DE GRUYTER OPEN

ISMSME International Society for Manufacturing, Service and Management Engineering

received: 30 September 2017
accepted: 30 January 2018

pages: 7-21

Impact of supplier-specific investments in inter-organisational information systems on strategic electronic coordination: the moderation effect of buyer dependence

Sergei Teryokhin, Gøril Hannås

ABSTRACT

This paper examines the factors which influence sharing of the strategic information (in other words, electronic coordination) in a buyer–supplier dyad. The antecedents of this coordination are examined rather well in the transaction cost economics (TCE) theory and resource-dependency theory (RDT), while the supply chain management perspective is contemplated. The mentioned frameworks are used in the analysis. However, the research focus is narrowed down to the exploration of the antecedents of information exchange conducted via inter-organisational information systems (IOS). The empirical analysis is based on 198 observations of Norwegian companies operating in different types of industries. A regression model is used to test the hypotheses about the antecedents of strategic electronic coordination. The research results indicate that the direct effect of the supplier-specific investments in the IOS on the exchange of strategic information in the buyer–supplier dyad is not statistically significant. The supplier-specific investment in the IOS becomes positively associated with the strategic information exchange in the buyer–supplier dyad only when the buyer is dependent on the supplier. The buyer dependency creates a high motivation for the company to exchange the strategic information with the supplier who is more powerful in the dyad. This research concludes that the companies making substantial investments in the IOS for electronic coordination purposes may not reach their goals if relation-specific factors, such as buyer dependency, are not comprehensively considered.

KEY WORDS

buyer dependency, inter-organisational information system (IOS), resource dependency theory, strategic electronic coordination, specific IOS investment, transaction cost economics (TCE)

DOI: 10.1515/emj-2018-0001

Corresponding author:

Sergei Teryokhin

Molde University College,
Faculty of Logistics, Norway
e-mail: sergei.teryokhin@himolde.no

Gøril Hannås

University of Agder,
Faculty of Engineering and Science,
Department of Working Life
and Innovation, Norway
e-mail: goril.hannas@uia.no

Introduction

Coordination is one of the most used terms in the supply chain management (SCM) literature. Moreover, some of the researchers like Mentzer et al. (2001) define the supply chain management as the strategic and tactical coordination of business functions within a company and across the supply chain (SC) actors intended to improve the performance of individual companies and the entire SC. That ensures that the coordination of the core activity of companies performs well in modern supply chains.

Another notable characteristic of today's coordination mechanisms in the SC is that inter-organisational information systems (IOS) play a pivotal role in the information exchange between the companies. Today, the types of the information that companies

exchange via IOSs go far beyond the simple data exchange regarding the processed invoices, orders, and payments. Some companies, such as Wal-Mart, Chrysler, and Ford, force their suppliers to deploy an IOS for the better coordination and collaboration (Subramani, 2004). This paper uses the terms "coordination" and "information sharing" interchangeably.

Despite the fact that business entities recognise the coordination as an important value-increasing tool, the practice shows that the companies are often reluctant to share their information or afraid to disclose certain strategic information because of the threat of opportunistic behaviour.

The problem mentioned above is the impetus to the search for the drivers and barriers for the coordination. Over time, the stream of literature which examines the information sharing and coordination is widening (Kembro et al., 2014). At the same time, the SCM literature is lacking a single framework which could comprehensively answer such questions as "What are the drivers of coordination?", "Why are collaboration relationships successful in some business relationships but do not bring desirable results to others?", "What kind of the collaboration level (tactical, strategic) fits the current goals and strategies of companies the best?" The researchers are using different theoretical "lenses" to investigate the coordination. Therefore, it leaves room for further explorations in the field.

The relevance of this study can be substantiated by addressing the issue of mixed results in the IOS literature with respect to the modelling results (i.e. the sign in the statistical models) reflecting the correlation between the investments in the IOSs and the expected outcomes of the IOS use, such as cost reduction, finding new distribution channels, speed and flexibility, electronic coordination, and value creation (Yao et al., 2010). Even though modern IOSs provide SC members with the possibility to exchange a broad spectrum of business information, the companies are often unwilling to exchange this information. Furthermore, some researchers claim that the IOSs can be considered a threat to organisations when, for instance, "they fear the risk of becoming more dependent on IOS partners, to be disintermediated or to be forced to move to more competitive markets…" (Boonstra & Vries, 2005, p. 486). Disintermediation effect of the IOSs which leads to the arm-length business relationships rather than the collaboration has been widely studied in the literature (Malone et al., 1987; Clemons & Row, 1992; Clark, 1992; Short & Venkatraman, 1992). This research pool demonstrates that companies who invest heavily in the IOSs also reduce the coordination costs since the market information becomes easily accessible to the IOS-users. As a result, companies tend to prefer the market forms of the relationships to the collaborative forms (i.e. hybrids and hierarchies). At the same time, such an aspect of buyer–seller relationships as the influence of dependency on electronic coordination has been given less attention in IOS literature so far. This aspect, if considered, can assist in choosing of the proper governance mechanism.

This paper aims to provide an insight into the information exchange mechanism in buyer–supplier dyads, namely, the exchange of strategic information conducted via information systems.

The paper contributes to the research area by exploring the antecedents of successful information exchange in buyer–supplier dyads. Given that companies may share various types of information and use different means of information exchange, the scope of the research was narrowed down to the exploration of antecedents of the strategic electronic coordination. The latter implies coordination of production plans, product design, and modifications, as well as development and testing of the new products in a buyer–supplier dyad via IOS. The study examines the buyer dependency as one of the important factors which may enforce the strategic electronic collaboration.

The research model used in this paper is based on 198 observations representing the data collected from Norwegian enterprises operating in different industries. A buyer–supplier dyad is taken as a unit of analysis. The empirical data are collected from the buyer perspective.

The following sections briefly describe the conceptual background for the strategic electronic coordination, develop the hypothesis and the model. The concluding sections discuss the results and limitations and make suggestions for future research.

1. Theory and hypotheses

There is no single definition of the coordination between the SC actors in the literature (Arshinder et al., 2008; Gao & Tian, 2014). The SC coordination is viewed by researchers from different perspectives: long-term contracts, risk and benefits sharing, information exchange and IOS usage, joint planning and

product development (Larsen, 2000); coordination as a tool to manage dependencies between the firms in the SC (Malone & Crowston, 1994; Xu & Beamon, 2006); coordination as general decision making and interaction between the SC actors in order to plan, control and adjust inventories, funds and information, and support the key SC business processes (Romano, 2003). The provided viewpoints suggest that the coordination mechanisms are different, and they include the following dimensions: information exchange and the use of IOS, contracting, joint decision making, and risk and revenue sharing. This paper focuses on an aspect of the coordination, namely, information exchange in the buyer–supplier dyad conducted via an IOS.

According to the literature review article by Kembro et al. (2014), the most applied theories which explain information exchange in dyadic relationships are transaction cost economics (TCE), relational governance theories, contingency theory, and resource dependency theory (RDT). Concerning the information sharing these theories discuss the following issues: whether to share the information or not and why, what to share and with whom, how to share, what kind of barriers, drivers, and prerequisites of information exchange questions may exist (Kembro et al., 2014).

The following subsections briefly present the theories most relevant to the study emphasising how they explain the drivers for the information exchange in the dyadic relationships. In the light of the research, information exchange drivers are also considered as the drivers for the coordination.

1.1. TCE perspective

The primary focus of TCE is the minimisation of the transaction costs which can be reached if the considered companies choose appropriate governance structures (Williamson, 1985). The latter should be selected by firms based on the main transaction characteristics, such as asset specificity, environmental uncertainty, and the frequency of information exchange. Opportunism is one of the central TCE assumptions (Williamson, 1985). Firms which invest in highly specific assets are exposed to opportunistic behaviour. To protect the specific assets from opportunism, the firms need to develop safeguards, such as formal contracts (Porterfield et al., 2010) or bind the interacting companies together by prompting the collaborating party to invest in the specific assets, or by other specific procedures (Bensaou & Andersen, 1999). According to TCE, formal contracts are the main driver for the information sharing (Grover & Saeed, 2007; Porterfield et al., 2010).

Another mechanism of firm bonding that motivates to maintain the relationship is switching costs (Geiger et al., 2012). There is no consensus on the conceptualisation of switching costs (Barroso & Picon, 2012). They can be defined as costs of concluding the ongoing relationship while establishing the relationship with a new business partner (Kim et al., 2010; Blut et al., 2016). The magnitude of switching costs is closely related to the level of specificity of the assets deployed in the relationship. Specific investments made both unilaterally and bilaterally increase switching costs. On the one hand, the firms investing in the asset increasing the switching costs become more dependent on each other (Berry & Parasuraman, 1991). On the other hand, high switching costs indicate that the companies believe that the relationship will strengthen in the future. Blut et al. (2016) highlight that the interdependency which is induced by high switching cost is the impetus for communication and knowledge transfer between the trading partners.

Though the TCE provides a framework to explain the drivers for information sharing through interdependency mechanism, the explanatory power of this mechanism is limited due to the interdependency being viewed merely because of some specific asset investments. Several researchers (e.g. Dietrich, 1989; Bourlakis & Bourlakis, 2005) note that TCE fails to explain the interdependent nature of business-to-business (B2B) relationships. The dependency concept is more broadly examined in RDT.

1.2. RDT perspective

The main tenet of RDT is the existence of some companies that are self-sufficient in terms of resources (Reid et al., 2001). Companies with inefficient resources become dependent on the companies who possess them. RDT suggests that to secure scarce resources and reduce uncertainty, companies tend to build bilateral relationships through, for example, mergers and acquisitions, joint ventures and other inter-organisational relationships (Pfeffer & Salancik, 1978; Stern & Reve, 1980). Any asset, such as information, knowledge, material or capital, may be regarded as a resource in this context (Tillquist et al., 2002).

According to RDT, "A depends upon B if he aspires to goals or gratifications whose achievement is facilitated by appropriate actions on B's part" (Emerson, 1962, p. 32). The power concept is closely related to dependency, meaning that if A depends on B, then B has power over A (Emerson, 1962). The magnitude of dependency is determined by the following factors: (1) the importance of the resource (structural dependence), (2) the availability of alternatives (market power), (3) the deployment of the resource (who controls the resource) (Medcof, 2001; Petersen et al., 2008). It may be observed that the nature of the dependency as a concept is much broader in RDT than in TCE.

The RDT literature examines the dependency as a tool which can be implemented by powerful actors in a supply chain to obtain favourable conditions in relationships with their dependent partners (Tillquist et al., 2002, pp. 93-94; Dastmalchian, 1986; Frooman, 1999; Pfeffer, 1992; Provan et al., 1980; Willer et al., 1997) and as a mechanism that promotes cooperation in the supply chain (Bensaou, 1997). Similar problems are also examined in the concept of power sources (French & Raven, 1959) where power asymmetry serves the interests of the more powerful party. This research stream also addresses the tactics which lead to more balanced power positions between the parties (Cowan et al., 2015; Pérez & Cambra-Fierro, 2015; Siemieniako & Mitręga, 2017).

When examining the impact of the dependency on the integration and coordination processes between the firms, the researchers highlight that only mutual dependency can lead to a successful collaboration and commitment (Kumar et al., 1995; Vijayasarathy, 2010; Kim et al., 2010; Kembro et al., 2014). Conversely, asymmetrical (unilateral) dependency is potentially considered a destructive factor in the organisational relationships (Vijayasarathy, 2010).

1.3. Connecting TCE and RDT theories with IOS literature

The study defines an IOS as an information system which is used in the buyer–supplier dyad for the purpose of coordination, i.e. sharing the information and knowledge. There are many technological solutions today which fall under the IOS category. The most commonly used IOSs are electronic data interchange (EDI) systems, integrated enterprise resource planning (ERP) systems, vendor managed inventory (VMI) systems, as well as highly customised software solutions offered by various IT developers. The expected benefits of employing an IOS are well-described in the literature. They may include the following: reduced transaction costs, reduced lead times, improved SC visibility, quick reaction to market changes, optimisation of internal processes, improved customer satisfaction (Chang et al., 2010; Johnson & Vitale, 1988; Malone et al., 1987).

In the literature, IOSs are often considered as a highly specific investment. These systems may reconfigure the existing business processes. It refers to the procedural asset specificity (Grover & Malhorta, 2003), and it often requires significant investments in the personnel training (Nelson & Winter, 1982).

When making the connection between the IOS, TCE and RDT theories with respect to the impact that IOSs have on the strategic electronic coordination, it is worth mentioning that the power-related issues may both (1) affect the IOS implementations and (2) be affected by the IOSs.

A powerful party can force a less powerful partner to deploy an IOS. A less powerful party, in its turn, has little possibilities to persuade the other party to use an IOS if the latter has little interest in using it (Wilson & Vlosky, 1998; Boonstra & Vries, 2005). For instance, the empirical research conducted by Yigitbasioglu (2010) demonstrates that the buyer dependency on the supplier and key supplier dependency on the buyer are positively related to the intensity of information sharing in the considered dyadic relationships. Yigitbasioglu (2010) asserts that the dependent buyers (for instance, due to the specific investments in the IOS) are more willing to share their information with the suppliers. Such buyers may also invest in the supplier information systems to get more information from the supplier side. The same arguments hold for the supplier dependency on the buyer.

On the other hand, the investments in the IOSs may have an impact on power-dependency structure which in the dyadic relationships has been established prior to the implementation of an IOS (Webster, 1995). For example, the buyer's power will increase if more suppliers will integrate their information systems with the buyer's IS. In that case, the buyer can take advantage of the leverage effect through the mechanism of electronic tendering.

It is worth to mention one specific feature of the IOS investments. On the one hand, TCE asserts that heavy investments in IOSs should increase the need for the investing party to safeguard the assets at risk. On the other hand, the companies make heavy invest-

ments in IOSs to reduce the cost of communication and increase monitoring power to protect the investments at risk (Clemons et al., 1993). While there is a consensus in the literature regarding the need to safeguard the highly specific assets, the impact that investments in an IOS have on the increased monitoring power and the strategic electronic coordination is not obvious. For example, the supplier's investments into an IOS made to obtain more information from the buyer about the demand, production planning, and inventory levels may not fulfil the purpose because of the buyer's unwillingness to share this strategic information. Thus, it can be concluded that the supplier's specific IOS investment is the necessary condition for the strategic electronic coordination improvement, but this condition alone does not suffice the coordination improvement.

A similar problem is addressed by Buvik and Reve (2002). They note that the main distinction between the TCA-based dependency established by the investments in specific assets and the RDT-based dependency may be described as "an important distinction between the incentive and the ability to safeguard assets at risk" (Buvik & Reve, 2002, p. 266). The authors claim that the RDT-based dependency (structural power) has an impact on a company's ability to protect specific assets and its bargaining power. A firm's need to safeguard the specific assets becomes lower when the firm can exercise the structural power over its partner.

1.4. Conclusions based on the literature examination

When a company invests in an IOS with the purpose of strategic information exchange, it puts investments at risk due to the excessive levels of procedural and human specificity of the IOS investments. According to TCE, high asset specificity increases switching cost and therefore the dependency on its trading partner. There is a need for the investing firm to safeguard these risky investments. TCE suggests using formal contracts as a safeguard tool and the main driver for information sharing. The other party's unwillingness to share the strategic information may create obstacles to formal contracting. It results in a search for other possible bonding mechanisms in the buyer–supplier dyad which can motivate the contractual parties to exchange the strategic information. The RDT asserts that structural dependency favours better terms of trade for more powerful actors. When the dependency is mutual, it influences the collaboration and commitment in a positive way.

Based on this reasoning, it is proposed that mutual dependency in a buyer–supplier dyad may occur when both conditions are satisfied: the supplier makes the investments in an IOS (TCE-based dependence), and the buyer is dependent on the supplier (structural RDT-based dependence). This type of mutual dependency can enforce the exchange of strategic business information via the IOS in the buyer–supplier dyad. Consequently, the following hypothesis is proposed:

Hypothesis 1: *When the buyer dependency is high, there is more positively shaped association between the supplier specific IOS investments and the strategic electronic coordination than under the conditions of low buyer dependency*.

1.5. IOS levels and strategic electronic coordination

IOSs provide different functionalities that serve different purposes in the buyer–seller relationships. According to Premkumar (2000), there are three levels of IOS development: (1) communication (substitution of paper/phone/fax modes of communication with computer-based communication), (2) coordination (information exchange on production planning, delivery schedules), and (3) cooperation (collaboration over product design and performance evaluation). A similar approach to classification of the stages of the IOS development is provided by Saeed, Malhorta, and Grover (2005). The first two stages imply only the integration of the buyer's purchasing system with the vendor's information system (placing the orders, order status check, etc.). Stages 3 and 4 imply the involvement of the buyer's production planning and control system into the information exchange with the vendor.

The section above examines the IOSs which allow firms to exchange their strategic information about production planning, product design, modifications, as well as new product development. These IOS characteristics correspond to the highest levels of the IOS development. On the other hand, the fact that the supplier uses the IOS for strategic coordination purposes does not conflict the use of the same IOS for both strategic and operational purposes such as processing of orders and invoices. Moreover, companies normally start the electronic collaboration with the exchange of simplest forms of information. It is reasonable to assume that the success of electronic information exchange on high levels of the IOS

sophistication depends (to some extent) on the way successful companies conduct their routine operations (such as invoicing and ordering via the IOS). For example, to cooperate on product design and its modifications, as well as development and testing of some new products, the companies also need to carry out the routine purchasing operations. The development and testing of new products require purchasing components, raw materials, and other items. Therefore, the strategic electronic collaboration process may be enhanced if the routine purchasing operations are supported by the IOSs instead of the older communication modes, such as phones and faxes. The following hypothesis is thereby proposed:

Hypothesis 2: *The electronic information exchange for tactical purposes is positively associated with the strategic electronic coordination*.

1.6. Other antecedents to strategic electronic coordination

To validate the suggested regression model which may be referred to as "Buyer dependency – strategic electronic coordination", three control variables are introduced: Buyer's industry type (BUYIND), Purchasing relative turnover (RELPUR), and Length of IT cooperation (LNITCOOP).

Buyer's industry type (BUYIND) is included to control possible differences between the type of manufacturing industry and other industries. The manufacturing sector is addressed more frequently in the TCE literature compared to other industry types (Zhao et al., 2004). It can be explained, for example, by the nature of business processes in the manufacturing industry which is more complex compared to those of the service industry. Broad use of physical assets, such as equipment, tools, vehicles, and the flow inventories, generate wider volumes of information compared to other industries. Therefore, it can be expected that manufacturing companies would be more willing to use an IOS for the purpose of strategic coordination. The variable is coded as a dummy variable: 1 – manufacturing, 0 – other industries (service, retail, public administration).

Purchasing relative turnover (*purchasing importance* RELPUR) demonstrates the buyer's purchasing volume from a particular supplier relative to the supplier's annual sales. This variable indicates the importance of the buyer for the supplier. In other words, it describes the magnitude of the supplier dependency. Pfeffer and Salancik (1978) note that the relative importance of sale or purchase interdependency positively correlates with the likelihood of mergers. Given that mergers correspond to a vertically integrated type of relationships, it can be assumed that high purchasing importance motivates firms to share their strategic information. As for the study, an assumption is made that high purchasing importance of a particular buyer can enforce the supplier's willingness to cooperate over such strategic issues as the product design and development, testing of new products, and the production planning.

Length of IT cooperation with the supplier (LNITCOOP) is measured as the natural logarithm of the number of years the companies have been cooperating via an IOS (Heide & John, 1990).

A positive association between the LNITCOOP and strategic electronic coordination is expected because of the increasing level of trust between the partners which normally evolves over time and with less IOS malfunctions.

2. Research method

A structural equation model (regression model) has been developed for the hypotheses testing. To collect the empirical data for the model, survey-based research has been conducted. The subsections below describe the data collection process and present the confirmatory factor analysis for the constructs used in the model "Buyer dependency – strategic electronic coordination."

2.1. Data collection

The unit of analysis is a buyer–supplier dyad which uses an IOS to exchange the business information. The data has been collected from Norwegian firms operating in different industries. First, a pilot test has been conducted among 20 firms to achieve the reliability of the items and to avoid possible misunderstandings in questions, scaling methods and inappropriate vocabulary (Hunt et al., 1982). The received feedback helped to revise the pilot questionnaire into its final version.

The questionnaire which contained 26 closed questions was sent by e-mail to the organisations with membership in NIMA (Norwegian Association of Purchasing and Logistics) and the companies registered in e-Procurement Secretariat in 2006. The sample size consisted of 1365 companies. The final questionnaire was sent to respondents in two

rounds with the time gap of two weeks. The total number of the answers received and available for analysis was 198. The non-response bias was measured between the first and the second rounds of data collection (Armstrong & Overton, 1977). The results of the t-test showed no significant difference between two groups concerning the annual sales volume, the number of employees and the purchasing volume (Hannås, 2007).

To achieve better information reliability about the investigated problem, key informant approach to the data collection was used. This approach is often applied to examine business-to-business relationships (Heide & John, 1992; Bensaou & Anderson, 1999; Buvik & John, 2000). The study considered key informants as those with knowledge about purchasing or logistic operations because they are related to upstream supply chain activities (Hannås, 2007).

2.2. Measures for the regression model "Buyer dependency – strategic electronic coordination"

To cover different aspects of the electronic coordination, various indicators to measure the information exchange between firms via various IOSs were used (Hannås, 2007). The items have been elaborated based on the coordination literature and the IOS literature (Buvik & John, 2000; Joshi & Stump, 1999; Zaheer & Venkatraman, 1995; Subramani, 2004).

Such measures as strategic electronic coordination (COORD) and operational electronic exchange (OPER) were derived from the confirmatory factor analysis (CFA) given the electronic coordination construct. To perform the CFA, AMOS graphics extension to SPSS 22 software was used.

The CFA suggests three-factor solutions for the electronic coordination construct. The results from the CFA for electronic coordination are presented below.

Chi-square = 52.424; degrees of freedom = 24; probability level = 0.001; CMIN/DF = 2.184; CFI = 0.953; NFI = 0.920; TLI = 0.912; RMSEA = 0.078.

Strategic electronic coordination (COORD: 3 items):

- (Q11_4) coordination of production plans (0.73),
- (Q11_5) product and design modifications (0.87),
- (Q11_6) development and testing of new products (0.83).

Operational electronic exchange (OPER: 3 items):

- (Q11_2) ordering process (0.58),
- (Q11_3) invoicing and payments (0.65),
- (Q11_9) active replenishment of our inventories (0.57).

The third suggested construct is not used in our model. It has the following items:

- (Q11_8) tender processing (0.71),
- (Q11_10) document exchange (0.75),
- (Q11_11) product specifications (0.76).

The dependent variable of the regression model "Buyer dependency – strategic electronic coordination" reflects the strategic business information which is exchanged in the buyer–supplier dyad via an IOS. The factor analysis has assigned three items (Q11_4, Q11_5, Q11_6) to COORD variable (Cronbach's $\alpha = 0.842$).

2.3. Independent variables of the regression model "Buyer dependency – strategic electronic coordination"

Buyer dependency (BUYERDEP) refers to the buyer's switching costs associated with changing the current supplier. The construct was developed based on Heide (1994). Factor analysis confirmed one-factor solution (Cronbach's $\alpha = 0.678$) with the three following items:

- (Q14_3) buyer makes extensive adaptations in the production system to make use of products from this supplier (0.99);
- (Q14_4) extensive internal reorganisation of our company to collaborate more efficiently with this supplier (0.74);
- (Q23_1) it would be relatively costly for our company to replace this supplier (0.34).

Supplier IT specific investments (SITINV) describe the investments in the IOS made by the supplier to facilitate the information exchange in the buyer–supplier dyad. The items of this construct attempt to cover the most important dimensions of the IT investments, such as personnel training, investments in software and hardware, the efforts undertaken by the supplier to integrate the IT systems of the buyer and the supplier. The factor analysis suggests one construct (Cronbach's $\alpha = 0.887$) with the four following items:

- (Q13_1) the supplier invests extensively in their own IT competence (0.84);
- (Q13_2) the supplier invests extensively in IT systems by our standards and requirements (0.96);

Tab. 1. Discriminant validity, the four-factor solution

	Component			
	1	2	3	4
Ordering processes	0.029	0.028	−0.025	**0.846**
Invoicing/payment processes	0.205	0.128	0.076	**0.769**
Replenishment systems	0.373	0.286	0.115	**0.469**
Production plans	0.101	**0.784**	0.116	0.215
Product/design	0.034	**0.904**	0.151	−0.004
Development/testing	0.154	**0.836**	0.198	0.098
Supp_ITspecinv_upgrading IT skills	**0.889**	0.076	−0.006	0.043
Supp_ITspecinv_IT systems	**0.902**	0.100	0.006	0.120
Supp_ITspecinv_training supplier's personnel for e-coordination	**0.800**	0.192	0.137	0.184
Supp_ITspecinv_integrate buyer/supplier's IT system	**0.791**	−0.024	0.110	0.105
Buyer_specinv_adapting internal production system	0.168	0.177	**0.876**	−0.028
Buyer_specinv_reorg internal routines for supplier collaboration	0.185	0.067	**0.873**	−0.020
IT would be relatively costly for us to replace this supplier	−0.126	0.198	**0.546**	0.152

- (Q13_3) the supplier invests substantially in training of their employers (0.79);
- (Q13_6) made extensive investments to integrate their IT systems with our IT systems (0.69).

Chi-square = 1.316; degrees of freedom = 2; probability level = 0.518; CMIN/DF = 0.658; CFI = 1.00; NFI = 0.997; TLI = 1.00; RMSEA = 0.000.

Operational electronic exchange (OPER) aims to describe the information flow on the very first level of the IOS sophistication (Premkumar, 2000). This factor is obtained from a broader construct called "Vertical electronic coordination". Three items have been assigned to this factor (Cronbach's $\alpha = 0.619$)

Other variables, such as *Purchasing relative turnover* (purchasing importance (RELPUR)), *Length of IT cooperation with the supplier* (LNITCOOP), and *Buyer's industry type*, are included in the model as control variables and are not subject to reliability tests.

The factor analysis was used to assesses the discriminant validity for the 13 items which describe strategic electronic coordination (COORD), buyer dependence (BUYERDEP), operational electronic exchange (OPER), and Supplier IT specific investments (SITINV). The factor analysis with varimax rotation suggested the four factors. The factor loadings are presented in the Tab. 1.

All the loadings of the constructs are above the 0.40 level which is often considered a cut-off point as a rule of thumb (Buvik & Haugland, 2005). Standardised variables were used, namely, strategic electronic coordination (COORD), buyer dependence (BUYERDEP), operational electronic exchange (OPER), and supplier IT specific investments (SITINV).

3. Specification of the regression model "Buyer dependency – strategic electronic coordination"

An OLS-regression model in SPSS statistics 22 software was built to test the hypotheses. The suggested model is presented in (1). Here, COORD is strategic electronic coordination, SITINV is supplier specific IOS investments, BUYERDEP corresponds to the buyer dependency, OPER is the operational electronic exchange, RELPUR is the relative purchasing turnover, LNITCOOP corresponds to the length of IT cooperation with the supplier, and BUYIND is the buyer's industry type.

$$\begin{aligned} COORD = {} & b_0 + b_1 \cdot SITINV + b_2 \cdot BUYERDEP \\ & + b_3 \cdot BUYERDEP \cdot SITINV + b_4 \cdot OPER + b_5 \cdot RELPUR \\ & + b_6 \cdot LNITCOOP + b_7 \cdot BUYIND + b_8 \cdot SITINV + \varepsilon \end{aligned} \quad (1)$$

H1 was analysed as a partial derivative of the equation (1) based on Schoonhoven (1981). An estimate was made of the effect of the supplier specific IT investments on strategic electronic coordination during an increase in the buyer dependency (BUYERDEP), as shown in equation (2).

Tab. 2. Correlations matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SITINV X BUYERDEP (1)	Pearson Correlation	1	0.131	−0.025	−0.018	−0.070	−0.098	−0.007	−0.101
	Sig. (1-tailed)		0.079	0.393	0.422	0.227	0.147	0.472	0.137
COORD (2)	Pearson Correlation		1	0.369**	0.159*	−0.051	0.251**	0.356**	0.236**
	Sig. (1-tailed)			0.000	0.043	0.291	0.003	0.000	0.005
BUYERDEP (3)	Pearson Correlation			1	0.052	0.016	0.255**	0.180*	0.192*
	Sig. (1-tailed)				0.290	0.432	0.003	0.025	0.019
BUYIND (4)	Pearson Correlation				1	0.131	0.027	0.150	−0.129
	Sig. (1-tailed)					0.079	0.388	0.053	0.082
RELPUR (5)	Pearson Correlation					1	0.227**	−0.138	−0.022
	Sig. (1-tailed)						0.007	0.069	0.407
LNITCOOP (6)	Pearson Correlation						1	0.157*	0.146
	Sig. (1-tailed)							0.046	0.058
OPER (7)	Pearson Correlation							1	0.367**
	Sig. (1-tailed)								0.000
SITINV (8)	Pearson Correlation								1
	Sig. (1-tailed)								

Note: * correlation is significant at the 0.05 level (1-tailed); ** correlation is significant at the 0.01 level (1-tailed).

$$\frac{\partial COORD}{\partial SITINV} = b_1 + b_3 \cdot BUYERDEP \quad (2)$$

According to H1, an increased level of the buyer's specific IT investments should contribute to a more extensive strategic electronic collaboration as the level of the buyer's dependency increases.

H2 was tested as a direct effect of operational electronic exchange on the strategic electronic coordination.

Tab. 3. Descriptive statistics

	Mean	Std. deviation	N
COORD	3.0150	1.54354	118
SITINV X BUYERDEP	0.3159	1.65405	118
BUYERDEP	2.8503	1.27497	118
BUYIND	0.4200	0.49600	118
RELPUR	8.3287	13.80267	118
LNITCOOP	1.2588	0.73352	117
OPER	4.4266	1.45779	118
SITINV	2.9776	1.30576	118

4. Results

The model has been tested for heteroscedasticity. No heteroscedasticity has been found (F = 0.975; p = 0.453).

The correlation matrix and the descriptive statistics are presented in Tab. 2 and 3, respectively.

The model demonstrates the acceptable goodness of the fit R^2_{Adj} = 0.243 (F = 6.306; df = 7; p < 0.01). Since the main hypothesis H1 is to test the interaction effect, there is a need to test whether the interaction adds the explanatory power to the regression model (Akien & West, 1991). Hierarchical multiple regression was used to estimate the statistical significance of the interaction effect. The results show that the R2 change is 0.027 (F = 4.135; df = 1; p < 0.05) which means that the interaction term is significant in the model.

The results of the regression analysis presented in Tab. 4 demonstrate the support of the hypothesis H1. The impact of the interaction effect between the supplier IT specific investments and the buyer dependency on strategic electronic collaboration is positive and significant (b_3 = 0.157; t = 2.033; p < 0.05), refer to Fig. 1.

Fig. 1 illustrates that the supplier's specific investments are well protected against the buyer's oppor-

Tab. 4. Regression analysis

Model	Unstandardised coefficients		Standardised coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	−0.493	0.282		−1.745	0.084
Supplier IT investments (SITINV)	b_1 = 0.143	0.108	0.120	1.324	0.188
Buyer dependency (BUYERDEP)	b_2 = 0.316	0.105	0.259	3.021	0.003
SITINV × BUYERDEP	b_3 = 0.157	0.077	0.166	2.033	0.044
Operational electronic exchange (OPER)	b_4 = 0.224	0.097	0.211	2.306	0.023
Purchasing relative turnover (RELPUR)	b_5 = −0.008	0.010	−0.070	−0.818	0.415
Length of IT cooperation (LNITCOOP)	b_6 = 0.345	0.185	0.163	1.862	0.065

Note: dependent variable: Strategic electronic coordination (COORD); n=118.

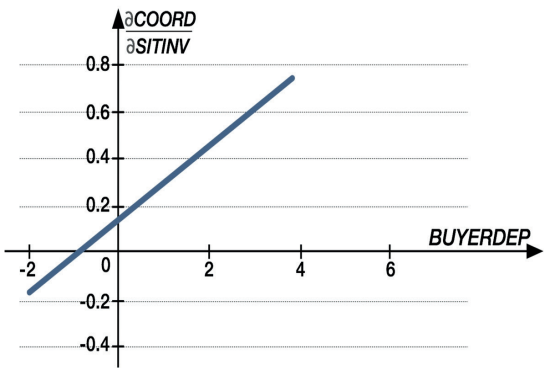

Fig. 1. Association between the supplier specific IT investments and the strategic electronic coordination for different buyer dependency levels

Source: results received by the author from the model run.

tunistic behaviour at the level of buyer's dependency greater than −0.91 (the mean centred value). Given that the mean value of the buyer dependency is 2.85 (Tab. 3), it can be concluded that in approximately 84% of cases (−0.91 is close to one standard deviation which corresponds to 34% confidence interval to the left from the Oy axis) strategic electronic coordination is strongly enforced by the buyer dependency's value of 1.94 on a seven-point Likert scale (1.94 = 2.85 − 0.91). This result is interesting. The minor change in the level of the buyer dependency from 1 (i.e. the buyer being very powerful) to ≈ 2 (i.e., the buyer is still powerful, but the magnitude of the buyer's power is slightly less) changes the value of the strategic electronic collaboration from negative (i.e. lower than the mean value) to positive (i.e. above the mean value).

The main effect of the independent variables which constitute to the interaction effect is statistically significant only for BUYERDEP (b_2 = 0.316; t = 3.021; $p < 0.05$). The effect of SITINV is positive but not significant. It may indicate that the IT investments per sé are beneficial only if they are coupled with other factors, such as, for example, trust (Ibbott & O'Keefe, 2004), IT infrastructure (Premkumar & Ramamurthy, 1995), power-dependency issues (Allen et al., 2000), and shared vision of the IOS goals between the firms (Poon & Wagner, 2001).

As suggested by H2, the relation between the electronic exchange of operational information and the strategic electronic coordination is both positive and statistically significant (b_4 = 0.224; t = 2.306; $p < 0.05$). This result indicates that the success of strategic information exchange between the firms depends on the success of the initial stage of the IOS deployment when the two companies start to exchange with the simplest transactional type of information.

As for effects of the control variables on COORD, not all of them demonstrated expected results. Only the LNITCOOP had a significant positive relation to COORD (b_6 = 0.345; t = 1.862; $p < 0.1$). The effect of the variable RELPUR on COORD was close to zero and insignificant (b_5 = −0.008; t = −0.818; p = 0.415). The dummy variable BUYIND had a positive effect on COORD but was insignificant (b_7 = 0.419; t = 2.306; p = 0.115). The next section of this paper elaborates on the possible reasons for the statistical insignificance of these two control variables in the regression model.

Conclusions

The results of the research presented in this paper contribute to one of the main domains in the supply

chain literature, namely the coordination literature. Also, an important role of structural dependencies in the information sharing within buyer–supplier dyads is highlighted for the decision-making units. These two aspects are discussed in the following two subsections concluding this paper.

The empirical analysis aims to explain the mechanism of electronic information exchange of the strategic business information in the buyer–supplier dyad.

The research shows that SITINV by itself does not enhance the strategic electronic coordination (COORD). This result supports the IOS literature stream claiming that IOSs may only have a neutral impact on firms' goals and objectives unless other specific characteristics of transactions are considered (Grover & Ramanlal, 1999). This result also indirectly reveals close agreement with the TCE assumption that unilaterally made specific investments may increase the risk of opportunism and the dependency on the non-investing party. In such conditions, the companies' willingness to create long-term connections with others reduces significantly (Heide, 1994).

However, the effect of SITINV on COORD becomes significant and positive when the buyer dependency (BUYERDEP) increases. It can be observed that BUYERDEP relaxes the problem of opportunistic behaviour caused by SITINV and forces both parties to share the sensitive strategic business information. Our results support the theoretical predictions that mutual dependency improves the coordination between the firms (Vijayasarathy, 2010; Kembro et al., 2014). In our example, bilateral dependency is created by the supplier's specific IT investments on the one side and the buyer's dependency on the other.

The statistical results of testing H1 demonstrate that when the level of BUYERDEP is higher than 1 on a seven-point Likert scale, COORD takes the values which are above the mean (Fig. 1). It can, therefore, be concluded that regardless of the BUYERDEP level (low or high) it has a strong impact on the companies' decision to share the strategic information via an IOS.

It has also been observed that the direct effect of BUYERDEP on COORD is positive and significant. This finding evidently supports the idea of the dependency created by the adjustment of a company's business routines to its partner's business processes. This is the situation when the dependency is set up by a non-monetary type of switching costs like routines and procedures (Dick & Basu, 1994; Heide & Weiss, 1995). When the dependency is high, a buyer has a strong incentive to share the strategic information with a dominant supplier.

It should be admitted that the scope of theoretical implications in our findings is restricted to a specific type of coordination (induced and conducted via an IOS) and a specific kind of dependency. The latter, however, represents the synthesis of the two types of the dependency: the technical adaptations and the structural dependency (Heide & John, 1992). It has also been noted that the technical component is incorporated in the variables which constitute the interaction effect (SITINV × BUYERDEP) and in the dependent variable COORD. It is reasonable to assume that the other types of dependencies, the specific investments or coordination mechanisms might create cause–effect relationships that may differ from the ones suggested in our model.

Our study also attempts to look somewhat deeper into the nature of the inter-organisational information exchange and test for the existence of the cause–effect relationships between some of its levels. The IOS literature proposes that the higher is the IOS development level, the more benefits the IOS users reap. However, the literature is not clear on whether the companies can reach the highest level of the IOS development which corresponds to the strategic coordination without having a well-established and functioning information exchange on its lowest level. Our research finds a positive association between low and high levels of information exchange via an IOS. This association can be explained by the technical factor and the features of the inter-firm coordination.

From the technical standpoint, less technical failures should be expected in the IOS functioning at the stage of strategic information exchange if the IOS has been previously tested and used at the stage of operational information exchange. Also, if the operational collaboration via the IOS precedes the strategic one, less personnel training should be expected for the staff to be able to work with the IOS. Thus, the risk of human factor mistakes may also be mitigated.

The connection between the operational and strategic levels of information exchange can reflect a situation when the operational information exchange represents a background for collaboration over the strategic issues. For instance, two stages of interaction between the firms can be specified in a collaborative product development process which refers to the strategic level of collaboration. At the first stage, the companies exchange their design ideas about the new product, use visualisation and

simulation tools within an IOS. The verification and testing of the new product are done on the following stage when ideas get materialised, and the physical transfer of the new product (its components or materials) between firms becomes required. The implementation of this stage is closely related to such routine business operations as invoicing, ordering, and payments. It is reasonable to assume that these operations are performed in the most efficient way when they are conducted via an IOS, thus, positively contributing to the collaborative product development process.

A few words of comment are necessary concerning the control variables: the relative purchasing turnover (RELPUR), the length of IT cooperation (LNITCOOP), and the buyer's industry type (BUYIND). Remarkably, these control variables which are not directly related to the use of IOS, demonstrated no significant correlation with COORD while the effect of the IOS-related variable LNITCOOP on COORD turned out to be as expected.

The non-significance of BUYIND variable is attributed to the statistical properties of our study sample. The observed buyer–seller dyads demonstrate a high level of operational electronic exchange (i.e. mean value of 4.4, mode value of 5 on a seven-point Likert scale) and low level of strategic electronic collaboration (mean value of 3, mode value of 1 on a seven-point Likert scale). Based on the mentioned concept of the IOS development and the mean values of OPER and COORD, it can be concluded that most dyads in the industrial sector are located at the initial stage of the IOS development. A larger number of dyads in the manufacturing industry which employ the IOS both for the operational and the strategic purposes could have altered statistical results of testing the BUYIND control variable.

Statistical non-significance of the relative purchasing turnover (RELPUR) variable can be explained by an ambivalent impact of this variable on COORD, i.e. it depends on the level of BUYERDEP. For example, increasing the level of RELPUR may shift power–dependency balance towards the buyer. If the high level of RELPUR is combined with the low level of BUYERDEP, it creates a strong incentive for the buyer's opportunistic behaviour and can hamper COORD. On the contrary, a mutual dependency that favours the strategic information exchange can be set up if the high level of RELPUR is coupled with the high level of BUYERDEP.

From a managerial standpoint, the results underline the importance of understanding the role of the structural dependencies in strategic information sharing in a supply chain. Sharing the sensitive strategic data (such as forecasts and product design) can be considered by various companies as a threat if they expect an opportunistic behaviour from other actors. On the other hand, if long-term buyer–supplier relationships are preferred to the arms-length ones, an extensive information exchange becomes a prerequisite to successful cooperation. So, practitioners may want to know which partners pose the most and least risk in sharing the strategic information. In our study, suppliers who invested heavily in the IOS are at risk. Furthermore, if the buyers are powerful, they represent an additional threat to the suppliers. These two factors, when coupled together, can easily block the suppliers' managerial decision to share certain sensitive strategic information with the buyers. One solution could be to search for less powerful buyers, although it might be difficult to do. Also, the suppliers can use different marketing tools to increase the buyer dependency and therefore to mitigate the risk of opportunism from the buyer side.

Another strategy could be to establish an extensive exchange of strategic information with those buyers, with whom the company has been long cooperating via the IOS. In this case, the practitioners may expect more trusting relationships between the partners who cooperate with via IOSs for many years. That may have a positive effect on the strategic information sharing (Yigitbasioglu, 2010).

The presented results also highlight the importance of the B2B market research conducted by specialists of a marketing department. Market indicators that can directly or indirectly describe the power-dependency structures as, for example, the market share Herfindahl-Hirschman Index, should be monitored on a regular basis.

The presented study has certain limitations. First, the developed model is based on the two theories while there are at least seven other theories which attempt to find the pre-requisites and drivers for information sharing in the supply chains (Kembro et al., 2014). Second, the level of the supplier's IT-specific investments from the buyer's perspective was estimated. Another result could have been obtained if the suppliers made their own evaluation of the IT-specific investments. And third, R-square of our model is relatively low which means that more antecedents of COORD may have been included into our model to increase its explanatory power. In turn, the bigger sample size is required to test the model with a bigger number of COORD antecedents.

Literature

Akien, L. S., & West, S. G. (1991). *Multiple regression: testing and interpreting interactions*. London, England: SAGE Publications.

Allen, D. K., Colligan, D., Finnie, A., & Kern, T. (2000). Trust, power and interorganizational information systems: the case of the electronic trading community TransLease. *Information Systems Journal*, *10*(1), 21-40. doi: 10.1046/j.1365-2575.2000.00078.x

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of marketing research*, 396-402. doi: 10.2307/3150783

Arshinder, A. K., & Deshmukh, S. G. (2008). Supply chain coordination: Perspectives, empirical studies and research directions. *International Journal Production Economics*, *115*, 316-318. doi: 10.1016/j.ijpe.2008.05.011

Barroso, C., & Picón, A. (2012). Multi-dimensional analysis of perceived switching costs. *Industrial Marketing Management*, *41*(3), 531-543. doi: 10.1016/j.indmarman.2011.06.020

Bensaou, M. (1997). Interorganizational cooperation: the role of information technology and empirical comparison of US and Japanese supplier relations. *Information System Research*, *8*(2), 107-124. doi: 10.1287/isre.8.2.107

Bensaou, M., & Anderson, E. (1999). Buyer-supplier relations in industrial markets: when do buyers risk making idiosyncratic investments? *Organization Science*, *10*(4), 460-481. doi: 10.1287/orsc.10.4.460

Berry, L. L., & Parasuraman, A. (1991). *Marketing Services: Competing through Quality*. Lexington, USA: Free Press, & Lexington Books.

Blut, M., Evanschitzky, H., Backhaus, C., Rudd, J., & Marck, M. (2016). Securing business-to-business relationships: The impact of switching costs. *Industrial Marketing Management*, *52*, 82-90. doi: 10.1016/j.indmarman.2015.05.010

Boonstra, A., & de Vries, J. (2005). Analyzing inter-organizational systems from a power and interest perspective. *International Journal of Information Management*, *25*(6), 485-501. doi: 10.1016/j.ijinfomgt.2005.08.006

Bourlakis, C., & Bourlakis, M. (2005). Information technology safeguards, logistics asset specificity and fourth-party logistics network creation in the food retail chain. *Journal of Business & Industrial Marketing*, *20*(2), 88-98. doi: 10.1108/08858620510583687

Buvik, A., & Haugland, S. A. (2005). The allocation of specific assets, relationship duration, and contractual coordination in buyer–seller relationships. *Scandinavian Journal of Management*, *21*(1), 41-60. doi: 10.1016/j.scaman.2005.02.003

Buvik, A., & John, G. (2000). When does vertical coordination improve industrial purchasing relationships? *Journal of Marketing*, *64*(4), 52-64. doi: 10.1509/jmkg.64.4.52.18075

Buvik, A., & Reve, T. (2002). Inter-firm governance and structural power in industrial relationships: the moderating effect of bargaining power on the contractual safeguarding of specific assets. *Scandinavian Journal of Management*, *18*(3), 261-284. doi: 10.1016/S0956-5221(01)00018-5

Chang, H. H., Wang, H.-W., & Kao, T. W. (2010). The determinants of long-term relationship on interorganizational systems performance. *Journal of Business & Industrial Marketing*, *25*(2), 106-118. doi: 10.1108/08858621011017732

Clemons, E. K., Reddi, S. P., & Row, M. C. (1993). The impact of information technology on the organization of economic activity: The "move to the middle" hypothesis. *Journal of Management Information Systems*, *10*(2), 9-35. doi: 10.1080/07421222.1993.11517998

Clemons, E. K., & Row, M. C. (1992). Information technology and industrial cooperation: the changing economics of coordination and ownership. *Journal of Management Information Systems*, *9*(2), 9-28. doi: 10.1080/07421222.1992.11517956

Cowan, K., Paswan, A. K., & van Steenburg, E. (2015). When inter-firm relationship benefits mitigate power asymmetry. *Industrial Marketing Management*, *48*, 140-148. doi: 10.1016/j.indmarman.2015.03.013

Dastmalchian, A. (1986). Environmental characteristics and organizational climate: An exploratory study. *Journal of Management Studies*, *23*(6), 609-633. doi: 10.1111/j.1467-6486.1986.tb00439.x

Dick, A. S., & Basu, K. (1994). Customer loyalty, toward an integrated conceptual framework. *Journal of Academy of Marketing Science*, *22*(2), 99-114. doi: 10.1177/0092070394222001

Dietrich, M. (1989). *Transaction Cost Economics and Beyond*. London, England: Routledge.

Emerson, R. M. (1962). Power-dependence relations. *American Sociological Review*, *27*(1), 31-41.

French, J. R. P., & Raven, B. (1959). The bases of social power. In D. Cartwright (Ed.), *Studies in social power* (pp. 150-167). Michigan, USA: University of Michigan.

Frooman, J. (1999). Stakeholder influence strategies. *Academy of Management Review*, *24*(2), 191-205. doi: 10.5465/AMR.1999.1893928

Gao, T., & Tian, Y. (2014). Mechanism of supply chain coordination cased on dynamic capability framework the mediating role of manufacturing capabilities. *Journal of Industrial Engineering and Management*, *7*(5), 1250-1267. doi: 10.3926/jiem.1266

Geiger, I., Durand, A., Saab, S., Kleinaltenkamp, M., Baxter, R., & Lee, Y. (2012). The bonding effects of relationship value and switching costs in industrial buyer–seller relationships: An investigation into role differences. *Industrial Marketing Management*, *41*(1), 82-93. doi: 10.1016/j.indmarman.2011.11.013

Grover, V., & Malhorta, M. K. (2003). Transaction cost framework in operations and supply chain management research: theory and measurement. *Journal of Operations Management*, *21*, 457-473. doi: 10.1016/S0272-6963(03)00040-8

Grover, V., & Ramanlal, P. (1999). Six Myths of Information and Markets: Information Technology Networks, Electronic Commerce, and the Battle for Consumer Surplus. *MIS Quarterly*, *23*(4), 465-495. doi: 10.2307/249486

Grover, V., & Saeed, K. A. (2007). The impact of product, market, and relationship characteristics on interorganizational system integration in manufacturer–supplier dyads. *Journal of Management Information Systems*, *23*(4), 185-216. doi: 10.0.10.193/MIS0742-1222230409

Hannås, G. (2007). V*ertical electronic coordination and specific IT investments in business-to-business relationships* [Ph.D. dissertation]. Molde, Norway: Molde University College.

Heide, J. B. (1994). Interorganizational governance in marketing channels. *Journal of Marketing*, *58*(1), 71-85. doi: 10.2307/1252252

Heide, J. B., & John, G. (1990). Alliances in industrial purchasing: The determinants of joint action in buyer-supplier relationships. *Journal of Marketing Research*, *27*(1), 24-36. doi: 10.2307/3172548

Heide, J. B., & John, G. (1992). Do norms matter in marketing relationships? *The Journal of Marketing*, *58*(2), 32-44. doi: 10.2307/1252040

Heide, J. B., & Weiss, A. M. (1995). Vendor consideration and switching behavior for buyers in high-technology markets. *Journal of Marketing*, *59*(7), 33-43. doi: 10.2307/1252117

Hunt, S. D., Sparkman R. D., & Wilcox, J. B. (1982). The pretest in survey research: Issues and preliminary findings. *Journal of Marketing Research*, *19*(2), 269-273. doi: 10.2307/3151627

Ibbott, C. J., & O'Keefe, R. M. (2004). Trust, planning and benefits in a global interorganizational system. *Information Systems Journal*, *14*(2), 131-152. doi: 10.1111/j.1365-2575.2004.00167.x

Johnston, H. R., & Vitale, M. R. (1988). Creating competitive advantage with interorganizational information systems. *MIS Quarterly*, *12*(2), 153-165. doi: 10.2307/248839

Joshi, A. W., & Stump, R. L. (1999). The contingent effect of specific asset investments on joint action in manufacturer-supplier relationships: An empirical test of the moderating role of reciprocal asset investments, uncertainty, and trust. *Journal of the Academy of Marketing Science*, *27*(3), 291-305. doi: 10.1177/0092070399273001

Kembro, J., Selviaridis, K., & Näslund, D. (2014). Theoretical perspectives on information sharing in supply chains: a systematic literature review and conceptual framework. *Supply Chain Management: An International Journal*, *19*(5/6), 609-625. doi: 10.1108/SCM-12-2013-0460

Kim, K. K., Park, S. H., Ryoo, S. Y., & Park, S. K. (2010). Interorganizational cooperation in buyer–supplier relationships: both perspectives. *Journal of Business Research*, *63*(8), 863-869. doi: 10.1016/j.jbusres.2009.04.028

Kumar, N., Scheer, L. K., & Steenkamp, J. B. E. (1995). The effects of supplier fairness on vulnerable resellers. *Journal of Marketing Research*, *32*(1), 54-65. doi: 10.2307/3152110

Larsen, T. (2000). European logistics beyond 2000. *International Journal of Physical Distribution & Logistics Management*, *30*(5), 377-387. doi: 10.1108/09600030010336144

Malone, T. W., Yates, J., & Benjamin, R. I. (1987). Electronic markets and electronic hierarchies. *Communications of the ACM*, *30*(6), 484-497. doi: 10.1145/214762.214766

Medcof, J. W. (2001). Resource-based strategy and managerial power in networks of internationally dispersed technology units. *Strategic Management Journal*, *22*(11), 999-1012. doi: 10.1002/smj.192

Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining supply chain management. *Journal of Business Logistics*, *22*(2), 1-25. doi: 10.1002/j.2158-1592.2001.tb00001.x

Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Cambridge, England: Belknap Press/Harvard University Press.

Pérez, L., & Cambra-Fierro, J. (2015). Learning to work in asymmetric relationships: insights from the computer software industry. *Supply Chain Management: An International Journal*, *20*(1), 1-10. doi: 10.1108/SCM-12-2013-0468

Petersen, K. J., Handfield, R. B., Lawson, B., & Cousins, P. D. (2008). Buyer dependency and relational capital formation: the mediating effects of socialization processes and supplier integration. *Journal of Supply Chain Management*, *44*(4), 53-65. doi: 10.1111/j.1745-493X.2008.00072.x

Pfeffer, J. (1992). Understanding power in organizations. *California Management Review*, *34*(2), 29-50.

Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence approach*. New York, USA: Harper & Row Publishers.

Poon, P., & C. Wagner. (2001). Critical success factors revisited: success and failure cases of information systems for senior executives. *Decision Support Systems*, *30*(4), 393-418. doi: 10.1016/S0167-9236(00)00069-5

Porterfield, T. E., Bailey, J. P., & Evers, P. T. (2010). B2B eCommerce: an empirical investigation of information exchange and firm performance. *International Journal of Physical Distribution & Logistics Management*, *40*(6), 435-455. doi: 10.1108/09600031011062182

Premkumar, G. P. (2000). Interorganization systems and supply chain management. *Information Systems Management*, *17*(3), 1-14. doi: 10.1201/1078/43192.17.3.20000601/31241.8

Premkumar, G., & Ramamurthy, K. (1995). The role of interorganizational and organizational factors on the decision mode for adoption of interorganizational systems. *Decision Sciences*, *26*(3), 303-336. doi: 10.1111/j.1540-5915.1995.tb01431.x

Provan, K. G., Beyer, J. M., & Kruytbosch, C. (1980). Environmental linkages and power in resource-dependence relations between organizations. *Administrative Science Quarterly*, *25*(2), 200-225. doi: 10.2307/2392452

Reid, D., Bussiere, D., & Greenaway, K. (2001). Alliance formation issues for knowledge-based enterprises. *International Journal of Management Reviews*, *3*(1), 79-100. doi: 10.1111/1468-2370.00055

Romano, P. (2003). Coordination and integration mechanisms to manage logistics processes across supply networks. *Journal of Purchasing & Supply Management*, *9*(3), 119-134. doi: 10.1016/S1478-4092(03)00008-6

Saeed, K. A., Malhotra, M. K., & Grover, V. (2005). Examining the impact of interorganizational systems on process efficiency and sourcing leverage in buyer–supplier dyads. *Decision Sciences*, *36*(3), 365-396. doi: 10.1111/j.1540-5414.2005.00077.x

Schoonhoven, C. B. (1981). Problems with contingency theory: testing assumptions hidden within the language of contingency "theory". *Administrative Science Quarterly*, *26*(3), 349-377.

Short, J. E., & Venkatraman, N. (1992). Beyond business process redesign: redefining Baxter's business network. *Sloan Management Review*, *34*(1), 7-21.

Siemieniako, D., & Mitręga, M. (2017). Improving power position with regard to non-mediated power sources – the supplier's perspective. *Industrial Marketing Management* (In Press).

Stern, L. W., & Reve, T. (1980). Distribution channels as political economies: a framework for comparative analysis. *The Journal of Marketing*, *44*(3), 52-64. doi: 10.2307/1251111

Subramani, M. (2004). How do suppliers benefit from information technology use in supply chain relationships? *MIS Quarterly*, *28*(1), 45-73.

Svensson, G. (2002). The theoretical foundation of supply chain management. *International Journal of Physical Distribution & Logistics Management*, *32*(9), 734-754. doi: 10.1108/09600030210452422

Tillquist, J., King, J. L., & Woo, C. (2002). A representational scheme for analyzing information technology and organizational dependency. *MIS Quarterly*, *26*(2), 91-118. doi: 10.2307/4132322

Vijayasarathy, L. R. (2010). Supply integration: an investigation of its multi-dimensionality and relational antecedents. *International Journal of Production Economics*, *124*(2), 489-505. doi: 10.1016/j.ijpe.2010.01.010

Webster, J. (1995). Networks of collaboration or conflict? Electronic data interchange and power in the supply chain. *Journal of Strategic Information Systems*, *4*(1), 31-42. doi: 10.1016/0963-8687(95)80013-G

Willer, D., Lovaglia, M. J., & Markovsky, B. (1997). Power and influence: A theoretical bridge. *Social Forces*, *76*(2), 571-603. doi: 10.1093/sf/76.2.571

Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American Journal of Sociology*, *87*(3), 548-577. doi: 10.1086/227496

Williamson, O. E. (1985). *The Economic Institutions of Capitalism*. New York, USA: Free Press.

Wilson, D. T., & Vlosky, R. P. (1998). Interorganizational information system technology and buyer–seller relationships. *Journal of Business & Industrial Marketing*, *13*(3), 215-234. doi: 10.1108/08858629810222225

Xu, L., & Beamon, B. M. (2006). Supply chain coordination and cooperation mechanisms: an attribute-based approach. *Journal of Supply Chain Management*, *42*(1), 4-12. doi: 10.1111/j.1745-493X.2006.04201002.x

Yao, L. J., Liu, C., & Chan, S. H. (2010). The influence of firm specific context on realizing information technology business value in manufacturing industry. *International Journal of Accounting Information Systems*, *11*(4), 353-362. doi: 10.1016/j.accinf.2010.09.007

Yigitbasioglu, O. M. (2010). Information sharing with key suppliers: a transaction cost theory perspective. *International Journal of Physical Distribution & Logistics Management*, *40*(7), 550-578. doi: 10.1108/09600031011072000

Zaheer, A., & Venkatraman, N. (1995). Relational governance as an interorganizational strategy: An empirical test of the role of trust in economic exchange. S*trategic Management Journal*, *16*(5), 373-392. doi: 10.1002/smj.4250160504

Zhao, H., Luo, Y., & Suh, T. (2004). Transaction cost determinants and ownership-based entry mode choice: a meta-analytical review. *Journal of International Business Studies*, *35*(6), 524-544. doi: 10.1057/palgrave.jibs.8400106