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## DETERMINANTS OF GOVERNANCE STRUCTURE FOR THE ELECTRONIC VALUE CHAIN: RESOURCE DEPENDENCY AND TRANSACTION COSTS PERSPECTIVES

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### Abstract

*This paper investigates boundary decisions that determine governance structures, particularly intermediaries and external contractors, for executing the primary functions of procurement, sales, and information technology support functions in the value chain model. Utilizing data from 113 firms doing business on the Internet, the findings indicate that firm resources have a significant impact on decisions to outsource or internalize electronic value chain functions. Specifically, firms with a greater reliance on sales intermediaries were found to deploy fewer technical e-commerce resources than firms less dependent on sales intermediaries. Moreover, the number of intermediary procurement functions was positively related to investment in web-based human resources. The results also suggest that firms experiencing lower levels of transaction frequency utilize more types of Internet sales methods.*

With the advent of Internet-based electronic commerce, firms are searching for new business models to achieve organizational effectiveness. New technologies often do not lead to improved performance because managers lack a framework for deciding the optimal business model given their particular internal and external circumstances (Fisher, 1997; Janssen & Sol, 2000). Thus, research is needed that focuses on resources and capabilities and their impact on governance decisions for firms pursuing Internet-based commerce (Williamson, 1999; Barney, 1999).

This study applies well-established paradigms from strategic management, marketing, and organizational economic literature to examine strategic and structural issues related to electronic commerce. Critical to the strategic objective of maximizing firm performance is the appropriate choice of corporate governance mechanisms for interorganizational relationships within the value chain. In light of new information technology, firms need to reassess boundary decisions that determine governance structures. In particular, a focus is needed on the primary functions of procurement, sales, and information technology support functions in the value chain.

Although research suggests that the divergent resource requirements of this newly evolved information systems technology necessitate different governance structures, optimal boundary choices have not been empirically investigated (McWilliam & Gray, 1995; Tsang, 2000). In response to this void, this study examines how firm resources and exchange attributes impact interorganizational governance structures for specific value chain functions. First a discussion of the literature related to channel functions and governance structures is provided, followed by hypotheses regarding the effects of various exchange attributes on governance structures. Next, the methods used to test the hypotheses are presented and the results are provided. Lastly, a discussion of the theoretical and managerial implications is offered.

## Literature Review

### Channel Functions

There are four basic types of companies that use the Internet in the core of their business: (1) e-commerce companies that sell goods over the Internet; (2) content aggregators who gather and display content from multiple sources; (3) market makers that act as intermediaries or conduct electronic markets; and (4) service providers who furnish Internet based services (Afuah & Tucci, 2000). This study focuses on market makers that act as intermediaries within the primary activities of procurement (supply) and sales (demand). Channel functions related to procurement include purchasing through multi-party, interactive, or dynamic pricing online markets. Selling channel services by intermediaries include selling through hubs, online auctions, use of competitive bidding, or the management of dynamic pricing systems. We also investigate information technology support services for website design and commerce support.

Research on traditional marketing channels suggests that intermediaries in the marketplace add significant costs to the primary activities in the value chain (Benjamin & Wigand, 1995). However, there are conflicting opinions on the efficiency of intermediaries in the electronic marketplace. The availability of interorganizational information systems facilitates the direct exchange between buyers and supplier in the electronic marketplace (Benjamin & Wigand, 1995). Particularly, Internet electronic commerce enables direct producer-consumer relationships, reducing costs and threatening the role of intermediaries.

However, Schmitz (2000) argues that the diffusion of electronic commerce does not diminish the effects of three intermediation services. First, the function of holding inventory provides a service of immediacy and insurance against systematic valuation risk. Some markets are characterized by random transactions, creating timing problems and uncertainty. In turn, marginal costs associated with opportunity costs and risk of capital loss due to shifts in supply and demand increase. The diffusion of information technology such as electronic commerce reduces costs of immediacy, resulting in greater market competition

and transaction volume. Secondly, asymmetric information prevails in markets characterized by random transactions. The diffusion of electronic technology helps traders overcome information asymmetries and realize lower information costs. Finally, electronic communication reduces the costs of communicating and processing existing information. Therefore, the value added from intermediaries gathering, organizing, and evaluating information should increase (Schmitz, 2000).

Other research suggests that due to economies of scope and scale and reduced coordination costs, intermediaries can provide channel functions at a lower cost over ubiquitous information systems infrastructure such as the Internet (Sarkar, Butler & Steinfield, 1995; 1998). Data communication infrastructures reduce coordination costs between producers and consumers, as well as producer to intermediary and intermediary to consumer interactions, thereby creating new opportunities for external firms to provide channel services in the new electronic market place. Sarkar et al. (1998) described the emergence of a class of commercial service providers called cybermediaries that operate in electronic markets to facilitate exchanges between producers and consumers by aggregating transactions to create economies of scale and scope.

Lower coordination costs associated with the ubiquitous information technology of the Internet are also expected to result in the unbundling of channel functions, thereby creating opportunities for channel-focused cybermediaries to provide services throughout the value chain (Sarkar et al., 1998). These value chain services can affect either primary activities upstream (supply) or downstream (demand), as well as technology support services. Supported by the resource view that firms will invest resources where they can appropriate the greatest return, research suggests that firms will turn to cybermediaries for the specialized expertise needed to operate, develop, and maintain rapidly emerging technologies, such as transaction security, product presentation, and on-line store management (Sarkar et al., 1998). In contrast, cybermediaries are not likely to be used for non-complex channel functions such as paper-based billing and telephone order processing.

### **Governance Structures**

The initial transaction cost economic (TCE) theory for explaining the firm suggests that firms and markets are alternative governance structures with differing transaction costs (Coase, 1937). According to TCE theory, the level of vertical integration is determined by the relative costs of using markets or employing resources within the firm. Research suggests governance decisions depend on the interaction between two main assumptions of human behavior (bounded rationality and opportunism) and two key exchange attributes (asset specificity and uncertainty) (Williamson, 1975, 1985, 1999). Bounded rationality can be thought of as intentionally rational behavior that is limited because decision makers recognize only a limited number of alternatives and are aware

of only a few consequences of these alternatives (Tsang, 2000). Opportunism results when management behavior is not in the best interest of the firm.

Transaction cost economics has been a popular framework for analyzing the efficiency of interorganizational boundary decisions (McWilliams & Gray, 1995; Poppo & Zenger, 1998; Tsang, 2000). The model presumes that performance is enhanced when there is congruence between a firm's governance structure and transactional attributes in a way that minimizes costs (Williamson, 1981, 1985, 1991). Empirical research supports the theory that firms seek to minimize costs through vertical integration and quasi-integration governance structures for the purpose of safeguarding transaction specific investments and adapting to environmental uncertainty of transactions (Heide & John, 1988, 1990; Rindfleisch, 1997). Moreover, research related to Internet-based electronic commerce suggests market-oriented governance structures can reduce transaction costs from economies of scale and scope facilitated by information technology efficiencies (Sarkar et al., 1998).

However, the dynamics of rapidly evolving information technology has exposed theoretical shortcomings of TCE research related to how exchange attributes affect governance structures along the value chain (Zaheer & Venkatraman, 1994). Scholars question an over-emphasis in TCE on asset specificity, without sufficient consideration of the firm's competencies and capability of coordinating productive resources that are not transaction specific (McWilliams & Gray, 1995; Poppo & Zenger, 1998; Tsang, 2000). Thus, it has been argued that if competitive advantage emanates from valuable and inimitable resources (Barney, 1991) then boundary choices should be explained by the possession and composition of resources that are a source of competitive advantage (Poppo & Zenger, 1998). Information technology resource deployment is distinctively characterized by transactions that use a common electronic infrastructure or firm-specific, unique and proprietary systems (Zaheer & Venkatraman, 1994). Inter-firm transactions utilizing the Internet's publicly accessible infrastructure do not require the degree of investment in firm-specific resources that are necessary in private networks of Electronic Data Interchange (EDI) (Zajac & Olsen, 1993; McWilliam & Gray, 1995; Tsang, 2000).

New and evolving interorganizational information systems have the potential to redefine TCE assumptions underlying governance structure decisions relative to the value chain (Sarkar, et al., 1998). Governance structures along the relational continuum are typically impacted by whether the interorganizational information system uses a firm-specific infrastructure or a common electronic infrastructure. Electronic hierarchies such as electronic data interchange are firm-specific linkages, which are maintained electronically, but coordinated by management rather than market forces. The term electronic integration is used to describe "a specific form of vertical quasi-integration achieved through the deployment of dedicated information systems between actors in adjacent stages of the value chain" (Zaheer & Venkatraman, 1994, p. 549). Research suggests

that firms obtain competitive advantage from transaction costs that are reduced in an asymmetrical manner by using proprietary electronic interfacing (Clemons & Row, 1988). Electronic hierarchies are typically characterized by bilateral interorganizational information systems such as EDI for dyadic exchanges between supplier and buyer. However, there are benefits and disadvantages indicated in the literature for hierarchical systems such as EDI. It is suggested that electronic hierarchies tend to improve competitiveness through higher quality products, increased customer service and business process reengineering, because they provide tighter links necessary to assimilate technology into the organization (Walton & Gupta, 1999). On the other hand, EDI technology tends to foster organizational inertia regarding the switching of trading partners (Walton & Gupta, 1999).

Electronic markets using Internet technology are multilateral inter-organizational information systems that facilitate transactions over telecommunications networks between multiple buyers and sellers. Electronic market governance structures enable producers to control the opportunism of suppliers by pursuing concurrent exchange relationships with the implied threat of switching to alternative vendors (Joshi & Stump, 1999). An electronic market provides several channel functions. First it helps to identify a set of potential trading partners for a transaction by providing seller's product information. It also supports selection by providing pricing information or market intelligence. Finally, an electronic market facilitates transactional execution through the exchange of information (Choudhury, 1998).

### **Exchange Attributes**

**Asset Specificity.** At the heart of TCE theory is the assumption that efficient production necessitates investments in physical and human assets that are transaction specific (Williamson, 1979, 1981, 1985; Poppo & Zenger, 1998). Although transaction cost logic assumes that firm specific assets reduce costs, these assets are also hypothesized to damage the performance of simple market governance as a result of costly contractual safeguards to protect from opportunist behavior (Williamson, 1981, 1985). Research has found that efforts of manufacturer agents to safeguard specific assets improved performance at high levels, but not at low level of asset specificity (Heide & John, 1988). Poppo and Zenger (1998) also tested this theory, finding that decisions to vertically integrate when information services are firm specific are more determined by performance dissatisfaction with using market governance (outsourcing) rather than performance satisfaction with using internal governance (internal sourcing). In sum, support has been found for the key explanation of boundary choice: that increasing asset specificity leads to diminishing effectiveness of market governance because markets lack effective mechanisms for resolving coordination problems and opportunism in specialized exchanges (Poppo & Zenger, 1998).

However, Poppo and Zenger's (1998) empirical evidence did not resolve some critical issues. First, by definition firm-specific assets are human and physical assets, as well as, routines and knowledge that are not transferable to alternative uses (Williamson, 1985). The measurement used by Poppo & Zenger (1998) to determine this was based on managers' perceptions of the degree these assets were custom tailored to their firm. Notwithstanding measurement rigor, this approach has more value for EDI networks that require significant investment in information technology and infrastructure that are not re-deployable. Exchange transactions using the Internet are based on assets that are relatively standard and not firm specific, such as a personal computer network with telecommunication access to the World Wide Web. Software applications using HTML and Java script are relatively standard and therefore transferable between other potential buyers and suppliers. Human skills embedded in firm knowledge of Internet based software and hardware assets are relatively ubiquitous, compared to skills associated with proprietary software and hardware used in EDI networks.

Resource dependency. The resource-based perspective is similar to TCE theory because asset specificity is related to the nature of firm resources (Tsang, 2000). However, resource-based theory takes a broader view of resources, focusing on the firm's competencies and capabilities of coordinating productive resources that are not transaction specific (McWilliams & Gray, 1995; Poppo & Zenger, 1998). According to the resource perspective, transaction and management costs are dependent on heterogeneous capabilities and resources of the firm (Tsang, 2000). Therefore, boundary choices should be a function of the possession and composition of rare and inimitable resources that are a source of competitive advantage (Barney, 1991; Poppo & Zenger, 1998).

Research suggests that vertical quasi integration is positively related to the firm's financial resources because internalizing functions allows firms to pursue value-increasing strategies, otherwise inaccessible (McWilliams & Gray, 1995). It is argued that activities that represent a source of competitive advantage to a firm are rarely externalized under conditions of environmental uncertainty or low transaction costs. Thus, if the activity can be outsourced, it can be imitated and is therefore not a source of sustainable competitive advantage.

Since financial resources are only a means to acquire productive assets, resources critical to electronic commerce are embedded in technical infrastructure and human skill sets. Interorganizational technical infrastructure and capabilities are typically a source of economic value creation and strategic competitive advantage (Clemons, Sashidhar & Row, 1993). As a result, it is expected that firms with greater investments in web hardware and software will tend to internalize functions that could serve as a source of competitive advantage and value created. The literature suggests that all firms are a depository of knowledge, learning, and interpersonal relations (Williamson, 1999). Therefore, if inter-firm contracting exposes a firm to leakage of proprietary knowledge man-

agers will move toward integration. Since technical support channel functions can be a source of learning and proprietary knowledge for firms engaged in electronic commerce, they will tend to invest technical and human resources necessary to internalize these functions. Thus, we offer the following hypothesis:

*Hypothesis 1A: Firms with greater investment in human resources and technical infrastructure will pursue greater levels of vertical integration in technical support channel functions.*

Research also suggests that the use of online intermediaries is inversely related to whether a specific channel activity relies on specialized skills or technologies that are available within the firm (Sarkar et al., 1998). It is argued that firms without specialized expertise to develop, maintain, and operate the rapidly developing electronic market technologies, will rely on online intermediaries. Market mechanisms can be used because the value of the technology investment can be preserved (Tsang, 2000). This does not hold true for human skills because firms cannot capture or own the value created by human resources (McWilliams & Gray, 1994). By nature, capabilities embedded in human skills are not readily accessible through market mechanisms (Tsang, 2000). Because organizational skills are a source of distinctive competence, firms will continue efforts to accumulate institutional knowledge through human assets, even as boundary-spanning functions such as sales or procurement increase through intermediaries. Therefore, we offer the following hypotheses:

*Hypothesis 1B: The usage of online intermediaries in sales functions will be inversely related to investments in technical infrastructure, but positively related to the availability of human resources.*

*Hypothesis 1C: The usage of online intermediaries in the procurement function will be inversely related to investments in technical infrastructure, but positively related to the availability of human resources.*

Transactions. Frequency of transactions is also an exchange attribute affecting governance structure (Williamson 1979, 1985; Noordewier, 1990). Knowledge-based or resource-based reasoning suggests that firms with superior capabilities tend to have more efficient production. Because these efficiencies are sensitive to scale, firms with greater production volume tend to internalize functions through vertical integration (Poppo & Zenger, 1998). Similarly, repeated dyadic market transactions lower transaction costs and enable using inter-firm networks, thus allowing for human asset specificity to develop and

deepen through the transfer of tacit knowledge (Tsang, 2000; Jones, 1997). Thus, we hypothesized that:

*Hypothesis 2: The degree of vertical integration will be higher for firms with greater transaction frequency.*

**Firm Age.** It has also been proposed that firms are more likely to use intermediaries during the early phases of new market entry (Sakar et al., 1998). Similar to small entrepreneurial firms, new entrants into electronic commerce are more likely to outsource channel functions that require specialized skills to quickly achieve economies of scale and scope (Sarkar et al., 1998). Traditionally, as markets develop, competition intensifies, with producers controlling channel functions gaining a competitive advantage. Increasing volume helps firms achieve economies of scale and scope, thereby reducing costs for internalizing the function and shortening traditional channels. In electronic markets, however, the cost of coordinating through cybermediaries is lower and the marginal cost difference is less than traditional markets. Because it is suggested that the speed at which firms use intermediaries in electronic commerce will decline as companies mature (Sarkar et al., 1998). Thus, we offer the following hypothesis:

*Hypothesis 3: The degree of vertical integration will be higher for more mature firms.*

## Methods

### Data Collection

Using a database of firms doing business on the Internet, survey data were gathered using a key informant technique from chief information service officer or the manager of information technology by Activmedia, an Internet research firm (Poppo & Zenger, 1998). Specifically, a population was extracted from a global directory of 550,000 publicly listed URLs. Once unduplicated, an  $n^{\text{th}}$  name random sample was drawn from English-language directory systems, which accounts for 80% of Web URLs overall. The instrument was a multi-part web-based survey. An e-mail invitation was sent to 4,604 businesses in the year 2000, giving them 48 hours to respond, promising a copy of the final report. In that period 1013 respondents provided usable data, representing a response rate of 22%. The sample was further reduced to include respondents who use the Internet for business-to-business (B2B) transactions resulting in 463 firms. Of these 463 firms, 113 provided the complete data necessary to conduct this study. Analysis of B2B firms suggested no apparent bias between firms with partial data and those with complete data used in this study. The survey requested information on three channel services: information technology support services, marketing through intermediaries and procurement through intermediaries.



### Dependent Variables

Technical Support Services. Consistent with previous research (Poppo and Zenger, 1998; Sarkar et al., 1998) information technology support services that require specialized skills were used as a dependent variable. Respondents were asked whether they outsourced or internalized four website transaction support functions and four website design functions. Each support service item was coded as a dichotomous boundary decision (yes = 1, no = 0) to outsource or internalize four channel functions: catalogs, online store, presentation management; shopping cart management; commerce services (credit cards and automatic clearing house (ACH) processing and approval); and business application services. Scores for each item were summed by outsource or internalized decision. Outsource responses were then reverse coded and added to the internalized responses to constitute a scale from -4 to +4, representing a continuum of vertical integration labeled SUPPORT.

Website design function was also a dichotomized decision to outsource or internalize four functions: website page and graphic design; website programming and scripting, Internet network design; and system integration. Scores for each item were summed by outsource or internalized decision. Outsource responses were then reverse coded and added to the internalized responses to constitute a scale from -4 to +4 representing a continuum of vertical integration labeled DESIGN.

Sales Functions. Intermediary sales functions were measured in two ways: (1) respondents were asked to rate how the Internet has influenced sales through intermediaries, on a 5 point Likert scale (5 = substantially influence, 1 = not influence); and (2) respondents were asked whether they currently sell through electronic commerce hubs, competitive bidding, online auctions, or use any form of dynamic pricing through the Internet, with each of the four factors summed.

Procurement Functions. Two variables were used to measure the use of cybermediaries: (1) respondents were asked to rate their reliance on purchasing functions through trading hubs, online auctions, and online managed bid processes on a 5-point Likert scale (extremely reliant = 5, not at all = 1) with each score of the three factors summed; and (2) respondents were asked what percentage of total online purchases are bought through any form of multi-party, interactive, or dynamic pricing online market such as e-commerce trading hubs, reverse auctions, or managed bid processes.

### Independent Variables

Human Resources. Conceptualization of relevant skill sets often takes the form of the number of employees assigned to germane tasks (Min & Galle, 1999). Based on this precedent, we measured human resources as the number of web employees as reported by the respondents.

**Technical Resources.** The basis for technical resources is the firm's investment in web-based technical infrastructure, such as hardware, software, communications support, and personnel skills (Angeles & Nath, 2000). Therefore, technical resources were measured as the self-reported investment in web-based hardware and software.

**Transaction frequency.** Transaction frequency was measured as the number of monthly online transactions (Jones, 1997). However, to control for firm size, the number of monthly online transactions was divided by the number of total monthly transactions.

**Firm age.** Firm maturity in electronic commerce was measured by firm age. Respondents were asked how many years their firm has engaged in web electronic commerce.

### **Control variable**

Firm size was used as a control variable. To measure size, the number of total employees as reported by the respondents was used.

### **Data Analysis**

Data on the 113 firms were analyzed using multiple linear regression. This method has been used in previous studies because of the expected relationship of the dependent variables with the multiple independent variables (Cohen & Cohen, 1983). The relationship between a firm's level of integration for technical services, procurement functions and sales functions and the independent variables was modeled as follows:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \text{control variable} + e,$$

where  $Y_i$  is the degree of integration for two technical support dependent variables; two sales intermediary variables; and two procurement intermediary variables.  $X_1$  represents level of web investment,  $X_2$  represents the number of web employees,  $X_3$  represents the frequency of transactions, and  $X_4$  represents the firm age. Size is included as a control variable. An alpha level of .05 was used as the critical value for significance testing.

### **Results**

Table 1 presents the means and standard deviations, as well as the correlation coefficients between variables. The results indicate there are significant linear relationships between governance structures and firm resources. As expected e-commerce resources (web investment and web employees) are positively correlated with the degree of integration for support functions and design functions. E-commerce resources are also positively correlated to a firm's use of intermediaries for sales functions, but interestingly, not procurement functions. These

correlations provide preliminary support for our hypotheses that suggest a relationship between a firm's web-based resources and the degree of integration or outsourcing of support and sales functions.

Table 2 presents the results of the regression analyses estimating the effects of firm resources on the degree of integration for, website design and technical support of channel functions, as well as the degree of intermediary use for sales and procurement functions.

Hypothesis 1A suggests firm resources have a positive impact on the degree of integration for technical support functions along the value chain. The results support this hypothesis indicating that the number of web employees has a significantly positive effect on the degree of integration for website support functions as well as website design functions ( $p < .05$ ).

Hypothesis 1B suggests that firm resources inversely impact the use of sales intermediary. As expected, the results indicate web investment has a significantly negative effect ( $p < .05$ ) on the respondents perception of their reliance on the use of sales intermediaries. Also, the number of web employees was positively related to reliance on sales intermediaries, supporting Hypothesis 1B. Contradicting Hypothesis 1B, web investments was significantly positive ( $p < .01$ ) when regressed against intermediary sales, as measured by the number of intermediary functions.

Hypothesis 1C suggests that the usage of intermediaries for the procurement function is inversely related to investments in technical infrastructure and positively related to the availability of human resources. The results suggest no significant relationship between investment in technical infrastructure and the use of intermediaries for procurement functions. However, as expected, the results indicate that web employees is positively related to the degree of intermediary use for procurement ( $p < .05$ ). When degree of intermediary usage is measured by the percentage of online purchases through intermediaries none of the resource variables are significant predictors.

Hypothesis 2 suggests that transaction frequency is positively related to the integration of channel functions. As expected, transaction frequency is a negative and significant predictor ( $p < .05$ ) of the number of intermediary functions. Hypothesis 3 suggests that more mature firms with have greater levels of vertical integration. However, the results suggest that firm age is not a significant predictor of level of vertical integration.

### Discussion and Conclusions

The purpose of this article was to examine governance structures within Internet-based electronic commerce. Using transaction cost economic theory and resource-based theory this study tested how firm resources and exchange attributes impact interorganizational governance structures for specific value chain functions. Consistent with previous research we used a multiple theory

**Table 1**  
**Descriptive Statistics and Correlation Matrix**

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. DESIGN	1.00	2.37										
2. SUPPORT	.26	1.19	.232**									
3. Sales reliance	3.94	1.83	-.002	.070								
4. Sales Hub	.01	.35	.125**	.064	.179*							
5. Purchase Function	13.26	2.17	-.006	.036	-.055	-.232**						
6. Purchase Hub	6.86	15.36	-.052	-.013	.056	.149	-.430**					
7. Web investment	83.17	307.92	.130*	.280**	.193*	.192**	-.128	-.175				
8. Web employees	5.80	27.11	.261*	.247**	.288*	.187*	.052	-.199	.536**			
9. Web age	3.31	2.13	.211	.107	-.043	.017	-.132	-.096	.115	.349**		
10. Transaction	1.52	10.66	-.163*	.108	-.027	.064	.053	.178	.282**	.260*	.094	
11. Size	105.81	603.42	.039	.161*	-.092	.116	-.064	-.028	.267**	.44**	.190*	.306**

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 2**  
**Results of Regression analysis**

Variable	Technical Support			Sales		Procurement	
	Design	Support	Influence of Sales Intermediaries	Internet Sales Methods	Reliance on Purchasing Functions	Percent Purchasing Online	
Web investment	-.209	.022	-.721*	.614**	.049	1.132	
Web employees	.563*	.453*	.755*	.078	.894*	-2.132	
Transact	-.209	.011	.061	-.557**	-.698	.974	
AGE	.057	-.162	.096	.144	-.078	-.362	
SIZE	.143	.150	.133	-.115	-.052	-.207	
R <sup>2</sup>	.130	.281	.180	.238	.277	.341	
F	1.313	3.439**	1.097	2.755	1.456	1.344	

Standardized beta coefficients

N = 113

\* p < .05

\*\* p < .01

approach for a more accurate assessment of firm boundary decisions (Bensaou & Venkatraman, 1995; McWilliams & Gray, 1995; Poppo & Zenger, 1998; Tsang, 2000). It was suggested that the asset specificity argument of transaction cost theory lacks relevance for Internet-based electronic commerce due to relatively inexpensive website hardware and software costs and a public and ubiquitous technical infrastructure. Consistent with recent research of transaction costs and resource-based theory, the current study considered the impact of competencies and capabilities on boundary decisions (Williamson, 1999; Barney, 1999). The results of this study support the concept that resource dependency provides a solid theoretical foundation for explaining boundary decisions to outsource or internalize support and primary functions along the value chain.

In terms of technical website support and website design, dependency on human resources in the form of employees dedicated to web-based business functions appears to be a predictor of higher levels in internalization. Although it seems to be intuitive that the more you internalize functions, the more function-specific employees you need, the same did not hold true for web investments. Investment in web infrastructure was not a good predictor for in-sourcing technical functions.

Considering the effects of resources on sales functions, we find that reliance on sales through intermediaries is negatively related to web investments. These results provide support for Hypothesis 1B suggesting that firms that perceive a greater reliance on sales intermediaries will deploy fewer technical e-commerce resources. Supporting Hypothesis 1B, there is a positive relationship between the respondents' perception of their reliance on intermediary sales and the level of function-specific human resources. Supporting Hypothesis 1C, there is also a positive relationship between the number of intermediary procurement functions and the level of function specific human resources. These results suggest that firms will continue to invest in learning, even when using intermediaries for boundary spanning channel functions. It gives further support to the concept that human resources behave differently than investments in infrastructure because of the need to protect knowledge embedded in human skills that are vulnerable to interfirm contracting (Williamson, 1999). The results also indicate that firms that sell more through hubs have lower transaction frequency. As suggested in transaction cost theory, firms with more frequent exchanges justify internalization by allowing for human asset specificity to develop and deepen through the transfer of tacit knowledge (Jones, 1997).

### **Implications**

This study has implications for practitioners in this newly evolving and broadly interesting area of Internet commerce. Much of the previous research has focused on electronic data interchange, based on dyadic vertically integrated relationships between large companies and their network of supplier. The advent of Internet information technology has broadened the scope of new entrants to

smaller firms that may not be part of a tightly linked supplier network. This new technology has also lowered the cost of the technical infrastructure to new entrants. Understanding the factors that predict governance structures in electronic value chain activities is becoming increasingly important. Using this research as a starting point, managers can begin to understand the relationship between resource deployment and the use of intermediaries and external contractors to execute channel function using the Internet. The lesson managers can learn is that internalizing technical support and sales functions will require either human resources, technical assets or both, with each having a different impact on the firm. Our findings suggest that procurement functions are not as dependent upon resources as sales functions. This suggests that intermediaries are more likely to be used in the sales function to attract a large consumer base. Moreover managers should be aware that neither the size, nor age of the firm, had a particularly strong influence on boundary decisions.

### Limitations and Future Research

One particular limitation of this study, as well as others, is the difficulty of measuring performance, particularly costs associated with managing an exchange (Poppo & Zenger, 1998). Future research should investigate the relationship between exchange attributes and performance to determine if certain governance arrangements result in better firm performance. Another limitation of this study is the cross-sectional nature of the data. The use of data at one point in time makes it more difficult to determine cause and effect relationships. However, given the young age of Internet commerce, a longitudinal timeframe for collecting data is not yet possible. Moreover, the use of theoretically based hypotheses allows for confidence in the predicted cause-effect relationships of this study.

It is evident that Internet commerce will continue to be a significant contributor to our economy in the future. This research provides a step along a new and exciting journey of applying our well established paradigms from strategic management, marketing, and organizational economic literature to issues related of electronic commerce.

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