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E-commerce and firm bargaining power shift in grocery marketing channels: A case of wholesalers' structured document exchanges

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Electronic commerce is transforming interorganizational relationships in marketing channels. Reports frequently note that 'power' goes to those who gain relevant trading information in marketing channels. The paper then asks whether and how structured or 'automated' trading information exchanges (e.g. electronic data interchange (EDI) links) between suppliers and wholesalers impact on their bargaining power in grocery marketing channels. This paper starts with the view that automated information exchanges favour the suppliers because they obtain trading information and gain marketing flexibility more than the wholesalers do. Focusing on the perspective of grocery wholesalers, the paper examines the relationships between (1) EDI use, (2) suppliers' incentives for EDI, (3) wholesalers' perceived bargaining power and (4) trust and cooperation between wholesalers and suppliers. Based on exploratory survey data from 33 grocery wholesalers, the paper finds that automated information exchanges may lower wholesalers' perceived bargaining power. It also shows that an appropriate level of incentives from suppliers tends to compensate for the power loss. This results in higher trust and cooperation in their trading relationships.

Introduction

Business-to-business (B2B) electronic commerce (e-commerce) in the USA will reach $1.3 trillion in 2003 according to Forrester Research (Knorr, 1999). In grocery marketing channels the potential of B2B e-commerce is manifesting itself in many ways such as on-line grocery stores, extranets, disintermediation or direct sales bypassing traditional intermediaries (i.e. wholesalers or even retailers) and document exchanges via the Internet including electronic data interchange (EDI). Inevitably, they change the relationships between grocery suppliers, wholesalers and retailers – favourably for some and unfavourably for others.

At the dawn of the e-commerce era, it was predicted that information would 'replace dollars as the currency of the deal, and creativity, knowledge and improved business systems and processes will be the fulcrum determining how power is assessed and balanced' (*Progressive Grocer*, 1995). If so, then how does the exchange of trading information on a regular basis influence the balance of firm bargaining power between upstream and downstream firms in grocery marketing channels? Interestingly, there are conflicting reports from both industry and academic studies on who gains power with information technology (IT) use in grocery marketing channels.

Indeed, empirical investigation of the 'power shift' in marketing channels is complex and challenging. To begin, there are different ways of defining and measuring 'power' (e.g. economic power as in revenues or profit margins or bargaining power as in how much control one has in trading). Even if one focuses on one type of power, there are usually several sources of such power. Lastly, a power shift may vary depending on the particular dyad types (e.g. supplier–wholesaler, supplier–retailer, supplier–consumer, and wholesaler–retailer) within a particular industry.

This study focuses on the impact of structured document exchanges (i.e. EDI) between grocery suppliers and wholesalers on their 'automated' (as opposed to *ad hoc* manual) trading processes from the wholesalers' standpoint for several reasons.[1,2] First, EDI provides a standardized unit of information exchange measurements, whether it is between enterprise resource planning (ERP) systems or via value-added networks (VANs), the Internet or even faxes. The use of other IT media such as groupware or extranets is still being 'explored' in marketing channels, although we need to examine their impact empirically as their use becomes more common. Second, EDI shares 'sensitive' information on a regular basis, which can directly impact on wholesalers' profit margins through the terms of trading. This does not seem applicable yet for the

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current web-based information systems (e.g. suppliers' on-line product catalogues). Third, empirical studies on wholesalers' IT use are still very rare to this day.

This paper starts with the view that standardized regular trading information exchanges via EDI between suppliers and wholesalers favour the suppliers. It argues that the suppliers obtain more trading information and gain more marketing flexibility than the wholesalers do. Based on the survey responses from grocery wholesalers, this paper finds that EDI use may lower wholesalers' perceived bargaining power, but that incentives – price incentives in particular – can compensate for this loss. Therefore, EDI use is associated with cooperative trading relationships.

In examining these power issues, there are two reasons why this research limited its inquiry to EDI use by independent grocery wholesalers with their largest supplier partners. First, these wholesalers and suppliers use relatively well-standardized EDI as opposed to proprietary EDI;[3] this makes a more stable measurement of EDI use possible. Second, these wholesalers do not depend upon a single supplier as other distributors do (e.g. motor vehicle distributors). This lower dependency level enables us to assess channel interfirm relations in a less biased context.

Theoretical background

Recent reports have noted that the Internet is empowering consumers with more convenience and information on products and services (e.g. Morrisette *et al.*, 1998; Curtis, 1999; Tattum, 1999). Similarly, recent marketing studies have noted that power is shifting from suppliers to retailers in marketing channels (Krishnan and Soni, 1997; Lohtia *et al.*, 1999). Then, the 'power' may be shifting downstream in marketing channels.

On the other hand, earlier marketing channel studies have suggested that firm performance data do not clearly show a power shift (Ailawadi *et al.*, 1995; Messinger and Narasimhan, 1995). However, these studies were performed in the early stage of the e-commerce era and we need to recognize that they focused on firms' economic performance such as profitability whereas Krishnan and Soni (1997) looked at French grocery retailers' bargaining power against suppliers' power based on these retailers' market concentration levels and Lohtia *et al.* (1999) analysed the control prospects of manufacturers and retailers in Japan.

Therefore, different definitions of power based on different sources of such power might have led to different conclusions about channel power shifts. For this reason, this study first reviews the definitions and/or sources of power in studies which have specifically looked at the impact of EDI-based systems on a firm's bargaining power. Then, the study considers their implications.

Definitions of power

What is power? Hunt and Nelvin (1974) defined power as 'the ability of one individual or group to control or influence the behavior of another' (p. 186). However, there is not just one kind of power. For instance, power can be classified by its sources. On the one hand, French and Raven (1959) categorized power by five sources of power: reward, coercion, legitimacy, referent and expertise. On the other hand, Thorelli (1986) proposed a different set of power sources: economic base, technology, expertise, trust and legitimacy. Therefore, what kind of power sources should we focus on with the use of EDI?

Among the existing studies, there are two main threads of research which look at the impact of EDI in channel power dynamics. The first research stream focuses on market structure as a primary source of bargaining power. The second research stream views firms' bargaining power as one part of firms' behaviours in the context of interorganizational relationships (IORs).

Thus, when examining the impact of EDI, we first need to know what these two research streams have found about EDI's impact on bargaining power.

Market structure view

The first research stream looks at the impact of EDI on market structure using a microeconomic framework. One of its focal points is rooted in the transaction cost economics or TCEs (e.g. Williamson, 1975). Using the TCEs, Malone *et al.* (1987) predicted that advanced IT favours an overall shift towards markets because IT reduces asset specificity, product description complexity and coordination costs. Emphasizing how IT lowers buyer search costs, this view also argues that the relative power between buyers and sellers shifts towards the buyers (Bakos, 1991).

However, there are factors which counteract the trend towards 'markets'. Bakos and Brynjolfsson (1993) argued that firms choose close relations with trading partners in order to enjoy technology innovations jointly and to maintain product quality as in the Japanese partnership (*keiretsu*) approach. Similarly, Clemons *et al.* (1993) noted that economies of scale, learning curve effects and other factors favour a move towards long-term relationships with a smaller set of trading partners. Finally, Corey (1985) asserted that TCEs did 'not adequately recognize the complex interdependencies' (p. 49) between channel partners.

The second focal point of this market structure approach looks at how EDI impacts on the balance of competitive advantage between firms. Using Porter's (1980) five-force framework, studies have noted how the use of EDI helps achieve competitive advantage (e.g. Johnston and Vitale, 1988; Bakos, 1991). Among the widely-cited case studies on EDI use are McKesson (e.g. Clemons and Row, 1988), the former American Hospital Supply Corporation (Gupta and Neel, 1992) and EDI use in the property and casualty insurance industry (Konsynski and Warbelow, 1987, 1988). These studies showed that the use of EDI was a distinct element of competitive power for a firm.

However, one shortcoming of this competitive power view is that the analytical framework does not provide a mechanism for assessing the impact of EDI. Moreover, the main difficulty in determining the impact of EDI on firm power is that market structure is influenced not only by EDI use but also by many other factors such as firms' strategies, technological innovations and their complex interactions. For instance, approximately 70% of grocery firm executives perceive that the industry's balance of power has shifted. While suppliers believe that the power has gone to retail outlets and end consumers, wholesalers and independent chain stores think suppliers are gaining more power (*Progressive Grocer*, 1996).[4] Nevertheless, when power is measured by profitability, no power shift was detected in the grocery distribution channel (Messinger and Narasimhan, 1995).

Interorganizational relations view

The second research stream assesses IT's impact from the IOR standpoint. The studies in this research stream view power as an integral part of trading relations. In contrast to the market structure studies, power is not treated as a separate entity but as only one part of IORs along with conflict, cooperation and maintenance.

Based on field interviews, Stern and Kaufmann (1985) conjectured the following.

(1) The information available to EDI-linked firms is more complete and accurate. This leads to higher satisfaction in the bargaining situation.
(2) EDI requires contact between firms at various departments and organizational levels. IOR commitment rises when the partners have more contact with one another.

According to their view, EDI makes existing relations closer and more satisfactory because EDI improves interfirm communication. In an empirical study, Bensaou (1993) indeed found that the *scope* of EDI use was positively related to the level of cooperative atmosphere in Japanese buyer–supplier relations. Vijayasarathy and Robey (1997) reported a similar positive impact of EDI use by retailers. From another viewpoint, Hart and Saunders (1998) showed that suppliers' commitment and trust to their trading partners were antecedents to EDI use.

However, EDI can increase a firm's vulnerability (Hart and Saunders, 1997) as well. For example, Clemons and Row (1993) described how grocery retailers may lose their bargaining power because EDI improves coordination. As more store-level information goes to suppliers, they use this information to exercise greater monitoring on product promotions at the retailer level. This tends to squeeze the profit margins of the event-driven retailers who use occasional, selective price discounts in order to attract customers while other prices carry higher margins. In particular, everyday-low-price (EDLP) promotions not only lower price margins but also eliminate promotions' funding for retailers.[5]

Summary

The existing literature has found that there are two perspectives of bargaining power relevant to EDI impact research. However, speculation on the nature and direction of power shifts differs between and within these two views. For the market structure view, studies have not yet detected empirical evidence of power shifts at the industry level. Equally, the IOR view has not yet provided a definitive answer to the EDI impact on bargaining power. One regards EDI as a coordination enabler, but the other finds EDI to be an element of contentions between suppliers and wholesalers.

Theoretical model for channel power shifts

A primary difficulty with the market structure view is that the use of EDI is merely one factor in market structural changes. As a first step in empirical investigation, this paper thus takes the IOR view in order to examine the impact that EDI has on the bargaining relationships between trading partners. That is, the concern is how trading information gained from EDI affects ongoing negotiations and transactions.

Using relational exchange theory, the following subsections present a theory in which the shift in bargaining power is assessed in relation to incentives.

Impact of EDI on bargaining power

EDI standardizes a variety of trading information exchanges between suppliers and wholesalers (see

Figure 1). Some EDI transaction sets such as invoices, price changes and item maintenance (new product information and/or changes to existing product specifications) are sent from suppliers to buyers. Some items such as purchase orders, product activity data (product sales status information) and (product sales) planning/forecasts are sent from buyers to suppliers. Other EDI transaction sets such as promotion announcements can be exchanged bidirectionally between suppliers and buyers. Through these information exchanges, suppliers obtain more accurate product sales activity data in real time and wholesalers also receive more accurate invoice and product specification data including prices.

Some benefits of EDI use such as logistics cost reductions can be enjoyed by both suppliers and wholesalers. However, other benefits are not necessarily symmetrical. For instance, suppliers obtain more accurate and timely information on product sales and on their partner's operational status through such EDI transaction sets as purchase orders and product activity. In contrast, wholesalers do not obtain any information on product development plans, manufacturing costs and product marketing status through EDI. Moreover, EDI helps a supplier execute actions which result from EDI-based information. For example, such EDI transaction sets as price changes, item maintenance and promotion announcements make it easier for suppliers to change their prices, product specifications and promotional plans. In fact, it was large suppliers who spearheaded early efforts in

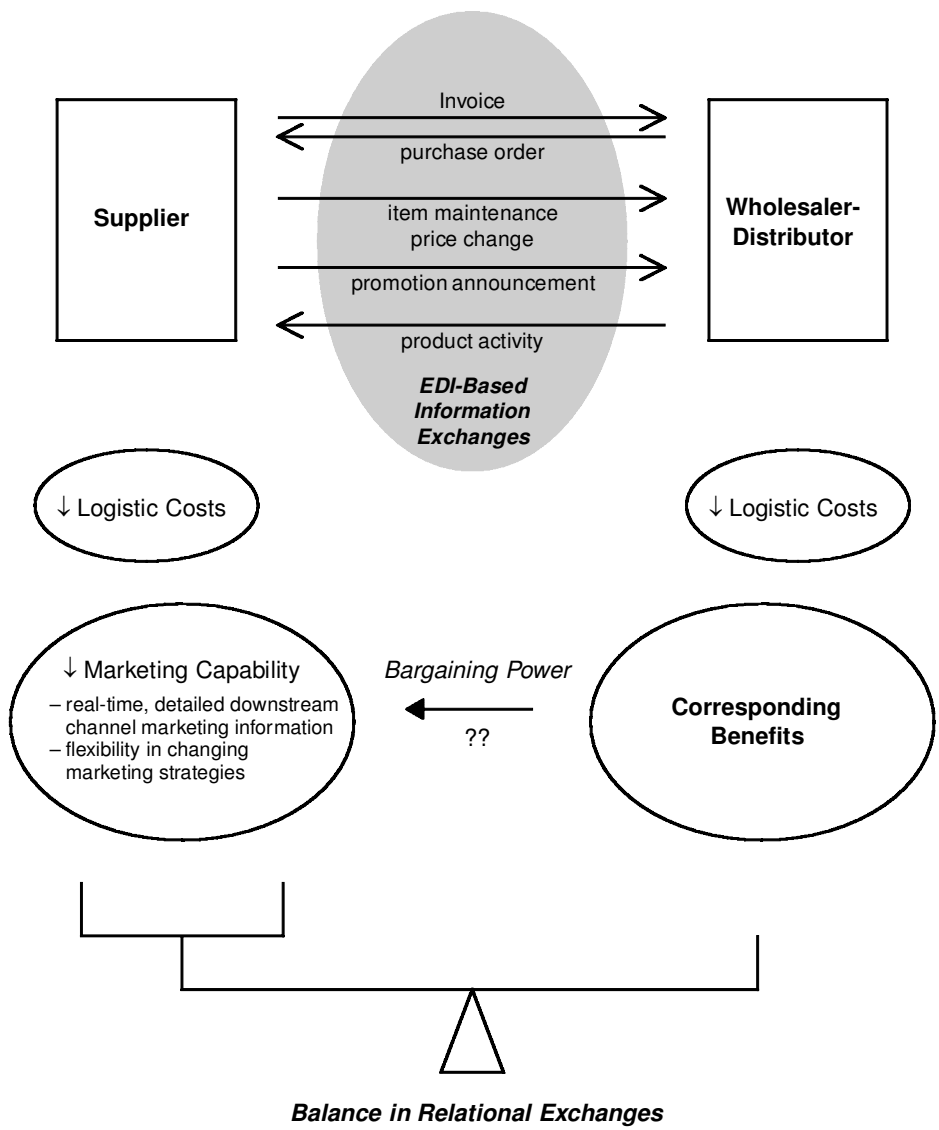


Figure 1 Overview of EDI use between grocery suppliers and wholesale distributors

EDI implementation for efficient consumer responses (ECRs) in grocery marketing channels.[6] Therefore, this paper hypothesizes that EDI enhances the marketing capability of the suppliers and favours bargaining negotiations on their side.

H_1: The extent of EDI use between suppliers and wholesalers correlates positively with the magnitude of the power loss felt by wholesalers.

Past research supports this hypothesis. Corey (1985) noted that EDI creates advantages for suppliers in trading negotiations. As mentioned earlier, Clemons and Row (1993) reported that, with EDI links, suppliers can monitor the use and allocation of promotional funding that they provide to the buyers better. In this respect, the power shifts towards the upstream direction in the channel. Finally, Hart and Saunders (1998) found a negative correlation between the perceived power of trading partners and the level of EDI use.

Relational implications of power shifts

If we assume that EDI usage results in a power shift towards suppliers, then why do wholesalers agree to

Table 1 Examples of wholesaler value-adding services (adopted from NAW/Arthur Andersen (1992))

Financial management services
Automatic reordering
Setting up EDI links
Engineering services
Repackaging
Market analysis for customer
Labelling
Education seminars/training
Inventory control for customers
Bar coding/scanning
Product lot tracking
Market development for manufacturers
Just-in-time/next day delivery
Technical support services
Product training
Warranty servicing
Promotional pricing
Furnishing catalogues
In-stock inventory
Inventory available checking
Small order handling
Inside sales person
Credit terms

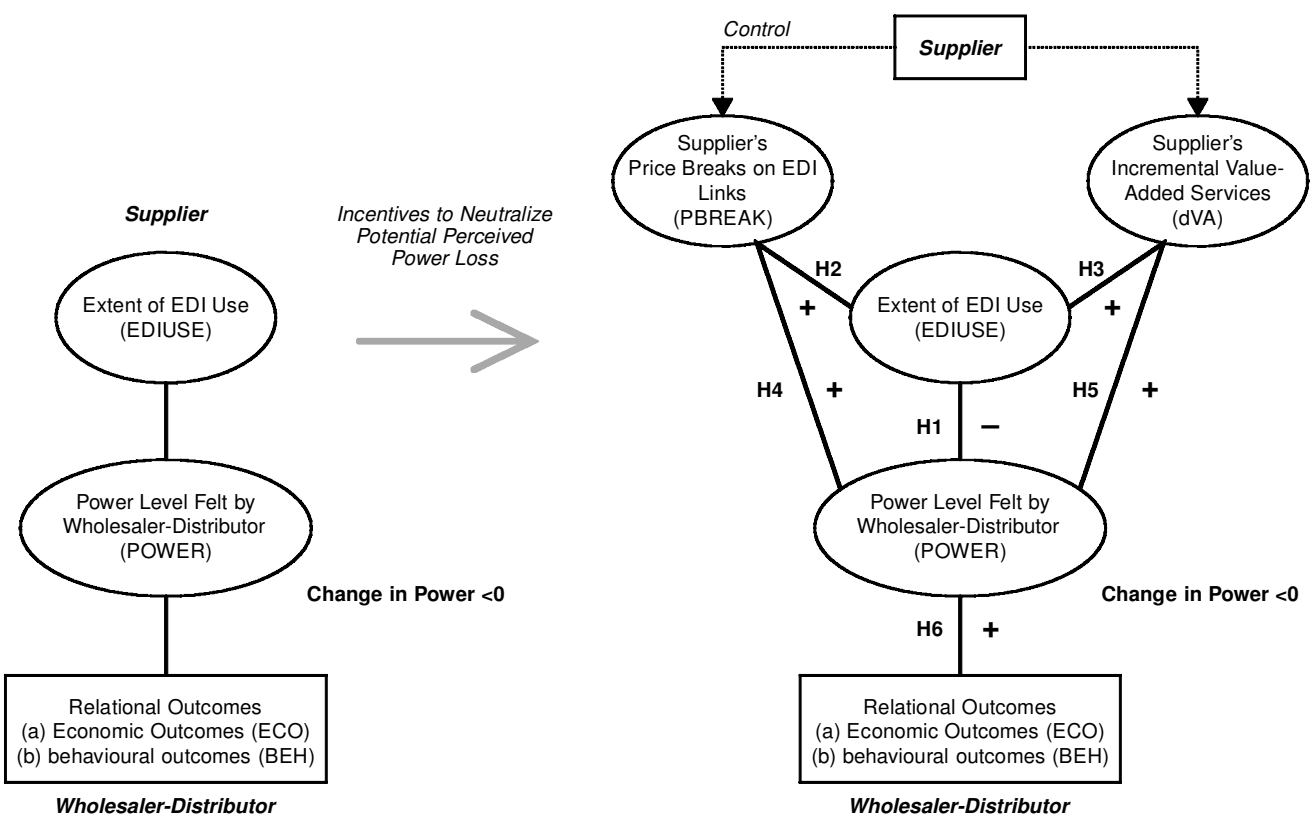


Figure 2 Theoretical framework

use EDI in the first place? One reason, according to Stern and Kaufmann (1985) and Bensaou (1993), is that EDI results in greater mutual understanding and more cooperation. Then, do not these findings contradict hypothesis 1?

In response to this question, relational exchange theory (Macneil, 1980; Dwyer *et al.*, 1987; Heide, 1994; Lusch and Brown, 1996) answers that the suppliers must somehow be compensating the negative consequences on the wholesalers' side in order to maintain the balance of trading exchanges. The theory asserts that 'relational exchange norms are based on the expectation of mutuality of interest, essentially stewardship behavior, and are designed to enhance the well being of the relationship as a whole' (Heide and John, 1992, p. 34).

If trading relationships are to be mutually beneficial, there are two possible ways in which the suppliers can compensate for the power shift. One way is by not taking advantage of the additional trading information gained from EDI use. Past marketing research shows that, when power is exercised, trading relations become more adversarial and less cooperative (e.g. Gaski, 1984). Therefore, when the trading relationship with a wholesaler is worthwhile for a supplier, it is unlikely that the supplier will one-sidedly exercise bargaining power over the decisions on purchase prices, payment terms and promotional discounts.

However, even if knowledge-based power is not 'exercised', there is evidence that the shift in bargaining power towards suppliers causes uneasiness in wholesalers and retailers. For instance, although the blatant use of power is rarely reported, most suppliers using EDI comment that their wholesalers and retailers are 'in general reluctant to share information with them' (Joint Industry Project on Efficient Consumer Response and Kurt Salmon Associates, 1995, p. vii).[7]

This leads to the other way in which suppliers can compensate for the wholesalers – the use of incentives. Previous studies have pointed out how the incentives provided by one side can alleviate the potential power loss of the other side. For instance, using economic theory, Bakos and Brynjolfsson (1993) rationalized the value of incentives in mitigating the potential power loss of one party when it provides sensitive trading information to the other.

On the basis of the interviews I conducted, grocery suppliers tend to provide two kinds of incentives to their EDI wholesalers. The first is direct incentives such as price breaks based on the extent of EDI use. The second is indirect incentives in the form of value-added services to the wholesalers. Some of these value-added services include information systems development support and increased managerial coordination support (see Table 1). These value-added services act as a goodwill gesture (Bouchard and Markus, 1996). Thus, this paper asserts the following.

H_2: The extent of EDI use between suppliers and wholesalers correlates positively with the degree of price breaks provided by suppliers.

H_3: The extent of EDI use between suppliers and wholesalers correlates positively with the level of incremental value-added services provided by suppliers.

Furthermore, if these incentives are intended to neutralize the perceived threat of potential power loss for the wholesalers, they must also compensate for the power loss deriving from the increased EDI use. In other words, the incentives should increase the perceived power level of the wholesalers proportionally so that the wholesalers agree to exchange more trading information via EDI (see Figure 2).

H_4: The degree of price breaks provided by suppliers correlates positively with the magnitude of the power gain perceived by the trading wholesalers.

H_5: The level of value-added services provided by suppliers correlates positively with the magnitude of the power gain perceived by the trading wholesalers.

The integration of hypotheses 1–5 is shown to form two triangular relationships in Figure 2: one between price break, EDI use and power and the other between incremental value-added service, EDI use and power. In each triangular relationship, an incentive manipulates the power perception by rewarding wholesalers (H_4 and H_5) in order to entice them to a higher

Table 2 Comparison in key variables between UCC and non-UCC groups

	UCC (n_1 = 11)		Non-UCC (n_2 = 22)	
Key variable[a]	Mean	SD	Mean	SD
PBREAK	4.46	4.41	5.86	4.63
dVA	22.90	2.74	22.09	5.08
EDI_TS	6.09	4.16	4.77	4.45
POWER 1	4.00	0.00	4.14	0.64
POWER 2	4.09	0.54	4.23	0.97
POWER 3	4.18	0.60	4.55	0.74
POWER 4	4.09	0.30	4.41	0.67
POWER 5	4.63	0.81	4.41	0.91
POWER 6	4.27	0.65	4.46	0.80
ECO	4.18	0.41	4.09	0.81
BEH 1	4.36	0.67	4.18	0.40
BEH 2	4.72	0.65	4.55	0.86
BEH 3	4.90	0.83	4.55	1.14

[a] The key variables are defined and described in Table 3.

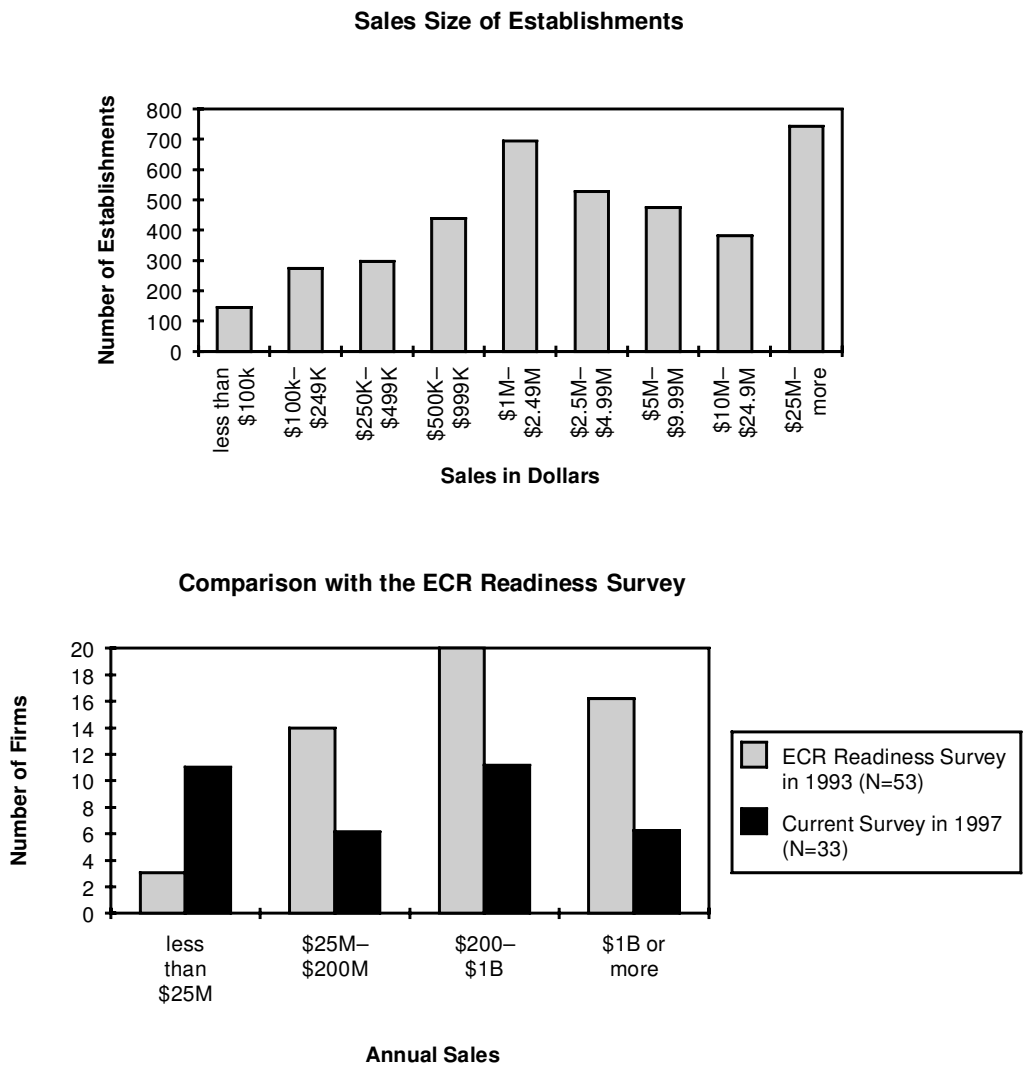


Figure 3 Sample characteristics. (a) Establishment size of grocery wholesalers (EDI users and non-EDI users). Source: *Grocery General Line, US Census of Wholesale Trade in 1992.* (b) The current survey versus the ECR Readiness Survey

level of EDI use (H_2 and H_3) which may disadvantage their bargaining position (H_1). If suppliers provide very generous incentives to wholesalers, the effects of the rewards (H_4 and H_5) are likely to overcome wholesalers' perceptions of their loss of bargaining power (H_1).

Finally, if relational exchange theory indeed applies, the change in the power level should lead to a change in relational outcomes such as economic outcomes (e.g. the purchase amount from suppliers) and behavioural outcomes (trust and cooperation). For example, relational outcomes should improve when the wholesalers feel they have more 'say' in their relationships with the suppliers. This naturally extends to the following two hypotheses.

H_6: The magnitude of the *ex post* power gain felt by the wholesalers correlates positively with favourable economic outcomes in the trading relationship.

H_7: The magnitude of the *ex post* power gain felt by the wholesalers correlates positively with favourable behavioural outcomes in the trading relationship.

In sum, this paper predicts that trading outcomes will depend on the balance between the main (reward) effect of EDI incentives on power and their indirect, negative effect on power.

Method

In order to test the theoretical model in Figure 1, I surveyed grocery wholesalers using a questionnaire. In principle, structural equation modelling (SEM) is

Table 3. Operationalization of the constructs

Variable	Scaling method	Reference
Price breaks (PBREAK)	How extensive are the price breaks or better payment terms offered you by the supplier because your firm has agreed with the following EDI exchange conditions? (Six-point Likert scale: 0 = none and 5 = very extensive) 1. Implementation of EDI link 2. Using product replenishment 3. Receiving price/specification changes 4. Reporting product activities PBREAK is the sum of the above four scores.	
Incremental Value-Added Services (dVA)	*During* and *after* implementing the EDI link, how do you describe the helpfulness of this supplier as a trading partner on the following items? (Seven-point Likert scale: 1 = significant decrease and 7 = significant increase) 1. Product information as well as education and training 2. IS development, support and systems integration 3. Warranty servicing 4. Coordination in shipping and delivery 5. Analysis and assistance in sales/marketing planning dVA is the sum of the above five scores.	cf. Celly and Frazier (1996)
Extent of EDI use (EDI_TS)	The number of transaction sets used 1. Implemented = 1, planning/testing = 1/2, otherwise = 0 for each transaction set 2. Weighted by 1 for purchase orders and invoices, 2 for price changes and item maintenance, 3 for promotion announcements and product activity and 2 for the other transaction sets.	
Power (POWER) Cronbach's $\alpha = 0.854$	*After* implementing the EDI link, how do you characterize your influence with this supplier on the following items? (Seven-point Likert scale: 1 = significant decrease and 7 = significant increase) 1. Purchase price (POWER 1) 2. Promotions planning (POWER 2) 3. Qualifications for discount/allowance (POWER 3) 4. Amount of discount/allowance (POWER 4) 5. Shipping schedule (POWER 5) 6. Terms of payment (POWER 6)	cf. Brown and Lusch (1983), El-Ansary and Stern (1972), Frazier and Summers (1986), Lusch and Brown (1982), Skinner *et al.* (1992) and Young *et al.* (1996)
Economic outcomes (ECOs)	*After* implementing the EDI link, how do you characterize your trading relation with this supplier on the following items? (Seven-point Likert scale: 1 = significant decrease and 7 = significant increase) 1. Purchase amount from the supplier	O'Callaghan *et al.* (1992), Christiaanse (1994) and Celly and Frazier (1996)
Behavioural outcomes (BEHs) Cronbach's $\alpha = 0.802$	*After* implementing the EDI link, how do you characterize your trading relation with this supplier on the following items? (Seven-point Likert scale: 1 = significant decrease/much worse off and 7 = significant increase/much improved) 1. Number of joint sales/marketing meetings (BEH 1) 2. Trust/Openness between the two companies (BEH 2) 3. Overall atmosphere of trading relationship (BEH 3)	Bensaou (1993) cf. Brown (1981), Anderson and Narus (1990) and Skinner *et al.* (1992)

an appropriate statistical method for testing relationships with multiple paths such as in Figure 2. However, given the sample size, I first applied partial correlation analysis and simulated SEM analysis by using EQS for Windows (Bentler, 1995) where multiple paths were involved. I then compared the results from both methods. The main focus of these analyses was to evaluate the direction and magnitude of the hypothesized relationships rather than a precise estimate of their coefficients. Next, I outline the sampling procedure and explain the construction of the variables and their validity.

Table 4 Descriptive statistics: zero-order correlation coefficients (in the matrix), means and standard deviations (n = 33)

		V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13
PBREAK	(V1)	–	–	–	–	–	–	–	–	–	–	–	–	–
dVA	(V2)	0.208	–	–	–	–	–	–	–	–	–	–	–	–
EDI_TS	(V3)	0.216	–0.310	–	–	–	–	–	–	–	–	–	–	–
POWER 1	(V4)	0.419	0.297	–0.230	–	–	–	–	–	–	–	–	–	–
POWER 2	(V5)	0.331	0.376	0.006	0.315	–	–	–	–	–	–	–	–	–
POWER 3	(V6)	0.529	0.189	0.092	0.399	0.493	–	–	–	–	–	–	–	–
POWER 4	(V7)	0.424	0.210	–0.001	0.418	0.516	0.886	–	–	–	–	–	–	–
POWER 5	(V8)	0.496	0.450	–0.103	0.519	0.428	0.518	0.561	–	–	–	–	–	–
POWER 6	(V9)	0.459	0.211	–0.084	0.546	0.279	0.422	0.433	0.658	–	–	–	–	–
ECO	(V10)	–0.055	–0.208	–0.019	–0.117	–0.569	–0.108	–0.170	0.003	–0.095	–	–	–	–
BEH 1	(V11)	0.039	0.030	–0.168	0.271	0.334	0.053	0.061	0.295	0.237	0.003	–	–	–
BEH 2	(V12)	0.368	0.213	–0.258	0.621	0.392	0.197	0.267	0.469	0.378	–0.081	0.565	–	–
BEH 3	(V13)	0.271	0.324	–0.080	–0.285	0.703	0.364	0.423	0.353	0.252	–0.541	0.454	0.704	–
Mean	5.39	22.36	5.21	4.09	4.18	4.42	4.30	4.49	4.39	4.12	4.24	4.61	4.67	
Standard deviation	4.54	4.41	4.34	0.52	0.85	0.71	0.59	0.87	0.75	0.70	0.50	0.79	1.05	

Table 5 Comparison of coefficient estimates

Method	Partial correlation	SEM (n = 33)	SEM (n = 100[a])	SEM (n = 500[a])	SEM (n = 1000[a])
χ^2	n.a.	18.0	86.5 (16.5) [b]	319.9 (30.1)	610.9 (40.2)
p	n.a.	$\leqslant 0.803$	$\leqslant 0.001$	$\leqslant 0.001$	$\leqslant 0.001$
CFI	n.a.	1.00	0.87 (0.03)	0.87 (0.01)	0.87 (0.01)
NFI	n.a.	0.88	0.83 (0.02)	0.86 (0.01)	0.87 (0.01)
NNFI	n.a.	1.08	0.80 (0.04)	0.80 (0.01)	0.80 (0.01)
H_1	–0.13	–0.17	–0.14	-0.16^{***}	-0.17^{***}
H_2	0.32^{*}	0.29^{*}	0.26^{***}	0.28^{***}	0.29^{***}
H_3	-0.32^{*}	-0.36^{**}	-0.35^{***}	-0.34^{***}	-0.35^{***}
H_4	0.56^{***}	0.63^{***}	0.63^{***}	0.62^{***}	0.62^{***}
H_5	0.28	0.29^{*}	0.33^{***}	0.32^{***}	0.31^{***}
H_6	–0.22	n.a.	n.a.	n.a.	n.a.
H_7	0.43^{**}	n.a.	n.a.	n.a.	n.a.

[a] Bootstrap simulation with ten replications: $^{*}\alpha \leqslant 0.10$, $^{**}\alpha \leqslant 0.05$, $^{***}\alpha \leqslant 0.01$.
[b] The values given for the simulation results are the averages with their standard deviations in parentheses.

Sampling procedure

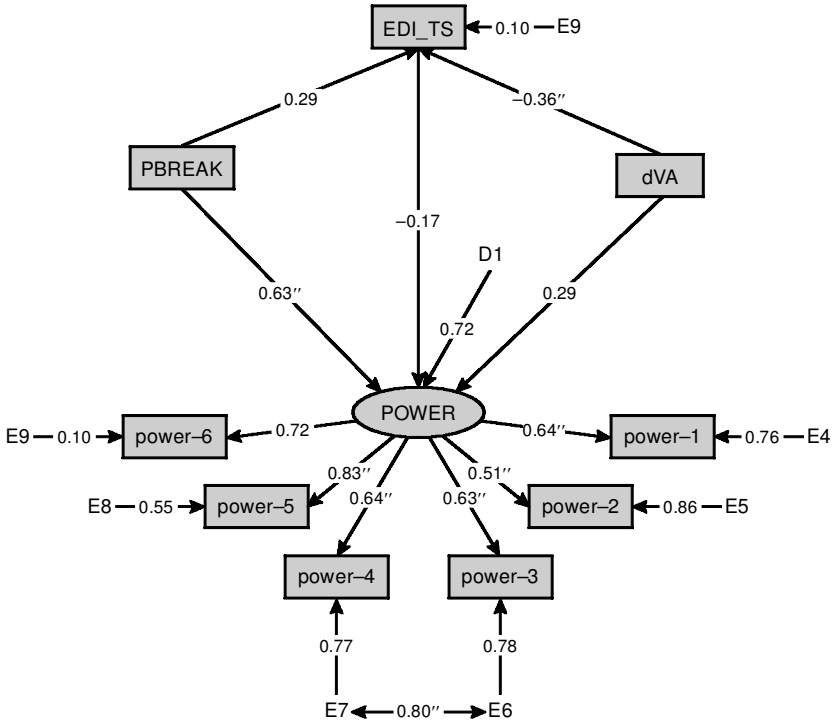
I collected data from two groups of wholesalers who were considered as EDI users. One group was 62 US grocery wholesalers who were listed as current EDI users in the *1996 Uniform Code Council EDI Member Directory*. Because the sample size of the first group (hereafter, UCC group) was small, another group of wholesalers was also sampled. This group consisted of 1087 sites at 881 US and Canadian grocery wholesalers who were found in the *Chain Store Guide/Wholesale Grocers '97* as potential EDI users (hereafter, non-UCC group).

In order to enhance the response rate, I made follow-up phone calls to the UCC group 1 month after the questionnaire was mailed. This yielded 11 usable returns or a response rate of 17.7%.[8] I mailed a reminder postcard 3 weeks after I mailed the questionnaire for the non-UCC group. In addition, I made follow-up telephone calls to 150 randomly selected firms from the list. The usable response rate was 2.0% or 22 returns.[9,10] Thus, the total usable sample size was 33.

On average, these 33 wholesalers had an annual sales revenue of $192 million with 300 employees and merchandised 5780 goods. With the suppliers, the mean length of trading relations was approximately 10 years with an average EDI experience of 3.5 years.

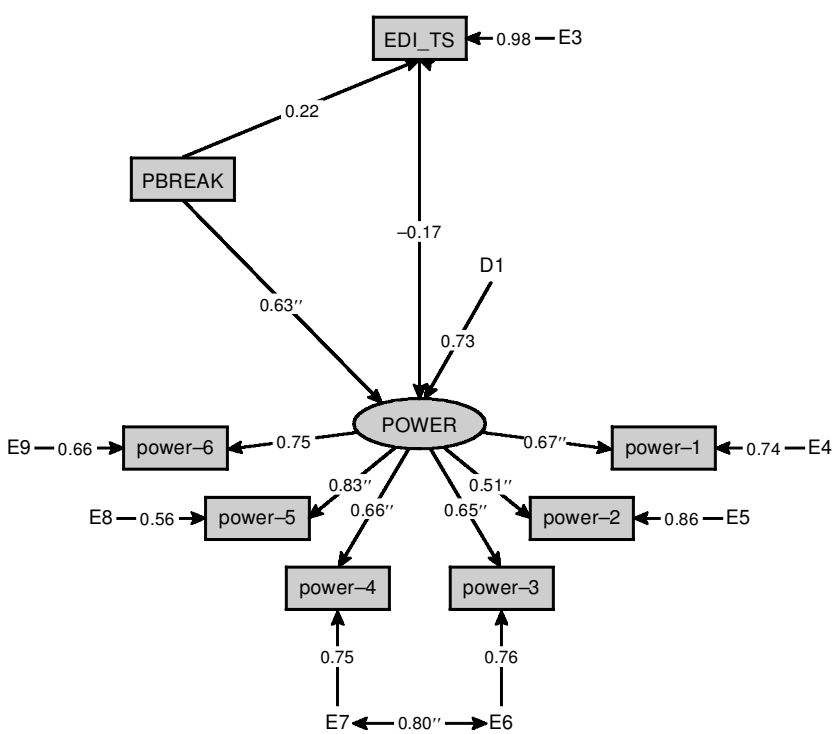
Although I used two sample groups, they were not significantly different in the values of the variables used for the study (see Table 2). It is thus reasonable to assume that they were drawn from a single population of current EDI users and may be pooled.

Even though the overall response rate was low, there is some evidence that the sample represents the



N = 33, χ^2 = 18.00, df = 24, p ≤ .80
CFI = 1.00, NFI = .88, NNFI = 1.08

Figure 4 An SEM model on relationships between EDI use, power and incentives



N = 33, χ^2 = 11.62, df = 18, p ≤ .87
CFI = 1.00, NFI = .91, NNFI = 1.10

Figure 5 A *post hoc* SEM model

Table 6 *Post hoc* coefficient estimates

Method	Partial correlation	SEM (n = 33)	SEM (n = 100[a])	SEM (n = 500[a])	SEM (n = 1000[a])
χ^2	n.a.	11.6	56.1 (12.8) [b]	200.6 (24.6)	387.3 (27.8)
p	n.a.	$\leqslant 0.866$	$\leqslant 0.001$	$\leqslant 0.001$	$\leqslant 0.001$
CFI	n.a.	1.00	0.91 (0.02)	0.91 (0.01)	0.91 (0.01)
NFI	n.a.	0.91	0.88 (0.02)	0.90 (0.01)	0.90 (0.01)
NNFI	n.a.	1.10	0.86 (0.04)	0.86 (0.01)	0.86 (0.01)
H_1	–0.24	-0.26^{*}	-0.24^{**}	-0.26^{***}	-0.27^{***}
H_2	0.31^{*}	0.22	0.18^{*}	0.20^{**}	0.22^{**}
H_4	0.61^{***}	0.69^{***}	0.70^{***}	0.69^{***}	0.68^{***}

[a] Bootstrap simulation with ten replications, $^{*}\alpha \leqslant 0.10$, $^{**}\alpha \leqslant 0.05$, $^{***}\alpha \leqslant 0.01$

[b] The values given for the simulation results are the averages with their standard deviations in parentheses.

population adequately for two reasons. First, an F-test between the early respondents and the late respondents on the variables used in this study was not significant. In other words, a non-response bias was not detected. Second, I compared the sample distribution of the firm annual sales with that of the ECR Readiness Survey – one of the largest EDI surveys conducted in the industry. Figure 3a shows the sales size of the entire wholesalers.[11] Only 19% of the wholesalers earned above $20 million per annum. In contrast, Figure 3b indicates that EDI adopters are typically very large wholesalers.[12] The sample distribution patterns of the current study and the ECR Readiness Survey are similar, except that the former captured more small-sized wholesalers. This is quite reasonable because (1) the use of EDI is taking off in grocery marketing channels (Joint Industry Project on Efficient Consumer Response and Kurt Salmon Associates, 1995; Harding, 1996) and (2) the ECR Readiness Survey was conducted 4 years prior to the current survey.

Operationalization of variables

The construction of the variables used in testing the hypotheses is shown in Table 3. Prior to designing the questionnaire, I conducted three pilot case studies at grocery wholesalers in California in order to enhance the validity of this research. As suggested by Straub (1989), I chose previously tested variables with some modifications where they were applicable and used new variables after I assessed their content validity through interviews with MIS/EDI managers.

Massetti and Zmud (1996) proposed four facets of EDI measurement: volume, diversity, breadth and depth. In this study, the extent of EDI use was assessed by the number of EDI transaction sets used (diversity).[13] The frequency of EDI exchange (volume) was not used because incentives on EDI were typically not placed on volume. The other two dimensions of EDI use were not measured in this study. 'Depth' was not used because some EDI transaction sets assume the use of applications and the design and sophistication of business applications vary from firm to firm.[14] The breadth of EDI use is rather limited at this time for the industry as a whole.[15]

The constructs of power, value-added services, economic outcomes, behavioural outcomes and control variables were mostly drawn from previous studies. The two modifications I made on previously used constructs were (1) adjusting the constructs to fit the grocery industry context and (2) adding IS-specific constructs such as IS development in value-added services and the length of EDI use with the supplier.

Validity of constructs

The format of the questionnaire and the content validity of the variables were evaluated from interviews with MIS/EDI managers. Based on their suggestions, I modified the wording of some questions and omitted other questions which were not relevant. Confirmatory factor analysis tested the internal validity of the power and behavioural outcomes (latent factors). As indicated in Table 3, the Cronbach's α values were higher than 0.8. This provides strong support for the reliability of these constructs.

The measurement of power is methodologically challenging because it is sensitive to how the construct is operationalized (Gaski, 1984). In addition, the study of power 'has been subject to criticism most commonly for focusing on behavioral phenomena in isolation from their antecedent conditions and outcomes' (Heide, 1994, p. 72). In order to remedy this criticism, the proposed theoretical model includes both economic and behavioural (trust and cooperation) outcome variables.[16]

Table 7 Jackknife estimates of SEM fit indexes

	SEM model in Figure 4			*Post hoc* model		
Estimate	CFI	NFI	NNFI[a]	CFI	NFI	NNFI[a]
Original (n = 33)	1.000	0.875	1.083	1.000	0.910	1.097
Jackknife	1.000	0.870	1.081	1.000	0.906	1.096
Difference [%]	0.000	0.570	0.180	0.000	0.430	0.120

[a] Non-normed fit index.

Results

The descriptive statistics of the variables are shown in Table 4 and a summary of the results is given in Table 5.

Relationship between EDI use, power and incentives

First, I evaluated the strength of their relationships by using partial correlation estimates. For H_1–H_5, I focused on four variables, EDI use (EDI_TS), price break (PBREAK), incremental value-added services (dVA) and felt power level (POWER) and obtained partial correlation coefficients of two variables by holding out the other two. The results show that PBREAK correlates positively with EDI_TS (r = 0.32 at $\alpha \leqslant 0.10$) and POWER (r = 0.56 at $\alpha \leqslant 0.01$), supporting H_2 and H_4. However, EDI_TS did not correlate significantly with POWER thereby rejecting H_1. In addition, dVA was negatively correlated with EDI_TS, while it had a non-significant positive correlation with POWER. Thus, H_3 and H_5 were rejected.

Then I created an SEM model (Figure 4) by using the original sample (n = 33) and three bootstrap simulation samples (n = 100, 500 and 1000). The overall fit of the model was reasonably good, as the CFI and NFI remained close to the normal 0.90 cut-off value (Hoyle and Panter, 1995) for the larger simulation samples. The coefficient estimates of the SEM analysis were fairly consistent overall with those obtained from the partial correlation analysis as shown in Table 5, except that the SEM analysis supports H_5 at $\alpha \leqslant 0.10$.

Relationship between power and outcomes

I calculated partial correlations between POWER and economic outcomes (ECOs) as well as between POWER and behavioural outcomes (BEHs) by holding out EDI_TS, PBREAK and dVA. That found POWER to be positively related to BEHs (r = 0.43 at α (0.05) but not significantly with ECOs, thereby confirming H_6 but not H_7.

Discussion

The results obtained imply that EDI use was not found to contribute to the power shift. However, the fact that PBREAK and dVA had opposite effects on EDI_TS casts some doubt on this observation. The results indicate that, while PBREAK can increase EDI_TS, dVA can also reverse the effect of PBREAK on EDI_TS. This prompted a *post hoc* analysis. A *post hoc* model clarified the roles of incentives and presented some evidence on the power shift effect of EDI use.

In the following subsections, I start with a discussion of the *post hoc* analysis. I then give a summary of the overall results and managerial implications followed by the limitations and future research agendas of the study.

Post hoc analysis on the role of incentives

The negative correlation between dVA and EDI_TS may mean that less EDI usage resulted as the suppliers provided more goodwill service to the wholesaler. However, this does not make much sense in the channel management context; the higher the level of goodwill service from suppliers should facilitate more open communication between suppliers and retailers including EDI-based information exchanges. Rather, a more appropriate way of interpreting this phenomenon is as follows. The nature of dVA is that the suppliers cannot increase their levels of services indefinitely; once these services reach a certain level, they are likely to stay constant. If so, the results mean that a higher adoption of EDI occurred when the level of dVA was high to begin with.[17] This conforms to observations that a cooperative relationship is a requirement for EDI adoption (Frazier *et al.*, 1988; Hart and Saunders, 1997). Therefore, dVA should be regarded as a reflection of the initial trading atmosphere rather than a direct incentive on EDI use.

To test this argument, I created a *post hoc* model by removing incremental dVA from the original one. The partial correlation analysis found a stronger negative correlation (r = 0.24) between EDI use and power (H_1). Its statistical significance did not reach

the 0.10 level, although it did so when power was measured by just purchase price ($r = 0.36$ at $\alpha \leqslant 0.05$) or purchase price and shipping schedule ($r = 0.35$ at $\alpha \leqslant 0.05$). On the other hand, the *post hoc* SEM model (Figure 5) did find support for H_1, while showing conforming results with those from the correlation analysis (Table 6). As a small sample size punishes the statistical significance, Table 6 thus appears to support H_1 overall.

Overall summary of findings

The *post hoc* SEM model showed that increased EDI use negatively impacted on wholesalers' perceived power levels. The model also revealed that the price break levels predict wholesalers' power gain positively, even though it did not find a statistically significant correlation between price break and EDI use levels. The level of incremental dVA was found to be a positive predictor of wholesalers' power gain. However, the analysis implies that we should not regard it as a direct incentive for EDI use, but consider it to be a consequence of antecedent conditions for a higher EDI adoption. Finally, the increased level of perceived power was found to correlate positively with behavioural outcomes such as trust and cooperation.

Implications

Given the directions and magnitudes of the effects considered, the overall results indicate that those suppliers who provide appropriate price breaks can maintain favourable trading relationships. This is because price breaks sufficiently compensate for the wholesalers' perception that EDI use leads to their loss of bargaining power. In addition, the compensated (i.e. increased) power resulted in more trust and cooperation between suppliers and wholesalers. Thus, these observations appear to confirm relational exchange theory in the context of channel EDI-based system adoptions.

The findings of this study may apply to other retailing sectors such as drugs and general merchandising as well as apparel and accessories, because grocery retailing often leads other retail sectors in IT innovations as was the case of the pioneering ECR efforts. It is also because we have seen the 'meltdown' of traditional retail categories as mass retailers and large supermarket chains offer an increasing range of products.

As the twenty-first century dawns, a wide variety of IT is available between firms in marketing channels. Indeed, traditional implementations of EDI systems can be narrow in scope (Hart and Saunders, 1998) and some industry sectors have already seen the deceleration of EDI adoption (Harper, 1999). Nevertheless, the functionality of EDI will still be useful and remain while other document exchange technologies such as Extensible Markup Language (XML) and extranets complement where traditional EDI falls short (Olsen, 1999a,b; Zuckerman and McLymont, 1999). Regardless of the technology used, firms in marketing channels must exchange documents of trading information in order to execute and facilitate interfirm transactions. Thus, they need to always be concerned about what trading information is to be shared with their trading partners and how such sharing is done.

The focus of this research is mainly on how IT is used in the 'political' situations of trading between grocery suppliers and wholesalers. Indeed, Markus (1983) noted almost two decades ago how a firm's internal political dynamics may favourably or unfavourably impact on the success of its IS implementations. A recent work by Chatfield and Yetton (2000) further extends such insights to EDI systems. Their study indicated that the effectiveness of EDI use is moderated by how EDI use meshes with the economic strategy and people links between companies. The results of this study then expand on other studies by analysing how IT effectiveness is leveraged or hindered by the context of trading relationships.

A major implication of this result to today's new B2B e-commerce practice is that trading partners must consider the trading consequences of new B2B IT adoptions in marketing channels. In addition, if they want to maintain a cooperative trading relationship, they need to share the benefits of such IT adoptions equally with each other in terms of overall relational benefits.

Limitations and future research agendas

The very small sample size of this study may have affected the reliability of the statistical analysis, even though some evidence of sample representativeness was shown. In order to evaluate the impact of small sample bias, jackknife estimates for the two SEM models were calculated.[18] Table 7 shows that the deviations of fit indexes are well below the 1% level. Thus, the study assumes that the small sample bias did not affect the overall statistical results substantially.

Another limitation is that this research tested the model only from the wholesalers' perspective on their supplier relationships. The next logical step will be to test the theory by looking at the perspectives of suppliers and retailers. In the long run, this research should evolve into an integrative IOR investigation in which three perspectives are examined simultaneously. To test the external validity of the theory, the model needs to examine channel power shifts in other industries. Finally, new types of

B2B IT use appear continuously. Thus, research data about channel power shift phenomena must be accumulated so that we can recognize the patterns and trends of power shifts and predict under what circumstances power shifts will occur.

Finally, we need to develop research methods suitable for e-commerce research, methods which assure research rigour and yet which are 'practical' for assisting e-commerce practitioners with timely results. The traditional survey method faces the situation where managers in e-commerce generally have little time to spare for replying to 'rigorous' survey questionnaires. Another challenge is that e-commerce, as both a business phenomenon and a research field, has been rapidly (r)evolving, so the time it takes to complete a research project may reduce its relevance.

Conclusion

This paper examined the impact of automated trading information exchanges via EDI links on the bargaining power of wholesalers in grocery marketing channels. The paper presented the theory that such information exchanges enhance the marketing capability of suppliers and that this enhanced marketing capability increases the bargaining power of suppliers in ongoing trade transactions.

Based on the survey results from grocery wholesalers, the paper finds that there is evidence that power shifts towards suppliers with EDI links. However, the results also suggest that successful trading relationships, which are characterized by higher trust and cooperation, have suppliers who provide reciprocal incentives to wholesalers in exchange for obtaining sensitive trading information from them. In this sense, suppliers have the choice of making 'sensitive' trading information exchanges – be they through traditional EDI links or new types of web-based information systems – in order to be either an enabler for cooperative joint operations or a source of conflict in trade bargaining.

This research has thus contributed to the empirical confirmation of relational exchange theory in the context of state-of-the-art IT use. This research also contributes knowledge on managing more fruitful trading relationships between grocery suppliers and wholesalers.

Notes

1 EDI refers to standardized documentation for computer-to-computer information exchanges. Thus, EDI links automate trading information exchanges between two companies.

2 In this paper, 'wholesalers' refers to merchant wholesaler distributors. They are independent companies which give titles to goods from suppliers, add value to them and sell goods to retailers (NAW/Arthur Andersen, 1992).

3 For example, grocery retailers often use proprietary EDI systems using Standard Interchange Language (SIL) – a more 'flexible' EDI approach than X12 and EDIFACT EDI approaches.

4 NAW/Arthur Andersen (1992) also reported equivalent findings.

5 For further details, refer to Weinstein (1994) and Zellner (1996).

6 ECR is an industry-wide re-engineering for improving the efficiency and effectiveness of grocery distribution channels.

7 The reluctance of information sharing by wholesalers and retailers was also reported by Clemons and Row (1993) and *Progressive Grocer* (1996).

8 I received 19 returns. Five of them reported EDI use with retailers and three did not have sufficient EDI experience to respond to the survey questions fully. Thus, 11 were usable for the study.

9 Out of 42 total returns in this group, 18 wholesalers could not complete the survey questions necessary for this study because they had just recently adopted EDI. Two reported EDI use with retailers. Thus, there were 22 usable responses.

10 There are three primary reasons for this low response rate. Industry reports indicate that less than half of grocery wholesalers may be using EDI. In addition, their EDI use still tends to be with either retailers or suppliers. Finally, many of them are rather recent EDI adopters. Considering these factors, an effective response rate from the non-UCC group would be $22 \div (1077 \times$ EDI user rate of $50\% \times$ supplier connectivity rate of $50\% \times$ 'experienced' EDI user rate of $50\%) \approx 16\%$.

11 Although the survey was mailed to approximately 80 Canadian firms, only one responded with a non-usable survey reply. Thus, the sample and the population are essentially all Americans.

12 This conforms to the fact that EDI adoption requires significant investment and resource commitment (e.g. Scala and McGrath, 1993).

13 Diversity and volume were weighted according to the types of transaction set used (see Table 3). For instance, purchase orders and invoices are considered to be the most basic and easiest EDI transaction sets to implement. On the other hand, price changes and item maintenance require more sophisticated set-ups and a more direct impact on marketing and bargaining. Promotion announcements and product activity produce even stronger effects on marketing and bargaining.

14 Depth refers to how much EDI and business process are integrated (Massetti and Zmud, 1996).

15 Breadth is defined as how many trading partners a firm has established EDI links with.

16 Regarding antecedent conditions, the paper views that value added service (dVA) reflects antecedent conditions as it is discussed further in the following Discussion section.

17 Absolute levels of dVA are very difficult to measure practically, particularly among different trading relationships.

18 I used the jackknife technique (a special case of bootstrap techniques) proposed by Fenwick (1970; as referenced by Brown *et al.*, 1995). Following Brown *et al.*'s (1995) procedure, the jackknife estimates were calculated by using 33 replications with a rotating holdout sample size of one.

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