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The Impact of EDI on a Hybrid Governance Structure

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Introduction

Increasingly electronic data interchange (EDI) is utilized to change how interorganizational transactions are conducted (Premhumar and Ramamurthy, 1995; Cash and Konsynski, 1985). The governance of interorganizational transactions has been the object of intense research (Coase, 1937; Williamson, 1975, 1981; Granovetter, 1985, Oliver, 1990). Little is known; however, regarding the impact of EDI on the governance of these interorganizational transactions.

In this research the theorized impact of electronic data interchange on interorganizational transaction governance is examined. The research context for this study is presented, followed by a summary of initial findings, and a discussion of the potential impact of this research.
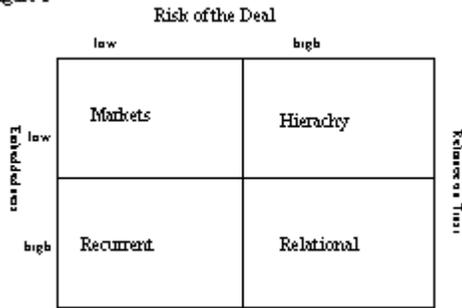
Theorized Impact of EDI on Interorganizational Transaction Governance

Two polar forms (markets and hierarchies) for describing transaction governance have been routinely criticized (Williamson; 1991: 269) for ignoring hybrid forms of transaction governance. Ring and Van De Ven (1992) proposed two hybrid forms of transaction governance: recurrent and relational. Ring and Van De Ven's (1992) criteria for differentiating the four governance types are "risk of the deal" and "reliance on trust among the parties."

Market based transactions are short term in nature between highly autonomous agents. In most cases these market based transactions involve the economically efficient transfer of property rights with few rich interactions (Zmud, Lind, and Young; 1990) between the transacting agents (Ring and Van De Ven, 1992). "Hierarchical transactions usually involve the production of wealth or the rationing of resources between superiors and subordinates" (Ring and Van De Ven, 1992, p. 485). The hierarchical transaction governance form works best for transaction situations that have highly uncertain outcomes, occur frequently, and require unique or specific investment (Williamson, 1985, Ring and Van De Ven, 1992). In the recurrent transaction governance form of Ring and Van De Ven (1992), the transactions involve repeated exchange of assets of moderate transaction specificity. The transactions are relatively short term and the agents in the transaction are autonomous. Because these agents have a recurring relationship, they become more socially embedded in the transaction process developing a high level of mutual trust between the agents and quickly become aware of any non-efficiency agent motives. Relational transaction governance involves a long term relationship characterized by a high level of trust between the agents that resulted from recurrent transacting. The property exchanged in relational transactions involves highly, very specific investments dependent on the results of the transaction. Any disputes are resolved through efficiency and equity outcomes sought in the long term recurrent relationship.

Through interpersonal relationships, a social embeddedness is established where the agents develop a mutual trust that discourages malfeasance (Granovetter, 1985). Through this trust, the agents can transact with each other confident that malfeasance will not appear (As Granovetter (1995) notes there are exceptions to this such as embezzling, confidence schemes, etc.). Thus the long term recurrent and relational governance types afford opportunities for the agents to become socially embedded which in turn increases trust and lowers the risk of the transaction (Figure 1).

Figure 1
Interorganizational Transaction Governance

Risk of the Deal

	low	high
low	Markets	Hierachy
high	Recurrent	Relational

(left axis: Embeddedness; right axis: Reliance on Trust)

Automating the Recurring Transaction Process

Adding to research on the adoption and use of EDI (Premkumar and Ramamurthy, 1995; Malone, Yates, and Benjamin, 1987), Hart and Saunders (1996) found power and trust to be critical factors. The objective of this research is to examine the effect of EDI on an existing recurring transaction process characterized by a high level of trust between the transacting agents.

Agents in a recurring transaction process develop over time a high level of mutual trust in how to conduct the transaction. This takes the form of predictably in dealing with the transacting partner. Through interpersonal embeddedness (Blau, 1964, Granovetter, 1985), the agents become familiar with each other's expectations for completing the transaction. This interpersonal embeddedness thus results in a mutual trust that reduces uncertainty regarding the transaction and the need for additional information search to reduce this uncertainty.

The introduction of an EDI technology to standardize and speed up the transaction flow between the agents may change the nature of the agents' transacting relationship. When the agents change long standing norms of transaction behavior, a period of heightened uncertainty regarding the transaction process may exist and result in lower trust between the transacting partners. Over time the transacting partners will have opportunities to reduce this uncertainty and return to their former trust level, provided opportunities for opportunistic behavior are not created and the EDI technology is reliable (Figure 2).

Figure 2   **Recurring Transaction Governance**

EDI Technology

Hi Trust	Lower Trust	Return to Hi Trust
Period 1	Period 2	Period 3
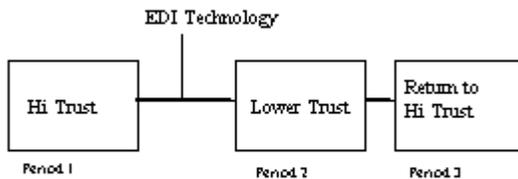
Hypothesis #1: In a recurring transaction process, the short term reaction to the use of EDI in the transacting process will be a lower level of trust between the transacting agents.

Hypothesis #2: In a recurring transaction process, the long term reaction to the use of EDI will be a return to the level of trust in effect prior to EDI implementation, provided EDI does not provide opportunities for opportunistic behaviors by the agents and is reliable.

Research Design

Efficiency and trust metrics will be collected over a fourteen month period from transacting agents. The agents are motor carriers who request credentials from state agencies in an eight state Midwest area. For two months prior to EDI implementation, efficiency and trust metrics will be collected from the transacting agents. After EDI implementation, the trust metrics will be collected every two weeks from the transacting agents (front line workers at the motor carriers and state agencies) with efficiency metrics on the credential turnaround time provided by the EDI system.

This recurrent credential transacting context provides a longitudinal research design where the time lagged effect of EDI on agent trust can be examined. Also the relationship between EDI system performance and trust will be examined.

Results

The baseline data collection, period 1, for the pre-EDI transacting process is ongoing at the time of this paper. Preliminary results indicate that there exists between the transacting partners a high degree of trust in their current credentialing process. By the time of the conference, data from the period immediately after EDI implementation, period 2, will allow examination of the short term impact of EDI on the transacting agents' mutual trust.

Conclusions

This study will provide a fine grained analysis of EDI impact. It is generally accepted that EDI increases transaction efficiency by speeding up the transaction cycle and the accuracy of the data exchanged. These efficiency improvements will improve market governance situations that are characterized by short term (quick in and quick out) relationships for the trading partners. Little is known however of the impact of EDI on the recurrent transacting relationships. If trust is permanently reduced, it could lead to a more adversarial relationship between the transacting agents. Also it is possible that the depersonalization of the recurrent transacting using EDI technology, may result in the transaction agents acting more opportunistically. They may take short cuts or finding ways to improve their position relative to their transacting agents.

Thus this research will not just examine not only the impact of EDI on transaction efficiency and the trading partners' work processes, but its impact on the transacting agents' social embeddedness relationship. In particular, will EDI reduce mutual trust and lead to more opportunistic behavior by the recurrent transacting agents? Will EDI result in a change in the trading partners' mutual trust level?

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Motivation for this Research

Within the United States, before many organizations can operate they have to be certified. In many cases, the regulation is imposed on a state by state basis so that there is no single body that can provide certification throughout the United States. When this certification has to be reissued on a frequent basis, this can be a time consuming activity for both the state agencies and the organizations desiring certification. In particular the motor carrier industry has to obtain such certification from the states in which its trucks will operate. This entails each motor carrier dealing directly with the state credentialing agency in that state. Also, carriers may have to obtain credentialing for trucks that infrequently travel through a state or may be oversized for standard hauling.

Theoretical Basis for Research

This state/ carrier relationship is neither market nor hierarchy which are characterized by Williamson (1990) as polar modes. Williamson (1990) proposes a hybrid interorganizational structure between the market and hierarchy poles. Through this bilateral dependence these hybrids develop coordinating mechanisms to support this interdependence and long-term contracts for dispute settlement equitable to both parties. A true hybrid midway between markets and hierarchies would be

characterized by semi-strong financial incentives for each party, an intermediate level of bureaucratic processes, and semi-strong adaptability.

The context of this hybrid is positioned more closely in the favor of the hierarchy due to the legal power of the state credentialing agency, i.e. to do business in the state the carrier must conduct a transaction (s) with the state agency.

The transaction that is the basic unit of analysis in this context is the credential process that the carrier conducts with each state. The credentials are produced on a truck by truck basis so that they are very asset specific and must be displayed in the truck if the truck is to do business in a particular state. Thus with this very real control that the state's have over the carriers' asset specificity, there is a very real bilateral dependence between the state and the carriers.

The dependence of the carrier on the states for certification imposes a governance cost on the carriers that is enacted through the credentialing transaction. This certification then allows the carriers to service the transportation requests of their customers. The governance costs consists of the labor to prepare the credential request, the time to transmit the credential to the state agency, the time it takes to clarify any problems, the labor for the state to process

the credential, and the time for the completed credential to be transmitted back to the carrier. Many small carriers will use an intermediary called a service provider to submit the credential request for the carrier for a fee.

In an attempt to reduce governance costs associated with the credentials, an electronic data interchange system is being developed. This system will automate the credential processing for the states and carriers. While the EDI approach is to streamline and standardize the credentialing process, each state has its own laws particular to that state. An added cost to implementing this credential technology is the cost of changing state mandated laws to adhere to a standardized EDI credential transaction.

Each state has mandated laws and regulations that govern credentialing in that state such as original signatures and credential cards that must be placed in the cabs of trucks. These mandated barriers usually result from legislation, executive orders, or popular demand. Other barriers include organizational issues that reflect problems with how the state or carrier is structured to implement the One-Stop technology. These organizational issues can result from jurisdictional overlaps, unclear responsibilities, conflicting operating and administrative policies and priorities, and cultural differences.

The socio/technical interface of the technology with its users (states and carriers) is an additional barrier to One-Stop adoption involving the person/ technology interface. If One-Stop is to be used and to be nationally deployable, it must fit the work styles and needs of the states and carriers. Thus within this hybrid governance context of states and carriers to successfully implement an EDI system the states, in particular, must seek to collaborate and reduce the barriers and the governance costs to the carriers.

Research Basis for Assessing the Impact of Electronic Data Interchange.

A time based process model will be used to analyze the impact of EDI on the states and partners. The dynamic approach proposed will not only model perceptual, behavioral, and procedural changes but will also assess the impact of these changes on partner effectiveness and efficiency. Many organizational theorists (Tushman and Romanelli, 1985; Markus and Robey, 1988; Monge, 1990) have argued that such process models may provide insights about the nature of organizational change that are not supplied by the correlation (variance) analysis models currently used by most researchers in this area. In barrier reduction, the partners must change the credentialing procedures within the states agencies and motor

carriers. Thus barrier management is effectively change management. These state and carrier organizational units will be examined as hybrid interorganizational systems (Williams, 1990; Van de Ven, 1994) to assess the ability of these states and carriers to adaptively institute changes resulting from the collaboration effort focused on reducing the barriers to One-Stop implementation. These organizational changes may entail not only changes in work procedures but changes in the culture of these organizations.

Structural interaction mechanisms that allow intensive and high quality interaction among the states and motor carriers will be necessary to enable these organizational and cultural changes (Adams, 1980) which will in turn affect the performance of One-Stop in the credentialing process. As the partners develop their interorganizational relationships, Ring and Van De Ven (1994) argue that such collaboration enables congruent decisions which then should allow the partners to reduce the barriers to One-Stop implementation. Thus it is argued that intensive collaboration among the partners will result in congruent barrier management which will determine the effectiveness of One-Stop after implementation.

Research Context

The Federal Highway Administration is sponsoring this

operational test of carrier EDI in the Mid-West in collaboration

with the eight partner Mid-Western states. The partners have

developed a set of metrics to assess the impact of the EDI

technology. The metrics are focused on cycle time to process a

credential, productivity impact of EDI on the credential worker,

satisfaction level of the states and carriers with the EDI

system, and the effectiveness of the barrier reduction process.

The research design for this study is a pretest/ posttest.

We are currently in the baseline period where we are obtaining

baseline values for each of the metrics. These results will be

included in the paper that is submitted for the proceedings. By

the time of the conference, we will be into implementation data

collection which begins on July 1, 1996. At the conference I

will provide preliminary results obtained during the posttest

period.

Conclusion

The goal of this paper is to use the hybrid governance

structure to explain this technology development and

implementation effort. This context is complicated by the

barriers that need to be removed to enable the ultimate

deployment of this EDI technology on a nation wide basis. This

pretest/posttest research design will allow for nice quantitative

analysis of EDI impact and should provide interesting qualitative

information on the technology development and implementation process.

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