Science*, 26(2), 405-422.

Van de Ven, A. H., and Poole, M. S. (1995). Explaining development and change in organizations. *Academy of Management Review,* 20 (3), 510-540.

Van Wijk, J., Stam, W., Elfring, T., Zietsma, C., and den Hond, F. (2013). Activists and incumbents structuring change: The interplay of agency, culture, and networks in field evolution. *Academy of Management Journal,* 56(2), 358-386.

Verganti, R. (1999). Planned flexibility: Linking anticipation and reaction in product development projects. *Journal of Product Innovation Management,* 16, 363–376.

Vohora, A., Wright, M., and Lockett, A. (2004). Critical junctures in the development of university high-tech spinout companies. *Research Policy, 33*(1), 147-175.

Von Branconi, C., and Loch, C. H. (2004). Contracting for major projects: Eight business levers for top management. *International Journal of Project Management,* 22(2), 119-130.

Vuori, E., Mutka, S., Aaltonen, P., and Artto, K. (2013). That is not how we brought you up: How is the strategy of a project formed? *International Journal of Managing Projects in Business,* 6(1), 88-105.

Wallace, L., Keil, M., and Rai, A. (2004). How software project risk affects project performance: An investigation of the dimensions of risk and an exploratory model. *Decision Science,* 35(2), 289-321.

Ward, S., and Chapman, C. (1991). Extending the use of risk analysis in project management. *Project Management Journal,* 9, 117-123.

Ward, S., and Chapman, C. (2008). Stakeholders and uncertainty management in projects. *Construction Management and Economics,* 26(6), 563-577.

Weick, K. (1979). *The Social Psychology of Organizing*. New York: McGraw-Hill.

Weick, K. E., and Roberts, K. H. (1993). Collective mind in organizations: heedful interrelating on flight desks. *Administrative Science Quarterly*, 38(3), 357-381.

Weick, K.E., and Quinn, R.E. (1999). Organizational change and development. *Annual Review of Psychology*, 50, 361-386.

Werder, A. (2011). Corporate governance and stakeholder opportunism. *Organization Science*, 22(5), 1345-1358.

Whitley, R. (2006). Project-based firms: new organizational form or variations on a theme? *Industrial and Corporate Change*, 15, 77-99.

Whittington, R. (2006). Completing the practice turn in strategy research. *Organization Studies*, 27, 613–634.

Williams, T. (2005). Assessing and moving on from the dominant project management discourse in the light of project overruns. *IEEE Journal*, 52, 497–508.

Winter, M., Smith, C., Morris, P., and Cicmil, S. (2006). Directions for future research in project management: The main findings of a UK government-funded research network. *International Journal of Project Management, 24*(8), 638-649.

Womack, J. P., and Jones, D. T. (1996). *Lean Thinking*. New York, NY: Free Press, Simon & Schuster, Inc.

Yates J.-A., Orlikowski, W. J., and Okamura, K. (1999). Explicit and implicit structuring of genres in electronic communication: Reinforcement and change of social interaction. *Organization Science*, 10(1), 83-103.

Yin, R. K. (2009). *Case Study Research: Design and Methods* (4th ed.). Thousand Oaks, CA: Sage.

Yitmen, I. (2013). Organizational cultural intelligence: A competitive capability for strategic alliances in the international construction industry. *Project Management Journal*, 44(4), 5–25.

Zbaracki, M. J., and Bergen, M. (2010). When truces collapse: A longitudinal study of price-adjustment routines. Organization Science, 21(5), 955-972.