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Capabilities that enhance outcomes of an episodic supply chain collaboration

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ABSTRACT

Firms are increasingly dependent on the knowledge and expertise in external organizations to innovate, problem-solve, and improve supply chain performance. This research examines two capabilities that enable firms to collaborate successfully as a means to combine knowledge and expertise in an episodic collaboration initiative. Building from two theoretical foundations, the knowledge-based and relational views of the firm, we examine the effects of absorptive capacity and collaborative process competence on the outcomes of an episodic collaboration initiative. Using structural equation modeling, we empirically validate the positive effect of absorptive capacity, collaborative process competence and level of engagement on the operational and relational success of a collaboration effort. Results show that collaborative process competence mediates the relationship between absorptive capacity and collaborative engagement, and positively influences both operational and relational outcomes. Finally, we offer suggestions for managers to improve the effectiveness of inter-firm collaboration initiatives and discuss future research opportunities.

1. Introduction

Over the past decade, collaboration has risen in importance with the push to develop core competencies and strategic capabilities within the firm, while outsourcing everything else (Gottfredson et al., 2005). Collaboration with suppliers, customers and even competitors to co-create solutions to problems is increasingly important to a firm's business strategy and a source of competitive advantage (Vargo and Lusch, 2004). We view collaboration as a mechanism to combine and deploy external and internal knowledge and skills, and examine two capabilities (absorptive capacity and collaboration process competence) that influence the operational and relational outcomes of such collaborations.

Historically, collaboration research has focused on long-term collaborative relationships that are strategic in nature such as alliances and partnerships. Dyer and Singh (1998) suggested firms who invest in long-term relationships to combine resources in unique ways could realize a competitive advantage and accrue "relational rents." Paulraj et al. (2008) suggested a long-term relationship orientation is an antecedent to building relational competencies that improve collaborating firms' performance. Yet many collaboration efforts are episodic in nature, focused on an episodic initiative, with a defined beginning and end, occurring in a limited timeframe, and taking place between specific organizations or teams within firms.

In today's dynamic environment, firms embedded in a "virtual" network or a supply chain must collaborate with other firms to pursue episodic initiatives, whether or not a formal alliance or long-term relationship exists. Resolution of a significant quality problem, supply chain network redesign, contingency planning, or a new product launch are examples of episodic initiatives that may require collaboration outside a formal alliance or long-term collaborative relationship. In some cases, for example customizing and implementing an information system, designing and building a facility, or developing an environmentally friendly recycling process, collaboration with firms not integral to ongoing supply chain processes may be required.

Based on our review of the literature and preliminary interviews with a number of firms, we concluded that when companies face unique or complicated challenges within the supply chain, they are often dependent on an episodic collaboration as a means to combine internal and external skills and knowledge for successful resolution (Fig. 1). In such situations, they are likely to engage intensely with another firm. We also identified absorptive capacity and collaborative process competence as internal capabilities that influence collaboration success. Firms with high levels of

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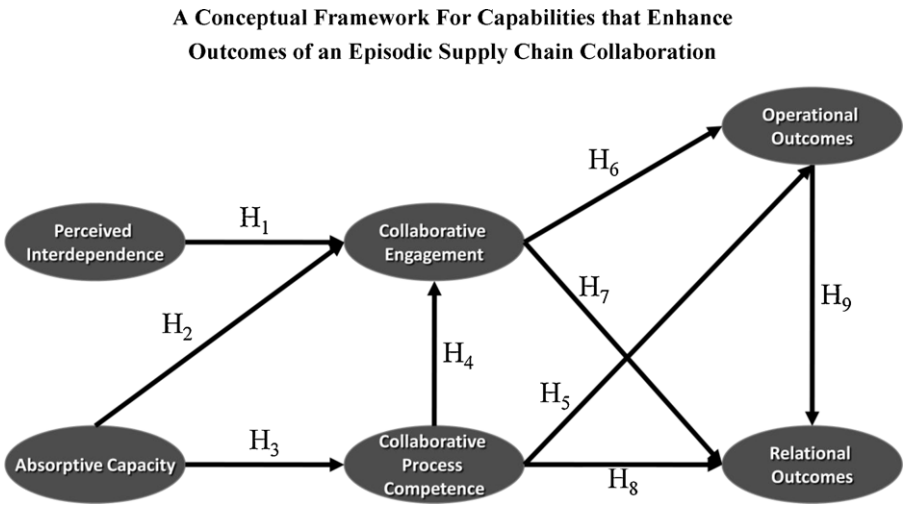

Fig. 1. A conceptual framework for capabilities that enhance outcomes of an episodic supply chain collaboration.

absorptive capacity are more likely to recognize the opportunity to benefit from external knowledge and engage intensely in collaboration efforts to capitalize on that knowledge. They are also likely to learn from previous collaborations and develop basic competencies (collaborative process competence) required to manage the process well. As a result, they achieve better outcomes, both operationally and in terms of the relationship with their collaboration partner.

This research makes several empirical contributions to existing literature. First, we developed and empirically validated a comprehensive model of an episodic collaborative initiative. Prior research has focused primarily on long-term collaborative relationships. However, knowledge and expertise required for many improvement initiatives reside in organizations outside a firm's existing relationships. We provide empirical support for the importance of episodic collaborations, and examine critical capabilities required to ensure success. In addition, while researchers have recognized perceived interdependence as an antecedent to long-term collaborations, we empirically validated the role of perceived interdependence as an antecedent to an episodic collaborative engagement.

We also identified and validated the importance of two capabilities to collaboration success (absorptive capacity and collaborative process competence) and their effects on the relational and operational outcomes of an episodic collaborative initiative. We identified, operationalized, and validated *collaborative process competence* as a critical capability with a direct positive effect on the degree to which firms engage in a collaboration effort and the outcomes of the collaborative initiative. We found the effect of *absorptive capacity* in a collaborative initiative is mediated by collaborative process competence, providing empirical support for the premise that absorptive capacity enables the development of other context specific capabilities that can yield a competitive advantage (Kale et al., 2002).

Finally, our results provide strong empirical evidence of the contribution of episodic collaborative efforts to performance in a wide range of types of collaboration and in multiple industries. The empirical validation of these relationships demonstrates the importance of collaboration as a means of accessing, synthesizing, and deploying knowledge to improve performance.

The theoretical background and hypotheses for this research are discussed in Section 2. Section 3 describes the research method and data collection, Section 4 presents the analysis and Section 5, the results. Section 6 discusses managerial and theoretical implications, and Section 7 points out the limitations of this research and opportunities for future research.

2. Theoretical background and hypotheses

2.1. Knowledge based view and relational view

The increasing importance of inter-organizational relationships has led to the development of a wide range of theories in a number of disciplines to explain the formation of collaborations. The two theories that provide the theoretical foundations for this research are the knowledge-based view (KBV) and the relational view (RV).

The knowledge-based view of the firm, an outgrowth of the resource-based view, suggests knowledge is the most strategically important of a firm's resources (Conner, 1991; Grant, 1996; Spender, 1996). KBV suggests the role of the firm is to create, acquire and deploy organizational knowledge that leads to superior performance (Spender, 1996; Nonaka, 1994). Dyer and Singh (1998) noted the importance of customers and suppliers as sources of external knowledge that complement an organization's own internal knowledge.

Knowledge itself can be delineated in many ways, but the most common distinction is between explicit knowledge (know what—facts and theories that can be codified) and tacit knowledge (know how—knowledge that can only be observed through application and acquired through practice) (Grant, 1996). Explicit knowledge can be articulated and easy to transfer while tacit knowledge is difficult to articulate and very slow, costly or uncertain to transfer (Kogut and Zander, 1992). Tacit knowledge produces more sustainable advantages, since it is difficult to imitate, and the process of accumulating and leveraging knowledge is more likely to create new sources of advantage (Choo et al., 2007).

Grant and Baden-Fuller (1995) noted collaborations may exist to exchange and integrate knowledge between buyers and suppliers when products are highly complex and knowledge is "imperfectly embedded" in the product exchange. In many interactions between firms, the exchange of explicit knowledge is required, and accomplished with very little collaboration. For example, a buying firm may request a change in package size, ship date, order quantity, or transportation mode in order to meet changing demands from their customer. While the buyer is dependent on the supplier to solve the problem, the solution is relatively straightforward, requiring only a simple exchange of information with a sequential or reciprocal response by the supplier firm (Thompson, 1967).

However, when firms work together to address more complicated issues, tacit knowledge critical for success is likely to reside in both organizations. In such cases, the firm may not be able to access knowledge and skills through "market transactions" (Grant and Baden-Fuller, 1995), requiring more active involvement between the firms. For example, new product development is knowledge-intensive work that requires rich interactions among intra- and inter-organizational networks (Hong et al., 2005).

The relational view of the firm suggests that idiosyncratic inter-firm linkages are an important source of competitive advantage (Dyer and Singh, 1998). Relational rents, defined as "supernormal profits jointly generated in an exchange relationship that cannot be generated by either firm in isolation," (Dyer and Singh, 1998), are generated through the combination of idiosyncratic assets, knowledge, and capabilities of the firms. When firms interact in a way that facilitates a combination of knowledge stocks and coordinated action (Dyer and Singh, 1998), the synergistic effect of combined resources can be a source of competitive advantage.

RV theory has historically focused on strategic alliances and long-term relationships. A logical extension is the application of RV theory to episodic collaborations. Unique problems or initiatives that must be addressed on a one-time basis in a limited timeframe may require knowledge and resources beyond the firm and beyond existing relationships. Organizations that can access and deploy knowledge and capabilities through such collaborations are likely to realize greater success.

2.2. Perceived interdependence

Organizations perceive they are interdependent when neither organization entirely controls all of the conditions necessary to achieve desired outcomes (Handfield and Bechtel, 2002). As a greater percentage of product value is completed outside the firm, there is a greater need to integrate activities across partners and supply chains to more effectively deliver products (Frohlich and Westbrook, 2001; Das et al., 2006). Thompson (1967) identified three types of interdependence—pooled (units act independently), sequential (units act in sequence), and reciprocal (unit a affects unit b and unit b affects unit a). Van de Ven et al. (1976) identified a fourth type of interdependence—team interdependence (both units act jointly and simultaneously). A low level of interdependence (pooled and sequential) requires little interaction during task performance, while a high level of interdependence (reciprocal and team) requires more emphasis on joint problem solving and communication during the task activity (Daft and Lengel, 1986). Perceived interdependence, or the perception firms need each other to perform their work and reach certain outcomes (Nauta and Sanders, 2000), can be a driver for achieving fruitful strategic partnerships (Mentzer et al., 2000).

When organizations perceive they are dependent on each other to achieve a successful outcome, they are much more likely to engage intensely. For example, Stock and Tatikonda (2008) found when there is a large gap between the information needed to acquire and implement a new technology and the information existing within an organization, firms engage with a high degree of inter-organizational interaction. In such cases, firms recognize the need to do more than simply acquire knowledge from the other firm and apply it. Rather the two organizations must make joint decisions based on their combined knowledge and act in concert to execute a common solution. Thus, firms recognize the need for engaging intensely in the collaboration.

2.3. Collaborative engagement

A firm's involvement in a collaboration effort can be strong or weak, which we define as the level of collaborative engagement. Kanter (1994) describes strong collaborations as those characterized by high levels of commitment, numerous joint activities, overlapping operations and relationships that cause changes in each other's organization. Intense collaborations require a commitment of time and resources on the part of each firm and are exemplified by open sharing of information and ideas, openness to new ways of thinking and doing things, and a joint decision-making process (Lee and Choi, 2003; Lejeune and Yakova, 2005).

Close, functionally interdependent relationships in which firms strive to create mutually beneficial outcomes for all participants facilitate high levels of engagement in an interfirm collaboration (Jap, 2001). High levels of perceived interdependence encourage a willingness to commit resources, meet frequently, negotiate functional transfer, share key information, and participate in rich information exchange and joint operational planning (Van de Ven et al., 1976; Dutton and Duncan, 1987; Heikkila, 2002; Sheu et al., 2006). Therefore, we hypothesize:

H_1. The level of perceived interdependence between firms is positively related to the level of collaborative engagement.

2.4. Organizational capabilities that enable successful collaboration

Researchers have recognized capabilities as an important source of an organization's operational strengths and competitive performance (Flynn and Flynn, 2004; Peng et al., 2008). Rosenzweig and Roth (2007) suggest competencies represent a bundle of tangible and intangible assets and resources that work together to create competitive capabilities. Ethiraj et al. (2005) focused on capabilities as information-based tangible or intangible processes embedded in a firm's human capital and developed over time through "learning by doing". For this research, we adopt this conceptualization and focus on two organizational level capabilities that contribute to the success of episodic collaboration initiatives—absorptive capacity (AC) and collaborative process competence (CPC).

2.4.1. Absorptive capacity

Absorptive capacity is an organizational capability defined by Cohen and Levinthal (1990) as a firm's ability to recognize the value of new external knowledge, assimilate it, and apply it to commercial ends. Firms with greater absorptive capacity are better positioned to learn from their partners to gain and sustain a competitive advantage (Barringer and Harrison, 2000; Zahra and George, 2002). Tu et al. (2006) defined AC as the organizational mechanisms that identify, communicate and assimilate relevant external and internal knowledge. We focus on AC as the capability to recognize and take advantage of new ideas, willingness to adopt new ideas and adapt to change, and commitment to create an environment that encourages new ideas. When organizations have the capability to access new ideas and adapt, they are more likely to invest time and resources to engage with external firms in anticipation that there is a significant return on that investment. Learning curve principles suggest that as firms get better at recognizing valuable knowledge and putting it to productive use, the cost incurred to access and deploy relevant knowledge will decrease. Firms become more confident in their ability to use the new knowledge and, as a result, more willing to engage deeply with other firms in knowledge sharing. Therefore, we hypothesize:

H_2. The level of absorptive capacity is positively related to the level of collaborative engagement in an episodic collaborative initiative.

2.4.2. Collaborative process competence

Today's increased emphasis on core competencies and specialized knowledge suggests that firms do not want to acquire (possess)

all of the knowledge needed for success. In a rapidly changing environment, firms have to decide what knowledge they need to access through others and what knowledge they need to possess. Instead of acquiring knowledge (learning) from its partner and solving a problem unilaterally, a firm may collaborate to access a partner's knowledge stock in a joint problem-solving process and apply the combined knowledge to exploit complementarities (Grant and Baden-Fuller, 2004) without fully absorbing the knowledge internally. This suggests the need for additional competencies to manage the collaboration process.

Ethiraj et al. (2005) argue that capabilities are often context-specific and can have a differential impact on performance. Absorptive capacity is a capability broadly applicable to multiple contexts, and can be a mechanism to develop other context-specific capabilities (Zahra and George, 2002). We identified a second capability (collaborative process competence) focused specifically on managing the collaboration process, from partner and participant selection, to facilitation of knowledge exchange and synthesis, to monitoring and adjusting the process for timely and successful completion.

Lambe et al. (2002) conceptualized alliance competence as an organizational ability to effectively deploy interfirm resources, which is enhanced by alliance experience and alliance manager development capability. Relational rents can be accrued when firms have the ability to identify and evaluate potential complementarities and effectively govern the relationship (Dyer and Singh, 1998). Firms with superior skills, knowledge, and ability to create and sustain fruitful cooperative arrangements with partners have a significant edge over their competitors (Day, 1995; Prahalad and Hamel, 1990).

Competent alliance managers can (1) recognize, select, and negotiate with potential partners, (2) manage interactions such that roles and responsibilities are clear, (3) work with their partner to combine and synthesize complementary knowledge and resources, (4) resolve conflicts that arise as part of the interaction, and (5) monitor the process and make adjustments if things are not moving in a positive direction. Since much of the knowledge required to find, develop, and manage alliances is tacit, learning through experience is a critical aspect of developing an alliance competence. Lambe et al. (2002) suggest that alliance management competencies are so dependent on learning from experience that firms should expect initial attempts to fail.

Similarly, organizations can develop a competency that enables them to manage an episodic collaboration initiative more efficiently and effectively (collaborative process competence). As with alliance competence, collaborative process competence reflects the firm's ability to select appropriate partners, establish processes to monitor and manage the initiative, and resolve conflicts and differences of opinion as they arise. Successful collaboration is dependent on the individuals involved, so selecting individuals who bring the required expertise is an essential component of CPC. Kale et al. (2002) noted that organizations develop capabilities based on day-to-day experience. As managers learn from experience how to select appropriate partners and participants, facilitate the exchange and synthesis of relevant knowledge, resolve conflict, and enable joint decision-making, they are able to manage the collaborative process more efficiently and yield better results.

We argue that absorptive capacity, or the ability to acquire, assimilate, and exploit "know-how" gained from previous collaboration efforts, will enable a firm to develop and nurture a strong collaborative process competence (Kale et al., 2002). AC enables recognition and utilization of relevant knowledge to improve the collaborative process over time, while CPC enables the process of sharing relevant information, managing conflict, assessing options, jointly making decisions, and combining resources to accomplish objectives in a collaborative way. Firms with high levels of absorptive capacity would be better at learning from experience how to manage conflict, ensure a collaborative initiative remains focused, and improve processes for monitoring progress and making needed adjustments to improve outcomes. Therefore, we hypothesize the following:

H_3. The level of absorptive capacity is positively related to the level of collaborative process competence.

2.5. Outcomes of an episodic collaborative initiative (operational and relational outcomes)

Firms primarily enter into collaborations with other firms for the express purpose of improving performance and gaining competitive advantage (Day, 1994; Jap, 1999). Often, the success of an episodic collaboration initiative is measured in terms of tactically oriented project objectives, such as project schedule or budget performance (Stock and Tatikonda, 2008). However, the decision to invest time and resources in any collaborative initiative is based on the desire to achieve larger organizational objectives, such as improving product quality, reducing process cycle time, or improving customer value (Koufteros et al., 2002; Rosenzweig et al., 2003; Swink et al., 2006). Achieving these objectives will ultimately contribute to the bottom line performance of the firm (Carr and Pearson, 1999; Frohlich and Westbrook, 2001).

Collaborative process competence would directly influence both the level of engagement and the operational outcomes of the collaboration initiative. When organizations assign individuals who bring relevant knowledge and are open to new ways of thinking to participate in a collaboration initiative, they encourage the willingness of both parties to engage in open and honest communications. Firms with high levels of CPC will select partners and individual participants who will work collaboratively to combine knowledge and skills to improve operational outcomes, as well as to establish trust and openness in the exchange. Additionally, organizations with good processes in place to manage the initiative will encourage systematic information exchange and effective analysis and decision-making, thus encouraging all participants to focus their efforts and engage seriously in the process.

At the same time, firms who recognize potential partners with which they can work effectively, or who bring needed expertise to the effort, are likely to generate higher relational rents. As conflicts arise between firms, organizations that have better processes to recognize competing objectives and work to resolve conflicts for mutual benefit will be more successful at finding good solutions. Monitoring and managing the process to resolve conflicts as they arise and keep the process focused on key issues will likely yield quicker and better results. Finally, selecting the appropriate people to represent the organization ensures relevant knowledge and experience are considered, resulting in more effective decisions. Therefore, we hypothesize:

H_4. The level of collaborative process competence is positively related to the level of engagement in an episodic collaborative initiative.

H_5. The level of collaborative process competence is positively related to the operational outcomes of an episodic collaborative initiative.

The level of collaborative engagement between the organizations also directly affects outcomes (Oke et al., 2008). By openly sharing information and exchanging ideas, firms are able to capture and combine the best ideas and learn from the experience and expertise of both firms. By capitalizing on the combined experience

of both parties, collaborations can help reduce errors, defects or flaws in design or execution, leading to improved operational performance. As collaborating firms share relevant information, each gains a better understanding of the issues, the possible solution set is broadened, and the potential for successful resolution is strengthened. As a result, collaborating firms would be more successful in implementing a solution that contributes to the operational performance of their business through improvements in quality, cycle time, and/or customer value. Therefore, we hypothesize the following:

H_6. The level of engagement in an episodic collaborative initiative is positively related to the operational outcomes.

A collaboration between firms affects not only operational outcomes, but also relational outcomes such as trust, credibility and relationship effectiveness. Trust, an important part of interorganizational relationships (Kumar et al., 1995; Doney and Cannon, 1997), is made up of two elements—belief in a partner's credibility or reliability (partner will stand by their word and obligations) and belief in a partner's benevolence (partner is interested in the firm's welfare and will not undertake actions that negatively affect firm). When firms collaborate intensely, they demonstrate a commitment to each other that nurtures an atmosphere of trust. They also openly share information that allows their partner to better understand their motivations, predict their actions and demonstrate a desire to help the other firm. As a result, the trust between the two firms is enhanced.

Credibility is the belief that a trading partner is expert and reliable (Siguaw et al., 1998), has needed skills and capability, and can be counted on to contribute to collaborative efforts. When firms collaborate intensely, each firm demonstrates to the other its expertise, capabilities, and reliability. The greater the interaction between firms, the more likely they will be able to see and appreciate their collaboration partner's skills and capabilities.

Relationship effectiveness focuses on the productivity of the interactions between different functions in an organization (Fisher et al., 1997). Research has shown that improved communication flow influences relationship effectiveness (Stoel, 2002). Intense collaborations with frequent and open communications contribute to firms' understanding of each other, as well as their ability and willingness to work together. The result is greater commitment and solidarity between the firms.

Relational outcomes such as trust, credibility and relationship effectiveness are frequently viewed as antecedents to successful collaboration. While they will no doubt influence a collaboration effort, these relational dimensions are not inherent to a relationship, but rather develop over time based on experience. These relational outcomes are enhanced or diminished based on the strength of a firm's contribution to the collaboration effort. As firms share vital information, work to find mutually beneficial outcomes, and learn from each other, they are likely to build stronger connections and improve their ability to work together (relational effectiveness). Therefore, we hypothesize the following:

H_7. The level of engagement in an episodic collaboration initiative is positively related to the relational outcomes.

The collaboration process would also affect relational outcomes. Firms with high levels of collaborative process competence are more likely to manage the process well, ensuring all participants have the opportunity to share relevant information, yet avoiding wasted time and energy on unproductive activities. Having learned from prior experience, companies with high levels of CPC are more likely to recognize issues and conflicts early on and resolve them. Engaging individuals who listen to the input of others without exhibiting the "not invented here syndrome" will result in the partner firm feeling listened to and appreciated. Managing the process effectively demonstrates positive intent and organizational capability that will enhance a firm's credibility and trustworthiness in the eyes of its partner. As a result, collaborating firms are more likely to develop mutual trust, credibility, and improved effectiveness in the relationship. Therefore, we hypothesize the following:

H_8. The level of collaborative process competence is positively related to the relational outcomes of an episodic collaborative initiative.

Operational outcomes of the collaboration will also influence relational outcomes. Firms that achieve the desired results are much more likely to trust their collaboration partner and view them as credible and reliable. Improvements in performance support the building of trust that leads to "partnership-like relationships" (Goffin et al., 2006). The successful outcome of the collaboration would serve as a tangible demonstration of the skills and capabilities of the partner firm and lead to a view they are credible and can be trusted in the future. Conversely, if a firm openly shares information and invests time and resources, but gains little in terms of performance improvement, there is a high likelihood the belief in the capabilities and credibility of the partner firm will be diminished. Therefore, we hypothesize:

H_9. The level of operational outcomes is positively related to the relational outcomes of an episodic collaborative initiative.

3. Research method and data collection

3.1. Measure development and pretesting

A survey research design following the total design method (Dillman, 1978) was used to collect the data and test the nine hypotheses. Multi-item measures were developed or adapted to evaluate the constructs (Churchill, 1979; Gerbing and Anderson, 1988). Scale development followed procedures and guidelines recommended by Churchill (1979) and Gerbing and Anderson (1988). In most cases, established scales were adopted directly or modified slightly to measure each of the constructs (Appendix A). The preliminary survey was reviewed by 23 mid- or senior-level supply chain managers for ambiguity, readability, and clarity. Four academic experts reviewed the survey for representativeness, item specificity, content validity, and face validity. Based on feedback from both practitioners and academics, some items were rewritten or eliminated.

3.2. Sample frame

Our target sample frame was experienced supply chain managers who deal with competitors, customers and/or suppliers on a regular basis. To ensure generalizability of results, respondents from multiple industries, functions and levels in the organizations were included in the sampling frame. A list of 5000 contacts in construction, manufacturing, transportation, communication, wholesale and retail trade industries was obtained from the Institute of Supply Management (ISM). A second list of 5160 contacts was obtained from a private U.S. university's supply and value chain center, resulting in a total of 10,160 potential respondents. A market research firm was contracted to phone a randomly selected sub-set of potential respondents and pre-qualify them based on their experience with collaboration. To ensure consistency in the data, at the beginning of the survey we provided our definition of a collaboration and identified five criteria the collaboration should meet (Appendix B). To ensure respondents focused on an episodic initiative with a defined end point, we asked them to reflect on a collaboration at or near completion. To encourage a wide range of

responses, respondents were asked to reflect on either a successful or unsuccessful collaboration. We also asked them to describe the nature and scope of their collaboration project at the beginning of the survey.

The survey was pre-tested with 237 qualified respondents. From this group, 60 surveys were submitted for a response rate of 25.3%. Using the data from the pre-test and conducting principal factor and reliability analyses, it was determined the items all loaded correctly on their respective constructs and all measures were reliable with a Cronbach's alpha of over 0.70. Therefore, no changes were made to the survey and the pretest data and final test data were combined for the analysis. A total of 1037 respondents were pre-qualified and 519 completed surveys were received. After duplicates and incomplete surveys (surveys with less than 90% complete) were eliminated, 473 useable surveys remained (effective response rate of 46%). Data from these 473 surveys were used for the subsequent analysis.

3.3. Sample

The potential for non-response bias was tested by comparing early responses (the first 100) to late responses (last 100) for all of the constructs using ANOVA (Armstrong and Overton, 1977). There were no significant differences in item responses across the two survey waves, reducing concern for nonresponse bias as a threat to internal validity (Armstrong and Overton, 1977). An ANOVA test also failed to find any statistically significant differences ($p \leq 0.05$) for differences between the two waves for demographic data such as industry type, number of employees, annual sales and organizational type.

However, considering the limitations with comparing survey waves as a test of selection bias, we also compared our sample demographics to the target sample frame to provide support for the representativeness of our respondents (Mentzer and Flint, 1997). Respondents were highly experienced with over 62% identifying themselves as managers, directors or CEOs. A wide range of industries were represented with no single industry greater than 11% of the sample. The respondents were also widely and equally dispersed in terms of annual sales, number of employees and years of existence. This evidence provides further support that our respondents reflect the target sample frame and population being studied, which limits the potential for selection bias (Mentzer and Flint, 1997).

The survey respondents were highly experienced with collaboration initiatives, with over 61% involved in seven or more collaborations. The majority of the respondents (57%) were from manufacturing organizations and 73% reflected on a customer–supplier collaboration. The majority of the collaboration initiatives (66%) were described as successful while 29% were described as unsuccessful.

The largest categories of collaboration initiatives reflected in this research include new product, service, and packaging development (25%) and process innovation (24%). Other responses focused on supplier development (9%), resolution of a problem (quality, delivery, billing, or product availability) (9%), difficult negotiations with suppliers (7%), efforts to develop or improve a working relationship (7%), and technology implementation (5%). A few examples of specific collaboration initiatives reported on include: (1) design of a standardized packaging solution involving multiple global business units; (2) design and implementation of a collaborative forecasting and planning process; (3) a port expansion to accommodate larger vessels involving shippers, regulatory bodies and numerous other organizations; (4) design and implementation of a contract manufacturing process for assemblies for offshore nuclear plants; and (5) design and implementation of a kanban system with a key supplier.

3.4. Analysis

We used confirmatory factor analysis (CFA) and structural equation modeling (SEM) to test and measure our conceptual framework using survey data. We conducted CFA and SEM analyses using AMOS (4.0) and descriptive analyses using SPSS (12.1). We then used Gerbing and Anderson's (1988) two-step approach (first measurement model and then structural model) to analyze the data.

3.5. Convergent validity

Items that exhibited low item-to-scale total correlations as well as items that did not load significantly to the appropriate constructs in the confirmatory factor analysis were removed (Appendix A). Convergent validity was assessed using standardized parameter loadings of the measurement items on their respective constructs. All standardized parameter loadings were significant (p-value < 0.01) and ranged from 0.55 to 0.94, providing strong support for convergent validity. Composite reliabilities and average variances extracted were calculated using the procedures suggested by Fornell and Larcker (1981). The composite reliabilities, which ranged from .815 to .956 (Table 1), exceeded .70. This implies the variance captured by the factor is significantly more than the variance indicated by the error components.

3.6. Discriminant validity

The overall measurement model provided an acceptable fit to the data ($\chi^2 = 1233.73$, DF = 449, $p < 0.0$, GFI = 0.86, CFI = 0.94, TLI = 0.93 and RMSEA = 0.061). The correlations between the constructs are shown in Table 2. Fornell and Larcker (1981) noted discriminant validity exists if the items share more common variance with their respective construct than any variance the construct shares with other constructs. Therefore, since the average variance extracted for each of the constructs (Table 1) is higher than the squared correlation between that construct and each of the other constructs, discriminant validity is supported.

3.7. Common method variance tests

Common method variance (CMV), identified as a potential problem in behavioral research if the same person is providing data on both the predictor and criterion variables in the same measurement context, can have a serious effect on empirical results (Podsakoff and Organ, 1986). Several steps were taken in the research process to avoid common method bias. First, we prequalified potential respondents to ensure the informants were mid- to senior-level managers with high levels of relevant knowledge (Mitchell, 1994). Second, we assured informants their responses would be kept anonymous (Fugate et al., 2009).

To assess CMV in the data, we conducted a marker variable test using a construct that theoretically should not be related to any of the other constructs in the study (Menon et al., 1996; Lindell and Whitney, 2001). We used the formal agreement (FA) construct developed by Lusch and Brown (1996) that measures the reliance on a formal agreement to handle disagreements (Appendix A). We allowed the six substantive constructs in Fig. 1 to load onto one second-order factor and compared that model to a second model that included the FA construct and allowed FA to load onto the second order factor (Fugate et al., 2009). The first model without the FA construct had a much better fit and all the paths were significant at $p < .001$. In the second model all paths were significant at $p < .001$ except the path to FA ($p = .543$), indicating CMV is not a problem.

Table 1
Construct analysis.

Construct	Mean	Std. dev	Average variance extracted	Composite reliability	Range of factor loadings
Perceived interdependence	5.86	0.913	53.1%	.815	.62 to .79
Collaborative engagement	5.3	1.15	55.2%	.893	.55 to .87
Absorptive capacity	5.55	1.14	76.5%	.942	.81 to .92
Collaborative process competence	5.41	0.942	65.5%	.883	.75 to .85
Operational outcomes	5.52	1.04	59.5%	.880	.70 to .85
Relational outcomes	5.56	1.33	75.7%	.956	.75 to .94

Table 2
Construct level correlation matrix.[a]

Constructs	PI	CE	AC	CPC	OO	RO
Perceived interdependence (PI)	1.00					
Collaborative engagement (CE)	0.520	1.00				
Absorptive capacity (AC)	0.236	0.373	1.00			
Collaborative process competence (CPC)	0.299	0.449	0.784	1.00		
Operational outcomes (OO)	0.293	0.543	0.366	0.435	1.00	
Relational outcomes (RO)	0.331	0.621	0.394	0.506	0.765	1.00

[a] $n = 473$ observations; All correlations are significant at $p < .001$ level.

A second test for CMV was conducted following the procedure recommended by Widaman (1985). Two latent variable models were tested, a measurement model with just the traits and a measurement model including a method factor in addition to the traits (Podsakoff et al., 2003; Ketokivi and Schroeder, 2004; Paulraj et al., 2008). With the inclusion of the method factor, there was marginal improvement in the normed fit index (NFI) by .016, the goodness of fit index (GFI) by .023, and the comparative fit index (CFI) by .014. However, this model accounted for only 15% of the total variance. This is significantly less than the amount of method variance (25%) considered problematic by Williams et al. (1989), and much closer to the 10% considered acceptable by Paulraj et al. (2008). The two models were also not very different in terms of path coefficients and their significance. Based on these tests, it is reasonable to conclude the results were not inflated due to the existence of common method variance in the data.

4. Results

The final structural equation model with standardized regression weights and standardized error, shown in Fig. 2, had the following fit values: $\chi^2 = 1267.63$, DF = 455, normed $\chi^2 = 2.79$, GFI = 0.85, IFI = .93, TLI = 0.93, CFI = 0.93, and RMSEA = 0.062. All hypotheses, with the exception of H_2, were supported at the $P < .001$ level.

Perceived interdependence is recognized as a driver for collaboration in long-term relationships (Daft and Lengel, 1986; Mentzer et al., 2000; Hong et al., 2005). This research examines the importance of perceived interdependence as a driver for an episodic collaborative initiative. The data validates the direct effect of perceived interdependence on the degree to which an organization will engage with another firm and be receptive to the knowledge and skills their partners bring to the process (H_1). This hypothesis was supported by the data (path weight = 0.44).

The results provide support for the importance of the two capabilities examined, AC and CPC, to achieving desired outcomes in a collaborative initiative. However, in H_2 we hypothesized that absorptive capacity (AC) would positively affect the level at which an organization engages in a collaboration. The direct effect of AC on collaborative engagement (CE) was not significant. Consequently, we concluded that CPC fully mediates the relationship between AC and CE. This finding provides support for the view that AC is a capability that enables organizations to develop and nurture additional domain-specific capabilities that can be used to competitive advantage, in this case CPC (H_3—path weight = 0.78) (Tu et al., 2006). The hypothesized positive relationship between CPC and CE (H_4) was also supported by the data (path weight = 0.31).

The relationship between collaborative process competence and operational outcomes (H_5) was also found to be significant (path weight = .25). This supports the premise that as firms become more competent at managing collaboration initiatives, the solutions developed and implemented yield better results. As firms get better at selecting a partner that brings the best information and expertise to the table, and at reducing wasted time and effort in the process, performance is improved and results achieved more quickly.

A greater direct effect on operational outcomes comes from the openness and willingness of firms to engage in information sharing, knowledge exchange, and idea generation. Collaborative engagement directly and positively affects the operational outcomes of the effort, in terms of both the efficiency (quicker project results) and effectiveness (better customer service, improved quality, lower costs) of the effort. (H_6). This relationship was found to be significant with a path weight of .43. Firms engage because they need the knowledge and expertise of the other firm, but must be willing to openly exchange ideas, consider different approaches, and collectively make sound decisions to capitalize on that knowledge.

CE also directly affects the relational outcomes of the effort (H_7). As firms engage openly and jointly make decisions focused on improving the performance of both firms, the respect, honesty, and productiveness of the relationship is improved, and a willingness to collaborate in the future is developed. Nyaga et al. (2010) found that in a long-term relationship, relationship effort (working together on teams, joint planning, and joint decision-making) positively affects trust in the relationship, but not long-term commitment. Because this research focused on an episodic collaborative initiative, rather than a long-term relationship, we did not incorporate long-term commitment into our measure of relationship quality, but rather a general commitment to work together in the future. Thus, our results do not seem contradictory to their findings.

CPC also has a direct effect on the relational outcomes of the process (H_8—path weight = .15). While the effect of CPC on relational outcomes is not as strong as that on operational outcomes, this does suggest organizations that manage conflict well, monitor progress, and effectively manage the engagement can build a more trusting and credible relationship with their collaboration partners. While achieving results is critical to the quality of the relationship,

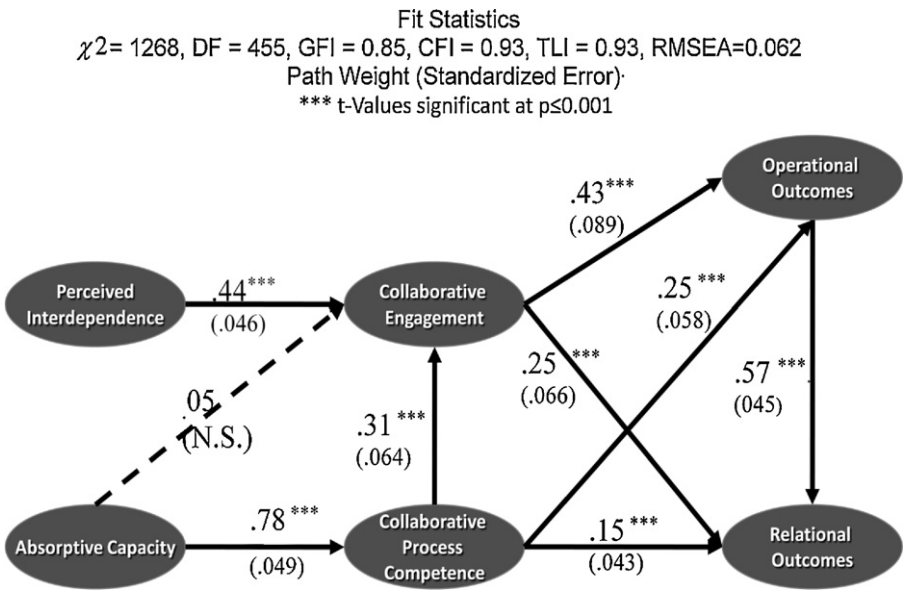

Fig. 2. Final structural model.

this suggests demonstrating positive intent will also strengthen the relationship between firms.

An interesting finding from the research is the effect of operational outcomes on relationship quality (H_9), with a path weight of .57. In hindsight, it is intuitively obvious that a successful collaboration will improve the relationship with the partner firm. However, a great deal of emphasis has been placed on how firms work together (collaborative engagement) as the primary driver of the trust and commitment in the relationship, with the expectation that greater trust and commitment will positively influence performance (Nyaga et al., 2010). Our results suggest that the performance improvements that result from a collaboration may be the most significant factor influencing the trust and commitment in a collaborative relationship. This implies that as conflicts arise, a resolution focused on results rather than on protecting the relationship or not offending others may result in a stronger relationship in the end.

4.1. Competing models

When using structural equation methodology, it is common practice to compare the proposed model to other models to clearly determine which model fits the data best (Paulraj et al., 2008; Bollen and Long, 1992). We compared our proposed model to three rival models to validate the proposed model is the best fit. In our proposed model (Model 1), CE and CPC fully mediate the relationship between PI and AC and operational and relational outcomes. Since perceived interdependence and absorptive capacity have both been linked to competitive advantage (O'Keeffe, 1998; Zahra and George, 2002), a second direct model was tested in which PI and AC, along with CPC and CE, are directly linked to operational and relational outcomes (Model 2). A third partial mediation model, was tested where we took model 1 and added direct paths from PI and AC to operational and relational outcomes (Model 3). The final model tested was CE and CPC as antecedents to PI and AC (Model 4) to determine if collaborative engagement or collaborative process competence will lead to perceived interdependence and/or strengthen an organization's absorptive capacity.

To determine which of the models provide the best fit, the criteria identified by Paulraj et al. (2008), are used. The criteria include overall model fit (NNFI > .90, CFI > .90, RMSEA < .08), statistically significant parameters, squared multiple correlations (SMCs, better closer to 1), parsimony (RMSEA < .08, PNFI, better closer to 1) and Akaike's information criterion (the smaller the better the model).

As shown in Table 3, the proposed model (Model 1) fits the data well considering the model fit indices (CFI NNFI, RMSEA) are well within acceptable ranges. The AIC and CAIC are the smallest of the four models and the explanatory power of the outcome variables (SMC) is larger than the other models. Eight of the nine hypotheses are significant at $p \leq 0.001$. The direct model (Model 2) has unac-

Table 3
Results of structural equation modeling of competing models.

	Proposed model Model 1	Direct model Model 2	Partial mediation Model 3	Rival model Model 4
PI to CE	.44***		.44***	
AC to CE	.06*		.06*	
AC to CPC	.78***		.78***	
CPC to CE	.31***		.31***	
CPC to OO	.25***	.20	.21**	
CE to OO	.43***	.46***	.43***	
CE to RO	.25***	.27***	.25***	
CPC to RO	.25***	.18***	.20**	
OO to RO	.57***	.58***	.57***	.68***
PI to OO		.02*	.00*	.26***
PI to RO		.01*	−01*	.13***
AC to OO		.08*	.04*	.31***
AC to RO		−.02*	−.06*	.13***
PI to CPC				
CE to PI				.52***
CE to AC				.08**
CPC to PI				.10**
CPC to AC				.77***
Model fit statistics				
χ^2	1267.63	1775.08	1266.42	1450.93
d.f.	455	455	451	455
CFI	.933	.892	.933	.918
NNFI	.900	.860	.900	.886
RMSEA	.062	.078	.062	.068
PNFI	.826	.789	.819	.812
AIC	1413.63	1921.08	1420.42	1596.93
CAIC	1790.25	2297.69	1817.67	1973.54
SMC (OO)	.319	.257	.319	.185
SMC (RO)	.646	.612	.649	.603

* Non-Significant.
** t-Values significant at $p \leq 0.05$.
*** t-Values significant at $p \leq 0.001$.

Table 4
Direct and indirect effects.

Constructs	Collaborative engagement	Operational outcomes	Relational outcomes
Absorptive capacity			
Total Effect	0.301[a]	0.321	0.372
Direct Effect	0.055[a]	–	–
Indirect Effect	0.246	0.321	0.372
Perceived interdependence			
Total Effect	0.439	0.188	0.216
Direct Effect	0.439	–	–
Indirect Effect	–	0.188	0.216
Collaborative process competence			
Total Effect	0.314	0.380	0.440
Direct Effect	0.314	0.246	0.146
Indirect Effect	–	0.135	0.295
Collaborative engagement			
Total Effect	–	0.429	0.492
Direct Effect	–	0.429	0.247
Indirect Effect	–	–	0.245

All these indirect effects are significant at $p = 0.01$ using a 95% confidence interval and bootstrapping in Amos.

[a] This is not significant.

ceptable fit indices, the highest AIC, CAIC, the lowest PNFI and SMC, and three non-significant paths suggesting Model 2 is unacceptable. The partially mediated model (Model 3) has acceptable fit indices, low AIC, CAIC and SMC comparable to Model 1. However, 5 of the 13 paths are non-significant and when the non-significant paths are removed, you are left with Model 1. Since Model 1 is nested within Model 3, it is also useful to do χ^2 difference test (Rust et al., 1995) to determine which is better. The χ^2 difference when comparing the full and partial mediation model was not statistically significant ($\Delta\chi^2 = 1.216$, d.f. = 4, $p = .875$), suggesting the proposed model fits as well as the less restrictive partial mediation model. The fourth rival model (Model 4) had acceptable CFI and RMSEA, but low NNFI. The SMC was the lowest of all four models, suggesting poorer explanatory power. The PNFI was lower than Model 1 and AIC and CAIC were much higher than Model 1, again suggesting this model is not as parsimonious as Model 1. These results support the proposed model as the model that best fits the data.

5. Discussion

Historically, relational research has focused on leveraging long-term alliances through knowledge transfer (e.g. supplier training) (Johnson et al., 2007) or knowledge acquisition (Mesquita et al., 2008) that enhance internal capabilities. Yet in today's world of outsourcing non-core competencies, firms may need to leverage relationships to utilize knowledge they do not want to acquire or retain in-house. Rather, the ability to combine internal and external knowledge and skills becomes critical. Opportunities to collaborate may arise within or outside existing long-term relationships. Innovations in information systems or new technologies that offer unique opportunities for improved performance may come from companies outside existing networks. In either case, the ability to successfully engage in a collaborative initiative that provides access to necessary knowledge and skills to address a specific issue, without assimilating that knowledge internally, is becoming increasingly important to companies.

The purpose of this research was to identify and empirically validate capabilities critical to episodic collaboration success. Specifically, we validated the importance of absorptive capacity and collaborative process competence as important capabilities for successful collaboration. Absorptive capacity is recognized as an important capability in the acquisition, assimilation, and deployment of new knowledge. As a result, we expected to find AC directly influences a firm's willingness to engage in a collaborative effort. However, we found instead that collaborative process competence fully mediates the influence of AC on the collaboration. It is AC that enables a firm to learn from experience and develop the competence to manage the collaborative process well. Collaborative process competence, adapted from prior research on alliance competence, was empirically validated as a critical collaborative capability. CPC directly influences the way in which firms engage with their collaboration partners, how effectively they combine knowledge and develop solutions, and the quality of the relationship between firms.

An important contribution of this research is the empirical validation of the importance of episodic collaboration. Historically, collaboration research and RV has focused on long-term alliances. In this context, researchers have focused on a long-term relationship orientation as an antecedent to improved collaborative communication (Paulraj et al., 2008) and relation specific assets, knowledge-sharing routines, complementary resources, and effective governance as sources of competitive advantage (Dyer and Singh, 1998). Our research emphasizes the emerging importance of episodic collaborations, which may involve firms who have never worked together or firms who have worked together in the past, but are working on a new and different problem. In this context, the success of the effort depends on adaptive knowledge-based organizational processes or capabilities rather than relation-specific assets and established knowledge sharing routines.

This research provides several important insights for managers. As organizations have increasingly focused on core competencies and outsourced non-core competencies, firms have become more dependent on collaboration with supply chain partners to adapt and respond to the increased uncertainty and volatility in today's economic environment. As a result, the ability to pool knowledge and expertise to develop and implement solutions to problems is increasingly important to a firm's competitive advantage. Managers must first recognize their dependence on other organizations to avoid sub-optimal solutions, innovate and adapt (Mentzer et al., 2000; Nyaga et al., 2010), then work to develop capabilities that enable them to collaborate effectively. Managers must also be willing to genuinely engage in a collaborative effort, not only in the exchange of information, but also in working to find a common solution that benefits both parties (Nauta and Sanders, 2000; Nyaga et al., 2010).

There are a number of direct and indirect relationships in the model that are of particular interest to managers as can be seen in Table 4. For example, even with high levels of CPC, the level of collaborative engagement has a greater effect on operational outcomes than CPC alone. Managers should recognize that being willing to share information and being open to the knowledge and ideas available externally are both critical to successful collaboration. In addition, the management of the process and level of engagement demonstrated in the collaboration directly affect the relational outcomes of the effort.

As one might expect, our results point to tangible operational outcomes as the key contributor to improved trust, credibility, and relationship quality. As conflicts emerge, the effectiveness of the solution may be more important in the relationship than how they are resolved. This suggests that perhaps managers should focus on the process of working together and resolving conflict with an eye toward operational success first, then on nurturing the relationship.

The level of engagement and collaborative process competence also directly influence relational outcomes. We hypothesize that while actual results are most critical, partner firms also respond to demonstrations of capability and positive intent. Behaving in ways that demonstrate a positive intent to collaborate, make the partner feel valued, and make collaboration efforts more efficient and effective, enhances the partner firm's trust in the organization.

Given the episodic nature of the collaborations we studied, one might question the importance of the relational outcomes. We theorize that even in episodic collaborations the reputation a company gains from collaborating successfully can affect future opportunities to collaborate with other firms (Christopher and Gaudenzi, 2009). Word of mouth "advertising" is likely to affect the image and reputation of the firm. As a result, previous collaboration initiatives may influence future collaborations, whether with repeat or new partners. Therefore, managers should consider that the manner in which they approach a collaboration effort might affect existing relationships and the reputation of the firm.

Firms with distinctive bundles of capabilities to enhance the effort will have an advantage over competitor firms (Zahra and George, 2002). Absorptive capacity is a capability that nurtures continuous learning and the development of other domain-specific competencies (Tu et al., 2006). Managers should focus on developing processes that allow them to proactively seek external knowledge, absorb and embed that knowledge in organizational processes, and exploit it for improved performance. For example, establishing processes to benchmark other organizations, encouraging employees to attend professional conferences, or routinely scanning news and industry publications can provide valuable knowledge about suppliers, competitors, and the operating environment.

Specific to collaboration, managers should focus on learning from experience to improve the managing processes for such collaborations. Brainstorming with collaboration partners and reflecting on the successes and failures in a collaboration experience to identify ways to improve future initiatives can directly influence a firm's ability to collaborate well. Assessing the characteristics of employees who have collaborated successfully and assembling a team that reflects all the perspectives needed for success is critical. Recognizing the knowledge and capabilities needed, and being able to identify and connect with the appropriate partners are also critical. Throughout a collaborative engagement, resolving conflicts with a focus on the best solution, working in concert to productively combine knowledge and synchronize activities, and putting tracking and measurement systems in place to guide the effort also result in better and faster results.

As noted in Table 4, we found the proposed full mediation model to be superior to competing models. This research empirically validates the mediating role played by collaborative engagement and collaborative process capability between the antecedents, perceived interdependence and absorptive capacity, and the outcome variables, operational outcomes and relational outcomes.

6. Summary and conclusions

The goal of this study was to investigate the capabilities that enable successful episodic collaboration in a supply chain context. Using multi-industry data based on 473 collaborative initiatives, we empirically validated a model of collaboration that incorporates two capabilities, *absorptive capacity* and *collaborative process competence*, that influence the degree to which organizations engage in a collaboration effort and contribute to successful outcomes. We also examined the concept of an episodic collaboration, and validated the importance of such collaborations in addition to the long-term collaborative relationships and alliances emphasized in prior research.

This research makes several empirical contributions to the existing literature. First, building on the concept of an alliance capability developed by Spekman et al. (1997), we identified, operationalized, and validated collaboration process competence as a capability that contributes to successful outcomes of an episodic collaborative initiative. Second, while absorptive capacity is an important capability in a collaborative effort (Cohen and Levinthal, 1990; Zahra and George, 2002; Tu et al., 2006), we found that AC is fully mediated by CPC. This suggests that AC is a necessary, but not sufficient, capability required for effective collaboration. This provides empirical support for the proposition that AC enables organizations to develop additional domain-specific capabilities that can provide a competitive advantage.

The third contribution lies with the embedding of these two capabilities in a larger collaboration model. We empirically validated the influence of perceived interdependence on the level of engagement between organizations in a collaborative initiative, which in turn affects both the operational and relational outcomes. The results also validated that collaborative process competence directly influences the level of engagement as well as the operational and relational outcomes of the initiative.

The fourth contribution of this research lies in the increased generalizability of the findings due to the broad scope of our sample. The data represented more than 16 industries and a wide range of collaboration initiatives. This would suggest our findings have implications for any organization engaging in a collaborative initiative.

6.1. Research limitations and future directions

This research study is subject to several limitations that should be addressed in future research. First, our findings are based on single respondent data. Even though the respondents were prequalified and had direct experience with collaborations, the same individual provided information on all measures, which could potentially bias the results. Tests for the presence of common method variance indicate common method bias is not a problem. However, future research incorporating data from multiple respondents involved in the same collaboration would further validate our findings.

Second, even though the sample included both successful and unsuccessful collaborations, there is potential for bias associated with respondent recall. Respondents might reflect on the success of the collaboration as a way to justify the choices they made in the past. This potential bias could be eliminated by using objective performance data from company reports instead of subjective recollections by the respondents to assess the outcomes of the initiative.

Third, this research assessed the impact of CPC and AC from the perspective of a single firm. In a study of the effects of collaborative activities on relational outcomes, Nyaga et al. (2010) found some differences in buyer and supplier perceptions. Future research comparing data from both firms would provide additional insights. Do perspectives about the process and outcomes differ? Is symmetry between firms in the two capabilities required, or can the collaboration be successful when the levels of CPC and/or AC are asymmetrical? What would be the impact of such asymmetry? If one organization has disproportionate power in the relationship, what is the effect on collaboration?

Fourth, collaborative process competence plays an important role in successful collaborations and warrants further investigation. What factors contribute to the development of CPC? Does organizational culture play a role in the development of CPC? How does CPC affect the need for, use and effectiveness of various types of governance mechanisms such as contracts, relational norms and transaction specific investments? Another fruitful area of research would be to test this model of collaboration across cultures. Are different capabilities required for firms in countries with very different cultures to collaborate successfully? The sample for this research was US based. Is this model of collaboration valid in countries with high cultural distance from the US?

Future research should also focus on better understanding the sources of relational advantage in an episodic collaborative initiative. What governance mechanisms are most effective? What other processes or capabilities enable firms to leverage joint knowledge and complementary resources outside a long-term strategic alliance?

Even with the increasing attention researchers have given to understand the collaboration process, there has been little research on the impact of the growing importance of outsourcing and the tension between knowledge acquisition and knowledge access. This research adds another level of insight about collaboration by focusing on episodic collaboration efforts that seek to combine and jointly deploy internal and external knowledge and resources rather than long-term strategic alliances that seek to acquire and exploit external knowledge. Given the critical importance of outsourcing in today's business environment, a better understanding of the key dimensions and behaviors that facilitate success in episodic collaborative initiatives can contribute to our understanding of how firms can leverage relationships to create a sustainable competitive advantage.

Appendix A. Construct items and their sources

[a] Deleted from final model.

Label	Item	Adapted or developed from	CFA
The organizations involved:			
PI_1	were dependent upon each other for an effective solution	Jap (1999)	0.74
PI_2	needed knowledge the other possessed	Jap (1999)	0.75
PI_3	needed skills the other possessed	Jap (1999)	0.62
PI_4	needed each other to reach their goals	Jap (1999)	0.79
In general my organization has the ability to:			
AC_1[a]	recognize valuable new knowledge	Cohen and Levinthal (1990)	
AC_2	absorb new knowledge useful to the organization	Cohen and Levinthal (1990)	0.87
AC_3	take advantage of new knowledge to improve performance	Cohen and Levinthal (1990)	0.89
AC_4	adapt to change and adopt new ideas to improve performance	Cohen and Levinthal (1990)	0.89
AC_5	identify and adopt new and useful ideas	Cohen and Levinthal (1990)	0.92
In general my organization has:			
AC_6[a]	the commitment to look for or develop new ideas	Lee and Choi (2003)	
AC_7	created an environment that encourages new and useful ideas	Lee and Choi (2003)	0.81
In general my organization has the ability to:			
CPC_1[a]	recognize opportunities to collaborate	Spekman et al. (1997)	
CPC_2	select partners we can successfully collaborate with	Spekman et al. (1997)	0.75
CPC_3[a]	learn from prior collaboration experiences	Spekman et al. (1997)	
CPC_4	recognize and resolve conflicts as they arise in collaboration efforts	Spekman et al. (1997)	0.85
CPC_5	select the "right" individuals for collaborative assignments	Spekman et al. (1997)	0.80
CPC_6	establish processes to monitor and manage collaboration efforts	Spekman et al. (1997)	0.84
FA	when we had disagreements we often referred to a formal agreement governing this collaboration	Lusch and Brown (1996)	

Label	Item	Adapted or developed from	CFA
The organizations involved:			
CE1[a]	used intensive collaborative planning	Interviews	
CE2	made joint decisions on most issues	Interviews	0.55
CE3[a]	jointly set goals for the collaboration effort	Interviews	
CE4[a]	met often	Interviews	
CE5	shared a lot of information	Interviews	0.59
Throughout this collaboration:			
CE6	there was a free flow of useful ideas	Lee and Choi (2003)	0.80
CE7	there was a free flow of novel ideas	Lee and Choi (2003)	0.68
CE8	there was an openness to new ways of thinking	Lee and Choi (2003)	0.86
CE9	there was an openness to discovering new knowledge	Lee and Choi (2003)	0.87
CE10	there was an openness to ways to improve joint performance	Lee and Choi (2003)	0.82
This collaboration resulted in:			
OO_1[a]	lower costs	Koufteros et al. (2002)	
OO_2	improved quality	Koufteros et al. (2002)	0.70
OO_3	better customer service	Koufteros et al. (2002)	0.85
OO_4	quicker project results	Koufteros et al. (2002)	0.79
OO_5	reduced cycle time or lead time	Koufteros et al. (2002)	0.77
OO_6[a]	better safety, environmental or regulatory performance	Interviews	
OO_7	improved value to our customers	Koufteros et al. (2002)	0.76
As a result of this collaboration, our organization gained:			
RO_1[a]	an increased appreciation for our collaboration partner	Interviews	
RO_2	an increased respect for the skills and capabilities of our collaboration partner	Interviews	0.75
RO_3[a]	an increased overall respect for our collaboration partner	Interviews	
This collaboration resulted in our two organizations having:			
RO_4	an improved level of honesty	Doney and Cannon (1997)	0.87
RO_5[a]	an improved level of trust	Doney and Cannon (1997)	
RO_6	more open sharing of information	Doney and Cannon (1997)	0.87
RO_7[a]	greater commitment to each other	Fisher et al. (1997)	
RO_8	a more effective working relationship	Fisher et al. (1997)	0.94
RO_9	an enhanced commitment to work together in the future	Fisher et al. (1997)	0.87
RO_{10}	a feeling of partnership and solidarity between us	Fisher et al. (1997)	0.90
RO_{11}	an overall more productive working relationship	Fisher et al. (1997)	0.89

Appendix B. Collaborative practices survey instructions.

Instructions. A collaborative effort is a joint effort with other organizations to work on a complex issue or a new opportunity that requires considerable time and effort or which none of the parties may be able to effectively address or satisfactorily solve on its own. As you respond to these questions, think about your most recent collaboration effort with another firm that best meets the following criteria:

- You were highly involved.
- The collaboration required considerable time and effort.
- The collaboration was focused on solving a complex problem or addressing a new opportunity.
- You worked together to solve a problem or take advantage of an opportunity that neither of you could effectively address by yourself.
- The collaboration is complete or near completion so you can reasonably assess whether the collaboration was successful or unsuccessful (we are interested in both).

Please tell us in a couple of sentences the nature and scope of the collaboration.

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