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Abstract:

There is an uptake of organizations' involvement in collaborative organizational structures (COS). Consistent with the resource-centric views of the firm, we suggest that the COS members need to contribute their managed IT competencies to their COS, whose synergies would create COS IT competencies. We suggest three key IT competencies for COS: proactive top management decision synergy, collaborative and agile IT infrastructure, and cross-functional tactical management synergy. Using survey data, we found evidence of a positive association between these COS IT competencies and the collaborative rent-generating potential of the COS. We also found a positive association between the collaborative rent-generating potential of the COS and the business value of the COS members. The results suggest that developing COS IT competencies add value to a COS and its members. This study provides guidance for organizations looking to leverage their involvement in a COS.

Keywords: Collaborative Organizational Structures, Collaborative IT, Relational View of Firm, Dynamic Capabilities, Collaborative Rent Generating Potential, IT Competencies, Business Process Performance, Firm Performance.

1 Introduction

In this study, we suggest information technology (IT) competencies for collaborative organizational structures (COS). IT competencies are IT-related knowledge that enables one to uniquely leverage IT (Teece, Pisano, & Shuen, 1997). For example, business managers' IT competency refers to the set of IT-related explicit and tacit knowledge that they possess that enables them to exhibit IT leadership in their area of business (Bassellier, Reich, & Benbasat, 2001). A COS is a group of related organizations, which are normally part of product or service value chains, engaged in a recursive process of working with each other to achieve shared goals while remaining independent organizations (Weber & Chathoth, 2008). A value chain is a chain of activities that organizations perform to deliver a product or service to the market (Porter, 1985). Structures such as COS facilitate co-creation, co-sharing of skills, co-management, co-development, and co-innovation among its members (Ceccagnoli, Forman, Huang, & Wu, 2012; de Rond, 2003; Grover & Kohli, 2012; Rai, Pavlou, Im, & Du, 2012). The IT competencies help a COS in facilitating these activities, which results in business value for its members.

Organizational collaboration is not a recent phenomenon: organizations have been part of alliances for a long time (Barringer & Harrison, 2000; Hamel, 1991; Oliver, 1990). However, the backbone of today's collaboration is the heavy investment in IT to establish a shared IT infrastructure: the inter-organizational IT infrastructure (Langfield-Smith, 2008; Mayer & Teece, 2008; Weber & Chathoth, 2008). An (inter-organizational) IT infrastructure is the composite hardware, software, network resources, and services required to operate and manage an IT environment. This inter-organizational IT infrastructure allows COS members to innovate processes that contribute to producing goods and delivering services. The COS members are able to access wider aspects of product and service value chains in an inter-organizational IT infrastructure (Ziggers & Tjemkes, 2010). For example, an inter-organizational IT infrastructure permits vendor-managed inventory (Cetinkaya & Lee, 2000), where the supplier is authorized to manage inventories of agreed-on stock-keeping units at retail locations. Most organizations' final products or services are outcomes of activities of wider inter-organization value chains (Iyer, Aubeterre, & Singh, 2008; Zeng, Sun, Duan, Liu, & Wang, 2013). Thus, by being part of a COS, organizations anticipate better leverage of IT and better gain incremental value from investing in IT compared to a similar in-firm investment in IT (Dyer & Singh, 1998), in helping then to achieve a better, or sustain an existing competitive advantage (Ceccagnoli et al., 2012; Grover & Kohli, 2012; Pavlou & El Sawy, 2004; Rai et al., 2012). .

The strategic necessity hypothesis [1] (Powell & Dent-Micallef, 1997), however, suggests that, in a competitive environment, the nature of IT investments in COS are similar. In this situation, organizational competencies, in complementary with these IT investments, provide business value to a COS and its members (Barney, 1991; Mata, Fuerst, & Barney, 1995). Significant research on the effect of IT on inter-organizational relationships exists. For example, studies have focused on IT's effects in reducing transaction and coordination costs in inter-organizational relationships (Brynjolfsson, Malone, Gurbaxani, & Kambil, 1994; Mithas, Tafti, Bardhan, & Mein Goh, 2012), IT-enabled flexibility on alliance performance (Tafti, Mithas, & Krishnan, 2013), profiles and communication and value (Rai et al., 2012), and alliance in a platform ecosystem (Ceccagnoli et al., 2012). The strategy literature has also considered alliance capability (Gulati, 1999; Gulati, Nohria, & Zaheer, 2000; Zollo & Winter, 2002). Research has also focused on complementarity between client and vendor IT capabilities (Han, Lee, Chun, & Seo, 2013), and the impact of general IT capabilities on firm performance in various contexts (e.g., supply chains) (Liu, Ke, Wei, & Hua, 2013). However, the nature of IT competencies required to leverage the IT investments in a COS setting has not received any resolute attention. Thus, we address the following question in this research.

    RQ1: What IT competencies leverage IT in a COS setting?

Figure 1 shows our conceptual model. With it, we suggest IT competencies for COS and their association with COS members' business value. We discuss this conceptual model in the following sections.

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[1] The strategic necessity hypothesis comprises two propositions: 1) IT provides value to a firm by increasing internal and external coordinating efficiencies, and firms that do not adopt them have higher cost structures and, therefore, competitive disadvantage; and 2) notwithstanding the first point, firms cannot expect IT to produce sustainable advantages because most IT is readily available to all firms—competitors, buyers, suppliers, and potential new entrants—in competitive factor markets (Powell & Dent-Micallef, 1997).
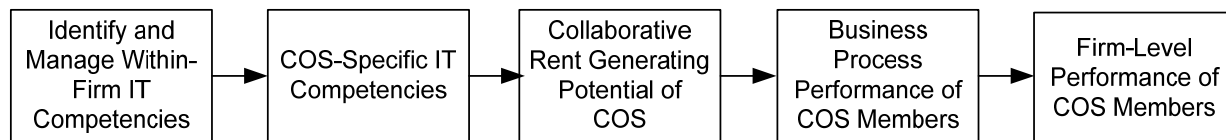
Figure 1. Conceptual Model

We concur with the arguments of the resource-based view of the firm that suggests that an organization comprises a bundle of resources (Barney, 1991). This bundle of resources contains the homogenous (common) and the heterogeneous (competencies) resources. Organizations' competencies leverage the common resources to help them achieve and maintain a competitive position (Barney, 1991; Mata et al., 1995). Thus, in Figure 1, we suggest that a COS requires COS-specific IT competencies to leverage the homogenous IT investment of the COS's members. Because a COS is not independent of its members, we suggest in Figure 1 that the path of developing COS-specific IT competencies starts with the member organizations. First, the members need to identify and manage their IT competencies. Then, they need to understand the synergies between their managed IT competencies to develop COS-specific IT competencies. Because the extant literature suggests various ways in which organizations identify and manage their IT competencies (see, e.g., Mata et al., 1995; Melville, Kraemer, & Gurbaxani, 2004; Wade & Hulland, 2004), we do not repeat these arguments in this study. Rather, we suggest in Figure 1 that the extent to which COS members identify and manage their IT competencies determines the extent of their contribution in combining their managed IT competencies to develop COS-specific IT competencies. We suggest that a proactive top management decision strategy, collaborative and agile IT infrastructure, and cross-functional tactical management synergy as IT competencies for COS.

We also suggest in Figure 1 that these IT competencies leverage the IT investment in a COS, which contribute to the COS's collaborative rent-generating potential (Borgatti & Cross, 2003; Dyer & Singh, 1998). Collaborative rent, which results from combining COS members' idiosyncratic resources, is the incremental value generated from a collaborative relationship not generated alone by the collaborative members (Dyer & Singh, 1998). The final elements of Figure 1 suggest that the members leverage the subsequent collaborative rent of their COS to improve aspects of their business processes, which contribute to the firm's overall performance.

We used smart PLS, a component-based SEM technique, to analyze field survey data from 188 respondents to validate our proposed research model. The analysis showed a positive association between COS members' ability to identify and manage their IT competencies and the IT competencies of their COS. There was also positive association between the COS IT competencies and the COS's collaborative rent-generating, which was positively associated with members' business process performance. The analysis also showed a positive association between business process performance and overall firm performance of COS members. These outcomes imply that the suggested COS IT competencies can contribute to developing capacity of a COS from which its members could source business value to achieve or maintain their competitive advantage.

This paper proceeds as follows. In Section 2, we present the study's theoretical framework and develop our hypotheses. In Section 3, we present the study's research design. In Sections 4 and 5, we present and discuss the study's results. In Section 6, we discuss the study's contributions and directions for future research, and, in Section 7, discuss the study's limitations and conclude the paper.

2   Theory and Hypotheses

2.1   Microfoundations and IT Competencies for COS

We propose the study's research model as depicted in Figure 2 below. We discuss this model in the following sections.
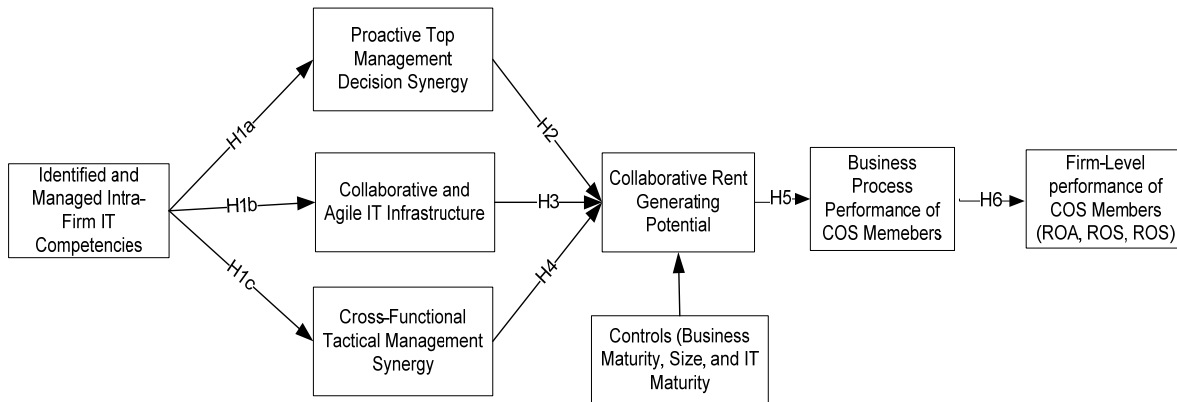
Figure 2. Research Model

2.2 IT and Organizational Collaboration: An Overview

Organizations have collaborated for many years. Oliver (1990) notes early forms of inter-organizational collaborative relationships that include trade associations, voluntary agency federations, joint ventures, joint programs, cooperative financial interlocks, and agency sponsor linkages. Barringer and Harrison (2000) discuss newer forms of inter-organizational collaborative relationships such as networks, consortia, alliances, trade associations, and interlock directorates. Recent inter-organizational collaborative relationships take the form of virtual organizations (Camarinha-Matos, Afsarmanesh, Galeano, & Molina, 2009; Markus & Agres, 2000) and virtual corporations (Staples, Hulland, & Higgins, 1999). Many prior inter-organizational collaborative structures are still present today. However, a subtle difference in today's inter-organizational collaboration is that IT is a major component in establishing these collaborative structures in the form of a shared IT infrastructure. The result of this level of IT participation in COS has created digital business ecosystems (Camarinha-Matos & Afsarmanesh, 2005; Ceccagnoli et al., 2012).

These IT-intensive collaborations have broadened the expectations of the invested IT. The IT investments in these settings are no longer about costs: they are about growth and innovation (Majchrzak & Malhotra, 2013; Patel, Fernhaber, McDougall-Covin, & van der Have, 2014). Thus, while IT continues to support business processes, its core role has shifted to proactively influencing business strategy (Burton, 2005). This shifting focus of IT's role has seen the need for collaboration change from a tool to perform standard processes at less cost to that of a source for innovation. This level of expectation from IT in a COS setting means developing better competencies to maximize IT's value.

2.3 The Need for IT Competencies

The resource-based view of the firm (RBV) advocates that an organization comprises common and unique resources (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). A resource is common if it is easily available to other organizations in an industry sector. A resource is unique if it helps differentiate an organization from other organizations in an industry sector or a similar group. Thus, unique resources are organizations' competencies. These organizational competencies leverage the common resources in unique ways to provide competitive advantage to organizations. The competencies that are rare, valuable, and appropriable help organizations attain competitive advantage (Barney, 1991). If these competencies are inimitable, non-substitutable, and immobile, they help organizations manage the attained competitive advantage (Barney, 1991).

IT investment in a COS is considered a common resource because other organizations can make the same investments in their COS settings. To obtain superior outcome from their COS, the members need to identify their IT competencies that they could take to their COS. A concern with the RBV is that it proposes the competencies *at a point in time* (see, e.g., Amit & Schoemaker, 1993; Barney, 1991; Barney, 1996; Mata et al., 1995; Melville et al., 2004; Wade & Hulland, 2004).

Organizations need to continuously improve their business processes to remain competitive. This situation requires continuous investment in resources, including IT. Consequently, members need to manage their IT competencies to continue to obtain distinctive value from their existing and new IT (Teece, 2007). Managing competencies relates to a continuous process of learning to leverage the new and changing common resources. Thus, managed competencies are dynamic competencies. A dynamic competency results from an organization's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Teece et al., 1997). Thus, a COS's members would need to bring their managed competencies, which are dynamic, to their COS.

2.4   Microfoundations for COS IT Competencies

A COS's IT competencies also need to be dynamic because sustainable collaborative rent requires continuously improving ways to leverage the COS's resources. A key to building dynamic competencies is understanding its microfoundations (Teece, 2007). Microfoundations are things whose synergies create dynamic competencies. For a COS setting, these microfoundations relate to members' managed IT competencies. Furthermore, Helfat et al. (2007) suggest that technical fitness and evolutionary fitness determine the extent of dynamic competencies. Technical fitness relates to how effectively a competency performs its function, whereas evolutionary fitness refers to how well the competency enables a firm to make a living (Helfat et al., 2007). According to Teece (2007), dynamic competencies assist organizations in achieving evolutionary fitness by managing the environment, which would promote innovation in an organization. Importantly, managing dynamic competencies has to be part of a recursive process in which the microfoundations need to adjust to new knowledge and changes in the business environment. Thus, in a COS setting, the interaction between the COS members would need to be continuous to maintain the synergy of their IT competencies.

The relational view of the firm (Borgatti & Cross, 2003; Dyer & Singh, 1998) also relates to Teece's (2007) dynamic capabilities argument and is a basis to maintain the synergy of COS members' IT competencies. It suggests that members' critical resources—their IT competencies—need to extend beyond their organizational boundaries (Dyer & Singh, 1998). The collaborative rent from a COS is possible when members are willing to make COS-specific IT investments and recognize the synergy between their IT competencies to leverage the investments (Dyer, 1996). That is, the microfoundations in the form of the members' managed IT competencies would be the source of unique collaborative rent for the COS. Knowledge sharing promotes synergies between the microfoundations of the COS's members. Organizations often learn by collaborating with others (Levinson & Asahi, 1995). Thus, the COS-specific IT competencies are the critical source of new ideas and innovation for a COS.

A large number of IT competencies leverage organizations' IT resources (Barney, 1991; Mata et al., 1995). Of these, the human resource (management) competencies are critical for effectively leveraging IT resources (Bassellier, Benbasat, & Reich, 2003; Bassellier et al., 2001; Bharadwaj, Bharadwaj, & Konsynski, 2000; Ngai, Chau, & Chan, 2011). Top managers determine the critical issues of timing and intensity of adopting IT resources (Powell & Dent-Micallef, 1997; Ray, Barney, & Muhanna, 2004; Ray, Muhamma, & Barney, 2005). Thus, we suggest that the members' top management's commitment to IT is an important microfoundation for the COS IT competency of proactive top management decision synergy. The tactical managers (the process managers) play a critical role in ensuring strategic alignment (Chan, Huff, Barclay, & Copland, 1997; Henderson & Venkatraman, 1993). The common understanding on the role of IT between the IT and business managers of the member organizations needs to expand in COS. We suggest that these microfoundations contribute to an array of IT-business manager relationships, a COS IT competency of a cross-functional tactical management synergy. The degree of fit of an IS to a business process is contingent on the IT infrastructure on which the information system is developed (Bhatt, Emdad, Roberts, & Grover, 2010; Broadbent, Weill, & Neo, 1999; Weill, Subramani, & Broadbent, 2002). We suggest that COS would require an IT competency of a collaborative and agile IT infrastructure to innovate in a value chain. The top managers' timing and intensity decisions and the IT and business managers' common understanding on IT's strategic value provide the appropriate IT to a COS, which, along with COS members' ability to organize these resources, are important microfoundations for a COS IT competency of a collaborative and agile IT infrastructure.

We suggest that these COS IT competencies contribute to its collaborative rent-generating potential. The members can then leverage this potential and improve aspects of their business processes. Improved business processes contribute to the member organization's overall performance. In Sections 2.5 to 2.9,

we discuss the nature of the relationship between IT competencies, collaborative rent-generating potential, and the business value of the COS members.

2.5 Understanding and Managing the Microfoundations of COS-specific IT Competencies

Developing IT competencies for a COS starts with its members. Thus, COS members need to identify their competencies (Bhatt & Grover, 2005; Doherty & Terry, 2009; Liu et al., 2013). An organization's efforts in understanding its key competencies contribute to directing resources to manage these competencies (Banerji, Leinwand, & Mainardi, 2009). This situation is especially pertinent in relation to a COS and its members. Consistent with the RBV argument, organizations' knowledge of their competencies indicate competencies' presence *at a point in time* (Teece, 2007). To sustain a competitive position, organizations need to maintain a continuous balance between common resources and leveraging competencies (Powell & Dent-Micallef, 1997; Wade & Hulland, 2004).

Members expect a long-term commitment to a COS. Thus, there will continuous IT-related investments to manage the COS and contemporary IT will be regularly available to a COS. In this case, the members will manage their IT competencies. Managing IT competencies concerns maintaining or improving one's ability to leverage new but common IT resources by understanding ways to integrate the IT into existing business processes in unique ways (Peppard & Ward, 2004). Thus, member organizations' ability to contribute relevant IT competencies to their COS is contingent on their ability to manage their IT competencies. They also need to recognize the synergy between their managed IT competencies to contribute to the effectiveness of the wider value chain that the COS manages. Thus, we propose:

H1a: COS members' ability to identify and manage their IT competencies is positively associated with their COS IT competency of proactive top management decision synergy.

H1b: COS member's ability to identify and manage their IT competencies is positively associated with their COS IT competency of a collaborative and agile IT infrastructure.

H1c: COS members' ability to identify and manage their IT competencies is positively associated with their COS IT competency a cross-functional tactical management synergy.

2.6 Proactive Top Management Decision Synergy and Collaborative Rent-generating Potential

Top management plays an important role in managing and directing organizational resources (Hambrick, 1987). Top management comprises individuals at the highest level of organizational management who have the day-to-day responsibility of managing an organization. In relation to IT, top management's commitment to IT ensures that organizations effectively deploy IT (Doll, 1985; Preston & Karahanna, 2009; Ray et al., 2005). For instance, top managers make critical adoption and diffusion decisions about IT (Ray et al., 2005), and when an organization chooses to adopt and diffuse IT affects its value to the organization (Karahanna & Straub, 1999; Musa, Meso, & Mbarika, 2005). Managers' knowledge of the IT affects the timing of the above decisions. Top management's commitment to IT also indicates their understanding of IT's function in the context of their organizations' strategy, structure, and systems (Henderson & Venkatraman, 1993). This understanding places IT as a central component of business thinking, and how IT influences organizations' strategic decisions (Powell & Dent-Micallef, 1997). Such commitment affects the continuity of IT investments; ensures the organization's information systems (IS) strategy, which supports its business strategy; and helps align IS planning with business planning (Powell & Dent-Micallef, 1997; Wade & Hulland, 2004). Some evidence suggests that top management's commitment to IT-related initiatives has contributed to business value in organizations (see e.g., Powell & Dent-Micallef, 1997; Ray et al., 2005). Thus, top management's commitment to make decisions on IT is an important IT competency for an organization.

In a COS setting, member organizations' top management need to be proactive when making decisions on IT. An effective and proactive approach to making decisions on IT requires organizations to anticipate and understand other members' IT decisions. In this way, a particular decision will contribute to the collective resource of the COS. An important antecedent to achieving this collective resource is organizations' top management's in-firm IT decision making competency (Ziggers & Tjemkes, 2010). With sustained within-firm top management competency, top managers can extend their knowledge to their COS. Top managers will have a better appreciation of the vision of their COS, which will promote synergistic top management decisions to promote these vision. Synergistic decisions are possible when

members understand each other's decision values and make IT-related and other decisions that are consistent with the COS's overall vision. The resulting decisions are proactive and result in organizations' swiftly identifying and subsequently leveraging opportunities for their COS. Thus, organizations' top managers' ability to cooperatively make decisions, which we term "proactive top management decision synergy" in this paper, is an important IT competency for a COS. Coordinated IT-related decisions should provide better IT for a COS. Furthermore, they should improve the COS's structure to leverage the invested IT. Members will be able to better leverage the collective IT that improves various aspects of their value chain, which means that organizations in a COS will better leverage IT compared to those acting individually. Thus, proactive top management decision synergy is an important IT competency for a COS, and it will contribute to its collaborative rent-generating potential. Thus, we propose:

H2: Proactive top management decision synergy is positively associated with a COS's collaborative rent-generating potential.

2.7 Collaborative and Agile IT Infrastructure and Collaborative Rent-generating Potential

Information systems are developed on an organization's IT infrastructure (Duncan, 1995). Effective IS must depict the real world that it manages (Wand, Monarchi, Parsons, & Woo, 1995; Wand & Weber, 2002). Thus, organizations continually manage their IT infrastructure with contemporary IT to facilitate changes to the IS (Bhatt et al., 2010; Lu & Ramamurthy, 2011). For example, organizations regularly update their network technologies, communication platforms, and data-sharing facilities to manage their communication infrastructure.

Moreover, IT infrastructure supports a COS's integrated IS. However, we can expect a COS's infrastructure expectations to differ from a single organization's because the COS would manage an expanded number of IS. These IS would control a diverse range of business processes that form part of a product or service value chain. Importantly, a COS's IT infrastructure should promote collaboration and provide an agile platform to leverage opportunities (Sambamurthy, Bharadwaj, & Grover, 2003). Collaboration refers to co-developing products/services or recombining products and services, jointly designing systems, and sharing managerial or technical expertise (Tafti et al., 2013). Agility relates to an organization's ability to rapidly adapt to market and environmental changes in productive and cost-effective ways (Chakravarty, Grewal, & Sambamurthy, 2013). Thus, the elements of collaboration and agility are important to a COS's IT infrastructure. While top management's proactive decisions ensure contemporary IT is available, appropriately configuring IT should result in a better IT infrastructure for a COS to develop and manage its integrative IS.

In a competitive environment, the window for new opportunities is often small. Organizations need to quickly reorganize their IS that manage the related business processes to leverage these opportunities. A collaborative and agile IT infrastructure platform assists organizations in managing this IS management process. A COS can achieve distinctive value-generating outcomes with these information systems. Thus, a collaborative and agile IT infrastructure is an important IT competency for a COS. A flexible IT infrastructure, which has an element of agility, has contributed to business value in other organizational settings (see, e.g., Ray et al., 2005; Sambamurthy et al., 2003).

A collaborative and agile IT infrastructure allows members to make swift adjustments to their IS that manage the business processes to take advantage of the available opportunities. The members will have a better set of coordinated IT to enable innovation and collaboration across the value chain, which will enable members to achieve better performance through innovatively adjusting their business processes because this form of IT infrastructure enables an improved fit of IT to a COS's wider value-chain processes. A collaborative and agile IT infrastructure also allows a COS to quickly adapt its IS to the real world. A collaborative and agile IT infrastructure improves a COS's collaborative rent-generating potential. Thus, we propose:

H3: Collaborative and agile IT infrastructure is positively associated with a COS's collaborative rent-generating potential.

2.8   Cross-functional Tactical Management Synergy and Collaborative Rent-generating Potential

IT and the business unit managers have different roles in organizations. IT managers introduce and implement IT to develop IT infrastructure, whereas business unit managers use the resultant IS to manage the business processes. Thus, aligning IT managers' and business managers' decisions is important in managing IT in organizations (Henderson & Venkatraman, 1993; Nelson & Cooprider, 1996; Rockart, 1988). Termed the IT-business alignment, it is an organization's ability to use IT effectively to achieve the set business objectives (Agarwal, Sambamurthy, & Brown, 2009; Henderson & Venkatraman, 1993).

An important consideration in achieving IT-business alignment is the common understanding between these managers of IT's requirements to achieve the organization's objectives (Reich & Benbasat, 2000). Business settings such as those in COS have a complex IT-business alignment. A COS's integrative IS environment means that an IT manager needs to have an understanding of IT's wider implications. Similarly, the business unit manager will need to recognize the value of IT for the extended value chain. Thus, a COS requires an array of IT-business alignment decisions. These IT-related decisions need to be aligned with the member organizations' objectives and also with the COS's objectives. The IT and business unit managers need to recognize the synergies between the objectives of member organizations and the ways in which these synergized objectives relate to forming a COS. The result is an IT competency of cross-functional tactical management synergy, which is an important IT competency for a COS.

The notion of working toward a common goal is embedded in the concept of appreciation (Nelson & Cooprider, 1996). Appreciation needs to be of the resource (IT in this case) itself rather than the providers (Swanson, 1974). Appreciation refers to various beliefs regarding the appreciated object (Swanson, 1974). In a COS, once the IT and business managers appreciate and have respect for the invested IT, they establish a synergy comprising mutual respect and understanding (Bostrom, 1989; Nelson & Cooprider, 1996). This respect and understanding is the cornerstone of a successful knowledge-sharing environment (Nelson & Cooprider, 1996). Furthermore, appreciation is the cornerstone of recognizing synergies between the objectives of IT and business unit managers in a COS. Successfully understanding the common objectives of IT and business unit managers' decisions has led to significant benefits to organizations (see, e.g., Armstrong & Sambamurthy, 1999; Jeffers, Muhamma, & Nault, 2008; Nelson & Cooprider, 1996; Ray et al., 2005; Reich & Benbasat, 2000).

We propose the COS IT competency of a cross-functional tactical management synergy. This COS IT competency relates to an improved understanding of the degree and magnitude of process conversions required in a COS to take advantage of the value of a COS setting. With this competency, tactical managers can better envision how to establish a COS and have the capacity to contribute to refining aspects of the COS's value chains. The outcome of this foresight can influence the effectiveness of the COS's value chain's wider functions and enhance the COS's collaborative capacity. Hence, a cross-functional tactical management synergy improves a COS's collaborative rent-generating potential. Thus, we propose:

> **H4:** The COS IT competency of a cross-functional tactical management synergy is positively associated with the collaborative rent-generating potential of a COS.

2.9   Collaborative Rent-generating Potential and Business Value of COS Members

Organizations participate in COS to identify opportunities beyond their organization to achieve or sustain their competitive position (Weber & Chathoth, 2008). However, to obtain such benefits, organizations must first contribute to the COS's collaborative rent-generating potential. Organizations then leverage this capacity to improve the value-chain sections that they manage. These improvements create better or more effective products and services and better mechanisms for delivering these products and services to key stakeholders. These outcomes contribute to an organization's business value in terms of delivering superior products, managing threats from new entrants, managing and understanding key stakeholders, and maintaining a competitive edge in their industry (Porter, 2001; Turban & Volonino, 2011).

IT's collaborative capacity is a powerful tool for improving business value (Smith & McKeen, 2008, 2011). Organizations invest in COS-based IT to improve their collaborative capacity (Tafti et al., 2013). For example, organizations invest and develop social network platforms to engage in partner-level

collaborations. Organizations also invest in beyond-organization enterprise resource planning (ERP) systems to obtain a unified view of various resources in structures such as COS.

The collaborative rent-generating potential and the resulting collaborative rent of these efforts is scalable, compatible, modular, and can handle multiple business applications and business models (Bhatt et al., 2010; Byrd & Turner, 2001). Collaborative rent permits members to improve firm specific value through collaboration in managing business processes (Dyer, 1997). That is, the COS members can segregate and realize specific value from the collaborative rent of the COS relative to organizations that do not engage in COS (Dyer, 1996; Dyer & Singh, 1998). The collaborative rent provides members with a much wider platform to refine existing and develop new information systems for their business processes. The capacities of these new information systems represent a better fit of IT to their business processes. The result of this fit is intelligent ways to create business value in the member organizations. This situation means that a COS's collaborative rent is an important source of business value for that COS's members. Thus, we propose:

H5: The collaborative rent-generating potential of a COS is positively associated with the COS's members' business process performance.

There is a path for creating business value from investment in IT (Kohli & Grover, 2008). In a COS setting, members can leverage the collaborative rent to improve their part of the combined value chains' business processes, which means that any leverage of collaborative rent will first affect the business processes of the COS's members. This situation is consistent with the notion that the first focal point of measuring IT's business value should be the IT-managed business processes (Alter, 2003; Dehning & Richardson, 2002; Lim, Dehning, Richardson, & Smith, 2011). Members' improved business processes assists in their leveraging their assets and investments and in lowering their cost of sales and service operations. These outcomes contribute to their firm-level performance and are important because organizations need to evaluate their overall return on investments in COS-related resources against their firm-level return matrices. However, firm-level returns are only possible through the effectively leveraging the collaborative rent at the business process level. Thus, we propose:

H6: A COS member's business processes performance is positively associated with its firm-level performance.

2.10 Control Variables

Several other factors could also affect a COS's collaborative rent-generating potential. An organization's maturity can affect its performance (Benbasat, Dexter, & Mantha, 1980; Choe, 1996; Mahmood & Becker, 1985). For example, Choe (1996) found that maturity factors such as user involvement and the capability of IS personnel influenced the performance of an accounting IS. Mature COS often have a more aligned and integrated IT infrastructure through more targeted IT investments. Thus, we control for the length of engagement in COS as a proxy for COS maturity. An organization's size determines its level of resources, which can affect business value (Harris & Katz, 1991; Tallon & Kraemer, 2006). The level of a COS's members' commitment and the intensity of their resource contribution, could have an impact on a COS's collaborative rent-generating potential. Thus, we use number of employees as a proxy to control for the size of a COS's members. IT maturity can also influence business value (Herbsleb, Zubrow, Goldenson, Hayes, & Paulk, 1997; Luftman, 2000). For example, Devaraj and Kohli (2000) suggest that IT maturity affects IT's payoff in the healthcare industry. The maturity of a COS's members' IT infrastructure could affect IT integration, which could contribute to the COS's collaborative rent-generating potential. We control for the maturity of COS members' IT use by considering the number of years they have invested in IT as a proxy. We discuss the research design relating to validation of the study's proposed model in Section 3.

3 Research Design

We employed a survey design to collect data to validate our research model.

3.1 Measurement Items, Instrument Development, and Test

We used perceptive measures for the three suggested COS IT competencies, collaborative rent-generating potential, and measures of business process performance[2]. We used reported financial data on return on assets (ROS), return on equity (ROE) and return on sales (ROS) for COS members firm-level performance. Table 1 lists the key studies that we referred to develop a pool of measurement items[3]. We also held discussions with organizations that collaborate in COS or COS-related structures. The table also defines the study's constructs.

Table 1. Key Reference Studies for the Construct Measurement Items

Construct	Definition	Key Source(s) of Reference
Identifying and managing within-firm IT competencies	The COS members' ability to identify and manage their IT competencies	Barney (1991), Wade & Hulland (2004), Mata et al. (1995), Melville et al. (2004)
Proactive top management decision synergy	The decision synergy between COS members' top managers	Ray et al. (2005), Powell & Dent-Micallef (1997)
Collaborative and agile IT infrastructure	The COS IT infrastructure that facilitates collaboration and is responsive to opportunities	Armstrong & Sambamurthy (1999), Broadbent et al. (1999), Chung, Rainer, & Lewis (2003), Liu et al. (2013), Lu & Ramamurthy (2011), Mitchell & Zmud (1999)
Cross-functional tactical management synergy	The IT-business alignment between a COS members' IT and unit managers	Agarwal et al. (2009), Brown & Magill (1994), Caron (1994), Oh & Pinsonneault (2007), Reich (2000), Tallon (2007)
Collaborative rent-generating potential	A COS's capacity to generate incremental value that the COS members would not generate alone	Baker, Gibbons, & Murphy (2002), Bensaou (1997), Fang, Wu, Fang, Chang, & Chao (2008), Goo & Huang (2008), Grover & Kohli (2012), Wasko, Faraj, & Teigland (2004)
Business processes performance	The performance of a COS members' business processes as relating to reductions in expenditure and improvement in productivity	Mitra & Chaya (1996)

We used the approach that Davis (1989) and Moore and Benbasat's (1991) suggest to develop and validate the measurement items for the study's constructs. To validate our approach, we generated the items, sorted and refined them, and conducted a pilot test. Twelve fellow faculty colleagues with interest and expertise relating to this research participated in the item sorting and refinement processes. The Cohen's Kappa (κ) for each pair of judges estimates their inter-rater reliability (Cohen, 1988).

Table 2. Measurement Items for the Constructs

Identifying and managing within-firm IT competencies (IMCP)
Our organization is able to identify factors that make better use of our IT Our organization knows that we are better users of IT than our competitors Our organization has valued some of human resources for being competent users of IT Our organization constantly considers ways to improve our ability to use our IT in unique ways Our organization trains and rewards individuals and groups that know how our IT works in our organization Our organization invests in IT that provide stronger infrastructure on which we could build our information systems
Proactive top management decision synergy (PTES)
Our top management work closely with other members of our collaborative alliances Our top management considers the impact of proposals and decisions on our organization and also on our collaborative members Our top management discusses decisions of top management of COS members when deliberating on proposals
Collaborative and agile IT infrastructure (CAIP)

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[2] We could not use objective measures of business process performance because the ORBIS database contained too many missing values on operational expenses.
[3] These studies do not use these measures but refer to the themes and concepts that related to the constructs.

Table 2. Measurement Items for the Constructs

Our collaborative structure has a flexible and smart IT base on which we consider various process improvements Our collaborative structure has an IT base that allows for quick reorganization of our value chain processes Our collaborative structure has an IT base that allows for quick development or refinement of information systems Our collaborative structure has an IT base that has a sense of shared ownership and control
Cross-functional tactical management synergy (CTMS)
Our unit managers regularly interact with unit managers of our collaborative structure Our IT and unit managers work closely with each other and with the managers of our alliance members Our tactical level IT-related decision making involves interaction with IT and unit managers of our collaborative structure Our IT and unit managers have a good understanding of the business processes of our wider value chains of our collaborative structure
Collaborative rent-generating potential (CRGP)
Our IT investment in the collaborative structure has improved the visibility of our business processes Our IT investment in the collaborative structure has improved our ability to generate new business models Our IT investment in the collaborative structure has improved our new product development efforts Our IT investment in the collaborative structure has improved our partner collaboration efforts
Business process performance (PROP)
Our selling cost per employee has reduced significantly compared to our competitors. Our labor cost has reduced significantly compared to our competitors. Our operating expenditure has reduced significantly compared to our competitors. Our sales revenue per employee has been outstanding compared to our leading competitors.
Firm performance of the COS's members—actual reported financial data
Return of assets, return on equity, return on sales (Dehning & Richardson, 2002; Dehning, Richardson, & Zmud, 2007; Mitra, 2005; Mitra & Chaya, 1996)
Note: We measured all items are on an eight-point Likert scale (no basis for answering (0), strongly disagree (1), disagree (2), slightly disagree (3), neutral (4), slightly agree (5), agree (6), strongly agree (7)).

Cohen's kappa measures the agreement between two raters who each classify N items (60 in this study) into C (6 in this study) mutually exclusive categories. Kappa values below 0.60 indicate low or weak level of agreement, values between 0.60 and 0.80 indicate full agreement, and values between 0.80 and 1.00 indicate almost perfect agreement (Cohen, 1988). The Cohen's Kappa (κ), of the refined pool of measures indicated that inter-rater reliability for the participants was in the full agreement (κ = 0.60 – 0.80) or almost perfect agreement (κ = 0.81 – 1.00) range. The outcome of this sorting and subsequent refinement process was a set of near-final measurement items for each construct.

Thirty graduate students from an MIS MBA course representing organizations that engage in some form of IT-based collaboration participated in the pilot test. Using a component-based statistical package to perform a preliminary factor analysis of the pilot test data, we found that the data exhibited normal measurement qualities. Table 2 presents the final measurement items for the research model's constructs.

3.2   Sampling Frame Construction and Survey Administration

We obtained the contact details of organizations that could be part of a COS from the ORBIS database. ORBIS is a publication of Bureau van Dijk Electronic Publishing (BvDEP). We also obtained actual firm performance data from this database. ORBIS integrates information from numerous sources such as company overviews and stock data and earnings estimates and complements this data with their own research to create a dynamic global research tool. ORBIS provides information on public and private companies across the globe. The ORBIS database does not explicate details of organizations' collaborative efforts. Therefore, our sample selection had to be non-random and purposeful. Furthermore, while some organizations collaborate internationally, a large number of organizations collaborate at a national or regional level. For this reason, we selected organizations from one country, Australia, in our sampling frame. The Australian economy has significant international connections and it is at the forefront of technological innovation. Australia ranks in the top 10 in critical indicators such as secure Internet servers, business-to-consumer Internet use, and e-participation index. Australia has also become a source of various distinctive technologies—especially in the areas of e-health, e-government, and financial

services (Takabi, Joshi, & Gail-Joon, 2010). Most of these technologies are applied in collaborative settings. Finally, considering the phenomena under investigation in this study, we have no reason to believe that organizations in Australia would not provide results readily generalizable to organizational settings in other developed countries around the world.

We analyzed organizations' corporate reports and other media releases, visited their websites, and contacted them by phone and email to obtain information on their collaborative engagements. We considered cues such as discussions on membership initiatives, IT investment announcements, and creation or expansion of e-commerce-based revenue models as indications of IT-based collaborative efforts. At the end of this exercise, 976 target respondents (companies) from this database constituted the sampling frame of this study.

We approached the contacts with the initial instrument package via email followed by two email reminders. The initial email contained the link to the survey. We sent reminders, which contained the link to the survey, after three weeks. At the conclusion of this instrument administration process, we received 188 valid responses, a response rate of 19.26 percent. We matched this perceptive data with the contacts reported firm performance data. Table 3 presents the industry and the occupation demographics of the survey's respondents. Furthermore, 28 percent of responding organizations had less than 200 employees, 35 percent had between 200 and 600 employees, 17 percent between 600 and 1200 employees, and 20 percent had more than 1200 employees. Thirty percent of responding organizations had been investing in IT for less than 10 years, 44 percent between 10 and 20 years, 18 percent between 20 and 30 years, and 8 percent for more than 30 years. The industry sector, position, and size demographic information indicate that the dataset contained a fair distribution of organizations and respondents.

Table 3. Industry and Respondent Demographics (n = 188)

Industry sector	Frequency	Position	Frequency
Retail/wholesale/distribution	37	Chief financial officer	80
Hospitality/tourism/travel	31	Chief information officer	44
Banking/finance	29	Director of MIS	17
Healthcare	25	Team leader	10
Transportation/logistics	18	General manager	9
Others	13	Chief executive officer	7
Education	10	Branch//division manager	6
Construction	5	Chief operating officer	5
Media/entertainment/publishing	5	Business analyst	5
Professional service	5	Managing director	3
Agriculture	3	Others	2
Mining	3		
Telecommunications	3		
Real Estate	1		

Our survey data is self-reported and, thus, subject to bias. As such, we performed various validity tests on the survey data. We used a t-test ($p<0.05$) to test for non-response bias with the first and the last thirty responses for all measures including control variables. We used the contacts that responded after the second reminder as the proxy for non-responders (Armbrust et al., 2010). The results showed no significant differences on any of the variables of the study. T-values of the measures ranged from 0.18 to 1.66. We also examined common methods bias and found no issues[4]. The ORBIS database contained information about the number of employees for 96 of the organizations that responded to the survey. We

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[4] First, we performed an exploratory factor analysis (EFA) with unrotated principal components analysis (PCA). Six components emerged with Eigenvalues greater than 1and a cumulative variance of 82.2 percent. The first component explained 28.7 percent variance. Second, we conducted PCA with varimax rotation. Again, six components emerged with Eigenvalues greater than 1. The rotated component matrix showed better clustering of the measures compared to the unrotated matrix. Third, we conducted principal axis factoring with varimax rotation. Six factors emerged and the explained variance was similar to PCA analysis. Finally, we loaded all variables on one factor. The first factor explained 28.7 percent variance, and there were five more factors with eigenvalues greater than 1.

performed a t-test (p<0.05) to determine the extent to which the self-reported data matched the published data. We assigned a number (1-7) to each employee scale and compared this data with the published data. We did not find any significant difference between the self-reported and the published data (t = 0.55). A small number of responses contained missing data, and Little's MCAR test found the data to be missing completely at random (p = 0.354). Maximum likelihood estimation (MLE), implemented by the EM (expectation maximization) algorithm in the SPSS missing values option, imputed the missing data. These outcomes indicate that the data was valid for our assessing its measurement and structural properties.

4   Results

4.1   Assessing the Measurement Model

We used SmartPLS, a components-based structural equation modeling (SEM) tool, to test the theoretical relationships amongst latent variables (structural path) and the relationship between the latent variables and their indicators (measurement paths). Rather than assuming equal weights for all indicators of a scale, the PLS algorithm allows for each indicator to vary in how much it contributes to the composite score of the latent variable (Chin, Marcolin, & Newsted, 2003). This situation means that the weaker relationships between the indicators and latent constructs have a lower weighting. This varied weighting also carries through to estimating the structural model. Thus, PLS is a preferable technique when compared with single-item regression, which assumes error-free measurement, and with summated regression, which assumes equal-weighted measurement. Table 4 shows basic descriptive information on the survey data and the outer loading when evaluated using SmartPLS. Most measurement items had a mean response value between 4 and 5. The mean of the outer loadings of all manifest variables was above 0.70, which suggests a strong association between measurement items and their associated constructs. The outer model standard deviation values indicate that the outer model loading were close to the means values.

Table 4. Survey Data and Outer Model Mean and Standard Deviation

	Survey data min.	Survey data max.	Survey data mean	Survey data STDEV	Outer model mean	Outer model STDEV
CAIP1	0	7	4.210	1.560	0.961	0.024
CAIP2	1	7	4.710	1.580	0.940	0.028
CAIP3	1	7	4.960	1.680	0.903	0.023
CAIP4	1	7	4.720	1.820	0.955	0.017
CRGP1	0	7	5.390	1.330	0.746	0.026
CRGP2	2	7	4.640	1.810	0.801	0.009
CRGP3	1	7	5.340	1.360	0.920	0.049
CRGP4	0	7	5.540	1.270	0.921	0.062
CTMS1	0	7	2.780	1.010	0.917	0.008
CTMS2	2	7	2.660	1.090	0.862	0.023
CTMS3	2	7	2.710	1.120	0.919	0.017
CTMS4	2	7	5.170	1.330	0.742	0.033
IMCP1	1	7	4.910	1.540	0.866	0.052
IMCP2	1	7	4.960	1.450	0.886	0.033
IMCP3	1	7	5.350	1.280	0.729	0.004
IMCP4	0	7	5.390	1.170	0.803	0.009
IMCP5	1	7	5.210	1.240	0.812	0.014
IMCP6	1	7	4.950	1.490	0.870	0.026
PTES1	1	7	4.500	1.700	0.836	0.014
PTES2	2	7	4.810	1.610	0.875	0.019
PTES3	1	7	5.100	1.390	0.813	0.009

Table 4. Survey Data and Outer Model Mean and Standard Deviation

PROP1	1	7	4.920	1.440	0.814	0.023
PROP2	1	7	4.570	1.860	0.842	0.017
PROP3	1	7	3.890	1.360	0.863	0.033
PROP4	0	7	4.670	1.250	0.825	0.052

Key: IMCP: identifying and managing IT competencies, PTES: proactive top executive synergy, CAIP: collaborative and agile IT infrastructure platform, CTMS: cross-functional tactical management synergy, CRGP: collaborative rent-generating potential, PROP: business process performance

Table 5 presents the factor loading, standard error, and t-statistics and the cross loadings. All items factored under their expected headings (constructs). Confirmatory factor analysis (CFA) via SmartPLS showed the factor loadings for constructs loaded highly on their designated constructs. The measurement items had a factor loading above the rule of thumb of a loading of 0.70, which indicates that the construct accounted for at least 50 percent of the variance in the manifest variable (Hair, Anderson, Tatham, & Black, 2008). Cross loadings analysis revealed the manifest variables loaded highly only on the desired latent variable. Table 6 presents the results of the measurement model assessment, which includes Cronbach's alphas, average variance extracted, composite readability, and inter-construct correlations. The alpha coefficients of all constructs was higher than 0.70 (Nunnally, 1978). The more accurate composite reliabilities, which avoid the assumption of equal weightings, were above 0.80. The average variance extracted were all above the acceptable 0.50 level (Chin, 1988). The square root of average variance extracted values (bold), which represent the average association of each construct to its measures, were higher than the correlations with the other constructs and indicates that the construct closely related to its own measures rather than to those of other constructs.

Table 5. Factor Loading, Cross Loading, Standard Error and T-statistics

	Factor loading	Std. error	t-stat	CAIP	CRGP	CTMS	IMCP	PTES	PROP
CAIP1	0.963	0.024	32.48	**0.963**	0.326	0.307	0.388	0.337	0.057
CAIP2	0.948	0.028	28.86	**0.948**	0.329	0.341	0.385	0.341	0.053
CAIP3	0.907	0.023	36.24	**0.907**	0.210	0.321	0.375	0.273	0.131
CAIP4	0.958	0.017	51.26	**0.958**	0.287	0.356	0.385	0.320	0.256
CRGP1	0.747	0.026	29.22	0.430	**0.747**	0.407	0.495	0.426	0.263
CRGP2	0.804	0.090	9.29	0.429	**0.804**	0.434	0.447	0.410	0.307
CRGP3	0.924	0.049	18.80	0.460	**0.924**	0.340	0.415	0.448	0.287
CRGP4	0.924	0.062	14.75	0.460	**0.924**	0.340	0.415	0.448	0.250
CTMS1	0.919	0.008	85.41	0.231	0.362	**0.919**	0.428	0.290	0.305
CTMS2	0.863	0.023	37.65	0.327	0.419	**0.863**	0.428	0.338	0.262
CTMS3	0.919	0.017	53.98	0.233	0.362	**0.919**	0.327	0.288	0.332
CTMS4	0.743	0.033	23.67	0.355	0.467	**0.743**	0.369	0.267	0.032
IMCP1	0.867	0.052	12.55	0.361	0.397	0.381	**0.867**	0.466	0.325
IMCP2	0.885	0.033	24.02	0.319	0.395	0.410	**0.885**	0.472	0.316
IMCP3	0.730	0.004	89.18	0.326	0.307	0.450	**0.730**	0.322	0.289
IMCP4	0.805	0.009	79.54	0.261	0.326	0.346	**0.805**	0.241	0.278
IMCP5	0.814	0.014	65.37	0.324	0.336	0.340	**0.814**	0.231	0.230
IMCP6	0.870	0.026	28.69	0.373	0.359	0.414	**0.870**	0.245	0.330
PTES1	0.838	0.014	63.00	0.186	0.306	0.249	0.423	**0.838**	0.385
PTES2	0.876	0.019	46.29	0.351	0.367	0.288	0.473	**0.876**	0.306
PTES3	0.813	0.009	97.46	0.301	0.358	0.368	0.449	**0.813**	0.268
PROP1	0.815	0.015	79.64	0.068	0.055	0.270	0.275	0.374	**0.815**
PROP2	0.844	0.014	80.12	0.111	0.093	0.231	0.422	0.301	**0.844**

Table 5. Factor Loading, Cross Loading, Standard Error and T-statistics

PROP3	0.863	0.025	66.58	0.142	0.115	0.287	0.363	0.339	**0.863**
PROP4	0.827	0.033	58.96	0.151	0.091	0.314	0.293	0.250	**0.827**

Key: IMCP: identifying and managing IT competencies, PTES: proactive top executive synergy, CAIP: collaborative and agile IT infrastructure platform, CTMS: cross-functional tactical management synergy, CRGP: collaborative rent-generating potential , PROP: business process performance
Note: the values in bold represent the measurement item loadings on the assigned constructs. Other values are cross loadings.

Table 6. Measurement Properties of Data

	AVE	COR	COA	CAIP	CRGP	CTMS	IMCP	PTES	PROP
CAIP	0.892	0.971	0.959	**0.944**					
CRGP	0.729	0.914	0.874	0.650	**0.854**				
CTMS	0.682	0.892	0.829	0.350	0.489	**0.826**			
IMCP	0.689	0.869	0.770	0.406	0.563	0.677	**0.830**		
PTES	0.710	0.880	0.797	0.337	0.649	0.365	0.624	**0.843**	
PROP	0.784	0.912	0.895	0.443	0.566	0.353	0.457	0.387	**0.885**

Key: AVE: average variance extracted, COR: composite reliability, COA: Cronbach's alpha, IMCP: identifying and managing IT competencies, PTES: proactive top executive synergy, CAIP: collaborative and agile IT infrastructure platform, CTMS: cross-functional tactical management synergy, CRGP: collaborative rent-generating potential, PROP: business process performance

4.2 Assessing the Structural Model

Figure 3 (next page) presents our assessment of the data's structural properties. The results show a favorable and significant association between COS members' ability to identify and manage their IT competencies and their ability to contribute to the COS's IT competencies. This outcome supports H1a-c. The COS IT competencies of proactive top management decision synergy, collaborative and agile IT infrastructure platform, and cross-functional tactical management synergy contributed positively to the COSs' collaborative rent-generating potential. They explained 65.5 percent variance in collaborative rent-generation potential. These outcomes support H2-4. Data also shows a positive relationship between COSs' collaborative rent-generating potential and the business process performance of their members. This outcome supports H5. Finally, we found a favorable and significant association between the business process performance of COS members and their firm-level performance measured with return on assets, return on equity, and return on sales. This outcome supports H6. Overall, there was a good fit of data to the proposed model IT competencies for COS. The control variables of business maturity, firm size, and IT maturity did not have a favorable association with collaborative rent-generating potential[5]. A possible explanation for this outcome could relate to the fact that these factors influenced the nature of the COS members' IT competencies, and their impact may have been captured in the measurement of these IT competencies. For example, mature businesses would have a better understanding of their competencies and, thus, would contribute more towards the IT competencies of their COS.

We conducted several further analyses to evaluate the quality of the structural model. First, we conducted the effect size, which is a measure of a specific predictor construct's impact on an endogenous construct (Hair, Hult, Thomas, Ringle, & Sarstedt, 2014). The (f^2) effect size measures the change in the R^2 value

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[5] We conducted several additional analyses on the survey data. We evaluated the impact of industry type. We grouped the industry type into IT-intensive and non-IT intensive industries. We considered banking and finance, education, healthcare, hospitality, media, professional services, telecommunications, and retail as IT-intensive industries. We divided the dataset equally from the others group. The t-test indicated some differences in responses (t-values: 0.53 to 1.16). We observed similar differences in path model analysis with the two groups of data. However, these differences were not statistically significant. We evaluated the impact of the respondent type on the response to survey questions. We grouped the business analyst, IT manager, director MIS, and the CIO as "technical respondents" and others as "business" respondents. A t-test (p<0.05) indicated that the responses of the groups were not significantly different (t-values: 0.66 to 1.33). We also evaluated the structural model with these groups of data and did not observe significant differences in the model path coefficients and the t-values.

when a specified exogenous construct is omitted from the model. We evaluated the effect size of the three COS IT competencies on collaborative rent-generating potential. We found an effect size of 0.258 for proactive top management decision synergy, 0.313 for collaborative and agile it infrastructure, and 0.159 for cross-functional tactical management synergy. Cohen (1988) suggests values less than 0.02 to be small effect size, values above 0.15 to be medium effect size, and values over 0.35 to be large effect. Thus, the effect sizes of our three COS IT competencies were medium. We also evaluated the values predictive relevance (Q^2). We used the cross-validated communality approach that Hair et al. (2014) suggests: this approach uses only the construct scores estimated for the target endogenous construct to predict the omitted data points. We performed this analysis on the collaborative rent-generating potential found a Q^2 value of 0.458. Hair et al. (2014) suggest values of 0.02, 0.15, and 0.35 indicate that an exogenous construct has a small, medium, or large predictive relevance for a selected endogenous construct. Finally, we calculated the goodness of fit (GoF) as Tenenhaus, Vinzi, Chatelin, and Lauro (2005) suggest, which is the geometric mean of average communality and average R^2 of all endogenous constructs. We found a GoF of 0.433, which indicates an overall good prediction power of the study's model. We discuss the results in the next section.
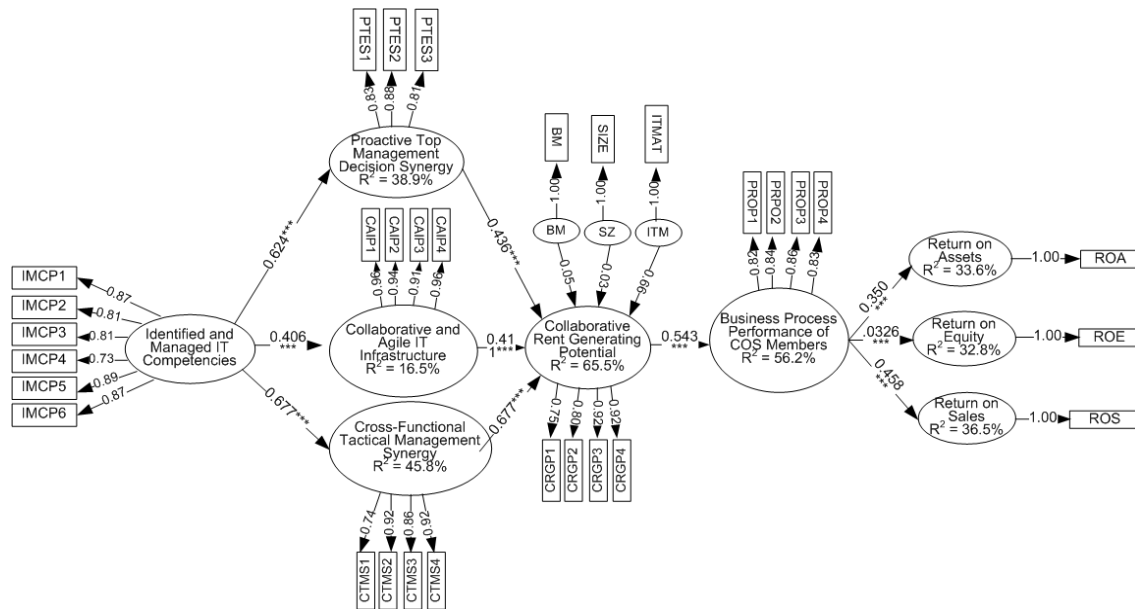

Figure 3. Structural Model Fit

5 Discussion

Organizations are engaging in new relationships and new business structures to survive in today's turbulent and competitive environment (Verdecho, Alfaro-Saiz, & Rodriguez-Rodriguez, 2012). Furthermore, organizations are increasingly using IT in a shared environment to collaborate by being part of collaborative organizational structures (COS) (Hung, Chang, Yen, Kang, & Kuo, 2011). In a COS, organizations expect to better use IT than they would on their own. They expect that better understanding the expanded value chain will contribute to their better managing their internal business processes. This outcome is possible because organizations anticipate better collaborative rent, which they can leverage to improve their business processes. However, the strategic necessity of investing in IT (Powell & Dent-Micallef, 1997) means that COS have a similar form and level of IT investment. In this situation, a COS would require IT competencies to leverage IT in unique ways to attain and maintain a level of competitive advantage (Han et al., 2013; Kühnhardt, 2010; Liu et al., 2013; Melville et al., 2004; Powell & Dent-Micallef, 1997).

Because a COS is not an independent organization, its IT competencies result from the synergies of its members' IT competencies. Achieving competitive advantage from invested IT requires members to act proactively to identify and manage their IT competencies. Thus, we suggest that a COS's members that are able to identify and manage their IT competencies will be in a better position to contribute to their COS's IT competencies because the members' appreciating their IT competencies leads to their protecting themselves and ensuring their longevity (Johnston & Vitale, 1988). By its nature, a COS is a

dynamic structure and experiences rapid changes in its organization and expectations. Thus, a COS's members need dynamic IT competencies to leverage the COS's new and changing resources.

With this study, we suggest key IT competencies for COS. However, organizations in their organizational settings ascertain the value of these IT competencies. Organizations anticipate better outcomes by being part of a collaborative setting such as a COS. Otherwise, organizations would have no incentive to incur an opportunity cost in the absence of this benefit. However, ensuring collaborative value at the outset is important in achieving this outcome for a COS's members. For these reasons, we suggest that three COS IT competencies (top management decision synergy, collaborative and agile IT infrastructure, and cross-functional tactical management synergy) contribute to COSs' collaborative rent-generating potential. We found support for these relationships by analyzing our survey data, which is important because COS members anticipate benefits from this aggregate collaborative rent. That is, COS members anticipate that they are able to secure better value from this collaborative rent compared to a similar effort in their organization.

Ultimately, we can expect that a COS's members evaluate their opportunity cost of engaging in one. They anticipate incremental value from their engagement in a COS compared to a similar within-firm efforts. As such, members need to anticipate firm-specific business value from their COS's collaborative rent, which they must do because they are ultimately responsible to their own stakeholders. These stakeholders require their organization to explain what resources they sacrifice against the value they gain from participating in a COS. Thus, we suggest that a COS's collaborative rent-generating potential contributes to the COS's members' business process performance. Furthermore, we suggest that the business process performance of a COS's members contributes to their firm-level return on assets, sales, and equity. Our results suggest that the members are able to leverage the collaborative rent of their COS with improved business processes. This benefit also flows to their overall firm-level performance, evidenced with better returns on their assets, equity, and sales. Overall, this study provides interesting insights on antecedents of IT competencies for a COS, the IT competencies for a COS, and a trajectory of flow of benefits from the leverage of IT with these competencies.

6 Contributions and Directions for Future Research

With this research, we make several contributions to theory and practice. First, we suggest IT competencies for COS to leverage their invested IT. We include ways to identify and manage a COS's members' IT competencies and recognize the synergies between these IT competencies to develop IT competencies for the COS. Second, we suggest ways to measure the effectiveness of a COS's IT competencies. In this suggestion, we include a trajectory for assessing value from the COS's collaborative rent-generating potential to the COS's members' business process performance and overall performance. These suggestions present future research with opportunities to apply these concepts in different collaborative settings to suggest and determine the effectiveness of the IT competencies we present. Researchers can consider collaborative rent-generating potential in various related settings to evaluate the initial value of collaborative structures. Even though the study's trajectory for developing and assessing competence is generic, it sets important steps in linking the IT competencies of COS members to a COS's IT competencies. Future research could consider ways to manage specific IT competencies and how these specific IT competencies relate to a COS's specific IT competencies. Researchers also have opportunities to adopt an interpretive design to obtain a deeper understanding of leveraging IT in a specific COS setting. Furthermore, future research could also consider how the collaborative rent-generating potential relates to specific business process performance and then to overall firm-level performance.

Third, in this study, we blend arguments of various theoretical perspectives and present a set of arguments that provides a guide for developing competencies from in a within-organization setting to an across-organization setting. We blend various resource-related theoretical views to consider organizational resources in a holistic environment. This effort presents future research with opportunities to better understand various organizational resources and the ways in which the understanding and combinations of these resources could benefit various organizational settings.

For practice, the findings imply that organizations need to be proactive and resourceful when collaborating with other organizations. Organizations should contribute to the capacity of a collaborative structure to later source firm-specific values from these structures. A member's capacity to contribute to a collaborative structure depends on how well it understands the eventual successful mechanics of the

collaborative structure. As such, members need to carefully evaluate their decisions to engage in collaboration to ensure their anticipated outcomes. Organizations should often make such evaluations to ensure they reap continuous benefits from their COS.

7   Limitations

This research has several limitations. As we indicate in Section 2, we suggest a generic trajectory of developing competence and assessing value for a COS. Thus, we do not suggest specific managed IT competencies that contribute to a COS's specific IT competencies. This may limit the study's rigor to some extent. However, the generic arguments are consistent with the theory and do appropriately inform the path of competence development in a COS setting. We employ generic perceptive measures for collaborative rent-seeking behavior because it suggests a model that one can apply to various collaborative settings. While well validated, inherent bias may exist in these measures of collaborative rent-seeking behavior. Tangible and published measures of collaborative rent-seeking behavior would be appropriate. Focus on a specific type of COS that may relate to a specific industry or a group of products could address this issue, but such a study may limit the findings' external validity. We tested for various biases and did not find any issues. However, while we made every effort to address biases associated with the survey research design, some bias inherently exist, which means readers should exercise some caution when interpreting our findings. The study's survey response rate was 19.26 percent, which is acceptable for mid- and top management as potential respondents (Jeffers et al., 2008; Ray et al., 2005) but may limit the validity of the findings. Moreover, we combined the concepts of collaborative IT infrastructure and agile IT infrastructure into a single discrete construct, which is a potential limitation of our proposed model. While these concepts have significant synergy, future research could evaluate these concepts individually to provide better insights on their contribution towards the collaborative rent-generating potential. Finally, while we received responses from organizations representing several industries, technology firms were not strongly represented. Technology firms engage in significant upstream and downstream collaboration and play a key role in facilitating collaboration between organizations. The absence of responses of these organizations in the dataset may have some influence on the extent of association between COS competencies and members' business value.

8   Conclusion

Research on ways to leverage and value IT need to be proactive. Organizations will continue to use IT in new and dynamic ways. The recent shift into cloud computing service is one example of this radical use of IT in a different setting. Of course, stakeholders will continue to question the value of IT in organizations. Most of these questions arise because much of IT investments' business value is intangible. However, researchers and others have adequately established IT's importance to organizations. Our efforts must continue to address the "how" and "where" questions relating to IT. With this study, we progress our understanding in that direction. We present a trajectory for developing IT competence to effectively use IT in a COS setting. It also suggests ways to value the benefits of using IT in the COS and ways to value its members. The study's outcomes provides organizations with confidence in how they use IT. Importantly, we add an important body of knowledge on how IT could be effectively leveraged and on its subsequent value evaluated in the changing business structures.

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