# Trust Within the Established Inter-Organizational Information Sharing System

Peter Mihok, Technical University of Kosice, Nemcovej 32, Kosice 040 01, Slovakia; E-mail: Peter.Mihok@tuke.sk
Tyler G. Frank, Technical University of Kosice, Nemcovej 32, Kosice 040 01, Slovakia; E-mail: tgfrank3@netscape.net

## ABSTRACT

*Trust is often considered to be a primary factor in the implementation of a collaborative information sharing system. These systems have become more common in organizations since the increase in the need to be more efficient and effective. Trust, it is often said, must be present prior to the exchange of often sensitive information. Based upon the results of a mail-based survey, we did not recognize trust in an established information sharing system as a key success factor, since it is replaced by contractual agreements defining the limitations of the transferred information usage. The derivation of the theory and the supporting evidence relating to information sharing is presented.*

## 1. INTRODUCTION

Trust is often stated in literature as being of critical importance in the creation and maintenance of an information sharing system. These systems are becoming quite common as the need for systems efficiency becomes not only important but necessary. The necessity for increased responsiveness has resulted in various types and levels of communication between elements in an organization's supply chain being established. Information sharing presents many distinct advantages to an organization but simultaneously opens the firm's critical and often sensitive information to the review of persons outside the firm. The structures that are needed to ensure a successful implementation are not identical though to those that ensure the successful maintenance of the same information sharing system. Trust, though critical in the implementation, is replaced by legal and contractual stipulations as the system ages.

The literature shows a multiple models of diverse elements in a complex series of theories that the respective authors say affect inter-organizational information sharing. These factors are predominantly influenced by individual behaviors, organizational behavior, inter-organizational relationships, and others that can be distributed into broad political and social contexts (Schermerhorn 1975). The importance of interorganizational information sharing is that it provides benefits to organizations including economies of scale, lower overhead and reduced risks (Alexander, 1995). The technology theory influencing information sharing is a vast and dynamic collection of database, communications, and network theories.

In this paper we deal with the role of trust within the information sharing systems. Based upon the results of a mail-based survey, we determined 10 key success factors for an established information sharing system. Trust, which did not occur as a factor among them, seems to be replaced by contractual agreements defining the limitations of the transferred information usage. Some our conclusions are based also on field studies of the FLUID-WIN and SEAMLESS projects (Delina 2007).

### Empirical Research on Information Sharing

Theoretical studies, and simulations to justify such, abound while empirical pieces are primarily limited to a few case studies with quite few broad-based empirical studies existent. In the short amount of time that Information Sharing has been studied, the trends in the dissolution of vertical integration have strengthened and alliances within a supply chain have become more common. Organizations have changed in that they now need to gather materials or goods in a manner and at a speed that the demands of the customer are considered.

In the development stages of interorganizational information systems, the structures underlying the system implementation are dynamic and complex. Two or more organizations are involved and numerous technological and social considerations must be made. Compromise is often necessary to accomplish any goal and such is more often the rule than the exception. Under these circumstances, trust is necessary since adjustments to contractual stipulations would be a hindrance. Information sharing structures for post hoc implementations have been but minimally explored.

Often, information sharing occurs in an ad hoc fashion via methods that are devised anew with each interchange: that is, single-use, single-purpose mechanisms. Trusting that the organization, that the information is being given access to, is not entirely self-serving in that it serves the purpose of not requiring a revision of contractual agreement each time as an exclusion to that contract presents itself.

However, as the system of sharing becomes more mature and the volume and frequency of information sharing grows, a more permanent mechanism for defining the limitations of the information exchange and usage often becomes beneficial, one that can function repeatedly and serve a variety of purposes. Strategic information is of great interest in sharing and infrastructure-building, due to the high cost of its production, its potential for re-use, and its value in strategic decision making. An information-sharing infrastructure links organizations with common goals and tasks by means of defined standards, navigation and conversion tools, shared "framework" information, and institutional structures such as supply-chain relationships.

### Inter-Organizational Information Sharing Literature Review

Inter-organizational information sharing is not a new concept but has been widely researched over the past thirty-five years since the empirical research of Schermerhorn (1977). These organizations work in a cooperative/competitive manner described by Lado et al. (1997). Aspects of trust in information exchange have been researched by Thompson (1991) and Thompson & Hastie (1990). Kemp & Smith (1994) found that the level of information shared correlated to the benefit derived for each participant. Though mature computer-based information sharing organizations and structures have not specifically been investigated, findings regarding more traditional means of information sharing have found that (1) shared information is based upon an initial expectation of trust (2) shared information results in faster mutual decisions (3) higher costs (4) decreased complexity (Butler 1999) (5) that shared information has strategic importance (6) correlated strategies (Doyle & Snyder, 1999) (7) a shared vision (8) mutual understanding and (9) routinization of synergistic interactions (Jassawalla & Sashittal, 2000).

The structure of the paper is to describe existing industry structures and benefits in section 2. Research objectives are described in section 3 with a comprehensive description of the methodology employed in section 4. The empirically derived model and descriptions of the factors is presented in section 5 followed by the conclusions in section 6.

## 2. INDUSTRY STANDARDS ON INFORMATION SHARING

Standards do not yet exist for database structures but information sharing between autonomous organizations is often desired or mandated. By autonomous firms using compatible data descriptions, data can be shared without translation or modification. Enterprise Resource Planning systems, with their limited array of translation

capabilities can communicate with a like system with little or no modification to either system. The effect is often described as "seamless" since the transaction of information sharing works in a like manner as a request or transmittal of data from an internal source (Palaniswamy, Frank, 2000). The evolution of business database systems towards "common" systems software definition is having the effect of achieving a minimum standard of compatibility that should eventually create a voluntary standard for data sharing.

Information sharing can reduce the cost of failure, operational costs and improve the scheduling and efficiency of current resources. It also provides intangible benefits such as improved quality with increased customer and shareholder satisfaction. To place confidence upon the achievement of these goals in something as intangible as trust is unlikely in an organization, that must report to its owners the detail of its actions. Such situations eventually result in written agreements that describe the actions and responsibilities of the organizations involved. These formal agreements are legally binding contracts and have legal remedies available with possible penalties for the firm violating the contract. Trust, being intangible does not always have legal remedies for its violation.

As organizations increasingly access the benefits offered by the inexpensive computer and communications technology, the problems and concerns that accompany the benefits become more apparent. The information that can be used to improve the actions of the supply chain and simultaneously reduce associated expenses is also often of a critical nature and need be protected from competitors and others.

Shared information can have a distinct influence on organizational cultures, strategies and behavior. Using shared information is often either a technological problem or an organizational one. It is difficult to fully anticipate how the information will be retrieved, combined, and employed. This tends in the implementation stage to disrupt most rigidly hierarchical organizational structures and influences the formation of more "organic" managerial structures. These organic structures then evolve, along with the information system, back to the more rigid, less organic structures involving contracts rather than trust to oversee the actions of the participants.

## 3. RESEARCH OBJECTIVES

This research examines the aspect of trust of information sharing and how relationships are mediated by that trust within an established information sharing. Trust aspects in information sharing are often considered to be crucial in previous studies of factors influencing the success of information systems. The research described here is that of already established. No study to date investigates what influence trust constitutes in an established information sharing system. Several studies have investigated the importance of trust in implementing an information sharing system but none to date have sought to explain "trust" as the system evolves. This study will seek to fill this void.

Trust is considered in this research as a feeling or belief that a partner organization will act in the best interests and without malice in actions that involve their partner. Providing strategic information without cost to supplier chain partners can strengthen the both organizations and provide a competitive advantage. Trust, it is said, is required in implementing a system of information sharing since strategic information could be used either constructively or destructively. But, as this research reveals, the need for trust is not constant and as the information sharing system ages and evolves, it diminishes in importance to the level of insignificance.

## 4. RESEARCH METHODOLOGY AND RESEARCH DESIGN

This study was of organizations that were determined a priori to have a need for sharing information. The keywords used in gathering the list of organizations were such that the organizations in the study were those that had suppliers and would place a greater level of demand on those suppliers than what would be considered normal. The organizations studied were chosen because of the production of products that had a great variety of demand and product parameters, those factors that had already been determined to affect supply chain performance and costs. Though previous empirical studies have found that trust exists in implementing an information sharing system, this study infers through its failure to discover a correlation that at some point following the implementation, the importance of trust diminishes. The firms involved in the study still benefited from sharing information but that they did not place any reliance on trust. The action of information sharing correlated to producing competitive rewards with few concerns of vulnerability as earlier studies had found.

The systems involved in this study, though physically more vulnerable because of increased levels of access, were typically not very complex though and thus correctable should any such problem occur. Organizations that share information with their supply chain partners have the ability to create highly efficient supply chains. This efficiency translates into increased customer satisfaction through improved quality and responsiveness, and increased revenue due to lowered costs. Sharing information with supply chain partners will initially need trust to counter the lack of an established system to manage the information transfer and usage but then evolve into contracts and formal agreements that regulate the application and ownership of the information.

A total of 680 questionnaires were directed to organizations drawn at random from a meta-search of organizations that met a predefined list of criteria. The questionnaire was composed of 121 questions all based on either yes/no answers or a Likert scale. In total, two questionnaires were mailed along with two follow-up requests to each firm selected for the survey. From the returned questionnaires, 110 were found to be usable, which represented a response rate of 16.1%. Surveys were returned from employees of organizations in various geographic locations and within various positions in their respective supply chains. The firms were both service and physical goods manufacturing firms of various sizes.

Multiple principal component based factor analyses with post hoc validation modeling were conducted to assess the validity of the survey measures and to determine the underlying factors and components influencing the success of an information sharing system; "success" being defined in this instance as a system that is used and provides some economic benefit. The factor analysis was applied to the survey responses and questions that had linear statistical similarities were clustered together. These clusters were clarified using Lisrel, a Structural Equation Modeling program, to strengthen the internal cohesiveness of the individual factors. The elements comprising the factors have individual internal correlations to the factors of at least 50 percent. These conglomerate factors were all statistically related to the factor defining success. The factors all have chi-square values exceeding 2.5. An ARTMAP neural network was used to correlate the factors to Successful Information Sharing, basing success on the financial viability of the firm and its respective industry, after sufficient time had passed to generate an effect. The ARTMAP correctly classified the firms, based upon these factors, 90 percent of the time. The scale for success was 6 categories ranging from high profitability in a growth industry to severe financial duress or bankruptcy.

## 5. RESULTS

The components – factors - identified by the factor analyses are: (1) Centralized Information Sharing Control, (2) Maintain and Update Information Sharing Rules, (3) Significant Exchange of Information, (4) Defined Use of Information, (5) Collaboration with Suppliers, (6) Cooperative Competition, (7) End-to-End Connectivity, (8) Formed Supply Alliances (9) Replace Traditional Communication with IT, and (10) Share Frequently with Suppliers. These are illustrated in Figure 1 and each of these components is discussed in the following.

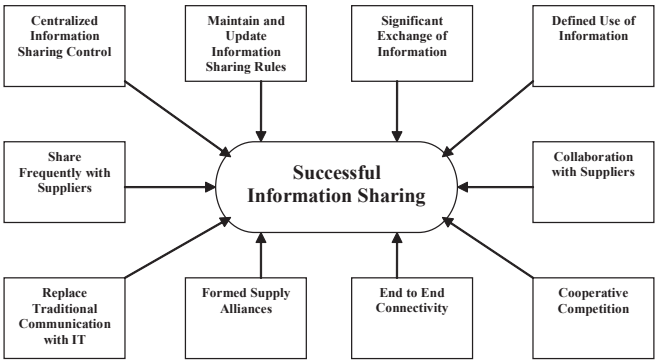
### Centralized Information Sharing Control

Information is often critical and possibly of a sensitive nature to a firm. Not all information is shared and often decisions are necessary that limit or restrict the disclosure of information. These decisions, to both maintain accountability and consistency are best accomplished in a centralized "information clearing house". Though many studies have decreed that information is best used when disseminated throughout the organization, the control of such information is best suited to a centralized location.

### Maintain and Update Information Sharing Rules

The sharing of information is not a fixed and static structure that needs no maintenance. As the type and level of information changes so must the rules regulating how, what, when, etc. must change to suit the conditions of information exchange. This provides the organizations within the system a level of security and confidence that the information that they provide and receive is within a set of defined uses while outside of their control. These rules also provide a basis for legal remedies should any organization with the chain act improperly with the information that the access or disseminate. It is interesting to note that "trust"

*Figure 1.*




is not existent within the model. Trust is an important aspect in developing a relationship for information sharing since the structures are either not or just minimally defined and abuses can occur. The more mature system uses rules and contracts to define contingencies.

***Significant Exchange of Information***

The cost to maintain information sharing systems must be offset by a benefit in excess of such cost in order to justify the continuation of the system. A high level and significant quantity of relevant shared information communications can represent both increased profitability and reduced costs to organizations. Organizations maintain an information-sharing environment with their supply chain partners to their mutual benefit. Information sharing is an economically viable alternative to forecasting and other estimates of an organizations supply chain partner's actions.

**Defined Use of Information**

Information within the organization receiving it must have a purpose and that purpose should be known to the organization that supplies the information. There are two primary reasons for this (1) the organization that provided the information will have a greater sense of security in knowing that the intent of requesting the information is for some purpose that is beneficial to the receiving organization. This will minimize the probability of misuse. (2) In understanding the potential use of the requested information the firm that provides the information may be able to improve on the type, level or transmittal of the requested information in such a way that improves the efficiency of the action. Organizations in a supply chain are concerned not only about the information gathered and/or mined by their supply chain partners but also as to the intent behind the use of the collected data (D'Amico, 2000).

**Collaboration with Suppliers**

An organization that works cooperatively with their suppliers can benefit in reduced inspection costs, increased responsiveness, product development input and improved profitability. Collaborating with ones suppliers would imply that information is being exchanged. The action creates the structures and system that provides the basis of information sharing. Collaboration, when the tenets of the action are mutually defined, can greatly benefit all the firms involved.

**Cooperative Competition**

Organizations have learned over the past years that to compete in a "cut throat" manner is often detrimental to each organization in the long run. The new levels of competition enabled by reduced trade barriers and increased levels of foreign competition have forced organizations to reevaluate their relationships with their competitors. Organizations now often act in such a way as to be competitive but to respect each other's markets and not to intrude. New markets or those not previously serviced by a direct competitor are open for exploitation but the traditional environs of a competitor are perceived as "off limits". There are numerous examples of two primary competitors in all out trade wars with the result of each losing a significant portion of their traditional markets to a third previously unconsidered competitor.

**End-to-End Connectivity**

End-to-End Connectivity is the establishment of communications resources to span the breadth of the supply and distribution channels. The information that is gathered form customers is thus available to suppliers thus reducing the whiplash effect that so often is disruptive to estimating trends in inventory levels. This component stresses the need for physical linkages from one end to the other of all the supply and distribution channels to gather and disseminate the maximum amount of information available and allow for its direction to the appropriate individual or organization. The information flow then assumes a matrix structure not unlike the early structure of the Internet since it is comprised of a simple series nodes and pathways through which information is channeled and reviewed.

**Formed Supply Alliances**

An established, lengthy, and cooperative relationship between a supplier and the supplied organization creates faith and defined cooperation between the elements of a supply chain. Trust is not significant here in that such is not legally defensible nor is it readily defined in what is permitted or restricted. An alliance that defines specifically each others actions and responsibilities creates the need and the basis for greater levels of information sharing. Supply chain alliances affect the costs, the responsiveness and the viability of the organizations involved.

**Replace Traditional Communication with IT**

The traditional means of communication in organizations, telephone, facsimile machine, mail all have difficulties in the transmission and distribution of information or data. Using the communications tools of EDI, the Internet, or more advanced Enterprise Systems, a firm can redistribute, store, sort and distribute to multiple sources the information or data that is gathered. The structure of the connections of these tools does not eliminate the more traditional means of communication but instead augments the tools to make the organization's information sharing more efficient and effective.

**Share Frequently with Suppliers**

When information is sporadically shared, the structures and efficiencies achieved languish and deteriorate. Information flow that is relatively constant allows an organization to have confidence in its value since it is validated by the information of a similar nature that follows. Frequency provides a usage and justification to the monetary outlays for the associated physical and organizational structures that are used to share information.

## 6. CONCLUSIONS

Integrating and sharing information in interorganizational settings involves a set of complex interactions. The organizations involved must establish and maintain collaborative relationships in which information and data of a sensitive and critical nature is transferred outside of the direct control of the organization. The sharing processes often involve significant organizational adaptation and maintenance. The purpose of this research is to develop a model of information sharing structures in these settings. Many organizations are looking for ways to optimize their supply chains as a means to create a competitive advantage. Consequently, these same organizations are modifying their business processes to accommodate the demands that sharing information places on an organization. To that end, this study addresses the issue of developing a comprehensive model regarding the supply chain system and the solutions needed to optimize it. The exploratory model does suggest that supply chain managers should consider the components of the model in order to achieve supply chain success. Though there were a great number of responses on the returned surveys that indicated that the respondent firms lacked "trust" in both their suppliers and customers, these same firms conducted business with these same firms and individuals with little to no intent of implementing any change. "Trust" is seemingly to abstract a factor to precisely define. Our contention is that "trust' does exist but is not specifically and uniquely defined. The actions of the firms would indicate that given a structure of defined uses and responsibilities of information that sufficient "trust", whether specifically defined as such, does exist.

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