When neighboring disciplines fail to learn from each other: The case of innovation and project management research

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ABSTRACT

As knowledge production becomes more specialized, studying complex and multi-faceted empirical realities becomes more difficult. This has created a growing need for cross-fertilization and collaboration between research disciplines. According to prior studies, the sharing of concepts, ideas and empirical domains with other disciplines may promote cross-fertilization. We challenge this one-sided view. Based on an analysis of the parallel development of the neighboring disciplines of innovation studies and project management, we show that the sharing of concepts and empirical domains can have ambivalent effects. Under conditions of ideological distancing, shared concepts and domains will be narrowly assimilated − an effect we call 'encapsulation' – which creates an illusion of sharing, while promoting further self-containment. By comparison, reflexive meta-theories and cross-disciplinary community-building will enable a form of sharing that promotes cross-fertilization. Our findings inform research on research specialization, cross-fertilization and effectiveness of interdisciplinary collaboration.

1. Introduction

Research disciplines typically develop through processes of specialization and fragmentation (Hoffmann et al., 2017; Siedlok et al., 2015). By "research discipline" we mean a topically, epistemologically and institutionally demarcated field of study that is maintained by an affiliated community of scholars. As disciplines co-evolve they become associated with particular research questions, associations, journals, university departments and educational programs. Disciplinary specialization promotes endogenous theory-building (Markoczy and Deeds, 2009), but often fails to address complex societal problems (Alvesson and Sandberg, 2014; Bitektine and Miller, 2015; Davis, 2015; March, 1996; Brusoni et al., 2001). Scholars have, therefore, called for integrative efforts (Berggren et al., 2011; Tell et al., 2016) to promote interdisciplinary research (Jacobs and Frickel, 2009) and cross-fertilization, i.e. processes through which disciplines can learn from each other to address complex and changing empirical realities (see also Corley et al., 2006). Such efforts have played an important role in nurturing scientific breakthroughs and developing novel research areas (Galison, 1997), but research bodies and policy-makers also continue to face challenges in making interdisciplinary collaboration and learning effective (Raasch et al., 2013; DeJong et al., 2016; Hoffmann et al.,

2017). Our study aims to improve our understanding of the critical mechanisms and barriers to cross-fertilization across disciplines.

Recent studies suggest that one core driver of cross-fertilization and new knowledge integration is the sharing of concepts, ideas and empirical domains with other disciplines (Zahra and Newey, 2009). For example, social science disciplines have benefited from borrowing concepts, theories and ideas from biology (Oswick et al., 2011). However, in many cases, the sharing of concepts, ideas and domains does not directly promote cross-fertilization (see also Corley et al., 2006). Consider, for instance, the disciplines of information systems, operations research and international business. They have shared a joint interest in IT-enabled global outsourcing, but have largely ignored each other's contributions in that area (indicated by very limited cross-referencing of special issues in *Journal of Operations Management* in 2008, *Management of Information Systems Quarterly* in 2008, and *Journal of International Business Studies* in 2009). We seek to better understand under what conditions the sharing of concepts, ideas and empirical domains may promote cross-fertilization and when it does not.

We do so by examining neighboring disciplines that overlap significantly in topical interests, empirical domains and often even terminology. Despite such overlaps, neighboring disciplines often fail to acknowledge each other's contributions (see e.g. Kuura et al., 2014).

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We examine this phenomenon for the specific case of innovation studies and project management research − two disciplines that are highly influential in management and organization studies (see e.g. Pettigrew, 2001; Fagerberg, 2004; Martin, 2012; Morris et al., 2011; Sydow et al., 2004). Both are concerned with the management of novelty and uncertainty, and they even have a common history in the study of large-scale defense projects in the 1940s and 1950s (Morris, 1994; Hughes, 1998). One particular interest they continue to share is the study of projects that are highly innovative. Yet even though both disciplines refer to the same concepts − projects and innovation − until recently there was very little mutual recognition and cross-referencing (Lenfle and Loch, 2010; Kwak and Anbari, 2009). We analyze the dynamics that have hindered cross-fertilization over several decades and those that have recently promoted cross-fertilization.

Based on our findings, we develop a generic theoretical model that specifies, based on the case of neighboring disciplines, when the sharing of concepts and empirical domains may promote cross-fertilization or reinforce self-containment. Our findings have important implications for understanding mechanisms of cross-fertilization and self-containment between disciplines, especially those with significantly overlapping concepts and empirical domains (Adler and Hansen, 2012; Floyd, 2008; Kuura et al., 2014). Generally, our findings inform research on the effectiveness of interdisciplinary collaboration (Jacobs and Frickel, 2009), especially by challenging and adding nuance to the idea that a 'common language' is important for knowledge exchange and learning (Galison, 1997).

2. The challenges of research specialization

As research disciplines evolve, they become increasingly specialized, often forming sub-disciplines which co-exist and contribute specialized knowledge under the umbrella of larger disciplines. The emergence of the discipline of management and organization studies, for example, has led to further specialization in sub-disciplines such as accounting, finance, human resource management, marketing, and supply chain management. Research specialization is often stimulated and reinforced by the functional and professional specialization in society (Haas, 1992; Payne, 2007). It is further solidified by the development of specialized concepts, theories, scholarly communities and journals (March, 1999). Specialization can be an important driver of knowledge production and endogenous theory-building (Jemison, 1981; Markoczy and Deeds, 2009). There is often little incentive to integrate bodies of knowledge as long as research specialization is reflected and supported by institutional specialization, as in the case of management sub-disciplines (Whitley, 1984). In contrast to 'hard sciences', there is also ambiguity surrounding research terminology used in the social sciences, leading to the emergence and co-existence of multiple paradigms (Zald, 1996).

Specialization can be effective when it reflects the nature of the research matter and aligns with the fragmentation of knowledge production. But it may prevent scholars from capturing complex and changing research problems and empirical realities (Davis, 2010; Knudsen, 2003; Weick, 1996; Kuura et al., 2014). There is an inherent tension between research specialization and the need for integration (Engwall, L., 1995; Zald, 1996; Greenwood, 2016; Knudsen, 2003; Whitley, 1984). In particular, specialization may discourage researchers from tackling large-scale societal problems, which tend to call for collaboration across disciplines (DeJong et al., 2016, Wagner et al., 2011). It may also restrict efforts to address more fundamental theoretical issues (Davies, 2014). March (1999), for example, argued that management and organization research was becoming more fragmented and losing its legitimacy as a field of study in part because of the reduced interaction with other disciplines (see also Engwall, L., 1995; Knudsen, 2003). This pattern of specialization and fragmentation has occurred elsewhere in other social science disciplines, such as economics, geography and linguistics, which have been accused of failing to address

society's grand challenges (Boulding, 1986; Chomsky, 2000; Flyvbjerg, 2001).

Paradoxically, the more differentiated disciplines become, the more likely they will share topical interests and empirical domains, and become either temporary or permanent disciplinary neighbors. Being neighbors, however, does not mean that disciplines necessarily collaborate or develop the capacity to examine complex problems in more comprehensive ways. This is because in practice they often fail to learn from each other (Kuura et al., 2014). Next we consider challenges of cross-fertilization between research disciplines in more detail.

3. The challenges of cross-fertilization

Prior studies emphasize that the fragmentation of research disciplines can be circumvented by cross-fertilization (Floyd, 2008). Cross-fertilization involves the exchange of ideas and findings across disciplines enabling the address of complex and changing empirical realities. Cross-fertilization, which may occur without undermining the core value and identity of individual disciplines, is important because boundaries between organizational and scientific problems are becoming increasingly indistinct (e.g. Brusoni et al., 2001; Tell et al., 2016, Van de Ven, 2007). Disciplines are expected to develop interdisciplinary approaches to tackle society's complex problems, such as climate change and poverty (Garud and Gehman, 2012; DeJong et al., 2016).

Cross-fertilization across disciplines can be promoted in multiple ways. For example, research programs may foster the formation of research teams from different areas (Polzer et al., 2009; Bitektine and Miller, 2015). Many initiatives have been launched to combine increasingly specialized knowledge and ensure that both long-term challenges and short-term problems can be addressed (Galison, 1997). In sustainability research, for example, various research programs have been combined to provide a more comprehensive analysis of contemporary sustainability problems (Hoffmann et al., 2017; Manning and Reinecke, 2016). Such programs are designed to create a synthesis of knowledge by establishing connections between knowledge domains and forging closer links amongst members of research teams (Carpenter et al., 2009). Yet, the ability to effectively design and organize such programs is difficult to foresee (Adler et al., 2009; Bammer, 2008; Brewer, 1999; Pohl, 2008). Teams that are composed of members from different disciplines may suffer from a 'clash of cultures' as scholars adhere to the different, sometimes conflicting norms and values of their epistemic communities (Haas, 1992; Knorr-Cetina, 1999). Such communities may have their own ways of defining problems, collecting and interpreting data, making collaboration across disciplines difficult, even if they share an interest in the same problem domains.

More recently another mechanism of cross-fertilization has been discussed that promises to stimulate learning and exchange effectively by importing, exporting and sharing of ideas and concepts (see e.g. Boxenbaum and Rouleau, 2011; Sullivan et al., 2011). Zahra and Newey (2009) argue that 'borrowing' from other disciplines may assist empirical research and the development of new theory. Oswick et al. (2011) show how the social sciences have benefitted from borrowing theories and insights from biology to advance their own theoretical frameworks. However, sharing important concepts and ideas does not mean that disciplines always learn from each other. Kuura et al. (2014) illustrate this for the case of project and entrepreneurship research which overlap in significant ways, such as sharing an interest in entrepreneurial projects. Studies like these argue that knowledge exchange is missing mainly because scholarly communities maintain their own paradigms (Kuhn, 1970) and criteria of relevance (Alvesson and Sandberg, 2013, 2014), including their own journals and 'citation cartels' (Gabriel, 2010; Vogel, 2012).

While such barriers to cross-fertilization might be important, we argue and show empirically that another, less understood mechanism may undermine the potential utility of sharing − the problem of

'ideological distancing'. By distancing we mean that certain dominant self-referential ideologies (Morgan, 1986; Rouleau and Seguin, 1995) may, more or less intentionally, exclude other relevant perspectives and interpretations. The cultivation of such ideologies may promote what we call 'encapsulation' − the narrow assimilation of shared concepts or ideas from other disciplines in line with such ideologies. Paradoxically, which is a key point with the present paper, encapsulation creates an illusion of sharing which hinders rather than promotes cross-fertilization and leads to further self-containment of disciplines. We also show how the adoption of meta-theories, along with cross-disciplinary community-building efforts, may counteract encapsulation, and enable processes of sharing to actually promote cross-fertilization between disciplines.

4. Data and methodology

Focusing on two neighboring disciplines, that share important topical interests and concepts, we use a case study methodology to examine when sharing promotes cross-fertilization and when it does not. Case studies are a suitable means to analyze complex and poorly understood processes (Yin, 2003), such as mechanisms and barriers to cross-fertilization between research disciplines. We employ an inductive and longitudinal case study approach to promote analytical generalization and theorizing to inform future research (Eisenhardt, 1989; Yin, 2003). Both the selection and analysis of the case are informed by prior research on cross-fertilization as detailed next.

Our specific case − the parallel development of innovation studies and project management research − serves to challenge existing theory and to inspire new ideas and thinking (Siggelkow, 2007). Focusing on the case of neighboring disciplines, we challenge the view that adopting and sharing of domains, ideas and concepts by itself promotes mutual learning (see e g. Sullivan et al., 2011; Zahra and Newey, 2009). We introduce a neglected barrier to learning we call encapsulation. Innovation and project management research share an interest in the study of projects in the context of innovation and the same historical roots (see below). They therefore qualify as an example of neighboring disciplines. At the same time, these disciplines are known for failing to recognize each other's contribution to their shared research agenda (Brady and Söderlund, 2008; Lenfle and Loch, 2017; Shenhar and Dvir, 1996), despite the increasing cross-fertilization that has been observed in recent years (Davies, 2014; Lundin et al., 2015; Pollack and Adler, 2015). This makes them an ideal case for studying and informing theory about the barriers and facilitators of cross-fertilization of neighboring disciplines.

We utilized multiple sources of data, including archival data and observations of debates at workshops and conferences, to assist data triangulation and cross-validation (Yin, 2003). One major initial source of data was a detailed review of the literature on innovation and project management research, which considered how and to what extent both disciplines have referenced and learned from each other over time. We took a qualitative rather than quantitative approach: rather than doing a co-citation or network analysis (Chabowski et al., 2010; Sullivan et al., 2011), we identified substantial changes in cross-fertilization of core ideas over time and the key mechanisms hindering or facilitating cross-fertilization. Following examples of other qualitative reviews of research evolution (e.g. for international business, Buckley, 2002, and Griffith et al., 2008), we also relied on our own expertise as scholars of projects and innovation to identify qualitative changes in cross-fertilization.

In terms of data collection, we proceeded in three steps. First, we screened previously published bibliometric and systematic literature reviews to describe the evolution of each disciplines and develop a consensus around major approaches to studying 'innovation' and 'projects' in each discipline (see for project management research, Bakker, 2010; Engwall, M., 1995; Johansen, 2015; Kwak and Anbari, 2009; Lenfle and Loch, 2010; Morris, 2011; Ng, 2015, Packendorff, 1995;

Pollack and Adler, 2015; Söderlund, 2011; Winch, 1998; for innovation studies see Castellacci et al., 2005; Davies, 2014; Fagerberg, 2004; Fagerberg et al., 2013; Fagerberg and Verspagen, 2009; Martin, 2013; Martin, 2016, Rafols et al., 2012). Notably, all three authors of this paper have contributed to both disciplines for many years, including review papers which are also referenced here. Second, we conducted an analysis of potential cross-fertilization around the study of projects in innovation contexts by screening recent issues of leading journals (e.g. *International Journal of Project Management, Project Management Journal, Journal of Product Innovation Management, Research Policy, IEEE Transactions on Engineering Management*) and influential books. Our focus was on significant changes in cross-referencing, and changes in editorial and reviewing boards as indicators of increasing cross-fertilization. Third, we reviewed our own experience as participant observers in recent conferences and workshops addressing project management and innovation research, focusing on how debates have developed overlapping concepts and domains. We consider how such conversations either facilitate or hinder a common understanding of issues and themes.

From our analysis, we identified three major phases in the evolution of these scientific disciplines, which can illuminate barriers and facilitators of cross-fertilization: (1) the emergence phase (from joint roots to separation); (2) the self-containment phase (ideological distancing and encapsulation); and (3) the cross-fertilization phase (meta-theories and community-building). This 'temporal bracketing methodology' (Langley, 1999; Pentland, 1999) facilitated our narrative reconstruction of the parallel development of the two disciplines and improved our understanding of how interdisciplinary relationships develop over time and what mechanisms influence those relationships (Jacobs and Frickel, 2009). We identified the three phases partly by reviewing and comparing prior literature reviews of both disciplines (Morris, 1994; Hughes, 1998; Brady and Hobday, 2011; Scranton, 2014, Söderlund, 2011; Söderlund and Lenfle, 2013; Davies, 2014). For example, prior reviews have acknowledged that innovation and project management studies have common roots (Davies, 2014).

Whereas prior studies have focused on the history of the two disciplines independently, we focused on significant changes in their parallel development and relationship with each other. To 'zoom into' on this relationship (Ibarra et al., 2005), we focused on how these two disciplines, over time, have conceptualized projects and innovation respectively, and particularly 'projects in innovation contexts': projects whose main objective is to develop new technology, products, services or processes. We investigate to what extent and how, in each phase, each discipline has benefited − or failed to benefit − from research undertaken by the neighboring discipline in this overlapping area. We now describe each phase in greater detail.

5. Findings

5.1. Phase #1: the emergence of innovation studies and project management research

Before following trajectories as distinct disciplines with their own academic associations and professional identities, innovation studies and project management started as a relatively integrated field of research. We review early joint formulations, including the emergence of two contrasting ideologies around the notion of 'innovation projects', which would later influence the parallel development of both disciplines. We then identify what marked the beginning of their independent trajectories. Table 1 gives a selective overview of research topics and foci of both disciplines over time. We will refer to some important topics in more detail further below.

5.1.1. Early joint formulations

The joint roots of innovation studies and project management research can be traced back to the 1940s and early 1950s when

Table 1
History of Innovation and Project Management Research (selected references).

Time period	Innovation research	Project management research
1950–1959	Models of the innovation process in uncertain projects. Contrasting two different kinds of approaches to innovation projects (Klein and Meckling, 1958).	Critical path method (Kelley and Walker, 1959)
		PERT (Program and evaluation review technique) Work breakdown structures (Gaddis, 1959)
1960–1969	Contingency frameworks, including organizing structures (Burns and Stalker, 1961) and project procedures (Woodward, 1965). Project managers as integrators (Lawrence and Lorsch, 1967). Projects and matrix structures (Middleton, 1967). Projects as "voyages of discovery" (Hirschman, 1967).	Critical success and failure factors (Avots, 1969)
		Project control and planning (Souder, 1969). PERT (Program and Evaluation Review Technique) and Critical path methods (Archibald and Villoria, 1967; (King and Wilson, 1967; Miller, 1962) Systems analysis (Cleland and King, 1968). Q-GERT modelling (Pritsker, 1968)
1970–1979	Project managers as organizational metronomes (Sayles and Chandler, 1971). Project matrix (Galbraith, 1973). Cross-functional teams (Allen, 1977). Projects and gatekeepers (Allen, 1977).	Cost, time and scheduling (Lucas, 1971; Perry et al., 1971).
		Cost control (Murphy et al., 1974). Project management models (Crowston, 1971). Critical success factors (Murphy et al., 1974; Thamhain and Gemmill, 1974). Systems and software engineering (Brooks, 1975).
1980–1989	Projects and adhocracies (Mintzberg, 1983). Innovative forms of organizing (Mintzberg, 1983). Information flows in the project matrix (Katz and Tushman, 1981). Locus of influence (Katz and Allen, 1985). Rugby approach to projects (Takeuchi and Nonaka, 1986).	Project success and failure (Kharbanda and Stallworthy, 1983; Pinto and Prescott, 1988).
		Risk management (Ashley and Avots, 1984). Tools and techniques (Liberatore and Titus, 1983). Scheduling (Levitt and Kunz, 1985). Effectiveness of project structures (Gobeli, 1987).
1990–1999	Heavyweight project managers (Wheelwright and Clark, 1992a,b). Tiger teams. Derivative, platform and breakthrough projects (Wheelwright and Clark, 1992a,b). Compression and experiential project models (Eisenhardt and Tabrizi, 1995). Agile projects (Thomke and Reinertsen, 1998).	Projects as temporary organizations (Lundin and Söderholm, 1995).
		Typological theory of project management (Shenhar and Dvir, 1996). Low-tech and high-tech project management (Shenhar, 1993). Projects as waterfalls and fountains (Lindkvist et al., 1998).
2000–2009	Ambidextrous structures (O'Reilly and Tushman, 2004). Projects as experiments (Thomke, 2003).	Diamond model (Shenhar and Dvir, 2007). Exploration projects (Lenfle, 2008)

government-sponsored large-scale projects were established to create complex military weapons, defense and aerospace systems, such as the Manhattan, Atlas ballistic missile, and the Apollo moon landing projects (Morris, 1994; Hughes, 1998; Sapolsky, 1972). At that time, as documented in detail in Lenfle and Loch (2010), innovation and project management were perceived as strongly interrelated processes

To solve major research and development (R&D) problems in the 1950s and 1960s and keep pace with rapid technological innovation, scientists, engineers and managers developed radically new project management tools, systems engineering techniques, and operations research approaches (Hughes, 1998). Project management processes were created to better integrate the specialized knowledge and resources required to achieve innovative outcomes on time, within budget and according to specification (Gaddis, 1959; Middleton, 1967). New forms of project organizing were created, such as cross-functional teams, combining functional and project lines of authority (Davis and Lawrence, 1977). At the same time, systems engineering knowledge and techniques were introduced to better coordinate the design, concurrent development and integration of complex, multiple and evolving technologies supplied by a large network of contractors (Johnson, 1997; Sapolsky, 1972). Operations research emerged as a discipline to analyze such military operational environments and the management of large-scale development efforts (Johnson, 2003).

In the late 1950s, economists and social scientists at the RAND Corporation began to analyze the processes associated with innovation in complex systems projects, such as fighter jets and intercontinental ballistic missiles (Morris, 1994; Hughes, 1998). These projects were highly uncertain in terms of cost, time, quality, and operational

outcomes (Klein et al., 1962). The RAND studies identified a variety of factors impinging on the innovation process, including the discrepancies between estimated and actual project cost and time spent on procurement (Freeman and Soete, 1997). RAND's research demonstrated that the uncertain process of innovation in complex products and systems must be distinguished from known and predictable processes characterizing mass production.

The observation that complex innovation projects were highly uncertain encouraged Klein and Meckling (1958) to identify two alternative models for managing such projects, referred to as the optimizing and the adaptive model, respectively (Davies, 2014; Brady et al., 2012). Although the two models represent contrasting ways of dealing with an uncertain future, this distinction marked the beginning of what became an ideological divide lasting many decades.

5.1.2. Two contrasting models and ideologies

The optimizing model relies on rationalistic planning, formal processes and analytical techniques applied at the start of a project to predict future conditions and reach a decision about the best end-product from a range of alternatives (Söderlund, 2011). This requires careful up-front planning to select the optimal technologies, detailed scheduling of project activities, and prearranged integration of components in the final system (Lenfle and Loch, 2017). For example, the Special Projects Office developed Program Evaluation Review Technique (PERT) in 1957 to plan, schedule and control the Polaris ballistic missile program (Sapolsky, 1972). However, the optimizing model fails to address emergent situations as projects unfold, including the introduction of novel technologies, new strategic factors and changes in

the operational environment. As research has shown, the cost of making modifications when predictions turn out wrong can be substantial (Morris and Hough, 1987).

The adaptive model, by contrast, recognizes that the goal of innovation (and the path to achieving that goal) is fundamentally uncertain. Rather than relying on up-front plans and formal processes, adaptive project management depends on intuitive judgment, informal processes and learning gained from trial-and-error experience to guide decision making (Hirschman, 1967). The adaptive model emphasizes the need to experiment, test and evaluate a range of alternatives before selecting the most desirable solution. Instead of attempting to set optimal performance targets, the original goal of the project is reviewed or modified when new information became available. The adaptive model recognizes that innovative projects are "voyages of discovery" (Hirschman, 1967: 78). Such projects have to gather real-time information and feedback gained by learning to reduce the risks and emergent problems encountered along the way (Shenhar and Dvir, 2007). Efforts to establish rigid performance specifications of the desired product or system − or early 'design freeze' − are to be avoided at the initiation of an innovative project − to allow for the possibility of incorporating more advanced technologies or addressing changing performance requirements while the project was underway (Lenfle and Loch, 2010). This model assumes that uncertainties encountered at an early stage can be reduced by engaging in multiple and parallel approaches to collect sufficient information before selecting the one best way (Hirschman, 1967: 82). The costs of experimental prototypes and repeated tests may be less than the cost of deciding on a single end product, which subsequently encounters major difficulties not envisaged at the outset. In this formulation, project management is considered an adaptive process of change applicable to innovation processes and organizations facing uncertainties (Hirschman and Lindblom, 1962).

The close bond between innovation and project management identified in these early studies was not restricted by disciplinary boundaries, communities of professional interests, or theoretical and practical differences between innovation and projects. During the subsequent decades, however, the two strands of research followed largely distinct and diverging intellectual and practical trajectories, while addressing similar questions such as: How can organizations manage the uncertainty associated with innovative projects?

5.1.3. Becoming independent disciplines

Following an early period of integrated research, innovation studies and project management research became independent disciplines in the late 1960s and 1970s. An important institutional episode in the history of project management was, for example, the foundation of professional associations to foster the establishment of project management as a profession and to encourage project management research (Morris, 1994). The Project Management Institute (PMI) (since 1969) and Association of Project Management (APM) (since 1972) were influential in promoting and extending the discipline of project management (Hodgson and Muzio, 2011), achieved in part by establishing standardized practices and certification programs for professional project managers (Morris, 2011). This development was further strengthened by the publication of several major project management textbooks informed by systems analysis and operations research (see for instance Cleland and King, 1968, for detailed review see Packendorff, 1993). The development of project management tools, methods and techniques encouraged scholars and practitioners to adopt a strongly normative approach and laid the foundation for the emerging profession (see also Engwall, M., 1995).

By contrast, innovation research was always closely aligned with scholarly developments in management studies and organizational theory (see also Lenfle and Loch, 2010). Early innovation research was influenced by contingency theory, including the idea that changing and uncertain environments require dynamic organic and adaptive

structures (Burns and Stalker, 1961). Unlike project management research, innovation studies did not become associated with a major professional association and innovation scholars did not develop tools and methods to assist in the certification of 'innovation managers'. However, innovation research would inform practice, for example, by promoting new, flexible organizational forms to match the requirements of dynamic environments (see e.g. Miles and Snow, 1986).

In the process of becoming independent, project management scholars largely adopted the optimizing model as a dominant paradigm, whereas innovation researchers favored the adaptive model. Both preferences can be in part explained by the 'zeitgeist' and the way in which both disciplines tried to make their mark on the research landscape. For project management scholars and PMI, emphasizing the professionalization of project management was a central concern, including the development of coherent frameworks and methods that could be applied across industries. They tended to favor the optimizing model and the search for a set of generic processes and tools that worked "in most projects most of the time" (PMBoK, 1996). By contrast, innovation scholars preferred the adaptive model because they aimed to understand how organizations adapt to complex, novel and rapidly changing environments. Next, we elaborate on these ideological differences in greater detail and identify how these differences hindered cross-fertilization over a period lasting several decades.

5.2. Phase #2: self-containment: ideological distancing and encapsulation

While sharing empirical domains, project management and innovation research failed to recognize each other's contributions. As shown in previous studies, there was little cross-fertilization and cross-referencing from the 1970s to the 1990s (Brady and Söderlund, 2008; Lenfle and Loch, 2017; Shenhar and Dvir, 1996; Söderlund and Lenfle, 2013). The pursuit of conflicting ideologies − the optimizing and the adaptive models − played an important role here. We show how these separate ideologies contributed to a process of encapsulation: the cultivation of conflicting ideologies and identifies how shared concepts or ideas from other disciplines are assimilated in line with a dominant ideology. More specifically, we show how the application of optimizing and adaptive models of organizing led to an encapsulation of the notions of 'innovation' and 'projects' in each discipline and the resulting inability of the two disciplines to recognize each other's contributions. Next, we describe how projects were encapsulated by innovation scholars according to the adaptive model, and how innovation was encapsulated by project management scholars in line with the optimizing model.

5.2.1. Encapsulation of projects in innovation studies: the adaptive model

Since the early accounts in the 1950s, studies of innovation focused on activities and processes involved in the highly uncertain development and commercialization of new products, processes or services (Dodgson et al., 2008). Facing rapid technological and market change, innovation was considered vital to the survival and success of firms (Utterback, 1994). Innovation studies adhered to the adaptive model and projects were identified as the core innovative structure and mechanism supporting new product development (Wheelwright and Clark, 1992a). However, innovation research rarely referred to the project management literature when discussing the role of projects in the innovation process (Brady and Hobday, 2011; Davies, 2014).

The main reason for this lack of attention was that projects became encapsulated in innovation studies in particular ways. To better understand this process, it is important to point out that, following the adaptive model, early innovation researchers developed contingency theories of organization to explain how innovation processes could be managed effectively in a rapidly changing and uncertain environment. Burns and Stalker's (1961) foundational work on contingency theory was highly influential as it challenged the prevailing assumption of a single best model of industrial organization. They and subsequent

scholars argued that innovation depended on project-based organic and highly adaptive structures (Mintzberg, 1979; Mintzberg and McHugh, 1985). In other words, the notion of a project was instrumentally used to 'fill out' an important category within the adaptive model: organic structures. At the same time, innovation researchers identified a range of organizational designs − from functional through matrix to pure project organizations − for coping with change, complexity and uncertainty associated with different technological and market environments. Lawrence and Lorsch (1967) argued that for organizations to operate effectively as adaptive systems, they need to reintegrate differentiated structures at the system level. Matrix structures were considered the preferred mode to integrate cross-functional resources and knowledge to cope with high uncertainty, complexity and change (Galbraith, 1973; Davis and Lawrence, 1977). In addition to becoming synonymous with organic structures, projects were contrasted with structures representing stability and integration, such as functional organizations.

Projects became associated with the organic and flexible forms of organizing required in new product development and unit production of customized, tailored-made or unique products and services found in industries as diverse as construction, film making, and engineering (Woodward, 1965; Mintzberg, 1983; Frederiksen and Davies, 2008). Innovation scholars in the 1980s and 1990s identified the new forms of project-based organizations responsible for the accelerated product development in the Japanese automotive and electronics industries (Takeuchi and Nonaka, 1986; Clark and Fujimoto, 1991; Wheelwright and Clark, 1992a,b). This research stressed that the uncertainty associated with innovation required specific forms of project organization and time-limited processes, which were highly adaptive, flexible and responsive to a rapidly changing technology, market and competitive environment.

Innovation scholars subsequently identified different categories of projects involved in innovation. Kanter (1990) argued that "mainstream projects" required certainty, whereas "newstream projects" specialized in managing the uncertainties associated with breakthrough innovation. Wheelwright and Clark (1992a,b) identified three types of innovation projects according to the degree of novelty in the product or process on a continuum from incremental to radical innovation (derivative, platform, and breakthrough projects). Other scholars distinguished between experimental exploration and efficiency-oriented exploitation (see Eisenhardt and Tabrizi, 1995), inspiring subsequent debates about the need for "ambidextrous organizations" to reconcile the tension between exploration and exploitation (O'Reilly and Tushman, 2004). Despite these more nuanced categories of projects, however, many innovation scholars preferred to reserve the project label for more experimental processes of innovation and change, as opposed to stable structures. For example, Christensen (1997), discussing the organizing of disruptive innovation, distinguishes between mainstream organizations that are suitable for effective long-term planning and execution, and "autonomous project organizations" that have a larger capacity for learning and gathering real-time information about new markets under conditions of uncertainty. Similarly, Thomke (2003) advocates the use of "projects as experiments" for testing, adapting to change, promoting organizational learning and resolving the uncertainty associated with innovation.

In summary, the notion of a project became encapsulated in innovation studies as a vehicle for flexibility and experimentation, following the adaptive model. This one-sided view of projects as adaptable forms helped early innovation researchers specify how organizations depend on organic structures to deal with exploratory activities and rapidly changing environments. At the same time, encapsulation would lead innovation researchers to shield themselves, more or less intentionally, from the alternative optimizing view of projects, which, in the first phase of joint research, addressed how project organizations depend on exploitative activities under stable conditions. As a result, innovation scholars would, in line with their ideology, over emphasize

the adaptive role of projects, while downplaying or failing to address potential challenges of planning and execution. By contrast, project scholars focused on the latter.

5.2.2. Encapsulation of innovation in project management research: the optimizing model

Although project management research recognizes that a project is a flexible and non-repetitive form, the literature in the 1970s and 1980s emphasized the development of rationalistic, formal and predictable processes that were required to plan and manage projects (Packendorff, 1995). Many project scholars subscribed to the optimizing model (Söderlund, 2011), largely adopting the idea of "projects as plans" (Packendorff, 1995), defining projects as tasks rather than organizations (Andersen, 2008; Winter et al., 2006).

In contrast to the innovation literature, contingency theory played a less significant role in project management research (Shenhar and Dvir, 1996; Shenhar, 2001), which drew inspiration from general systems theory (Morris, 2011; Boulding, 1956; Cleland and King, 1968; Kerzner, 1979) and focused on developing universal management approaches (Packendorff, 1995). This was evident in influential project management textbooks in the 1960s (see Cleland and King, 1968; Johnson et al., 1963; Steiner and Ryan, 1968). Rarely grounded in empirical research (Morris et al., 2011), project management scholars were preoccupied with identifying the factors and practices that were valid in "most projects, most of the time" (Morris, 1994), following the notion that "one size fits all" (Shenhar and Dvir, 1996). Unlike innovation studies where projects were seen as a vehicle for change, projects in project management research were seen as complex, one-off endeavors that need to be managed with standardized tools, structures and techniques. Informed by a universal approach to management, every project, no matter what context, faced the 'triple constraint' of time, cost and quality specifications (Morris, 1994) and progressed through a project lifecycle (PLC) from project definition, through execution to commissioning, start up and operations (Winter et al., 2006). The prevalence of these universal principles has been documented in numerous scientific articles (Liberatore and Titus, 1983; Gutierrez and Kouvelis, 1991), and addressed in several comprehensive literature reviews (Söderlund, 2011; Johnson, 1997, 2003, 2013).

As a result, mainstream project scholarship concentrated on achieving project goals as a universal problem following the optimizing model (Brady and Hobday, 2011; Davies, 2014). Unlike innovation studies, project management research did not address the question of how to choose between projects to get things done under different environmental conditions. Whereas innovation research focused almost exclusively on the adaptive structure of projects, project management research ignored the various forms of project and different contexts within which they are implemented (Lundin and Söderholm, 1998).

While project management scholars sometimes acknowledged that projects were "the lifeblood of innovation" and claimed that "today's project managers must create innovation in order to compete in a changing world" (Randolph and Posner, 1988, p. 65), in practice innovation-centered projects were treated in the same way as any other project. According to this perspective, effective project managers were expected to "plan, then manage the plan" and get "innovative projects done on time, within budget, and according to the desired quality standards" (Randolph and Posner, 1988, p. 65). Another well-cited contribution stated that the "rewards for successful project management are attractive: one-time tasks can be accomplished with a minimum interruption of routine business: chances of meeting cost, schedule, and performance targets are greatly improved" (Avots, 1969: 77).

Whereas innovation studies would conceptualize projects as an ideal way to adapt, experiment and innovate, project management research considered innovation a risk and challenge that required stringent management control. This strict adherence to the optimizing model explains how innovation was encapsulated in project management

research: innovation was an execution problem for project managers and too much adaptation and experimentation (which innovation scholars focused on) was seen as counter-productive and risky. For example, according to the prevailing triple constraints measure of project success (Jugdev and Muller, 2005), any deviation from time, cost or quality has to be prevented or corrected to get a project back on track (Atkinson, 1999). Meeting project specifications is more important than being able to respond to changing technology and market needs (see also Cleland and King, 1983; Cleland and King, 1988). Innovation projects, like any other project, have to go through distinct, sequential phases of the project lifecycle (PLC) (Adams and Barndt, 1983). Each phase or stage gate had an output − such as a scope statement, detailed plan, or concept design − which has to be reviewed before proceeding to the next stage. Phase designs are regarded as essential ways of reducing uncertainty in innovation projects (Randolph and Posner, 1988). Project management studies assumes that uncertainties can be identified at the outset of a project and mitigated by the application of project risk management tools (Ward and Chapman, 2003). While recognizing that innovation projects can be highly uncertain, managing this uncertainty is a matter of measuring the probability of risks occurring and the extent of their impact on project outcomes. Risks were seen as negative and something to be avoided (Johansen, 2015). In the optimizing approach, effective risk management depends on up-front formal planning and problem-solving before the project was underway (Engwall, M., 1995; Packendorff, 1995).

In summary, innovation was encapsulated in project management research as a problem of optimization that required careful planning, scheduling and executing, including cost control, time management, scope management, and risk assessment (see Table 2). Universal principles, such as the iron triangle (Atkinson, 1999) and the PLC played an important role in analyzing and managing innovation. These principles were promoted as part of the professionalization of the project management discipline (Hodgson and Muzio, 2011). Unlike innovation researchers, project management scholars neglected to consider the wider role of projects in business strategy and the competitive environment. They also ignored the potential role of creativity, crisis management, muddling through and other adaptive processes that innovation scholars emphasized (Betts and Lansley, 1995; Themistocleous and Wearne, 2000; Zobel and Wearne, 2000).

In Phase #2 in conjunction, we find that encapsulation led to the self-containment and lack of mutual recognition of innovation studies and project management research. Encapsulation is a subtle mechanism. On the surface the sharing of empirical domains and related vocabulary gives the illusion of a mutual interest in the same topic, whereas their narrow framing by each discipline hinders the sharing of ideas. Our data also suggest that the process of encapsulation itself is a rather unintentional result of trying to use and make sense of certain concepts, such as 'innovation' and 'projects', in line with pre-existing agendas and research ideologies. It is also a self-reinforcing process: the repetitive utilization of concepts legitimizes their use and makes

alternative conceptualizations impractical. For example, innovation scholars originally attempted to differentiate between different types of projects, but subsequently returned to a more universal understanding of projects as vehicles of creativity and change. This illustrates how encapsulation solidifies certain understandings. Next, we discuss what it took to eventually make conceptual boundaries more permeable and allow for greater cross-fertilization.

5.3. Phase #3: cross-fertilization: meta-theories and community-building

As we have seen, innovation studies and project management research largely ignored each other's contributions for several decades. In recent years, however, there has been greater cross-referencing and mutual recognition. Innovation scholars are occupying prominent positions in the project management community: for example, Professor Hans Georg Gemünden, an innovation researcher, became editor-in-chief of *Project Management Journal* in 2013. Many scholars now publish in both innovation and project management outlets (see e.g. Engwall, 2003; Shenhar and Dvir, 1996; Pollack and Adler, 2015, for a review). For example, more than a third of the contributors to the *Oxford Handbook of Project Management* published in 2011 (Morris et al., 2011) were affiliated to the innovation studies community (such as Andrea Prencipe, Michael Hobday, Tim Brady, Andrew Davies, Fredrik Tell). Several chapters explicitly addressed innovation topics associated with project organization. An increasing number of the members of editorial boards and editorial teams also have a background in innovation studies (see *International Journal of Project Management, Project Management Journal*). Innovation has also emerged as a key topic in project management outlets. A recent study of citations showed that innovation is the third most popular topic in project management journals and conferences and that project management scholars are relying more on literature within innovation studies (Pollack and Adler, 2015). Other reviews indicate that a growing number of articles discussing project management and innovation in theoretical terms are being published in mainstream management and organization studies journals (Kwak and Anbari, 2009; Söderlund, 2011).

Another indicator of this cross-fertilization is shown by the increase in references to project management literature in articles by innovation scholars. This is illustrated in the higher citations to project management journals by scholars outside the project management community. For instance, the *International Journal of Project Management* has increased its impact factor to a great extent because of the increasing number of references to papers written by scholars in other scientific communities, including innovation. Several important publications on project-based organizing have been jointly produced in collaboration with innovation scholars (see e.g. Cattani et al., 2011; Lundin et al., 2015; Midler et al., 2017).

We argue that two inter-related drivers are behind this recent trend: the adoption of meta-theories and community-building initiatives across disciplinary boundaries. As we detail below, both mechanisms have mitigated the dangers of ideological distancing and encapsulation and promoted cross-fertilization. They have, however, also posed a challenge to the identities of project management and innovation scholars.

5.3.1. The role of meta-theories

Project management research and innovation studies have been influenced in recent years by meta-theories. A meta-theory is a theoretical framework or paradigm with generic and reflexive qualities that prompt scholars to question established assumptions (see also Garud and Gehman, 2012). In project management research, meta-theories have led to the emergence of a new branch of research on 'project-based organizing' (e.g. Sahlin-Andersson and Söderholm, 2002; Bakker et al., 2016). Reflexive meta-theories, such as structuration theory (Giddens, 1984; Manning, 2008, 2010), organizational learning theory (March, 1991) and practice theory (Feldman and Orlikowski, 2011), utilize a

Table 2
Innovation and Project Management Research: Key Differences.

	Innovation research	Project management research
Theoretical foundation	Contingency theory	General systems theory
Approach	Adaptive	Optimizing
Emphasis	Strategy and opportunities	Control and deviations
Managerial level	Top management	Middle management/project management
View on uncertainty and risk	Focus on opportunities, positive risk, risk willingness	Focus on negative risk, focus on methods for risk management, risk aversion, controlling progress, avoiding deviations
Management focus	Designs and structures	Tools and techniques

generic language that is applicable across empirical domains. Research informed by such meta-theories questions some of the underlying assumptions about projects or innovation. They are typically linked to changing experiences of lay actors (Giddens, 1984) and remain open to empirically grounded inductive theorizing. They also direct attention as sensitizing devices: rather than "provide prescriptions of what to see," they "suggest directions along which to look" (Blumer, 1954: 7). In the following, we focus on two meta-theories that have recently influenced project management and innovation research and created bridges between the two disciplines: theories of organizational learning and social practice theories of organizing.

The first influential meta-theory is organizational learning, particularly research informed by March's (1991) distinction between explorative and exploitative learning. In the late 1990s and early 2000s, a number of influential edited books and special issues were produced focusing on organizational learning in projects. The learning agenda was promoted by the 'Scandinavian School of Project Management', notably through an edited book titled *Projects as arenas for renewal and learning processes* (Lundin and Midler, 1998), which published papers from the second IRNOP conference. In 2000, a special issue in *Research Policy* on innovation in complex product and systems included many articles on project-based organizations, firms and learning (e.g. Hobday, 2000; Gann and Salter, 2000, Davies and Brady, 2000). Another special issue in *Organization Studies* in 2004 on "Project-based Organizations, Embeddedness and Repositories of Knowledge" (Sydow et al., 2004) included several highly cited papers adopting a learning or knowledge perspective (e.g. Bresnen et al., 2004; Grabher, 2004; Brady and Davies, 2004). Papers in this special issue had previously been presented at an EGOS sub-theme addressing projects and learning. Many of the papers published in this special issue cite papers from *Research Policy* as well as the *International Journal of Project Management* (e.g. Bresnen et al., 2004, Engwall and Westling, 2004, Grabher, 2004). Today, organizational learning in project environments represents one of the major themes in research on project-based organizing (Bakker et al., 2016), which has changed the scholarly understanding of the nature, process, and characteristics of projects in the wider field of project management research.

The learning theme challenged the optimizing approach in project management research and created new bridges with innovation studies. The traditional conception of project success based on the triple constraints was reformulated to include longer-term success criteria such as newly-acquired skills and capabilities resulting from team learning and growth (Winch, 1998; Shenhar and Dvir, 2007). Research incorporating how organizations learn while planning and executing projects provided less rigid and more agile alternatives to the linear 'waterfall model' of the project life cycle (Lindkvist et al., 1998; Thomke, 2003; Turner et al., 2015). The learning perspective suggests that project-based firms learn from individual projects, memorize and adapt to an uncertain and rapidly changing environment (Prencipe and Tell, 2001), which links project management research directly to research on adaptable forms of organizing. Learning and capability building may occur when project-based firms launch innovative projects to develop novel technologies and create new markets (Brady and Davies, 2004; Shamsie et al., 2009), including the exploration of new strategic opportunities, and new approaches to manage uncertainties (Frederiksen and Davies, 2008). Learning, knowledge transfer and replication of practices across projects and the wider organization can help a firm institutionalize new routines and build the project capabilities required to perform a growing number of projects over time (Davies and Brady, 2000; Shamsie et al., 2009; Söderlund and Tell, 2009, 2011). In that respect, the learning literature also made project management scholars more aware of company-wide and strategic challenges of the firm, including the need for ambidexterity in the face of stable and rapidly changing conditions (O'Reilly and Tushman, 2004).

The second increasingly important meta-theory is the 'practice perspective', which has recently become widely adopted in

organization studies (Feldman and Orlikowski, 2011). In the context of project management research, practice research focuses on the actual novel, improvised and innovative activities performed by individuals and teams in projects, and how these align with or deviate from established norms, routines, and behavioral expectations (Manning, 2008). The practice paradigm emphasizes that project and innovation activities are embedded in and influenced by multiple social contexts (Manning, 2008; Engwall, 2003; Grabher, 2004; Sydow et al., 2004). It draws attention to the ways in which project activities are enacted and thereby modified, negotiated and contested by and among the actors involved. The practice perspective encourages scholars to conceptualize norms and ways of doing things as potentially dynamic, contextual and subject to change, working against narrow ideologies, such as the optimizing model. Examples include the work by Bechky (2006) on the negotiation of roles and responsibilities in film-making projects, and the study by Bechky and Okhuysen (2011) on how project teams engage in bricolage activities by drawing upon combinations of resources at hand, adapting their routines and responding innovatively to unexpected surprises. The practice perspective on projects was originally promoted by the Scandinavian School (Engwall, 2003; Lundin and Söderholm, 1995; Sahlin-Andersson and Söderholm, 2002; Söderlund, 2005). A number of studies followed this approach, such as research on transnational projects (Levina and Vaast, 2008; Vlaar et al., 2008) and project networks (Manning and Sydow, 2011; Manning, 2010). The practice view has been an important foundation for the current debate on temporary organizing (Bakker, 2010; Bakker et al., 2016), focusing on how temporary structures and processes affect the way individuals are coordinated within and across organizations (Hällgren and Söderholm, 2011).

Practice theorizing also played a role in innovation studies and built further bridges to project management research. One example is research on experimental responses to crises and critical events in teams, including how teams respond innovatively by creating new routines when faced with novel and uncertain situations (Gersick and Hackman, 1990). When teams face extreme degrees of uncertainty they must remain 'mindful' of the complete situation, learn rapidly and act swiftly to tackle unexpected events (Weick and Roberts, 1993; Weick and Sutcliffe, 2001). The practice perspective has inspired research on how prior capabilities and existing routines shape improvisation (Brown and Eisenhardt, 1995) and how organizations rely on managerial judgment and intuition to create entirely novel, creative and improvised responses to the unexpected (Weick, 1998). Such improvised activity often occurs outside of pre-existing routines and formal plans, and refers to the deliberate − as well as accidental − creation of novel activity (Miner et al., 2001). Practice theorizing has thereby facilitated a more processual and practice-based understanding of innovation (Boland et al., 2007). It also helped deconstruct notions of projects and innovation by employing a dynamic process and contingency perspective on project-based organizing and innovation, thereby questioning the very assumptions upon which project management and innovation research are built (see e.g. Blomquist et al., 2010; Hällgren and Söderholm, 2011).

5.3.2. The role of community-building initiatives

In conjunction with the application of meta-theories, joint-community building events, such as conferences and workshops, have created opportunities for project management and innovation scholars to share, debate and confront each other's assumptions and agendas. Such events foster collaboration across disciplines and may have field-configuring effects (Garud, 2008; Lampel and Meyer, 2008), because they (re-)produce role and status structures (Anand and Watson, 2004) and facilitate the exchange of ideas across boundaries (Schuessler et al., 2015). They provide opportunities for "temporary clustering" (Maskell et al., 2006) of otherwise dispersed individual professionals, facilitating interaction across communities.

We find that events of this kind have recently promoted cross-

fertilization and arenas for communication between project management and innovation research. Both disciplines continue to host core disciplinary conferences, such as IRNOP for project researchers and DRUID for innovation researchers, where little interaction occurs between disciplines. Until recently few conference tracks invited scholars from the neighboring disciplines to share their ideas. However, IRNOP is playing a more active role in discussing innovation challenges and has invited innovation scholars to give keynote presentations. Several of the organizers of the IRNOP conference over the past decade have been well-established innovation scholars affiliated with prominent institutions in the innovation community, such as SPRU at Sussex University, CENTRIM at Brighton University and TU Berlin. In addition, a growing number of special workshops have taken place outside the established conference settings. One example is the annual "Megaproject workshop" launched in 2013, which invites innovation, project management and other scholars to discuss the challenges involved in managing large-scale infrastructure projects, including innovative forms of organization. Special workshops forming part of mainstream management conferences, such as annual special tracks, panels and streams on project-based organizing at EGOS, EURAM and the Academy of Management, have been organized in recent years to stimulate diverse participation and attract scholars from other disciplines. These tracks often refer to meta-themes, such as 'temporary organizing' or 'learning', in their titles. Several have been associated with special issues on the same topics and attracted numerous project management and innovation scholars (see e.g. Cattani et al., 2011; Bakker et al., 2016).

One significant example of a boundary-crossing and community-building event was the 2015 Organization Science Winter Conference (OSWC) on "Projects and Organization," which was designed to bring organization and project management scholars together to discuss the role of projects in various organizational domains, including innovation. The conference aimed to initiate a conversation about projects as an important unit of analysis in organization research. In this process, it became apparent that research on project management has been subsumed by the literature on 'teams' in more mainstream management and organization scholarship. This partly explains why, compared to teams, the project category remained rather underdeveloped in organization research. Recent project management research has been mainly driven by European researchers (Geraldi and Söderlund, 2016, 2018), whereas research on teams has been dominated by American scholars (Humphrey and Aime, 2014) − a geographical divide that has also restricted cross-fertilization. The OSWC workshop revealed that the inwardly-focused view of projects has prevented project management researchers from recognizing some of the larger debates on routines and learning in organizational research. As a result of this workshop, participants became more aware of the cognitive limitations of their own community. They agreed to participate in an exchange of ideas by organizing special issues on project-based organizing to start a conversation with scholars outside the project management research community. This has stimulated a stronger interest in project management in *Organization Science* (see for instance Obstfeld, 2012; Oliveira and Lumineau, 2017) linking innovation and project management.

In summary, through the increasing adoption of meta-theories and joint community-building events, the boundaries between innovation and project management research have become increasingly permeable. Debates between the two communities are overlapping, as innovation scholars engage in conversations about project-based organizing (see e.g. Prencipe and Tell, 2001; Obstfeld, 2012) and project management scholars address topics of innovation and organizational learning (Davies and Brady, 2000; Brady and Davies, 2004; Lindkvist et al., 1998). This, in turn, poses a critical dilemma: with increasing cross-fertilization, how will each discipline maintain its own identity? One way to manage this dilemma is through differentiation of journals and conferences. Traditional outlets may continue to publish and

develop 'orthodox' research with some outside input, whereas more 'avant-garde' research that potentially crosses disciplinary boundaries will be published by special issues and journals more amenable to cross-fertilization, such as *Organization Science* and *Organization Studies*, that invite contributions from across disciplines. However, there seems to be a tension between the benefits of cross-fertilization and self-containment, which we discuss further below.

6. Discussion

Based on our analysis of the parallel development of project management and innovation research, we now develop a generic theoretical model that improves our understanding of the drivers and constraints of cross-fertilization among disciplines (Floyd, 2008; Knudsen, 2003). We add nuance to the notion that sharing ideas may contribute to learning and advancement of a discipline (Zahra and Newey, 2009) by suggesting that sharing can promote *both* cross-fertilization *and* self-containment. Fig. 1, which presents the overall model, distinguishes between outcomes − cross-fertilization (O1) and self-containment (O2), and interdependent mechanisms (M1-5) promoting either one or the other outcome. Of central concern is the ambivalent effect of "sharing of concepts or domains" (M1), which under certain conditions may promote cross-fertilization, but under different conditions may as well lead to further self-containment. We now explain this dynamic in detail.

Prior research often assumes that the sharing of ideas, domains and concepts may promote learning and the advancement of research disciplines (Zahra and Newey, 2009). However, our findings, especially in Phase #2 of the parallel development of innovation and project management research, suggest that a combination of factors − Sharing of (new or established) concepts and domains (M1), Ideological distancing (M2) and Encapsulation (M3) − may promote self-containment (O2) of disciplines rather than cross-fertilization (O1) (see Fig. 1).

We illustrated this dynamic by examining the role of projects in the context of innovation − an important empirical area in innovation and project management research. From a systemic perspective, self-referential disciplines are only able to 'work with' concepts from other disciplines when they become integrated into an existing semantic network or hierarchy to allow for meaningful conversation and debate (Weismayer and Pezenka, 2017; Oswick et al., 2011). However, integration can become problematic if it obscures or prevents other possible meanings and interpretations. We introduced the term encapsulation to describe this mechanism (M3). We demonstrated how innovation studies narrowly approached projects as vehicles of change, while overlooking potential issues of planning and execution. We also showed that project management research treated innovation narrowly as a planning problem, while ignoring the potential role of creativity, play and experimentation in projects (Lenfle and Loch, 2010; Packendorff, 1995; Söderlund, 2011). Encapsulation literally works like a 'capsule' − protecting and shielding a dominant interpretation or use of a concept from potentially contradictory interpretations. Ironically, therefore, encapsulation *hinders* the influx of new and challenging ideas a concept potentially carries. This is partly because, in the process of encapsulation, concepts become subordinated under certain established categories and positioned in opposition to other ones. In innovation studies, for example, projects were long seen as 'organic/flexible forms', in opposition to 'stable/permanent structures'. In consequence, there was little interest in studying project planning or routines, as they contradicted the image of an organic form. Encapsulation thus enables the sharing of terminology, while at the same time constraining the sharing of underlying ideas and conceptions.

Encapsulation is promoted by self-referential ideologies (Morgan, 1986; Rouleau and Seguin, 1995), which may conflict with dominant ideologies in other disciplines and constrain the adoption of new perspectives − a problem we call ideological distancing (M2). Ideological distancing and encapsulation are intertwined, yet distinct mechanisms. Disciplines can be ideologically distant but use different terminology.
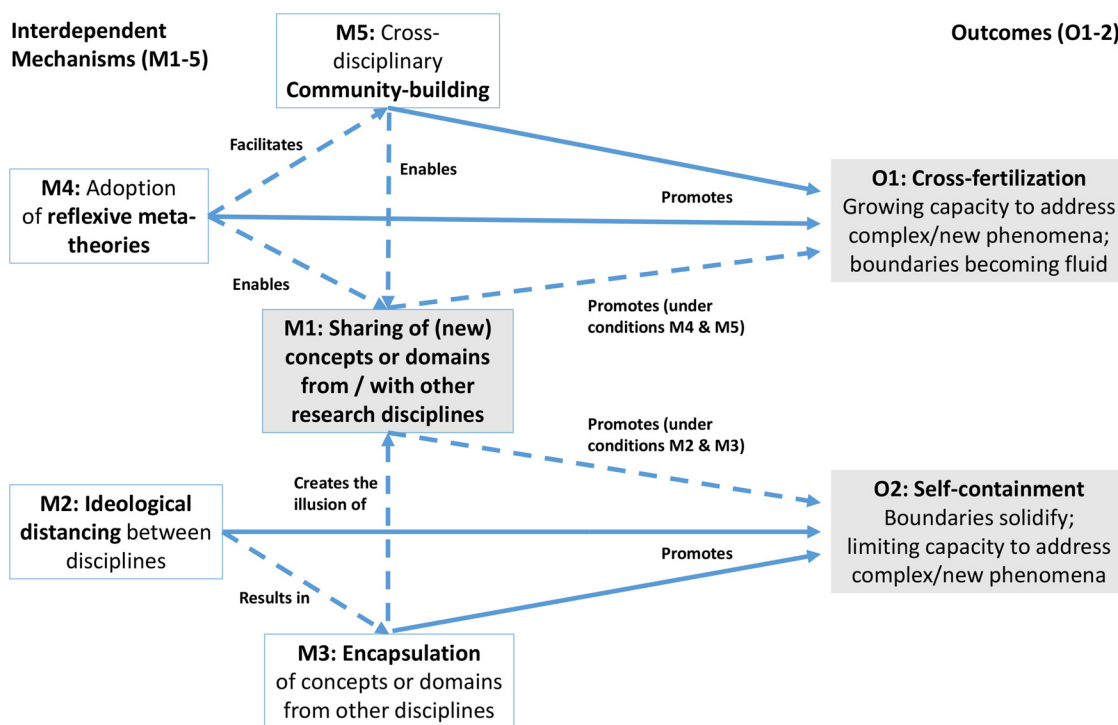
Fig. 1. Dynamics of cross-fertilization and self-containment between neighboring disciplines.

What makes ideological distancing in combination with encapsulation so problematic is that it may create the illusion that ideas are being shared with other disciplines (see Fig. 1), such as the idea that projects are important in innovation. This however prevents cross-fertilization even further, as scholars tend to use certain concepts in certain ways and may not recognize the need to pay attention to how (encapsulated) concepts are talked about in neighboring disciplines. The self-reinforcing dynamics of encapsulation and self-containment thus legitimizes the constrained use of concepts and de-legitimizes the potential for alternative conceptualizations. As we have seen, innovation scholars, for example, often ignored other forms of projects that are relatively stable, repetitive and routinized.

Similar challenges can be observed in other disciplines in management and organization studies. One example is the debate about 'institutions' in international business (IB) research (Kostova et al., 2008; Phillips et al., 2009; Phillips and Tracey, 2009). Following the paradigm of institutional economics, IB research treats institutions as stable norms, rules and frameworks affecting economic exchanges (North, 1990). They have been discussed mostly at the national level (see e.g. Kostova et al., 2008). In this tradition, Kostova et al. (2008) argued that multinational corporations are unlikely to be subject to isomorphic pressures due to their embeddedness in multiple institutional contexts. Phillips et al. (2009) argued that Kostova et al., like many other international business scholars, rely on an outdated and one-sided understanding of institutions, whereas sociological scholarship in institutional theory would conceptualize institutions more dynamically and at multiple levels − transnational, national, industry, regional, and local. According to this logic, multinationals may be subject to isomorphic pressures (for example at the transnational field level) and act as institutional entrepreneurs in establishing new industry standards or corporate practices that in turn become norms across geographic boundaries (Manning et al., 2012). This example shows how encapsulation − institutions as largely state-level properties in international business research − has prevented IB scholars from recognizing informal, institutional forces operating at multiple levels (Phillips et al., 2009; Phillips and Tracey 2009).

Our findings also indicate, however, that the combined workings of

meta-theories (M4) and cross-disciplinary community-building (M5) may enable the sharing of concepts and domains (M1) to contribute to increasing cross-fertilization (O1) (see Fig. 1).

We showed in Phase #3 of the development of project management and innovation research how reflexive meta-theories (M4), which are typically anchored in broader disciplines, encourage scholars to question established assumptions and adapt theorizing to changing empirical realities, rather than adhere to narrow ideologies. We illustrated how practice and organizational learning perspectives in recent project research promoted communication with other disciplines and helped introduce the idea that project management practices may change over time and adjust to different logics and forces. This allowed for a more nuanced sense of innovation processes in projects (see e.g. Lenfle, 2008). And this may in turn stimulate cross-disciplinary community-building efforts (M5), such as special issues and workshops, which increase the capacity of disciplines to incorporate new ideas, concepts and paradigms (M1). Highly adaptable and malleable meta-theories build bridges between scholarly communities and facilitate the exchange of new ideas, while lowering the risk of encapsulation. Cross-fertilization, meta-theories and cross-disciplinary community-building may, however, indirectly challenge the integrity and identity of a discipline as boundaries become less relevant. For example, proponents of meta-theories in project management rarely identify with the traditional project management paradigm (Geraldi and Söderlund, 2018), which creates a tension within the scholarly community.

Other disciplines display similar dynamics. For example, the adoption of 'sustainable practices' has been analyzed and discussed separately by organization studies and sustainability transitions (ST) research. The former study adoption from the perspective of institutional change (e.g. Reinecke et al., 2012; Van Wijk et al., 2013), while the latter tend to apply evolutionary theory (Markard et al., 2012). Sustainable practices in organizational studies are regarded as rather fluid and subject to ongoing negotiation (see e.g. Levy et al., 2016; Manning and Reinecke, 2016), whereas ST research largely adopts the view that "more sustainable modes of production" objectively exist (e.g. Markard et al., 2012). In fact, promoting these modes has been a major reason for the existence of ST research. In more recent years, the ST debate has

been cross-fertilized by ideas from contemporary institutional theory, such as the idea that business conduct is embedded in field practices, relations and norms that are socially constructed (e.g. Geels, 2010). Fuenfschilling and Truffer (2014), for example, argue that multiple logics of action may co-exist in transitions, and Garud and Gehman (2012) link "sustainability journeys" to several potential narratives. However, while theoretically enriching the debate on transitions, the adoption of ideas from organization studies and contemporary institutional theory also challenges the utility of major ST assumptions, such as the objective value of sustainability as a goal. Maintaining the identity of ST research as its own field or debate has become increasingly difficult (Garud and Gehman, 2012).

Analyzing the potential tension between cross-fertilization and self-containment and its effect on scholarly identity goes beyond the scope of this paper. However, we encourage future studies to explore this dynamic. Based on our observation of project management research, for example, distinguishing between 'conventional/orthodox' and 'avant-garde' research has been one way of coping with this tension, which is reflected by the different scope and purpose of academic journals. For example, meta-theories of learning and practice are typically applied in organization studies articles, or in special issues, targeting a broader and more eclectic audience (see e.g. Bakker et al., 2016; Sydow et al., 2004; Hodgson, 2005), whereas traditional studies of project management continue to follow the optimizing model and thus find their home in more conventional project management journals (Maylor et al., 2016).

7. Implications and conclusion

This paper has multiple implications for future research: it shows (1) when the sharing of concepts fails to promote cross-fertilization between disciplines; (2) what it takes to better promote cross-fertilization; and (3) how interdisciplinary research can be made more effective.

First, we contribute to studies of research specialization and integration (Markoczy and Deeds, 2009; Floyd, 2008; Pettigrew, 1997; March, 1999) by elaborating under what conditions the borrowing and sharing of concepts fails to stimulate learning and enable disciplines to tackle complex empirical realities (Zahra and Newey, 2009). We focused on innovation and project management research which share similar topics and empirical domains, most notably the study of projects in innovation contexts, but which failed, until recently, to recognize each other's contributions. While issue-specificity and related community-building (Haas, 1992; Payne, 2007), and the effects of professionalization (Jemison, 1981) all played a key role, the ongoing ignorance of each other's contributions was driven primarily by a combination of ideological distancing and encapsulation: the narrow assimilation of shared concepts in line with contrasting dominant ideologies. Prior studies suggest that different ideologies create distance through the incommensurable use of *different* research languages (Galison, 1997; Rouleau and Seguin, 1995), whereas we show that encapsulation is a more subtle process by which the *same* terminology is used in different ways in neighboring disciplines, thus hindering rather than promoting cross-fertilization. Although encapsulation may appear to demonstrate the successful adoption of concepts (Zahra and Newey, 2009), only upon closer examination our research shows that it may result in a narrow and more restricted interpretation of shared concepts.

Encapsulation may not be much of a problem as long as dominant paradigms help analyze important empirical realities, but it becomes problematic when a discipline fails to provide a convincing analysis of new and/or more multi-faceted empirical trends. For example, whereas an optimizing model of project management was timely and significant when innovation projects were undertaken by large bureaucracies (justifying the interpretation of innovation as an optimizing problem), it became less relevant as smaller and more agile organizations appeared frequently in the innovation space. Similarly, the emphasis on projects as a means of adaptation and renewal in the innovation

literature was timely when dynamic environments questioned the role of stable structures and routines. Yet, recent research shows that projects − even in creative industries − are increasingly standardized and routinized (Davies and Brady, 2000; Manning and Sydow, 2011). Both disciplines thus face the growing importance of understanding the tension between adaptability and routinization in innovation and project management today (see, in more general terms, Schreyoegg and Sydow, 2012). The effects of ideological distancing and encapsulation are therefore ambivalent and largely contingent upon the extent to which dominant paradigms are aligned with empirical developments. We encourage future research to pay more attention to this dynamic.

Second, a combination of meta-theories and cross-disciplinary community-building may promote cross-fertilization and lower the risk of the oversimplified 'instrumentalization' of shared concepts by exposing them to ongoing discussion and reflection. We showed how contemporary innovation and project management research have recently borrowed concepts and meta-theories from larger management debates (Söderlund, 2011; Söderlund and Geraldi, 2012), which have helped to deconstruct and question assumptions underpinning the concepts of projects and innovation. Future research needs to address under what conditions meta-theories and joint community-building events can become a catalyst for cross-fertilization.

Third, our findings have important implications for interdisciplinary research. Cross-fertilization is required to foster scientific breakthroughs and the long-term vibrancy of scientific fields (Hoffmann et al., 2017). Research underlines the importance of maintaining knowledge specialization, whilst ensuring the integration of knowledge across scientific disciplinary boundaries (Wagner et al., 2011). To remain successful in the long-term, such integration has to be promoted without undermining scientific distinctiveness (Jacobs and Frickel, 2009). In line with prior research (Polzer et al., 2009; Alvesson and Sandberg, 2013; Bitektine and Miller, 2015), our findings suggest that community-building efforts across neighboring disciplines, including workshops and common research projects, can foster collaboration and learning (see also Raasch et al., 2013; DeJong et al., 2016). However, we also suggest that community-building may be more effective when combined with bridging theoretical paradigms that facilitate communication and understanding.

Based on our findings we further question the strong focus on the role of a 'common language' in facilitating interdisciplinary collaboration (see e.g. Galison, 1997). Although different disciplines may share the same empirical topics and use the same words, they may still fail to talk to each other in a thoughtful and reflexive manner. The interpretation of a common language is often idiosyncratic depending on which epistemic frameworks and paradigms are invoked to make sense of concepts. This finding is important as it suggests that a common empirical agenda − such as promoting sustainability or tackling climate change − may not sufficiently align with efforts to coordinate research across disciplines. In contrast, it is important to acknowledge that multiple, sometimes even contradicting paradigms and templates co-exist, which may restrict communication and collaboration among scholars from different disciplines. As a result, heightened awareness and reflexivity are needed to either accept and embrace the multiplicity of perspectives or achieve a common ground based on a joint epistemology.

This, in turn, has important implications for policy-makers and research funding bodies. We suggest that teams involved in interdisciplinary research proposals should not just be connected through a common empirical domain, vocabulary, skillsets and research methodologies, but should also share a common epistemology or theoretical paradigm to formulate research agendas and interpret findings in coherent ways. Only when there is sufficient commonality in assumptions about structures, processes, human behavior, and other fundamental elements of theory, will scholars be able to learn from each other across domains, integrate formerly fragmented bodies of knowledge and work collaboratively towards a common goal.

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