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Memory objects in project environments: Storing, retrieving and adapting learning in project-based firms

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ABSTRACT

This paper investigates the role of objects holding representations of knowledge in the transfer of learning across projects. On the basis of an in-depth case study, this paper shows that the way in which relatively simple artifacts, such as Excel workbooks, represent knowledge enables them to act as boundary objects across occupations and as memory devices across projects. It is the *temporal capacity* of these boundary objects that makes them points of juncture in a widely distributed memory system, enabling project-based firms to balance preservation and adaptation of knowledge. The mechanisms for the preservation of learning are not missing from project environments, rather they are less visible and less direct than in other settings, and therefore less docile in the face of managerial action.

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1. Introduction

In recent years, firms have increasingly relied on projects to generate, access and deploy knowledge in complex and uncertain environments (e.g., Whittington et al., 1999; Ekstedt et al., 1999; Lundin and Midler, 1998). Widely prized for its versatility in producing and adapting knowledge, project-based organizing is, however, notorious because differences in output, participants and processes make knowledge accumulation difficult (Grabher, 2004; Gann and Salter, 2000; Scarbrough et al., 2004). Following recent research showing that the competencies deriving from the accumulation of knowledge over series of projects are crucially important for firm performance – even in high-tech, highly innovative and network-oriented environments such as biotechnology (Pisano, 2000), the issue of how knowledge accumulation can be sustained in project-based environments has become much debated.

This paper contributes to the growing body of research on knowledge accumulation in project environments in two ways. Firstly, this paper adopts the ‘remembering’ rather than the more commonly used ‘learning’ metaphor. While learning implies modification of the knowledge held in an organization’s ‘memory’ (Walsh and Ungson, 1991), the use of the learning metaphor tends to concentrate attention on the creation or modification of knowledge, taking for granted the processes through which this new or modified knowledge is consigned to and retrieved from the organization’s memory (cf. Winter and Szulanski, 2001; Spender, 1996). However, it is precisely the ability to devise ‘storage’ and ‘retrieval’ processes that enable the timely retrieval of and adaptation to new contexts of relevant knowledge, that is crucial for firms operating in discontinuous environments such as projects (cf. Bannon and Kuutti, 1996; Paoli and Prencipe, 2003).

Secondly, this paper argues that our understanding of how these ‘storage’ and ‘retrieval’ processes work in project environments can be significantly improved by examining the role played by artifacts. The literature on across-project learning has tended to focus on the tacit knowledge held by individuals in the form of expertise on the one hand, or on

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objects holding codified knowledge, such as 'lessons learnt' databases, on the other hand. In the wake of the information technology revolution, these two forms of knowledge storage have been primarily seen as substitutes. However, recent developments in the literature on knowledge codification and the emergence of 'practice-based' approaches to knowledge have shown that many features of knowledge exchange hinge on how codified knowledge and expertise interact. Furthermore, literature in these fields has shown that the way in which knowledge is represented is central in determining the features of this interaction and of the resulting knowledge transfer. Building on this literature and an in-depth case study, this paper shows that the representational features of relatively simple artifacts, such as Excel workbooks, enable them to perform the dual function of memory devices across projects and boundary objects across professional groups. This *temporal capacity* of the boundary objects observed in the case study makes them points of connection within a widely distributed memory system, spanning the project, the individuals taking part in them, the organization and the professional communities involved. The combination of the community spanning and temporal features of these objects enables firms to build on experience, while maintaining the flexibility necessary to adapt to the specificities of each project.

The paper is organized as follows. Section 2 provides a review of what we know about the mechanisms supporting organizational remembering in project-based environments. Section 3 focuses on the role of artifacts in an organization's memory. Section 4 presents the empirical setting and method. Section 5 presents the case study, which is discussed in Section 6. Section 7 draws the conclusions.

2. Learning, remembering and forgetting across projects

A large body of research rooted in the resource-based view of the firm (Barney, 1991; Penrose, 1959) and in evolutionary economics (Dosi, 1982; Nelson and Winter, 1982) has shown the critical importance of firm-specific competencies in the survival and growth of firms. From an organizational point of view, competencies are seen as the result of learning processes that 'encode inferences from history into routines that guide behavior' (Levitt and March, 1988, p. 517). These routines constitute the main form of organizational memory with regard to a firm's operations, so that, as Nelson and Winter (1982) famously put it, firms *remember by doing*. Higher order routines that are able to alter operational routines are seen as the critical means by which firms are able to adapt their competencies to survive in a changing and turbulent environment (Teece et al., 1997; Zollo and Winter, 2002). At the core both of the normal operations of firms and their ability to produce or adapt to change, there are therefore stable organizational processes.

The literature on projects conducted by former mass manufacturing firms has tended to emphasize projects as ways to build upon existing competencies while avoiding some of their rigidities (e.g., Leonard-Barton, 1992). However, the literature on firms that operate *mainly* through projects (e.g., engineering design firms, producers of com-

plex products and systems, movie makers) has argued that the temporary and often inter-organizational nature of projects makes it difficult to develop routines, thereby precluding one of the main means through which organizations remember what they have learnt (Gann and Salter, 1998, 2000; DeFillippi and Arthur, 1998; Hobday, 2000). The difficulties that project-based organizing poses to knowledge accumulation in firms, and the growing awareness of the importance of inter-organizational networks in the production of knowledge (Chesbrough, 2003; Grandori, 1999; Powell et al., 1996), has led us to question whether firms can still be relevant stores of competencies in the new knowledge and project-intensive economy (Grandori, 2001). Indeed, recent research has shown that there are viable alternatives to firms as managers of competencies and that industry-wide social networks and institutional arrangements can support distributed social learning in at least some project-intensive contexts such as film-making and advertising (Grabher, 2002; DeFillippi and Arthur, 1998). However, these and other studies also suggest that firms still have an important role when the production of technically complex services or products is involved (Barlow, 2000; Davies and Brady, 2000; Heimer, 1985; Ibert, 2004; Morris and Empson, 1998; Prencipe and Tell, 2001; Scarbrough et al., 2004). In particular, Grabher (2004) shows that, while in the advertising industry individual expertise is considered a key source of competitive advantage, and that industry-wide social networks play an important role in locating and retrieving it, the software industry is characterized by the importance of firms in accumulating technical and organizational competencies. Similarly, the emphasis on 'not reinventing the wheel' is much stronger in software production than in advertising.

In those contexts in which firms are important repositories of competencies, the initial response to the perceived difficulty of encoding learning that takes place at project level into stable organizational processes, has been to rely either on individuals¹ or 'technology'. This view perceives competencies as consisting primarily either of firm members' expertise, which is largely tacit and cannot be easily stored, or of particular technological solutions that are embodied in objects (such as databases or software modules) that can be reused and in this way are made replicable and portable. This polarization between the extremely tacit and the extremely codified has introduced the idea of organizational memory in project-based firms into the debate on the extent to which information technologies (IT) can or cannot be used to store, augment or complement human memory (Bannon and Kuutti, 1996; Paoli and Prencipe, 2003; Schultze and Leidner, 2002; Swan and Scarbrough, 2001). Indeed, there is research that shows that reliance on IT to support organizational memory increases with the degree of standardization in the products and services provided, and that firms that provide highly customized products and services rely more on intra-firm social networks for the location and adaptation of knowledge (Morris and Empson, 1998; Hansen et al., 1999).

¹ See, for instance, many contributions in the *Management Learning Special Issue on Project-Based Learning*, 32(1), 2001.

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