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Knowledge formation and learning in the management of projects: A problem solving perspective

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Abstract

In contrast to traditional projects, which are assumed to be fully specified and then executed with little learning anticipated, complex projects cannot be *fully* specified at the outset and require continuous learning over their life cycles. Nevertheless, the key role of knowledge formation and learning in managing complex projects is under-developed for expanding project capability boundaries to include knowledge uncertainty and indeterminacy.

Drawing inspiration from Karl Weick's enactivist ideas and an empirical study of two organizations that developed project capability for complex projects, the paper develops an integrated view of projects and project management that is grounded in problem solving learning and organizing. More specifically, a project is reconceptualized as 'a mode of organizing to accomplish a temporary undertaking' with intrinsic learning. This perspective views complex projects under knowledge uncertainty as learning organizations, with implications for project management theory and practice.

Keywords: Project management; Complex problem solving; Knowledge formation; Modes of organizing and learning (MOL); Practice

1. Introduction

In traditional project research, even when complex projects cannot be fully specified and planned in advance, such as major infrastructure projects, normative expectations require the appearance of planning and control for these projects through management processes based on instrumental rationality (Sapolsky, 1972). This normative approach treats 'complex' projects, which cannot be *fully* specified in advance, as just 'complicated' projects that can still be managed and planned in the traditional way as "the *application* of knowledge, skills, tools, and techniques … to meet the project requirements" (PMI, 2013, p. 5, italics added). Not surprisingly, this planning approach privileges static and explicit 'known' knowledge (designs, etc.) over dynamic and experiential 'knowing' knowledge (know-how, etc.), which leads to an expectation of little learning during the execution of project plans as prior knowledge. In this project culture, the role of knowledge formation and learning in project delivery is downplayed, which is to the detriment of enhancing the boundaries of traditional project capability to include project settings characterized by knowledge complexity and indeterminacy.

Using the enactivist ideas of Weick (1979, 1995), this paper examines knowledge formation and learning as a key aspect of developing an organizational capability for delivering complex projects, which is based on an empirical study featuring two Irish state-owned organizations in the late 1990s and early 2000s. During this time, each of these organizations was challenged to develop a project capability as a core supporting competence in order to deliver major infrastructure projects well beyond their project capability up to then (Thompson, 1967). While acknowledging the difficulty of distinguishing between large projects and complex projects, Williams (2002) builds on Baccarini (1996) to highlight the indeterminacy and uncertainty of complex projects, "whose behaviour is *beyond*

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the sum of their parts and whose reaction to changes in inputs is *difficult* for the human mind to *predict*" (p. 50, italics added). Thus, an important empirical finding in the study is that developing complex project capability can best be understood as a form of complex problem solving (CPS) learning, which does not lend itself to being fully specifiable in advance. In terms of knowledge formation, this means that a central aspect of developing organizational capability in complex settings involves managing intrinsic knowledge uncertainty. In complex projects, this implies the need to generate knowledge continuously over the project life cycle that is not specifiable at the outset (Engwall, 2002).

In the two organizations under study, both were found to have evolved multi-level organizational learning processes over the course of the featured projects that revolved around complex problem solving (CPS) as a mode of organizing and learning. In effect, in order to generate the 'missing' knowledge that was unspecifiable in designs, plans, etc., at the outset of complex projects, the project team in each case became a community of learners that was *learning the project* over the life cycle though organizational CPS. The full empirical inquiry that led to these findings is reported elsewhere (Ahern, 2013), which is an exploratory case study investigation of two complex organizations in the government sector that draws on primary data from 51 semi-structured interviews using a contextualist perspective (Pettigrew, 1997, 2013). The primary purpose of this paper is to examine some of the main conceptual and practical implications for the project literature associated with the above two empirical insights found to be characteristic of a complex project context, namely, incomplete pre-given knowledge and emergent knowledge formation. This will be done through conceptual development inspired by the relevant literature and the study data.

Following this introduction, the remainder of the paper is organized as follows. Section 2 reviews the literature on two project knowledge perspectives for complex projects – planned and emergent. Under a knowledge formation approach, Section 3 adopts an integrated view of a project as a process of knowledge formation through problem solving and project management (PM) as an organizational practice, in order to develop the core idea of projects and PM as *modes of organizing and learning* for knowledge uncertainty. In this view, a project is reconceptualized as 'a mode of organizing to accomplish a temporary undertaking' with implicit learning. This perspective synthesizes the two main approaches to project knowledge—explicit 'known' knowledge (designs, etc.) and experiential 'knowing' knowledge (know-how, etc.). Finally, the concluding Section 4 outlines the implications of this new 'modes of organizing and learning' (MOL) perspective for future research and practice.

2. Planned and emergent knowledge in project delivery

Informed by the empirical insights of incomplete pre-given knowledge and emergent knowledge formation, both found to be inherent characteristics of the delivery of complex projects, this section reviews the literature on complex projects in relation to knowledge formation and learning under traditional PM and practice-oriented approaches. From the perspective of knowledge and learning, traditional PM under PMBOK guidelines assumes knowledge certainty at the start of projects in designs, plans, etc. (APM, 2012; PMI, 2013), whereas practice-oriented approaches accept the need for learning over the life cycle (Cattani et al., 2011). Further, a distinction is made between traditional projects, however complicated, that can be fully specified in advance and complex projects that cannot be fully specified in advance of their delivery. Finally, different modes of problem solving learning are discussed, including complex projects and PM as a form of organizational complex problem solving (CPS), which facilitates the formation of emergent knowledge over the project life cycle. If complex projects are distinguished from traditional projects by unspecifiable pre-given knowledge, then, the formation of emergent knowledge and its effective coordination become central concerns in their successful delivery.

In traditional project research, which tends to reflect a linear model of input-outcome relationships (March, 2006; Nightingale, 2004), knowledge is seen to revolve around plans, designs, and associated activities, which are implemented by competent project team members to achieve predetermined targets, such as cost, time, and scope. In this approach, project knowledge is assumed to be available up-front as explicit 'known' knowledge (designs, etc.) and, then, assembled like Lego blocks with little learning anticipated beyond the application of prior knowledge. This approach is reflected in its definition of PM by the Project Management Institute (PMI) as "the *application* of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (PMI, 2013, p. 5, italics added). This kind of explicit 'known' knowledge (designs, etc.) is context-independent and can be documented and transferred without difficulty between projects (Popper, 1979). In terms of traditional project research, the project team (subject) endeavours to manage a separate project plan (object) as documented informational knowledge that is fully specified in advance, in order to successfully deliver a project (Leybourne and Sadler-Smith, 2006; Smyth and Morris, 2007).

Over time, however, this traditional linear perspective, which privileges planning over learning in its conceptualization of project management delivery, came to be seen as increasingly problematic and incomplete. In 2006, in response to growing criticism of the divide between PM theory and practice, the UK government sponsored a multi-disciplinary review entitled *Rethinking Project Management*. The main findings of this two-year research programme are presented by Winter et al. (2006) in terms of five directions aimed at developing project theory and practice. These five directions are categorized in three groups around PM as practice: (1) theory ABOUT practice (project complexity); (2) theory FOR practice (projects as social processes, project value creation, project conceptualization); and (3) theory IN practice (practitioner development). The findings represent a move to rebalance the traditional monolithic project paradigm of technical rationality with insights from the social sciences to yield a socio-technical framework that is malleable to cope with the exigencies of specific project delivery. They also resonate with the approach of Scandinavian scholars in relation to viewing projects as temporary organizations (Engwall, 2002; Engwall et al., 2003; Lundin and Söderholm, 1995; Packendorff,