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INTER-ORGANIZATIONAL IMPLANTATION: AN EMPIRICAL EXAMINATION OF LOGISTICS SERVICE PROVIDER – CUSTOMER RELATIONSHIPS

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SCOTT J. GRAWE
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INTER-ORGANIZATIONAL IMPLANTATION: AN EMPIRICAL EXAMINATION OF LOGISTICS SERVICE PROVIDER – CUSTOMER RELATIONSHIPS

A DISSERTATION APPROVED FOR THE
MICHAEL F. PRICE COLLEGE OF BUSINESS ADMINISTRATION

BY

Dr. Patricia J. Daugherty, Chair

Dr. Rajiv P. Dant

Dr. Anthony S. Roath

Dr. Suman Basuroy

Dr. Michael R. Buckley

This dissertation is dedicated to my family, especially…

to Michelle, my best friend and the love of my life;

to Lydia, whose inquisitive mind and sharp intuition keeps me searching for knowledge;

to Caleb, whose simple question, "Dad, will you play with us?" is more important than any of the research questions proposed in this dissertation;

to Julia, whose gentle spirit reminds me that patience and persistence are two of the most important tools in life;

and to Alysa, whose smile and laughter remind me that if I'm not having fun, it's time to find something else to do.

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ABSTRACT

The current research examines an inter-organizational relationship structure that has not received much attention in prior studies: inter-organizational implantation. This phenomenon is explored in this dissertation using a three-paper format. Each paper is a separate empirical study which examines a unique aspect of such relationships. Although the dissertation specifically addresses the use of inter-organizational implants in logistics service provider (LSP) – customer relationships, the use of inter-organizational implants extends to other applications. The findings from each of the empirical studies should be considered when examining these applications, as well. Dyadic data used in the analysis were collected from 298 inter-organizational implants and 81 dyads, consisting of implants and representatives of their respective customers.

The first paper examines the impact that inter-organizational implants have on the relationship commitment of buyers and sellers at the organizational level. The research specifically examines the roles of outcome interdependence and responsiveness in the development of relationship commitment. The findings show that while outcome interdependence positively impacts the commitment of the LSP to the customer, it does not significantly impact the commitment of the customer to the LSP. Gaining the commitment of the customer was show to result from the implant's ability to develop relational capital with the customer.

The second paper considers the individual commitment of the inter-organizational implant. Specifically, the research examines the affective commitment of the implant to his/her employer, i.e. the LSP, and to the customer. The research

posits that as the implant builds relational capital with the customer and perceives greater levels of support from the customer, he/she will feel greater levels of commitment to the customer. Similarly, the research proposes that as the implant spends more time engaged in face-to-face communication with the LSP, he/she is likely to perceive greater levels of support and, therefore, display greater commitment toward the LSP. The findings from the study indicate that implants can develop greater levels of affective commitment to their customers by building relational capital with the customer. However, the study did not support a relationship between inter-organizational implantation and face-to-face communication with the LSP.

The final paper examines the role of the implant in the development of new processes and services within the customer's logistics operation. Specifically, the research proposes that as implants build relationships and exchange knowledge across organizational boundaries, innovation performance increases. The results of the analysis provide support for the use of inter-organizational implants to improve innovation performance in logistics operations.

LOGISTICS SERVICE PROVIDERS AND THEIR CUSTOMERS: GAINING COMMITMENT THROUGH INTER-ORGANIZATIONAL IMPLANTS

INTRODUCTION

North American firms have outsourced about 56% of their transportation spend to logistics service providers (LSPs) in recent years. However, many of these firms have expressed concerns about the responsiveness of their providers (Kerr 2007). Similarly, LSPs have indicated that their customers do not effectively share information with them (Kerr 2007). Thus, there appears to be low levels of satisfaction on both sides of the buyer-seller dyad. LSP-customer relationships have been characterized as being poorly designed, citing issues such as the lack of specific expertise, unmatched expectations, and poor communication (Meixell and Norbis 2008; Selviaridis and Spring 2007).

The current research addresses the issue by examining the impact of a common structure found in many LSP-customer relationships – inter-organizational implantation. Commonly referred to in practice as *on-site representation*, inter-organizational implantation involves the placement of a representative from one organization at another organization's facility in order to execute specific duties. Consider the following scenario: A retail operations manager reviews the latest product sourcing plan and shakes his head. Frustrated with the planned vendor selection, he steps out of his office and walks to a nearby cubicle. The manager calls another individual over to the cubicle and shows him the plan. "How are we supposed to get this product into our network? The vendor is located in a very remote region," the manager states. The other two individuals look at the plan and agree that the location is remote and will likely present distribution challenges. "We may have to

put the responsibility on the supplier for getting this product to us," replies one. The other asks further questions regarding the product volume and timing before stating that while challenging, there is a solution to the issue. The three of them sketch out a plan to get the product without compromising existing operations.

While this scenario may seem typical for most organizations, consider that the third individual in the scenario is an employee of the retail firm's LSP. The individual is working on-site at the retailer's office to provide strategic and operational support for the account. The implant lends expertise as needed, manages the operations of his firm, and provides access to logistics resources that the retailer might otherwise not have. This includes not only the logistics firms' physical assets required to deliver the product, but also a unique base of knowledge not available through the retailer's employees. The relationship between the customer (retailer) and the LSP's implanted employee becomes crucial to achieving mutual success for the two organizations.

The current research focuses on the impact that inter-organizational implants have on the outcome interdependence and relationship commitment from two perspectives: the LSP and the customer. The following section will discuss the theoretical framework of the study, which is then followed by introduction of the hypotheses and an overview of the research methodology. The paper concludes with a discussion of the findings, limitations, and future research opportunities.

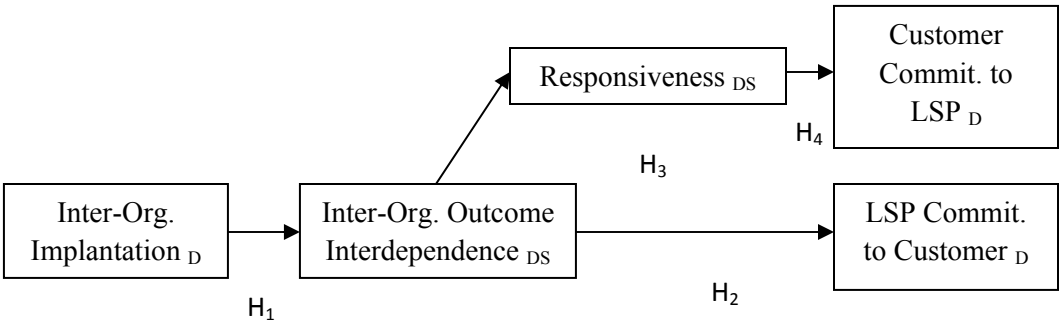
THEORETICAL FRAMEWORK

The relationship marketing literature provides a theoretical base to help understand the relationships between LSPs and their customers. Relationship

marketing is defined as the collection of activities directed toward establishing, developing, and maintaining successful relational exchanges (Morgan and Hunt 1994). Palmatier et al.'s (2006) meta-analysis of the relationship marketing literature supports the fundamental premise that relationship marketing and strong inter-organizational relationships positively affect relationship performance. Their research, along with many other studies in relationship marketing, helped to identify key factors that can lead to greater levels of commitment between service providers and their customers. The relationship marketing framework suggests that firms should strive to attain commitment from their channel partners as commitment has consistently been linked to greater relationship performance (Palmatier et al. 2007a).

Anderson and Weitz (1992) identified relationship-specific investments, i.e. idiosyncratic investments, as strong signals of commitment to channel partners. The authors cite the training and dedication of personnel to a specific relationship as an example of such an investment (Anderson and Weitz 1992). Consistent with this, the current research examines inter-organizational implants as relationship-specific investments between LSPs and their customers. We use a dyadic approach to examine the role that inter-organizational implants play in the development of commitment within inter-organizational relationships. The following section will examine the relationships between inter-organizational implantation, inter-organizational outcome interdependence, responsiveness, and commitment and will introduce the research hypotheses. The proposed relationships are shown in Figure 1.

FIGURE 1
THE THEORETICAL MODEL



D = Degree; DS = Degree-Symmetric

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Inter-organizational implantation is the degree to which a representative of one organization is physically embedded within another organization (e.g. employees of logistics service providers working on-site at customer facilities). Organizations use co-location to develop relationships with business partners and facilitate joint operations. Previous researchers have noted that an environment of collaboration, relationship-building, and joint decision-making can be promoted through co-location of employees (Kahn and McDonough III 1997). Co-location also enhances the dissemination of information across organizations and allows for more effective coordination between organizations (Maltz and Kohli 1996; Reid 1964).

However, placing a representative within a customer facility can also be cause for concern – especially if the representative and the customer are not working toward similar goals. To minimize the risk associated with allowing a "foreign" representative into the operation, the customer is likely to set specific performance

expectations for the implant and the respective LSP. An implant from a LSP working at a retail distribution center provides an illustration. If the retailer sets an on-time delivery goal of 99% for its logistics operation, the implant will work towards attaining that goal. In order for the implant to reach the on-time delivery goal, the customer must provide information regarding each shipment. Likewise, the implant should provide information regarding the LSP's capacity availability and shipment status. Each party is dependent on the other to fulfill certain duties in order to meet the operational goal. Therefore, outcomes are interdependent. Outcome interdependence is the "degree to which group members are presented with group goals or provided with group feedback" (Van Der Vegt et al. 2000, p. 635). Group goals are "the level of performance to be achieved by all members of the group working together" (Van der Vegt et al. 2000, p. 636). Within the current context, inter-organizational outcome interdependence is the degree to which the organizational implant and the customer are presented with common goals and provided common feedback. The presence of the implant within the customer's operation facilitates consistent feedback between the implant and the customer and focuses efforts on desired outcomes. Therefore, the following hypothesis is offered:

Hypothesis 1: Inter-organizational implantation is positively related to inter-organizational outcome interdependence.

When individuals accept and are held accountable to a common outcome, i.e. inter-organizational outcome interdependence, a strong sense of commitment to the project or relationship is often created among the individuals (Wageman 1995).

Commitment, in this context, is the enduring desire to maintain a valued relationship with an exchange partner (Moorman et al. 1992; Morgan and Hunt 1994). Outcome interdependence between inter-organizational implants and their customers can promote solidarity within the group (Schippers et al. 2003). In other words, outcome interdependence can reduce the perception of organizational bias among the members of the group. Interdependence between the implant and the customer suggests that each party has influence over the outcomes of the other party (Rusbult and Buunk 1993). This also suggests that the implant can impact the outcomes of the customer's logistics operation just as the customer has influence on the performance of the inter-organizational implant. For example, the implant's ability to provide the transportation capacity and schedule deliveries as requested by the customer has a direct impact on the customer's ability to operate effectively. Likewise, the customer must communicate expectations as well as detailed information regarding each shipment in order for the implant to effectively serve the customer. As the customer sets expectations for delivery performance, capacity availability, and communication performance, the LSP adopts the same expectations for outcome performance.

The LSP's commitment to the customer reflects the LSP's dependence on the customer. While the LSP is likely capable of surviving without the customer, a history of dependence and positive experiences resulting from the relationship with the customer can lead the LSP to adopt a longer-term orientation within the relationship. For example, as the LSP allocates assets and other resources to meeting the needs of the customer, the LSP is likely to adopt a long-term perspective of the relationship as it seeks to achieve a positive return on the resources allocated to the relationship.

Reallocating such resources to other relationships can be costly and can jeopardize the ability of the LSP to achieve an acceptable return on the resources. Therefore, the following is proposed:

Hypothesis 2: Inter-organizational outcome interdependence is positively related to the LSP's commitment to the customer.

Although the literature supports a similar impact regarding the commitment of the customer to the service provider, the current research proposes a mediated relationship between inter-organizational outcome interdependence and customer commitment to the LSP. Due to the basic nature of the relationship between LSPs and their customers – one party being compensated for services and the other paying for services – the research takes the view that it takes a little "extra" to gain the commitment of a customer.

Interdependence theory suggests that the degree of dependence plays an important role in determining the level of commitment one party demonstrates toward another (Rusbult and Buunk 1993). While firms may be dependent on LSPs to provide knowledge and resources to their logistics operations, their dependence on *specific* LSPs is not as high. Individual LSPs can overcome this challenge by being responsive to the needs and desires of the customer. Responsiveness is the willingness to help the customer and provide prompt service (Crosby and LeMay 1998). As noted by Stank, Daugherty, and Ellinger (1998), close customer relationships are characterized by anticipating customer expectations and measuring the extent to which outcomes align with expected outcomes. When inter-organizational implants and

customers work together toward common goals, the implant is able to react quickly if operations deviate from achieving desired outcomes. Responsiveness on behalf of implants is aided by the co-location of implants with the customer. This allows for quick and comprehensive performance information to flow between the parties as the delay associated with mediated communication modes is reduced in a co-located environment. Therefore, it is proposed that responsiveness mediates the relationship between inter-organizational outcome interdependence and the customer's commitment to the LSP:

Hypothesis 3: Inter-organizational outcome interdependence is positively related to the responsiveness of the inter-organizational implant.

Hypothesis 4: The responsiveness of the inter-organizational implant is positively related to the customer's commitment to the LSP.

RESEARCH METHODOLOGY

In order to effectively study both customer commitment and service provider commitment, the collection of dyadic data was essential. This design allows for the examination of key constructs from the perspective of each party – an important consideration in the study of inter-organizational relationships (Chen and Paulraj 2004; Fang et al. 2008; John and Reve 1982; Palmatier et al. 2007b). In the current context, the perspectives of the inter-organizational implants and the customers they serve are of interest. Therefore, a cross-sectional study of LSP-customer relationships was designed with the dyad as the unit of analysis.

Measurement Development

Each construct was evaluated using a survey consisting of multi-item reflective measures (Churchill 1979). A preliminary draft of the survey was developed and reviewed by five academic researchers and two industry experts, all of whom were familiar with the topics of interest. The input from these experts was then used to revise the survey. The revised survey was pretested using 37 inter-organizational implants and 31 customer representatives. Results of the pretest were used to develop the final version of the survey, which was administered online at www.surveymonkey.com. A link to the survey was embedded into an introductory letter for distribution to research participants.

All measurement items utilized Likert-type measures. A new scale was developed to measure inter-organizational implantation; other items were measured using existing scales. All items were anchored at 1 = strongly disagree, 4 = neutral, and 7 = strongly agree. Additionally, respondents were given the option to select "N/A" for items not applicable to them. The range of standardized means for the four inter-organizational implantation items was 0.89 – 0.95.

Inter-organizational outcome interdependence was measured using items adapted from Van der Vegt, Emans, and Van de Vliert (2000). Implants were asked to indicate their level of agreement with a series of statements relating to outcome interdependence with their respective customers. Customers were asked about outcome interdependence with implants. The standardized means for the implant responses on the four items ranged from 0.79 to 0.86. The standardized means for the customer responses ranged from 0.77 to 0.89.

Measurement items from Stank, Daugherty, and Ellinger (1996) were used to assess the responsiveness of the inter-organizational implant. Implants and customer representatives were each asked to indicate level of agreement with statements regarding the implant's responsiveness. The range of standardized means for the five measurement items was 0.91 to 0.96 for implant responses and 0.83 to 0.88 for customer responses.

Relationship commitment was measured using items adapted from Daugherty, Stank, and Ellinger (1998); Kumar, Scheer, and Steenkamp (1995); and Morgan and Hunt (1994). Implants and customer representatives were each asked to indicate their level of agreement with statements regarding their firm's relationship with the other firm. For example, the implant was asked about the LSP's relationship with the customer and the customer representative was asked about his/her firm's relationship with the LSP. Standardized means from the implant responses ranged from 0.95 to 0.98 for the five items. The range of standardized means from the customer responses was 0.76 to 0.91 for the five items.

All measurement items, along with associated means and standard deviations from the implant responses, are included in Table 1. Measurement items, means, and standard deviations from the customer responses are included in Table 2.

TABLE 1
CONSTRUCTS AND MEASUREMENT ITEMS: IMPLANT RESPONSES

		Mean	Std. Dev.
Inter-organizational Implantation			
(New Scale)			
*Please indicate your level of agreement with the following statements.**			
OI1	I have a workspace available at my host firm.	0.91	0.21
OI2	I spend a significant amount of time at my host firm.	0.95	0.15
OI3	I spend greater than half of my work time at my host firm.	0.93	0.19
OI4	I see several people each day at my host firm.	0.89	0.21
Inter-Organizational Outcome Interdependence			
(Adapted from Van Der Vegt, Emans, and Van De Vliert 2000)			
*Please indicate your level of agreement with the following statements.**			
OID1	My host firm informs me about goals I should achieve with my host firm.	0.84	0.21
OID2	Members of my host firm and I receive feedback on the basis of our collective performance.	0.83	0.21
OID3	I am accountable for the operational performance of my host firm.	0.79	0.26
OID4	My host firm monitors my progress on achieving performance goals.	0.86	0.20
Responsiveness			
(Adapted from Stank, Daugherty, and Ellinger 1996)			
*Please indicate your level of agreement with the following statements.**			
RES1	I can provide emergency services	0.91	0.15
RES2	I can quickly adjust our operations to meet unforseen needs.	0.94	0.13
RES3	I am flexible in responding to requests.	0.96	0.09
RES4	I manage change effectively.	0.95	0.08
Relational Capital			
(Adapted from Kale, Singh, and Perlmutter 2000)			
*Please indicate your level of agreement with the following statements.**			
RC1	There is close, personal interaction between myself and members of my host firm.	0.81	0.22
RC2	There is respect between myself and members of my host firm.	0.91	0.18
RC3	There is trust between myself and members of my host firm.	0.89	0.19
RC4	There is personal friendship between myself and members of my host firm.	0.67	0.26
RC5	I am happy with my firm's overall relationship with my host firm.	0.87	0.19

*Items were measured using a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly Agree).

TABLE 1 (CONT.)
CONSTRUCTS AND MEASUREMENT ITEMS: IMPLANT RESPONSES

		Mean	Std. Dev.
Commitment to the Customer			
(Adapted from Daugherty et al. 1998; Kumar et al. 1995; Morgan and Hunt 1994)			
*Please indicate your level of agreement with the following statements.**			
CLOY1	The relationship that my firm has with this firm is something we are very	0.97	0.07
CLOY2	The relationship that my firm has with this customer deserves our best effort to maintain.	0.98	0.05
CLOY3	Maintaining a long-term relationship with this customer is very important	0.98	0.04
CLOY4	We would like to do more business with this customer in the next year.	0.98	0.04
CLOY5	We are willing to put more effort and investment in supporting this	0.95	0.10

*Items were measured using a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly Agree).

TABLE 2
CONSTRUCTS AND MEASUREMENT ITEMS: CUSTOMER RESPONSES

		Mean	Std. Dev.
Inter-Organizational Outcome Interdependence			
(Adapted from Van Der Vegt, Emans, and Van De Vliert 2000)			
*Please indicate your level of agreement with the following statements.**			
OID1	My firm has informed the 3PL on-site representative about goals that he/she should achieve with our logistics employees.	0.89	0.11
OID2	Our logistics employees and the 3PL on-site representative receive feedback on the basis of their collective performance.	0.87	0.12
OID3	The 3PL on-site representative is accountable for the operational performance of our firm.	0.77	0.23
OID4	My firm monitors the 3PL on-site representative's progress on achieving performance goals.	0.89	0.12
Responsiveness			
(Adapted from Stank, Daugherty, and Ellinger 1996)			
*Please indicate your level of agreement with the following statements.**			
RES1	The 3PL on-site representative can provide emergency services	0.85	0.14
RES2	The 3PL on-site representative can quickly adjust our operations to meet unforseen needs.	0.83	0.18
RES3	The 3PL on-site representative is flexible in responding to requests.	0.88	0.16
RES4	The 3PL on-site representative manages change effectively.	0.83	0.19
Relational Capital			
(Adapted from Kale, Singh, and Perlmutter 2000)			
*Please indicate your level of agreement with the following statements.**			
RC1	There is close, personal interaction between our logistics employees and the 3PL on-site representative.	0.85	0.18
RC2	There is respect between our logistics employees and the 3PL on-site	0.89	0.15
RC3	There is trust between our logistics employees and the 3PL on-site	0.87	0.16
RC4	There is personal friendship between our logistics employees and the 3PL on-site representative.	0.71	0.21
RC5	I am happy with my firm's overall relationship with the 3PL.	0.86	0.14

*Items were measured using a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly Agree).

TABLE 2 (CONT.)
CONSTRUCTS AND MEASUREMENT ITEMS: CUSTOMER RESPONSES

		Mean	Std. Dev.
Commitment to the LSP			
(Adapted from Daugherty et al. 1998; Kumar et al. 1995; Morgan and Hunt 1994)			
*Please indicate your level of agreement with the following statements.**			
LOY1	The relationship that my firm has with this 3PL is something we are very	0.90	0.12
LOY2	The relationship that my firm has with this 3PL deserves our best effort to maintain.	0.91	0.12
LOY3	Maintaining a long-term relationship with this 3PL is very important to my firm.	0.89	0.12
LOY4	We would like to do more business with this 3PL in the next year.	0.77	0.17
LOY5	We are willing to put more effort and investment in supporting this 3PL.	0.76	0.18

*Items were measured using a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly Agree).

Degree and Symmetry within Dyads

Degree-symmetric constructs were derived using the measurement items from the implants and the customers as outlined by Straub, Rai, and Klein (2004). As its name implies, degree-symmetric constructs provide an assessment of two pieces of information. First, they assess the degree to which each factor is present. For example, responses of 7 on each of the relational capital measurement items would yield a degree value of 7, indicating a high level of relational capital. Second, they assess the symmetry of responses within the dyad. So, if one respondent within the dyad indicates high levels of relational capital and the other respondent within the same dyad indicates low levels of relational capital, the degree-symmetric construct would yield a moderate level of relational capital for the dyad as each respondent is considered. This technique allows the researchers to not only assess the differences among respondents in paired dyads, but also the degree to which the variable is present

in the dyad. For example, consider a single dyad consisting of one LSP inter-organizational implant and the corresponding customer representative. Assume that the inter-organizational implant indicates very low levels of responsiveness within the operation (i.e. 1-2 on the Likert scale). Also, assume that the customer representative indicated low levels regarding the implant's responsiveness within the operation. An assessment of the dyadic symmetry yields high results as each member of the dyad is in agreement regarding the level of the implant's responsiveness within the operation. However, our primary concern is not symmetry, but the degree to which the implant *is* responsive. In order to effectively assess whether there is a relationship between inter-organizational outcome interdependence and responsiveness (as proposed in Hypothesis 3), it is important to know the level of responsiveness within the dyad. In this example, responsiveness was low. The derivation of degree-symmetric constructs allows us to accomplish this within each dyad (Klein et al. 2007; Straub et al. 2004). A detailed description of the development of degree-symmetric constructs is shown in Table 3.

TABLE 3
DEGREE AND DEGREE-SYMMETRIC CONSTRUCT DERIVATIONS[a]

	Derivations	Definition	Formula	Assumptions
(i)	Implant or Customer Value: C_I or C_C	Summated index of the level, l, of each item, x_i, that belongs to the set of items $\{x_1, x_2, \ldots x_n\}$ used to measure construct a for the implant or customer.	$(\sum^{n}_{i=1} x_i * l_i)/(n*L)$ where $0 \leq l^i \leq L$	a. $C_I \geq 0$ and $C_C \geq 0$ b. $C_I \leq 1$ and $C_C \leq 1$
(ii)	Degree Value: C_D	Summated index of the implant and customer values of construct a.	$(C_I + C_C)/2$	$0 < C_D \leq 1$
(iii)	Symmetry Value: C_S	Symmetry index of construct a within the relationship.	If $C_I \geq C_C$ then $C_S = C_C/C_I$; If $C_I < C_C$ then $C_S = C_I/C_C$	$0 < C_S \leq 1$
(iv)	Degree-Symmetry Value: C_{DS}	The index of both symmetry and value of construct a within the relationship.	$(C_D + C_S)/2$	$0 < C_{DS} \leq 1$

[a] The definitions, formulas, and assumptions were originally developed by Straub, Rai, and Klein (2004).

Data Collection

Data collection targeted LSP implants and their customers. The data collection focused on each facility covering one inter-organizational implant and one customer representative; i.e. the dyad. The facilities consisted of manufacturing sites, distribution centers, and corporate offices.

A total of 18 logistics service providers were selected from personal contacts to represent a variety of logistics services. Collectively, the service providers included ocean carriers, air freight forwarders, truckload carriers, asset-based providers, and

non-asset based providers. Each provider was contacted by phone to discuss the project. After speaking with senior-level (Director and above) executives at each of the firms, 15 logistics service providers agreed to participate in the research project.

After sending an introductory email to each participating firm assuring confidentiality, a letter with a link to the implant version of the survey was sent to a single contact at each of the LSPs. Each key contact then distributed the letter to inter-organizational implants within his/her respective organization. This method allowed each LSP to protect the confidentiality of customer lists (i.e. customer contact information was not shared with the researcher). To gain the perspective of the customers, each implant was then asked to forward a separate letter (created by the researcher) to key customer contacts which included a link to the online survey. This process also served to preserve the confidentiality of the LSP customer lists. The LSP key contacts subsequently reported the number of letters distributed. The letter with the link to the survey was sent to a total of 750 inter-organizational implants. Approximately three weeks after sending the initial email to potential participants, each firm's key contact sent a follow-up email to the group of inter-organizational implants.

During the ten-week data collection process, a total of 344 implant surveys were received, representing an initial response rate of 46%. Ninety-five customer surveys were received from the 344 implant participants, representing a 28% response rate.

To further qualify each participant, two additional statements had been included in the survey. The first statement was: "I had enough information to answer

all of the questions" (1 = strongly disagree, 4 = neutral, 7 = strongly agree). The second was: "The questions in this survey are relevant to my firm" (1 = strongly disagree, 4 = neutral, 7 = strongly agree). Responses of 4 or lower were omitted from the analysis. Of those surveys submitted, 32 implant surveys and 7 customer surveys were omitted due to:

- too much missing data;
- all neutral responses;
- responses of 4 or lower on either of the two qualifying statements.

The remaining 81 customer surveys were paired with remaining implant surveys using information provided by each respondent. Each implant was asked to indicate the name and location of the customer about whom the survey would be completed. Similarly, the customer was asked to indicate the name and firm of the inter-organizational implant about whom the survey would be completed. Using this information, surveys from the implants and customers were matched to form paired dyads. All unpaired responses were dropped from the study. This process resulted in 81 paired dyads, representing a final response rate of 24%.

Non-response and Common Method Biases

When collecting survey data, the potential exists for bias resulting from non-respondents and common methods. Therefore, additional tests were conducted to ensure that the risk of bias was minimized. Potential for each type of bias was tested on: inter-organizational implant responses and customer responses. Non-response bias for the implant responses was tested by comparing responses from the final one-third of the respondents with the first two-thirds using ANOVA (Armstrong and Overton

1977). No significant differences were found between the groups at $p < 0.05$. The same procedure for the customer responses also yielded no significant differences between the final one-third and the first two-thirds.

The threat for common method bias was assessed using Harmon's one-factor test (Podsakoff and Organ 1986). The unrotated principle components analysis yielded 8 factors with eigenvalues greater than 1, accounting for 74% of the variance. The first factor accounted for only 35% of the variance. Since no single factor accounted for a majority of the variance, the threat to validity associated with common method bias was minimized for the implant responses. The same process for the customer responses resulted in 12 factors with eigenvalues greater than 1, accounting for 80% of the variance. The first factor using customer responses accounted for only 20% of the variance, indicating that common method bias from the customer responses was also minimized.

Analysis

Data were analyzed using the CALIS procedure in SAS 9.1. An initial examination of the data to evaluate item normality, skewness, kurtosis, means, standard deviations, and outliers yielded acceptable results (Mentzer et al. 1999). Additional analysis is described in the following sections.

Reliability and Validity

The CORR procedure in SAS was used to estimate coefficient alphas for all constructs. Coefficient alpha is a measure of internal consistency of a construct (Fornell and Larcker 1981). The alphas in the current study range from 0.74 to 0.92,

which exceed the recommended minimum value of 0.7, suggesting that the scales used to measure the constructs are reliable (Nunnally and Bernstein 1994). Coefficient alpha reliability estimates are presented in Table 4 along the diagonal.

TABLE 4
AVERAGE VARIANCE EXTRACTED, CORRELATIONS, AND RELIABILITIES

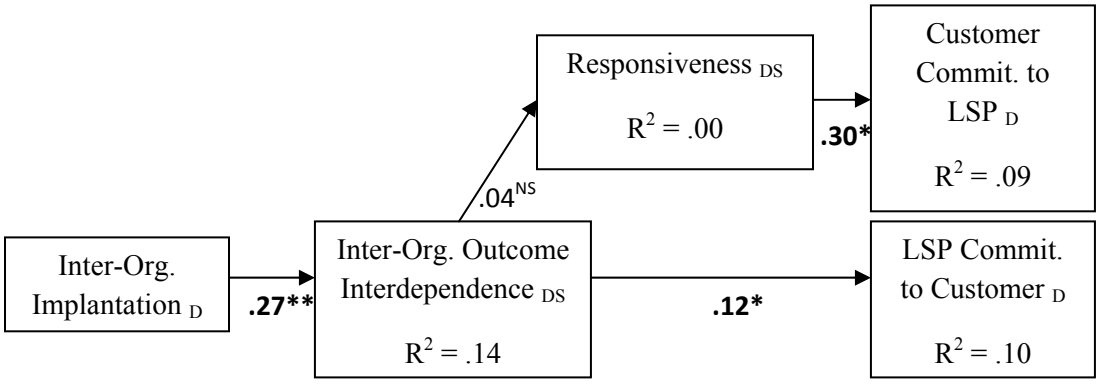
	Average Variance Extracted	I-O Implantation	I-O Outcome Interdep.	Resp.	Commit. To Customer	Commit. To LSP
I-O Implantation	0.88	**0.92**				
I-O Outcome Interdep.	0.60	0.14	**0.80**			
Responsiveness	0.72	0.00	0.00	**0.82**		
Commitment to Customer	0.74	0.08	0.10	0.01	**0.74**	
Commitment to LSP	0.50	0.03	0.00	0.09	0.00	**0.89**

* Coefficient alpha estimates are bolded along the diagonal

The CORR procedure was also used to assess construct validity. Convergent validity is demonstrated in that all measurement items for each construct demonstrate reasonably strong correlations with the sum of the remaining measurement items for each respective construct (Fornell and Larcker 1981). These correlations range from 0.57 to 0.89. Discriminant validity was assessed by examining the variance extracted estimate for each construct. This provides an indication of the amount of variance captured by each construct relative to the error variance (Fornell and Larcker 1981; Hatcher 1994). To demonstrate discriminant validity, the variance extracted estimates for each of the two factors of interest should exceed the square of the correlation between the factors. Additionally all constructs in the measurement model had variance extracted estimates of 0.5 or greater, which provides added evidence of

discriminant (Fornell and Larcker 1981). Variance extracted estimates are also presented in Table 4.

FIGURE 2
PATH COEFFICIENTS & EXPLAINED VARIANCE



D = Degree; DS = Degree-Symmetric
* Significant at .01 level; ** Significant at .001 level

Hypothesis Testing

Path analysis was used to test the theoretical model presented in Figure 1. The path analysis was performed using the CALIS procedure in SAS. The results are shown in Figure 2. Hypothesis 1, which proposed a positive relationship between inter-organizational implantation and inter-organizational outcome interdependence was supported. The path coefficient of 0.38 and t-value of 3.67 indicate that the relationship is significant at $p < 0.001$.

The second hypothesis suggested that inter-organizational outcome interdependence would be positively related to the LSP's commitment to the customer.

This hypothesis was also supported at $p < 0.01$, with a path coefficient of 0.12 and a t-value of 3.01.

Hypothesis 3 proposed that inter-organizational outcome interdependence would lead to greater responsiveness from the implant. This hypothesis was not supported, indicating that there is not a direct, positive relationship between the variables. The analysis yielded a path coefficient of 0.04 and a t-value of 0.42, which is not significant.

The fourth hypothesis proposed that the implant's responsiveness would lead to greater commitment from the customer toward the LSP. This relationship was supported at $p < 0.01$. The path coefficient is 0.30 and the t-value is 2.78.

Goodness-of-fit indices from the analysis indicate that the theoretical model represents an appropriate fit. Indices examined include: chi-square ($\chi 2$), comparative fit index (CFI), the normed fit index (NFI), and root mean square error of approximation (RMSEA). The $\chi 2$ yielded a value of 6.882 ($df = 6$, $p < 0.332$), which is not significant, indicating support for the model. The CFI for the theoretical model was 0.97, which is above the recommended cutoff value of 0.9 (Bentler 1990). The NNFI and RMSEA also yielded acceptable values at 0.94 and 0.04, respectively (Bentler 1990; Browne and Cudeck 1993).

Additionally, the utility of the proposed model can be assessed by examining the multiple squared correlations (R^2) for each of the endogenous variables. These results are also presented in Figure 2. The findings from the current study indicate that inter-organizational implantation explains approximately 14% of the variance in inter-organizational outcome interdependence. The model also suggests that approximately

10% of the variance in the LSP's commitment to the customer can be explained by inter-organizational outcome interdependence and about 9% of the customer's commitment to the LSP can be explained by the responsiveness of the inter-organizational implant.

Alternative Model

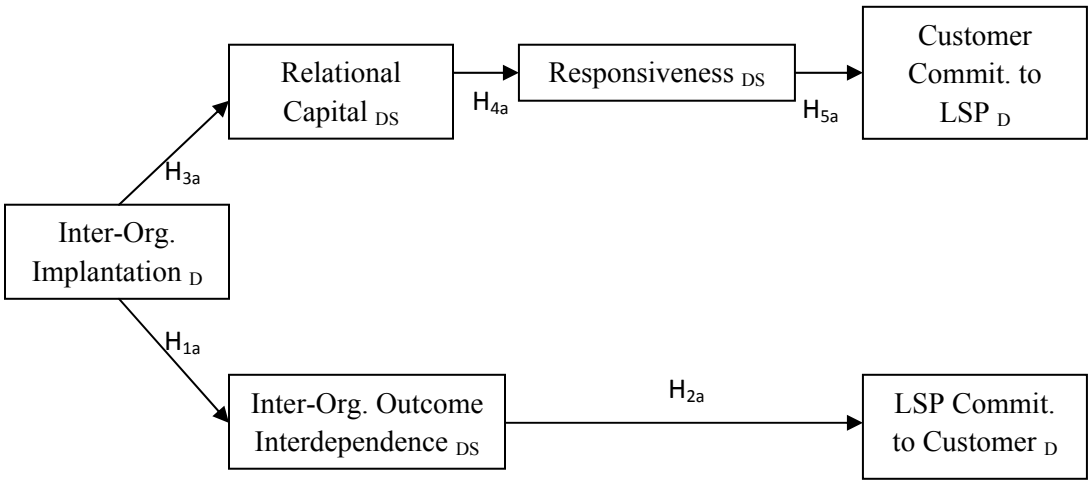
Justification

The results of the path analysis provide support for the use of inter-organizational implants from the perspective of the customer. The implants' goals become aligned with the goals of the customer, resulting in greater loyalty from the logistics service provider. However, there are two important questions that remained unanswered:

1. How can logistics service providers use inter-organizational implants to generate commitment *from* the customer?
2. How can the relationship marketing literature be extended to address the development of commitment *from* customers?

In order to answer these questions, an alternative model is proposed. The results from the initial model show that while responsiveness is important for generating commitment from the customer, it is not achieved through outcome interdependence. Therefore, the following alternative is offered:

FIGURE 3
THE ALTERNATIVE MODEL



D = Degree; DS = Degree-Symmetric

The alternative model (shown in Figure 3) posits that the development of relational capital leads to greater responsiveness and ultimately, commitment from the customer. Relational capital is defined as the trust, shared norms and perceived obligations, and sense of mutual identification within the social connections of a firm (Nahapiet and Ghoshal 1998). Essentially, relational capital is a reflection of the *personal* relationships an individual has developed. Inter-organizational implants are in a unique position to develop relational capital with customers as they are co-located with their employees. Previous research has shown that co-locating individuals from separate organizations enables informal communication and allows them to spend less time and effort in scheduling meetings and more time engaging in communication (Zenun et al.). In addition, the physical presence of the implant at the customer's facility increases likelihood that the implant will come to know members of the customer organization and develop interpersonal relationships with them (Bolino et al.

2002; Carver and Scheier 1985; Van den Bulte and Moenart 1998). As the implants work alongside customers' employees, they become viewed as part of the organization (Hogg and Terry 2000) and create an environment characterized by collaboration, trust, and effective relationships (Kahn and McDonough III 1997; Zenun et al.).

As implants develop relational capital with employees of the customer organization and identify with the customer, they are likely to take greater ownership of the operation's performance. Additionally, closer relationships between the implant and the customer's employees allow the implant to anticipate operational needs and gain access to detailed customer knowledge (Stank et al. 1998). Readily available information and knowledge allows the implant to achieve high levels of responsiveness for the customer (Ellram and Cooper 1990; Stank et al. 1996). Therefore, the following hypothesis is offered relating to the alternative model:

Alternative Hypothesis: Relational capital mediates the relationship between inter-organizational implantation and responsiveness.

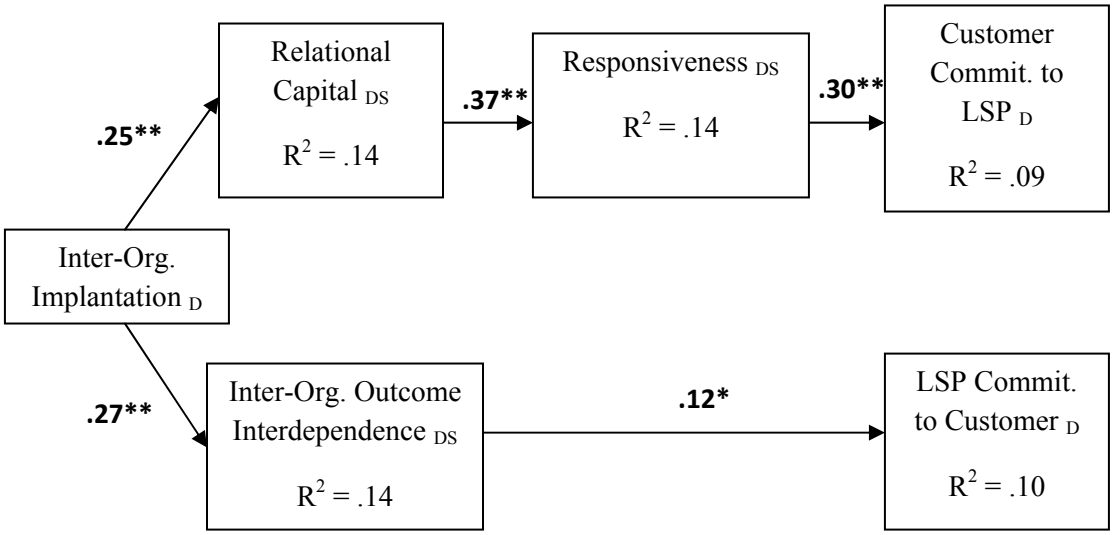
Results

In order to add relational capital as a mediating variable in the alternative model, new items were included in the analysis to measure relational capital. The responses for each item were collected as part of the original survey. Relational capital was measured using items adapted from Kale, Singh, and Perlmutter (2000). Implants were asked to indicate their level of agreement with statements regarding their relationships with customer representatives, while customer representatives were asked about their relationships with their respective implant. Standardized means for

the five items from implant responses ranged from 0.67 to 0.91. The customer standardized means ranged from 0.71 to 0.89.

The results of the alternative model test are shown in Figure 4. Support was found for all hypotheses. Goodness-of-fit indices from the analysis indicate that the theoretical model represents an appropriate fit. Indices examined include: chi-square ($\chi 2$), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The $\chi 2$ yielded a value of 15.13 (df = 10, $p < 0.13$), which is not significant, indicating support for the model. The CFI and RMSEA also yielded acceptable values at 0.90 and 0.08, respectively.

FIGURE 4
ALTERNATIVE MODEL PATH COEFFFICIENTS & EXPLAINED VARIANCE



D = Degree; DS = Degree-Symmetric
* Significant at .01 level; ** Significant at .001 level

Path coefficients for the model are all significant at the 0.01 level or lower, providing support for the relationships proposed in the model. Additionally, we can assess the utility of the proposed model by examining the multiple squared correlations (R^2) for each of the endogenous variables. These results are also presented in Figure 4. The added findings from the alternative model indicate that inter-organizational implantation explains approximately 14% of the variance in relational capital and relational capital explains about 14% of the variance in the responsiveness of the implant.

DISCUSSION AND IMPLICATIONS

As Palmatier et al. (2007a) indicated, "Management strategies must increase customers' motivation to maintain (commitment) and enable" relationships (p. 186). The findings from our study can help managers at LSPs and their customers to more effectively design relationships utilizing inter-organizational implants. From the customer's perspective, the findings indicate that a significant factor in obtaining commitment from the LSP is the establishment of an environment in which the implant and the logistics employees are held accountable for the same outcomes. This includes getting the implant involved in defining expectations. It also includes providing feedback to the implant along with the logistics employees regarding the operation's performance.

As one may expect, securing customer commitment to the LSP can be more challenging and requires additional effort from the implant. Our findings indicate that establishing mutual goals, i.e. outcome interdependence, is not sufficient for gaining

commitment from the customer. As predicted, responsiveness on the part of the implant to the needs of the customer can lead to greater commitment from the customer. Responsiveness was not found to result from simply being on-site at the customer's facility. In order to be responsive to the needs of the customer, the implant must build relational capital with the customer's logistics employees. In essence, inter-organizational implantation does not work if the implant is simply placed on-site out of convenience to perform duties in an isolated manner. To effectively build the relationship and generate commitment from the customer, the implant needs to engage with the customer formally and informally. The inter-organizational implant is on the front line. He/she is the LSP "face" that the customer sees. Therefore, inter-organizational implants are in position to personalize the relationship with the customer. The implant should take the time to get to know the people working around him/her and take an interest in the well-being of the group.

In light of the findings from the research, managers should carefully assess the capabilities of the representative selected to work at the customer's facility. In addition to being operationally competent, inter-organizational implants need to be relationship-oriented. Managers should identify metrics to capture the ability to build relational capital and effectively manage the operation.

LIMITATIONS AND FUTURE RESEARCH

As with any empirical study, there are limitations associated with the current research. The first limitation is related to the sample size. The availability of only 81 dyads in the sample limits the analysis that can be performed and the conclusions that

can be drawn from the study. Although the sample size is consistent with previous inter-organizational dyadic studies, future research should expand on this research by seeking larger samples and employing a variety of analytical techniques.

A second limitation is related to the research context. The study focused on the relationships between logistics service providers and their customers. Since the use of inter-organizational implants is prevalent in other industries, future research should seek to generalize the findings by obtaining input from inter-organizational implants in other industries (i.e. IT, manufacturing, human resources, etc.).

Future research should examine other ways in which inter-organizational implants affect inter-organizational relationships. For example, the relationship marketing literature highlights trust as another key ingredient in building successful relationship between organizations. The placement of representatives within another organization may introduce concerns regarding inter-personal trust. Studies aimed at extending the research on inter-organizational implants should examine the level of trust between co-located individuals from separate organizations and the resulting trust levels at the organizational level. Research should consider the extent to which individuals are willing to engage in knowledge and information sharing with individuals who are not part of the organization.

Dyadic and triadic studies could be used to gain a more complete perspective of the relational implications of implanting members within another organization. This might involve the inclusion of account managers, operations managers, and senior-level executives to gain additional insights into broader inter-organizational relationships.

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BALANCING ORGANIZATIONAL COMMITMENT: THE ROLE OF RELATIONAL CAPITAL AND FACE-TO-FACE COMMUNICATION

INTRODUCTION

Organizational influence extends beyond a firm's own facilities. Organizations often work closely with their supply chain partners on a wide range of operational and strategic initiatives. In many of these situations, firms will even dedicate representatives specifically to serving the needs of particular inter-organizational relationships. The representatives assigned to this task are referred to as boundary spanners as they engage in "multiple roles at the interface of an organization and its environment" (Stock, 2006, pp. 589-590) and engage in "significant transactions" with members of other groups (Richter et al., 2006, p. 1253). In other words, a boundary spanner is an employee who reaches out to work with other organizations on behalf of his/her own firm. The importance and visibility of these individuals has grown in recent years as customers increasingly seek greater personal interaction, consulting services, product development assistance, and other value-added services (Cardozo et al., 1992; Homburg and Stock, 2004; Stock, 2006). In many instances, firms place these boundary-spanning representatives inside the physical boundaries of their customers' facilities, i.e. they are implanted.

In an interview published in Harvard Business Review, Michael Dell indicated that he had thirty people "living" at Boeing to manage the customer account (Magretta, 1998). According to Dell, "We don't look like a supplier, we look more like Boeing's IT department. We become intimately involved in planning their PC needs and the configuration of their network" (Magretta, 1998, p. 79). A challenge

faced by Dell and other organizations using representatives at customer facilities is keeping the boundary spanners committed to their own organizations while providing value-added services for customers within this type of structure. Continuing exposure to the values and culture of customers raises the potential for these representatives to commit to and identify with the customers that host them. According to McElroy et al. (2001), "commitment to multiple organizational targets is commonplace is many business settings, especially where organizational representatives serve as boundary spanners with other client organizations" (p.238).

The placement of representatives within other firms is not new, but it has become more common as firms work more closely with their business partners. In addition to the Dell example provided above, implants can be found in human resources, manufacturing, logistics, and other industries (Freeland and Kidwell 1995). The current research focuses on the use of inter-organizational implants within logistics operations.

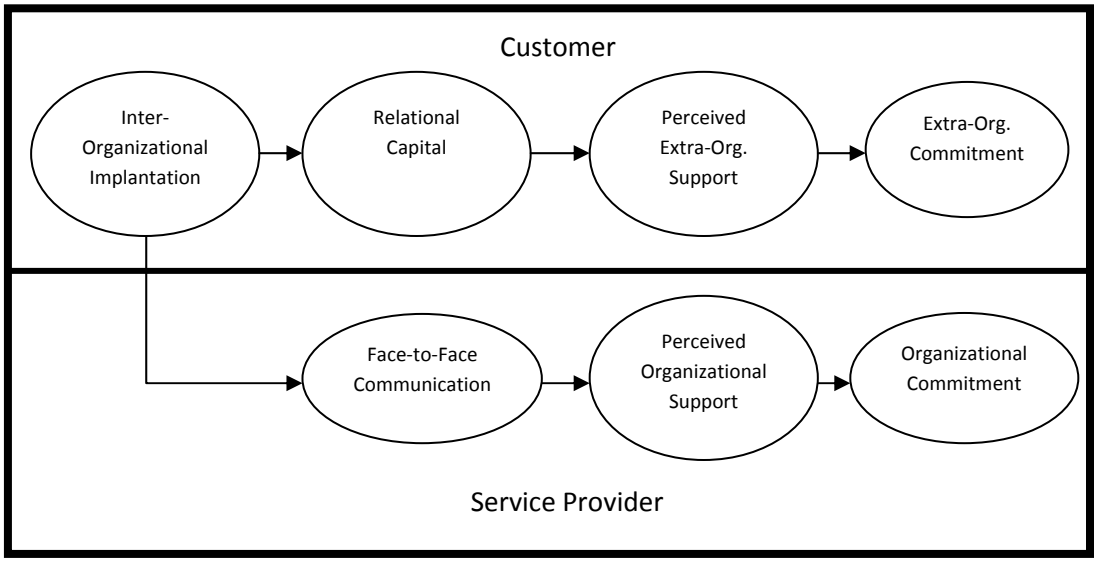
As logistics service providers (LSPs) turn to implants to manage customer-specific operations, they face a unique challenge – maintaining the commitment of the implants to the LSP. The current research seeks to address this challenge through an empirical examination grounded in social exchange theory. Social exchange theory has been used in previous research to predict the commitment of employees to organizations (Eisenberger et al., 1990; McElroy et al., 2001).

THEORY AND HYPOTHESES

According to social exchange theory, individuals and groups trade their efforts for rewards or the prospect of future rewards (Blau, 1964; Emerson, 1976; Homans, 1958). The framework suggests that relational mechanisms govern inter-organizational exchanges (Granovetter, 1985). Relational mechanisms have been shown to be more effective than authoritative relations in creating behavioral standards to discourage opportunism and malfeasance (Granovetter, 1985; Liu et al., 2009). Previous research has found that such social connections lead to greater commitment to the relationship from each party involved (Liu et al., 2009; Settoon et al., 1996).

Our research seeks to build on the social exchange theoretical framework through an empirical examination of the social connections between an implanted boundary spanner and the customer. Specifically, the research asks the following question: if an individual is placed inside a customer's facility, can he/she develop affective commitment toward the customer's organization? Additionally, does the representative also display affective commitment toward the LSP? In addressing these questions, the study proposes that individuals can be committed to multiple organizations if certain factors are present in the relationships. According to McElroy et al. (2001), the literature has failed to examine the antecedents and consequences of strong extra-organizational commitment. The current research makes a contribution by examining antecedents to extra-organizational commitment while also assessing the dual commitment of inter-organizational implants; i.e. to the customer firm and to his/her employer organization. The proposed relationships are shown in Figure 1.

Figure 1. Theoretical Model of Extra-Organizational Commitment



Inter-organizational Implants and their Customers

Inter-organizational implantation is defined as the degree to which a representative of one organization, i.e. the inter-organizational implant, is physically embedded within another organization (e.g. employees of logistics service providers working on-site at customer facilities). Inter-organizational implants often manage a portion of their customers' logistics operation and assist them in planning. Although the use of inter-organizational implants has not been widely examined, previous studies of groups and co-location can provide understanding of the potential impact of using inter-organizational implants.

Inter-organizational implants are co-located with their customers' employees. This physical structure allows firms to overcome barriers associated with distance between individuals. According to Van den Bulte and Moenart (1998), some of the common barriers to physical separation include:

- Reduced probability of chance encounters
- Reduced chance of unplanned, serendipitous information transfer and problem clarification
- Encouragement of technical jargon
- Heightened perceptions of personality differences

Co-location allows individuals to connect with each other and focus their efforts on completing tasks, rather than spending effort trying to schedule meetings (Zenun et al., 2007). Individuals working together in the same place are likely to see one another more frequently than individuals geographically dispersed. As they interact within conference rooms, offices, or even passing in the hall, individuals become increasingly familiar with those working around them. Research has shown that when individuals are in proximity to other people, they tend to show concern for interpersonal relationships (Carver and Scheier, 1985). As a result, inter-organizational implants are likely to pay close attention to how they relate to customer employees and, over time, develop stronger relationships within the customer's organization (Valacich et al., 1994; Van den Bulte and Moenart, 1998).

These relationships can contribute to the development of relational capital. Relational capital is defined as the trust, shared norms and perceived obligations, and sense of mutual identification within the social connections of a firm (Nahapiet and Ghoshal, 1998). Inter-organizational implants working in the customer's network are influenced by the reinforcement of behavioral norms of the organization (Coleman, 1990). As the implants adhere to such norms, they begin to act like members of the customer's organization, which reduces behavioral uncertainty and increases the acceptance of implants by customer employees (Bolino et al., 2002; March et al., 1958). Therefore, the following hypothesis is proposed:

H_1: Higher levels of inter-organizational implantation lead to higher levels of relational capital.

As indicated, relational capital includes trust and mutual identification within the social network of the firm. Additionally, the development of relational capital allows the implant access to resources embedded within the customer through relationships with the customer's employees (Nahapiet and Ghoshal, 1998). Consider that as the implant develops relationships within the customer's organization, the implant is likely to express certain needs associated with his/her own work. For example, the implant may indicate that he/she could provide the customer with additional services to help prepare for operational changes if additional information about the changes was made available. The customer's willingness to share information, along with other resources needed to perform his/her tasks, i.e. office space, phone line, etc., can be perceived by the implant as evidence of support. Perceived extra-organizational support is the general perception concerning the extent to which an external organization values a representative's contributions and cares for the representative's well-being (Eisenberger et al., 1986). In the current context, the inter-organizational implant may perceive support from the customer. Although providing resources and other forms of support is the result of individual decisions and efforts, it is not uncommon for individuals to assign humanlike characteristics to organizations (Eisenberger et al., 1986). Research also has indicated that an organization's employees reflect the organization's intentions through their actions (Levinson, 1965). As the customer's employees share facilities, information, and

knowledge (resources of the firm), the implant perceives the organization as providing support for him/her. Thus, the following hypothesis is offered:

H_2: Greater levels of relational capital lead implants to greater perceptions of extra-organizational support.

Previous studies have found that perceptions of organizational support lead to greater levels of affective commitment toward the organization (Eisenberger et al., 1990; Kraimer et al., 2001). Affective commitment is the desire for a relationship to continue, which "reflects a feeling of emotional attachment to an organization" (Lievens and De Corte 2008, p. 561). McElroy et al. (2001) extended this concept by proposing that employees can also show affective commitment toward external organizations. Extra-organizational commitment refers to the affective commitment of a boundary-spanning employee toward an external organization (McElroy et al., 2001). Individuals can show commitment toward a number of different groups or individuals, including top management, supervisors, or other work groups (Becker, 1992). Therefore, when considering the commitment of an employee – particularly boundary spanners such as inter-organizational implants – a reference point is needed (Reichers, 1985). The object of an employee's commitment may be only a part of the organization (department, manager, etc.) and not the organization as a whole. When considering boundary spanners, the object of commitment can also be external.

Perceived extra-organizational support strengthens the implant's belief that the customer recognizes and rewards higher levels of performance (Rhoades and Eisenberger, 2002). Additionally, perceived extra-organizational support can play a

role in fulfilling an employee's socioemotional need for affiliation and emotional support, thus contributing to his/her sense of purpose and meaning (Armeli et al., 1998; Eisenberger et al., 1986; Rhoades and Eisenberger, 2002). Essentially, perceived extra-organizational support produces a felt obligation to care about the customer's welfare and help the organization achieve its objectives. Therefore, the following hypothesis is offered:

H_3: As implants perceive greater levels of support from the customer, they will exhibit greater levels of commitment to the customer.

Inter-organizational Implants and LSPs

Inter-organizational implants are boundary-spanning field representatives. As such, they spend a limited amount of time with their LSP co-workers. Instead, they are positioned at customer facilities and carry out operational duties on behalf of both the customer and LSP. Implants engage in frequent interactions with employees of the customer. In fact, they are likely to interact more with the customer's employees than their own LSP colleagues. In addition to gaining knowledge and information about the customer's operation, inter-organizational implants also act as gatekeepers to LSP resources. For example, an implant from an LSP located at a shipper's facility can provide the shipper with access to the truckload capacity and driver availability needed to attain operational goals. In order to effectively manage these resources, the implant must coordinate with his/her colleagues at the LSP.

In many instances, inter-organizational implants communicate with members of their own organizations electronically or over the phone. However, reliance on only one mode of communication is rare (Kirkman et al., 2004). Thus, geographically

dispersed employees working together are likely to communicate at least occasionally face-to-face (Geber, 1995; Kirkman et al., 2004). Although separated geographically, inter-organizational implants rely on their colleagues to provide information and resources to support customer operations. In other words, they work interdependently with their colleagues. Research has shown that as interdependence among individuals increases, face-to-face communication can be a more effective channel of communication when compared to mediated (e.g. email, phone) channels of communication (Bordia, 1997; Duncan and Moriarity, 1998). Therefore, it is proposed that inter-organizational implantation leads to more frequent face-to-face communication as LSPs seek to gain as much knowledge about the customer as possible from the implant.

H_4: Greater levels of inter-organizational implantation lead to greater levels of face-to-face communication with LSP colleagues.

Inter-organizational implants and their LSP colleagues work in different organizational contexts. Implants are situated within a customer's operation and operate in an environment that is influenced by the social and cultural norms of the customer's organization. The LSP, as an organization, has its own social and cultural norms which influence employees working inside the LSP's facilities. Communication allows individuals working in different organizational contexts to reduce uncertainty and ambiguity associated with their roles in achieving organizational objectives (Daft and Lengel, 1986). However, the effectiveness of communication can vary depending on the communication mode. Previous studies

have found that face-to-face communication yields several advantages over mediated communication modes such as email and telephone. For example, Short et al. (1976) found that social presence, or face-to-face communication, allows for a variety of communication channels in a single exchange. Gestures, tone, expressions, and utterances ("mm", "uh-huh", "right", etc.) can indicate understanding, acceptance, or confusion related to the speaker's message (Andres, 2002). As the variety of communication modes in an exchange decreases, less attention is paid to other parties involved in the exchange.

Face-to-face communication, whether formal or informal, leads to greater understanding of the speaker when compared with mediated communication modes (Straus and McGrath, 1994). Within the current context, this can then lead to a clearer understanding of the customer's logistics operation. The speaker in a face-to-face exchange can assess the receiver's understanding of the message. As an example, consider the receiver who responds with a repetition of the phrase "uh-huh" and a glazed look versus the receiver who asks clarifying questions and listens intently to the details of the message.

While it is common for co-located organizational members to engage in face-to-face communication, inter-organizational implants can find it difficult to engage in this type of communication with fellow employees at their own organization. As such, there can be a disconnect between the implant and other members of his/her organization. However, implants who do engage in face-to-face communication with co-workers are more likely to effectively communicate details of the customer's operation, including new and unique processes that allow the operation to be

successful. The face-to-face engagement between implants and their LSP coworkers can allow implants to more easily recognize the support dedicated to making the implant successful in his/her relationship with the customer. Since the allocation of resources and other types of support is perceived as discretionary and indicative of value and respect for the recipient, the implant is likely to perceive greater levels of support from the LSP. Therefore, the following hypothesis is offered:

H_5: Greater levels of face-to-face communication between the inter-organizational implant and the LSP lead implants to greater perceptions of organizational support from the LSP.

As with the relationship between perceived extra-organizational support and extra-organizational commitment, the perception of the organizational support from the LSP should be related to organizational commitment to the LSP from the inter-organizational implant. Employee commitment is based on emotional involvement, shared values, and identification with the organization (Lievens and De Corte, 2008; Meyer and Herscovitch, 2001). As the inter-organizational implant perceives that the LSP is supportive of the efforts and accomplishments of the implant, he/she is likely to identify with the LSP and its values.

H_6: As implants perceive greater levels of support from their own organizations, they will exhibit greater levels of commitment to the LSP.

RESEARCH METHODOLOGY

Research Setting and Participants

Before beginning the data collection, executives at 18 logistics service providers were contacted by telephone to discuss the research project. The service providers were selected from the researchers' personal contacts to represent a variety of logistics services. The sample included ocean carriers, air freight forwarders, truckload carriers, asset-based providers, and non-asset based providers. After speaking with senior-level (Director and above) executives at each of the firms, 17 logistics service providers agreed to participate in the research project. Each of the participating firms indicated a preference for a survey that could be distributed electronically to their employees. Therefore, paper-based surveys were not used for the study. The final survey was administered online at www.surveymonkey.com. Inter-organizational implants were specifically targeted as they were assumed to have the greatest insights regarding the concepts of interest in the current research.

Due to the sensitivity of customer-specific information, a letter containing a link to the online survey was sent to a single contact at each logistics service provider. (Many of the inter-organizational implants used had email addresses with their customers' domain names). Each contact distributed the letter to inter-organizational implants within their networks. Across all participating LSPs, a total of 750 inter-organizational implants received a letter with the link to the survey. Approximately three weeks after sending the initial email, a follow-up email was sent to each of the inter-organizational implants. During the ten-week data collection process, a total of 344 surveys were received, representing an initial response rate of 46%.

In order to ensure that the representatives completing the survey were appropriately qualified to answer the questions, two additional questions were included in the survey. The first question was: "I had enough information to answer all of the questions" (1 = strongly disagree, 4 = neutral, 7 = strongly agree). The second question was: "The questions in this survey are relevant to my firm" (1 = strongly disagree, 4 = neutral, 7 = strongly agree). Responses of four or lower were omitted from the analysis. Of those surveys submitted, 46 surveys were omitted due to:

- too much missing data;
- all neutral responses;
- response of 4 or lower on the additional qualifying questions.

The number of surveys remaining for final analysis was 298, representing a final response rate of 41%.

Two types of bias were tested before further analysis was conducted: non-response bias and common method bias. First, non-response bias was tested by comparing responses from the final one-third of the respondents with the first two-thirds using ANOVA (Armstrong and Overton, 1977). No significant differences were found between the groups at $p < 0.05$. Second, common method bias was assessed using Harmon's one-factor test (Podsakoff and Organ, 1986). The unrotated principle components analysis yielded seven factors with eigenvalues greater than 1, accounting for 69% of the variance. The first factor accounted for only 27% of the variance. Since no single factor accounted for a majority of the variance, the threat to validity associated with common method variance was minimized.

Measurement Items

Multi-item reflective measures were developed to evaluate relevant constructs. Reflective measures are viewed to be caused by a common underlying construct (Churchill, 1979). As such, each item was selected using previous scales and research based on its ability to represent the construct of interest. A preliminary draft of the survey was reviewed by five academic researchers and two industry experts, all of whom were familiar with the topics of interest. Their input provided guidance for revisions. The revised survey was pretested using 37 inter-organizational implants and the results were used to develop the final version of the survey.

All measurement items were Likert-type measurement items. Intra-organizational implantation was assessed using a new scale. Means for the four measurement items ranged from 6.14 to 6.41 (1 = strongly disagree, 4 = neutral, 7 = strongly agree). Participants were also given the option to select "N/A" for questions not applicable to them.

Relational capital was measured using items adapted from Kale et al. (2000). Implants were asked to indicate their level of agreement with statements regarding their relationship with customer representatives. The means for the four measurement items ranged from 4.88 to 6.17 (1 = strongly disagree, 4 = neutral, 7 = strongly agree).

A new scale was developed to measure face-to-face communication. Respondents were asked to indicate their level of agreement with statements concerning their face-to-face interactions with employees of their own firms, i.e. their co-workers. Means from the three measurement items ranged from 3.66 to 4.62 (1 = strongly disagree, 4 = neutral, 7 = strongly agree).

Perceived extra-organizational support was measured using items adapted from Piercy et al. (2006). Respondents were asked to indicate their level of agreement with statements concerning their perceptions of support received from their customers. Means from the four measurement items ranged from 5.00 to 5.83 (1 = strongly disagree, 4 = neutral, 7 = strongly agree).

Similarly, perceived organizational support was measured using items adapted from Piercy et al. (2006). Respondents were asked to indicate their level of agreement with statements concerning their perceptions of support received from their own organizations. Means from the four measurement items ranged from 5.69 to 5.95 (1 = strongly disagree, 4 = neutral, 7 = strongly agree).

Extra-organizational commitment was measured using items adapted from Piercy et al. (2006). Respondents were asked to indicate their level of agreement with statements concerning their affective commitment to their customers. The means from the four measurement items ranged from 5.32 to 6.29 (1 = strongly disagree, 4 = neutral, 7 = strongly agree).

Items from Piercy et al. (2006) were also used to measure organizational commitment. Respondents were asked to indicate their level of agreement with statements concerning their affective commitment to their own organizations. The means from the four measurement items ranged from 6.04 to 6.51 (1 = strongly disagree, 4 = neutral, 7 = strongly agree).

The measurement items, along with means and standard deviations for each item, are shown in Table 1.

Table 1. Constructs and Measurement Items

		Mean	Std. Dev.
Inter-organizational Implantation			
(New Scale)			
Please indicate your level of agreement with the following statements.			
OI1	I have a workspace available at my host firm.	6.34	1.54
OI2	I spend a significant amount of time at my host firm.	6.41	1.52
OI3	I spend greater than half of my work time at my host firm.	6.30	1.74
OI4	I see several people each day at my host firm.	6.14	1.74
Relational Capital			
(Adapted from Kale, Singh, and Perlmutter 2000)			
Please indicate your level of agreement with the following statements.			
RC2	There is respect between myself and members of my host firm.	6.17	1.41
RC3	There is trust between myself and members of my host firm.	6.05	1.43
RC4	There is personal friendship between myself and members of my host firm.	4.88	1.83
RC5	I am happy with my firm's overall relationship with my host	5.90	1.50
Perceived Extra-Organizational Support			
(Adapted from Piercy et al. 2006)			
Please indicate your level of agreement with the following statements			
EOS1	Help is available from my host firm when I have a problem.	5.83	1.49
EOS2	My host firm is willing to help me when I need a special favor.	5.43	1.59
EOS3	My host firm cares about my opinions.	5.52	1.60
EOS4	My host firm cares about my general satisfaction at work.	5.00	1.74
Extra-Organizational Commitment			
(Adapted from Piercy et al. 2006)			
Please indicate your level of agreement with the following statements			
EOC1	I praise my host firm to my friends as a great place to work.	5.32	1.67
EOC2	My values and my host firm values are very similar.	5.45	1.64
EOC3	I am proud to tell others I am part of my host firm.	5.71	1.53
EOC4	I really care about the future of my host firm.	6.29	1.37
7-point Likert-type scales (1 = Strongly Disagree; 7 = Strongly Agree).			N = 298

Table 1 (cont.). Constructs and Measurement Items

		Mean	Std. Dev.
Intra-Organizational Face-to-Face Communication			
(New Scale)			
Please indicate your level of agreement with the following			
FT1	I meet face-to-face with members of my firm regularly to discuss processes in my host firm's operation.	4.43	1.93
FT2	I share ideas with members of my own organization face-to-face.	4.59	2.01
FT3	I interact face-to-face with members of my own organization outside of work.	3.66	1.98
Perceived Organizational Support			
(Adapted from Piercy et al. 2006)			
Please indicate your level of agreement with the following statements			
POS1	Help is available from my firm when I have a problem.	5.95	1.29
POS2	My firm is willing to help me when I need a special favor.	5.94	1.30
POS3	My firm cares about my opinions.	5.84	1.39
POS4	My firm cares about my general satisfaction at work.	5.69	1.48
Organizational Commitment			
(Adapted from Piercy et al. 2006)			
Please indicate your level of agreement with the following statements			
OC1	I praise my firm to my friends as a great place to work.	6.05	1.23
OC2	My values and my firm's values are very similar.	6.03	1.29
OC3	I am proud to tell others I am part of my firm.	6.21	1.18
OC4	I really care about the future of my firm.	6.51	1.09
7-point Likert-type scales (1 = Strongly Disagree; 7 = Strongly Agree).			N = 298

Analysis

Data were analyzed using the CALIS procedure in SAS 9.1. Initial analysis included an examination of the data to evaluate item normality, skewness, kurtosis, means, standard deviations, and outliers, which yielded acceptable results (Mentzer et al., 1999). To analyze the proposed model, Gerbing and Anderson's (1988) two-step procedure was used. First, maximum likelihood estimation was used to estimate a

measurement model. This is equivalent to confirmatory factor analysis as every latent construct is allowed to covary with every other latent construct (Hatcher, 1994). Second, the resulting theoretical model was tested.

The Measurement Model

The measurement model investigated in this study consisted of seven latent variables, corresponding to the constructs described earlier: inter-organizational implantation, relational capital, face-to-face communication, perceived organizational support, perceived extra-organizational support, organizational commitment, and extra-organizational commitment. Each latent variable was measured using at least three manifest variables. Results of the measurement model analysis are presented in Table 2. Fit indices from the analysis indicate that the measurement model represents an appropriate fit. Indices examined include: chi-square/degrees of freedom ($\chi 2$/df), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The $\chi 2$/df index yielded a value of 2.47 ($\chi 2 = 747.89$, df = 303, $p < 0.001$), which is within the recommended range of 1 and 3 (Bollen and Long, 1993). The CFI for the measurement model was 0.94, which is above the recommended cutoff value of 0.9 (Bentler, 1990). The RMSEA also yielded an acceptable value at 0.07, which is below the recommended maximum value of 0.08 (Browne and Cudeck, 1993). The NNFI and RMSR yielded values of 0.93 and 0.11, respectively.

Table 2. The Measurement Model

Constructs and Indicators	Std. Weight	t-value	Reliability	Variance Extracted
Inter-organizational Implantation			0.93[a]	0.767
OI1 ← Inter-Org. Implantation	0.80	16.66	0.640	
OI2 ← Inter-Org. Implantation	0.97	22.80	0.941	
OI3 ← Inter-Org. Implantation	0.92	20.54	0.846	
OI4 ← Inter-Org. Implantation	0.80	16.63	0.640	
Relational Capital			0.89[a]	0.688
RC1 ← Relational Capital	0.89	19.43	0.792	
RC2 ← Relational Capital	0.90	19.74	0.810	
RC3 ← Relational Capital	0.64	12.00	0.410	
RC4 ← Relational Capital	0.86	18.42	0.740	
Intra-Organizational Face Time			0.89[a]	0.728
FT1 ← I-O Face Time	0.83	15.47	0.689	
FT2 ← I-O Face Time	0.95	18.04	0.903	
FT3 ← I-O Face Time	0.77	9.46	0.593	
Perceived Extra-organizational Support			0.93[a]	0.789
EOS1 ← Perceived Extra-org. Support	0.89	19.68	0.792	
EOS2 ← Perceived Extra-org. Support	0.86	18.55	0.740	
EOS3 ← Perceived Extra-org. Support	0.95	21.98	0.903	
EOS4 ← Perceived Extra-org. Support	0.85	17.99	0.723	
Perceived Organizational Support			0.92[a]	0.764
POS1 ← Perceived Org. Support	0.86	18.46	0.740	
POS2 ← Perceived Org. Support	0.80	16.35	0.640	
POS3 ← Perceived Org. Support	0.94	21.21	0.884	
POS4 ← Perceived Org. Support	0.89	19.46	0.792	
Extra-organizational Commitment			0.92[a]	0.761
EOC1 ← Extra-org. Commitment	0.87	18.66	0.757	
EOC2 ← Extra-org. Commitment	0.88	19.06	0.774	
EOC3 ← Extra-org. Commitment	0.96	22.21	0.922	
EOC4 ← Extra-org. Commitment	0.77	15.68	0.593	
Organizational Commitment			0.93[a]	0.795
OC1 ← Org. Commitment	0.93	21.20	0.865	
OC2 ← Org. Commitment	0.89	19.53	0.792	
OC3 ← Org. Commitment	0.98	23.06	0.960	
OC4 ← Org. Commitment	0.75	15.21	0.563	

Fit statistics: [a] denotes composite reliability

$\chi^2 = 747.89$ ($df = 303$); CFI = 0.94; RMSEA = 0.07; NNFI = 0.93; RMSR = 0.11

All t-values sig. ($p < 0.001$)

Validity and Reliability

The CALIS procedure in SAS was also used to measure construct validity. Results of the construct validity analysis are shown in Table 2. Convergent validity was assessed by examining the standardized factor loadings of each item along with the t-values for each coefficient. The t-values range from 9.46 to 23.06, indicating that all factor loadings are significant ($p < 0.001$), and provides evidence in support of convergent validity among the measurement items for each construct (Gerbing and Anderson, 1988). Discriminant validity was assessed by examining the variance extracted estimate for each construct. This provides an indication of the amount of variance captured by each construct relative to the error variance (Fornell and Larcker, 1981; Hatcher, 1994). The variance extracted estimates were compared with the squared correlations among the variables to ensure that they exceeded the squared correlations of each pair of variables. However, a review of these comparisons indicated that the squared correlation between cognitive congruence and intra-organizational face time exceeded the average variance extracted from the cognitive congruence construct. Therefore, a more stringent chi-square difference test was conducted in which the correlation between these constructs was fixed at 1. The chi-square difference between the measurement models was significant ($p < 0.01$), providing evidence in support of discriminant validity. All average variance extracted estimates and squared correlations are presented in Table 3.

Table 3. Average Variance Extracted Estimates and Squared Correlations

	Average Variance Extracted	I-O Implant.	Relational Capital	FTF Comm.	Percieved Extra-org. Sup.	Perceived Org. Support	Extra-org. Commit.	Org. Commit.
I-O Implant.	0.767	1.000						
Relational Capital	0.688	0.221	1.000					
FTF Comm.	0.728	0.000	0.010	1.000				
Percieved Extra-org. Sup.	0.789	0.203	0.757	0.008	1.000			
Perceived Org. Support	0.764	0.048	0.109	0.053	0.270	1.000		
Extra-org. Commit.	0.761	0.116	0.578	0.005	0.593	0.176	1.000	
Org. Commit.	0.795	0.036	0.078	0.012	0.160	0.548	0.292	1.000

Reliability among the measurement items was also tested using the CALIS procedure. Reliabilities of the measurement items, along with the composite reliabilities of each construct, are shown in Table 2. Composite reliability is a measure of internal consistency of a construct (Fornell and Larcker, 1981). The composite reliabilities range from 0.89 to 0.93, which exceeds the recommended minimum value of 0.7 (Nunnally and Bernstein, 1994). The results suggest that the scales used to measure the constructs are reliable.

The Theoretical Model

The theoretical model was tested using the CALIS procedure in SAS. Goodness-of-fit indices are as follows: $\chi 2 = 939.90$ ($df = 311$); CFI = 0.92; RMSEA = 0.08; NNFI = 0.91; and RMSR = 0.38.

The first hypothesis stated that inter-organizational implantation is positively related to the development of relational capital between the implant and the customer's employees. Our study supports this hypothesis. Based on the standardized path coefficient of 0.48 and t-value of 5.28, this path is supported at $p < 0.001$. Hypothesis 2 stated relational capital was positively related to perceived extra-organizational

support. The standardized path coefficient of 0.88 and t-value of 9.53 indicate that this was supported at $p < 0.001$. The third hypothesis proposed a positive relationship between perceived extra-organizational support and extra-organizational commitment. This relationship was also supported with a path coefficient of 0.79 and a t-value of 9.07 ($p < 0.001$). The fourth hypothesis, which proposed a positive relationship between inter-organizational implantation and face-to-face communication among implants and co-workers at their own organization, was not supported. This relationship yielded a standardized path coefficient of 0.04 and a t-value of 0.59, which is not significant. The fifth hypothesis proposed that face-to-face communication and perceived organizational support are positively related. This relationship was also supported. The study yielded a standardized path coefficient of 0.24 and a t-value of 7.73, which indicates significance at $p < 0.001$. The final hypothesis proposed that perceived organizational support is positively related to organizational commitment. This hypothesis was supported with a path coefficient of 0.75 with a t-value of 2.42 ($p < 0.05$).

The utility of the proposed theoretical model was assessed by examining the multiple squared correlations (R^2) for each endogenous latent variable. Inter-organizational implantation explains over 23% of the variance in relational capital. Just over 78% of the variance in perceived extra-organizational support can be explained by relational capital. However, only about 6% of the variance in perceived organizational support can be explained by face-to-face communication. Results also indicate that almost 63% of the extra-organizational commitment variance is explained by perceived extra-organizational support and almost 56% of the variance in

organizational commitment can be explained by perceived organizational support. The results from the structural model are shown in Table 4.

Table 4. Path model results

Path	Std. Weight	t-value	p-value	Note	R^2
H_1: Inter-Org. Implantation → Relational Capital	0.480	5.280	<.001	Supported	0.23
H_2: Inter-org. Implantation → FTF Communication	0.040	0.590	NS	Not Supported	0.00
H_3: Relational Capital → Perceived Extra-org. Support	0.880	9.530	<.001	Supported	0.78
H_4: FTF Communication → Perceived Organizational Support	0.240	7.730	<.001	Supported	0.06
H_5: Perceived Extra-org. Support → Extra-org. Commitment	0.790	9.070	<.001	Supported	0.63
H_6: Perceived Org. Support → Organizational Commitment	0.750	2.420	<.05	Supported	0.56

DISCUSSION

As mentioned in the introduction, inter-organizational implants present a unique and underexplored context for research. One key reason for this is the complexity of the relationship structure associated with using boundary spanners who are placed inside the walls of another organization. Research can be conducted to examine the relationship between the implant and his/her employer, between the implant and the customer, between the implant and other implants, and between the organizations involved in the implantation structure. The current research was concerned with two of these relationships:

- Inter-organizational implant – customer
- Inter-organizational implant – employer (LSP)

Our findings indicate that firms should carefully consider the relationships associated with boundary spanners. By placing representatives on-site at customer locations, the implants can build relational capital with the customer. The relational

capital between inter-organizational implants and their customers can generate greater perceptions of support for the implant from the customer, which can then lead to greater commitment to the customer. Essentially, the findings indicate that by placing a representative on-site at a customer facility, the representative is likely to develop relationships with the employees of the customer and develop affective commitment toward the customer.

Because of the assigned responsibilities and the physical location of inter-organizational implants, these boundary-spanning employees may relate more to the outside organization than to their own employer. This can have positive long-term implications. Implants/boundary spanners are in an ideal situation to foster long-term relationships with customers. The fact that the implants are likely to exhibit extra-organizational commitment toward the customer reflects the likelihood that they place a priority on maintaining the business relationship. Implants represent the ultimate in relationship management, i.e. we are there for you…literally.

However, it should also be acknowledged that there is a potential downside to using implants. As stated, there is potential for the implants to relate to the customer more than to his/her own organization. Concerns have been raised about divided loyalties in such situations. Implants can feel isolated from their own organizations. The current research reinforces the importance of the employer maintaining connections with employees implanted in the field. Regular communication, particularly face-to-face communication, is critical for maintaining a lifeline. This reinforces the fact that the implant is still a part of the "home team" and can rely upon them for support and resources.

This empirical investigation of extra-organizational commitment is not intended to provide evidence to support or discourage its development. As mentioned by McElroy et al. (2001), "(extra-organizational commitment) is not a phenomenon to be encouraged or discouraged; rather, it needs to be managed such that the employing organization can realize the advantages of such commitment while avoiding the undesirable outcomes," (p. 253). The current study demonstrates that relational capital is a key contributor to perceived extra-organizational support – a concept that has consistently been shown to directly relate to commitment.

LIMITATIONS AND FUTURE RESEARCH

As with any research design, there are limitations associated with the current research. The cross-sectional nature of the study limits the ability to draw causal inferences from the findings. Thus, the presentation of the results highlighted the associations in the variance between the examined variables. The use of single, self-reporting respondents presents another limitation to the study. While this limitation is inherent to using the survey design, the survey approach allowed the researchers to gain input from a large number of respondents across many organizations (Kerlinger and Lee, 2000). The common method variance risk associated with this research design was assessed using Harmon's one-factor test and found to be acceptable. Thus, the risk of bias was determined to be acceptably minimized. The sample was derived from logistics service providers, specifically targeting implants in a logistics role at customer locations, which may limit the generalizability of the study to logistics operations. However, the use of inter-organizational implants extends beyond the LSP

context to include many areas such as IT implants, human resources implants, manufacturing implants, and others. Future research should be aimed at exploring the use of inter-organizational implants in other settings. Due to the various interactions and relationship intersections associated with implants, future research should also identify factors that can allow organizations to effectively utilize their personnel resources to manage each relationship.

Inter-organizational implantation is a phenomenon that is commonplace in logistics. Logistics managers should, therefore consider these findings and recommendations as they establish relationships with their customers and make decisions regarding the physical structure and placement of representatives responsible for managing customers' operations.

The research also highlights the necessity of properly managing implants and their relationships with customers. If implants are not managed in a way to promote closeness with the employer, alienation and divided loyalties may be the result. Alternatively, effective management can yield synergistic results and greater rewards for the LSP/implant and the customer.

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GETTING THE MOST OUT OF YOUR BUSINESS PARTNERS: INTER-ORGANIZATIONAL IMPLANTS AND INNOVATION PERFORMANCE

INTRODUCTION

Take a look inside many firms today and you will not only find employees of that firm, but you are also likely to find employees of other organizations – business partners – working together to make the firm successful. This is not a new concept. However, as firms work closely with their business partners, it has become more prevalent. Firms invite representatives from their business partners on site to manage the relationship between the organizations, share ideas, perform specific functions, manage part of an operation, and provide a more effective means of inter-organizational communication. The use of these implanted employees, or inter-organizational implants, is the focus of the current study.

More specifically, the research focuses on the potential for innovation that results from the use of inter-organizational implants. According to a McKinsey Quarterly (2007) poll, 75% of top managers indicate that sources for new and innovative ideas include discussions with peers, partners, and suppliers. The combined internal and external perspectives can have an additive – and maybe even synergistic – effect. Research has found that external expertise combined with internal resources increases the likelihood of innovation being successful (Agarwal and Selen 2009; Cassiman and Veugelers 2006; Freeman 1991). Bringing external sources on site allows firms to exchange ideas and see them applied as implants engage with the operation of the firm.

Suppliers, service providers, and other external partners play an important role in a firm's supply chain in that they bring their own unique resources to the relationship. The resources can include physical assets, information, knowledge, and production capacity, among others. Inter-organizational resources can be essential to a firm's ability to compete in the marketplace as they allow a firm to effectively serve their customers. Firms gain access to the resources by working with representatives – sales and operational – of their business partners. Thus, the current research asks, "What happens when the external representative is moved in-house to become part of the operation?" The closer relationship and the proximity of the representatives has important implications which will be discussed later.

The context considered for the current research is the relationship between firms and their logistics service providers (LSP). The use of LSPs has been shown to be an effective approach for firms wishing to improve performance within logistics operations (Sinkovics and Roath 2004; Stank et al. 2003). LSPs provide expertise, planning, and operational support for their customers. In many relationships, the LSP will locate a representative on-site at the customer's facility to manage these functions for the account. This is a common practice within a logistics operation and can also be found in manufacturing, IT, and many other settings (Freeland and Kidwell 1995; Magretta 1998).

Although the use of these implanted representatives is common in practice, their use has not been given much attention in academic research. The current study proposes that the implanted relationship structure leads to the development of relational capital and knowledge exchange, which, in turn, leads to greater levels of

innovation performance. The following sections will present the theoretical foundations for the study followed by the development of a theoretical model. The research design, analysis, implications, limitations, and research opportunities are then discussed.

THEORETICAL BACKGROUND

Knowledge-based View of the Firm (KBV)

According to the knowledge-based view of the firm, a firm's sustained ability to compete is the result of the uniqueness of the firm's knowledge (Grant 1996; Turner and Makhija 2006; Zander and Kogut 1995). A key assumption of this view is that "the critical input in production and primary source of value" is knowledge (Grant 1996, p. 112). The dilemma facing firms, then, is how to effectively manage knowledge to improve performance and gain a competitive advantage (Barney 1991; Wernerfelt 1984). The management of knowledge, however, extends beyond the exchange of codified information within and between organizations. There are two types of knowledge. The first type is explicit knowledge, which is knowledge that is revealed in its communication; it is "knowing *about* facts and theories" (Grant 1996, p. 111). The other type of knowledge is tacit knowledge. Tacit knowledge is knowledge that is revealed to others only in its application (Grant 1996). Tacit knowledge has also been referred to as "know-how" (Cohen and Levinthal 1990).

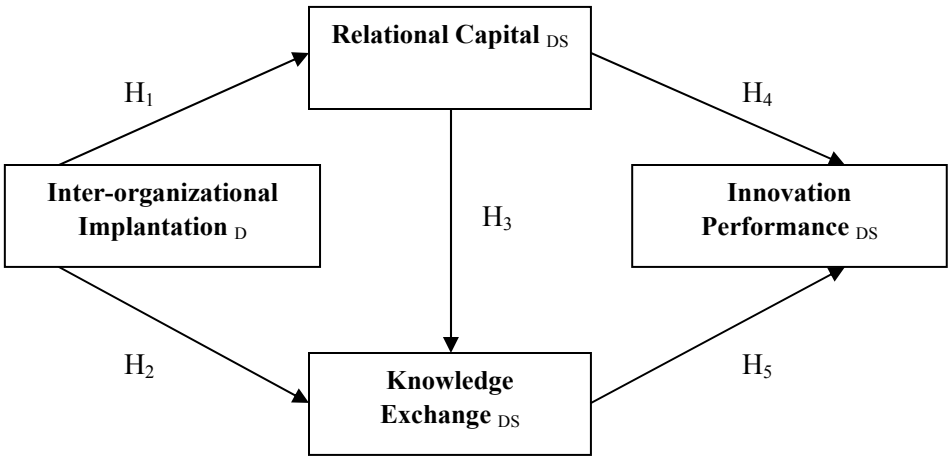
In order to clarify the distinction between the types of knowledge, consider the following example. In order to prepare for a potential shortage of truckload capacity within a distribution operation, employees create a detailed set of

instructions to cover the contingency, outlining several alternative processes to keep the operation running. These plans direct the employees to perform specific tasks and reflect the explicit knowledge of the employee. However, the *execution* of the contingency plans also requires *knowing how* to perform each task in an effective manner. Obtaining this tacit knowledge presents a great challenge to organizations as its transfer is slow, costly, and uncertain and can only be acquired through practice (Kogut and Zander 1992). Inter-organizational implants are in a unique position to exchange both explicit and tacit knowledge. The current research examines the use of inter-organizational implants and its impact on the development of relational capital and ultimately, innovation performance.

The first resource considered is inter-organizational implantation. Inter-organizational implantation is the degree to which a representative of one organization is located within another organization (i.e. employees of logistics service providers working on-site at customer facilities). Inter-organizational implants are often placed at exchange partners' facilities to perform operational duties on behalf of both organizations in the relationship. The second resource considered is relational capital. Relational capital is the trust, shared norms and perceived obligations, and sense of mutual identification within the social connections of a firm (Nahapiet and Ghoshal 1998). These resources are proposed to lead to greater knowledge exchange and ultimately, greater innovation performance.

All proposed relationships are shown in Figure 1.

Figure 1: Inter-organizational Implants and Innovation: A Conceptual Framework



D = Degree; DS = Degree-Symmetric

MODEL DEVELOPMENT

Inter-organizational Implants and Relational Capital

The use of inter-organizational implants (or *on-sites* as termed in practice) is common in many operations (i.e. manufacturing, distribution, logistics, IT, human resources, etc.) (Freeland and Kidwell 1995; Magretta 1998). Implants often serve to manage operations, identify sales opportunities, and assist the customer in planning. They may be placed at customer locations individually, or they may be part of a group of implants at a single facility. Assignments can include a number of different settings, including corporate, manufacturing, or distribution facilities. Inter-organizational implants present an interesting research context for a number of reasons. First, implants work outside of their own corporate culture. Implants go to work each day at a customer facility that has its own norms and expectations. The customer's norms and expectations may or may not align with those of the implant's employer. Second, the implant's new co-workers are employees of the customer.

Informal dialog during the typical workday allows the implants to develop relationships with the new co-workers that might not otherwise be possible. Although inter-organizational implants have not served as the focus of previous research, studies of groups and co-located individuals help to provide understanding of the potential impact of using inter-organizational implants.

The use of inter-organizational implants allows LSPs to overcome barriers associated with the physical separation of the firm and its customers. According to Van den Bulte and Moenart (1998), some of the common barriers to physical separation include a reduced probability of chance encounters; a reduced chance of unplanned, serendipitous information transfer and problem clarification; the hindrance of planned, face-to-face meetings due to scheduling difficulties; the encouragement of technical jargon, and heightened perceptions of personality differences.

Co-locating members from different organizations enables informal communication and allows the members to focus collective effort on completing tasks rather than scheduling a meeting (Zenun et al. 2007). Physically, an implant is usually situated in an environment allowing for many connections with the customer. An implant is likely to work at a customer's facility with a workspace surrounded by the customer's employees. As part of the implant's regular social activity, the implant is likely to interact with and come to know these individuals (Van den Bulte and Moenart 1998). Additionally, meetings and social activities at the customer facility will increase the number of connections between the organizations as the implant meets new people (Bolino et al. 2002).

Previous research has shown that when an individual is in the presence of others, the individual is more aware of how he/she relates with others (Valacich et al. 1994). Additionally, the presence of others elicits a concern for interpersonal relationships (Carver and Scheier 1985). In other words, individuals tend to work at fitting in when physically surrounded by other individuals. Face-to-face environments have been shown to support more timely feedback, greater relational concern, wider language variety, and a greater number of information cues than environments in which communication is mediated, i.e. telephone, computer-based communication (Valacich et al. 1994). In this sense, face-to-face environments are rich in communication, allowing the transmission of many types of signals between the sender and receiver of communication flows.

The relative frequency and ease of communication between co-located individuals can be important factors in the development of relational capital. However, relational capital requires more than just communication. As defined, it also requires trust, shared norms and perceived obligations, and a sense of mutual identification among all members of the group. Inter-organizational implants carry out assigned responsibilities on behalf of both organizations (i.e. managing logistics activities of their employer for the benefit of the customer). The customer's facility is a closed network. Behavioral norms are conveyed and reinforced within that network (Coleman 1990). As such, implants are expected to adhere to the norms of the customer. Adherence to the customer's rules serves to reduce behavioral uncertainty and increase the acceptance of the implanted members with employees of the customer (Bolino et al. 2002; March et al. 1958). Members of the customer

firm are more likely to accept and identify with the implants as the implants become viewed as reliable and competent (Hogg and Terry 2000). The presence of the organizational implant can create an environment that facilitates collaboration, trust, and effective interpersonal relationships (Kahn and McDonough III 1997; Zenun et al. 2007).

Based on the preceding discussion, it is proposed that:

H_1: Greater levels of inter-organizational implantation lead to greater levels of relational capital.

Inter-organizational Implants and Knowledge Exchange

In Grant's (1996) seminal work toward the development of the KBV framework, he highlights the importance of the specialization of knowledge within an organization. For example, he points out that "production requires the coordinated efforts of individual specialists who possess many different types of knowledge." (Grant 1996, p. 112). This includes explicit and tacit knowledge. When representatives of a supplier are located at customer facilities, the customers are able to more freely observe the application of implicit knowledge belonging to the supplier. Likewise, the inter-organizational implant can more freely observe the application of implicit knowledge of the customer's employees.

Inter-organizational implants can also more effectively engage in the exchange of explicit knowledge. According to Szulanski (1996), "exchanges of knowledge are embedded in organizational context" (p. 31), which can present a barrier to the

transfer of knowledge between parties. Inter-organizational implants can overcome this barrier as they are embedded within the operational context. As implants work interdependently with the customer's employees to run an operation, they exchange necessary information and data that allows each party to execute their assigned responsibilities. However, since they are co-located, they will often do this face-to-face, which allows for the free exchange of knowledge beyond that which is essential to the execution of specific tasks. For example, implants and customer employees may engage in informal discussions about the operation over coffee. As such, it is proposed that:

H_2: Greater levels of inter-organizational implantation lead to greater levels of knowledge exchange.

Socialization between individuals from different organizations is an important part of inter-organizational knowledge (Dhanaraj and Parkhe 2006). Similarly, Szulanski (1996) highlights the importance of relational "intimacy" for the exchange of knowledge between individuals. Inter-organizational implants are dedicated to specific customers and placed on site at customer facilities to carry out responsibilities in customer operations. As implants develop relational capital with their customers (i.e., shared norms, shared perception of obligations, and mutual identification), they also become motivated to exchange knowledge that is necessary for the coordination of responsibilities within the operation (Coleman 1990). The shared obligations and mutual identification associated with relational capital imply

expectations about future obligations and concern for collective processes and outcomes, leading to the recognition of the importance of knowledge exchange (Kramer et al. 1996; Nahapiet and Ghoshal 1998). Therefore, the following hypothesis is offered:

H_3: Greater levels of relational capital lead to greater levels of knowledge exchange.

Relational Capital and Innovation Performance

Inter-organizational implants offer their customers access to knowledge and assets not otherwise available to their customers. By building a relationship with the implant, the customer can access these resources. Relational capital allows a firm to leverage direct ties to individuals and firms to gain access to resources (Moran 2005). As the implants and customer employees connect on a regular basis, each becomes more familiar with alternative ways of thinking and behaving (Burt 2004). This is particularly important as firms strive to improve their logistics and firm performance through advancements in logistics processes and services. Innovation is often the result of collaboration within and across organizations as individuals collaborate to address current and future needs of the organization (Chapman et al. 2003; Hakansson and Persson 2004). As Schumpeter (1994), indicated, innovation can occur within services, processes, or any social system. Innovations are ideas, practices, or objects that are perceived as new by the adopting unit (Rogers 2003). Similarly, innovation has also been described as "the adoption of an idea or behavior

– whether pertaining to a device, system, policy, program, product, or service – that is new to the adopting organization" (Zaltman et al. 1973).

According to Hargadon and Sutton (1997), ideas from one organization can only solve problems of another organization if connections between existing solutions and problems can be made across the organizational boundaries. Relational capital leads to innovation by facilitating communication among individuals (Adler and Kwon 2002; Luk et al 2008). As the implant and the customer communicate regarding the needs of the operation, they can work together to come up with new ideas for making the operation better. Chapman et al. (2003) point to the need for firms to work together to understand current and future needs and requirements of customers. Interacting groups bring a greater variety of perspectives to business problems (Holloman and Hendrick 1972). Therefore, the following hypothesis is offered:

H_4: Greater levels of relational capital lead to greater levels of innovation performance.

Knowledge Exchange and Innovation Performance

Knowledge is imperative for innovation (Chapman et al. 2003). As stated in the introduction, managers often look outside the firm for innovative ideas to help them compete more effectively. This is evident in the growing popularity of open innovation. Open innovation – the free flow of intellectual property, ideas, and people into and out of an organization – has been promoted as a flexible alternative

for companies seeking to reduce expenses (Chesbrough and Garman 2009). The practice involves firms coordinating with suppliers, customers, service providers, or other firms to exchange knowledge and ideas. Inter-organizational implants are in a unique position to engage in such an exchange.

Implants and the employees of the customer participate in the exchange of knowledge in order to effectively perform their duties within the operation. However, one should also consider the impact of tacit knowledge, or know-how, on the ability of the firm to improve the operation. As the inter-organizational implant and customer employees recognize problems or inefficiencies within the operation, they can look at individual processes within the operation together and apply their respective "know-how" to each process to identify potential changes to each process and predict outcomes associated with such changes. The ability of the service provider to engage the customer and exchange knowledge, allows the firm to respond to the customer's needs and respond with innovation (Agarwal and Selen 2009). Therefore, it is proposed that:

H_5: Greater levels of knowledge exchange lead to greater levels of innovation performance.

RESEARCH DESIGN

In order to effectively evaluate the constructs of interest, dyadic data were collected. Dyadic data allow examination of relationships and knowledge exchange from the perspective of each party of interest, an important consideration in

business-to-business relationships (Chen and Paulraj 2004; Fang et al. 2008; John and Reve 1982; Klein et al. 2007; Palmatier et al. 2007). In the current context, the perspectives of the inter-organizational implants and the customers that they serve, i.e. host firms, are of interest. Therefore, a cross-sectional study of LSP-customer relationships was designed using the dyad as the unit of analysis.

Measurement Development

A survey using multi-item reflective measures was developed to evaluate relevant constructs (Churchill 1979). New and adapted scales were used to measure the constructs. A preliminary draft of the survey was developed and reviewed by five academic researchers and two industry experts, all of whom were familiar with the topics of interest. A revised survey was then developed based on the input of these experts. The revised survey was pretested using 37 inter-organizational implants and 31 customer representatives. The results of the pretest were used to develop the final version of the survey.

The survey was administered online at www.surveymonkey.com. A link to the survey was embedded into an introductory letter for distribution to research participants.

All measures utilized Likert-type items. A new scale was developed to measure inter-organizational implantation. All items were anchored at 1 = strongly disagree, 4 = neutral, and 7 = strongly agree. Respondents were also given the option to select "N/A" for items not applicable to them. The range of standardized means for the four measurement items was 0.89 – 0.95.

Relational capital was measured using items adapted from Kale, Singh, and Perlmutter (2000). Implants were asked to indicate their level of agreement with statements regarding their relationship with customer representatives, while customer representatives were asked about their relationship with their respective implant. Standardized means for the five items from implant responses ranged from 0.67 to 0.91. The customer standardized means ranged from 0.71 to 0.89.

Measurement items from Collins and Smith (2006) were used to assess knowledge exchange between the implant and the customer. Implants and customer representatives were each asked to state their level of agreement with statements regarding knowledge exchange with each other. The range of standardized means for the five measurement items was 0.81 to 0.89 from implant responses and 0.80 to 0.84 from customer responses.

Innovation performance was measured using a new scale. Implants and customer representatives were each asked to indicate their level of agreement with statements regarding innovation performance within the customer's logistics operation. Standardized means from the implant responses ranged from 0.78 to 0.88 for the five measurement items. The range of standardized means from the customer responses was 0.81 to 0.92 for the five measurement items.

All measurement items, along with associated means and standard deviations from the implant responses are included in Table 1. Measurement items, means, and standard deviations from the customer responses are included in Table 2.

Table 1: Constructs and measurement item summary: Implant responses

		Mean	Std. Dev.
Intra-Organizational Task Interdependence			
(Adapted from Van Der Vegt, Emans, and Van De Vliert 2000)			
*Please indicate your level of agreement with the following statements.**			
TI1	I have to obtain information from my colleagues at my own organization to complete my work.	0.91	0.21
TI2	I depend on my colleagues at my own organization for the completion	0.95	0.15
TI3	I have a one-person job; I rarely have to work with others. (reverse-	0.93	0.19
TI4	I have to work closely with my colleagues at my own organization to do my work properly.	0.89	0.21
Relational Capital			
(Adapted from Kale, Singh, and Perlmutter 2000)			
*Please indicate your level of agreement with the following statements.**			
RC1	There is close, personal interaction between myself and members of my host firm.	0.81	0.22
RC2	There is respect between myself and members of my host firm.	0.91	0.18
RC3	There is trust between myself and members of my host firm.	0.89	0.19
RC4	There is personal friendship between myself and members of my host firm.	0.67	0.26
RC5	I am happy with my firm's overall relationship with my host firm.	0.87	0.19
Knowledge Exchange			
(Adapted from Collins and Smith 2006)			
*Please indicate your level of agreement with the following statements.**			
KNO1	I move projects forward by exchanging ideas with members of my host firm.	0.82	0.19
KNO2	I learn from my colleagues by exchanging ideas.	0.84	0.19
KNO3	I exchange ideas with members of my host firm to find solutions to problems.	0.85	0.18
KNO4	I share my expertise to make projects successful.	0.89	0.15
KNO5	Members of my host firm share their expertise with me to make projects successful.	0.81	0.2
Innovation Performance			
(New Scale)			
*Please indicate your level of agreement with the following statements.**			
INN1	We are developing new processes within the logistics operation at my host firm.	0.82	0.19
INN2	We are developing new services within the logistics operation at my	0.78	0.21
INN3	We seek out new ways to do things within the logistics operation at my host firm.	0.85	0.18
INN4	The logistics operation has been changed to meet new business needs	0.88	0.15
INN5	We have identified opportunities to expand processes to new applications at my host firm.	0.85	0.18

*Items were measured using a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly Agree).

Table 2: Constructs and measurement item summary: Customer responses

		Mean	Std. Dev.
Relational Capital			
(Adapted from Kale, Singh, and Perlmutter 2000)			
*Please indicate your level of agreement with the following statements.**			
RC1	There is close, personal interaction between our logistics employees and the 3PL on-site representative.	0.85	0.18
RC2	There is respect between our logistics employees and the 3PL on-site representative.	0.89	0.15
RC3	There is trust between our logistics employees and the 3PL on-site representative.	0.87	0.16
RC4	There is personal friendship between our logistics employees and the 3PL on-site representative.	0.71	0.21
RC5	I am happy with my firm's overall relationship with the 3PL.	0.86	0.14
Knowledge Exchange			
(Adapted from Collins and Smith 2006)			
*Please indicate your level of agreement with the following statements.**			
KNO1	Our logistics employees move projects forward by exchanging ideas with the 3PL on-site representative.	0.81	0.19
KNO2	Our logistics employees learn from the 3PL on-site representative by exchanging ideas.	0.80	0.17
KNO3	Our logistics employees exchange ideas with the 3PL on-site representative to find solutions to problems.	0.84	0.16
KNO4	Our logistics employees share their expertise with the 3PL on-site representative to make projects successful.	0.84	0.16
KNO5	The 3PL onn-site representative shares his/her expertise with our logistics employees to make projects successful.	0.83	0.16
Innovation Performance			
(New Scale)			
*Please indicate your level of agreement with the following statements.**			
INN1	We are developing new processes within our logistics operation.	0.87	0.16
INN2	We are developing new services within our logistics operation.	0.81	0.18
INN3	We seek out new ways to do things within our logistics operation.	0.91	0.14
INN4	Our logistics operation has been changed to meet new business needs.	0.92	0.14
INN5	We have identified opportunities to expand processes to new applications.	0.85	0.16

*Items were measured using a 7-point Likert-type scale (1 = Strongly Disagree; 7 = Strongly Agree).

Degree and Symmetry within Dyads

The measurement items described above were used to derive degree-symmetric constructs as outlined by Straub, Rai, and Klein (2004). This technique assesses

both the degree and symmetry of each construct. For example, consider a single dyad consisting of one inter-organizational implant and the corresponding customer representative. Assume that the inter-organizational implant indicates very low levels of innovation within the operation (i.e. 1-2 on the Likert scale). Also, assume that the customer representative indicated low levels of innovation within the operation. An assessment of the dyadic symmetry yields high results as each member of the dyad is in agreement regarding the level of innovation within the operation. However, our primary concern is not symmetry, but the degree of innovation. In order to effectively assess whether there is a relationship between knowledge exchange and innovation performance (as proposed in H_5), we need to know that within that dyad, innovation performance was low. The derivation of degree-symmetric constructs allows us to also assess degree within each dyad (Klein et al. 2007; Straub et al. 2004). A detailed description of the development of degree-symmetric constructs is shown in Table 3.

Table 3: Degree and degree-symmetric construct derivations[a]

	Derivations	Definition	Formula	Assumptions
(i)	Implant or Customer Value: C_I or C_C	Summated index of the level, l, of each item, x_i, that belongs to the set of items $\{x_1, x_2, \ldots x_n\}$ used to measure construct a for the implant or customer.	$(\sum^{n}_{i=1} x_i * l_i)/(n*L)$ where $0 \le l^i \le L$	a. $C_I \ge 0$ and $C_C \ge 0$ b. $C_I \le 1$ and $C_C \le 1$
(ii)	Degree Value: C_D	Summated index of the implant and customer values of construct a.	$(C_I + C_C)/2$	$0 < C_D \le 1$
(iii)	Symmetry Value: C_S	Symmetry index of construct a within the relationship.	If $C_I \ge C_C$ then $C_S = C_C/C_I$; If $C_I < C_C$ then $C_S = C_I/C_C$	$0 < C_S \le 1$
(iv)	Degree-Symmetry Value: C_{DS}	The index of both symmetry and value of construct a within the relationship.	$(C_D + C_S)/2$	$0 < C_{DS} \le 1$

[a] The definitions, formulas, and assumptions were originally developed by Straub, Rai, and Klein (2004).

Data Collection

The collection of dyadic data targeted inter-organizational implants and customer representative within an operational setting. Specifically, implants from logistics service providers and their respective key customer contacts were targeted. The data collection focused on each facility as a dyad consisting of one inter-organizational implant and one customer representative. The facilities included manufacturing sites, distribution centers, and corporate offices.

In the first stage of the data collection, 18 logistics service providers were contacted by telephone to discuss the research project. The service providers were selected from the researcher's personal contacts to represent a variety of logistics services. Collectively, the service providers included ocean carriers, air freight

forwarders, truckload carriers, asset-based providers, and non-asset based providers. After speaking with senior-level (Director and above) executives at each of the firms, 15 logistics service providers agreed to participate in the research project.

Each of the participating firms received an introductory email with an overview of the project and assurance of confidentiality. A letter with a link to the implant version of the survey was then sent to a single contact at each of the LSPs. Due to confidentiality concerns regarding the sharing of customer-specific information, each of the key contacts distributed the customer version of the survey to each customer hosting an inter-organizational implant. This process was selected so that the service providers would not have to provide the researcher with customer-specific information. Each key contact distributed the letter to inter-organizational implants within their networks. The LSP key contacts then reported the number of letters distributed. The letter with the link to the survey was sent to a total of 750 inter-organizational implants.

In order to collect responses from the customers to complete the dyadic pairs, the key contact at each LSP sent the customer letter, including the link to the customer survey, to each inter-organizational implant. The implants were asked to distribute the letter to their primary contact at the customer location. Approximately three weeks after sending the initial email to potential participants, each firm's key contact sent a follow-up email to the group of inter-organizational implants.

During the ten-week data collection process, a total of 344 implant surveys were received, representing an initial response rate of 46%. Ninety-five customer surveys were received, representing a 28% response rate.

Two additional questions had been included in the survey to further qualify each participant. The first question was: "I had enough information to answer all of the questions" (1 = strongly disagree, 4 = neutral, 7 = strongly agree). The second question was: "The questions in this survey are relevant to my firm" (1 = strongly disagree, 4 = neutral, 7 = strongly agree). Responses of 4 or lower were omitted from the analysis. Of those surveys submitted, 32 implant surveys and 7 customer surveys were omitted due to:

- too much missing data;
- all neutral responses;
- responses of 4 or lower on either of the two qualifying questions.

The remaining surveys were paired using information provided in the surveys. Before beginning the survey, each implant was asked to indicate the name and location of the customer about whom the survey would be completed. Similarly, the customer was asked to indicate the name and firm of the inter-organizational implant about whom the survey would be completed. Using this information, surveys from the implants and customers were matched to form paired dyads. This process resulted in the creation of 81 paired dyads, representing a final response rate of 24%.

Non-response and Common Method Biases

Two types of bias were tested before further analysis was conducted: non-response bias and common method bias. Each bias was tested for each set of responses: inter-organizational implant responses and customer responses. First, non-response bias for the implant responses was tested by comparing responses from

the final one-third of the respondents with the first two-thirds using ANOVA (Armstrong and Overton 1977). No significant differences were found between the groups at $p < 0.05$. The same procedure for the customer responses also yielded no significant differences between the final one-third and the first two-thirds.

Second, common method bias was assessed using Harmon's one-factor test (Podsakoff and Organ 1986). The unrotated principle components analysis yielded eight factors with eigenvalues greater than 1, accounting for 74% of the variance. The first factor accounted for only 35% of the variance. Since no single factor accounted for a majority of the variance, the threat to validity associated with common method bias was minimized for the implant responses. The same process for the customer responses resulted in twelve factors with eigenvalues greater than 1, accounting for 80% of the variance. The first factor using customer responses accounted for only 20% of the variance, indicating that common method bias from the customer responses was also minimized.

Analysis

Data were analyzed using the CALIS procedure in SAS 9.1. Initial analysis included an examination of the data to evaluate item normality, skewness, kurtosis, means, standard deviations, and outliers (Mentzer et al. 1999). This examination yielded acceptable results. Further analysis is described in the following sections.

Reliability and Validity

Chronbach's alphas for all constructs were estimated using the CORR procedure in SAS. Chronbach's alpha is a measure of internal consistency of a construct (Fornell and Larcker 1981). The alphas in the current study range from 0.86 to 0.93, which exceed the recommended minimum value of 0.7 (Nunnally and Bernstein 1994). These results suggest that the scales used to measure the constructs are reliable. Chronbach's alpha reliability estimates are presented in Table 4 along the diagonal.

Construct validity was also assessed using the CORR procedure in SAS. Convergent validity is demonstrated in that all measurement items for each construct demonstrate reasonably strong correlations with the sum of the remaining measurement items for each respective construct (Fornell and Larcker 1981). These correlations range from 0.65 to 0.89. Discriminant validity was assessed by examining the variance extracted estimate for each construct. This provides an indication of the amount of variance captured by each construct relative to the error variance (Fornell and Larcker 1981; Hatcher 1994). All constructs in the measurement model had variance extracted estimates in excess of 0.5, which provides evidence of discriminant validity among the constructs (Fornell and Larcker 1981). Variance extracted estimates are also presented in Table 4.

Table 4: Correlations, Average Variance Extracted (AVE), and Reliabilities

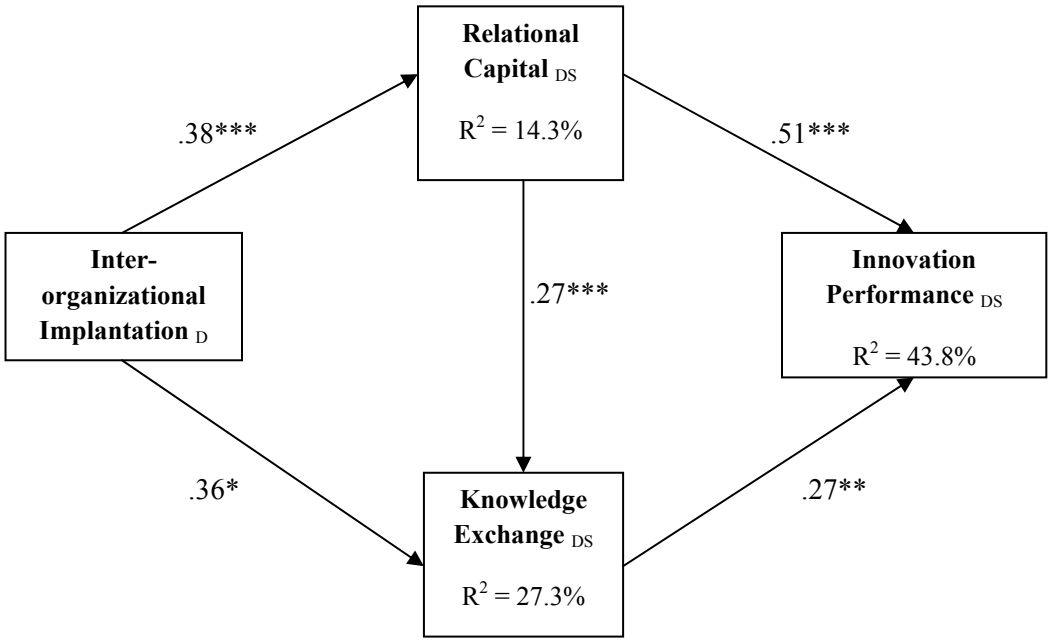
	AVE	Inter-org. Imp.	Relational Capital	Know. Exchange	Innov. Perf.
Inter-org. Implantation	0.877	**(0.91)**			
Relational Capital	0.83	0.38	**(0.86)**		
Knowledge Exchange	0.919	0.46	0.40	**(0.93)**	
Innovation Performance	0.867	0.37	0.62	0.47	**(0.89)**

Hypothesis Testing

The theoretical model presented in Figure 1 was tested using path analysis. The path analysis was performed using the CALIS procedure in SAS. The results of the hypothesis test are shown in Figure 2. Support was found for all hypotheses. Goodness-of-fit indices from the analysis indicate that the theoretical model represents an appropriate fit. Indices examined include: chi-square ($\chi 2$), comparative fit index (CFI), the normed fit index (NFI), and root mean square error of approximation (RMSEA). The $\chi 2$ yielded a value of 0.497 ($df = 1$, $p < 0.480$), which is not significant, indicating support for the model. The CFI for the theoretical model was 1.0, which is above the recommended cutoff value of 0.9 (Bentler 1990). The NFI and RMSEA also yielded acceptable values at 0.99 and 0.00 (Bentler 1990; Browne and Cudeck 1993).

Path coefficients for the model are all significant at the 0.05 level or lower, providing support for the relationships proposed in the model. Additionally, we can assess the utility of the proposed model by examining the multiple squared correlations (R^2) for each of the endogenous variables. These results are also presented in Figure 2. The findings from the current study indicate that inter-organizational implantation explains approximately 14.3% of the variance in relational capital. Just over 27% of the variance in knowledge exchange can be explained by inter-organizational implantation and relational capital. Finally, almost 44% of the variance in innovation performance can be explained by relational capital and knowledge exchange.

Figure 2: Path coefficients and explained variance in the structural model



D = Degree; DS = Degree-Symmetric
*Significant at .05 level; ** Significant at .01 level; *** Significant at .001 level

MANAGERIAL IMPLICATIONS

As stated in the introduction, business partners play a key role in innovation for firms. Our research shows that firms can leverage the resources of business partners by embedding a representative of the business partner within their operations. These resources can then lead to knowledge exchange and improved innovation performance. We found that by co-locating individuals, they are likely to build inter-personal relationship with each other. Specifically, firms are able to build relational capital, which provides the firm access to the service provider's resources, through the inter-organizational implant. Additionally, inter-organizational

implantation and the development of relational capital are shown to lead to greater knowledge exchange between the firms.

Inter-organizational implants play a unique role in the relationship between firms and should be considered carefully. While the study suggests that an increase in knowledge exchange between the inter-organizational implant and the employees of the customer, there may also be an added element of value associated with the presence of these representatives. Since they are able to see the operation as it actually is, they are able to offer knowledge that is directly relevant and actionable. Inter-organizational implants may have a greater understanding of the constraints under which the operation is running and can offer insights and resources that account for those constraints, limiting the need to filter the knowledge received from the implant. Managers concerned with their ability to keep their operations ahead of shifts in the market and competitive operations should partner closely with select business partners and inviting inter-organizational implants to participate in the operations of the firm.

In a business environment that is seeing technology advancing at a rapid pace as firms seek to communicate more frequently and efficiently, the value of personal contact can seem to get lost in the shuffle. The current study demonstrates the importance of creating an environment in which frequent, face-to-face formal and informal interactions are encouraged. This is especially encouraged between individuals from separate organizations as each brings their own perspective to the operation. As relationships between individuals develop, access to resources, including knowledge, increases and leads to innovation.

RESEARCH IMPLICATIONS

The research contributes to the literature in two primary ways. First, it offers new insight into the permeable nature of inter-organizational boundaries. Second, it addresses an aspect of inter-organizational relationships common in practice, but not yet fully examined in the literature – inter-organizational implants.

Organizations with permeable boundaries are now more common as evidenced by the use of inter-organizational implants. Some implants are there on a temporary basis and others are there on a more permanent basis. While the management of business-to-business relationships has received a great deal of attention in many areas of business literature, the current research adds to this base of literature by considering the impact of placing a representative within the walls of a business partner's facility. Specifically, we used the KBV framework to examine the flow of knowledge between organizations as representatives are implanted within business partner facilities. The findings show that physical proximity and the development of relational capital are important factors in the exchange of knowledge and innovation performance within an operation.

This research also contributes to the literature on innovation by offering an empirical analysis to further our understanding of how organizations, specifically logistics service providers and their customers, work together to drive innovation. This research also provides a new perspective on the creation of inter-organizational relational capital – through inter-organizational implants. The current research highlights the importance of physical proximity, as evidenced through inter-organizational implantation – in the development of relational capital.

LIMITATIONS AND FUTURE RESEARCH OPPORTUNITIES

This study is not without its limitations. The first limitation relates to the research context. Although paired dyads were obtained, they were limited to providers of logistics services and their customers. The use of inter-organizational implants is prevalent in other industries. Future research seeking to gain input from inter-organizational implants in other industries (i.e. IT, manufacturing, human resources, etc.) can provide an indication of the generalizability of our findings.

Another limitation is the sample size. Although the 81 paired dyads is in line with prior dyadic studies in inter-organizational research, the sample presents limitations regarding the analysis and conclusions that can be drawn. Future research should expand on this research by seeking larger samples and employing a variety of analytical techniques.

Future research should also seek to compare the responses of inter-organizational implants to traditional representatives. For example, how does knowledge exchange between an inter-organizational implant and customer employees differ from the exchange between a traditional operational representative and the customer's employees? Comparisons of this nature, although challenging in the collection of triadic data, could offer valuable insights into the effective structure of account management from an operational perspective. Research in this area should also be extended to include input from senior-level managers at the implant's employer to gain another perspective on the use of these representatives.

The inter-organizational implant presents a context with a wide range of potential future research. The current study provides a starting point. Future research questions should include: How do inter-organizational implants affect the commitment of each organization to the business relationship? How can the diffusion of proprietary knowledge and innovations be controlled when inter-organizational implants are present? These questions, along with the other research opportunities presented, should be addressed in a manner that allows managers to improve the design of relationships with business partners.

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