

Information Quality as a Strategic Asset in Inter-firm Relationships

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Abstract

This paper addresses the influence of IT and the exchange of information in inter-firm relationships. It is argued that in inter-firm relationships, the access to high quality information about other firms can serve as a powerful source for monitoring and influencing that other firm's behavior. High quality information thus used as a strategic asset can be viewed as one of the ways in which IT capabilities can be exploited, and business performance increased. This paper presents a model of both the use of IT and information as an asset in inter-firm relationships in a marketing channel. The study provides empirical evidence for the effects of the use of information quality and information exchange frequency in the channel by suppliers on the perception and performance of distributors.

1. Introduction

"For a marketing channel to achieve its performance potential, it must provide the mechanisms whereby information can flow smoothly, rapid and accurately among its members"

(Stern and Kaufman 1987).

This paper explores the influence of knowledge and information as an asset in marketing channels. The impact of IT on competitive relationships in business networks has had a considerable amount of attention in IS literature (Hopper 1990, Cash and Konsynski 1985, Clemons 1989, Johnston and Lawrence 1988, Johnston and Vitale 1988, Konsynski and McFarlan 1990, McFarlan 1984). However the role of information exchange or information as an asset in inter-firm relationships has not explicitly been the subject of much empirical research,

neither in the IS literature nor the marketing literature (Glazer 1991, 1993). One of the most dramatic developments in recent times has been technology's role in significantly expanding the capacity of the marketing channel to store, process and transmit information (Glazer 1991). It is argued that in inter-firm relationships, the access to information about other firms can serve as a powerful source for monitoring and influencing that other firm's behavior, and that this can be viewed as one of the ways in which IT capabilities can be exploited (Venkatraman and Christiaanse 1996, Christiaanse 1994). The paper tests a model that is based on the notion of influence through the use of IT and the exchange of information in inter-firm relationships while using channel performance and satisfaction as dependent variables.

The main objectives of this paper can be described as:

- (a) To develop a general conceptual model of the influence of information as an asset in *inter-firm* relationships, especially at the level of dyadic buyer-supplier relationships.
- (b) To test this model empirically (with two dependent variables: satisfaction and electronic integration).

First, this study will be positioned among other research addressing the impact of IT on business performance. This will be related to the role of information as an asset, and the mechanisms by which this can take place, followed by a discussion of the specific theoretical background for the model to be tested. Next the model and hypotheses are presented, and the results of the analysis of the hypothesized relationships among constructs will be discussed. Finally, the implications and the limitations of the study will be addressed, together with suggestions for future research.

2. Theoretical Background of IT Mediated Vertical Relationships

This theoretical section will first position this study among other IS research approaches addressing the impact of IT on business performance. Then we will address the influence of information as a strategic asset and its impact on firm performance, particular in inter-firm settings in marketing channels. The section will conclude with a conceptual model.

2.2 IT and Business Performance Effects

Research in the Information Systems (IS) field on the impact of dedicated systems on IT mediated vertical relationships has evolved over time. Basically three different modes of IT-impact research can be distinguished: By the mid 1980s, a number of influential articles appeared on IT frameworks and strategic advantages.¹ Extensive case-based (Cash and Konsynski 1985, Clemons and Row 1989, Johnston and Lawrence 1988, Johnston and Vitale 1988, Konsynski, 1990, McFarlan 1984) had stressed the potential that IT had to restructure vertical relationships and provide important competitive advantages. The empirical support during this era of research focused largely on

the effects of IT (treated predominantly as a black box with the exception of the open-versus-closed nature of the system). The focus here was on IT applications and their effects on differential sources of competitive advantage in the market place (Venkatraman and Kambil 1991, Cash and Konsynski 1985, Copeland and McKenney 1988). The work by Venkatraman and Zaheer (Venkatraman and Zaheer 1990) was one of the first to empirically demonstrate the impact of IT in vertically related settings. Most research in this tradition is however not very explicit about *the attributes* of IT and the specific determinants which define IT's exploitability (Henderson and Venkatraman 1992). The information quality perceived either by users or targets like distribution channel members was not addressed by this stream of research.

The *determinants* of the effects of IT were addressed by subsequent research. Given limited discriminatory and explanatory power of the existence of dedicated systems on competitive success, subsequent research focused on the underlying characteristics of the interorganizational systems. The attention shifted towards 'opening up the black box' to delineate specific relationships between system characteristics and governance structure. This, more process oriented, research addressed the attributes of the use of IT that had an impact on inter-firm relationships. Zaheer and Venkatraman (1994) for example developed a model that attempted to derive a set of determinants based on a transaction cost perspective based on earlier work (Bakos and Treacy 1986, Malone, Yates, and Benjamin 1987, Clemons and Row 1989 and Gurbaxani and Whang 1991) had argued to be relevant for settings impacted by IT applications and found strong support for the effect of IT-induced *business process specificity* on the degree of IT-induced quasi-integration.

Recently the focus of attention in the IS and marketing field is shifting to what can be characterized by the influence of "*knowledge as an asset*" instead of the technology itself in channel settings (Hopper 1990, Glazer 1991, Stern and Kaufman 1987, Blattberg, Glazer, and Little 1994, Moorman 1995). We believe that the real power of IT in vertical channels lies in this concept of *knowledge as an asset*. Glazer described this evolution in strategic use of IT within distribution channels as follows: "*The organization first put in place an IT infrastructure and then went beyond the technology to review the management of information itself as an asset to gain competitive advantage*" (1991: p. 2). This line of thinking is also consistent with recent writings on the role of knowledge and expertise as a key resource that differentiates successful organizations from unsuccessful ones (Nonaka and Takeuchi, 1995). We contend that IT-induced asset specificity *per se* may not be a sustainable determinant of vertical quasi-integration and that the system deployers need to focus on the unique set of knowledge and insights to structure and leverage the interorganizational relationships. More recently, Moorman has addressed the role of acquisition, dissemination and utilization of information as 'knowledge assets' that can be leveraged to achieve competitive advantage (1995: 319). Her notions of information utilization and instrumental information utilization are conceptually close to our concept of expertise exploitation although our focus here is on inter-firm channels as opposed to intra-firm knowledge leverage for effective marketing decision-making.

The main argument is that the exchange of valuable information, market knowledge among vertically related entities in a value chain or marketing channel can be a source of important strategic advantage (Blattberg, Glazer, and Little 1994). As goods and services move along the value chain (Porter 1985), a major component of exchange is increasingly the exchange of *high quality information*. Increases in the speed and amount of processing are functions of technology, but the emergence of new ways of 'packaging' or organizing information suggest the importance of the information itself, above and beyond the technology, as a key variable for analysis (Glazer 1991 p. 2). The literature discusses a shift in the strategic use of IT within distribution channels (Glazer 1991, Hopper 1990, Blattberg, Glazer, and Little 1994). It is argued that the capability to use *information*, instead of the use of IT by itself, is the source of competitive advantage in inter-firm competition.

As a result of the availability of detailed, reliable and accurate information, the marketing field is changing rapidly. The influence and the value of information are only *conceptually* addressed by the marketing channel literature (Moorman 1995, Webster 1992, Glazer 1991), while not many empirical studies have addressed the impact of high quality information exchange in inter-firm settings, in particular in marketing channels. It is in this recent stream of research where our contribution lies: none of the studies described above have tested the effects of the impact of the use of information as a strategic asset in inter-firm relationships empirically. This study is one of the first that actually tests the effects of the use of high quality information used as an asset across organizational boundaries, in vertical relationships. Since information exchange takes place at the boundaries of the organization, and the particular system we are examining here was designed to support *boundary spanners*, we will first briefly discuss the relevant literature in the context of our research model below.

3. A brief Introduction to the Setting of this Study

3.2 The Setting

The setting of this study is the US airline industry. This industry is one of the most cited examples of the competitive use of IT (Copeland and McKenney 1988, Hopper 1990, McFarlan 1984, Malone, Yates, and Benjamin 1987). The computerized reservation systems indeed contributed to a lot of incremental revenues for the airlines that developed these systems. However, as discussed in the previous section of this paper, the *systems*, instead of the use of *information*, were always the focus of attention for researchers interested in IT- related performance effects. Most research on airline reservation systems discusses the direct relationship between the system and its benefits in terms of electronic integration and/or incremental revenues (Copeland 1990, McFarlan 1984, Malone, 1987) while the exact attributes or determinants of the effects of these systems remain unclear.

3.3 The System

The SMARTS® system (Sales Marketing and Report Tracking System) is a decision support system (DSS) that American Airlines developed for their sales representatives. After the use of Sabre, American Airlines provided its sales-reps with information about the travel agents in their specific territory. The information the system uses comes from consolidated data from the other reservation systems which, according to the Department of Transportation (DOT 1990), have to be made available to all US carriers.

Since almost all² US travel agencies do their bookings on one of the four reservation systems, consolidating this information means that, the exact reservation behavior of each of the about 33,000 US travel agencies is available. The SMARTS system accesses multiple data sources to allow consolidated data to be manipulated by several reporting systems, including standard predefined reports, ad hoc reports and on-line data query. The system is designed to be easy to use in order to motivate the sales-reps to use the system frequently. After creating customized reports for the account the rep will be visiting, the rep brings the laptop to the travel agent and shows the reports and comparisons between the last month's bookings and those of the same month in the previous year. In general, the system was received well by most of the reps as illustrated by the following citation:

"The system really shows how state of the art we are at American, and how important we reps are at American. They would have never invested all these millions if they did not believe we reps are very important"

3.4 The users

The user of the system is the AA sales rep. The main task of any airline sales-representative ("rep") is to visit travel agencies in her territory and built up a relationship with them that encourages the travel agent to sell that particular airline to its clients. Almost all travel agents are visited by sales-reps of various airlines to inform them of promotions and other incentives. During these sales-visits, the travel agency manager receives gadgets and information about new destinations, special deals and other offers. Sales-reps can develop special incentive programs to stimulate agencies to sell more of a particular carrier. These incentives take the form of extra commissions on top of the regular percentages (called overrides) or free ticket programs. It is obvious that the more these (expensive) incentives can be targeted, the more the airline can allocate its resources efficiently. Giving the reps access to high quality information on the performance of distribution channels in their territory was expected to have an impact on their performance.

4 The Model

4.2 “The Informed Boundary Spanner”

It is known from the emphasis on organizational boundaries that boundary spanners are essential to the efficient and effective operation of organizations (Thomson 1967, Aldrich and Herker 1977, Bradach and Eccles 1989). Much of the administration in complex organizations is the management of *exchange* across organizational boundaries (Friedman and Podolny 1991). The *exchange of high quality information* across organizational boundaries however has not been subject of much empirical research. Only recently, a tendency towards the delegation of decision-making to the boundaries of the organization has been related to the *availability* of information (Aoki 1990, Brynjolfsson 1991). To influence and change behavior on the other side of the supplier-distributor dyad requires appropriate means of influence and communication. Research into such strategies stressed that the availability, quality and accurateness of the information exchanged in such channel relationships is of the highest importance in influencing other firms' behavior (Frazier and Summers 1984, 1986, Frazier and Rody 1991) and integrating them into a suppliers' network.

It is hypothesized that, through the use of IT, the exchange of information can take place on a much more timely and efficient basis and will increase the power of the supplier involved by evoking a change in behavior on the side of the target of the influence attempt. The positive effects of frequent communications of a non-coercive nature on the strength of inter-firm relationships have been shown to be significant in earlier studies (Anderson and Narus 1990, Van der Ven and Walker 1984). According to Kanter (1987, 1989a, b) and Zuboff (1988), more information available to employees leads to their "empowerment" in the sense that they have more flexibility to carry out their actions. These changes in the organization of work have been labeled the "new managerial work" (Kanter 1987), or 'informed workforce' Zuboff (1988) while Drucker (1988) described these changes based on the availability of information as the "information-based organization" or "knowledge specialists". Common to all of the above approaches is the link between the availability of high quality information and the effects of the information on decision making. Our model extends this to inter-firm relationships, by addressing the use of such quality information to opportunities to influence distribution channel behavior.

The availability of information is important in the allocation of influence strategies (Frazier and Summers 1984, 1986). In the IS field IT and information in the hands of boundary spanners has been shown to be of importance in case studies such as Frito-Lay (Applegate 1989) and Otisline (Stoddard and McFarlan 1986) but

have not been the subject of much quantitative work. An article in Business Week on IT and business productivity³ notes the same trend and concludes:

"User-friendly software, PC networks, handheld wireless terminals and other gadgets are used to move information to the front lines- to give the folks on the factory floor or customer service department the knowledge they need to act quickly" (p. 3).

4.3 Propositions and Hypothesis

We are examining the use of IT and the use of high quality information as a strategic asset as a stimulus to make relatively more use of non-coercive strategies and as an influence on the satisfaction and performance of channel members. Our main propositions are as follows:

- **Proposition 1: The use of high quality information is positively related to electronic integration effects.**
- **Proposition 2: The use high quality information will have a +/- effect or satisfaction of the distribution channel member.**

4.4 The Theoretical Rationales for the Model

Based upon the above-discussed theoretical concepts, it is possible to construct a general model of the influence of information as a strategic asset in inter-firm settings.

Below, the model will be explained, the rationale for each link will be described and previous literature, which examined similar relationships, will be discussed briefly. In addition in particular there where the links in the model have, to our knowledge, not been addressed in previous work, we will elaborate on the observations inductively derived from our fieldwork which was done both on the supplier side (with the users of the system) and on the distributor side of the dyad⁴.

Together with the model description, relevant hypotheses will be discussed.

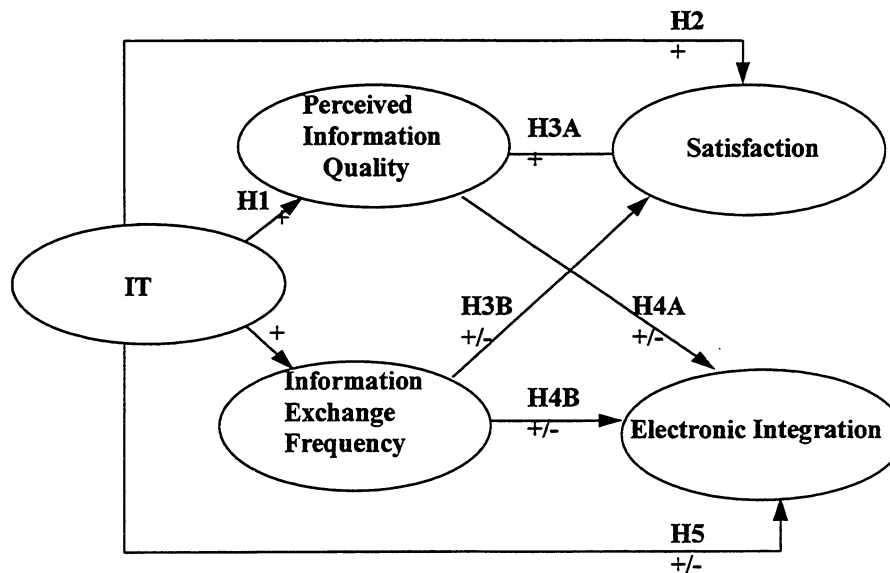


Figure 1: The Research Model

Very important to note is that the link between satisfaction and electronic integration is not depicted in our model. This is related to the fact that this paper addresses the influence of IT and the impact of information quality as perceived by the user of the system on inter-firm relationships. While this paper uses two dependent variables, namely distributor satisfaction and electronic integration, it goes beyond the scope of this paper to discuss and test the inter-relationship between these two constructs. The model presented should be regarded as two different models, each testing the effects of the use of IT and information quality on the dependent variables, satisfaction and electronic integration. Working from the left to the right in the model, we will now turn to a discussion of the relationships in our model.

IT—Information Quality:

As already mentioned in the introduction, IT can be seen as a mechanism and enabler, and can give rise to a higher quality of information exchanged in a channel situation (Glazer 1991). During fieldwork sales-reps indicated that the use of the SMARTS system provided them with information of much higher quality than they had had available before. Because we, however, are interested in the dyadic effects i.e. the effects of the use of the DSS on the *other* side of the supplier - distributor dyad we measure distributor (travel agency) perception of the quality of the information exchanged as a result of the use of the SMARTS System. We expect a positive relationship between the use of the SMARTS System by the sales representatives and distributors perception of the quality of information exchanged. We thus propose the following hypothesis:

H1: The perception of information quality by the agent will be higher with agencies that have been confronted with the SMARTS system than the agencies that have not been confronted with the system.

IT—Non-coercive Influence Strategy:

The SMARTS system, is designed to influence distribution channels by providing sales-reps with specific high quality information on distribution channel business operations and then to stimulate these travel agencies through targeted incentives to recommend that particular airline to their customers. Fieldwork indicated that the reps believe that the SMARTS system provides them with a lot of high quality, very useful information. Traditionally, these sales-reps did not have much information about electronic integration and other performance data of the travel agencies in his or her territory and the job consisted mainly of preserving a good relationship with the travel agent. With the SMARTS system however, this role has changed significantly for the airline's sales-rep. A user on the East Coast put it this way:

The System is great; all the information we need at our fingertips. Now we can really push the agents to sell more on our airline."

Fieldwork indicated that reps in general were satisfied with the information provided by the SMARTS system and that the information was perceived as very useful for identifying sales opportunities and using non-coercive means of influence, as was indicated by another rep:

"I would not be able to do without the information in the laptop anymore: it gives us the opportunity to analyze account specific data and tie this to incentives for the agents which was impossible before because we did not have the data available"

Most users indicated that, through the use of the DSS and the higher quality of the information available, a very different interaction with distributors could be achieved during sales-calls. Since, by using the system, distributor-specific information was available to the sales-reps which in most cases was unknown to the distributors themselves, sales-reps could take advantage of these information asymmetries and set up different incentive structures and influence strategies than had been used previously.

It is hypothesized that the use of non-coercive influence strategies by the supplier reduces conflicts and increases the satisfaction within distribution channels, which leads to the following set of hypotheses:

H₂: There will be a positive effect of the use of IT by the boundary spanner on the satisfaction of the distributor with the supplier.

H_{3a}: The quality of information provided by the supplier to the distribution channel member has a positive effect on the satisfaction of the distributor with the supplier.

H_{3b}: The information exchange frequency has a positive or negative effect on the satisfaction of the distributor with the supplier.

Information Quality—Electronic Integration:

'Knowledge is power' is a well-established social principle, and a major determinant of marketing power has always been the quality of information possessed by agents (Glazer 1991). As discussed in section 4.1, following Gaski and considering information a possible source of power, an increase of the quality of information possessed by the supplier could lead to electronic integration effects. We thus propose the following hypothesis:

H4a: The quality of information provided by the supplier to the distribution channel member is positively or negatively related to the level of electronic integration of this distribution channel.

H4b: The information exchange frequency provided by the supplier to the distribution channel member is positively or negatively related to the level of electronic integration of this distribution channel.

IT—Electronic Integration :

Strategic advantage through IT is a popular and important theme, but "the extent of research support is minimal, anecdotal, and sporadic" (Venkatraman and Zaheer 1990). The main way this relationship has been explored in the IS literature is by relating some type of performance measure such as electronic integration as a dependent variable to its direct relationship with IT. We discussed in section 2 of this paper that instead of this black box approach we believe more process-oriented models are needed. This direct relationship between IT and its benefits for the performance of the firm using it has been assumed to be a positive one; however, many empirical studies have failed to show the positive relationship between IT and productivity or some other measure of firm performance (Loveman 1988, Roach and Morgan 1987, Brynjolfsson 1990). Case studies have repeatedly reported a positive relationship between IT and competitive advantages and power but when this relationship is tested in studies of a more cross-sectional and quantitative nature, the results turned out to be disappointing and could not confirm this relationship.

The use of market share as a proxy for electronic integration is very common in the marketing channel literature (Gaski 1984) and IS literature (Zaheer and Venkatraman 1994; Venkatraman and Zaheer 1990). It is argued that the effects of IT on performance can only be assessed by examining the changes in behavior in the *process of interaction* between the parties involved. This direct link is included in the model to test the direct impact of the use of the system itself and electronic integration effects, because fieldwork indicated that the use of the DSS had a positive effect on suppliers' electronic integration but that there was a lot of variation in the way the reps were using the information provided by the system.

H5: If IT is used by the suppliers' sales-rep (in the exchange relationship), the greater the level of electronic integration of the distributor

Summarizing the
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TABLE 1: DESIGN STAGES AND CONSTRUCTS		
Stages		Main Constructs and Variables
1	Fieldwork with suppliers (distributors)	User perception and implementation of the DSS. Perception of the changes in boundary spanning roles as a result of the use of the system and quality of the information available.
2	Fieldwork with distributors (travel agents)	Distributors' perception of the system and their relationship with suppliers. Role of IT in this business network in general. Perception of American Airlines' sales-reps after the use of the DSS (SMARTS)
3 ⁵	Supplier/User survey with sales-representatives	User perception, perceived effectiveness, perceived ease of use, perceived usefulness, information quality**, rep performance****, perceived performance improvement, reported use of the system, satisfaction.
4	Travel Agency Survey	Information quality*, influence strategies*, use of incentives*, motivation to comply***, trust, dependence, conflict, satisfaction.

- * Measured on both sides of the dyad
- ** Measured on the user (American Airlines) side of dyad
- *** Measured on agency side of dyad
- **** Gathered from American Airlines' Databases

5.2 Sample Base for Model Testing

We obtained a random sample of 2000 travel agencies from American Airlines' database. We then divided the sample to ensure that 50% of the agencies was confronted with the sales representatives that had access to the SMARTS system and the other 50% had not been confronted with the SMARTS system. Since not all the sales representatives had access to this capability at the time of our study, this step ensured that our sample included adequate number of agencies dealing with the sales representatives who use the SMARTS system. We then tested the random sample for its representiveness to the population along two important criteria: geographic and size attributes at a final sample of 1768 travel agencies. We mailed a structured questionnaire to these 1768 agencies and received, completed usable data from 455 travel agencies, representing an effective response rate of 28.6%. This response rate is consistent with those obtained in similar studies involving channels of distribution

5.3 Dependent and Independent Variables

Table 2 below provides an overview of the dependent and independent variables used in this particular model.

Table 2: Measurement Properties of the Constructs and their Indicators		
VARIABLE NAME AND TYPE	OPERATIONALIZATION	CRONBACH ALPHA
DEPENDENT VARIABLES:		
ELECTRONIC INTEGRATION	The percentage of total market share directed to the supplier by the distributor. This construct is consistent with the previous operationalizations by Venkatraman and Zaheer (1990) and Zaheer and Venkatraman (1994).	N/A.
SATISFACTION	Extent of travel agency's agreement/disagreement with following statements (measured on a 7-point scale): <ul style="list-style-type: none"> · Overall our agency and this carrier are in harmony. · I often think of the relationship with this carrier as a kind of partnership. · Our overall working relationship with this carrier has been satisfying. · Extent of seriousness before stopping to recommend this carrier's products to the travel agency's clients. 	.78
INDEPENDENT VARIABLES:		
IT	A DSS application (the SMARTS system) used by the supplier (American Airlines) and designed to exert influence over the distribution channel (coded zero or one).	N/A.
INFORMATION QUALITY	Travel agency's perception of this carrier's sales rep (compared to other airlines' sales-reps) on the following items (measured on a 7-point-scale): <ul style="list-style-type: none"> · The extent to which this rep provides you with <i>reliable</i> information. · The extent to which this rep provides you with <i>accurate</i> information. · The extent to which this rep provides you with <i>detailed</i> information. · The extent to which this rep provides you with <i>complete</i> information. Consistent with previous operationalizations by Baroudi and Orlikowski (Baroudi and Orlikowski 1988).	.96
INFORMATION EXCHANGE FREQUENCY	Based on work by Frazier and Summers (1984)	
CONTROL VARIABLES:		
SIZE	The total dollar value of sales of a distribution channel member in a particular year.	N/A.

Results

This section discusses the results of this study. First, some descriptive statistics will be provided in section 6.1, then the results of the regression analysis with satisfaction and electronic integration as dependent variables will be discussed in section 6.2, followed by the path analysis.

6.1 Descriptive Statistics

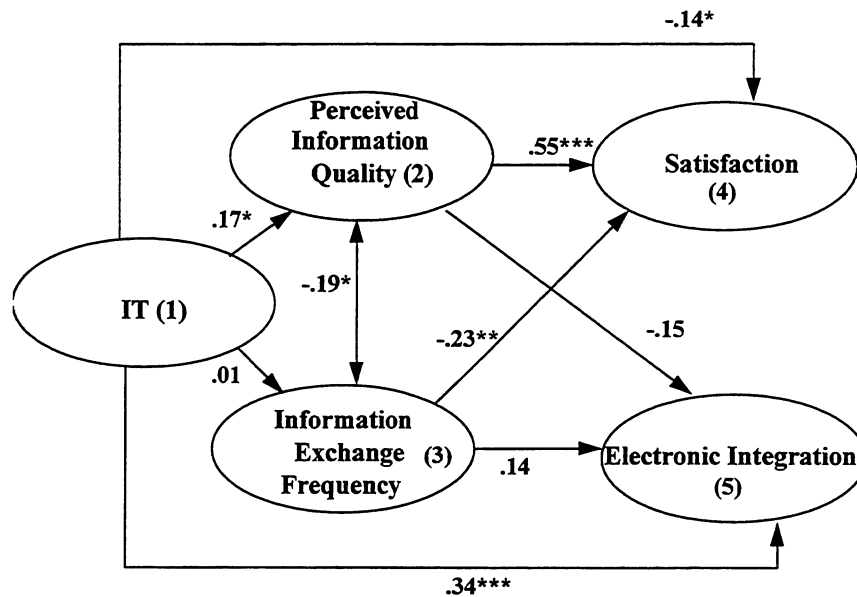
Table 3 below provides the means, standard deviations and Pearson correlation coefficients of the variables used in the regression models. It is surprising that airline satisfaction of the distributor is *negatively* related with electronic integration in our sample. However as was noted before, the relationship between our two dependent variables is not the main subject of this paper, and the link between our two dependent variables satisfaction and electronic integration will not be further discussed here.

Table 3: Means, Standard Deviations and Pearson Correlation Coefficients								
	N	Mean	St. Dev.	El integr.	Satisf	IT	Infoqu	Size92
ELECTR. INTEGR.	117	27.49	13.95	1.00				
SATISF.	117	5.21	1.24	-0.13	1.00			
IT	117	0.71	.46	30***	-0.07	1.00		
INFOQU	111	5.14	1.38	-0.11	0.57*	0.17*	1.00	
SIZE92	117	12526	23289	0.00	.14	0.05	0.07	1.00

* p< .1 ,** p< .05, *** p< .01

6.2 Analysis

T-tests were done to test the differences between the experimental and control groups, the groups with and without the SMARTS system. The test showed a significant difference for information quality ($t=-1.37$; $p < 0.08$). This implies that agencies confronted with the system perceived the information provided by the supplier to be of higher quality than the information provided without the application and confirms the first hypothesis that the perception of information quality by the distributor will be higher with the distributors that have been confronted with the system than the distributors that have not been confronted with the system.



*** = $P < 0.01$

** = $p < 0.05$

* = $P < 0.10$

Figure 2: Results of Analysis

Figure 2 above depicts the results of the analysis. The asterisks refer to the significance levels of the path analysis.

6.3 Satisfaction as Dependent Variable

The model was tested first using satisfaction as a dependent variable. Table 4 below shows the results of the regression analysis⁶. The table shows that IT does not have a significant effect on airline satisfaction, at an acceptable level. In fact, the coefficient (P41) is negative

($b = -.14$; $p < .10$). Thus, hypothesis 2 has to be rejected. The use of IT does not have a significant positive effect on satisfaction with the supplier.

Information quality in contrast, does have a significant effect on satisfaction (P42; $b = .55$; $P < .001$). The use of information quality has a strong significant effect on the airline satisfaction of travel agents and thus supports hypothesis 3a. Information exchange frequency does have a significant effect on satisfaction (P43). The coefficient is negative and significant ($b = -.23$, $p < .05$). Thus hypothesis 3b can be accepted, there is a negative relationship between IEF and satisfaction.

Table 4: Path coefficients for the Model in Figure 2 with Satisfaction as a Dependent Variable		
Path	Path Coefficient (standardized)	T-Value⁷
P43	-.23**	-2.913
P42	.55	6.99***
P41	-.14	-1.84*
Adjusted $R^2 = .40$ (N=117)		

6.4 Electronic Integration as a Dependent Variable

Table 4 shows that the use of IT has a significant effect on electronic integration (P51; $b = .34$ $p < .001$). Thus hypothesis 5 was supported by the data. The use of SMARTS has a positive effect on electronic integration with an adjusted R^2 of .11. The variable information quality (P52) has a negative insignificant effect on electronic integration, which implies that hypothesis 4 has to be rejected (P52; $b = -.13$ $p < .10$). Information exchange frequency does not have a significant relationship with Electronic Integration. The coefficient (P53) is positive but not significant ($b = .14$, $p < .10$). This implies we have to reject hypothesis 4b.

Table 5: Path-coefficients for the Model in Figure 2 With Electronic Integration as a Dependent Variable		
Path	Path Coefficient (standardized)	T-Value⁸⁹
P53	.14	1.47
P42.	-.13	-1.35
P41.	.34	3.70***
Adjusted $R^2 = .10$ *** (N=117) ¹⁰		

6.6 Summary of Results:

Summarizing the most important findings, it can be concluded that:

- 1) The T-tests show a significant effect of the experienced information quality between the experimental and control group of travel agents.
- 2) There is a significant effect of the use of IT on pre-post test electronic integration but not on supplier satisfaction.
- 3) There is a strong significant effect of the perceived information quality on satisfaction but not on electronic integration.
- 4) The effects of IT directly on our dependent variable, electronic integration and satisfaction are stronger than the indirect effects. The effect of SMARTS through information quality on satisfaction was strong however, which suggests that information technologies like DSS's influence distributor satisfaction intensely through their effects on information quality.

7. Discussion

The exploitation of information based expertise in marketing channels is a topic that has hardly been addressed by empirical research (Venkatraman and Christiaanse 1996). We observed how a company like American Airlines continually improved its IT capabilities and develops new systems capitalizing on the use of information as a strategic asset (Hopper 1990, Christiaanse 1994, Venkatraman and Christiaanse 1996), by providing their employees with high quality information to be used across their organizational boundaries in marketing channels.

The main proposition of this paper, that information can be used as a strategic asset in inter-firm relationships, has partially been supported by the data in this study. The most important claim of the paper that the exchange of information effects inter-firm relationships and satisfaction has been confirmed: the data showed a significant effect of information quality on satisfaction with suppliers. In addition we showed a significant effect of information exchange frequency on satisfaction. Both measures of these information attributes turned out to be significant. The direct effect of IT on information quality was confirmed as well as the effect that information quality in turn had on supplier satisfaction. In addition, there was a strong and significant direct effect of IT on electronic integration while information quality did not turn out to have an effect in these regression models. However there were some very surprising findings in the shape of the different effects of information quality on satisfaction and electronic integration. Each of these will be discussed below.

The information provided by the system changes the job of the boundary spanner significantly: as indicated by field work and discussed before, it is the case that these boundary spanners by having high quality information available become "*analyzers*" and influencers instead of "*relationship builders*" after the system has been implemented. The information available to them enables them to interact in a significantly different manner with the distributors. Fieldwork indicated that the way the information can be used has not been thoroughly addressed in sales training according to the sales-reps themselves:

"We are not really trained to link the use of all this information to targeted incentives."

The training they received to become acquainted with the system was oriented towards *system use*, but at the moment the fieldwork and the survey were conducted, no specialized sales training based on the new and high quality information available had been provided while it was to be expected that this would have a significant impact on the role of sales-reps in marketing channels. This additional training was indicated to be a necessity by some of the reps during fieldwork. By focusing on the initial training of the users on system use instead of the use of the newly available high quality information probably explains the difficulty some of the reps had integrating the information effectively in their sales calls and lack of effect on electronic integration.

In addition it was noticed during fieldwork with travel agents that many travel agency owners perceived the fact that this airline apparently had so much high quality information about their operations to be a serious intimidation and a threat to their privacy. A travel agency owner expressed his concern during one of the interviews:

"It is a pretty scary thought that they seem to know this much about our business."

However, when the information exchanged is of such a confidential nature and not available to the distributor herself and seems to come from unknown sources, the information might be perceived as a threat and thus as being of a coercive nature.

The fact that information that is exchanged by boundary spanners in interorganizational relationships has a positive effect on satisfaction of members of the organization that the information is exchanged with is an important finding with implications both for marketing channel theorists as well as I/S researchers that want to gain insight into the determinants of the competitive effects of information technology in inter-firm relationships. The role that an informed boundary spanner is able to play when he or she is provided with high quality information can be crucial in inter-firm influence processes such as sales processes. In such cases competitive advantages are no longer based on the use of systems themselves but on the information that is available through these systems that can be used as an important asset. The information and knowledge as an asset argument has not been empirically tested

previously although theoretical contributions have been made (Glazier 1991). The next section provides some implications of our research and suggestions for further research.

8. Implications and Suggestions for Further Research

The effects of information exchange strategies on market power and inter-firm relationships is a very challenging research question. Few empirical studies have provided an accurate understanding of the processes and mechanisms affecting IT-induced performance improvements. The importance of information in the hands of boundary spanners provides firms with important opportunities to influence other firm's behavior by making relatively more use of non-coercive influence strategies.

To be able to influence other firms' behavior and thus to exert power by using high quality information is of importance to IT practitioners and researchers interested in the effects of IT. Research models are needed that explore the *process* of IT -induced influence in inter-firm settings, as discussed in section one of this paper. IT fundamentally changes aspects of inter-firm relationships that need to be understood to understand the way in which information based expertise is providing firms with the ability to influence other firm's behavior.

A related research question is which role the "informed boundary spanner" could play in inter-firm influence processes. Influencing other firms' behavior by informing boundary spanners could be an important strategic asset in inter-firm relationships. The reported finding that information quality has this positive effect on satisfaction is an important aspect of the relationship since all organizations have such boundary spanning functions that might benefit from the exploitation of such information based expertise by informed boundary spanners.

The traditional view of the business organization with clear boundaries, limited relationships with other organizations, and a focus on internal efficiency and effectiveness is no longer adequate. Interorganizational information systems are proliferating, as companies become aware of the potential of these systems to extend and transform organizational boundaries (Konsynski 1993). The way information can be used as a strategic asset to extend firm boundaries and influence distribution channel behavior needs more attention and new rigorous research models. We hope that this study has made a contribution to the field of IS and marketing and, even though the difficulties of conducting empirical research on channel relationships and the influence of IT and high quality information exchange are substantial, hopefully research activity in this area will increase in the near future.

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1 For an excellent overview of the different frameworks that appeared in this literature, we would refer to chapter 3 of
"Management Strategies for Information Technology" by Michael Earl (Earl, 1989).

2 The 1992 Louis Harris study of the travel industry showed that 98% of the travel agencies in the US is using one or more reservation
systems.

3 "The Technology Payoff", Business Week, June 14 1993 p. 3-14.

4 It should be noted that the fieldwork we did in the deductive phase of our research on the distributor side of the supplier- distributor
dyad was done with travel agents that were not included in the sample that filled out our questionnaires and that was used to test our
model.

5 Please note that this particular paper does not use data gathered in this third stage of the overall study.

6 Standardized betas are reported since these will be used in the path analysis as well to test for the relative strength of the direct
versus the indirect effects.

7 Significance levels are one-tailed for hypothesized paths. Indirect effects: $(P42 * P21) + (P43 * P31) = (.61 * .18) + (-.16 * .10) = (.11$
 $+ (-.016)) = .094$. Ratio: $.094 / -.13 = |-.72|$

8 Significance levels are one-tailed for hypothesized paths. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

9 Indirect effects: $(P52 * P21) + (P53 * P31) = (-.16 * .18) + (.03 * .10) = (-.0288 + .003) = |-.0258|$ Ratio: $.0258 / .34 = .0764$