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Turn to the material: Remote diagnostics systems and new forms of boundary-spanning

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ABSTRACT

To learn and adapt, organizations engage widely in Information Technology (IT)-mediated boundary-spanning. This involves making sense of a swath of peripheral information made available by digital means so as to expand local knowledge. Prior research on boundary-spanning has paid scant attention to material differences between IT systems in enabling or constraining such activity. In this article, we argue that material features do matter: features afforded by IT systems have a significant impact on the form and content of boundary-spanning. We analyze material features and related affordances provided by remote diagnostics systems – a family of ubiquitous IT systems. These features allow remote diagnostics systems to collect, store, and continuously analyze data about the state of machinery and related production processes across space, time and organizational boundaries. Organizations use these systems to determine when maintenance intervention is needed, or to improve their production processes. Often, these systems are run by external service providers at remote sites, which become the new ears and the eyes of a focal organization's production processes. Building on a longitudinal multi-site case study of two organizations, we explore the impacts of remote diagnostics systems on boundary-spanning. We observe that material features afforded by the remote diagnostics led the organizations to change their boundary-spanning in contradictory ways. On one hand, they reinforced existing boundaries. On the other hand, they crossed or cut down others, or created new ones. This suggests that the material features of these systems, when combined with new knowledge creation and sharing practices, within and

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between the local and the remote sites generate richer, multi-faceted inter-organizational knowledge flows. We surmise that IT's new material features will continue to significantly shape organizing logics that determine where and when organizational boundaries are drawn and crossed. Future boundary-spanning will increasingly be shaped by socio-technical assemblages brought together by increasingly pervasive IT capabilities.

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1. Introduction

The ability to protect knowledge within organizational boundaries, or to allow it to flow across them, has long been recognized as a critical element of organization design. It affects, among other things, innovation and organizational transformation (Grant, 1996; Kogut & Zander, 1992; Nonaka, 1994; Von Hippel, 1988). When the members of an organization cross boundaries to attain external knowledge, the activity is called boundary-spanning, and the actors involved are called boundary-spanners (Leifer & Delbecq, 1978).

Information Technology (IT) eliminates the problem of distance, increases speed, provides universal access, and cuts down on communication costs. Not surprisingly, for some time IT has been viewed as an important mechanism that contributes to boundary-spanning in that it: (1) renders heterogeneous internal information resources more transparent and thus integrate diverse knowledge (Ross, Beath, & Goodhue, 1996) and (2) helps assimilate external knowledge through virtual exchange and collaboration (Bharadwaj, 2000). Evidence for the positive influence of IT on boundary-spanning is, however, mixed. On one hand, IT has increasingly enabled 'cross-over' practices within and between organizations (Hayes, 2001). On the other hand, it has reinforced existing boundaries (Levina & Vaast, 2006). One reason for these mixed findings is that the extant research has paid scant attention to material differences between IT systems that underlie boundary-spanning (Lindgren, Andersson, and Henfridsson (2008)). Clearly, an inter-organizational transaction system within a supply chain (Malhotra, Gosain, & Sawy, 2005), and a collaboration system supporting inter-organizational design work (Majchrzak, Rice, Malhotra, King, & Ba, 2000) will have different effects on boundary-spanning. This calls for more careful consideration of how the material and social become "entangled" in the process of boundary-spanning (Orlikowski, 2007).

In this study, we address the significance of such material differences by investigating how a family of inter-organizational Information Systems (IS), denoted remote diagnostics systems, enables and constrains boundary-spanning. Remote diagnostics systems—an application family within ubiquitous computing (e.g. Lyytinen & Yoo, 2002)—collect, store and continuously analyze data about the state of production machinery and processes and help, for example, to determine when maintenance or other types of intervention are needed. In transmitting digital representations over space and time for extensive analysis, these systems have the potential to transform localized, manual practices into complex, digitally mediated, organizationally and geographically distributed socio-material practices.

To date, studies of remote diagnostics systems have focused on the benefits of timely and extensive information-handling in hostile, capital-intensive, and time-critical environments (Jonsson, Westergren, & Holmström, 2008). No studies have been conducted on forms of boundary-spanning that follow these systems as they extend the flows of information and knowledge across boundaries. We posit that remote diagnostics have the potential to spawn new forms of boundary-spanning involving novel interactions among previously unconnected actors, both inside and outside a given organization. In this paper, we will address, in particular, the following questions: (1) do practices associated with remote diagnostics create new forms of distributed maintenance, drawing new organizational boundaries? and (2) do remote diagnostics systems generate and support new forms of boundary-spanning in these distributed arrangements? To address these questions, we will examine *in situ* boundary-spanning associated with remote diagnostics systems in dispersed work settings.

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