



# Information technology and interorganizational learning: An investigation of knowledge exploration and exploitation processes



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## ABSTRACT

In this paper, we study the impact of IT-enabled learning mechanisms and learning strategies on the long-term knowledge outcomes of a firm in an interorganizational setting. Consistent with prior research in this area, we use a computational simulation model to study four IT-enabled learning mechanisms: internal electronic communication networks, external communication networks, company knowledge repositories and portals, and interorganizational knowledge repositories and portals. We also explore the interactions between a firm's internal and external learning strategies and these learning mechanisms under three different scenarios of partner size symmetry.

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## 1. Introduction

With the emergence of global markets and the increasing need to bring innovative products rapidly to market, the knowledge needed to meet market demands is no longer easily acquirable by a single firm [1]. Supply chains and other business relationships, enabled by interorganizational information systems for sharing knowledge among the partners, provide firms with the ability to rapidly learn from business partners [2,3]. The current literature points to various examples where firms rely on their partner's knowledge to improve performance in areas such as product design, marketing, logistics, and research & development [4–7]. In the organizational learning literature, the “exploration” and “exploitation” learning strategies have been shown to have an important bearing on an individual firm's knowledge outcomes (e.g., [8,9]). In an “exploitation” learning strategy, the participants learn from an organization's codified knowledge (a knowledge base or knowledge repository). In an “exploration” strategy, participants contribute to an organization's codified knowledge. However, there is little research on understanding the impacts of learning strategies in an interorganizational setting.

Within a single organization, through systems such as Enterprise Resource Planning and Customer Relationship Management, best

practices place emphasis on integrated knowledge repositories that allow sharing of knowledge across the organization. In the case of knowledge about customers, for example, the focus is on a global shared view of customer profiles across all points of contact within the organization, which has been shown to benefit the organization as a whole. In contrast, in an interorganizational relationship, each firm usually has competence on specialized knowledge domains (e.g., product design, sourcing, and customer service) and may share its knowledge with partners selectively based on collaborative agreements and its own learning strategies [10]. For example, Tesco shares its knowledge of customers (e.g., shoppers attracted to Walmart) obtained through its loyalty program database with Kimberly-Clark, its skin-care product maker so that Kimberly-Clark can use this knowledge to design products that meet Tesco's customer needs [11]. In another example, Shaw et al. [12] report on the partnership between Procter & Gamble (P&G) and Walmart and the various ways they share critical marketing knowledge. Despite the pervasiveness of such knowledge sharing arrangements, the internal (intraorganizational) and external (interorganizational) learning strategies employed may be different and the impact of these learning strategies on the knowledge outcomes has not been established in the research. Furthermore, although different knowledge management ITs, such as knowledge repositories and portals (KRP) and electronic communication networks (ECN), have been shown in a number of studies (e.g., [3,13]) to be useful in interorganizational knowledge sharing, the interplay between the strategy and technology choices is unknown. Specifically, KRPs are centralized knowledge repositories where digital knowledge

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documents are stored and are electronically accessible by employees of the partnering firms. ECNs connect domain experts and others in the firm(s), fostering knowledge sharing during problem-solving and decision-making, such as through email or social network applications.

Therefore, our research question is “How do different learning strategies and the choice of supporting IT (learning mechanism) in an interorganizational setting affect the knowledge outcomes?” Answering this question would not only fill the gap in the interorganizational knowledge management literature, but would also provide a practical understanding of how to leverage a firm’s relationship with interorganizational partners in order to achieve long-term knowledge benefits.

To answer the research question, we investigate the *interorganizational knowledge management phenomena in question by modelling a dyad of firms that use different learning strategies and IT-enabled learning mechanisms within and across their firm boundaries*. Given the past evidence on the importance of relative partner size [14–16], we model three different scenarios of partner size symmetry. As Kane and Alavi [9, p. 789] note, building on existing computational models is an effective approach for “validating existing work, developing a cumulative research tradition, and enabling deeper exploration of foundational ideas than would be possible through the continual creation of new models.” Computational simulation methods complement other research methods, such as surveys, lab experiments, and case studies, by providing a better understanding of and deeper insights into social science problems [17]. In addition, simulation-based research can be used to explore new concepts, ideas, and boundaries even when empirical assessment is not readily available [17,18]. Furthermore, the agent-based modelling approach used in our study enables the discovery of unknown phenomena that emerge from the interactions of individual actors (e.g., employees in an organization). Therefore, similar to prior studies investigating the behaviour of social systems by modelling the behaviours of the agents and their interactions, we adopt the agent-based modelling approach. This allows us to take into account the complex and dynamic contexts in interorganizational learning and to examine the underlying mechanisms by which KM IT impacts firms’ knowledge performance. Our results indicate that, to obtain the best learning outcomes, a firm cannot simply replicate its internal learning strategies externally. This is one of the main contributions of this research, and it has implications for both practice and theory.

This research contributes to the interorganizational learning literature by extending the research on the impact of IT-enabled KM from a single organization [9] to an interorganizational context. In addition, by allowing the modelling of asymmetric relationships among partnering organizations, our research lays a foundation for theory building in IT-enabled interorganizational knowledge management that could be extended to more complex interorganizational relationships. The unit of analysis, an interorganizational dyad, has long been of research interest in broad ranging contexts, such as strategic collaboration and value creation [19], trust [20], relationship evolution [21], joint problem solving [22], and many others. Dyadic interorganizational relationships are also the foundational unit of analysis for important theories such as the Interorganizational Relations Theory and the Resource Dependence Theory. Finally, interorganizational dyads have been used as a convenient unit of analysis even in examining supply chain issues (e.g., [23,24]).

The rest of our paper is organized as follows. The next section reviews the related literature, including March’s [8] original model of knowledge exploration and exploitation and the extant research that builds on March’s model. The third section describes how IT-enabled interorganizational learning is modelled. The fourth

section depicts the experimental design used to investigate the impact of the firms’ internal learning strategies, external learning strategies, and IT use on the long-term knowledge levels of the firms in the relationship. The fifth section presents the results of the experiments and related discussions. Limitations of the research and future directions are noted in section six. The last section concludes with a summary of the findings and contributions.

## 2. Review of related research

Organizational learning through knowledge exploration and exploitation was studied by March [8]. The three primary components in March’s model are an external reality, an organizational code representing the organization’s belief about the reality, and individual knowledge, which represents an individual’s belief about the reality. Exploitation occurs when individuals modify their beliefs to adapt to the existing organizational code. Hence, the exploitation process diffuses knowledge among individuals. Exploration occurs when the organizational code is modified by individuals whose beliefs match reality, thus creating new knowledge in the organization. March observed that although an emphasis on exploitation strategies can generate quicker knowledge gains in the short run than can the use of exploration strategies, a sole focus on exploitation can be detrimental to organizations in the long run. Thus, knowledge exploration and exploitation are considered complementary rather than competing processes that enable knowledge creation and application in an organization [41]. Kane and Alavi [9] studied the effect of IT-enabled learning mechanisms on exploration and exploitation and modelled three types of IT-enabled learning mechanisms used in a single organization: (1) Group-based learning technologies such as team rooms, (2) Individual learning technologies such as email and instant messaging, and (3) Organizational portals that are used to store and disseminate organization-wide knowledge. Kane and Alavi [9] found that knowledge repositories/portals and team rooms lead to exploitative use of knowledge (knowledge increases in a short period and plateaus in the long run), while individual learning mechanisms tend to show an exploratory effect on organizational knowledge (slow but continuous increase of knowledge level). They also discovered a number of interaction effects between the learning mechanisms. For example, the overall performance of individual learning mechanisms degrades when other tools are added, and when a team room is combined with the use of the other tools, there is continuous knowledge growth, indicating an exploration process.

Kane and Alavi’s extension to March’s model can be highlighted by two main points. While March’s model assumes that individuals do not interact directly with each other but only indirectly through a universal organizational code, in Kane and Alavi, individuals can learn from individuals or nonhuman repositories that contain the knowledge. Second, Kane and Alavi’s extended model organizes individuals into teams, which takes into consideration the effects of organizational structures on organizational learning. Bray and Prietula [25] extend March’s model to study the effects of organizational hierarchies in a multi-tier organization and the use of knowledge management systems (KMSs) on the average knowledge level of individuals.

The knowledge management literature has looked at knowledge management strategies and their impact on performance. Kim et al. [26] used the knowledge-based-view (KBV) to model and study four knowledge management strategies – external system-oriented, internal-system oriented, external person-oriented, and internal person-oriented. They used a contingency approach to show that the most effective strategy depends on the organizational IS maturity and its environmental knowledge intensity.

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