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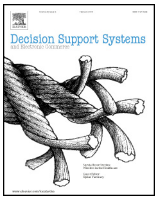

Knowledge boundary spanning and productivity in information systems support community

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ABSTRACT

An information systems (IS) support community represents a knowledge-intensive network where IS professionals interact with end-users to resolve system use problems during the IS post-implementation stage. For IS professionals in the support function, providing support for multiple information systems to multiple business units requires knowledge about different domains (business units or technical systems). In this paper, we take a network perspective to empirically evaluate the effects of an IS worker's network position and knowledge boundary spanning on productivity. Drawing upon theories of experiential learning and knowledge boundary, we perform social network analysis and linear mixed effects modeling to analyze archival data comprising 36 IS workers and 23,450 support requests made by 4568 end-users during the first 13 months post SAP/R3 implementation in a large U.S. organization. Our findings reveal that IS workers' network centrality and boundary spanning positively influence productivity. Surprisingly, their boundary-spanning experience plays a substantially more important role than network centrality. This study makes important contributions to theory and practice in individual experiential learning in knowledge-intensive networks.

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1. Introduction

Organizational support for a newly-installed information system (IS) is a knowledge-intensive setting where IS professionals engage in frequent knowledge sharing activities with their business colleagues and provide them with information, knowledge and solutions in a timely manner. Such an IS support community comprises of both end-users (business employees) who use the system to accomplish their work and IS professionals (support personnel) who provide support for system use and maintenance. We consider IS professionals in such a context knowledge workers, as they utilize their knowledge and expertise to support organizational use of the implemented systems. As such, their ability to share knowledge effectively with business employees in an organization is critical to the efficiency of IS support operation. For example, prompt and effective resolutions by IS support personnel enable employees to perform their IS-enabled work, promoting organizational use of IS [7] and facilitating the extended use of IS [24]. In contrast, their failure to efficiently address users' requests is found to cause user frustration and disruption in work [44]. Moreover, the knowledge required to efficiently perform IS support work cannot simply be a body of knowledge to be learned once. Rather, it is acquired through a dynamic process of learning from work-based activities dedicated to the support tasks at hand. Thus, understanding the factors contributing to IS workers' learning and productivity in the support function becomes an important strategic issue for IS managers and business executives.

One important predictor for a knowledge worker's productivity is experiential learning, learning from individual experience. A worker's cumulative experience provides the worker with an opportunity to become more proficient in individual tasks and in performing established routines and practices [2,42]. As knowledge workers increasingly perform tasks in an interconnected environment, their experiential learning is likely to be affected by the network in which they are embedded. In a network, individuals not only learn through their personal experiences, but also benefit from knowledge accumulated by others [23,42]. In the IS support environment, collective learning and problem-solving among IS workers and users underlies a crucial knowledge sharing process [36,46]. In this regard, IS workers' network positions in the IS support community are likely to influence their access to knowledge sources, subsequently affecting their performance in completing IS support tasks. This suggests that examining experiential learning from a network perspective may provide insights into IS workers' productivity.

Yet, experiential learning in a knowledge network may be constrained by the boundaries of knowledge domains, such as business areas or technical systems. Knowledge boundaries often arise around specialized domains of knowledge and give rise to semantic, syntactic and cognitive differences among individuals from different knowledge domains [8,10]. Moreover, knowledge boundaries cause discontinuities

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in knowledge sharing and integration [5,9], which can become problematic in a knowledge network, hindering the flow of knowledge across boundaries and impeding collaborative work. One strategy to deal with the negative consequence of knowledge boundary is boundary spanning, e.g., participating in two different knowledge domains across the boundary. Boundary spanning allows an individual to build the trust with members of both domains and to pass good practices from one domain to another [36]. More importantly, boundary spanning in a network is found to facilitate diverse knowledge exchange and create opportunities for learning from others in the network [60]. As a result, individuals may gain varied experience associated with different knowledge domains [28,36].

In this paper, we take a network perspective and empirically evaluate the effects of network position and boundary spanning on experiential learning and productivity of IS workers. To achieve our research objectives, we integrate Kolb's [26] experiential learning theory and Nonaka's [34] knowledge creation theory to empirically investigate the performance effect of IS workers' learning in IS support. We consider organizational support for implemented information systems as a knowledge-intensive IS support community where IS workers interact with their business colleagues to share knowledge and resolve system use problems. In particular, we examine the effect of spanning two types of knowledge boundaries—business units and technical systems—and examine IS workers' productivity through their efficiency in completing IS support tasks. The research is conducted in the post-implementation support of a newly-implemented enterprise resourcing planning (ERP) system, SAP/R3, in a large U.S. organization. We perform social network analysis and linear mixed effects modeling to analyze an archival dataset comprising 36 IS workers and 23,450 support tasks completed for 4568 business employees during the first 13 months post the SAP/R3 implementation. Our results demonstrate that both network centrality and knowledge boundary spanning have positive effects on IS workers' experiential learning and productivity, with knowledge boundary spanning playing a substantially more important role than network centrality. Theoretically, our findings extend experiential learning theory by incorporating two significant predictors of individual learning and performance—varied experienced via boundary spanning and network position—and propose a network-based model of experiential learning.

The structure of the paper is as follows. We start with the description of our research context of IS post-implementation support and of multi-site implementations of enterprise systems. This section allows us to explain why this research design enables us to examine individual learning of multiple knowledge domains in a knowledge-intensive network. In the Theoretical background and hypotheses section, we develop hypotheses by drawing on studies on experiential learning, knowledge boundary, and social networks. In the Methods section, we describe our research site and data, and specify statistical models. We then present our data analysis and results in the Data analysis and results section, and discuss our research contributions and practical implications in the Discussion section. In the Concluding remarks, we discuss the implications of the findings and outline directions for future research.

2. Investigative context: IS post-implementation support

The core of IS support work involves understanding problematic incidents of system use, uncovering causes to the problems, creating solutions, and delivering the solutions to end-users in the format of information, knowledge, and corrections/fixes. In the IS support context, support tasks are often assigned to an individual worker; individual experience in resolving end-users' problems thus provides an IS worker with a learning opportunity to become more proficient in the provision of IS support services. In such an environment, IS workers involve in the activities of knowledge sharing—pertaining to both the acquisition and provision of knowledge by individuals [43]—with other participants in the support community. Learning and knowledge sharing are important for IS workers to develop proficiency, speeding up their process of completing problem-solving tasks in the technical support context [25]. Hence, the speed at which a support task is completed becomes an important measure of IS workers' productivity.

IS post-implementation support often entails knowledge transfer between support personnel and business employees; knowledge transfer is evidenced from the process of resolving system use problems. When a user (e.g., a purchasing agent) encountered a problem in using SAP/R3's supply chain module to perform a routine task (e.g. processing employee purchase orders), he would call the support center and describe the problematic incident, detailing the steps he performed on the system and the system error message. This problem description often provided IS workers with information on the business context where a system feature was actually applied. Then after the assigned IS worker diagnosed the problem, he would communicate directly with the employee who initially reported the problem, and guided the employee on how to resolve the problem. Hence, the ticket resolution process reflected the process of knowledge transfer and learning between IS workers and users. Moreover, the knowledge transferred was not only about new system features; it could also involve knowledge regarding business processes. Prior research has considered IS support personnel as important sources of technical knowledge for their business colleagues. For example, Santhanam et al. [46] found knowledge of technical systems flowed from IS personnel to business users, and Pawlowski and Robey [36] viewed IS personnel as an important channel to facilitate the knowledge flow between business units. When users encounter problems in integrating the new technology into their work routines [7,17], the interactions between IS personnel and users, and their knowledge sharing activities in particular, become critical in achieving effective system use. As such, prior research has highlighted IS personnel's problem-solving ability for improving their productivity [16].

IS support community provides us an excellent context to examine individual learning in a knowledge-intensive network due to the presence of multiple types of knowledge domains. At the SAP Support Center, IS workers were often associated with one support team, focusing on one specific technical system (e.g., HR/Payroll Management) used by multiple organizational sites. Under this circumstance, the variety of users could create an opportunity for knowledge sharing between user locations, which facilitated the experiential learning of IS workers. The Support Center manager usually assigned open tickets to those IS workers who were available in each support team. When necessary, the Support Center manager rotated the support personnel among the five systems to meet the fluctuating demands for staffing in different systems. In that regard, IS workers could also accumulate experience with multiple technical applications. To encourage knowledge sharing between IS workers, the SAP Support Center adopted several strategies, including weekly meeting to discuss the frequently reported system use problems and IS workers' solutions, posting on the Intranet "Frequently Asked Questions" (FAQ), and forming cross-team focus groups to support the same business unit on major enhancement requests. Informally, the IS workers, sitting in the same office, often consulted with their peers regarding helping the same group of users. Therefore, an IS worker may have access to multiple types of knowledge domains.

3. Theoretical background and hypotheses

Learning at workplace occurs at both individual and collective levels, combining explicit and tacit forms of knowing and theory and practice modes of learning [39]. In developing a framework of network-based experiential learning in the IS support context, we pay attention to an analytical framework which encompasses experiential learning at both individual and network level. We adopt the experiential learning model developed by Kolb [26], which provides a detailed framework

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