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Information technology and open innovation: A strategic alignment perspective

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ABSTRACT

Advances in information technology (IT) have enabled firms to increasingly rely on open innovation. Although researchers and practitioners are interested in this phenomenon, there is a lack of theoretically driven research on how IT impacts organizational open innovation performance. Drawing on the strategic IT alignment perspective and related literature, we proposed a model to explain the performance of organizational open innovation; i.e., the alignment between IT strategies and the openness of open innovation strategies results in different outcomes for open innovation. Through the analysis of data from 225 firms in China, we found that the alignment between IT flexibility and breadth enhances innovation radicalness and innovation volume, whereas the alignment between IT integration and depth positively affects innovation volume only. Innovation volume and radicalness were found to enhance organizational performance in terms of sales growth. Our study contributes to the literature on open innovation and strategic alignment. Its findings also have important managerial implications for practitioners.

1. Introduction

Phenomenal advances in information technology (IT) have rendered organizational boundaries very porous such that knowledge can be easily transferred inward and outward [90]. Consequently, firms need both external and internal knowledge to compete [10]. This paper provides increasing momentum for open innovation through management intervention, which results in "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" [22] (p. 1). Open innovation has been expected to bring significant benefits to firms [20], e.g., sourcing novel ideas [81], obtaining complementary knowledge for innovation [52], or engaging customers in value co-creation [25,80].

Despite the potential benefits of open innovation, firms have encountered difficulties in successfully implementing open innovation initiatives [52,79]. A survey of 107 European firms showed that 48% of managers were concerned with the difficulty of incorporating external knowledge into an innovation process [35]. It is noted that significant internal supporting resources are needed to unlock open innovation's potential to contribute to innovation performance [21]. As an important organizational resource with great penetration into the open innovation context, IT provides the conditions for open innovation deployment [28,33]. For example, firms rely on online communities to actively search for potential external knowledge [31], and the virtual environment of knowledge transfer and integration is supported by collaborative innovation systems or communication tools [92]. However, limited information systems (IS) research has theoretically modeled and empirically examined how firms can mobilize their IT resources to support open innovation for optimal innovation performance, i.e., use the corresponding IT strategy for open innovation. IT strategy refers to the use of IT to support business operation and strategy [11,34,50]. Because of the importance of IT in enabling open innovation initiatives, the effects of IT strategy on the performance of open innovation requires investigation.

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Previous literature finds that IT strategy needs to align with organizational strategy to obtain optimal performance [77]. In the context of this study, the pursuit of different open innovation strategies may require support from corresponding IT strategies. Appropriate IT strategies will allocate required resources to support the implementation of organizational strategies and hence enhance their performance [84], e.g., open innovation strategy. However, previous theories in open innovation literature cannot explain the influences of IT strategies aligning with open innovation strategy. In other words, although aligning IT strategies with open innovation strategy is likely to impact organizational open innovation, limited research has theoretically examined and empirically tested how IT strategies align with open innovation strategy to affect innovation performance. Furthermore, minimal research has delved into the underlying causal mechanisms of open innovation performance. Our study incorporates two intermediary innovation outcomes (radicalness and volume) and employs actual, rather than perceptual, measures of organizational performance (sales growth) to assess their effects.

In this study, our objective is to fill the research gap by addressing the research question: *How does the alignment of IT strategies and open innovation strategies impact organizational innovation performance, in terms of innovation radicalness and volume, and consequently the organizational performance, i.e., in terms of sales growth?* This study draws on the strategic IT alignment perspective to explain the impacts of the alignment between IT strategy and open innovation strategy on organizational innovation performance. Specifically, IT flexibility and IT integration are studied to reflect organizational IT strategy [75,78], whereas the breadth and depth of openness is derived to reflect the features of open innovation strategy [59]. We theorize that a better organizational innovation performance is achieved when a firm's IT strategy aligns with its open innovation strategy.

In the following section, we discuss the concepts of breadth and depth in open innovation literature and provide an overview of the strategic IT alignment perspective as our theoretical foundation. Subsequently, we develop the research model and hypotheses. We then test our hypotheses using data collected from 225 firms. Finally, we conclude this paper with a discussion of its limitations, contributions and implications.

2. Conceptual background

This section first reviews previous open innovation and strategic IT alignment literature to establish the theoretical foundation for this paper. From this, we then identify the relevant constructs and include them in our model to explain the outcomes of open innovation.

2.1. Open innovation strategies

Past literature has suggested three open innovation approaches, i.e., inbound open innovation, outbound open innovation, and coupled processes (Gassmann and Enkel, [94]). Inbound open innovation is the practice of leveraging the discoveries of others (Chesbrough and Crowther, [95]). Through searching, acquiring and integrating external knowledge or technology into internal R&D operation or licensing-in external technology, firms can unlock the potential of internal innovation for commercialization or learn new ways to reconfigure the existing knowledge allocation and exploitation for innovation [20,22].

Outbound open innovation refers to externally commercializing a firm's innovation through licensing-out, spin-offs, joint ventures, or alliances. Outbound open innovation suggests that firms can seek external firms with business models that are suited to commercialize a technology exclusively or in addition to its internal application (Chesbrough and Crowther, [95]).

A coupled process involves integrating external knowledge and competencies while externalizing the firm's knowledge and competencies. To do this, firms that utilize a coupled process innovate using a co-creative process involving (mainly) complementary partners through alliances, cooperation, and joint ventures, during which cooperation is crucial for success.

In this study, we focus on firms' open search behavior for innovation outcomes, i.e., searching for external actors and sources to help them achieve and sustain innovation [35]. This involves searching, acquiring and integrating external knowledge or technology into internal R&D or co-creating with external partners [59]. Therefore, this study focuses on external search using the inbound open innovation approach.

2.2. External search for open innovation

With the increasing trend toward connectivity and cooperation, a new model of innovation has been gathering momentum, i.e., open innovation. Firms have increasingly changed the way they search for new ideas, adopting open search strategies that involve the use of a wide range of external actors and sources to help them achieve and sustain innovation [35]. These external sources include customers, suppliers, universities, research institutions, industry consortia, and even rival firms [20].

Firms may differ in the open innovation strategies that they adopt by searching among distinct external sources. The extent to which firms draw from external knowledge sources reflects *external search openness* that is required for searching external knowledge to innovate [59]. This includes the breadth and depth of search openness [59]. *Breadth* of search openness refers to the number of external sources that a firm taps for innovation. *Depth* of search openness refers to the extent to which a firm deeply draws from external sources. In other words, breadth reflects the diversity of external sources a firm has searched, whereas depth reflects the intensity of relying on these sources.

Prior open innovation literature has found that firms may adopt different degrees of organizational external search openness [32,86], which may result in variances in organizational innovation performance. Organizational innovation performance includes two distinct aspects, i.e., *innovation radicalness* (i.e., innovativeness of new products) and *innovation volume* (i.e., the number of new products introduced) [36]. Although the existing open innovation literature has enriched our understanding of the phenomenon, few studies have investigated how firms adopt IT strategies to support the implementation of external knowledge for innovation. Therefore, in this study, we posit that the effect of search openness (i.e., breadth vs. depth) on organizational innovation performance will depend on its alignment with organizational IT strategies, which will be described in the next section.

2.3. Strategic IT alignment perspective and IT strategies

In IS literature, strategic IT alignment is viewed as the fit between information technology and business strategy [48,84]. According to this perspective, the strategic IT alignment can enable firms to use IT to facilitate a business strategy and obtain better performance [30]. The strategic IT alignment literature argues that a shared understanding between IT and business executives enables more effective resource allocation to respond to environmental threats and opportunities [40,84], e.g., innovation [18]. This perspective posits that IT needs to be embedded in key business activities, which will change if a rapid shift in strategic focus is exerted by environmental forces [84]. Aligning IT resources with business activities allows for