Research-In-Progress

The Mediating Role of Absorptive Capacity on Inter-organizational Information Sharing

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Abstract

The sharing of information across inter-organizational supply chains has been recognized as a method of reducing the information asymmetries that can lead to operational inefficiencies. The level of information system integration between firms in a supply chain represents a technical factor that can impact the effectiveness of information sharing. However, many of the factors that facilitate information sharing are not technical in nature and instead are more intangible such as trust and commitment between firms in a supply chain. In the context of cost management, we develop a construct of absorptive capacity that measures these intangible factors influencing inter-organizational information sharing. Our research model positions absorptive capacity as a mediating variable between a firm's integrated information system and the subsequent sharing of cost information. Through a survey of management accountants, we test our research model and improve our understanding of the role of absorptive capacity in inter-organizational information sharing.

Keywords: Absorptive capacity, supply chain, inter-organizational information systems, cost management.

Introduction

The coordination of resource flows in supply chains is recognized by firms as an important component of success, especially in enabling firms to respond quickly to fluctuations in supply and demand and in improving operational efficiencies. The supply chain literature (e.g. Simchi-Levi, Kaminsky, and Simchi-Levi, 2000) recognizes the importance of information sharing among firms in reducing the information asymmetries that can lead to operational inefficiencies and the role of information technology (IT) in enabling information sharing in supply chains. Although information technology can enable information sharing by providing the technical infrastructure for organizations to connect, other more intangible factors such as trust (Tomkins, 2001), commitment (Welty and Becerra-Fernandez, 2001), and inter-firm interaction routines (Patnayakuni, Rai, and Seth, 2006) have also been suggested as complementary factors required for firms to reap the full benefits of inter-organizational information sharing.

The objective of this study is to develop a theoretical understanding of these more intangible antecedents of inter-organizational information sharing within a supply chain. Drawing from the concept of the *absorptive capacity* of firms, our research focuses on identifying a parsimonious set of factors that comprises the absorptive capacity of a firm for facilitating information sharing among supply chain partners. Absorptive capacity refers to the ability of a firm to recognize the value of new information, assimilate it, and apply it towards creating business value (Cohen and Levinthal, 1990). In the context of the supply chain, this study develops an absorptive capacity construct that focuses on the readiness of a firm for inter-organizational information sharing related to improving operational efficiencies through more effective cost management. We develop and test a model of inter-organizational information sharing which positions our construct of absorptive capacity as a mediating variable between a firm's information technology infrastructure and inter-organizational information sharing for cost management. This research answers the following questions:

1. What is absorptive capacity?

2. How is absorptive capacity related to inter-organizational information sharing?
3. Does absorptive capacity mediate the influence of information systems integration on inter-organizational information sharing?

This research-in-progress paper is organized as follows. First, we review the literature on absorptive capacity, which provides the theoretical foundation of the study. Next, we develop our research model based on the constructs of absorptive capacity, information systems integration, and inter-organizational information sharing. This is followed by a test of the research model through a survey of management accounting professionals. We conclude with a discussion of the implications of this study.

Theoretical Foundation

Originating in the field of macroeconomics, the concept of absorptive capacity refers to the ability of an economy to absorb and utilize external information and resources (Adler, 1965). Cohen and Levinthal (1990, p. 128) adapted this macroeconomic concept to the organizational level and define absorptive capacity as the "ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends." It is from the Cohen and Leventhal (1990) conceptualization that we begin our review of absorptive capacity from three different perspectives[1] -- strategy, information systems, and operations. The three perspectives on absorptive capacity are summarized in Table 1 and form the foundation for this study's contribution of absorptive capacity in a cost management context.

The Strategy Perspective

Inherent in the Cohen and Levinthal (1990) definition of absorptive capacity are three dimensions of the construct: 1) recognition of the value of new information; 2) assimilating the new information; and 3) applying the new information to commercial ends. In Cohen and Levinthal's view, the absorptive capacity of an organization is primarily a function of a firm's level of prior existing knowledge and the structure of communication transfers between the external environment and the firm. Cohen and

[1] Our theoretical approach is similar to Patnayakuni et al. (2006) who examine the preconditions of information flow integration from the perspectives of strategy, operations, and marketing.

Levinthal (1990) identify absorptive capacity as an important source of a firm's technical knowledge and innovation capabilities via the interaction of absorptive capacity with knowledge from external competitors and partners, resulting in new innovations that can enhance a firm's value.

The construct was further enhanced by Zahra and George (2002a, p. 185) who position absorptive capacity as a "dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage." Dynamic capabilities are sets of organizational routines that can lead to the development of new operational capabilities, as well as the integration and reconfiguration of existing capabilities (Eisenhardt and Martin, 2000). As such, absorptive capacity with its emphasis on the creation of new capabilities through an interaction of existing knowledge and new knowledge can be considered a "change-oriented dynamic capability" (Zahra and George 2002a, p. 149). Zahra and George (2002a) suggest that absorptive capacity is a dynamic capability that consists of acquisition, assimilation, transformation, and exploitation capabilities.

In summary, the strategy literature emphasizes the innovation-creation aspect of absorptive capacity and its role in stimulating the development of other organizational capabilities for competitive advantage.

The Information Systems Perspective

The IS literature focuses on the role of information technology (IT) in enabling the absorptive capacity of an organization. Building on the Zahra and George (2002a) conceptualization of absorptive capacity as consisting of four separate capabilities (acquisition, assimilation, transformation, and exploitation), Zahra and George (2002b) suggest that each of these capabilities represent specific knowledge management routines and tasks that can be enhanced through IT.

Malhotra et al. (2005) extend Zahra and George (2002b) by examining specific configurations of IT systems and inter-organizational processes that enhance the four absorptive capacity capabilities of a firm. In their model, the information system, in conjunction with inter-organizational processes, comprises a capability platform that drives the absorptive capacity capabilities and results in improved operational efficiencies and partner-enabled market knowledge creation.

In summary, the IS literature recognizes the enabling role of IT in the creation of absorptive capacity.

The Operations Perspective

The operations literature emphasizes the role of the supply chain in facilitating information sharing among members in order to improve material flows and demand forecasts, determine optimal levels of inventory, and more efficiently match supply and demand (e.g. Simichi-Levy et al. 2000). As such, the operations perspective on absorptive capacity emphasizes the role of absorptive capacity in creating supply chain partnerships that in turn create new markets or provide greater customer value (Malhotra et al. 2005).

In addition to emphasizing supply chain relationships, the operations literature focuses on optimizing the efficiencies of internal operations. In this vein, Tu et al. (2006) examine the organizational mechanisms that can lead to higher absorptive capacity. Whereas the Zahra and George (2002a) conceptualization focuses on a process or a temporal view of the absorptive capacity capabilities (acquisition, assimilation, transformation, and exploitation), Tu et al. (2006) take a variance approach[2] and identify four specific components or elements of absorptive capacity: 1) prior relevant knowledge, 2) communication network, 3) communication climate, and 4) knowledge scanning.

In summary, the operations literature emphasizes the role of absorptive capacity in enabling operational efficiencies and in effectively exploiting inter-organizational supply chains.

[Insert Table 1 Here]

Research Model

Our study builds upon the three perspectives of absorptive capacity and develops a new construct of absorptive capacity for one specific type of organizational capability in an accounting setting-- the capability of cost management. Whereas the operations literature emphasizes optimizing efficiencies of intra-firm and inter-firm operations, the accounting literature specifically emphasizes cost management,

[2] See Markus and Robey (1988) for a discussion of process theories versus variance theories.

both from an internal cost management perspective (Stenzel and Stenzel, 2003), as well as an inter-organizational cost management perspective (Cooper and Slagmulder 2004; Coad and Cullen 2006).

Our conceptual model positions the absorptive capacity for cost management as a mediating variable from which information systems enables inter-organizational information-sharing related to cost management (Figure 1). The three constructs of interest in this study are absorptive capacity, information systems integration, and inter-organizational information sharing.

[Insert Figure 1 Here]

Absorptive Capacity

The construct of absorptive capacity for this study is targeted at the specific context of cost management. Building on the Cohen and Levinthal (1990) definition, we define absorptive capacity for cost management as the ability of a firm to recognize the value of cost information, assimilate it, and apply it for competitive advantage. Our current study uses the 4-dimension definition of absorptive capacity by Tu et al. (2006) which define absorptive capacity as the organizational mechanisms that facilitate the acquisition, assimilation, transformation, and exploitation of relevant internal and external knowledge. In other words, the absorptive capacity construct as operationalized by Tu et al. are the organizational mechanisms that improve Zahra and George's process view of absorptive capacity as the process of acquiring, assimilating, transforming, and exploiting knowledge. Using Tu et al.'s conceptualization of absorptive capacity, our study focuses on the 4 dimensions that lead to higher absorptive capacity -- 1) prior relevant knowledge, 2) communications network, 3) communications climate, and 4) knowledge scanning.

Prior Relevant Knowledge

Prior relevant knowledge represents a fundamental building block of absorptive capacity and allows individuals in an organization to recognize both the potential and importance of new information (Cohen and Levinthal, 1990). In the context of this study, the relevant prior knowledge base is that of cost management. Cost management uses the information from cost accounting systems in order to

understand the nature and behavior of costs in managing firm resources (Stenzel and Stenzel, 2003). Cost management is an operational capability which is built upon human resource skills and knowledge about cost management and can be used to manage costs to further organizational success. As firms gain more internal expertise within an area such as cost management, they become more prepared to move beyond internal boundaries and take a more inter-organizational approach to information sharing and cost management (Coad and Cullen 2006; Cooper and Slagmulder 1999).

Knowledge Scanning

Knowledge scanning is a mechanism that enables firms to identify and capture relevant external and internal knowledge and technology. It refers to practices within a firm that encourages individuals to actively seek new information that can be used for competitive advantage. Examples of knowledge scanning activities include organizational benchmarking of best practices, strategic alliances, customer and supplier surveys (Levinson and Asahi, 1995).

Communications Climate

The communications climate is defined as the organizational atmosphere regarding communications behavior (Brown, 1997). An open, supportive environment can facilitate organizational learning (Nevis et al. 1995). Closely related to the communications climate is trust. Trust has been identified as a factor upon which all inter-organizational relationships are dependent, especially with interorganizational partnerships implying a sense of sharing in knowledge, decision-making, and collective / joint rewards (Tomkins, 2001).

Communications Network

The communications network is the "scope and strength of structural connections that bring flows of information and knowledge to different organizational units" (Tu et al. 2006, p. 695). In our conceptualization, the communications network is not technical in nature and instead refers to the social network of human contacts that must be in place for effective communication between partner firms.

Information Systems Integration

The construct of information systems integration captures the extent to which the technical infrastructure of an organization facilitates inter-organizational information sharing. Information systems integration refers to the ability of a firm's IT systems to provide visibility of cost management information to employees of both a focal firm and a partner firm. Our definition is based on Barua et al. (2004, p. 593) who define systems integration as "the extent to which a firm integrates its various IT systems to provide visibility to customer and supplier data and to allow online information sharing and transaction execution across the value chain."

Inter-organizational Information Sharing

The construct of inter-organizational information sharing is the dependent variable of this study and refers to the sharing of specific cost information among supply chain partner firms. Examples of the types of cost information that can be shared include sales or order entry information, logistic and shipping information, market demand, and forecasts. Information sharing among partners in a supply chain represents a method of overcoming the information asymmetries that are associated with operational inefficiencies. In a supply chain, with knowledge and information both physically and temporally distributed, information sharing is an important mechanism of reducing the information asymmetries associated with costs (Patnayakuni et al. 2006).

Research Model and Methodology

Our research model positions absorptive capacity as a mediating factor affecting inter-organizational information sharing (Figure 2). As indicated in Figure 2, we are hypothesizing a partial mediation model. Our model hypothesizes that information systems integration will have a direct effect on information sharing (Hypothesis 1) and a direct effect on absorptive capacity (Hypothesis 2). Our model also predicts that absorptive capacity will have a direct effect on information sharing (Hypothesis 3).

The constructs in our research model are operationalized based on prior literature. Table 2 provides the definition of the constructs, while Tables A1-A3 in the appendix identify the items and their origin.

[Insert Figure 2 Here]

[Insert Table 2 Here]

Our measure of absorptive capacity and information-sharing are formative, meaning that the construct is viewed as an explanatory combination of the items (Fornell and Bookstein, 1982; Fornell, 1987). If a latent variable is conceptualized as a construct of all of its indicators, as in an index, it should be measured formatively (Fornell 1982). In contrast, a reflective scale consists of items that reflect a common, underlying dimension (Bagozzi 1982).

For our formative measures of absorptive capacity and information sharing, we measure the degree to which organizations engage in various activities that are representative of the construct. The sum of these comprises an index of the organization's capabilities of that construct. Thus each construct is an index, where the higher extensive use of the techniques or presence of attributes indicates a greater level of intensity with respect to that particular construct. The measure of information systems integration is a reflective measure and is adapted from Barua et al. 2004.

The measure of absorptive capacity is a 2^{nd} order construct, composed of four 1^{st} order constructs (prior relevant knowledge, communication network, communication climate, and knowledge scanning). To model the 2^{nd} order construct, we first used principal components analysis to obtain scores for each of the four variables (Sharma 1996) and then used the scores as formative items for the Absorptive Capacity construct. The other two constructs (systems integration and information sharing) are 1^{st} order constructs.

Measures

Our measures as indicated in Tables A1-A3 were first refined through a pilot study (Lee et al. 2006). After we modified the measures based on the pilot, we then collected the data for the main study. With the assistance of the Institute of Management Accountants (IMA), we collected the data for the main study at two IMA-sponsored events (a national meeting and a lean accounting conference). Only IMA members that work in companies that are a part of a supply chain were encouraged to participate.

A total of 73 respondents participated in this study. As indicated in Table 3, over 85% of the respondents have a position in accounting or finance (Panel A) and are assumed to be knowledgeable about cost management. Over 90% of the respondents work in firms that are a part of a traditional supply chain (Panel C). These respondents are therefore qualified to answer questions regarding the constructs in this study.

[Insert Table 3 Here]

Data Analysis

In order to test for the mediation effect of absorptive capacity on inter-organizational information sharing, we use a Partial Least Squares (PLS) approach, which enables us to model both formative and reflective constructs in the same model.

Measurement Model

The measurement model in PLS is assessed by examining convergent validity and discriminant validity (Barclay et al., 1995). Convergent and discriminant validity are assessed by applying two criteria: (1) the square root of the average variance extracted (AVE) by a construct from its indicators should be at least .707 (i.e. AVE>.50) and should be greater than that construct's correlation with other constructs (Fornell and Larcker 1981; Barclay et al. 1995), and (2) item loadings should be at least .50 (Sharma 1996) and should load more highly on the intended construct that on another construct.

Table 4 presents the correlation among the constructs and the square root of the AVE.

[Insert Table 4 Here]

In Table 4, the diagonal elements (bold) are the square root of average variance extracted (AVE) between the constructs and their measures. Off-diagonal elements are the correlations between constructs. For discriminant validity, diagonal elements should be larger than off-diagonal measures. As recommended, both the square root of the AVE is greater than .707 for all 3 constructs and also greater than the construct's correlation with other constructs.

Table 5 presents the factor structure matrix of the study variables.

[Insert Table 5 Here]

In Table 5, no item loaded higher on another constructs than the one intended. Also, all items exhibited loadings greater than .50. Taken together, the items overall demonstrated acceptable discriminant and convergent validity.

Structural Model

The structural model is assessed by examining the significance of the path coefficients (similar to standardized beta weights in a regression analysis) and the variance accounted for by the antecedent construct. Figure 3 provides the results of the structural model analysis. As recommended (Chin 1998), bootstrapping (with 500 subsamples) was performed to test the statistical significance of each path coefficient using t-tests. Overall, our structural model shows a significant path between Systems Integration and Absorptive Capacity (β=.4833, $p<.001$), as well as between Absorptive Capacity and Information Sharing (β=.692, $p<.001$). The path between Systems Integration and Information Sharing was not significant (β=-.099, p=-.825).

[Insert Figure 3 Here]

Mediation Analysis

Because our model is a mediation model, we supplement our analysis of the full path model by following the guidelines of Baron and Kenny (1986) to test the mediating role of absorptive capacity in facilitating inter-organizational information sharing.

The first step recommended by Baron and Kenny (1986) is to show that the initial variable (Systems Integration) is correlated with the outcome variable (Information Sharing). Using PLS and testing a model with only the 2 variables (Systems Integration and Information Sharing), we found that the path between Systems Integration and Information Sharing is positive and significant (β=.259, $p<.01$).

The second step recommended by Baron and Kenny (1986) is to show that the initial variable (Systems Integration) is correlated with the mediator. Using PLS and testing a model with only the 2 variables (Systems Integration and Absorptive Capacity), we find that the path between Systems Integration and Absorptive Capacity is indeed positive and significant (β=.502, $p<.001$).

The third step of the Baron and Kenny guideline is to show that the mediator (Absorptive Capacity) affects the outcome variable (Information Sharing). The fourth step is to show that the mediator (Absorptive Capacity) completely mediates the relationship by demonstrating that the effect of Systems Integration on Information Sharing, while controlling for the mediator (Absorptive Capacity) is zero. Steps 3 and 4 are tested simultaneously in Figure 3. As expected in a mediation relationship, the path between Systems Integration and Information Sharing is no longer significant (β=.-.099, p=-.825), while the path between the mediator (Absorptive Capacity) and the dependent variable (Information Sharing) is significant (β=.692, $p<.001$).

Discussion

From our data analysis, we have support that a firm's absorptive capacity for cost management is a mediating factor between an organization's systems integration capability and subsequent information sharing. Our full path analysis in Figure 3 indicates that H2 and H3 are supported. A subsequent test for mediation suggests that Absorptive Capacity is a full mediating variable.

The study of mediation variables is important because it allows us to describe a sequence of events that leads to a specific phenomenon (Kenny 2008). In this study, we have identified a firm's

absorptive capacity for cost management as a catalyst in enabling the value of a firm's system integration capability in influencing inter-organizational information sharing.

Our study makes several contributions to both research and practice. From the research perspective, we have developed a construct of absorptive capacity in the accounting context of cost management. This construct development was based on a multi-disciplinary approach of integrating literature from three specific areas (strategy, information systems, and operations). Through this study, we have an example of IT adding value through its role in enabling an organization's absorptive capacity for cost management.

Our study also has implications for practice. Through our construct of absorptive capacity, we can infer specific things that can be done by a firm to extract value from IT integration efforts. First, it is important to build on prior relevant knowledge. In the case of cost management, prior relevant knowledge refers to having good internal, within-firm cost management practices, which in turn can set the foundation for more effectively managing costs through information sharing. Second, the communication network of knowing the right people in partner firms must be in place. Third, management can foster an environment of trust and open communications between firms. Finally, management can foster a continuous environment of knowledge-seeking, where employees are actively increasing their knowledge about cost information and how business can improve through the sharing of joint information.

A primary limitation of our study is the small sample size (n=73). However, despite the small sample size, our data analysis was able to reveal statistically significant support of mediation. In addition, our target respondents (management accountants) are in a position to answer our questions regarding cost information sharing within a supply chain. As with all cross-sectional studies, another limitation of this study is that we cannot make causal inferences.

In summary, we provide support that absorptive capacity is a mediating factor of a firm effectively obtaining value from IT systems integration efforts. Just building the IT infrastructure for inter-firm integration is not enough. In order for a firm to engage in effective inter-organizational

information-sharing, other non-technical factors (such as inter-organizational trust and an environment encouraging continual knowledge-seeking) must be in place for a firm to realize the value from its IT integration efforts. By emphasizing these more intangible factors, management can impact the overall effectiveness of their systems integration effort.

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Figures and Tables

Figure 1

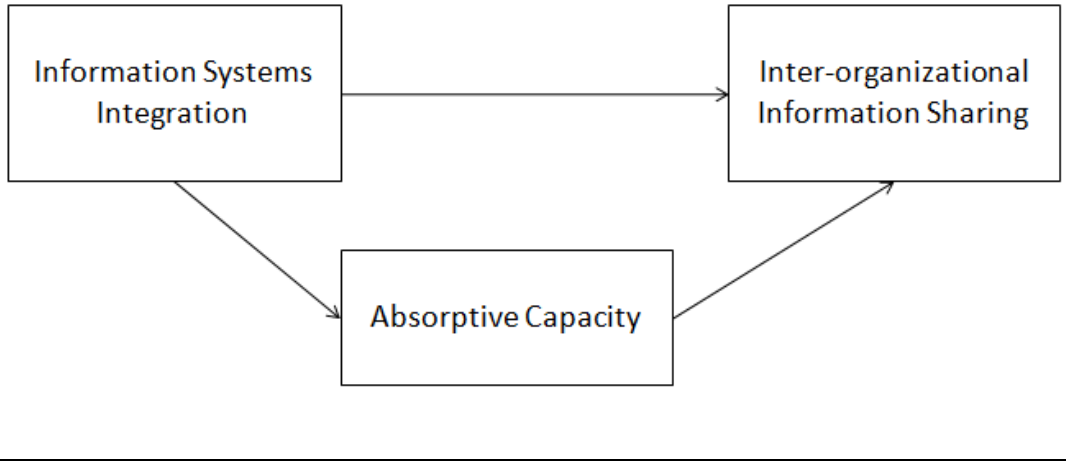

Figure 1: Conceptual Model

Figure 2

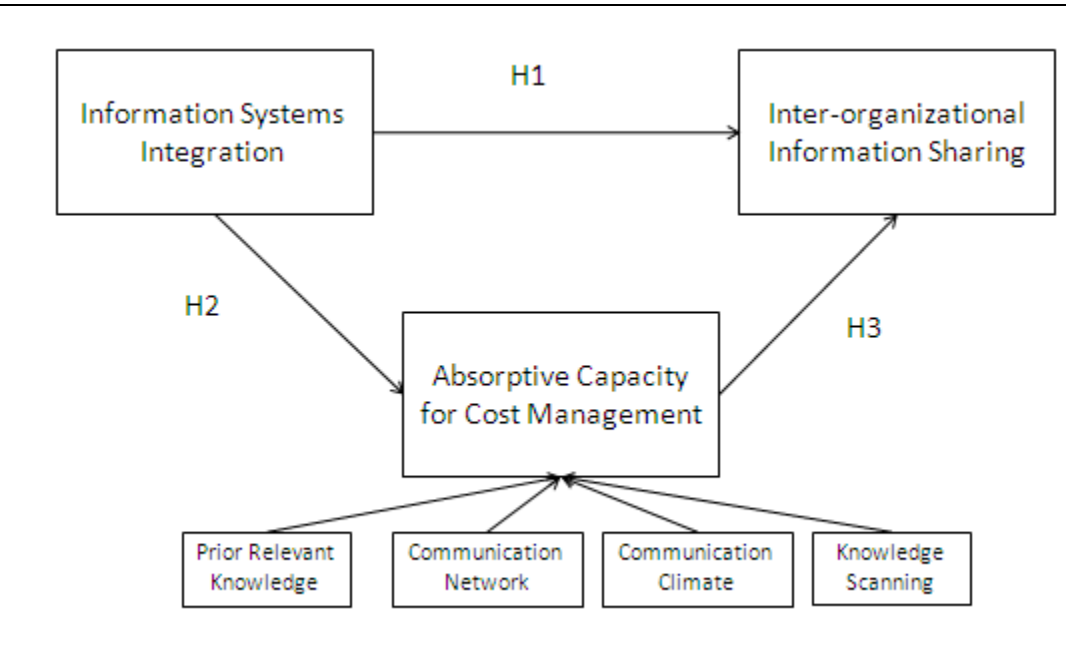

Figure 2: Research Model

Figure 3

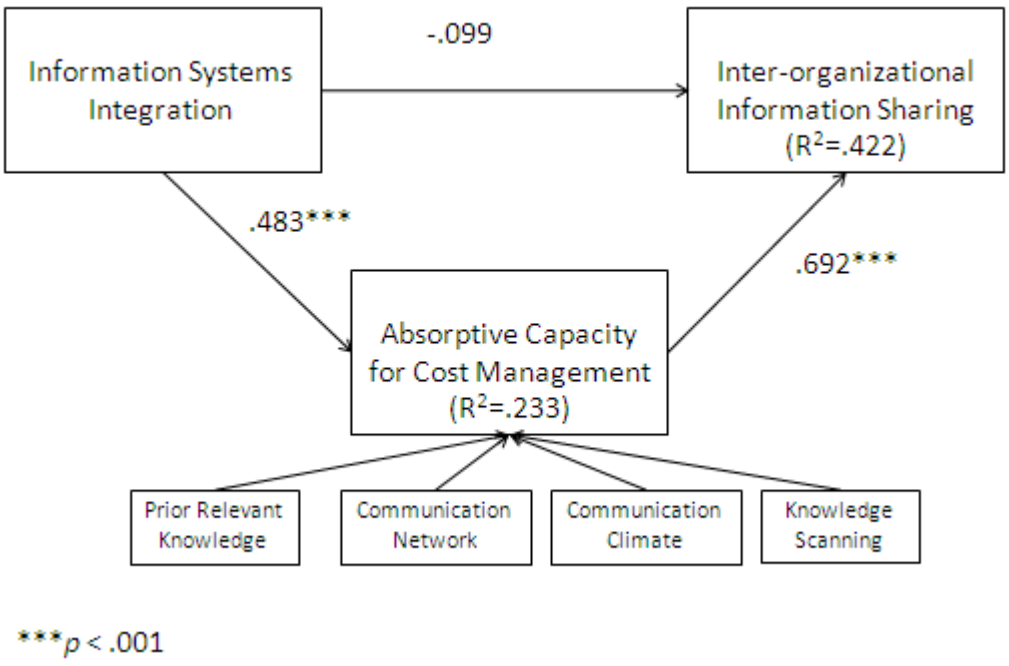

Figure 3: PLS Test of Research Model

Table 1: Summary of Absorptive Capacity Literature

	Perspective	Study	Definition
1.	Macroeconomics	Adler, 1965	ability of an economy to utilize and absorb external information and resources
2.	Strategy	Cohen and Levinthal, 1990	"The ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" p. 128
	Strategy	Lane and Lubatkin, 1998	• "the ability of a firm to learn from another firm is jointly determined by the relative characteristics of the student firm and the teacher firm" p. 462 • "a student firm's absorptive capacity is its ability to value, assimilate, and apply new knowledge from a learning alliance partner" p. 462
3.	Strategy	Zahra and George, 2002a	"Reconceptualization of ACAP as a *dynamic capability* pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage." p. 185 Dimensions: • Acquisition • Assimilation • Transformation • Exploitation
4.	Strategy	Lenox and King (2004)	Extends Cohen and Levinthal's work by exploring the role of managers in administering the flow of information within the organization; "managers' internal policies and programs for information transfer can pay a critical role in developing a firm's absorptive capacity", p. 333
5.	IS	Zahra and George (2002b)	• "Some firms may develop acquisition and assimilation capabilities (i.e. 'potential capacity') but may be ineffective in transformation and exploitation capabilities ('realized capacity')." Difference between potential and realized absorptive capacity is the firm's "efficiency ratio" • Knowledge creating absorptive capacity is an IT-driven capability
6.	IS and Operations	Malhotra, Gosain, and El Sawy (2005)	• Complements the Zahra and George (2002) perspective of individual firms' internal capability by "deriving a set of attributes that form a capability platform that enhances the potential of an enterprise to share information with its supply chain partners and create new knowledge." p. 151 • Identifies 2 distinct groups of constructs that represent the elements of an absorptive capacity enhancing capability platform for enterprises engaged in supply chain relationships: 1. integrative interorganizational process mechanisms (enables acquisition and assimilation) o Joint decision making o Interorganizational process modularity o Standard electronic business interfaces 2. partner interface-directed information systems (enables assimilation and transformation) o Memory systems for interorganizational activities o Interpretation systems for interorganizational information

7.	Operations	Tu, Vonderembse, Ragu-Nathan, and Sharkey (2006)	• In the context of assimilation of manufacturing practices, the authors identify 4 dimensions that lead to higher absorptive capacity: o Prior relevant knowledge o Communication network o Communication climate o Knowledge scanning

Table 1: Summary of Absorptive Capacity Literature

Table 2

Construct	Definition
Absorptive Capacity	**Absorptive Capacity** is a measure of the *ability* and *readiness* of a firm's personnel to recognize the value of new information, assimilate it, and apply the new information to the business. Absorptive capacity includes: • the knowledge of a firm's employees (Prior Knowledge) • the extent of communications (Communication Network) • the communications climate (atmosphere within a firm that defines accepted communication behavior, e.g. trust) • the desire of personnel to learn (Knowledge Seeking)
Information Systems Integration	**Information Systems Integration** is the extent to which a firm has integrated its IT systems to allow visibility to its partners in order to allow information sharing and transaction execution across the supply chain. In other words, it is the technical ability to generate and communicate information with their supply chain partners.
Inter-organizational Information Sharing	**Inter-organizational Information Sharing** refers to the extent to which firms engage in the sharing of cost information with a partner in a supply chain. This includes the sharing of information that can be used to reduce operational uncertainty and to enhance collaboration with partners to transform current business practices or create new revenue generating opportunities.

Table 2: Construct Definition

Table 3

Panel A		
Position of Respondents	**Number**	**% of Total**
Controller/ Area Controller	**33**	*45%*
CFO	**11**	*15%*
Various Management	**11**	*15%*
Cost Accountant/ Supervisor	**6**	*8%*
Various Accounting Positions	**5**	*7%*
Various Finance	**4**	*5%*
VP of Finance	**3**	*4%*
Panel B		
Annual overall firm sales in dollars		
Less than $1 million	**1**	*1%*
$1 million to $10 million	**4**	*6%*
$10 million to $100 million	**30**	*42%*
$100 million to $500 million	**12**	*17%*
$500 million to $1 billion	**5**	*7%*
More than $1 billion	**20**	*28%*
Panel C		
Type of Company		
Manufacturing	**46**	*49%*
Service	**14**	*15%*
Materials/Parts supply	**9**	*10%*
Distribution	**8**	*9%*
Retail	**5**	*5%*
Wholesale	**4**	*4%*
Other	**8**	*9%*

Table 3: Respondent information

Table 4

	Systems Integration	Absorptive Capacity	Information Sharing
Systems Integration	**0.9427**		
Absorptive Capacity	0.4820	**0.7413**	
Information Sharing	0.2350	0.6440	**0.7814**

Table 4: Correlation among the constructs and square root of AVE

Table 5

Scale Items	(ISI) Information Systems Integration	(AC) Absorptive Capacity	(ICIS) Information Sharing
ISI1	0.967	0.5156	0.2729
ISI2	0.9742	0.4559	0.2318
ISI3	0.9501	0.4264	0.1777
ISI4	0.9389	0.4399	0.2152
communications network	0.3749	0.7325	0.4567
knowledge seeking	0.4303	0.7064	0.3886
trust	0.3824	0.8399	0.5588
cost management	0.2998	0.7264	0.5067
ICIS1	0.2262	0.549	0.8455
ICIS2	0.2453	0.5173	0.7892
ICIS3	0.1931	0.585	0.9118
ICIS4	0.1612	0.452	0.7021
ICIS5	0.1268	0.4392	0.6889

Table 5: Factor Structure Matrix

APPENDIX A

Table A-1: Information Systems Integration Measures

Variable	Information Systems Integration Measures	Indirect Origin of Item
ISI-1	Our firm and our partner firm have information systems that facilitate information exchange across firm boundaries.	New
ISI-2	Our firm and our partner firm have interorganizational information systems that support the easy exchange of information.	New
ISI-3	Our firm's information systems are connected to our partner firm's systems, allowing data to be shared easily between firms.	Barua et al. 2004
ISI-4	Our firms systems can easily transmit, integrate, and process data with our partner firm.	Barua et al. 2004

Table A-2: Absorptive Capacity Measures

Variable	Absorptive Capacity	Indirect Origin of Item
	Knowledge seeking	
KS-1	Employees within both our firm and our partner firm actively seek knowledge about costs information associated with our firm's products and/or services.	Tu et al. 2006
KS-2	Employees within both our firm and our partner firm actively seek to learn from cost information to improve our business activities.	Tu et al. 2006
KS-3	Employees within both our firm and our partner search for the best cost management practices in our industry to apply to our firms.	Tu et al. 2006
KS-4	Employees within both our firm and our partner firm actively seek to learn from the cost information provided by both firms.	Tu et al. 2006
	Communications Network	
CN-1	Employees within our firm know the right people at the partner firm who can provide cost management information.	Tu et al. 2006
CN-2	Employees within our partner firm know the right people at our firm who can provide cost management information.	Tu et al. 2006
	Communications Climate (TRUST)	
CC-1	The employees both in our firm and in our partner firm trust each other.	Tu et al. 2006
CC-2	Both our firm and our partner firm have a very open communications environment.	Tu et al. 2006
CC-3	The employees in both our firm and our partner firm are willing to share ideas about cost management with each other.	Tu et al. 2006
CC-4	The employees in both our firm and our partner firm are willing to accept new ideas from each other.	Tu et al. 2006
CC-5	The employees in both our firm and our partner firm deal with each other fairly.	Stuart and McCutcheon, 2000

Table A-2 (cont.): Prior Relevant Knowledge

Variable	Prior Relevant Knowledge (Cost Management)	Indirect Origin of Item*
	Within our firm, we use…	
CM-1	… *cost information* to determine whether costs are fixed or variable.	
CM-2	… *performance standards and budgets* to manage or control internal costs within our firm.	
CM-3	… *Activity-Based Costing (ABC)* to determine costs associated to specific activities.	
CM-4	… cost information associated with specific activities to manage the costs of activities and processes (i.e. *Activity-Based Management*).	
CM-5	… use *Kaizen* or other continuous improvement processes	
CM-6	… *target costing* in the internal planning, design, and development of products or services.	
CM-7	… an analysis of internal value chain activities as part of our management of internal costs.	
CM-8	… *business process redesign* (reengineering) to manage costs.	
CM-9	… *TQM, Six Sigma* or other such processes to manage costs associated with quality.	
CM-10	… non-financial measures of performance such as those in a *balanced scorecard* as part of our internal cost management processes.	
CM-11	… *Activity-Based Costing (ABC)* to evaluate our internal costs of working with our supply chain partners.	
CM-12	… *measures of the efficiency* of the processes that convert our resources (such as material, labor and/or overhead) into goods and/or services.	
CM-13	… *inventory management procedures* to manage and control work-in-process, merchandise or other such internal inventory costs.	

***** The items for the "prior relevant knowledge" construct were developed from generally accepted management accounting practices, as documented in works such as Brewer, Garrison, and Noreen (2007).

Table A-3: Inter-organizational Cost Information Sharing

Variable	Inter-organizational Cost Information Sharing	Indirect Origin of Item*
	When working with our partner firm to manage or control inter-organizational costs, our firm openly shares and uses the following types of information:	
ICIS-1	Sales or order entry information	
ICIS -2	Logistic and shipping information	
ICIS -3	Information related to future production and/or customer service plans	
ICIS -4	Information related to future capacity changes and capital investments plans	
ICIS -5	Information on market demand and forecasts	

***** The items for the information sharing construct were developed from generally accepted management accounting practices, as documented in works such as Brewer, Garrison, and Noreen (2007).