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COORDINATION OF TASK INTERDEPENDENCIES IN COLLABORATIVE SUPPLY CHAINS: INTERORGANIZATIONAL IT-ENABLED COORDINATION CAPABILITIES

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Abstract

This study examines how information flows in product development in collaborative supply chains can be effectively managed to improve performance. Following the information processing view of the product development process, interorganizational collaboration implies that tasks and capabilities are aligned for maximum effectiveness. However, misalignment among these factors is common, resulting in (i) poor communication, (ii) inefficient information sharing, and (iii) poor access to relevant real-time information, lengthening product development times, increasing design costs, and endangering innovation and product quality. This study proposes the concept of interorganizational IT-related coordination capability, drawing upon the dynamic capabilities, coordination theory, the relational view, and IT management literatures. Alignment between coordination capabilities and task interdependencies influences supply chain performance, which is manifested as (a) faster time to market, (b) improved product quality and innovation, (c) efficiency, and (d) collaborative advantage. This study aims to theoretically develop and empirically validate the co-evolutionary interrelationship between interorganizational IT-related coordination capability and task interdependence, in addition to the role of goal congruence, organizational interdependence, inter-organizational trust, and relationship specific investments on facilitating coordination capabilities. This research has implications for the coordination of complex information flows in the supply chain, the utilization of IT-related coordination capabilities in interfirm new product development processes, and long-term supply chain competitive advantage.

Introduction

Despite the use of Internet technologies toward modular organizations for certain supply-chain processes, the product development process still requires close collaboration. It is widely accepted that collaborative supply chains are key for improving product development and innovation (Dyer 2000). However, supply chain dependencies in the product development process are hard to manage. Nonetheless, IT provides the resources to manage these interdependencies and facilitate collaboration. This study examines how organizations can leverage IT resources to build interorganizational IT-enabled capabilities to manage information flows and task interdependencies. Drawing upon the dynamic capabilities (Teece et al. 1997), coordination theory (Malone and Crowston 1994), relational view (Dyer and Singh 1998), and the IT capabilities literatures (e.g. Bharadwaj 2000, Sambamurthy and Zmud 2000), this study proposes the concept of interorganizational IT-enabled coordination capabilities as instances of best practices in managing information flows and task interdependence in collaborative product development in supply chains.

The extant literature has predominantly focused on contractual structures at the firm level, aiming to reduce the transaction costs of interfirm exchanges (Williamson 1985). Despite the focus on efficient contractual modes, organizations are now changing their traditional governance logic by focusing on teams, tasks, and informal processes as the primary vehicles through which supply chains are orchestrated (Sambamurthy and Zmud 2000). This study differs from prior research that focused predominantly on contractual or governance structures at the firm level. This study examines the role of IT-enabled coordination capabilities in

improving supply-chain performance through effective management of interdependent activities in the product development process. To my knowledge, no studies have been reported in the alignment and co-evolution of task interdependence with coordination capabilities in the new product development process for supply-chain performance.

Conceptual Development

The conceptual basis of this proposal is rooted in the organization's information processing view (Galbraith 1977), as applied to an interorganizational level of analysis (Bensaou and Venkatraman 1995). Alignment suggests that the information processing needs (task interdependencies) are matched with the information processing (coordination) capabilities. Following the relational view of interorganizational relationships (Dyer and Singh 1998), the emphasis is on the pursuit of relational value realization by aligning task interdependencies with interorganizational IT coordination capabilities.

Interorganizational IT-Related Coordination Capabilities

Coordination refers to the mode of linking together different work units to collectively accomplish a set of tasks (Andres and Zmud 2002). Following Malone and Crowston (1994), coordination is defined as the management of distinct interfirm tasks, activities, and work. In the product development context, coordination is the means to overcome the difficulties of sharing information. Coordination mechanisms differ on their complexity and their burden on communication (Thompson 1967, p. 56). Following March and Simon (1958), there are two types of coordination to manage task interdependence, (a) by programming and (b) by feedback. While coordination by programming requires standards and rules, coordination by feedback requires intense information flow, which Thompson (1967, p. 56) defines as mutual adjustments.

IT capabilities are combinations of IT-based assets and routines that support business tasks in value-adding ways (Bharadwaj et al. 1999). Sambamurthy and Zmud (2000) describe coordination as value realization through the orchestration of complementary capabilities. IT has long been viewed as an enabler of interorganizational capabilities. Coordination is a critical interorganizational IT-related capability, described as the information processing capacity of interorganizational product development units to manage information flows. Bharadwaj (2000) integrated the resource-based view with IT to propose organizational IT-related capabilities. This study proposes the concept of interorganizational IT-related capability that is the result of combining IT resources across enterprises, drawing upon the relational view (Dyer and Singh 1998). Coordination efforts are ongoing attempts to exploit existing synergies (Anderson and Narus 1990). Through coordination of activities in a way that creates an efficient joint workflow system, enterprises can raise the value of the relationship (Blankenburg Holm et al. 1999). Interorganizational IT-related coordination capabilities enable organizations to share information to facilitate product development performance and competitive advantages.

Task Interdependence

Following Andres and Zmud (2002), task interdependence refers to the extent to which a task requires work units to engage in workflow exchanges of information, so that changes in the state of one activity affect the state of the other. While there are many sources of information processing needs, this study focuses on the needs from task interdependencies. According to Moss-Kanter (1994), interdependence is a key factor in building successful interfirm relationships. Exploitation of co-specialized capabilities, which is an important source of relational value (Dyer 2000), is greater when task interdependencies are higher. By creating different types of interdependencies, it is possible to effectively coordinate interorganizational tasks to create value (Blankenburg Holm et al. 1999). Krishnan et al. (1997) shows that overlapping sequential activities, hence increasing their interdependence, reduces development lead-time. Helper and MacDuffie (2001) argue that interdependent activities are key sources of performance improvement. Interdependencies in supply chain problem-solving routines also affect innovative and learning processes (Sobrero and Roberts 2001). Hence, a higher level of task interdependence is positively associated with product development performance in collaborative supply chains.

Alignment of Task Interdependence and IT Coordination Capabilities

Galbraith (1977) forms the conceptual basis of the alignment between task interdependence and coordination capabilities. This perspective maintains that performance is determined by the alignment between the interdependence of the work unit's tasks and the ability to coordinate the information needed to deal with the uncertainty that interdependence essentially creates. This argument is validated by the notion that interdependence creates uncertainty (Bensaou and Venkatraman 1995); hence,

coordination capabilities are introduced to alleviate this uncertainty by properly managing information flows. Task interdependence gives rise to information processing needs that supply chain partners need to match with appropriate information processing capabilities for greater performance (Bensaou 1997). Reduction in uncertainty is often associated with increased performance. Williamson (1991) argues that a coordinated adaptation enjoys advantages as the condition of interdependence increases. Whereas alignment had traditionally focused on efficiency considerations (Thompson 1967), this study follows Zajac and Olsen's (1993) emphasis on joint value maximization. Therefore, alignment between task interdependence and interorganizational IT-related coordination capabilities is positively associated with performance.

Co-Evolution of Task Interdependence and IT-Enabled Coordination Capabilities

Co-evolution of task interdependence and IT coordination capabilities refers to the reciprocal, mutually-reinforcing integration of information processing needs with information processing capabilities. Capability building refers to the interfirm ability to integrate joint resources for creating interfirm capabilities. Eisenhardt and Brown (1999) propose co-evolution as a strategic process where firms change their collaborative links, such as information exchanges and resources to capture collaborative advantages. Eisenhardt and Brown argue that co-evolution among partner organizations generates synergistic combinations. Co-evolution implies an iterative loop among capabilities and tasks that allows exploitation of new opportunities (Helfat and Raubitschek 2000). For example, Srinivasan et al. (1997) argues that increasing IT capabilities make it optimal to pursue multiple concepts and select designs later in the process. Thus, co-evolution describes how firms improvise combinations of capabilities, knowledge, and resources to create value through strategic options (Sambamurthy et al. 2002). Hence, we expect a co-evolutionary, mutually reinforcing relationship between task interdependence and interorganizational IT-related coordination capabilities in the product development process toward superior performance.

Other than the two basic building blocks – task interdependence and IT-enabled coordination capabilities – this study proposes several variables as their antecedents:

Interorganizational Trust: The presence of interfirm trust obliges partners to behave cooperatively. Trust allows confidential information sharing (Dyer 1997), facilitating coordination. Thus, trusting partners have easily manageable information exchange interfaces, allowing increase of their interdependencies, and also work to improve their coordination capabilities. Hence, interorganizational trust is positively related to (a) higher task interdependence and (b) superior interorganizational IT-related coordination capabilities.

Organizational Interdependence: Following Blankenburg et al. (1999), organizational interdependence is defined as the strength of balanced dependence relationship between partners. There is process where organizational interdependence moves into task interdependence with mutual interest in coordinating activities for value creation. Therefore, organizational interdependence is positively related to task interdependence.

Goal Congruency: Goal congruency is defined as the extent to which organizations perceive the possibility of common goal accomplishment (Jap 1999). Goal compatibility reduces the uncertainty and fears of opportunistic behavior, inviting greater interdependence and coordination. Thus, goal congruency is positively related to (a) higher task interdependence, and (b) superior interorganizational IT-related coordination capabilities.

Relationship-Specific Investments: Relationship-specific investments are non-fungible investments that uniquely support a relationship and cannot be readily used elsewhere (Williamson 1985). Such investments promote efficiencies in coordination (Dyer 1997) and facilitate coordination efforts between partners (Jap 1999). Hence, the extent of relationship-specific investments is positively related to superior interorganizational IT-related coordination capabilities.

Research Methodology

This study will use a combination of field interviews and survey methodology, allowing qualitative and quantitative materials to be used in this research design. First, the exploratory interviews with product development managers will help refine the study's hypotheses and provide qualitative support. Hence, a primary goal of the data collection effort is to uncover ideal configurations between task interdependence and coordination capabilities. It will also aim to validate the proposed construct of IT coordination capability. Second, a large-scale empirical study using survey methodology will provide statistical support for the proposed set of testable hypotheses using a sample of interorganizational product development relationships. A survey instrument will be

created on the basis of the extant literature and scales, with great care on developing the proposed construct of interorganizational IT-enabled coordination capability, following Malone and Crowston (1994).

Expected Contribution

The primary purpose of this study is to show that the effective management of task interdependencies in the product development process in collaborative supply chains results in improved performance. An important driver of effective coordination lies in creating IT-enabled coordination capabilities. These coordination capabilities have a co-evolutionary relationship with task interdependencies since greater task interdependence requires greater coordination, and superior coordination capabilities require increasingly intensive information flows. This study aims to inform research and practice about how to utilize IT-enabled capabilities, aiming to contribute to its theoretical development and operationalization. In addition, this study proposes a set of antecedent factors that influence coordination capabilities and task interdependence.

This study intends to shed light on how IT resources can transform into viable strategic options (IT-enabled capabilities) that influence performance and collaborative advantage. It also aims to prescribe how product development managers can take advantage of these capabilities to improve product quality and procedural efficiency.

Whereas Thompson (1967) proposed that rational organizations should coordinate task interdependence to minimize coordination costs, following Zajac and Olsen (1993), this study proposes that IT-enabled coordination capabilities could help firms align their interdependencies to improve performance, manifested both through time and cost efficiencies, but also through innovation and quality. Finally, co-evolution of interorganizational IT-enabled coordination capabilities with task interdependencies is posited as a critical opportunity for long-term collaborative advantage.

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