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Effect of internal cost management, information systems integration, and absorptive capacity on inter-organizational cost management in supply chains ☆

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A B S T R A C T

Inter-organizational cost management is a strategic cost management approach to managing costs that span organizational boundaries in supply chains. Drawing on the resource-based view of the firm, we develop a model to predict which inter-related resources might enable companies to manage inter-organizational costs. We test this model using a survey of managerial accountants whose organizations are part of a supply chain. Using structural equation modeling, we conclude that the resources of internal electronic integration, external electronic integration, internal cost management, and absorptive capacity play significant direct and indirect roles in the development of an inter-organizational cost management (IOCM) resource. We find that these resources are inter-related and together are useful in enabling companies to ultimately benefit from managing inter-organizational costs. We find in particular the importance of relational resources associated with absorptive capacity in the development of an IOCM resource. Our research contributes to theory and practice by explaining how specific resources can be combined in allowing companies to better manage inter-organizational costs.

Introduction

Inter-organizational cost management (IOCM) is a strategic cost management practice that extends the application of cost management activities beyond the traditional management of internal costs to include managing costs among supply chain partners. In many cases, these activities are easily recognized as inter-organizational applications of traditional cost management activities, such as an inter-organizational application of activity-based costing (Kaplan & Narayanan, 2001). IOCM activities may also be viewed as supply chain management techniques benefiting supply chain partners, such as just-in-time processes to manage and control inventory levels (Berry, Ahmed, Cullen, & Dunlop, 1997; Callioni, de Montgtos, Slagmulder, VanWasenhove, & Wright, 2005). The common theme defining IOCM activities is that they involve collaborative or cooperative actions among supply chain members to reduce costs and to create value for organizations in a supply chain (Coad & Cullen, 2006; Cooper & Slagmulder, 1998). Based on this view of inter-organizational cost management, the set of techniques for managing boundary spanning costs can be considered an organizational resource used to create firm value (Coad & Cullen, 2006; Cooper & Slagmulder, 2004).

Prior research on activities related to inter-organizational cost management has mainly consisted of narrowly focused studies, often longitudinal and case studies (e.g., Cooper & Slagmulder, 2004; Dekker & Van Goor, 2000; Mouritsen, Hansen, & Hansen, 2001) that examined only

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a few specific IOCM activities. Individually, these studies reveal how certain organizational attributes or practices enable one or two cost management activities in the context of a limited number of companies. While these studies contribute to our understanding of inter-organizational cost management, they lack a unifying framework that would be useful to organizations wanting to manage their inter-organizational costs. Our objective is to develop a theory-based framework that unifies these prior studies and provides guidance to organizations interested in managing inter-organizational costs with supply chain partners. We draw upon the resource-based view of the firm to develop and test our framework of the resources required to enable an inter-organization cost management resource. The resource-based view of the firm focuses on how organizations derive value through the strategic application of their resources (Amit & Schoemaker, 1993; Barney, 1991; Holweg & Pil, 2008; Peteraf, 1993; Wade & Hulland, 2004). Resources are described as being valuable, rare, imperfectly imitable (i.e. unique), and having no equivalent substitutes (Anderson & Dekker, 2009; Barney, 1991; Combs & Ketchen, 1999; Das & Teng, 2000; Holweg & Pil, 2008; Peteraf, 1993; Wade & Hulland, 2004). Resources may be firm-specific or may span firm boundaries such as physical assets that are jointly placed in partner firms. In addition, resources can consist of organizational capabilities, routines, and various other attributes of supply chain relationships (Anderson, 1990; Dyer & Singh, 1998; Holweg & Pil, 2008; Wade & Hulland, 2004).[1] Given that Coad and Cullen (2006)[2] perceive IOCM as a value-adding resource, the resource-based view serves as an appropriate framework for identifying the resources that facilitate this strategic resource.

Consistent with Coad and Cullen (2006), we position individual IOCM activities as part of an overall IOCM resource. Furthermore, we study several firm-specific and relational resources as possible enablers of IOCM: internal electronic integration, external electronic integration, internal cost management, and absorptive capacity. With the support and cooperation of the Institute of Management Accountants, we collect data related to various organizations' cost management practices and supply chain relationships. Structural equation modeling is used to test the overall model representing our framework, as well as to test the hypothesized relationships among the resources and how they enable IOCM. Thus, we take a quantitative, theory-driven, positivist approach that complements prior studies by examining the following research questions: (1) To what extent do the resources of internal and external electronic integration, internal cost management, and absorptive capacity enable an organization's IOCM resource, and (2) To what extent are these resources inter-related?

Our findings offer several contributions to the resource-based view of the firm and IOCM research and theory. We find that the resources of internal and external electronic integration, internal cost management, and absorptive capacity enable an overall IOCM resource and that these resources themselves are inter-related. Through a broad-based survey that empirically examines these enabling resources, we extend previous research findings in the area of IOCM. Our theoretical model suggests an order to the development of these resources and their relative importance. As a contribution to the resource-based view, we find that both firm-specific and relational resources (such as those associated with absorptive capacity) are inter-related and contribute to the development of the IOCM resource. Finally, we provide an improved understanding of how these resources coalesce to enable organizations to engage in IOCM and how organizations might more effectively and efficiently develop an IOCM resource to ultimately create value.

This paper is organized as follows. First, we examine the extant literature on inter-organizational cost management and the resource-based view of the firm, developing hypotheses about the various IOCM-enabling resources and their relationships. Second, we describe the scale development process where we operationalize the resources into measurable constructs. Third, data collection and the analysis using structural equation modeling are described. Finally, we discuss the results and implications and present our contributions and conclusions.

Background, theory and hypothesis development

IOCM background

Historically, the norm for inter-organizational behavior has been for autonomous organizations to engage in arm's length transactions with other organizations (Cullen, Berry, Seal, & Dunlop, 1999). However, as recognized by strategic cost management proponents (e.g., Berry et al., 1997; Shank, 1989; Shank & Govindarajan, 1992), this arms-length or independent focus by organizations makes it difficult to take advantage of joint cost reductions and management synergies among supply chain partners. This fact perhaps explains why companies have recently started to collaborate with their supply chain partners. In doing so, the collaborating organizations must be able to identify potential inter-organizational synergies and manage specific resources needed to extend cost management beyond organizational boundaries (Anderson, 2007; Anderson & Dekker, 2009; Cooper & Slagmulder, 1998; Das & Teng, 2000; Dekker, 2004; Dyer & Singh, 1998; Hakansson & Lind, 2004; Hakansson & Lind, 2007).

One example of a collaborative effort is the identification and management of inter-organizational costs. Specifically, inter-organizational cost management consists of one or more activities that allow organizations to manage costs that extend beyond their boundaries (Coad & Cullen, 2006; Cooper & Slagmulder, 2004). Through the sharing and use of information and other resources, the objective is to reduce costs in the value chain, as well as to enhance the strategic position of all organizations involved[3] (Ander-

[1] For this study, we focus on the general term "resource" instead of defining each type of resource. The exception is that we differentiate firm-specific and relational resources because we feel that this distinction contributes to the current literature on organizational resources.

[2] Coad and Cullen (2006) characterize IOCM as a capability, which is one example of resources under the resource-based view framework.

[3] This is in contrast to one partner using their market power to force changes on the other partner.

son, 2007; Anderson & Dekker, 2009; Cooper & Slagmulder, 1998; Cooper & Slagmulder, 2004; Das & Teng, 2000; Dekker, 2003; Dekker, 2004; Dyer & Singh, 1998; Hakansson & Lind, 2004; Hakansson & Lind, 2007; Ireland, Hitt, & Vaidyanath, 2002). Examples of cost management practices commonly recognized as IOCM activities include inter-organizational applications of activity-based costing, target costing, kaizen costing, and open book accounting. While these cost-management activities are traditionally applied to manage internal costs, what brings them into the realm of IOCM is the active involvement of two or more firms jointly using the combined resources associated with these activities for their mutual benefit.

What is clear from prior case studies (e.g., Anderson & Lanen, 2002; Cooper & Chew, 1996; Cooper & Slagmulder, 2004; Cooper & Yoshikawa, 1994; Dekker & Van Goor, 2000; Kajuter & Kulmala, 2005; Mouritsen et al., 2001) is that there are key attributes and activities that enable some organizations to engage in certain inter-organizational cost management activities. Generally, the results in these studies are consistent with the belief that identifying and managing inter-organizational synergies require specific resources. However, what is not clear is whether individual IOCM activities at individual companies result from resources that are specific to those unique partnerships or whether certain types of resources can effectively enable an IOCM resource for a cross-section of organizations. Moreover, due to the limited scope of many prior studies, a unifying framework or theory has yet to emerge and be tested that shows how resources might be combined to enable companies to manage inter-organizational costs.

Theoretical foundation

The resource-based view of the firm is a long-standing and well-recognized theoretical framework for explaining how organizations succeed (Barney, 1991; Daft, 1983). A central tenet is that organizations create competitive advantages through the strategic deployment of their resources (Das & Teng, 2000; Reed & Defillippi, 1990). Moreover, resources can build upon each other and result in the creation of new resources that are more unique and potentially more valuable to organizations. In an early and broad description of resources, Daft (1983) suggests that resources consist of the "assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (Barney, 1991, p. 101). These can be viewed as firm-specific resources. More recent research specifically recognizes that relational resources spanning organizational boundaries also exist (e.g. Anderson & Dekker, 2009; Das & Teng, 2000; Ireland et al., 2002). With relational resources, the inter-organizational aspects of collaborative partnerships can provide competitive advantages for an organization and their supply chain partners. Examples of these relational resources are jointly-owned assets, communication and knowledge sharing routines, controls used to coordinate and manage inter-organizational activities, complementary resources, and complex inter-organizational social networks and relationships (e.g., Anderson, 1990; Dekker, 2004; Dyer & Singh, 1998; Holweg & Pil, 2008; Ireland et al., 2002; Wade & Hulland, 2004).[4]

Consistent with Coad and Cullen's (2006) proposition that the ability to manage inter-organizational costs gives organizations an advantage over their competition, we position IOCM as a resource. Based on prior IOCM literature, we contend that an IOCM resource is enabled by other resources: internal electronic integration, external electronic integration, internal cost management activities, and absorptive capacity, as noted in Table 1. While each of these resources is likely found to some extent in nearly all organizations, the resource-based view suggests that the value of the resources is dependent upon the way the resources are combined and used (Chapman & Kihn, 2009). It is important to understand how these antecedent resources in combination might enable an IOCM resource. To determine which resources are enabling, we develop a theoretical model presented in Fig. 1. The individual antecedents are discussed and hypothesized from the resource-based view[5] in the following sections.

Internal cost management and inter-organizational cost management

An internal cost management resource can be described as a portfolio of activities and routines that allows organizations to manage their internal costs and make cost management decisions. This portfolio can include a wide range of cost management activities used within the firm's own internal value chain, such as activity analysis, activity-based costing, target costing, quality improvement, and continuous improvement (kaizen costing) (e.g., Anderson, 2007). Given that IOCM has been described as an inter-organizational extension of internal cost management activities (Cooper & Slagmulder, 1998; Cooper & Slagmulder, 2004), we expect that organizations with a strong ability to manage internal costs may leverage their knowledge and experience to develop similar IOCM activities. Arguably, the same planning and control processing abilities that are fundamental to managing costs internally can be applied to IOCM. Evidence exists that individual internal cost management activities have been applied to inter-organizational environments to manage costs for the joint benefit of supply chain partners (see Anderson, 2007 for a more extensive overview).[6]

For example, the traditional focus of activity-based costing has been to identify internal organizational activities or business processes that drive costs in order to trace activity costs to the appropriate products, suppliers, distribution channels, or customers (e.g., Cooper, 1988; Kaplan

[4] With respect to firm specific or relational resources, both are considered valuable, but there is a debate as to whether they are independent of each other or inter-related (Dyer & Singh, 1998).

[5] In addition to the resource-based view, another common theory that is used to explain an organization's transition from managing internal to inter-organizational costs is transaction cost economics. The comparison of these theories is discussed in several publications (e.g., Anderson & Dekker, 2009; Combs & Ketchen, 1999).

[6] In addition, Hakansson and Lind (2007) review a broad range of industries and countries where inter-organizational accounting exists.

Table 1
Construct descriptions.

Construct	Formative or reflective	Description
Internal electronic integration	Reflective	The internal electronic integration resource allows for the processing of transactions, information sharing and retrieval, and monitoring within the organization.
External electronic integration	Reflective	An external electronic integration resource allows an organization to integrate its various IT systems to provide customer and supplier data visibility and to allow online information sharing across the supply chain (Barua et al., 2004; Vickery et al., 2003)
Internal cost management	Formative	A portfolio of activities and routines that allows organizations to manage their internal costs and make cost management decisions
Inter-organizational cost management (IOCM)	Formative	IOCM consists of one or more activities that allow organizations to manage costs that extend beyond their boundaries (Coad & Cullen, 2006; Cooper & Slagmulder, 2004)
Absorptive capacity	2nd order (mixed)	The ability of a firm to recognize the value of new, external cost management information, assimilate it, and apply it to commercial ends (Cohen & Levinthal, 1990, p. 128). It is recognized as a resource "pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage"(Zahra & George, 2002, p. 185). This construct is operationalized as a 2nd order construct. It consists of trust, the communications network, and knowledge-seeking measured as 1st order reflective constructs, with the repeated indicators as formative for the 2nd order construct (Wetzels et al., 2009)
Communication climate	Reflective	Communication climate includes trust, an openness of communication, and a spirit of fairness where ideas can be shared and accepted between parties (Tu et al., 2006)
Communication network	Reflective	Communication (or knowledge) network is a network of inter-personal interactions and relationships between partner firms (e.g., Brown, 1997; Cooper & Slagmulder, 2004; Dekker, 2004; Dyer & Singh, 1998; Nevis et al., 1995; Zahra & George, 2002).
Knowledge Seeking	Reflective	Knowledge seeking is the outward-looking exploration and search of new ideas that can lead to innovation, which enables firms to respond to changing conditions (Holweg & Pil, 2008; March, 1991; Teece et al., 1997)
Size	Formative	Size of the company in terms of number of employees and sales

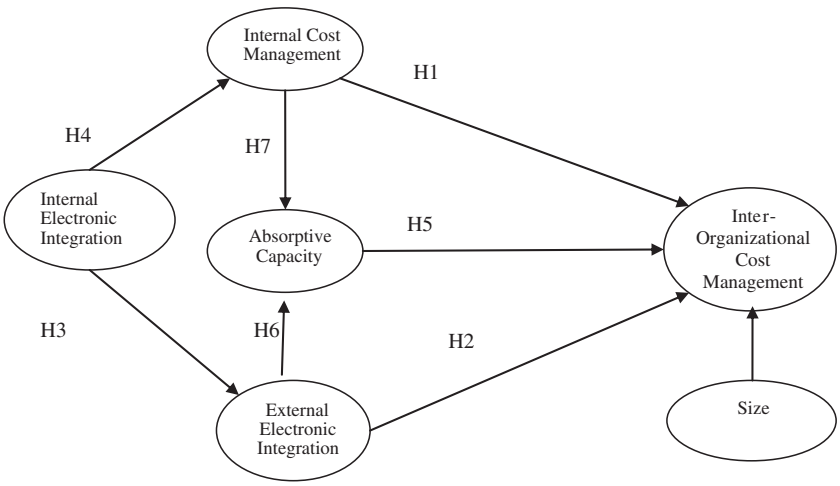


Fig. 1. Theoretical framework and model.

& Narayanan, 2001; Narayanan & Sarkar, 2002; Niraj, Gupta, & Narasimhan, 2001; Peterson, Handfield, & Ragatz, 2005). However, activity-based costing can be applied in an inter-organizational context. For example, Dekker and Van Goor (2000) demonstrate how activity-based costing is used to support relocation and changes in logistic activities to manage inter-organizational costs. The total cost of ownership is essentially an extension of activity-based costing across firm boundaries (Carr & Ittner, 1992; Degraeve, Labro, & Roodhooft, 2005). By considering both the supplier and customer, Wouters, Anderson, and Wynstra (2005) use the total cost of ownership to extend activity-based costing to the inter-organizational realm in order to jointly manage costs.

Another traditional internal cost management technique is target costing (e.g. Anderson & Dekker, 2009; Cooper & Chew, 1996; Cooper & Yoshikawa, 1994; Kulp, Lee, & Ofek, 2004). Cooper (1996, p. 28) defines target costing as a "structured approach for determining the cost at which a proposed product with specified functionality and quality

must be produced to generate the desired level of profitability at the product's anticipated selling price." Target costing focuses on the management of the development and design processes (Kato, 1993; Monden & Sakurai, 1989; Tani et al., 1994). Traditionally, target costing was an internal cost management program that did not actively involve a supply chain partner (Cooper & Slagmulder, 2004; Monden, 1995). However, several studies suggest that target costing can be extended inter-organizationally to jointly share the resources of each organization to add to their combined value (e.g., Anderson & Dekker, 2009; Bonaccorsi & Lipparini, 1994; Carr & Ng, 1995; Cooper & Slagmulder, 1997; Cooper & Slagmulder, 2004; Hakansson & Lind, 2007; Kulp et al., 2004; Monden & Sakurai, 1989; Mouritsen et al., 2001; Sakurai, 1996). Specifically, Cooper and Slagmulder (2004) discuss how inter-organizational target costing is used in three Japanese supply chains to cooperatively manage inter-organizational costs.[7]

As another example, Kaizen costing is a system of incremental or continuous improvements used to support the cost reduction process of a product in the manufacturing phase (Monden & Hamada, 1991). Kaizen costing generally accepts the design of the product as fixed and seeks ways to manage or reduce costs in the manufacturing and delivery phases (Cooper, 1996). However, there is evidence that firms can also use Kaizen costing to identify and set cost-reduction objectives for suppliers (e.g., Cooper & Slagmulder, 1998; Guilding, Cravens, & Tayles, 2000). Cooper and Slagmulder (1998, p. 19) find that real benefits from inter-organizational Kaizen costing can be realized "when the firms in the supply chain cooperate to find new low-cost solutions that they cannot identify in isolation." Guilding et al. (2000, p. 120) further classify Kaizen costing as a strategic management accounting practice when it focuses on an external, market-oriented approach "that is forward-looking and closely aligned to a quest for competitive advantage."

A final example is open book accounting which refers to the practice of supply chain partners opening up their internal accounting information to each other in order to support active collaboration to ultimately find the best use of their joint resources or find the most efficient way to process transactions and manage their inter-organizational costs (Anderson & Dekker, 2009; Carr & Ng, 1995; Hakansson & Lind, 2007; Kajuter & Kulmala, 2005; Mouritsen et al., 2001; Munday, 1992).

In summary, there is substantial literature indicating that individual internal cost management activities can be extended to an inter-organizational environment. The knowledge and experience in using internal cost management resources can be extended to build inter-organizational resources for managing costs for supply chain partners for their combined benefit. Thus, we expect an organization's ability to manage internal costs to be an important antecedent or enabler of IOCM as shown in Fig. 1. We therefore hypothesize:

H1. *There is a positive relationship between an internal cost management resource and an IOCM resource.*

External electronic integration and its effect on inter-organizational cost management

In general, electronic integration is considered important in enabling cost management throughout the supply chain (Anderson, 2007; Anderson & Dekker, 2009; Chapman & Kihn, 2009; Coad & Cullen, 2006; Holweg & Pil, 2008; Hopwood, 1996; Ward & Zhou, 2006). However, research results related to the general use of electronic integration have been mixed in terms of the benefits that accrue to supply chain partners (Chapman & Kihn, 2009; Hunton, Lippincott, & Reck, 2003; Poston & Grabski, 2001). To help clarify the impact of electronic integration, we follow Bergeron and Raymond (1992) and Ward and Zhou (2006) by categorizing electronic integration into two distinct, but closely related resources: *internal* electronic integration and *external* electronic integration. With respect to enabling IOCM, we first examine external electronic integration and then discuss how it is impacted by internal electronic integration.

Many inter-organizational activities require an external information system to control, transact business, provide data, coordinate activities, and to communicate with supply chain partners (Anderson, 2007; Hopwood, 1996). Such an external resource allows an organization to integrate its various information technology systems to provide customer and supplier data visibility and to allow online information sharing across the supply chain (Barua, Konana, & Whinston, 2004; Vickery, Jayaram, Droge, & Calatone, 2003). Coad and Cullen (2006) specifically suggest that physical assets such as integrated information systems are critical resources for managing an IOCM resource. In addition, Vickery et al. (2003) point out that vertically integrated information systems facilitate information sharing and the execution of transactions among supply chain members by enabling more efficient sharing of planning, tracking, ordering, and shipping information. Ellram and Zsidisin (2002) indicate that cost analysis associated with purchasing and supply chain management requires extensive use of integrated systems in order to examine supplier cost structures. Furthermore, Anderson and Lanen (2002), Kulp (2002), Ranganathan and Brown (2006), Bharadwaj, Bharadwaj, and Bendoly (2007) and Saraf, Langdon, and Gosain (2007) all found positive collaborative outcomes associated with integrated information exchange between organizations from a management accounting and control perspective.

External electronic integration clearly is an important antecedent to inter-organizational collaboration like cost management. The integrated systems that define external integration often involve the use of unique communication systems, policies, procedures, and routines for processing transactions and storing data and knowledge associated with these systems and routines. These integrated systems

[7] Cooper and Slagmulder (2004) identify three specific IOCM techniques driven by target costing that progressively involve more collaboration between the focal firm and the partner firm: (1) functionality-price-quality tradeoffs; (2) inter-organizational cost investigations; (3) concurrent cost management.

are an important resource that can be used to enable the collaborative efforts and coordination of activities for supply chain partners to manage inter-organizational costs. This view is further supported by the information systems literature in that organizations can achieve a competitive advantage through the management of customer and supplier information within a supply chain. Thus, we expect that the ability to share transactions, data, and planning and management information through external electronic integration is an important antecedent and enabler of IOCM. We therefore hypothesize:

H2. *There is a positive relationship between an external electronic integration resource and an IOCM resource.*

Internal electronic integration

In contrast to external integration, an internal electronic integration resource consists of internally-focused resources such as point-of-sale systems, databases, and enterprise resource planning systems to coordinate and plan internal, intra-organizational production, procurement, and inventory activities, as well as the knowledge and routines associated with these activities. While the internal electronic integration resource is not proposed to directly enable IOCM, it is expected to enable external electronic integration. It is reasonable to expect that an organization must first be able to *internally* perform tasks such as processing transactions and sharing data related to management, planning, control, logistics, and financial transaction and monitoring activities before doing the same with *external* supply chain partners. For example, Ward and Zhou (2006) argue that most manufacturing firms implement their internal systems, e.g., material requirement planning and database systems first, and then expand the systems to plan and manage logistics between firms in the supply chain. This suggests that each type of electronic integration is a distinct resource and that an organization's external integration resource is dependent upon its internal integration resource. In particular, resources such as knowledge and experience developing internally integrated systems can be leveraged to develop externally integrated systems. Thus, we expect that the ability to share transactions, data, and planning and management information internally will enable external electronic integration and hypothesize.

H3. *There is a positive relationship between an internal electronic integration resource and an external electronic integration resource.*

We likewise expect internal electronic integration resources to enable a firm's ability to manage internal costs. In Cooper and Kaplan's (1999) four-stage model of cost system development, the final stage of internal cost management requires significant integration of product, service, and customer cost information. They specifically suggest that a firm's level of internal cost management is dependent on the integration of their internal value chain activities. Prior research suggests that this is particularly true in organizations with integrated manufacturing, where an internal information system is needed to coordinate these activities (e.g. Dean & Snell, 1991; Hansen & Mouritsen, 2007). Ward and Zhou (2006) demonstrate a relationship among internal systems and Just-In-Time inventory management, which is a relatively high-level cost management activity. It then follows that the internal systems may also affect other internal cost management activities, such as the analysis of cost behavior, planning and budgeting, activity-based costing, target costing, continuous improvement, business processes reengineering, quality control, inventory management, and in the general management of the internal value chain. This suggests that the internal cost management resource is directly enabled and enhanced by the internal electronic integration resource by linking various activities within a firm's internal value chain, increasing transaction accuracy, improving data access, and facilitating information sharing within the firm. Therefore, we expect internal electronic integration to enable internal cost management and hypothesize.

H4. *There is a positive relationship between an internal electronic integration resource and an internal cost management resource.*

Absorptive capacity

Absorptive capacity refers to the "ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128). It is recognized as a resource "pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage" (Zahra & George, 2002, p. 185). As such, absorptive capacity is viewed as a resource that can enable other resources. Zahra and George (2002) stress the importance of prior knowledge, organizational routines, and communication processes in organizations being able to create new resources. Tu, Vonderembse, Ragu-Nathan, and Sharkey (2006) add social mechanism or relationship dimensions to absorptive capacity and summarize it as (1) communication climate, (2) communication network, and (3) knowledge seeking practices. While there are no studies that link absorptive capacity directly to IOCM activities, several studies link these three absorptive capacity dimensions to other collaborative efforts as described below.

Communication climate

Within absorptive capacity, the communication climate includes trust, open communication, and a spirit of fairness where ideas can be shared and accepted between parties as noted in Table 1 (Tu et al., 2006). Numerous prior studies consistently point out the importance of trust between partner firms as they engage in inter-organizational collaboration such as IOCM (e.g., Cooper & Slagmulder, 2004; Hakansson & Lind, 2007; Handfield & Nichols, 1999; Hoyt & Huq, 2000; Ireland et al., 2002; Langfield-Smith & Smith, 2003; Mentzer, Min, & Zacharia, 2000; Mouritsen et al., 2001; Tomkins, 2001; Van der Meer-Kooistra & Vosselman, 2000). Trust is both a prerequisite to sharing knowledge

(information), as well as a result of sharing knowledge through repeated interactions and exchanges through inter-organizational supply chain relationships (Cooper & Slagmulder, 2004; Mentzer et al., 2000; Tomkins, 2001). Trust also serves as an alternative to more formal inter-organizational control relationships and activities (Van der Meer-Kooistra & Vosselman, 2000) and is important in forming effective alliances (Ireland et al., 2002). For example, a "climate of openness" can enhance IOCM by allowing supply chain partners to share proprietary information (e.g. cost, demand, and planning information), learn more about each other (Liedtka, 1996; Nevis, DiBella, & Gould, 1995), and facilitate collaboration and cooperation on product development and design (Mentzer et al., 2000). Sharing information over time can enhance trust between the partners; however, trust is needed to share this information. Thus, trust requires time to develop (Cooper & Slagmulder, 2004; Tomkins, 2001). Lengnick-Hall (1998) argues that trust developed through effective communication is an important resource that can lead to a competitive advantage for both partners in an inter-organizational relationship. Likewise, Mouritsen et al. (2001) identify a highly developed sense of trust between partners as an important prerequisite for open book accounting (an IOCM activity) to be effectively implemented between partners. With goodwill trust, partners have an open commitment to each other (Dekker, 2004; Dyer & Singh, 1998; Sako, 1992), and there are no explicit pledges to be fulfilled as in contractual trust or predetermined standards to adhere to as in competence trust (Van der Meer-Kooistra & Vosselman, 2000). Vosselman and van der Meer-Kooistra (2009, p. 267) even conceptualize accounting as a trust-building technology that results in "stable and durable inter-firm transactional relationships." Thus, the communication climate (which includes trust as an aspect of absorptive capacity) is a particularly important resource in inter-organizational collaboration and cooperation relationships with the ultimate goal of increasing the value of firms in the supply chain.

Communication network

The communication (or knowledge) network is a dimension of absorptive capacity that describes the frequency and depth of or communication between two parties. The communication network also refers to the flow and procedures for sharing information across and within organizational boundaries from a human relationship standpoint (Brown, 1997) and is distinguishable from the technical infrastructure. As a network of inter-personal interactions and relationships between partner firms, the communication network has been identified as critical for firms to engage in inter-organizational collaboration such as IOCM (e.g. Brown, 1997; Cooper & Slagmulder, 2004; Dekker, 2004; Dyer & Singh, 1998; Nevis et al., 1995; Zahra & George, 2002). Open and effective communication channels with the right individuals where expertise and knowledge resides in the firms are needed to obtain relevant cost management information (Dyer & Singh, 1998; Tu et al., 2006). Ittner, Larcker, Nagar, and Rajan (1999) found that frequent meetings with suppliers resulted in improved joint planning processes (an IOCM activity) and tended to increase firm performance. Cooper and Slagmulder (2004) suggest that good communication is required when two firms want to successfully engage in joint identification, management, and resolution of cost management issues. Without the communication processes and relationships, it is difficult to share the information to manage costs.[8] Thus, the communication network as an aspect of absorptive capacity is an essential resource for enabling IOCM.

Knowledge seeking

Knowledge scanning or seeking, which enables firms to identify and capture relevant knowledge, is another important aspect of absorptive capacity for organizations engaging in inter-organizational collaboration such as IOCM (Tu et al., 2006; Zahra & George, 2002). Knowledge seeking is the outward-looking exploration and search of new ideas that can lead to innovation, which enables firms to respond to changing conditions (Holweg & Pil, 2008; March, 1991; Teece, Pisano, & Shuen, 1997). Cohen and Levinthal (1990) and Zahra and George (2002), suggest that integrating external knowledge is critical to knowledge-seeking activities. In the context of this study, a firm may be seeking knowledge from their supply chain partner on how to leverage cost management strategies between the two organizations, with the knowledge-seeking activity itself considered a resource.

In summary, we consider absorptive capacity to be an important resource that allows organizations to gain and sustain a competitive advantage through IOCM by creating and utilizing the communication climate, the communication network, and knowledge seeking resources important to IOCM. These resources are developed through and incorporated within the routines, communication systems, and social networks needed to implement these inter-organizational resources. Many aspects of these resources are based on relationships and not just the financial or technical aspects of inter-organizational cooperation and collaboration activities. These resources, whether based on the organization's own resources, leveraged from their supply chain partner, or based on inter-organizational relationships, can be valuable, rare and unique and used for the joint benefit of all in the supply chain. Thus, the absorptive capacity resource is an important resource in enabling IOCM and we hypothesize.

H5. *There is a positive relationship between an absorptive capacity resource and an IOCM resource.*

Effect of external electronic integration on absorptive capacity

The overall communications climate among partners in a supply chain can be improved as a result of external electronic integration. Through the use of external electronic integration and the sharing of data, trust (a component of the communication climate) can be increased, and through this trust, communication can increase even more as suggested by Kumar (1996), Tomkins (2001), Mentzer

[8] Hakansson and Lind (2007) review many of these communication networking issues and their importance to accounting in an inter-organizational setting.

et al. (2001), Cooper and Slagmulder (2004), and Hakansson and Lind (2007). Furthermore, increased sharing of information and the corresponding reduction in information asymmetry can improve the communication climate (Coad & Cullen, 2006; Cooper & Slagmulder, 2004; Fiala, 2005; Simchi-Levi, Kaminsky, & Simchi-Levi, 2003; Vickery et al., 2003). In addition, through the building of interpersonal relationships and trust that goes along with these relationships, external electronic integration can enhance the communication network component of absorptive capacity. Thus, both the communication climate and network resource components of absorptive capacity can be enhanced by external electronic integration as it facilitates the communication and data sharing needed to foster a good communication climate and effective network.

Elbashir, Collier, and Sutton (2011) find that absorptive capacity is fundamental to the assimilation of business intelligence into management control systems. Knowledge scanning or seeking that enables firms to identify and capture relevant knowledge is an important aspect of absorptive capacity for organizations engaging in inter-organizational collaboration (Tu et al., 2006; Zahra & George, 2002). Knowledge scanning, which is important in an organization's search for new ideas and its ability to adapt to changing conditions (Holweg & Pil, 2008; March, 1991; Teece et al., 1997), can further be enhanced through external electronic integration.

As a firm gains more experience and expertise in using external electronic integration systems, it is likely to enhance the communication climate, communication network and knowledge seeking capabilities and ultimately the absorptive capacity resource of the organization. We therefore hypothesize that external electronic integration will affect absorptive capacity:

H6. *There is a positive relationship between an external electronic integration resource and an absorptive capacity resource.*

Effect of internal cost management on absorptive capacity

An organization's internal cost management resource can also affect its absorptive capacity. Knowledge gained from internal accounting practices can play a key role in building relationships among business partners (Hakansson & Lind, 2007). Specifically, Hakansson and Lind (2007) found that accounting structures such as budgets and responsibility centers were used to build new organizational structures that fostered cooperation (i.e., communication climate and communication networks) within and between organizations. Within supply chains, partner relationships between buyers and suppliers tend to be long-term with a select number of partners. These partner relationships require accounting systems to reflect the efficiency of the entire value chain (Anderson & Sedatole, 2003). Furthermore, these are typically built upon mutual collaboration and information sharing, which requires a good communication climate. As firms gain more experience and expertise in using internal cost management to support IOCM, they are likely to realize substantive benefits and to seek added ways to use their knowledge to further IOCM in a changing environment. Through the knowledge gained from internal cost management experience, an organization can develop the knowledge-based resource to enable the effective use of cost management opportunities that cross organizational boundaries. Thus, we hypothesize that internal cost management practices will affect absorptive capacity.

H7. *There is a positive relationship between an internal cost management resource and an absorptive capacity resource.*

Research methodology

This study examines the potential hypothesized resources that enable IOCM. We model these resources using constructs consisting of representative measures of attributes and activities for a cross-section of organizations. To obtain these measurements, we employ a survey methodology that includes scales for the five constructs in our framework, as well as the control variable of size as measured by number of employees and sales.

Scale development

Measurement scales are typically used when there are no direct observable measures of the constructs. Our measurement scales use several questions (items) to indirectly measure the unobservable constructs that represent the resources considered in this study. The measured value of each construct is determined by participants' responses to the measurement scale questions and by the nature of the construct. Following the guidelines of Jarvis, MacKenzie, and Podsakoff (2003) and Bisbe, Batista-Foguet, and Chenhall (2007), we began the scale development process by first determining if each modeled construct was conceptually formative or reflective. If a construct is reflective, the participants' responses are assumed to reflect the condition of a latent (unobserved) construct; therefore, changes in the construct cause changes in the response. In contrast, formative constructs are modeled as a linear combination of participants' responses on a given scale; thus, changes in the measured items are assumed to cause variation in the construct, rather than the other way around in the reflective approach (Bollen, 1989; Bollen & Lennox, 1991; Diamantopoulos, 2008). Based on Jarvis et al. (2003), a construct can be determined to either be formative or reflective through conceptual evaluation of the construct using specific decision rules. The decision rules that we applied for defining reflective or formative constructs are based on (1) the direction of causality from the construct to the item measures implied by the conceptual definition; (2) the interchangeability of the measurement items; (3) covariation among the measurement items; and (4) consideration of the nomological network of the construct indicators.

Next, we selected and/or developed a set of survey items designed to measure each construct. For the reflective constructs, we followed the guidelines of Churchill (1979) for scale development. For the formative constructs,

we followed the guidelines of Diamantopoulos and Winklhofer (2001) in developing an index with formative indicators. For both the reflective and formative constructs, we selected measurement items representative of the resources expected to add value through inter-organizational relationships and to enable IOCM in our model. Many of the measurement items originate from previously validated instruments. When the exact wording of original items did not capture the desired aspect of our construct, minor modifications were made to the item. When our review of the literature revealed that there were no previously developed measurement scales or items designed to measure our constructs, we defined and developed new measurement scales based on the literature. As the items were developed for each construct, we continued to follow the decision rules of Jarvis et al. (2003) in determining whether we had properly specified the formative or reflective nature of the construct. Table 1 categorizes each construct used in our model as either formative or reflective. The survey items for our data collection are presented in Tables A1–A6 in Appendix, along with the literature sources for the survey items.

Q-sort and pilot study

We first tested the reliability of our scale items using a "q-sort" (Rust & Cooil, 1994) to assess their reliability. In our initial q-sort, we asked eight judges to read our preliminary list of 65 survey items and to categorize each item initially into 1 of 5 constructs.[9] During the q-sort, the proportional agreement was determined, which is the total number of pair-wise agreements between judges across an initial set of 65 items divided by the total number of pair-wise comparisons. The proportional reduction in loss was 1.00 according to the tables provided by Rust and Cooil (1994), suggesting that the initial pilot study instrument items were reliable.

While this methodology provides an overall reliability of the measures based on inter-judge agreement, it does not address judgment deviations from the predicted constructs. Therefore, we further examined each preliminary survey item that had more than three judges who did not place the item into the predicted construct (12 out of 65). These 12 items were then reworded to address the likely cause(s) of misclassification. Following the q-sort, the survey was administered electronically to eight members of the Institute of Management Accountants (IMA). We used these results to further refine our survey items for a pilot study.

We then conducted a more extensive online pilot study by surveying members of a regional chapter of the IMA who work for organizations that are part of a supply chain. Forty-nine members completed the survey. The pilot study was a broad-based representation of those in the sample frame of the main study. The firm types in the pilot study included manufacturers (73%), distributers (13%), retailers (4%), and wholesalers (7%). Preliminary results of the pilot study were presented at an academic conference (Fayard, Lee, Leitch, & Kettinger, 2007), and the feedback was used to refine and enhance the survey items.

Final construct measures

Internal and external electronic integration

Our initial selection of survey items used to measure internal and external electronic integration originates with the measure of "System Integration" defined by Barua et al. (2004, p.593) as "the extent to which a firm integrates its various IT systems to provide visibility to customer and supplier data and to allow online information sharing and transaction execution across the value chain". Given our desire to distinguish between internal and external electronic integration, we divide the "System Integration" construct into two parts. For the internal electronic integration construct, we use four of the Barua et al. (2004) internally-focused integration items to measure the internal resource as shown in Table A1. Based on the expectation that a higher level of internal integration will lead to higher responses on each of the items, the internal electronic integration resource is modeled as a reflective construct as noted in Table 1. The q-sort and validity tests[10] of the pilot test data support the use of the four survey items to measure the reflective construct in our data collection.

In developing the survey items to measure the external electronic integration construct, we started with the single externally-focused item used by Barua et al. (2004) and supplemented it with three items from Vickery et al. (2003) as noted in Table A2. The additional items reflect the resources needed to support inter-organizational information exchange and data sharing (e.g. Anderson & Lanen, 2002; Chapman & Kihn, 2009; Kulp, 2002; Kulp et al., 2004; Saraf et al., 2007; Ward & Zhou, 2006). Like internal electronic integration, the external electronic integration construct is expected to be reflective as noted in Table 1. Although the original Vickery et al. (2003) items were modified, the validity tests of the pilot data confirm the reflective nature of the construct and the appropriateness of the final four items in measuring external electronic integration.

Absorptive capacity – communication climate, communications network, knowledge seeking

The absorptive capacity construct is a hierarchical[11] construct. More specifically, as shown in Fig. 2, absorptive capacity is a formative, 2nd order construct that is measured with three 1st order constructs: (1) knowledge seeking, (2) communications network, and (3) communication climate, where each of the 1st order constructs is reflective in nature. The initial items used to measure the 1st order constructs

[9] Two judges were accounting professors. The remaining six judges were Ph.D. students in accounting (2), management information systems (2), and operations management (2).

[10] Pilot test data was used to test discriminant and convergent validity of the constructs and to ensure that items did not cross-load onto other constructs. To validate the constructs and items, we conducted exploratory factor analysis using every item of every scale, as well as confirmatory factor analysis for each construct and its related items.

[11] Our operationalization of Absorptive Capacity as a 2nd order hierarchical (mixed) construct follows the guidelines of Wetzels, Odekerken-Schröder, and Van Oppen (2009). The construct is considered "mixed" because it consists of formative and reflective components.

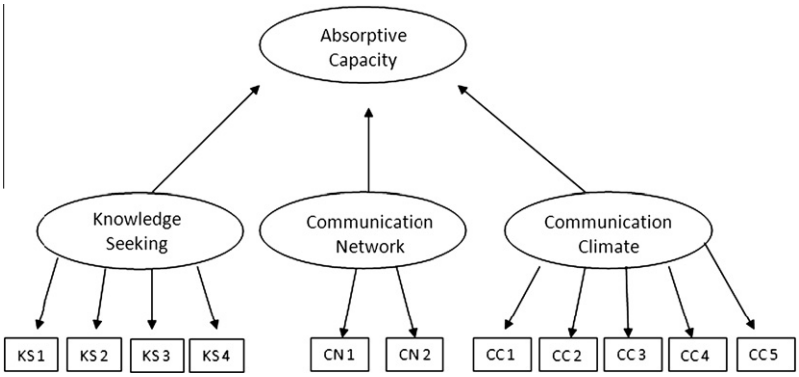


Fig. 2. Absorptive capacity as a 2nd order construct.

are adopted from Tu et al. (2006), Dyer (1997), and Vickery et al. (2003) and consistent with the ideas regarding absorptive capacity as an inter-organizational resource as presented in the literature (e.g. Dyer & Singh, 1998; Elbashir et al., 2011; Tomkins, 2001; Zahra & George, 2002). In each case, we modified the original items to specifically measure the absorptive capacity for inter-organizational cost-management. For example, instead of measuring overall general knowledge seeking, we more specifically measure the degree that organizations sought knowledge regarding cost management. The results of validity tests on the pilot data suggest that each of the retained items are appropriate for measuring their respective 1st order construct. The validity tests of pilot test data further support the expectation that the 1st order constructs are reflective in nature, while the 2nd order absorptive capacity construct is conceptually a formative measure of the 1st order construct as noted in Table 1. Table A3 lists the items and their sources that are used to measure each of the 1st order constructs of absorptive capacity.

Internal cost management

Because our research revealed no previously developed scale for measuring an organization's internal cost management resource, we followed the guidelines of Diamantopoulos and Winklhofer (2001) and used both academic and instructional (cost management texts) literature to develop a formative construct to represent an organization's internal cost management resource (Tables 1 and A4). Specifically, the measurement of an organization's internal cost management resource is determined by the degree that the organization engages in a cross-section of cost-management activities, as shown in Table A4. Each item in the scale represents a single cost-management activity. Extant literature has examined the importance of some of these individual activities (e.g. Anderson & Sedatole, 1998; Coad & Cullen, 2006; Cooper, 1996; Cooper & Chew, 1996; Cooper & Slagmulder, 1998; Cooper & Slagmulder, 2004; Kaplan & Narayanan, 2001; Kaplan & Norton, 1996; Monden & Hamada, 1991). Most are cost management activities that are routinely taught as part of the management accounting or cost management curriculum in typical accounting or MBA programs (e.g., Brewer, Garrison, & Noreen, 2007; Hansen & Mowen, 2006). Validity tests of the pilot test data support the use of these items to measure a single formative construct. Table A4 lists our measures for internal cost management and the corresponding references and sources of the items.

Inter-organizational cost management

For IOCM, prior measures were also not available. We again followed the guidelines of Diamantopoulos and Winklhofer (2001) in developing a formative measure of an organization's IOCM resource based on the academic literature and based on the internal cost management construct as noted in Tables 1 and A5. The IOCM construct is intended to measure the degree to which respondent organizations engage in IOCM activities with a supply chain partner and, as such, represents an IOCM resource. Validity tests of the pilot test data support the use of these items to measure a single formative IOCM construct.

Scales

For all of the items in our survey, participants indicated their agreement with the item statement using a seven point Likert scale ranging from "strongly disagree" to "strongly agree." The responses to these items are used to calculate a measured value for each construct. We specifically asked respondents to "... consider a business partner, either a customer or a supplier, that is very important to your employer and with whom you are familiar." In this way, we were asking the respondents to focus on those customers or suppliers in a supply chain that were strategically significant. In addition, we have a control variable of size based on the number of employees in the organization and the annual sales (Table A6).

Data collection

The research instrument questions (items) used to collect data for this study are presented in Appendix (Tables A1 through A6). With the assistance of the IMA, the data for the main study was collected at three IMA-sponsored events: (1) a National Meeting; (2) a Lean Accounting Conference; and (3) a regional IMA conference. Only IMA members in supply chain organizations were encouraged to complete our survey.[12] Most of the respondents

[12] The participants' supply chain association was confirmed by the authors prior to their completion of the survey.

Table 2
Survey respondent demographics.

	Number	% of Total
Panel A: Position of respondents		
Controller/area controller	31	40
CFO	13	17
Various management	10	13
Cost accountant/supervisor	9	12
Various accounting positions	8	10
Various finance	3	4
VP of finance	3	4
Panel B: Annual overall firm sales in dollars		
Less than $1 million	1	1
$1 million to $10 million	4	5
$10 million to $100 million	34	45
$100 million to $500 million	12	16
$500 million to $1 billion	5	7
More than $1 billion	20	26
Panel C: Nature of company[a]		
Manufacturing	47	49
Service	14	15
Materials/parts supply	10	10
Distribution	8	8
Retail	5	5
Wholesale	4	4
Other	8	8

[a] Total is greater than the sample size because respondents were allowed to select more than 1 response.

completed the survey in person at the conferences. At their request, a few conference attendees completed an online version via a web site or mailed in their survey. Random drawings for gift certificates were conducted to encourage attendees to complete the survey at the conference.

A total of 77 respondents participated in the survey.[13] The survey sample frame was targeted to accountants knowledgeable of inter-organizational cost management and their organization's relationships with important supply chain partners. IMA members who are familiar with their supply chain activities, information systems, and cost management practices are the appropriate sample frame from which to gather empirical data on the resources needed for IOCM. Not all respondents completed the demographic information, but over half had graduate degrees, slightly more than half were male, and more than 70% were over 40 years of age. Moreover, the length of time working with a partner firm in a supply chain, for those disclosing this information, was: 7 (<1 year), 13 (1–3 years), 12 (3–5 years), 13 (5–10 years), and 25 (>10 years). As seen in Table 2, the participants were from a variety of companies within a supply chain and were in a position to answer questions regarding the constructs.

Results

We test our hypotheses using partial least squares (PLS), a second-generation structural equation modeling (SEM) technique that offers several advantages in our analysis over covariance-based SEM techniques such as LISREL.[14] As illustrated in Fig. 1, we hypothesize a comprehensive theoretical framework and research model of relationships among the various constructs and their impact on the IOCM resource construct. In the PLS model, we include a measure of company size (Table A6) as a control construct.

Measurement properties

PLS allows the simultaneous test of the measurement model and the structural model. The first step in a PLS analysis is the assessment of the measurement model by formally examining construct validity. Construct validity, the assessment of the degree to which a measure actually measures the intended latent construct, is evaluated for both the formative and reflective constructs.

Formative constructs

To assess the validity of the formative constructs, we followed the guidelines of Petter, Straub, and Rai (2007). In terms of content validity, our items were subject to the q-sorting described previously to evaluate if the measures can be categorized per theoretical predictions (Straub, Boudreau, & Gefen, 2004). Because the formative measurement model is based on multiple regression, the stability of the coefficients (i.e., multicollinearity among formative constructs) is sensitive to sample size and the strength of the item correlations (Diamantopoulos & Winklhofer, 2001). Following the guideline from Petter et al. (2007) that a variance inflation factor (VIF) in excess of 3.3 is an indicator of multicollinearity and may be unduly influencing the parameter estimates, we identified items with a VIF > 3.3 (IOCM3 and IOCM4). Because IOCM3 and IOCM4 are highly correlated (.945) and related to activity-based costing and activity-based management respectively, we dropped IOCM4 and only retained IOCM3 for the PLS analysis.

Reflective constructs

In our research model, both internal and external electronic integration are modeled as 1st order reflective constructs. Reliability measures such as Cronbach's alpha and composite reliability are used to assess the internal consistency of these reflective latent constructs. Internal consistency is the inter-relatedness among items in a scale. As shown in Table 3 Panel A, the Cronbach's alpha and composite reliability for internal electronic integration (0.96) and external electronic integration (0.87) are both above the adequate level of .70 as recommended by Nunnally (1978).

[13] Seventy-seven respondents is in line with several related studies with their respective sample sizes. For example, Kulp (2002): $n = 53$; Kulp et al.(2004): $n = 54$; Ranganathan and Brown (2006): $n = 116$; Saraf et al. (2007): $n = 63$.

[14] First, PLS is best suited for our relatively complex model that includes a rather large number of latent construct and manifest variables to measure those constructs (Chin & Newstead, 1999; Wetzels et al., 2009). Second, PLS is suitable for models with formative constructs (Chin & Newstead, 1999; Wetzels et al. 2009). Third, PLS is more suited for our sample size and sample distribution; covariance-based SEM techniques require a relatively larger sample size and are more sensitive to deviation from normality (Chin & Newstead, 1999; Hall, 2008; Wetzels et al., 2009). Because PLS is largely based on ordinary least squares regression, the sample size requirements are essentially the same as for regression analysis. Finally, PLS is suitable for our goal to develop a new theoretical model based on hypotheses derived from macro-level theory (such as the resource-based view).

Table 3
Reflective construct reliability measures.

		AVE	Composite Reliability	Cronbach's Alpha
Panel A: Internal and external electronic integration				
External electronic integration		0.894772	0.971435	0.960844
Internal Electronic Integration		0.715316	0.909161	0.866128
Panel B: Absorptive capacity constructs				
1st Order Constructs	Knowledge-seeking	0.742735	0.920258	0.884348
	Communication Network	0.822181	0.902399	0.784521
	Communication Climate	0.701619	0.921374	0.894049

To test for discriminant validity, we verify that the items measuring the construct in question are more closely associated with its intended construct than with other constructs. Discriminant validity was first assessed by verifying that the squared root of the average variance extracted (AVE) for each construct is higher than the correlation between it and the other constructs (Fornell & Larcker, 1981). Table 4 Panel A displays the correlation between internal and external electronic integration (0.446286), with the diagonal element representing the square root of the AVE. From Table 4 Panel A, we see that each of the integration constructs shares a greater variance with its own block of items measuring it (as indicated by the square root of the AVE) than with another block of items measuring a different construct.

We further tested for discriminant validity by following the Chin (1998) cross-loading method. As indicated in Table 5 Panel A, each item loads more highly on its assigned construct than on other constructs (Chin, 1998). In addition, each item loading is greater than .707, implying that there is more shared variance between the construct and its items than error variance (Barclay, Higgins, & Thompson, 1995).

Hierarchical construct

Our conceptual model of absorptive capacity is presented in Fig. 2, where knowledge seeking, communication network and communication climate are the formative items. To simultaneously assess the measurement and structural properties of the hierarchical absorptive capacity construct, we follow the guidelines presented by Wetzels et al. (2009) in modeling mixed constructs. Absorptive capacity is considered a mixed construct in that it consists of both reflective components (1st order) and formative components (2nd order). We follow the Wetzels et al. (2009) method of using the measurement items for both the respective 1st order constructs as well as for the formative items for absorptive capacity. The loadings of the 1st-order latent constructs (knowledge seeking, communication network, and communication climate) on the 2nd order construct of absorptive capacity are 0.837, 0.784 and 0.755 respectively, all of which exceed 0.70 and are significant at $\alpha = 0.05$. Table 3 Panel B provides the reliability measures (AVE, composite reliability, and Cronbach's alpha) for the 1st order constructs, all of which are above the recommended values. Our results from Table 4 Panel B also demonstrate discriminant validity, in that the squared root of the AVE, shown by the diagonal elements, for each 1st order construct is higher than the correlation between these constructs and the other off diagonal constructs (Table 4 Panel B), which make up absorptive capacity. Thus, from Table 4 Panel B, we see that each 1st order construct (knowledge seeking, communication network,

Table 4
Correlation among reflective constructs.[a]

	IEI	EEI	
Panel A: Internal and external electronic integration			
IEI	0.84576		
EEI	0.446286	0.94592	
	KS	CN	CC
Panel B: Absorptive capacity			
KS	0.86182		
CN	0.500102	0.90674	
CC	0.382060	0.514373	0.83763

AVE – average variance extracted.
IEI – internal electronic integration.
EEI – external electronic integration.
KS – knowledge-seeking.
CN – communications network.
CC – communication climate (including trust).
[a] The square root of the AVE is on the diagonals.

Table 5
Discriminant validity loadings and cross-loadings.

	IEI	EEI	
Panel A: Internal and external electronic integration			
EEI1	0.445346	0.949259	
EEI2	0.443687	0.961806	
EEI3	0.397807	0.942528	
EEI4	0.396632	0.92982	
IEI1	0.882546	0.424134	
IEI2	0.91241	0.429329	
IEI3	0.798286	0.358181	
IEI4	0.782704	0.286354	
Panel B: Components of absorptive capacity			
	KS	CN	CC
KS1	0.836358	0.383728	0.285005
KS2	0.895776	0.479672	0.335213
KS3	0.848738	0.403708	0.368594
KS4	0.86526	0.452029	0.32522
CN1	0.393864	0.894486	0.431592
CN2	0.506708	0.918835	0.497786
CC1	0.272682	0.444577	0.848276
CC2	0.296094	0.393226	0.856176
CC3	0.484767	0.528005	0.864437
CC4	0.311636	0.488647	0.870968
CC5	0.170154	0.240874	0.741382

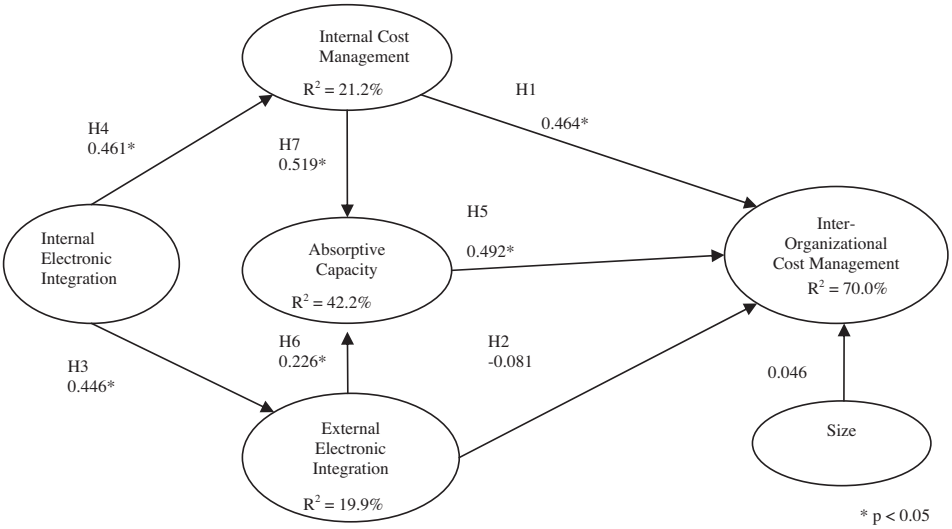
IEI – internal electronic integration.
EEI – external electronic integration.
KS – knowledge-seeking.
CN – communications network.
CC – communications climate.

and communication climate) shares a greater variance with its own block of items that measure it (as indicated by the square root of the AVE) than with another block of items measuring a different construct. We further demonstrate discriminant validity in Table 5 by showing that each item of the 1st order measure loads more highly on its assigned construct that the other 1st order constructs (Table 5 Panel B). Taken together, these results in Fig. 2 and Tables 3–5 indicate a strong measurement model.

Structural model test results

We use SmartPLS 2.0 software (Ringle, Wende, & &Will, 2005) to test our hypotheses. Similar to other recent accounting studies (e.g. Chapman & Kihn, 2009; Hall, 2008) and as recommended by (Chin, 1998), bootstrapping (with 500 subsamples) was performed to test the statistical significance of each path coefficient using *t*-tests. Overall, the results of the structural model suggest the model has good predictability. The results also reveal that 70% of the IOCM construct variance, 42% of the absorptive capacity construct variance, 21% of the internal cost management construct variance and 20% of the external electronic integration construct variance are explained by the model. We further use the PLS path coefficients to test the direct effects of the hypothesized relations between constructs.

In particular, previous research findings would indicate that a company's internal cost management can lead to an IOCM capability. Based on the PLS analysis, the path coefficient between internal cost management and IOCM is significant (0.464, $t = 2.965$, $p < 0.05$) supporting H1 as shown in Fig. 3. We conclude that for a cross-section of organizations, the knowledge and experience used to more extensively manage internal cost management activities can be directly leveraged and extended to manage inter-organizational costs. Our results also suggest an indirect role of internal cost management in enabling IOCM based on the significant path coefficient between internal cost management and absorptive capacity (0.519, $t = 7.703$, $p < 0.05$) supporting H7, as well as between absorptive capacity and IOCM (0.492, $t = 3.243$, $p < 0.05$) in supporting H5. This indirect effect, as shown in Fig. 3, suggests not only the direct enabling influence of internal cost management on IOCM, but also the



	Link	Path	Path t-statistic	Support
H1	Internal Cost Management to Inter-organizational Cost Management	0.464	2.965	YES
H2	External Electronic Integration to Inter-organizational Cost Management	-0.081	0.672	**NO**
H3	Internal Electronic Integration to External Electronic Integration	0.446	5.264	YES
H4	Internal Electronic Integration to Internal Cost Management	0.461	4.104	YES
H5	Absorptive Capacity to Inter-organizational Cost Management	0.492	3.243	YES
H6	External Electronic Integration to Absorptive Capacity	0.226	2.720	YES
H7	Internal Cost Management to Absorptive Capacity	0.519	7.703	YES
not hyp.	Size to Inter-organizational Cost Management	0.046	0.339	**NO**

Fig. 3. PLS structural model results.

indirect influence of the communication network, the communication climate, and knowledge seeking activities in fostering cost management information sharing.

Our results also show in Fig. 3 that the ability of the external electronic integration resource to enable IOCM is related to other resources. In particular the PLS path coefficient between external electronic integration and IOCM does not support our hypothesized direct relationship (H2). However, the path coefficient between external electronic integration and absorptive capacity (0.226; $t = 2.720$, $p < 0.05$) supporting H6 and between absorptive capacity and IOCM (0.492; $t = 3.243$, $p < 0.05$) supporting H5 are both significant. Thus our findings provide support for the importance of external electronic integration in enabling IOCM, albeit indirectly through the communication climate, the communication network, and the knowledge-seeking aspects of absorptive capacity. Our results support the belief that an external electronic integration resource is a necessary, but not a sufficient condition for enabling IOCM (Holweg & Pil, 2008; Short & Venkatraman, 1992; Venkatraman, 1994; Wade & Hulland, 2004).

The final resource to be examined is internal electronic integration. While few studies link internal electronic integration directly to IOCM, Fig. 3 shows how an internal integration resource can indirectly enable IOCM. First, we see that the PLS path coefficient between internal electronic integration and internal cost management (0.461; $t = 4.104$, $p < 0.05$) is significant, thereby supporting H4. This suggests that internal integration can enable an internal cost management resource, which in turn can directly and indirectly enable IOCM. Furthermore, the PLS path coefficient between internal and external electronic integration is significant (0.446; $t = 5.264$, $p < 0.05$) supporting H3. This result indicates that companies having an internal electronic integration resource can leverage this to enable the external electronic integration resource, which in turn can enable IOCM through absorptive capacity. Thus, internal electronic integration is an important resource that enables both internal cost management and external electronic integration.

In summary, Fig. 3 reveals statistically significant support for the direct relationships hypothesized by H1, H3, H4, H5, H6 and H7. H2 is the only proposed relationship without a supported direct effect. However, using the Baron and Kenny (1986) three regression equation mediation test, we find that the relationship between external electronic integration and IOCM is at least partially mediated by absorptive capacity.[15] This means that IOCM is enabled indirectly by external electronic integration, thus providing partial (albeit indirect) support of H2. Finally, with respect to our control variable of size, we did not find a statistically significant relationship between size and IOCM.

Discussion and conclusions

Resource-based view and IOCM

Prior research on inter-organizational cost management activities has largely focused on identifying antecedents of individual activities within a few organizations. This loosely-related body of research lacked a unifying theoretical framework to explain the findings. This study provides such a unifying framework by using the resource-based view to explain the development of the IOCM resource. The resource-based view focuses on the upside of cooperation among business partners as they share resources for the good of their partnership, i.e. a win–win situation (e.g., Anderson & Dekker, 2009). By characterizing the antecedents as resources, we are able to make theory-based predictions (hypotheses) about how they influence IOCM, as well as how they relate with each other in developing and enabling IOCM as shown in Fig. 3. The support we have for our hypotheses suggests that the resource-based view is an appropriate and useful theoretical framework for understanding how these resources enable an organization's IOCM resource in a supply chain.

Our model provides an example of the resource-based view's expectation that organizations use some resources to develop other resources to create a competitive advantage. Establishing an IOCM resource can begin with an internal electronic integration resource that can help enable both an external electronic integration resource and an internal cost management resource. Our results further show that both the internal cost management and the external electronic integration resources can enable an absorptive capacity for IOCM, which in turn can enable an IOCM resource. By positioning IOCM research within the theoretical framework of the resource-based view, we have attempted to unify a stream of research, which had previously focused on fragmented aspects of the constructs. Moreover, our understanding of how the resource-based view is related to IOCM can be used as the foundation for future IOCM research.

Practical implications

Our results offer several practical implications for organizations wanting to develop an IOCM resource. While there is no direct link between internal electronic integration and IOCM, the results from Fig. 3 suggest that internal integration can be an important initial resource for enabling IOCM because of its importance in the development of two intermediate resources: external electronic integration and internal cost management. Organizations seeking to develop an IOCM resource would likely benefit by first ensuring they have a strong internal electronic integration resource.

An IOCM resource may also require both a strong internal cost management resource and a strong absorptive

[15] The regression equations for the mediation test were performed by using the simple means for each factor, while considering only external electronic integration (EEI), absorptive capacity (AC), and IOCM. Specifically, when IOCM is regressed on EEI, the coefficient t-statistic and p-value for EEI are $t = 4.48$; $p \leqslant 0.0001$. When AC is regressed on EEI, the coefficient t-statistic and p-value for EEI are $t = 4.57$; $p \leqslant 0.0001$. When IOCM is regressed on AC and EEI, the respective coefficient t-statistics and p-values are AC: $t = 4.87$; $p \leqslant 0.0001$, and EEI: $t = 2.21$; $p = 0.0301$. Using the Sobel test, the reduction in the coefficient for EEI in the presence of AC is significant in that the t-statistic and p-value are $t = 3.332$; $p \leqslant 0.0014$. While still significant, the relationship is partially mediated due to the significant reduction in the coefficient on EEI in the presence of AC (Baron & Kenny, 1986; Iacobucci, Saldanha, & Denj, 2007; MacKinnon, 2008).

capacity resource. This implies that organizations focus on excellence in internal cost management combined with an emphasis on the inter-organizational communication climate, the communication network, and knowledge-seeking activities. Since the internal cost management resource has a direct effect on the level of the IOCM resource, companies may also develop IOCM by simply extending internal cost management activities externally and not focus on absorptive capacity. This result may seem counter intuitive because it raises questions as to how IOCM could be developed without a favorable communication climate, a communication network, or a desire to seek ways to manage inter-organizational costs. Perhaps, the partner without the strong absorptive capacity resource can leverage their supply chain partner's absorptive capacity, with the shared absorptive capacity resource contributing to IOCM. This is an area that could be further explored in future research.

Similarly, the results suggest that even without a strong internal cost management resource, organizations with a strong absorptive capacity for cost management can enable IOCM. As before, perhaps the partner without the strong internal cost management resource can leverage and share their supply chain partner's internal cost management resources, which then contribute to joint cost management capabilities.

Additionally, external electronic integration appears to be important through impacting absorptive capacity. Organizations should pay particular attention to the organizational and relational aspects of absorptive capacity, i.e. the role of the communications climate, communication network and knowledge seeking capabilities in leveraging external electronic integration resources. However, we are not suggesting that the value of external electronic integration is dependent upon absorptive capacity. External electronic integration is necessary for the future development of IOCM, and it may well be a beginning point for supply chain partners to focus jointly on both absorptive capacity and external integration as they develop their IOCM resource.

Overall, having a high level of absorptive capacity is beneficial to enable inter-organizational cost management strategies. To develop an absorptive capacity resource, we suggest organizations be proactive in seeking opportunities to reduce costs, communicate with partners frequently, and develop a trusting and open relationship so information can be shared with supply chain partners.

Limitations and future research

There are several limitations of our study that may lead to interesting extensions. First, while many of our survey items ask about a dyadic partnership between a focal firm and its partner firm, we only measure the relationship from the focal firm's perspective. Future studies might take a dyadic perspective and explore both sides of a supply chain relationship. Secondly, surveys essentially take a cross-sectional, snapshot of the level of each organization's resources. From these snapshots, we infer a temporal order to the development of these resources. Future research could more specifically test the order in which the various resources enable organizations to engage in IOCM. A third potential limitation of this study is that the respondents of our survey all came from IMA conferences. While we acknowledge that using targeted samples can affect the generalizablity of results, these participants were chosen

Table A1
Internal electronic integration (IEI) measures.

Survey item	Internal electronic integration of information systems	Direct source of each survey item
IEI-1	Our firm's information systems allow continuous monitoring of activities across our firm	Barua et al. (2004)
IEI-2	Data can be shared easily among various internal systems within our firm (e.g. forecasting, production, manufacturing, shipment, finance, accounting, etc.)	Barua et al. (2004)
IEI-3	Status changes within our firm (such as account balances or forecasts) are automatically reflected within our firm's information systems (e.g. inventory, manufacturing resource planning, and manufacturing systems.)	Barua et al. (2004)
IEI-4	Our firm's employees are able to retrieve information from various databases for decision support (e.g. cost information, reporting tools.)	Barua et al. (2004)

Table A2
External electronic integration (EEI) measures.

Survey item	External electronic integration of information systems	Direct source of each survey item	Indirect source of each survey item
EEI-1	Our firm and our partner firm have information systems that facilitate information exchange across firm boundaries		Vickery et al. (2003)
EEI-2	Our firm and our partner firm have inter-organizational information systems that support the easy exchange of information		Vickery et al. (2003)
EEI-3	Our firm's information systems are connected to our partner firm's systems, allowing data to be shared easily between firms		Vickery et al. (2003)
EEI-4	Our firms systems can easily transmit, integrate, and process data with our partner firm	Barua et al. (2004)	

Table A3
Absorptive capacity measures.

Survey item	Absorptive capacity	Indirect source of item
Knowledge seeking		
KS-1	Employees within both our firm and our partner firm actively seek knowledge about costs information associated with our firm's products and/or services	Tu et al. (2006)
KS-2	Employees within both our firm and our partner firm actively seek to learn from cost information to improve our business activities	Tu et al. (2006)
KS-3	Employees within both our firm and our partner search for the best cost management practices in our industry to apply to our firms	Tu et al. (2006)
KS-4	Employees within both our firm and our partner firm actively seek to learn from the cost information provided by both firms	Tu et al. (2006)
Communications Network		
CN-1	Employees within our firm know the right people at the partner firm who can provide cost management information	Tu et al. (2006)
CN-2	Employees within our partner firm know the right people at our firm who can provide cost management information	Tu et al. (2006)
Communications Climate (including Trust)		
CC-1	The employees both in our firm and in our partner firm trust each other	Tu et al. (2006)
CC-2	Both our firm and our partner firm have a very open communications environment	Tu et al. (2006)
CC-3	The employees in both our firm and our partner firm are willing to share ideas about cost management with each other	Tu et al. (2006)
CC-4	The employees in both our firm and our partner firm are willing to accept new ideas from each other	Vickery et al. (2003)
CC-5	The employees in both our firm and our partner firm deal with each other fairly	Dyer (1997)

KS – Knowledge-seeking.
CN – Communications network.
CC – Communication climate including trust.

Table A4
Internal cost management (ICM) measures.*

Survey item	With-in Firm Cost Management	Indirect source of item
	Within our firm, we use...	
ICM-1	... *cost information* to determine whether costs are fixed or variable	Generally accepted management accounting practice
ICM-2	... *performance standards and budgets* to manage or control internal costs within our firm	Generally accepted management accounting practice
ICM-3	... *Activity-Based Costing (ABC)* to determine costs associated to specific activities	Generally accepted management accounting practice
ICM-4	... cost information associated with specific activities to manage the costs of activities and processes (i.e. *Activity-Based Management*)	Hansen and Mowen (2006)
ICM-5	... use *Kaizen* or other continuous improvement processes	Monden and Hamada (1991)
ICM-6	... *target costing* in the internal planning, design, and development of products or services	Cooper and Chew (1996)
ICM-7	... an analysis of internal value chain activities as part of our management of internal costs	Hansen and Mowen (2006)
ICM-8	... *business process redesign* (reengineering) to manage costs	Hansen and Mowen (2006)
ICM-9	... *TQM, Six Sigma* or other such processes to manage costs associated with quality	Anderson and Sedatole (2003)
ICM-10	... non-financial measures of performance such as those in a *balanced scorecard* as part of our internal cost management processes	Kaplan andNorton (1996)
ICM-11	... *Activity-Based Costing (ABC)* to evaluate our internal costs of working with our supply chain partners	Kaplan and Narayanan (2001)
ICM-12	... *measures of the efficiency* of the processes that convert our resources (such as material, labor and/or overhead) into goods and/or services	Brewer et al.(2007) and Hansen and Mowen (2006)
ICM-13	... *inventory management procedures* to manage and control work-in-process, merchandise or other such internal inventory costs	Brewer et al.(2007) and Hansen and Mowen (2006)

* In general, the items for the internal cost management construct were developed from generally accepted managerial accounting practices (e.g., Brewer et al., 2007; Hansen & Mowen, 2006).

because of their ability to knowledgeably respond to all of the survey questions regarding a broad range of items that affect their organization's IOCM and its antecedent resources. A final limitation of this study is its relatively small sample size of 77. Although this size is in line with other PLS studies in the accounting literature (Lee, Petter, Fayard, & Robinson, 2011), the generalizability of the results could be examined in future studies by sampling additional respondents (both accountants and non-accountants) in varied industry groups.

Another promising area of research would be to examine the underlying factors of absorptive capacity (communications climate, communications network, and knowledge-seeking) and how they can be expanded in an inter-organizational cost management context. The possibility of other factors enabling an IOCM-based partnership could also be explored, such as the strategic alignment or strategic fit between partners or the impact of a new technology on cost management partnerships.

Contributions and conclusions

We contribute to the theory and research related to the resource-based view of the firm and inter-organizational cost management by developing a theoretical framework of how resources may be inter-related and combined to enable other resources and ultimately an IOCM resource. Using this framework in conjunction with our broad, cross-sectional sample of supply chain organizations and our research design and methodology, we are able to hypothesize and test the relationships among internal electronic integration, external electronic integration,

Table A5
Inter-organizational cost management (IOCM) measures.

Variable	Inter-organizational cost management	Indirect source of each survey item
IOCM-1	Our firm and our partner firm jointly … … *analyze inter-organizational cost information* to determine whether costs are fixed or variable	Marquez, Bianchi, and Gupta (2004)
IOCM-2	… develop *common demand, sales or order forecasts*	Cooper and Slagmulder (2004) and Ramos (2004)
IOCM-3	… measure inter-organizational costs as a function of the activities that drive the costs (i.e. we apply *Activity-Based Costing* to inter-organizational costs)	Cooper and Slagmulder (2004), Kajuter and Kulmala (2005), Cooper (1988), Kaplan and Narayanan (2001), Narayanan and Sarkar (2002), Niraj et al. (2001), and Peterson et al. (2005),
IOCM-4*	… use information about the activities that drive inter-organizational costs to manage and control those activities. (i.e. we apply *Activity-Based Management* to inter-organizational costs)	Cooper and Slagmulder (2004), Kajuter and Kulmala (2005), Cooper (1988), Kaplan and Narayanan (2001), Narayanan and Sarkar (2002), Niraj et al. (2001), and Peterson et al. (2005),
IOCM-5	… engage in continuous improvement processes (e.g. *Kaizen*) to control inter-organizational costs	Monden and Hamada (1991), Cooper (1996), Cooper and Slagmulder (1998), and Guilding et al. (2000)
IOCM-6	… use inter-organizational *target costing* processes to meet market prices for our product while providing a profit margin to our firm and our partner	Cooper and Slagmulder (2004), Cooper and Chew (1996), Monden (1995), Bonaccorsi and Lipparini (1994), Carr and Ng (1995), Sakurai (1996), and Monden and Sakurai (1989)
IOCM-7	… engage in *inter-organizational cost investigations* in order to analyze the cost structure of processes/products which impact both firms	Cooper and Slagmulder (2004) and Dekker (2003)
IOCM-8	… engage in "*functionality-price-quality trade-off*" analysis to manage *joint* costs in order to deliver an appropriate level of functionality, price and quality	Cooper and Slagmulder (2004)
IOCM-9	… engage in open-book accounting	Kajuter and Kulmala (2005) and Simchi-Levi et al. (2003)
IOCM-10	… conduct *business process redesign* to manage and control *inter-organizational* costs	Simchi-Levi et al.(2003), Barua et al. (2004), Mitra and Chaya(1996), and Poston and Grabski (2001)
IOCM-11	… use processes to manage and control inventory levels (e.g. *Just-In-Time*) to control *inter-organizational* costs	Berry et al. (1997) and Callioni et al. (2005)
IOCM-12	… share common assets with our partner or place assets at our partner firm's location to coordinate activities and/or to reduce costs	Cooper and Slagmulder (2004)), Malhotra et al. (2005))
IOCM-13	… place employees at each other's location for the purpose of *coordinating activities and collaborating* on product or service plans, design or development	Cooper and Slagmulder (2004) and Malhotra et al. (2005)
IOCM-14	… foster and develop inter-organizational cost management *collaboration activities* to manage and control the overall costs of both firms	Cooper and Slagmulder (2004) and Malhotra et al. (2005)
IOCM-15	… analyze and manage our *overall supply chain or value chain costs* that extend beyond our firm and our partner's firm	Malhotra et al. (2005)
IOCM-16	… work to manage *quality costs* in the inter-organizational value chain	Malhotra et al. (2005)

* IOCM-4 dropped from measurement model due to multicollinearity issues.

internal cost management, and absorptive capacity together as they directly or indirectly affect an organization's IOCM resource. For our cross-section of organizations, we find that these resources explain a significant amount (70%) of the variance of IOCM. We find that the activities enabling IOCM can be characterized as resources. We find that organizations can combine these antecedent resources to not only enable a higher level of cost management activities, but to enable a higher level of IOCM so that all supply chain partners may ultimately benefit by these relationships. Our research suggests that the resources are interrelated and can enable other resources, such as the IOCM resource. Additionally, we offer evidence in an ongoing debate about whether firm-specific and relational resources are inter-related or independent (Dyer & Singh, 1998), finding that the firm-specific resources in our model (electronic integration and internal cost management), as well as the relational resources (absorptive capacity) are interrelated and contribute to the development of the IOCM resource. Our results further suggest that there may be an order by which organizations develop resources that eventually enable IOCM. As a result, one resource such as internal electronic integration can enable other resources in a firm to ultimately enable IOCM for the combined benefit of the partners in a supply chain.

Furthermore, the measurement scales developed in this study provide a tool for future internal and inter-organization cost management research. These scales could also be used by organizations to self assess their own resource levels and may be a good beginning point for organizations wanting to develop an IOCM resource.

Finally, through our survey examining multiple cost management attributes and activities in an inter-organizational context, we are able to empirically confirm and broaden the scope of previous findings that were based on limited cost management activities within a relatively small number of organizations. Thus, our research provides a broad, theory-based explanation of the resources that can enable IOCM.

In summary, this study provides evidence regarding how organizations might develop an inter-organizational cost management resource. Firm-specific and relational resources that comprise absorptive capacity (communication climate, communication network, and knowledge seeking) play a central role in effectively extending the internal focus of cost management to the broader inter-organizational perspective of IOCM. Given the importance of managing supply chain costs, we hope that our results will motivate more companies to consider IOCM.

Appendix

See Tables A1–A6.

Table A6
Control variable (size).

Variable	Description
SIZE-1	Number of Employees
SIZE-2	Annual Sales

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