Extending project management research: Insights from social theories

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Abstract

Our article answers the call for renewing the theoretical bases of project management in order to overcome the problems that stem from the application of methods based on decision-rationality norms, which bracket the complexity of action and interactions in projects. By grounding our reflection in the practice perspective and by adopting Nicolini's (2013) toolkit approach, we suggest ways that could help practitioners and theorists make better sense of aspects that are highly relevant for project management but are usually overlooked. The paper discusses Nicolini's five dimensions of practice and three social theories (activity theory, actor–network theory and structuration theory) to highlight the combinations that are most appropriate and fruitful for addressing various theoretical and practical issues requiring the attention of project management researchers.
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1. Introduction

The project management field experiences a revolution with two main drivers. The first driver is a practical reconsideration of prescriptions rooted in the rationality of decision theory, which seem to generate technical and commercial failures, internal and external conflicts, and inadequate responses to unexpected events (Miller et al., 2001). Project practitioners respond to these shortcomings by proposing new approaches, such as agile methods or partnering approaches, anchored in different rationalities (Highsmith and Cockburn, 2001). In turn, echoing the trend occurring in social sciences around the "practice turn," academic researchers take a fresh look at what practitioners actually do in projects (Blomquist et al., 2010). The second driver is a

theoretical reconsideration of projects as temporary organizations embedded in different social contexts (Lundin and Söderholm, 1995; Packendorff, 1995). Researchers aim to better account for project phenomena and outcomes by redirecting efforts away from developing principles for optimizing plans, contracts and charts, and towards understanding the specific nature of social relations, structures and processes that occur in projects. In particular, they seek to draw upon fundamental sociological theories in order to deepen the understanding of project organizations (Levitt, 2012; Söderlund, 2004).

These two drivers generate advances that occur, to a large extent, independently of one another. Our aim is to suggest ways in which their forces can be combined in order to address more effectively the specific challenges that confront the project management field. To this effect, we hope to make three contributions in this paper. First, by reviewing practical issues in project management we propose ways in which the practice perspective can provide a theoretical and methodological lens enabling practitioners and theorists to make better sense of these issues and proposed solutions. In particular, we explain how

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Nicolini's (2013) five dimensions of practice can enlighten the practical issues we identified. Second, based on a review of the efforts to understand projects as organizations we suggest that they could benefit from the development of a theoretical toolbox based on three fundamental theories: activity theory, actor–network theory and structuration theory. Their proven contributions to the study of work and organization make these theories powerful tools for thinking and intervening in a project context. Moreover, they belong to the scholarly traditions that have contributed to the "practice turn" in social studies (Miettinen et al., 2009). By reviewing the key assumptions and arguments of the three theories, and by analyzing their compatibility with the practice perspective and the way project research has used them so far, we highlight new ways in which they can inspire the conceptualization of project organizations. Third, we develop rudiments of the proposed toolbox by combining insights from our discussion of the three fundamental theories and of the five dimensions of practice to suggest what theoretical perspectives more fruitfully address the different practical and theoretical issues we identified. These contributions are outlined in the following three section of this article. Section 2 discusses practical problems and the possible contribution of the practice perspective with its five dimensions. Section 3 addresses the theorizing of projects as organizations and potential insights from the three theories we selected in understanding the five dimensions of practice. Section 4 outlines the rudiments of the proposed theoretical toolkit. A conclusion section closes our argument.

2. Practical problems and the practice perspective

Decision rationality, as expressed in decision theory, economics and finance (Bierman and Smidt, 1960; Milgrom and Roberts, 1992; Von Neumann and Morgenstern, 1943), has contaminated the conceptual underpinnings of many practical tools for project selection, organization, contact design, and activity planning (Garvin and Ford, 2012; Howard, 1988; Krishnan and Ulrich, 2001; Shapira, 1995). At the core of this perspective, a decision maker imagines alternatives for action, anticipates future evolutions, and emphasizes the logical consistency of the choice among these alternatives, in light of the values and probabilities attributed to the various possible outcomes of each action alternative. From this perspective, project planning is a series of decision moments, in which planners choose between alternative projects or output parameters; designing a contract is allocating responsibilities and risks between parties given the uncertainties and means of control that characterize its object (Chapman and Ward, 1994; von Branconi and Loch, 2004), and operational planning, guided by tools such as work breakdown structure, is a consistent programming of activities, given their anticipated length, dependencies and uncertainties.

But difficulties and failures associated with decision rationality (Ball et al., 2001; Flyvbjerg et al., 2002; Merrow, 1988; Standish Group International, 1994) led practitioners to question its validity and propose practical approaches that go against its tenets. Completion failures and "white elephants" resulting from rational decisions prompted practitioners to plan more iteratively and flexibly, elaborating successive visions, producing evidence

of their viability and mustering political support (Boehm, 1988; Miller et al., 2001). Likewise, conflicts and overruns resulting from rational schemes for contractual allocation of risk, including turnkey and public–private partnership forms, have led to agreements in which participants share risks and focus on collaborative problem solving (Cohen, 2010; Davies et al., 2009). The difficulty of anticipatively programming outputs and activities for complex projects and dynamic contexts prompted practitioners to develop agile approaches, in which commitments and advances are made in smaller increments, by analyzing the outcomes of prior increments and communicating intensively between participants (Aubry and Lièvre, 2010; Highsmith, 2004).

Such practical innovations suggest that a fruitful avenue for project management could be turning away from decision rationality and focussing on what happens in projects and on what practitioners do and say, seeking to understand the alternative "rationalities" involved in their actions (Cicmil et al., 2006). Some researchers already embarked on such a move and found a starting point in the practice turn that currently transforms many social sciences (Schatzki et al., 2001). Despite the polysemy of the practice perspective (Corradi et al., 2010) and the absence of a unified theory of practice (Reckwitz, 2002), a stream of research has blossomed around this concept in the project management field (Hällgren and Söderholm, 2010; Jerbrant and Karrbom Gustavsson, 2013; Smith and Winter, 2010; Smits and Van Marrewijk, 2012; Söderholm, 2008).

In essence, proponents of this project-as-practice approach argue that both practical and theoretical advances can result from studying the concrete actions of project participants, situated in their individual, social, material and historic context, as well as the network of shared and interconnected practices that form the field of project management practices (Blomquist et al., 2010). However, this impetus may suffer from the fact that many theories evoke, in one way or another, the concept of practice without necessarily clarifying it. We hope to ease such concerns by relying on Nicolini's (2013) work. Nicolini has been using a practice-based approach to study many complex settings such as healthcare (Nicolini, 2011), biomedical engineering (Nicolini et al., 2012), government (Nicolini et al., 2011) and construction projects (Nicolini, 2002). He was one of the guest editors of a special issue of the *Journal of Organizational Change Management* dedicated to the current "turn to practice" within organization and management studies (Eikeland and Nicolini, 2011). He has long stressed the need to explicitly address the social and psychological aspects of project management in a way that would speak not only to the research community, but also to practitioners (Nicolini, 2002: 171). His latest book (Nicolini, 2013) is the first successful attempt at synthesizing practice theory by clearly illustrating its potential to study work and organizations. He suggests that the practice perspective can be used as a *toolkit*, i.e. a package of theory and methods that allows for a rich investigation of social reality. Nicolini's (2013: 213) toolkit approach is "an eclectic strategy [that allows] to provide a thicker account of the world we live in". This strategy follows a generative, rather than an eliminative logic, by turning conceptual diversity into a foundation for the analytical, not

simply descriptive, study of practice. In essence, the concept of practice provides an entry point into project organizations that illuminates five dimensions of practice overlooked in the simplifying assumptions of project methodologies. As a first step in building our generative toolkit, we detail these dimensions and suggest how they enlighten some of the practical problems encountered in projects.

First, the practice perspective calls for uncovering the *work and efforts* that have to be invested in the making of any durable feature of the world. This helps overcome the illusion that "rational" decisions, plans, contracts or organization charts lead automatically to effective project implementation, by illuminating the difficulties involved in a diversity of project activities from building a project concept and maintaining consensus around its validity to introducing new methods and tools and cultivating different types of attitudes and relations between participants.

Second, the practice perspective brings to the fore the nontrivial role of *materiality* in projects, by uncovering how the intertwining of project activities with a rich array of material processes prevents their rationalization based on a utility–probability framework. This sheds new light on why, despite available models and experience, projects are so frequently surprised by soil conditions, meteorological phenomena, and materials; why planning and sharing physical spaces on project sites is so difficult; why physical and informational tools are so often misused; and why so many failures occur when projects start operation (Davies et al., 2009).

Third, the practice perspective allows a space for *agency and creativity*, which can help grasp why entrepreneurial capabilities, rather than abstract decision making, are needed for project development and planning (Lampel, 2001), why public and development projects need competent, creative and active clients or sponsors to steer them in the right direction, and why inertia takes hold of project organizations during implementation (Floricel et al., 2011).

Fourth, the practice view transforms our view of *knowledge*, from a decision resource that is easy to centralize, preserve, integrate and transfer, to "a way of knowing shared with others, a set of practical methods acquired through learning, inscribed in objects, embodied and only partially inscribed in discourse" (Nicolini, 2013: 5). Observing the full array of knowing practices used by project participants may reveal how they create, maintain and use distributed expertise, how they fail to transfer and mobilize knowledge from past projects or, on the contrary, how they fail by over-relying on past knowledge (Prencipe and Tell, 2001).

Finally, the practice view highlights the emergent and diverse nature of *interests and power*, as opposed to assuming stable value functions and a centralized hierarchical authority. This illuminates the shifts of authority and dependence patterns in temporary organizations, in the presence of concurrent projects and of changes in what is considered legitimate or good practice; the conflicts, tensions, and aberrant response to unexpected events that affect so many projects, irrespective of their use of allocative or partnering schemes; and the pervasive corruption in certain types of projects across institutional and cultural settings (Hällgren and Wilson, 2008).

In sum, the practice perspective could shed light on action aspects that are overlooked by the simplifying assumptions on which project management prescriptions rely. This, in turn, could help address practical issues in projects. However, the entry point provided by Nicolini's (2013) five dimensions is just one side of the toolkit we propose. To complete a research journey "that begins with individual actions and asks what overall models and concepts result from those actions" (Blomquist et al., 2010: 6), we need another ingredient: theories that could anchor such generalizations and their contributions. The second revolution occurring in project management, which aims to rethink projects as social systems, particularly as temporary organizations (Packendorff, 1995), is a valuable source of inspiration in this respect. Following the lead of many project management scholars, we believe that a number of fundamental social theories can help build the needed theoretical base to complete our toolkit, as we explain in the next section.

3. Projects as organizations through the lens of three fundamental social theories

Projects have first been defined as temporary organizations within the Scandinavian school of thought (Lundin and Söderholm, 1995), and this view now influences theorizing of many issues, such as programs and portfolios (Turner and Müller, 2003), coordination mechanisms (Bengtsson et al., 2007), governance inside and outside projects (Ahola et al., forthcoming), project management offices (Aubry et al., 2011), and interorganizational temporary organizations (Kenis et al., 2009). These contributions have placed social relations and human aspects at the center of reflections on projects. But most conceptualizations of projects as temporary organizations espouse a social systems perspective influenced by decision rationality (Boudon, 2009; Coleman, 1990) and functionalism (Luhmann, 1995; Thompson, 1967). In the rational decision stream, project organizations form as autonomous self-interested actors enter a web of strategic relations or contracts to achieve pre-determined goals (Turner and Müller, 2004). The roots of these conceptualizations are economic theories such as game theory, principal-agent theory and transaction cost theory (Floricel and Lampel, 1998; Henisz et al., 2012; Roehrich and Lewis, 2010). The functionalist stream depicts project organizations as a hierarchy of formal processes that confine actors to well-defined roles and orchestrate the ties between them in order to optimize the systemic performance of the organization, mostly in terms of information processing for decision (Stinchcombe and Heimer, 1985). Its key insight is that the best form of hierarchy, processes, actors and ties depends on the nature of the complexity of the project and the uncertainty of its environment (Carroll and Burton, 2012; Floricel and Ibanescu, 2008; Hansen, 1999; Reagans and Zuckerman, 2001; Shenhar, 2001). While theoretical and empirical research based on these perspectives produced interesting insights, in light of disappointing application in practice, for example in public–private partnership (PPP) contracts (Grimsey and Lewis, 2005), researchers have started to evoke the possibility that their rational–functional discourse is just a pretext for reproducing old project approaches and orders without understanding their antecedents and consequences

(Cicmil et al., 2009). From the practice perspective, this discourse has inherent problems, because it arbitrarily carves up phenomena into three levels, from very micro (actors), to meso (routines) and to macro (institutions), and marks, in the form of a decision moment, a strong break between past and future. In contrast, practice is understood as taking place simultaneously both locally and globally, as being both unique and culturally shared, 'here and now' as well as historically constituted (Miettinen et al., 2009). The study of temporary organizations such as projects can benefit from vocabularies that transcend the divisions between various levels of analysis, and help project researchers study a living practice 'here and now' and relate it to its history and to its larger institutional context. Therefore, we sought inspiration in three fundamental social theories which all take practice seriously and are a continuing source of inspiration for particular concepts of practice (Nicolini, 2013). These theories—activity theory, structuration theory and actor–network theory—all see projects as social networks of sorts. Like the standard sociological network theory (Burt, 1992; Granovetter, 1973), they put all actors on the same level, but rely on a richer conceptualization of actors, of their ties, and of the practices they deploy to create and maintain networks. In essence, while they retain traces of old divisions via particular emphases in conceptualizing networks, they propose original ideas on how actors and networks form a basic, inseparable social unit (Crossley, 2011).

These theories are, of course, not the only sociological perspectives that criticize rational-functionalist assumptions, and could therefore provide fresh insights for the understanding of project organizations. For example, neoinstitutional theory (DiMaggio and Powell, 1983; Haveman and Rao, 1997; Meyer and Rowan, 1977) explains the origin and evolution of project organization forms through conflicting institutional pressures (Currie and Guah, 2007; Miller and Floricel, 2001). However, by emphasizing macro-social "organizational fields" and "institutional logics" at the expense of actors and their activities (DiMaggio, 1991; Friedland and Alford, 1991), these explanations are suitable for understanding change in populations of project organizations, but not what happens in each project. Neoinstitutional theory is only starting to focus on the actors, networks and work involved in creating, reconciling and updating institutions (Lawrence et al., 2011). For this reason, its assumptions remain largely incompatible with a practice perspective (Suddaby et al., 2013), whereas, for example, more compatible activity theory and structuration theory offer similarly fruitful avenues for understanding the role of societal influences and, respectively, of actors' cognition. We also decided to not include other schools of thought, such as the critical and realist perspectives, as a separate category in our framework, either because they have received significant attention in the project management literature (Cicmil and Hodgson, 2006) or because their insights could be integrated within one of our three perspectives (Elder-Vass, 2007; Stones, 2001). Below, we introduce the three theories we selected, suggest how they illuminate each dimension of practice, and highlight how these perspectives can generate new insights on project management issues.

3.1. Activity theory

Activity theory originates in the work of Soviet psychologists Vygotsky and Leont'ev who, starting in the 1920s, proposed a more complex, situated and social perspective on human activity than the one prevalent at the time in psychoanalytic and behavioral approaches. Its reformulation by Engeström (1987) emphasized the collective nature of human activity and generated interest in social sciences and management studies (Blackler, 1993; Daniels et al., 2009; Jarzabkowski, 2003; Sannino et al., 2009). The cross-disciplinary framework of activity theory enriches the project research toolkit by calling for attention to a different basic unit of analysis: the "object-oriented activity system," as a social matrix with specific historical and cultural properties. The starting point of this theory is the acknowledgment that developing human motives are of social and cultural origin. An "object" of activity (a motive, purpose or focus of engagement) is a driving force guiding the activity as it unfolds through space and time. It is the 'why' of an activity and a horizon for practical actions. The "object" has an organizing capacity by giving actions their continuity, coherence and meaning (Engeström, 2000). For example, the "object" of medical work is the patient, with his health problem. Without patients, the activity would cease. The same "object" can bring together agents who have different and divergent personal goals. Thus, the "object" is not to be confused with the goal. While individual short-lived actions are directed towards a goal, the "object" is a durable higher motive guiding the community engaged in an activity as it unfolds through space and time. This conceptualization of the "object" provides an interesting lens for the study of project temporality, which requires simultaneously short and expanded time perspectives. For example, a doctor participating in an International Red Cross project engages in struggles with very long-term "objects," actually with no end in sight, such as chronic famine, while her individual actions are directed to short-term goals, such as performing a health assessment (Engeström, 2006). Therefore, activity theory is not limited to the "local level of action" but anchors its analysis in the historical development of the activity.

The activity system (represented in Fig. 1) can also be used as a framework to analyze material and social mediations occurring in a project. The subject is the human actor (individual or group)
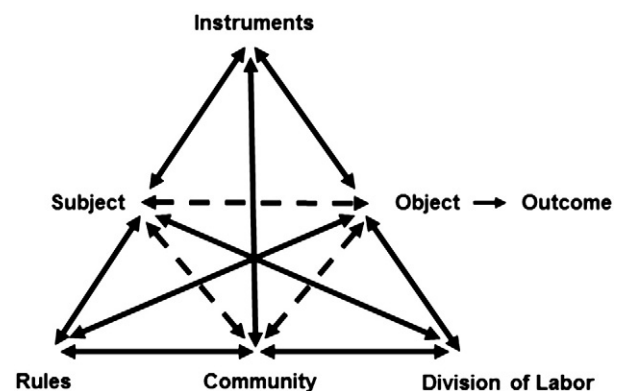

Fig. 1. The activity system as described by Engeström (1987).

engaged in the activity and also denotes the point of view chosen for the analysis. The community regroups all actors sharing the same "object." The division of labor refers to the distribution of tasks, power and status that organizes the community, while rules correspond to the explicit or implicit norms shaping actions and interactions. Relations between the elements of an activity system are not direct but mediated. Instruments refer to the material and conceptual tools mediating the relationship between subject and the object of doing (Vygotsky, 1978). Therefore, the object of an activity is seen and manipulated not "as such" but within the limitations set by the instruments (Kuutti, 1996).

Activity theory can also inform the study of networks in which multiple activity systems share (fully or partially) the same "object" (Engeström, 2009). Interactions between activities, within and outside an organization, have been studied in outsourced software work, which is essentially a collective achievement of objectives by teams belonging to various organizations across many locations (Vakkayil, 2010). Together with practice-based concepts such as boundary objects, activity theory produced new insights into the dynamics of project mode of work and of project-based organizations. For instance, it highlighted the need for project managers to respond to the horizontal dimension of expertise development by designing collaborative arrangements in a manner in which their learning potential is maximized. Activity theory was also used to study the partnering phenomenon in construction and showed how the collaborative relationship required in such setting contradicts and challenges the working style that individuals had internalized and been used to (Hartmann and Bresnen, 2011). Moreover, activity theory is particularly useful for understanding the complex organizational forms observed in the New Economy, with more fluid boundaries than traditional project organizations. For example, online communities involved in global open source software projects pose new challenges in terms of creating, maintaining and sharing expertise. These distributed and heterogeneous settings can be analyzed as networks of overlapping activity systems. By doing so, project researchers can explain how a group of people who have never met before can work together towards a common (or partially shared) "object." It is the idea of a common "object" that enables such temporary and distributed organization forms, by allowing shared conceptions of the activity. For project research in general, activity theory, in combination with the practice approach, can help grasp the essence of temporary organizations, in particular of emerging ways of organizing work. But the significant potential of activity theory is still unexploited, with the notable exception of Small and Walker's (2011) conceptualization of projects as "complex human activity systems". To help achieve this potential, we describe how activity theory could be used to conceptualize Nicolini's (2013) five dimensions of practice.

The particular take of activity theory with respect to *work and efforts*, the first dimension of practice, comes via the central concept of contradictions, which has a very specific definition in line with Marxist dialectics. The development of the activity over time is based on a process of resolving contradictions that keep the activity system in constant instability (Engeström, 1987). This process is the engine for change but also for creating any durable

feature of the world. Thus, the concept of contradiction helps transcend the dichotomy of micro-level processes and macro-structures in analyzing work practices. Project scholars can relate their understanding of locally evolving organizational practices to a much larger temporal and spatial realm and consider their development over time as an effort to resolve activity system contradictions (Bonneau, 2013).

Activity theory also has a particular take on *materiality* in project organizations, by stressing the mediating role of artificial, manufactured things (artifacts), such as information systems and tools, which are inextricably involved in the enactment of practices. Activities are performed by using artifacts and tools, which carry with them historically-grounded experience and knowledge. By observing how artifacts mediate the relationship between subject and the "object" of doing, researchers can uncover their "organizing" role in projects, and account for the beneficial or deficient trajectories in which they channel project activities. Researchers can also understand how the creation of new mediational artifacts helps project participants develop and expand their practice, for example in response to unexpected events, such as meteorological and soil conditions. Moreover, by analyzing the entire activity system or even overlapping systems, instead of a stand-alone artifact, activity theory sheds light on how artifacts support or hinder connections between different practices within an activity system, and establish standards when projects cross activity boundaries. Thus, activity theory served to analyze the role of technology in mediating human activities (Kaptelinin and Nardi, 2006), to inform the design of IS/IT systems (Nardi and Redmiles, 2002), to study change management efforts (Shih et al., 2013) and to identify sources of failure in IT implementation projects (Hasu and Engeström, 2000).

Although it emphasizes the role of a social aggregate, the activity system, activity theory allows space for *agency and creativity*. The intentionality of human actors is characterized by the orientation of their activity towards an "object" (higher motive). This particular angle can help uncover how temporary project organizations are constituted in light of a common (or partially shared) "object." Tensions between the "objects" of various activity systems that concur in a project can account for the hesitant and inconsistent behavior of project leaders and participants as well as for nonlinearities in the development of project organizations. At the same time, while taking into account the material dimension of work practices, activity theory clearly gives priority to human over material agency. In activity theory, material agency is limited to the mediating role of artifacts, which, in turn, extends the agency of the humans who built the artifacts in the first place. But, in the latter case, relevant human intentionality is mediated, and therefore, situated at different moments in time and animated by distinct proximate goals, which can produce inconsistencies and contradictions with the concrete, unmediated aims of project participants. This can account for nonlinearities in the process of organizational convergence, and aberrant responses to challenges in project execution. Another form of distant agency, captured by the concept of "knotworking" (Engeström et al., 1999), can describe collaborative project work that is not coordinated from a fixed control center. A "knot" is a latent orchestration of performance, a

kernel of tasks, relations and artifacts, which can be flexibly activated by different persons to collaborate in various situations (Engeström, 2000). Contrary to a network, which is a relatively stable web of links constantly reactivated by the same actors, knots remain dormant until ad hoc actors reactivate them in an improvised manner (Corradi et al., 2010; Engeström, 2006). The tying or dissolution of a knot is not reducible to any specific actor. Instead, actors' orientation towards the "object" (higher motive) of an activity enables the development of shared conceptions that "knot" relationships into enduring forms. With respect to planning and development practices in projects or in long-term client-customer agreements, "knotworking" highlights the efforts to negotiate shared conceptions of work and to create "knots" on which participants could rely down the road. Such "knots" may account for surprising effectiveness in fluid situations while reliance on distributed "knots" originating in different activity systems may also account for difficulties.

Activity theory also has a lot to say about *knowledge* practices, as it has been developed by psychologists and education researchers, later joined by scholars interested in organizational learning. Interestingly, the theory has been used both as a conceptual framework (or analytical tool) and as a basis for intervention methodologies. Engeström's "Change Laboratory" method was used in transformation projects in health care and education to study conditions for change and to help workers develop their practices (Miettinen et al., 2009). Activity theory is also well equipped for scrutinizing the role of artifacts in the transmission of knowledge, because it sees them as inextricably involved in the enactment of human practices, mediating the relationship between subject and object. Consequently, human actions are 'reified' into artifacts, which, in turn, serve as means for further practice. Artifacts become sociocultural reservoirs of knowledge developed earlier and elsewhere, giving actors representations and means beyond those available in the current situation (Kaptelinin and Nardi, 2006). The knowledge reservoirs idea can help researchers grasp how past experience is carried through to new project activities, and account for difficulties. In particular, it can clarify how information systems support project activities by managing project-specific information. Kaptelinin's (2003) study of a system developed and evaluated based on activity theory principles concludes that virtual work environments are more effective in mediating project activities if they integrate high-level representations of goals with the resources needed to accomplish these goals, and are as transparent as possible to allow users to focus on meaningful goals rather than on interacting with technology.

Finally, activity theory does not provide a strong conceptualization of *interests and power*. According to Blackler (1995: 1039), the "analysis of power in everyday life has featured far less in the writings of activity theorists than it has in the work of others who are theorizing practice from different traditions." Indeed, the wider patterns of social relations in which activity systems are located tend to be ignored (Avis, 2009). Therefore, it is difficult to understand the relationships between the local practices and larger political structures without conceptual tools enabling their broader political contextualization (Peim, 2009). However, the analysis of contradictions, explained above, places the problems and

disturbances faced by subjects in a concrete project in the context of historically formed activity system contradictions (Engeström, 2001). This helps researchers identify sociohistorical conditions that cause conflicting interests and tensions "here and now" (Groleau et al., 2011) and hence account for conflicts in projects.

In sum, activity theory informs a practice perspective on projects by pointing out that significant work and efforts are deployed to resolve contradictions within and between activity systems, which often also produce conflicting interests; that agency and creativity are oriented towards distant "objects" that give meaning to short-term goals, and can work by activating latent assemblages of tasks, relations and artifacts; and that artifacts mediate activities and convey past knowledge beyond its creation context.

3.2. Actor-network theory

Actor network theory (ANT) emerged in the 1980s from sociological studies of science, with the seminal work of Callon (1986, 1987) and Latour (1987, 2005), joined by Law (1987, 2008). ANT claims to reassemble the social (Latour, 2005) as embedded in all other aspects of phenomena by tracing associations. One of its distinctive features is recognizing that nonhuman actors take an active role in the course of action; the term *actant* was coined to denote both human and nonhuman actors. This way, ANT denounces rationality and opens a path for grasping the full complexity of the social (Denis et al., 2007).

We turned to ANT for its natural proximity with the project considered as a temporary and non stabilized set of actors pursuing various goals. The introduction of ANT in the project management literature is relatively recent (Blackburn, 2002), but growing interest led to publications on many topics such as IS/IT projects (Linde and Linderoth, 2006), technology-mediated engineering (Rennstam, 2012), project management tools (Aubry, 2011), and construction projects (Sage et al., 2011). Some authors propose ANT as a theoretical foundation for rethinking project management (Alderman and Ivory, 2011; Maylor, 2006), especially for complex and highly uncertain projects (Cicmil and Hodgson, 2006). Others use ANT as a basis for criticizing the influence of professional norms, such as the project management bodies of knowledge, which preclude professionals from developing their own competencies (Sage et al., 2011). Yet others choose ANT for a more in-depth analysis of project organizations, based on qualitative and longitudinal methods (Denis et al., 2007; Harty, 2010; Pollack et al., 2013). In particular, the process orientation of ANT research (Langley et al., 2013) reflects more accurately the practices and the evolving context of a project. By considering a project as a dynamic set of relations and associations that transcends hierarchical organizational boundaries, ANT provides the opportunity to follow the elaboration of projects regardless of borders or predefined matrix structures (Hobday, 2000). These objects and methods of study would benefit from clarifying the ANT take on Nicolini's (2013) five dimensions of practice, as outlined below.

ANT contribution with respect to the *work and efforts* required to create durable features of the world hinges on the concept of translation, as a continuous process to enroll actors

in networks and maintain interest in a project-generating controversy. The following four moments (Sage et al., 2011; based on Callon, 1986) capture the essence of the translation process. The first moment is problematization: formulating a question or issue that will make different actors engage in the network. This moment is only made possible by the presence of a legitimate translator capable of such formulation. The second moment, intéressement, is the on-going negotiations with actors to make them perceive their own interest to participate to the network. The third, enrolment, marks the successful translation of interests within a network. Finally, mobilization refers to the moment when actors in the network can speak in the name of others as "spokespersons." Several traits of the translation process make it ideal for understanding project development, and grasping how the fragility of projects leads to dead ends, how absent or incompetent sponsors produce failed projects, and how modern societies increase the costs of project development. Translation is not free, because investment is needed to create a variety of intermediary results (artifacts), such as technical (statistics) and economic data (sales potential), used to negotiate and mobilize actors (Callon, 1989). Neither is translation a linear process; constant back and forth is required to maintain and extend the network. Network irreversibility increases with the number of entities engaged in it, with the vigilance in countering any concurrent translations, and with the degree of confidence-building transparency (Amblard et al., 2005). Finally, effort is spent for multiple translations, to convey any situation in the life of a project from different points of view, such as sponsors, users, and clients (Winter and Szczepanek, 2009). The stress this kind of pluralism puts on the translation process helps account for the frequent deviations, iterations and compromises observed in project organizations during planning and execution.

In turn, *materiality* is strongly represented in ANT by the assumption that nonhuman actants play an active role in project processes, on par with human actors. Actants can be intermediary deliverables, artifacts or any material playing a mediating role between actors, and inducing them to act in the network. From this perspective, the role of artifacts in a project has a certain resonance with that put forward by the literature on boundary (Carlile, 2002; Star and Griesemer, 1989), epistemic (Ewenstein and Whyte, 2009; Knorr Cetina, 1997), or active objects (Rennstam, 2012), namely interfacing, focalizing and controlling human participants' work. Attributing artifacts an active role in project development, convergence, and intermediation may help researchers understand some compelling aspects as well as the unpredictability of project organization evolution. But, the potential of ANT in understanding materiality goes much beyond the intermediary and repository roles that activity theory gives tools. The linguistic term *translation*, as well as the assumed symmetry between human and nonhuman *actants* (Latour, 1991), which echoes the way in which the subject of an active sentence can be both human and nonhuman, reflect the roots of ANT in linguistics-inspired French structuralism (Callon, 1995). This school of thought assumes that language or cultural practices reflect deep structural propensities inherent in the world, perhaps in its material foundation. This assumption of ANT enables a more radical reconsideration of the role of materiality, similar to

that proposed by the sociomateriality school of thought (Barad, 2003; Orlikowski, 2007). The actant symmetry assumes the primacy of underlying materiality for both human and nonhuman actors and looks beyond apparent affordances, to access directly their deep material substrate, always difficult to understand and master, ready to resist translation and cause unexpected interactions and failures (Barad, 2003; Simondon, 1989). This assumption would account for the persistence of many practices, including superstitions and rituals among human project participants. Moreover, this kind of symmetry would also call for reconsidering human actors, and having a fresh look at their actions and practices in light of their compelling material substrate, instead of qualifying them as opportunism, delinquency, or deviance in light of the prescriptions of rational models or cultural conventions (Barad, 2003). Assuming such a profound impact of the material substrate for both human and nonhuman actants makes the translation process look even more complex, and the required effort, even more intense. Moreover, this implies that rational models and conventions, including plans and contracts, never fully subsume human actors' interests, will, and feelings, as their complex material nature pierces through idealized behavior expectations. This explains why plans cannot execute themselves, continuing translation is needed to preclude actors from drifting towards alternative controversies, and conflicts or aberrant behavior are so common in projects.

When compared to the other two theories, ANT has perhaps the strongest emphasis on *agency and creativity*. This is expressed through a particular view of the actor, considered as a whole, including personal interests and, as argued above, material substrate. This contrasts with the project literature, in which stakeholder interests are often considered from an instrumental perspective (Assudani and Kloppenborg, 2010). Besides, ANT recognizes not just the coexistence of multiple actors, and of multiple interests for each actor, but also that all actors are acting together to deploy or mobilize a network. In other words, rather than emphasizing the agency of a dominant actor, such as a planner or manager, as rational-decision models assume implicitly, ANT assumes a negotiation space where novelty emerges from the interplay of highly autonomous actors, engaged together in the translation process. In ANT, the unit of analysis, the creation of networks around controversies (Latour, 2005), builds on convergence among actors, on their engagement in the controversy, through the art of *intéressement* (Akrich et al., 2002). But translation happens only if actors recognize their own stake in the controversy. This perspective helps understand projects, because projects are temporary organizations aiming at a goal which is rarely well defined upfront; projects are emerging (Williams, 2005). Public, inter- or intra-organizational controversies create in and around projects constant negotiations between multiple stakeholders with competing, often divergent, points of view. All this highlights the limits of accounts based on a view of project organizations as implementing deliberate commitments expressed in the forms of plans and conventions, and may explain why "irrational" practices, such as partnering and agile approaches, are surprisingly successful in complex projects.

The contribution of ANT to the understanding of *knowledge practices* hinges on the concept of "inscriptions" as elements of knowledge that are temporarily deemed unquestionable so that they can be represented on an external support; in doing so most actors and actions involved in their production and any lingering doubts are put in a black box or "bracketed" (Akrich, 1992). The concept is derived from observations of the practice of science (Latour, 1987) and of the social construction of technologies (Hughes, 1987), in which "definitive statements" or "winning concepts" conceal a sequence of less definitive inscriptions or products, each produced by a network of interested actors, relying on imperfect instruments, and engaging in murky compromises, and messy manipulations. Some actors, including computer software, carry or stand for such inscriptions (Walsham, 1997). From this perspective, the project can be considered as a consequential myth that builds on similar sequences of inscriptions, resulting from negotiation between many interested actions. By focusing on practices that construct project representations researchers can retrace the sequence of translations that converge towards a definitive inscription that shapes and legitimates the project (Henderson, 1991; Latour, 1986). This approach has been used in a study of IT-dependent change projects, where the inscription was defined as the "desired programs of action, or patterns of use that someone inscribes into a medium such as technical artifact" (Linderoth and Pellegrino, 2005: 416). Results show how users' interpretation and interaction with inscriptions shape and re-shape the technology frame over time in a project, through a pattern of translation. The concept of inscription has been used similarly to study organization-level knowledge processes that impact a project. Thus, Räisänen and Linde (2004) studied how a project methodology was developed and adopted in a multinational telecommunication firm, and found that inscription technologization shifted power from project managers to higher levels. The study of inscriptions in the process of translation can suggest why projects, practices, legitimating arguments, powers, and technical solutions are, at times, discouragingly tenuous and, at times, incredibly hard to reverse.

ANT integrates *interests and power* in the ongoing processes of negotiation and translation through an evolving assemblage of affinities between actors rather than via predetermined positions and individual interests. From this point of view "power emerges from dynamic configurations of human and non-human actors" (Greenhalgh and Stones, 2010: 1287), rather than preexisting governance mechanisms (Clegg et al., 2002; Crawford et al., 2008). By including materiality, emotions, history and so on, alongside actors' technical skills, ANT extends the possible diversity of actor viewpoints, enabling a richer understanding of how actors get together around an issue or a problem in a project, construct networks in, around and for projects through negotiation and translation. By assuming that power stems from constant efforts to translate the controversy and to compromise in order to stir up enrolment in the project, and that, as a result, actors' power and affinities are constantly shifting, ANT can help account for the nonlinear development and aberrant response of projects. For example, Denis et al. (2007) show how project actors with that were too many and too diverse failed, for a long time, to converge towards a point of irreversibility in a university

hospital project. Another issue that would benefit from being explored through ANT is that mechanisms for managing projects also create networks or at least temporary settings, which increases organizational complexity (Clegg, 2012). This complexity comes partially from the coexistence of bureaucracy, with its traditional hierarchy, and projects, with their cross-functional coordination mechanisms. ANT provides a fruitful perspective to explore the social dynamics between hierarchy and projects (Maylor et al., 2006). For example, Alderman and Ivory (2011) combined ANT with the concept of multinodality (Wynne, 1988) to study the success and failure of large complex projects, in which social, political and technical aspects are intimately interweaved. Project convergence is complicated by pockets of resistance that persist in multiple pre-existing nodes that bring together a variety of actors with diverging objectives.

In sum, ANT contributes to a practice perspective by suggesting that projects are fragile organizations, which rely on a constant and collective process of translation to align actors' interests with and within the project. Both human and non-human actors are involved in this process; their agency and their interests are rooted not in individual intentionality, but in material affinities between diverse actors. The knowledge involved in this process is represented by inscriptions that represent temporary compromises, which, in turn, influence actors and subsequent translations.

3.3. Structuration theory

Structuration theory (Giddens, 1984) stresses the recurrent reproduction of social structures by means of actions that follow, time and again, a similar pattern. It is part of a group of theories that stress the role of human cognition in generating and reproducing social relations (Bourdieu, 1977; Crossley, 2011; Garfinkel, 1967; Weick, 1979). These cognitive assumptions emphasize pre-reflective (tacit or implicit) processes, in particular the propensities to act in habitual ways, but include abilities for reflectively judging, deciding, solving problems, planning and imagining (Emirbayer and Mische, 1998). In fact, a recent development in this school of through was the attempt to understand the role of actors' reflexivity in generating, maintaining and transforming structural properties (Archer, 1995; Beck et al., 1994; Feldman, 2000). But even if some of these new theories are quite critical of structuration theory, they share its key assumption that "all structural properties found in any [organization] are continuously activity dependent" (Archer, 2010: 275) rather than self-sustaining. The central role of actors' cognition distinguishes structuration theory, on the one hand, from activity theory (as well as from neoinstitutional theory), which emphasize the organizing role of abstract goals (or models) that somehow persist beyond individual actors, and, on the other hand, from ANT, which emphasize the material properties of actors and objects, as a source of structural properties that is somewhat independent of actors' activities and knowledge. In other words, while all three theories emphasize the role of actors and their interactions in creating and maintaining the structural properties of societies and organizations, structuration is the only one that

does not postulate entities outside actors' current cognitions and network ties in order to account for these properties.

From the structuration perspective, any organization, such as a project, is a network of social relations, which human actors construct by actively negotiating meanings, roles and interaction norms (Barley, 1986). In this process, actors reflectively represent and interpret the actions and roles of other actors, and may explicitly agree on shared meanings, definitions and rules (Crossley, 2011). Emergent, partly shared and partly distributed cognitive representations create overt expectations that guide and constrain action (Orlikowski, 1992). But pre-reflective cognition plays a critical role in stabilizing networks, and the asymmetries between actors that are embedded in these networks, such as authority over resource allocation. Actors' reliance on past categories and scripts initially saves cognitive effort, but sets interactions into repetitive patterns, which, in turn, transform explicit representations into habitual frames, and routine trajectories, interactions and practices. In time, through implicit learning, actors become marginally aware of the origin or influence of these frames and routines, and, by relying on them, inadvertently contribute to their re-production. In some cases, these may acquire over time a compelling, objective nature, strongly shaping interactions (Berger and Luckmann, 1966).

From this perspective, a project organization is shaped by pre-existing representations, including abstractions circulating in the broader social field, and by specific representations, such as plans, that actors build reflectively. But its effective social structure coagulates from recursive interactions, as categories, trajectories and scripts intersect, and as actors make sense of, and reconcile, their junctures. In stable and uniform interaction conditions, partial networks may sediment into a continuous field of shared frames and routines that actors may learn to skillfully navigate (Bourdieu, 1977). However, in the diverse, dynamic context of a complex project, such partial networks are "overlapping, contradicting and precarious," and "actors are constantly struggling with their divergent demands" and "local failures" (Whittington, 2010: 110).

So far, this view was mainly used to understand how broader networks shape projects, for example, how rules and resources for action institutionalized in a multinational organization favor collaboration in geographically distributed teams (Klimkeit, 2013), how the introduction of new project management practices causes changes and difficulties in projects (Bresnen et al., 2004), or how new tools lead to new work routines (DeSanctis and Poole, 1994; Orlikowski, 1992), for example, how new technologies influence collaboration in virtual project teams (Bjørn and Ngwenyama, 2010). Structuration theory also illuminated mutual influences (Manning, 2008) between project organizations and, for instance, industry networks (Windeler and Sydow, 2001) or host organization capabilities (Brady and Davies, 2004). But structuration theory can lead to many other insights, based on understanding the tensions resulting from the fact that actors, on the one hand, need the freedom to discuss, model explicitly, and innovate, in order to solve the problems they face in carrying out project tasks, and, on the other hand, they need a stable base of rules and resources for action, even a stable identity and role, in order to act and

coordinate with others. This base results from processes by which interactions become routinized into explicit or implicit project norms and procedures, and actors' understanding of the project network, for instance about who has knowledge, resources and decision authority in what areas, becomes institutionalized, namely widely shared, taken for granted and reproduced habitually. Because structuration theory is one of the roots of the practice turn (Whittington, 1992), the following analysis of its interpretation of Nicolini's (2013) five dimensions of practice is particularly fruitful in uncovering new avenues for research in project organizations.

Regarding the first dimension, *work and efforts*, structuration theory suggests that durable features of the world result from the rather long process described above. In particular, the effort may involve local negotiation and legitimation to bring rules in line with institutionalized norms and moral imperatives, reconcile their contradictory demands, and justify keeping them despite repeated failures and conflicts (Jarzabkowski, 2008). Although not entirely deliberate, the effort is substantial, because these features do not exist outside their continuous reproduction in action (Giddens, 1984). Analyzing cognitive structuration processes in projects highlights how taken-for-granted frames and routines make possible and shape action. Assuming that they subtly guide actors to reproduce action patterns, they may also account for the surprising inertia of project organizations at the height of implementation or for their inadequate reaction to unexpected events. Moreover, the emergence of project networks from local frames and routines may explain why the behavior of project organizations differs from that predicted by both decision-rational and functional–hierarchical models of project planning and implementation; why planning and development is not a linear progression but an emergent iterative process that takes many detours in unexpected directions; as well as why many projects deviate from plans, charts and schedules, to produce accidental organization forms and aberrant actions (Barley, 1986).

Structuration processes can also account for the role of *materiality* in projects, even though processes are mediated by actors' cognition. The active monitoring of action relies on implicit familiarity and recognition of the natural and built material environment, with its geographic extension, obstacles and bypasses, functionality, dangers etc. Enduring trajectories, scripts and practices are inevitably "bound up with the material forms and spaces through which humans act and interact" (Orlikowski, 2007). But assuming that human actors are knowledgeable and capable of monitoring and justifying their own actions relegates nonhuman entities to a more passive role compared to ANT. Rules of interaction are not determined by material conditions or object–actors. Instead, these conditions and the affordances of natural and artificial objects are subject to interpretation by human actors; new practices are negotiated based on these interpretations (DeSanctis and Poole, 1994; Orlikowski, 1992), yielding different forms around the same object (Barley, 1986). Moreover, advancing knowledge and mastery frontiers reduce the aspects considered as given constraints, increasing the area open to interpretation and creativity (Mouzelis, 2001: 438). This primacy of cognitive over material considerations puts structuration theory close to a social

construction perspective, which would argue, for example, that the turn towards large power plant and network projects in the early twentieth century was not caused by material conditions inherent in the emerging electrical technology but by the interests and covenants of powerful actors, rationalized with myths such as economies of scale and natural monopoly (Hughes, 1983). This perspective helps explain why project organizations facing similar material conditions end up having different network forms and action patterns, perhaps under the influence of socially-agreed norms and procedures. Besides, assuming a pre-reflective reproduction of action patterns may help explain why project actors persist to act in habitual ways in the face of changing material conditions, as well as the crises, disorientation and indecision that result when prevailing cognitive frames and action scripts are belatedly questioned in light of accumulating problems. It should be mentioned, however, that realist critics of Giddens' point of view open the way for a more direct role for material objects, by pointing out that actors' access to resources often requires physical access as well as a direct consent by other actors; cognitive frames and taken for granted rules are not enough to offer such access (Archer, 1995; Crossley, 2011). This more nuanced take on the role of materiality opens the possibility for circumstantial and temporary suspension of norms and rules that may still hold overall, and also account for surprising failures to act and effective counteraction by actors without formal authority.

Despite its emphasis on pre-reflective cognition, structuration theory can help researchers grasp the role of *agency and creativity* in project organizations. Giddens' intent in proposing his theory of structuration was a reaction to structuralist theories that left no role to human agents in creating social structures by likening these structures to externally imposed functional orders or grammars of action (Crossley, 2011). He gave human actors a central role in creating and maintaining social structures, exerted by acting in accordance with cognitive frames produced by explicit or implicit learning from past action. But critics argued that Giddens' idea of reciprocal determination between action and structure leaves in fact no space for agency. They proceeded to clarify and extend his conceptualization to distinguish three levels of agency, each enabling increasingly radical structural change (Emirbayer and Mische, 1998). The first level involves the purposeful, self-monitored, skillful navigation of existing practices and organizational routines, which avoids pitfalls and softens contradictions. Structural rules and resources "are to be mobilized with competence if they are to work in practice" (Crossley, 2011: 128). In this case, structural change results from imperceptible drifts in application, or forgetting past practices. The second level is the adaptation (DeSanctis and Poole, 1994) of practices and routines, by selecting and interpreting the rules and methods to be applied in a given situation, or by drawing on alternative sets of institutionalized rules and resources (Levina and Orlikowski, 2009). This level of agency is capable of producing a gradual yet more significant evolution of organizational structures. The third level of agency involves the explicit, knowledge-based imagination and deliberate planning of new practices and organization forms (Emirbayer and Mische, 1998). This level produces radical structural change, but may also

cause the acute realization that complete mastery over social networks is impossible (Beck et al., 2003). The shift from skillful navigation, to deliberate adaptation and innovation is deemed to occur when the context of action shifts from stable and familiar to turbulent, challenging and problem-prone (Archer, 2010). This rich theorizing of agency opens several opportunities for a practice-based perspective on projects. One is to study project planning and development as a strategic structuration process (Jarzabkowski, 2008), in which planners' actions combine direct negotiation and influence practices, expressing interests and seeking agreement from others, with attempts to bring institutionalized rules and resources, for example rules on how to organize a bidding process in public contracts, to bear on project interactions, as additional means for action. Another opportunity is examining project network coalescence and evolution from practices that creatively select, interpret and reshape routines, to accommodate both past experiences and new circumstances (Feldman, 2000). Every application of a routine provides an occasion for such reinterpretation, particularly in projects, which are a rare occurrence in many organizations; every project is a mix of thoughtless reproduction and creative reconsideration of past practice.

Structuration theory can also clarify the role of *knowledge* in project organizations. Instead of abstract (theoretical) knowledge, detached from the concrete context (here and now) of action, it stresses actors' practical consciousness: the ability of knowledgeable actors to navigate social systems and monitor their own actions in ways that are not, and cannot be completely articulated (Giddens, 1984). This ability relies on practical knowledge obtained through implicit learning from the "continuous decoding of the perceived – but not consciously noticed" (Bourdieu, 1977: 10). A condition for such learning is interacting with other actors, and probing the affordances of the surrounding material world and tools, which results in knowledge shared by actors who spend a lot of time together, in the presence of the same material objects and places. The role of such knowledge, which remains largely attached to objects, embodied in agents' perceptual and motor systems, and difficult to articulate, is essential, as structure "has no existence independent of the knowledge that actors have about what they do in their day to day activity." (Giddens, 1984: 27) In particular, knowledge constitutes the core of the structures of signification, which include institutionalized interpretive schemes and beliefs about actions (Jarzabkowski, 2008). But extending the impact of these signification structures requires a significant effort, because practical knowledge is hard to abstract from its context and then embed in a different context, and any "discursive formulation of a rule is already an interpretation of it" (Giddens, 1984: 23). Actors' knowledge is also limited in the sense that it is always bound to miss unintended consequences of human action. This may help account for the difficulties of transferring knowledge from one project to the next in project based organizations (Prencipe and Tell, 2001). The understanding of project organizations can benefit from studying knowledge in the form of organizational and societal practices, defined as the "accepted ways of doing things, embodied and materially mediated, that are shared between actors and routinized over time" (Vaara and Whittington, 2012: 297). The "accepted and shared"

aspects in this definition suggest that institutionalized practices are structuring principles, kernels from which structured networks extend to form a project organization. Adopting this view may help researchers understand how abstract models and generic tools for project planning and management, particularly those promoted as norms by the project management profession or prescribed by governments, influence project organizations. Researchers can trace project structuring processes to actors' explicit struggle to understand and reconcile the requirements of these models, but also to their ceremonial application, because they clash with the usual ways of doing things.

Finally, structuration theory also highlights *interests and power* in project organizations. Giddens (1984) sees power as a duality between actors' capacity to effect transformative actions, in particular their interest or will, and institutionalized differences among actors regarding access to resources—the media through which actions are exercised. Therefore, power in projects "presumes regularized relations of autonomy and dependence between actors" (Giddens, 1984: 16). In addition to the institutionalized distribution of material resources, the institutionalized "structures of domination" comprise "institutionalized authority relationships involved in mobilizing power" (Jarzabkowski, 2008: 623). But, for Giddens (1984: 16), "all forms of dependence offer some resources whereby those who are subordinated can influence the activities of their superiors." This "dialectic of power" (Giddens's term) can explain, for example, why, in many projects, managers in positions of authority are unable to impose decisions and engage in quid-pro-quos with formally subordinated actors. This view can also amend the understanding of contractual relations between project participants, for example when contract clauses suggest that the principal can simply force the agent to execute an action, yet hesitates to do so. Combined with the view of agency as reflexive monitoring, weighing up and anticipative projection regarding other actors, and of social relations as unfolding processes, irreducible to actors, but to which the latter continually refer, this view of power can inform the study of shifting relations between actors in a project organization, and with external stakeholders.

In sum structuration theory informs a practice perspective by calling attention to the fact that project organizations persist in part via the thoughtless reproduction of past practices, as well as through efforts to reconcile various practices and imagine new ones. Project actors rely on habitual, often implicit, cognitive representations of social networks and of the material context of action, but engage in a more deliberate and creative agency mode when facing problems or diverse and unstable conditions. They are aware of asymmetries in the distributions of resources and authority over them but also realize that more powerful actors also depend on them.

4. Discussion: rudiments of a theory toolkit for project organizations

Our article seeks to answer the call for renewing the theoretical bases of project management (Bakker, 2010; Cicmil et al., 2006; Söderlund, 2011) by focusing on underexploited and promising perspectives on the complexity of project organizations. Because

project management is a practice-oriented domain, we started our quest with a review of practical issues and of solutions developed by practitioners and found that many problems stem from the application of methods that rely on decision-rationality norms and bracket the complexity of action and social interaction in projects.

We found that the practice perspective helps shed light on the overlooked aspects of action by studying what practitioners actually do in projects. We adopted Nicolini's (2013) five dimensions of practice as a set of pointers to specific aspects that require researchers' attention in order to understand why projects deviate from decision-rationality norms. We supplemented this entry point with three theoretical perspectives that can inform the investigation of project organizations. All three selected social theories are compatible with the practice view; in particular, all three attempt to overcome the divisions that other theories assume between levels of aggregation and between past, present, and future, by focusing on networks of interacting actors and on the way their action and interaction joins history and purposes. However, each of these theories retains vestiges of old divisions in the particular emphases they place via their conceptual frameworks. For example, activity theory emphasizes the structuring role of a social abstraction, the object of activity; structuration theory stresses pre-reflective cognition, which emerges at the juncture of individual frames and social interactions; while ANT emphasizes the constitutive role of actors and material substrates. Likewise, activity theory seems to emphasize the compelling influence of history on action via higher motives, artifacts and contradictions; structuration theory emphasizes the mutual influence between current actions and past cognitive frames, while ANT highlights the fragility of past certainties and the need for constant future-oriented interpretation and translation.

Like in the case of the five dimensions of practice, we consider that these differences have a significant generative potential, because each theory offers different opportunities for investigating actual practice in project organizations. The matrix shown in Table 1, resulting from the intersection of the five dimension of practice with the three fundamental theories, forms the rudiment of the toolkit we propose for project management researchers in this paper. Researchers can select from it a combination of social theory and practice dimension to investigate certain types of theoretical and practical issues in project management. In some cases, they can complement the lens provided by a particular cell in Table 1, by contrasting different theoretical takes on the issue or by focussing on more than one dimension of practice.

Examining Table 1 suggests that, while all cells have something to offer the project management researcher, some theoretical perspectives are more appropriately combined with some dimensions of practice. Hence, with respect to work and efforts, ANT and structuration theory provide the strongest, albeit highly complementary, insights. While ANT stresses network fragility and the constant effort required to maintain its convergence, structuration theory highlights how relations that become taken for granted can unassumingly instill inertia in the project network. Thus, the former can inform the study of

Table 1
The rudiments of a toolkit approach.

	Activity theory	ANT	Structuration
Work and efforts	The concept of contradiction can be used to anchor projects within their socio-historical context and to consider their development over time as a process of resolution of systemic contradictions.	Translation, the continuous process of enrolling actors in networks, can explain why project viewed as networks to be deployed and assembled are so fragile, why project fail without a real sponsor, and project development is so costly.	The thoughtless reproduction of action patterns can account for the long and convoluted emergence of project organizations, and for their inertial and aberrant response to unexpected events
Materiality	Practices are mediated by artificial things, such as tools and databases, which have organizing capabilities in projects. They set possibilities and constraints for action.	Material properties account for the active role of some things, such as drawings or forms, in regularizing action, as well as for the aberrations and conflicts produced by other things, such as people or soil, which hinder action convergence.	Trajectories and scripts that are rather loosely embedded in material forms and spaces, as a result of imperfect cognitive mechanisms, may account for project variety in similar conditions and for the surprising onslaught of problems.
Agency and creativity	Project participants intentionally orient their efforts towards a (partially) shared object of work. Collaborative project work that is not coordinated from a fixed control center can be made possible by 'knotting' relations into enduring forms.	The variety of actors and the need to engage all of them, and the fact that projects emerge from the interplay of competing viewpoints around controversies may explain the success of agile or partnering practices.	Assuming that actors skillfully interpret, select and use past practices, as well as imagine new ones, redefines planning as a social structuring process and the evolution of project organizations as a creative network transformation process.
Knowledge	Tools and other things are reservoirs of social and cultural knowledge. They carry past experience into new project activities and give access to means and depictions (ideas, procedures, formulas) beyond those available in the current project.	Studying project representations, such as plans and feasibility studies, reveals how project forms and justifications evolve from murky compromises, and how this makes them, at times, hopelessly tenuous and, at times, incredibly compelling.	An emphasis on learning that is largely implicit and embedded in concrete contexts can explain why practices persist and are so difficult to transfer to new contexts, and why abstract models for action are so hard to implement.
Interests and power	Analyzing the history of the activity system using the concept of contradictions can identify sociohistorical conditions that are causing conflicting interests and tensions "here and now" in projects.	Power and interests associated to and resulting from constant translation efforts and compromises constantly shift. This helps account for the iterative development, deviating execution and aberrant response of project networks.	Persisting patterns of differential access to resources and dependence between actors can explain the strategic behavior in subordinate and contractual relations and the constantly evolving relations with stakeholders.

issues, efforts and actors involved in developing and reshaping projects, while the latter suggest how efforts fail to respond to challenges in mature project organizations (Floricel et al., 2011). However, structuration views, in particular through related critical theories, can also inform the study of project change by assuming that reflexive actors are capable of reshaping project networks through practices of strategic interaction and negotiation (Herepath, forthcoming; Horrocks, 2009). Activity theory can complement these insights with a focus on the efforts to resolve various contradictory demands on project activities.

With respect to materiality, activity theory and ANT are likely to provide the most fruitful insights. Activity theory suggests that project activities are always mediated by artifacts. Therefore, the object of such activities is always understood and manipulated within the possibilities and constraints set by artifacts. In addition, ANT highlights how the material substrate of objects and even human actors leads to aberrant processes that cannot be controlled with plans and conventions. These complementary insights could be used to study how actors and practices in projects interweave with a variety of objects, including the way project management tools and controls set boundaries and focal points or force action (Sapsed and Salter, 2004); how the physical layout of working spaces and construction sites conditions actor coordination, teamwork and creativity (Kornberger and Clegg, 2004); as well as how material processes expressed in soil and weather conditions,

properties of materials and organisms, behavior of prototypes, equipment and systems intertwine with project activities (Ingold, 2010a, 2010b; Knorr Cetina, 1997). On top of all this, structuration theory suggests that the "distance" between actors' understanding of the situation and relevant material processes affects the dynamics of difficulties and problems in a project, an insight which could be used to study the onslaught of crises and the response of project organizations to them.

Concerning agency and creativity, activity theory and ANT are likely to provide most insights. Activity theory suggests that human intentionality is always oriented towards an object (higher motive), and helps explain how projects, as intermediate goals, are shaped by participants' shared or diverging objects, as well as how different activities are woven together around a partially shared object of work that knots relations into enduring forms. In turn, ANT can revolutionize the theorizing of project actors by calling attention to the diverse properties and sources of their agency, including their emotions and material processes, as well as to the required involvement from all actors for project success, helping to account for the effectiveness of agile and partnering practices. Structuration theory adds the insight that past-, present-, and future-oriented aspects of agency are jointly expressed in actors, which helps explain why project practices vary from skillful navigation to the invention of new forms.

Regarding knowledge, activity and structuration theories are the most likely sources of insights. Structuration theory stresses the

variety of knowledge forms and knowledge-producing practices that can occur in projects but stresses the local and sticky nature of tacit knowledge, which helps account for transfer and implementation difficulties within and between projects. On the other hand, activity theory suggests how artifacts become reservoirs of knowledge, which can explain how means and representations from other projects and contexts impact practices in the current project. ANT can complement these insights by suggesting that what is considered reliable knowledge, including project justifications, is the result of a murky manipulations and compromises in a process that goes through many hesitant stages.

Finally, ANT and structuration theory, hold out the most promising avenues for interests and power. ANT suggests that power is constantly shifting because of attempts to translate the controversy to various actors, which accounts for the dynamics of shaping and maintaining project networks. Structuration suggests that actors take advantage of pre-existing authority and resource access asymmetries that either coalesce in projects or are imported from the broader networks to which actors belong, which sheds light on conflicts and strategic behavior in and around projects. Activity theory provides the extra insight that some of the interests and tensions in projects can stem from the historic contradictions in the formation of the project management domain.

As mentioned above, the toolkit described in Table 1 and the preceding paragraphs can be used in several ways. The most obvious way is to select one cell in the table, which provides a combination between a practice focus and a theoretical lens that could be used to address the issues for which the given combination is more likely to provide new insights, as well as other project issues deemed appropriate by the researcher. Another possibility is combining in one study a focus on two or more dimensions of practice with the same theoretical lens. For example, both ANT and activity theory seem to associate closely the knowledge and materiality dimensions. Namely ANT associates knowledge practices with a network of inscriptions on material supports, such as plans and drawings that represent the project and its economic and technical viability. In turn, activity theory considers that material objects such as tools and instruments make possible the production of knowledge and carry in time and space knowledge accumulated in past activities. Therefore, researchers could pay attention to the way knowing practices interweave with and are carried forward through material things (Rennstam and Ashcraft, 2014). Implementing this kind of combination is not likely to face many obstacles; at most, it could disperse researchers' focus and dilute their efforts because they will have to track and understand too many aspects of practice.

Another possibility is to rely on insights from two of more theories with respect to the same dimension of practice. Nicolini's (2013) toolkit idea encourages this kind of eclectic approach. As discussed above, for all dimensions of practice, at least two of our three theories are likely to provide complementary insights. A simple combination strategy could rely on Allison's (1971) approach, namely using theories separately and comparing which of them gives a better account of project phenomena. But another option would be attempting to combine two or more theories in a unitary theoretical framework. This option faces the obstacle that the three theories build on different assumptions, as stated in the beginning of this section, which may preclude integration. Yet, some of them have common roots, which may ease the task if researchers are willing to go into some depth in order to understand these assumptions. For example, ANT and activity theory share a concern for the materiality of the world and its direct impact on social processes, as a means to overcome the divisions between society and nature, and between subject and object (Miettinen, 1999). ANT conveys this concern by assuming symmetry between social and material relations, while activity theory does so by assuming a tension (dialectics) between social and material aspects of the world. These approaches could be combined, for instance, in order to study learning in project organizations, with activity theory inspiring the analysis of tensions and changes in practices relying on tools and instruments, and ANT informing the study of practices that create networks of inscriptions about projects as objects in natural contexts, and as organizations and agreements (Gherardi, 2001). Likewise, ANT has some affinities with structuration theory because of their shared concern for the role of actors in creating and stabilizing social networks; while structuration theory emphasizes the role of actors' stable implicit beliefs, ANT highlights their deliberate involvement in more dynamic and context-bound translation processes. Greenhalgh and Stones (2010) attempted to combine these theories by assuming that actors hold both stable implicit beliefs and more changing, context-related, knowledge about tools and networks. This combination enabled them to grasp the difficulties of government-mandated implementation of large information systems by analyzing both taken for granted beliefs coming from external networks, and the actors' knowledge of local networks.

5. Conclusion

A practice perspective, viewed through Nicolini's toolkit approach, enables the selection of a theoretical framework that suits the object of inquiry. This paper attempted to demonstrate the potential for constructing such a toolkit by combining five dimensions of practice with three fundamental social theories, in order to encourage project management scholars to use this approach. This resulting toolkit suggests that the choice of practice dimensions and social theories to be included in the conceptual base can be made in light of their respective strengths in guiding the study of a particular issue facing project organizations. Moreover, several dimensions and complementary perspectives can be combined in order to obtain a more nuanced lens.

While the three social theories presented in this paper may open up new perspectives to project management scholars, they are far from accounting for all aspects of project phenomena. This paper is more an invitation to mobilize more social theories than a prescription for using only some theories. Other theories could be subjected to the same inquiry that we followed in this paper. The success of creating and using such a toolkit depends on the compatibility of the respective theory with the practice perspective and on awareness that it may be

based on hidden assumptions that bring back temporal and aggregation level divisions.

We hope that our contributions will stimulate the use of the toolkit proposed here and of other similar tools in order to understand project practices and temporary organizations. But the work we have performed in preparing these contributions already suggests some preliminary conclusions in this respect. Applying the five dimensions of practice to projects reveals a clear diversity of highly relevant aspects for research that are usually overlooked or smoothened out in decision-rationality frameworks. The three fundamental theories suggest that these factors, whose origin can be 'here and now' but also far away in time and space, place contradictory demands on project organizations, making them much more dynamic, fragile, and unpredictable than rational-decision models would suggest. In essence, this means that project practices effect a perpetual construction, reconstruction or unfreezing of project networks. Actors carry out these processes in a distributed manner by relying on a variety of means and tools. Project management would only gain if these practices would be first understood as such and then rewoven in new theories of project processes and organizations.

Conflict of interest

There is no conflict of interest.

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