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Managing multiple-supplier project teams in new software development

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Abstract

Goal and resource interdependence are vital elements in structuring new software development programs distributed across multiple organizations. Yet, we know little about how the precursor interdependencies affect collaborative behaviors among the inter-organizational projects. The objective of this study is to examine the collaborative structure of multiple projects in a supplier network, particularly in the context of new software externally developed. Based on social interdependence theory (SIT), we explore the impacts of goal interdependence and resource interdependence among the inter-firm software project teams on inter-project cooperation and coordination. The focus is on the combined effect of both interdependencies to determine if they contribute additively to the promotive behaviors of cooperation and coordination. Based on a sample of matched key informants for 149 business-to-business (B2B) product development programs in China, both goal interdependence and resource interdependence have a positive influence on coordination and cooperation as suggested in the literature. However, goal and resource interdependence interact such that the effects are not additive, but that the presence of goal interdependence reduces the effect of resource interdependence.

1. Introduction

Just as for hard assets, an organization must develop a supply chain management strategy for the procurement of new software (Pérez and Cambra-Fierro, 2015). Organizations may secure new software products through internal development, through an external network involving multiple firms, or through a structure of suppliers somewhere between. Externally, potential suppliers include major software providers, which dominate the packaged software segment (e.g., Oracle or Microsoft), and system integration firms, which develop customized software products for implementation by specific clients (Schneider and Sunyaev, 2016). The role of the system integration firm is to select and manage different suppliers and coordinate the distributed development of a software product to match the business requirements of a business client (a B2B relationship). Fig. 1 illustrates the relationships among these supply chain partners in a distributed IS development project managed by a system integration firm. In Fig. 1, the supply chain has a hierarchical structure consisting of multiple projects as part of an overall program of software development. The hierarchy of suppliers in this context increases project management difficulties and adds complexity to the supply chain (Arsenyan and Büyüközkan, 2014). The system

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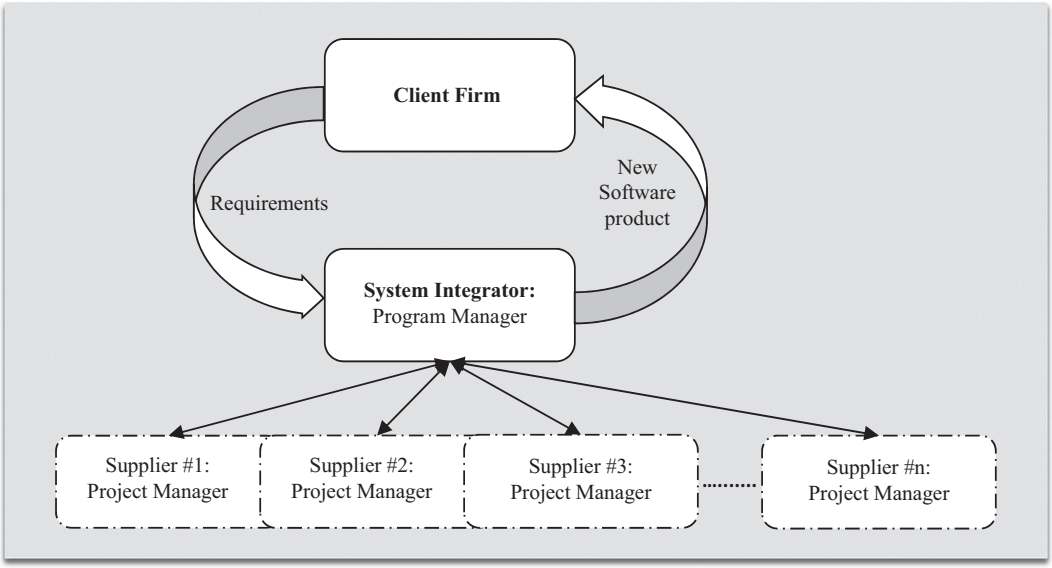

Fig. 1. Inter-firm software development program.

integrators must safeguard completion of the local projects, integrate deliverables from multiple projects, and manage projects across the organizational boundaries of partners up and down the supply chain.

The nature of the product under development adds a further consideration to attaining integration of project deliverables into a comprehensive software product. New software product development (NSPD) in a distributed environment requires more cooperation and coordination of the interdependent tasks performed by each supplier's project to ensure the tasks and goals assigned to each project meet their responsibilities (Arsenyan and Büyüközkan, 2014; Smite et al., 2014). Table 1 highlights the differences between a new physical product development and an NSPD involving external suppliers. Essentially, the differences range across the level of specification, agility to meet demands, level of communication required, knowledge shared, and modularity of the overall product (Joglekar and Rosenthal, 2003; Sarker and Sarker, 2009). The system integrator must structure the overall program to comply with the demands of the client in this unique context. In the structure, focal actors such the program manager, client representatives, and project managers from each supplier collaborate to complete the final deliverable. Barriers to success in an inter-organizational NSPD primarily reside in a reluctance to share key resources and the pursuit of opportunistic behavior by one or more suppliers (Lejeune and Yakova, 2005; McCarter and Northcraft, 2007). Project managers in the inter-organizational setting must overcome these barriers while also addressing novel features of inter-organizational projects that include disordered hierarchies, blurred organizational boundaries, and reframed individual behaviors (Söderlund, 2004; Sydow and Braun, 2017).

The system integrator achieves the success of the program when all suppliers combine their resources to create synergistic and innovative value under the constraints of the client contract (Dyer and Singh, 1998; von Danwitz, 2017). Investigations into the means of achieving success focus on both project management and individual behavior during the duration of the program (Pérez and Cambra-Fierro, 2015; von Danwitz, 2017; Yan and Dooley, 2013). Formal coordination efforts during the governance of the program are essential to the sharing of required knowledge and integration of the final product (Hsu et al., 2011; Joglekar and Rosenthal, 2003; Pauget and Wald, 2013). Cooperative efforts at the individual level

Table 1
Physical goods vs. Software system development involving external suppliers. [a]

	Physical goods development	Software systems development
Outsourcing Driver	Reduction in the time to market and product cost; Coupling production and design knowledge	Development cost; Keeping up with the changes in underlying software technology; Meeting operational needs
Contracting nature	Limited formal specification; Informal sharing of client requirements and status reports	Largely explicit specifications and formal status reviews; Informal exchanges dependent on methodology
Idea Generation and Problem Solving	Integral aspects of design not suited for collaborative problem solving	Modularity allows idea generation and testing spread across the supply chain
Management Challenge	Project management; Directing individual suppliers; Relying on knowledge of engineering, design, and production processes	Project management; Collaboration among suppliers; Sharing and capitalizing on knowledge of software architecture and testing
Client Participation	Minimal	Continuous

[a] Adopted from Joglekar and Rosenthal (2003).