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The Purchasing Performance of Organizations Using e-Marketplaces

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**We apply transaction cost economic theory and perspectives in an empirical test
regarding purchasing performance using electronic marketplaces. Basically, buyers can
purchase products either by hopping across multiple electronic marketplaces or
maintaining close relationships with a particular electronic marketplace. We investigate
which is more beneficial for a buyer organization's purchasing performance in terms of
price reduction and purchasing efficiency. We undertake this task by developing
hypotheses and a research model and subjecting them to testing and analysis using the
purchase of maintenance, repair and operations products in a large and important
market, South Korea.**

Introduction

Business-to-business (B2B) transactions for orga-
nizations and industries are a critical part of
doing business and management. However, such
transactions, and the relationships and differen-
tial benefits between buyers and sellers, have
often been under-emphasized in the past. Also,
more recently such transactions themselves have
been radically transformed. This has been by
the development and spread of the Internet
allowing radically new ways of doing this parti-
cular aspect of business with the emergence of
on-line operations via electronic marketplaces
(e-marketplaces).[1] An e-marketplace is a virtual
marketplace on the Internet where organiza-
tions can conduct economic transactions. These
e-marketplaces are seen as possibly generating
significant benefits for all the participants.

Besides this topicality, there are several further
reasons to investigate buyer–seller relationships
with e-marketplaces, including a lack of research.
First, most e-marketplace studies emphasize the
standpoint of market-makers or vendors, yet
buyers are also critically important. Second, there
is interest not only in the possibility of benefits
emerging from e-marketplaces, but also their type
and if they are mutually exclusive. Third, the type
of relational governance structure of buyers–
sellers in e-marketplaces is crucial. Supply chain
management (SCM) studies traditionally concen-
trate on relational governance structures that
maintain long-term and close relationships with a
few suppliers, whereas short-term, market-based
governance structures also exist in e-market-
places. Fourth, most SCM studies focus on
purchasing direct materials, not indirect materials
such as maintenance, repair and operations
(MRO) items which are important to business.

Given the above, we can see that so far no
study has compared how purchasing MRO
products via different e-marketplace governance
structures might produce varied benefits with

[1]Also known as web marketplaces, virtual marketplaces,
market-spaces, market-makers, electronic intermedi-
aries, exchanges and e-hubs (Bakos, 1997; Kaplan and
Sawhney, 2000; Malone, Yates and Benjamin, 1987).

implications for businesses and management. Therefore, our paper helps add detail to this gap with the following research questions:

(1) What are the main benefits of using e-marketplaces for purchasing MRO products?
(2) What is the relationship between these benefits and are they simultaneously attainable?
(3) Are buyers better off committed to one or multiple e-marketplaces for MRO procurement?

To answer these questions our paper has six further sections. Next we outline the specific focus of our research and a brief overview of e-marketplaces. The next section reviews the key constructs and also introduces the research model and hypotheses. The following section discusses the research methodology, including the operational definitions of the constructs in our research model. Analysis of the results and hypothesis testing follow. The last sections provide a discussion and some implications and conclusions.

Focus and overview of e-marketplaces

Purchasing in e-marketplaces is a huge area. Therefore, we narrow down the topic of purchasing in e-marketplaces in the following four ways: in terms of type of organization, benefit, relationship and product. First, we are interested in buyers rather than vendors. Second, we are interested in benefits in the purchasing area. Popular measurements for purchasing performance relate to cost, time and price (Gebauer and Buxmann, 2000; Perlman, 1990). Perceptual measures (e.g. satisfaction) are also used in relation to quality, delivery, sales, after-sales service and technical assistance (Cannon and Perreault, 1999). We focus on purchasing price and purchasing efficiency (Brunn, Jensen and Skovgaard, 2002; Cannon and Homburg, 2001; Choudhury and Hartzel, 1998; Noordewier, John and Nevin, 1990). However, reducing purchasing price while improving purchasing efficiency are traditionally regarded as trade-offs or contradictory in off-line-based SCM. We are interested whether e-marketplaces could help overcome this trade-off in transaction cost economics (Williamson, 1975). Third, we are interested in the implications for benefits from different types of relationship (multiple, short, one-off versus single, long-term, continuous) that buyers have with e-marketplaces. For example, buyers can conduct purchasing operations either by comparing various bids across multiple e-marketplaces (market exchange) or by maintaining close relationships with particular e-marketplaces (relational exchange). This typology follows the traditional governance[2] structure in transaction cost economics (Williamson, 1975). Market exchanges tend to be short term and unrepeated interactions and so buyers purchase by price, taking advantage of the number of vendors. Relational exchanges are long-term transactions based on trust and close relationships and buyers put less importance on price and show commitment towards particular partners (Dwyer, Schurr and Oh, 1987; Frazier, Spekman and O'Neal, 1988; Spekman and Johnston, 1986).[3] Fourth, we are interested in examining not all products but MRO items in e-marketplaces.

There are about 1000 e-marketplaces globally (Standing *et al.*, 2006) and the portions of B2B transactions through them are expected to reach 35% in 2006 (Granot and Sosic, 2005). e-Marketplaces have been launched by private firms and industry consortia. For example, Cisco and Dell run their own private e-marketplaces to sell their products while Harley-Davidson invites multiple vendors' bids on its private e-marketplace. Industry consortia include Covisint (auto industry led by GM, Ford and Chrysler) and Exostar (airplane industry led by Boeing). Independent industry marketplaces, such as ChemConnect, maintain a neutral position (for neither buyer nor seller) to facilitate transactions on their own sites.

These e-marketplaces can be used to purchase products that are direct materials for final products or indirect materials, such as MRO items. Even though about 80% of total purchasing

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[2]The term 'governance' of e-marketplaces can otherwise mean the possession of ownership or control (O'Reilly and Finnegan, 2005), the status of neutrality, and seller-side or buyer-side initiative (Brunn, Jensen and Skovgaard, 2002).

[3]Examples are horizontal and vertical integration, joint ventures, collaborative R&D, collaborative logistics and franchising. Pseudo-companies (Eccles, 1981; Luke, Begun and Pointer, 1989), virtual integration (Zaheer and Venkatraman, 1994) and re-intermediaries (Clemons, Reddi and Row, 1993) are synonyms for this type of governance.

cost involves direct goods, indirect goods (such as MRO) frequently purchased involve labour-intensive information processing tasks (Laudon and Traver, 2007). Furthermore, for most organizations MRO purchasing is irregular and *ad hoc* (i.e. spot purchasing) so strategic purchasing planning by demand forecasting has not been possible. Eventually, most companies have difficulties in controlling MRO spending from centralized procurement offices (Schneider, 2007). Indeed, e-marketplaces have been particularly effective for commodity products such as MRO items (Campbell, Ray and Muhanna, 2005). Two of the largest MRO suppliers in the world are McMaster-Carr and W.W. Grainger. The W.W. Grainger website offers more than 220,000 different products (Schneider, 2007, p. 223). Office Depot and Staples are the market leaders in office equipment. Digi-Key, InOne and Global Computer Supplies sell electronic and computer parts.

There are diverse dimensions in categorizing e-marketplaces, such as stakeholder, business domain, price mechanism, purchasing process, openness, supported transactions, structure and market mechanism (Grieger, 2003; Mahadevan, 2003; Skjott-Larsen, Kotzab and Grieger, 2003; Standing *et al.*, 2006). Among these categories we focus on the category of vertical or horizontal e-marketplaces. Vertical e-marketplaces are specialized in particular industries, such as computers, electronics, automobiles, chemicals or steel, and provide vertically integrated services unique to each industry, e.g. E-Steel, PaperExchange and PlasticsNet.com. Horizontal e-marketplaces deal with various kinds of items not confined to a particular industry. For example, TradeOut.com helps clear surplus inventories by aggregating vendors and buyers more effectively than off-line brokers. VerticalNet and MRO.com are other examples here.

Model development

In this section we explain the development of our hypotheses and research model. Figure 1 depicts our research model and how governance structure with e-marketplaces influences purchasing performance.

Relational exchange

A high degree of relational exchange with e-marketplaces means a long-term and close relationship with particular e-marketplaces. A low degree of relational exchange denotes short-term and *ad hoc* transactions by a market-based
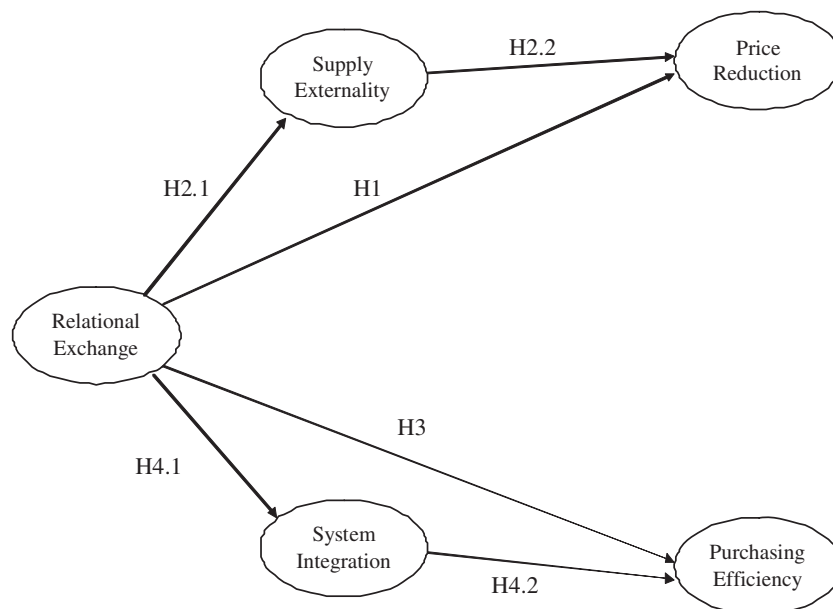

Figure 1. Research model

mechanism (i.e. by moving across multiple e-marketplaces and comparing as many vendors as possible).

Price reduction

One of the major attractions of e-marketplaces lies in the support of market search because searching activities are costly (Choudhury and Hartzel, 1998; Eisenmann, 2002; Malone, Yates and Benjamin, 1987). If the buyer's searching cost is too high vendors can benefit from excessive rents by setting the selling price higher than the buyer's demand utility. In e-marketplaces buyers can obtain more alternatives by searching and comparing vendors' electronic catalogues and lowering the price by using electronic auctions or reverse auction services (Sarkar, Butler and Steinfield, 1998). As well as providing diverse alternatives in choice, e-marketplaces can help overcome the handicap of small volumes in orders by aggregating identical or similar orders. Thus, two incompatible benefits – diversity and volume – can be realized simultaneously in e-marketplaces (Bakos and Bailey, 1997). In a market exchange with multiple e-marketplaces buyers are likely to purchase products at lower prices than in a relational exchange with particular e-marketplaces because they can search and compare multiple e-marketplaces, therefore increasing supply alternatives (Malone, Yates and Benjamin, 1987).

The relationship between buyers and vendors in e-marketplaces is different from that in off-line transactions. The move from market exchange to relational exchange in off-line purchasing directly leads to a reduction in the number of supply alternatives, while that move in e-marketplaces does not necessarily result in a direct reduction of supply alternatives because even a single e-marketplace still provides more supply alternatives than off-line. However, it is plausible that a buyer has a smaller number of vendors by committing to a particular e-marketplace than by moving around multiple e-marketplaces. In general, compared to off-line transactions buyers can purchase products at lower prices in e-marketplaces by lowering search costs and vendors' monopolistic rents while accelerating competition among vendors (Bakos, 1997; Malone, Yates and Benjamin, 1987; Sculley and Woods, 1999). However, purchasing price reduc-

tion is subject to the degree of relational exchange that buyers choose for e-marketplaces.

Network externality

An e-marketplace helps realize economies of scale and scope simultaneously by aggregating vendors and buyers in the same place (Bakos and Bailey, 1997). The increased number of vendors reduces variances in expected purchasing prices and attracts more risk averters (Emmelhainz, 1990). This phenomenon can be rephrased as: the attractiveness of an e-marketplace from the buyer's standpoint is susceptible to network externality, or the value of an e-marketplace is in proportion to the number of vendors (Driedonks *et al.*, 2002; Kauffman and Wang, 2001). Network-related products, services and technologies have this positive network externality, which means that the value and utility of the network increases as the number of users rises (Farrell and Saloner, 1986; Katz and Shapiro, 1994). Network externality in the form of current installed base and expected installed base is often observed as being an important driver of adoption behaviour (Katz and Shapiro, 1985).

Depending on the type of network this externality may be direct or indirect (Economides, 1996). Two-way networks such as telephone, fax, e-mail and Internet chatting exhibit direct network externality. Here an additional customer provides direct externalities to all the customers in the network where value is in direct proportion to the number of users. For example, in group-buying discount cyber-markets new bidders care about the number of orders already placed (Kauffman and Wang, 2001). Kauffman and Wang (2001) called this positive network externality 'demand externality'.

In one-way networks, such as financial exchange networks and credit cards, externality is only indirect. For example, the number of credit card users is not as important to credit card users as the number of credit card terminals installed in stores. Similarly, stock markets exhibit positive size externality in the sense that the increasing number of sellers in a stock exchange increases the expected utility of buyer participants, eventually increasing the utility of all participants (Diamond, 1982; Economides, 1996; Economides and Siow, 1988; Garbade and Silber, 1976).

An e-marketplace that involves two types of player (i.e. buyers and vendors) exhibits one-way network externality where the value of the e-marketplace to buyers is dependent on the number of vendors (Economides, 1996; Kauffman and Wang, 2001; Yoo, Choudhary and Mukhopadhyay, 2002) rather than the number of buyers, sometimes referred to as 'cross-network externality' (Bhargava and Choudhury, 2004). Buyers benefit as the participation of more vendors drives down price. Vendors benefit from the size and diversity of buyers. This one-way characteristic leads to a 'chicken and egg' dilemma regarding which one to entice to e-marketplaces first – buyers or vendors (Wise and Morrison, 2000).

Due to an e-marketplace's capability of increasing the diversity of vendors, buyers come to have higher expectations from participation. As supply alternatives increase existing buyers enjoy increased premiums without additional payments (Kauffman and Wang, 2001) and they may also expect lower prices. We refer to this phenomenon as 'supply externality', where buyers benefit from free premiums stemming from an increased number of supply alternatives. Supply externality is expected to increase further if buyers move between e-marketplaces to compare as many vendors as possible. In other words, if buyers stick to a particular e-marketplace they are giving up the additional opportunity to increase supply externality further, which can lower purchasing price even more.

This formulation implies that increasing the availability and number of vendors by moving across multiple e-marketplaces is likely to help reduce purchasing price further.[4] Such incentives are especially strong for low-end buyers who appreciate the basic matching services of e-marketplaces (Bhargava and Choudhury, 2004). Thus, the probability is higher that buyers will find favourable offers and lower purchasing prices by using multiple e-marketplaces rather than sticking to particular e-marketplaces. Therefore:

_H1:_ Relational exchange will be negatively related to price reduction.
_H2:_ Supply externality mediates the effect of relational exchange on price reduction.
_H2.1:_ Relational exchange will be negatively related to supply externality.
_H2.2:_ Supply externality will be positively related to price reduction.

Purchasing efficiency

An e-marketplace can help buyers improve purchasing operations by electronically using the accumulated purchasing records of buyers in negotiating with vendors (Williamson, 1975). Such benefits are more likely to be realized if buyers maintain relational exchange with a particular e-marketplace (Dwyer, Schurr and Oh, 1987). Accumulated transaction records and experience with buyers facilitates the net-enabled innovation of the purchasing business process for both vendors and e-marketplaces to improve their customer satisfaction (Wheeler, 2002).

When buyers maintain a relational exchange with a particular e-marketplace they can lower time and costs required in purchasing operations (Aldrich, 1979; Choudhury and Hartzel, 1998; Hess and Kemerer, 1994), and can even streamline SCM, such as demand and inventory management and forecasting (Eng, 2004). The vendor's learning from accumulated transaction experience and adherence to ancillary services can be the main reasons for this effect. The ancillary value-added services can range from merchandising to transportation, financing and security (Bhargava and Choudhury, 2004).

System integration

Due to the openness and standard of the Internet, system integration between organizations is becoming easier. Such integration efforts have been extended to include e-marketplaces. For Truman (2000) and many others, interface and internal integration can be distinguished (Chatfield and Bjørn-Andersen, 1997; Hart and Saunders, 1998; Riggins and Mukhopadhyay, 1994; Srinivasan, Kekre and Mukhopadhyay, 1994; Swatman, Swatman and Fowler, 1994). Interface integration means integration between inter-organizational systems and internal systems and

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[4]We assume buyers can reduce purchasing price after moving to e-marketplace purchasing. So, we used price reduction as the measurement instead of price change. Our data indicate that the average perceived price reduction is 3.49 (on a Likert scale: 1, increase; 2, no change; 3, slight decrease; 4, decrease; 5, heavy decrease) and average percentage real price reduction is 10.7.

can extend value chain activities for transactions, information exchange and cooperation with other companies (Devydov, 2001). Internal integration denotes integration between internal systems. A typical example is Enterprise Resource Planning (ERP) systems integrated with other legacy systems by Enterprise Application Integration. System integration between vendors and buyers ends up benefiting both financially (Barua *et al.*, 2004). Such integration, for example, can occur through the four dimensions of inter-organizational activities: process; project management; information and knowledge management and collaboration; communication (Nambisan, 2003).

One of the advantages of system integration is that redundant efforts in data management can be eliminated. Also, buyers can reduce the time and costs of purchasing operations across searching and ordering processes (Emmelhainz, 1990; Ramsdell, 2000; Sokol, 1989). Furthermore, the increasing demand for internal transparency in proportion to the growth of businesses necessitates the information system instrument (such as e-marketplaces) to locate, monitor and investigate various sources of inefficiencies and misdemeanours (Street and Meister, 2004). Therefore, a relational exchange with e-marketplaces is more likely to lead to information system integration so that buyers can improve purchasing operations by various automatic services (workflow, replenishment, collaborative design etc.).

Meanwhile, searching for larger numbers of vendors by skipping across e-marketplaces produces negative influences on purchasing operation efficiencies because each e-marketplace may have its own procedures, conventions and information systems, and these may not be compatible. Due to such incompatibilities buyers may maintain close relationships with particular e-marketplaces and forge tight system integration if their main concern is purchasing efficiency. Such concerns are relatively explicit for high-end buyers looking for substantially advanced value-added services and intending to pay high service fees (Bhargava and Choudhury, 2004). Therefore:

H3: Relational exchange will be positively related to purchasing efficiency.
H4: System integration mediates the effect of relational exchange on purchasing efficiency.

H4.1: Relational exchange will be positively related to system integration.
H4.2: System integration will be positively related to purchasing efficiency.

Research methods

In this section we explain the data collection procedures and discuss the operationalization of the major constructs in our research model.

Data collection

First, a quick overview of the Korean context is given as business relations differ from more market-dominated economies. Korean companies traditionally depended on relational exchange rather than market exchange in B2B transactions, especially as the country's powerful, large and diversified business conglomerates (the *chaebol*) were major forces in economic growth. Their hierarchical and relational B2B transactions were the tradition and culture in the economy. Interestingly, the government and many commentators expected e-marketplaces might help overcome some of the limitations and pitfalls of such traditional B2B transactions.

There are many different types of e-marketplaces in Korea, among which MRO-based e-marketplaces have been the most successful. We focused on MRO e-marketplaces because they are the most active type in Korea in terms of growth rate, number of participants and volume of transactions. For example, there are about 200 Korean e-marketplaces in cyberspace, albeit only 5% of them are running in the black (www. etnews.co.kr, 24 March 2005). Among the top players, MRO e-marketplaces dominate the indirect-material-focused e-marketplaces in terms of revenue, profitability and number of customers (www.etnews.co.kr). For example, iMarketkorea. com, entob.com and ServeOne.co.kr are some top Korean MRO e-marketplaces.

To ensure the validity of our research model and questionnaire based on prior research, we undertook a series of interviews with e-marketplaces and their major client companies. Our questionnaire was constructed, reviewed and sometimes revised during these interviews. Our unit of analysis is the purchasing department of

buyer organizations that use e-marketplaces. We constructed a list of more than 3000 MRO e-marketplace users from newspapers, industry magazines, e-marketplace websites and consulting firms. After considering revenue size and industry type to give enough diversity in our sample, we contacted 329 companies from this list via phone, fax, email or web bulletin boards. We mailed surveys to managers of purchasing departments and 184 valid replies were received between September and October 2003, a 55.9% valid return ratio. Tables 1 and 2 summarize their profiles and distribution in terms of industry and employee size as well as comparing them with the total distribution of Korean companies.

Measure development and assessment

According to Diamantopoulos and Winklhofer (2001) the choice between a formative and a reflective specification should be based primarily on theoretical considerations. Our literature review and interviews suggested the formative measurement approach for the constructs of price reduction, purchasing efficiency and supply externality. Meanwhile, relational exchange and system integration are measured by a single item. The reasons why these constructs need to be measured by formative indicators or can be measured by a single item are discussed below in the relevant sections.

Table 1. *Profiles of respondent companies*

Industry	Frequency	Per cent	Population[a]
Manufacturing	52	28%	10.3%
Information and communication	27	15%	0.3%
Education	26	14%	3.7%
Public service	21	12%	0.4%
Distribution	16	9%	28.1%
Finance	9	5%	1.1%
Construction	4	2%	2.6%
Others[b]	8	4%	53.5%
No replies	21	11%	–
Total	184	100%	

[a]*Source*: Korea National Statistical Office. The total number of companies in Korea was 3,187,916 as of the end of 2003.
[b]Others include first industry (agriculture, forestry, mining and fishery: 0.1%), public utilities (electricity, gas, water: 0.1%), lodging and restaurant (20.3%), transportation (10.2%), real estate (3.5%), services (2.6%), health (2.2%), entertainment (3.8%), waste and maintenance (10.7%).

Table 2. *Profiles of respondent companies by employment*

Size (no. of employees)	Frequency	Per cent	Population[a]
Below 50	40	22%	69.3%
51–100	35	19%	8.9%
101–300	27	15%	9.6%
301–500	15	8%	3.5%
Above 501	46	25%	8.7%
No replies	21	11%	–
Total	184	100%	

[a]*Source*: Korea National Statistical Office. The total number of employees in Korea was 14,729,166 as of the end of 2003.

Relational exchange. As noted above, e-marketplace governance can be split into two major exchange types: market and relational (Dwyer, Schurr and Oh, 1987; Frazier, Spekman and O'Neal, 1988). However, transactions between companies can have a mixture of both these extreme governance types. In our research if companies maintain a long-term and close relationship with a particular e-marketplace they have a higher degree of relational exchange. Companies that purchased products by the market mechanism have a lower degree of relational exchange.

Following the literature, relational exchange was measured differently by raters (individual, expert or group) depending on the goods and services transacted. For example, in the context of consumer products, relational exchange was measured by customer willingness to do business continuously with a particular seller and to recommend this seller to others (Sirdeshmukh, Singh and Sabol, 2002). In the context of direct materials relational exchange was measured by one item of relationship duration for purchasing (Kendall, 1999), by multiple items on levels of cooperation, such as information sharing, joint planning and joint problem solving (Gundlach and Cadotte, 1994; Mohr and Spekman, 1994), or by the exchange partners' intention to maintain the relationship for the foreseeable future (Heide and Miner, 1992).

To develop the items to properly measure the degree of relational exchange in the context of purchasing MRO products we interviewed purchasing managers using e-marketplaces for MRO products with regard to the appropriateness of relationship duration, cooperation level and willingness to maintain the relationship, all of

which derived from Dwyer, Schurr and Oh (1987), Frazier, Spekman and O'Neal (1988, 1990), Gundlach and Cadotte (1994), and Kendall (1999). Nearly every purchasing manager identically recognized the degree of relational exchange as 'the number of e-marketplaces where to transact MRO products' as a concrete singular object (Rossiter, 2002). According to Rossiter (2002) 'concrete singular' is when all raters know the object as only one and, even though the object is not a single object, it is singular in the sense that it is a set of reasonably homogeneous objects. In both cases above only one item would be needed to represent the object.

We also interviewed Chief Executive Officers and e-marketplace experts to cross-check the validity of our previous interviews, and gained their verification. As a result, one item to measure six different levels of relational exchange was adopted and the survey respondents (purchasing managers) were asked to choose one of them: not pre-select e-marketplaces but purchase from a random one in every transaction; select one e-marketplace and continuously purchase at that e-marketplace; select two e-marketplaces and purchase after comparing them; select three e-marketplaces and purchase after comparing them; select four e-marketplaces and purchase after comparing them; select more than four e-marketplaces and purchase after comparing them.[5]

Supply externality. In the context of two-way networks, network externality has been measured by such items as availability and replication of song in peer-to-peer file sharing networks (Asvanund *et al.*, 2004), the percentage market share of a particular product in software markets (Gallaugher and Wang, 2002), the installed base of network products (Brynjolfsson and Kemerer, 1996) and the numbers of participants in group-buying discount auction markets (Kauffman and Wang, 2001). However, in the context of a one-

way network like an e-marketplace, buyers and sellers need to be recognized as counterparts (e.g. Rochet and Tirole, 2002; Yoo, Choudhary and Mukhopadhyay, 2002). In this case the utility of buyers increases with the size of the seller network rather than the size of the buyer network.

From the standpoint of the buyer who participates in an e-marketplace, its major attractiveness is supply externality. Thus, we focus on supply externality. As defined earlier, supply externality is the degree that buyers benefit from free premiums stemming from the increasing number of supply alternatives that consist of vendors and their products. Based on the literature and interviews with purchasing managers we measured supply externality by two items: vendors and products in e-marketplaces. These measures were on a five-point scale comparing moving from off-line to e-marketplace purchasing: reduced; no change; slight increase; increase; great increase (see the Appendix). The middle point is termed 'slight increase' because during our interviews we discovered that the number of vendors or products for buyers had increased in e-marketplaces compared to off-line.

In e-marketplaces buyers appreciate the diversity of both vendors and products. Our point is not which aspect matters more, but that both aspects constitute the construct of supply externality. Supply externality is a formative latent variable because the number of vendors is not necessarily correlated with the number of products. For example, in e-marketplaces where spatial or time constraints are less serious than off-line, even a single vendor can cover lots of product items, and also many vendors can compete over the same product item. As such, we can conclude that the two indicators of supply externality are not correlated with each other.

System integration. The measures of system integration were based on interface and internal integration (Truman, 2000). In a similar process to the development process of the relational exchange measure, nearly every purchasing manager identically described system integration as a 'concrete singular object' (Rossiter, 2002). Through the interviews with purchasing managers and e-marketplace experts we came up with five levels of system integration between buyers and e-marketplaces and respondents were asked to choose one of them.

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[5]One can assume that early users unfamiliar with e-marketplaces purchase MRO products at one or a small number of e-marketplaces. Thus, we adopted experience with e-marketplaces as a control variable. As a result of correlation analysis there was no meaning between relational exchange and experience with e-marketplaces ($r = 0.021$).

The first level is no system integration between buyer and e-marketplace. The buyer places orders in e-marketplaces and manages all the transaction records on his/her own computer system. Second, a buyer uses the accumulated but non-standardized transaction records provided by e-marketplaces. Buyers can partly control their own purchasing performances by descriptive information provided by e-marketplaces. Third, e-marketplaces electronically send transaction records weekly or monthly to buyers. This is the batch mode of interface integration. Here e-marketplaces and buyers make an agreement about data format and regularly exchange transaction records by text or Excel files attached to emails. Such system integration substantially reduces the amount of purchase-processing tasks because purchasing clerks can download and import files into accounting information systems without retyping data. Fourth, transaction records are automatically imported and processed in a buyer's computer system connected to e-marketplaces. This is complete interface integration. As a buyer's computer system is closely integrated with an e-marketplace, all the purchasing transactions are automatically and immediately reflected. Fifth, all the transaction records obtained in e-marketplaces are not only completely transferred to a buyer's computer system, but also used and manipulated by all the other application programs such as sales, accounting, inventory and distribution installed inside the buyer company. This corresponds to internal integration. The recent upgrade of ERP systems (extended ERP) has this feature. In relation to Truman's (2000) typology of system integration, the third and fourth levels correspond to interface integration and the fifth level to internal integration.

Purchasing performance. Purchasing performance regarding MRO products can be measured by two aspects: direct product cost (price) and acquisition cost (Cannon and Homburg, 2001; Noordewier, John and Nevin, 1990). Direct product cost is the actual price charged by vendors for products sold to buyers. Acquisition costs include the expenses related to ordering, delivering and storing products, as well as the expense of monitoring supplier performance and coordinating and communicating with vendors. Lowering such costs has been the primary objective of SCM.

Through interviews with purchasing managers and e-marketplace experts we identified that purchasing performance can be measured by the reduction of purchasing price (i.e. direct product cost) and purchasing efficiency (i.e. acquisition cost). In our measurement price reduction means the degree of reduction of purchasing price actually experienced after moving from off-line to e-marketplace purchasing. We measured price reduction by two items: perceived price reduction and percentage of price reduction. Perceived price reduction was measured by a five-point Likert scale (1, increase; 2, no change; 3, slight decrease; 4, decrease; 5, heavy decrease). The middle point is 'slight decrease' because during our interviews we discovered that the price of products declined in e-marketplaces after moving from off-line.

Price reduction is a formative latent variable because these two indicators (i.e. perceived price reduction and percentage of price reduction) independently forge the construct of price reduction and also because a buyer's perception of price reduction can be different from the percentage of price reduction. For example, when a buyer purchases an item A worth \$10 at \$5, they save 50%. When a buyer purchases an item B worth \$1000 at \$800, they save only 20%. However, the amount of saving which a buyer perceives is greater for item B (i.e. \$200) than item A (i.e. \$5). As such, we can conclude that the perceived price reduction is not necessarily correlated with the percentage of price reduction. Interviews with purchasing managers also verified our conclusion.

In our study purchasing efficiency means the degree to which purchasing department time and effort was saved after moving from off-line to e-marketplace purchasing. We originally measured purchasing efficiency by four items: searching time, ordering time, number of employees and amount of work saved on a five-point Likert scale (1, increase; 2, no change; 3, slight decrease; 4, decrease; 5, heavy decrease). For the same reason as price reduction, the middle point in the scale is 'slight decrease'. Although each item about purchasing time contributes to total purchasing efficiency, items measuring a particular type of purchasing time are not necessarily correlated. According to Cannon and Homburg (2001) and Rossiter (2002) such measures are best represented as the sum of the different components. Therefore, we evaluated the time

dimension of purchasing operations by summing up two components (i.e. searching and ordering) of time.

Purchasing efficiency is a formative latent variable because these indicators independently constitute the latent variable of purchasing efficiency. For example, a decrease of employee numbers in the purchasing department does not necessarily increase searching and ordering times. Also, the number of employees can be in a trade-off relationship with the amount of work. Therefore, we can conclude that these indicators are not necessarily correlated with each other.

Control variable: experience with e-market-places. Purchasing performance can be influenced by other exogenous variables besides relational exchange, supply externality and system integration. We may assume that the more experienced the buyer is with e-marketplaces, the more efficient purchasing operations are and the less the purchasing price because the buyer can save price, time and effort due to trial and error learning. Thus, we need to control for such experience factors to assess relationships between relational exchange, supply externality, system integration and purchasing performance. We operationalized buyer's experience with e-marketplaces as the familiarity with conducting purchasing operations in e-marketplaces that Grewal, Comer and Mehta (2001) used (see the Appendix). We also included control variables of company size and industry as they are popular in studies where the unit of analysis is the organization. Number of employees was used as the measure of company size. Company industries identified in Table 1 were clustered into four (manufacturing, information and communication, public services including education and

government, and others) due to the unbalanced distribution of industry categories in our sample.

Analysis and results

To test our research model, partial least squares (PLS) was conducted using PLS-Graph, Version 3.0 (Chin and Frye, 1998). The covariance matrix for the measures is shown in Table 3. All the latent variables have formative indicators so that convergent validity was assessed by regression coefficients. Then discriminant validity was assessed by examining loadings and cross-loadings and the average variance extracted (AVE) by each construct.

Formative indicators do not need to demonstrate reliability by internal consistency because they must have mutually exclusive effects on latent variables (Jarvis, MacKenzie and Podsakoff, 2003). When the latent variable has a reflective indicator, reliability can be investigated by internal consistency indicators, such as Cronbach's alpha or composite reliability. So, internal consistency is not reported in our measurement modelling. However, Lee and Hooley (2005) caution us to distinguish reliability from internal consistency. This is because for them 'reliability is concerned with the proportion of variance in a measure, which is attributable to the true score on the latent construct that is being measured. . . . Thus, reliability is essentially a theoretical concept, in that (practically speaking) we can never be certain of the true score of a subject on a given latent construct' (p. 369), whereas internal consistency means 'the proportion of a scale's total variance that is attributable to a common source' (p. 370). We believe that we explained thoroughly enough in the previous section that all of our

Table 3. Covariance matrix

	RE	SE1	SE2	PR1	PR2	SI	PE1	PE2	PE3
Relational exchange	1.553								
Supply externality 1	−0.291	1.016							
Supply externality 2	−0.284	0.737	1.025						
Price reduction 1	−0.553	0.317	0.263	0.874					
Price reduction 2	−2.874	1.332	0.851	4.942	68.698				
System integration	0.185	0.004	0.020	−0.105	−0.224	0.467			
Purchasing efficiency 1	0.310	0.059	0.009	−0.102	−0.846	0.176	1.112		
Purchasing efficiency 2	0.551	0.016	−0.057	−0.248	−0.726	0.279	0.752	1.478	
Purchasing efficiency 3	0.158	0.014	−0.063	−0.063	0.200	0.163	0.250	0.589	0.945

measures of constructs are true (reliable) formative indicators of relevant latent variables.

Measurement model

In a formative model the corresponding constructs are estimated by the linear aggregates of their observed indicators. Thus, regression weights (or coefficients) can be used for the judgement of convergent validity in contrast to component loadings in a reflective model (Chin, 1998a, 1998b). A rule of thumb is to accept items with regression weights of 0.7 or more (Carmines and Zeller, 1979; Chin, 1998a, 1998b). Table 4 provides the result of convergent validity by regression coefficients. The standardized coefficients were high (> 0.70) and significant at the 0.01 level (t values > 2.58). The result suggested sufficient convergent validity.

Table 5 presents AVE and inter-correlations for discriminant validity. All AVE values were

well above the 0.50 recommended level (Chin, 1998a, 1998b; Fornell and Larcker, 1981). Comparing the square root of AVE (i.e. the diagonals in Table 5, representing the average association of each construct to its measures) with the correlations among constructs (i.e. the off-diagonal elements in Table 5, representing the overlap association among constructs) indicates that each construct is more closely related to its own measures than to those of other constructs (diagonal elements should be larger than off-diagonal elements). In sum, these results support sufficient discriminant validity to allow an interpretation of structural parameters.

Structural model

We ran four different PLS models that connected three control variables to each dependent variable (supply externality, price reduction, system integration, purchasing efficiency) in turn. However, we could not run the model where all three control variables are connected to all four dependent variables simultaneously due to model under-identification. We found that the control variables of experience with e-marketplaces, company size and industry were not significantly associated with the dependent variables except for the impact of experience on purchasing efficiency. We confirmed that our research model can be analysed without control variables. Figure 2 presents a graphical depiction of the PLS results without the three control variables.

The structural model was evaluated on the basis of the R^2 values, effect sizes and structural paths for each endogenous construct. Bootstrapping was done to derive t statistics to assess the significance level of the model's coefficients and

Table 4. *Convergent validity by regression coefficients*

	Standardized coefficients	t statistic	Significance level
Relational exchange (RE)			
RE	1.00	0.00	0.00
Supply externality (SE)			
SE1	0.94	33.50	0.00
SE2	0.94	33.68	0.00
Price reduction (PR)			
PR1	0.70	13.14	0.00
PR2	0.99	166.42	0.00
System integration (SI)			
SI	1.00	0.00	0.00
Purchasing efficiency (PE)			
PE1	0.77	16.46	0.00
PE2	0.90	27.02	0.00
PE3	0.71	13.52	0.00

Table 5. *Inter-construct correlations*

Construct (no. of items)	RE	SE	PR	SI	PE
Relational exchange (1)	**1**	–	–	–	–
Supply externality (2)	−0.246**	**0.928**[a]	–	–	–
Price reduction (2)	−0.444**	0.291**	**0.898**	–	–
System integration (1)	0.217**	0.018	−0.131	**1**	–
Purchasing efficiency (3)	0.329**	−0.002	−0.154*	0.351**	**0.794**

*Significant at 0.05 level.
**Significant at 0.01 level.
[a]The boldface numbers on the diagonal are the square root of the variance shared between the constructs and their measures. Off-diagonal elements are correlations among constructs. The diagonal is the square root of $\Sigma\lambda_i^2/(\Sigma\lambda_i^2+\Sigma\varepsilon_i)$; the composite reliability is $(\Sigma\lambda_i)^2/[(\Sigma\lambda_i)^2+\Sigma\varepsilon_i]$. In both cases, λ_i are factor loadings and ε_i is the unique error variance $1-\lambda_i^2$.

R² = 0.060

Supply Externality

R² = 0.282

Price Reduction

0.245** (t = 4.201)

−0.245** (t=−3.593)

−0.415** (t=−5.929)

Relational Exchange

0.301** (t = 4.554)

0.217** (t = 3.898)

System Integration

0.279** (t = 3.821)

Purchasing Efficiency

R² = 0.047

R² = 0.205

Path coefficients with t values in parentheses
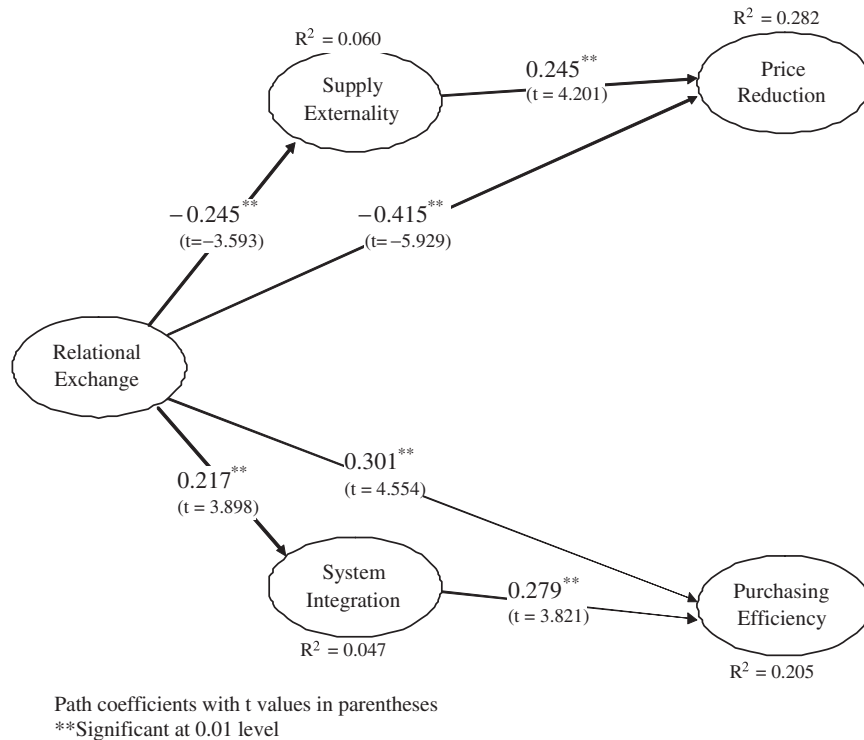**Significant at 0.01 level

Figure 2. Analysis results. Supply externality, price reduction and purchasing efficiency have the formative indicators

to test the hypotheses. As shown in Figure 2 the model explained a substantial amount of variance for price reduction ($R^2 = 0.282$) and purchasing efficiency ($R^2 = 0.205$), which were both greater than the recommended 0.10 level (Falk and Miller, 1992).

According to Chin (1998a, 1998b), in order to estimate the predictive power of a predictor latent variable the effect size of each predictor latent variable should be estimated.[6] For this, supply externality and system integration respectively were omitted from the structural model and R^2 values of price reduction and purchasing efficiency were recorded. Table 6 presents the R^2 values and the effect sizes. As recommended by Cohen (1988), effect size values of 0.02, 0.15 and 0.35 may be viewed as a gauge of whether a predictor has a small, medium or large effect at the structural level. Table 6 demonstrates that the partial mediation model has a medium effect size on the R^2 value of price reduction and also a medium effect size on purchasing efficiency compared to the non-mediation model. When

compared to the full mediation model the partial mediation model had a large effect size on the R^2 value of price reduction and also a large effect size on purchasing efficiency. In sum, our research model, which is the partial mediation model, was assessed to be the most appropriate conceptualization among those constructs in our model.

Table 6. Comparison of effect size of partial, full and non-mediation models

		PR ← SE	PE ← SI
Partial mediation model	R^2_{included}	0.282	0.205
Full mediation model (Compared to partial model)	R^2 f^2	0.122 0.567	0.125 0.390
(Compared to partial model)	Effect size	large	large
Non-mediation model (Compared to partial model)	R^2_{excluded} f^2	0.227 0.195	0.136 0.337
(Compared to partial model)	Effect size	medium	medium

PR, price reduction; SE, supply externality; PE, purchasing efficiency; SI, system integration.

[6]Effect size can be calculated by $f^2 = [R^2(\text{interaction model}) - R^2(\text{main effects})]/R^2(\text{interaction model})$.

As shown in Figure 2, the path coefficient from relational exchange to price reduction is –0.415 (t = –5.929, p < 0.01), supporting H1. The path coefficient from relational exchange to supply externality is –0.245 (t = –3.593, p < 0.01), supporting H2.1. The path coefficient from supply externality to price reduction is 0.245 (t = 4.201, p < 0.01), supporting H2.2. Therefore, the mediating role of supply externality between relational exchange and price reduction (H2) is verified. The path coefficient from relational exchange to purchasing efficiency is 0.301 (t = 4.554, p < 0.01), supporting H3. The path coefficient from relational exchange to system integration is 0.217 (t = 3.898, p < 0.01), supporting H4.1. The path coefficient from system integration to purchasing efficiency is 0.279 (t = 3.821, p < 0.01), supporting H4.2. Therefore, the mediating role of system integration between relational exchange and purchasing efficiency (H4) is verified.

In sum, all six hypotheses in our research model were supported with empirical evidence. However, two mediators (supply externality and system integration) took a partial mediating role because the direct paths from relational exchange to purchasing performance were still significant even with the existence of these mediators. These results demonstrate the possible existence of additional mediators other than supply externality and system integration.

Discussion

This study started from the belief, based on previous studies, that purchasing in e-marketplaces improves purchasing performance. Buyers can reduce purchasing price as they can decrease search costs and compare more alternatives than with off-line purchasing (Eisenmann, 2002; Sarkar, Butler and Steinfield, 1998; Sculley and Woods, 1999). Also, buyers can improve purchasing efficiency by electronically processing purchasing operations and using accumulated purchasing records (Bakos and Bailey, 1997; Choudhury and Hartzel, 1998; Williamson, 1975).[7] We contribute to this field as we show

that the relative strength of the two benefits (price reduction and purchasing efficiency) depends on the governance structure (market versus relational). Thus, the more relational exchange, the less price reduction, and supply externality furthers this price reduction. Also, the more relational exchange, the more purchasing efficiency, and system integration enhances this purchasing efficiency. The only control variable that had significant impact was experience with e-marketplaces. The more experienced buyers are, the more they can improve purchasing efficiency (but not purchasing price). This finding contains significant implications that e-marketplaces are instruments to improve purchasing operations rather than to reduce purchasing price as buyers accumulate experience. This implication may well be investigated in future longitudinal studies to test which one of these benefits appeals more or which e-marketplaces survive over time.

The academic and theoretical implications of our study include the following. First, studies of e-marketplaces have traditionally taken the standpoint of either market-makers (e.g. Brunn, Jensen and Skovgaard, 2002; Mahadevan, 2003; O'Reilly and Finnegan, 2005; Standing et al., 2006) or vendors (e.g. Campbell, Ray and Muhanna, 2005; Granot and Sosic, 2005; Zhu, 2004). Some studies proposed using e-marketplaces as instruments for SCM (e.g. Eng, 2004; Grieger, 2003; Skjott-Larsen, Kotzab and Grieger, 2003), but ended up suggesting strategies for e-marketplaces not buyers. Our study is one of the rare studies of the buyer's standpoint with the focus on e-marketplace governance.

Second, indirect materials like MRO products have attracted less attention from researchers than direct materials because of lower costs, influence on final product quality and impact on overall manufacturing operations. For example, many presumed that direct materials cost more and were more directly associated with final product quality and overall manufacturing operations. However, as e-marketplaces enable purchasing operations to be managed more efficiently, the importance of efficiently managing MRO products has increased substantially. Yet, studies investigating how to improve the purchas-

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[7]We proved the previous studies on purchasing performance in our data analysis again, showing that price reduction = 3.49, searching and ordering time = 2.7,

amount of work = 3.1, number of employees = 2.7 on a Likert scale (1, increase; 2, no change; 3, slight decrease; 4, decrease; 5, heavy decrease).

ing operations of those MRO products are scarce. The SCM area has focused more on efficiently purchasing direct materials. Our study is one of the few regarding purchasing operations for MRO products.

Third, network externalities are largely discussed in the context of networks that have only one type of member, e.g. users of a telephone network (Bhargava and Choudhury, 2004). Yet, e-marketplaces exhibit one-way network effects where the value of e-marketplaces to buyers is dependent on the number of vendors (i.e. supply externality) rather than the number of buyers. The distinctive effects of one-way networks have been recognized in recent literature (Rochet and Tirole, 2002, Yoo, Choudhary and Mukhopadhyay, 2002). This paper also contributes to this emerging literature.

Thus, theoretical work in the area that synthesizes these three areas (buyer perspectives, indirect material purchases, network externalities) needs to be encouraged. This development can also be in terms of integrating these and the ideas of the variable efficacy of B2B governance mechanisms that are not an 'either/or' binary choice of market or relational exchange, but along a spectrum stretching from one to the other resulting in a mixed and nuanced range of options. In particular, theoretical development needs to encompass the fact that businesses can choose such appropriate e-marketplace governance mechanisms. This implies a contingency fit between objectives and that there should be appropriate means for each objective. Once an organization understands the right objective regarding its purchasing activities it can pick the most appropriate governance mechanism for e-marketplaces and then strive to obtain the necessary means to establish it. Without explicit understanding of this issue organizations may not be able to launch the most effective purchasing operations for e-marketplaces. This concern is especially critical for MRO products that are not necessarily strategic, but standardized, items eligible for automatic transaction mechanisms, like e-marketplaces.

Our results have the following practical implications. First, we verified that there is a trade-off between price reduction and purchasing efficiency. An e-marketplace aggregates multiple vendors in cyberspace and facilitates searching and comparing alternatives through well-orga-
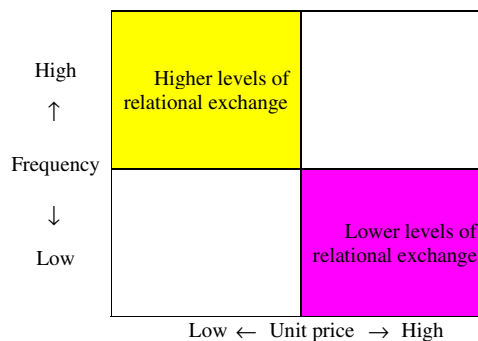

Figure 3. *Appropriate e-marketplace governance*

nized electronic catalogues. Buyers can reduce purchasing price by adopting lower levels of relational exchange with e-marketplaces (i.e. maintaining market exchange with multiple e-marketplaces), meanwhile sacrificing the efficiency potential of purchasing operations. Or, by adopting higher levels of relational exchange, buyers can enhance purchasing efficiency due to cooperation and operations routinization with one or a small number of e-marketplaces.

Recently organizations have tried to incorporate value chains with their customers and launch more collaborative commerce. Closer relational exchange with e-marketplaces is a good strategic choice in implementing such collaborative commerce. This trade-off implies that buyers need to choose appropriate governance with e-marketplaces that fits their purchasing situations rather than blindly conducting electronic purchasing. Purchasing situations can be modelled (see Figure 3) based on the level of purchasing price and purchasing frequency.[8] Purchasing frequency is one of the critical issues involved with purchasing operations efficiency because frequent purchasing with the same vendor has been the target for automation by computer systems. When purchasing price is low with high frequency, buyers can be better off by increasing the degree of relational exchange. In cases where purchasing price is high with low frequency,

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[8]We assume that e-marketplaces can help realize these two independent objectives (unit price and purchasing efficiency) simultaneously (high frequency–high price cell). As we explained, these two objectives are two extreme types with various continuous forms in the middle. We left the high frequency–high price cell blank just to understand the trade-off effect of these two extreme values.

buyers may well lower the degree of relational exchange.

Second, the value of e-marketplaces is realized through supply externality and system integration. The more vendors join an e-marketplace, the more favourable offers are available, and the more favourable offers enable lower purchasing prices in turn through competition between vendors. On the other hand, higher relational exchange with e-marketplaces facilitates more system integration, and more system integration eventually produces more purchasing efficiency. Therefore, buyers need to seriously consider system integration with e-marketplaces if their main concern is improving purchasing operations. However, we found that supply externality and system integration are partial mediators for the respective benefits of price reduction and purchasing efficiency. Future studies need to investigate additional mediators for each path to e-marketplace benefits.

As for purchasing operations, indirect materials like MRO products are as important as direct materials. Therefore, we call attention to indirect materials for improving purchasing performance and suggest taking a contingency approach in selecting governance structures with e-marketplaces. Also, we suggest longitudinal studies that can further solidify the evidence of our findings. Especially interesting would be to investigate the changing influences of governance structure on purchasing performance as e-marketplaces mature.

Conclusion

Here we return to our research questions set out in the Introduction.

(1) What are the main benefits of using e-marketplaces for purchasing MRO products? Our study found these to be reduced prices and increased efficiency in purchases for buyers. e-Marketplaces help reduce purchasing price through supply externality, and improve the efficiency of purchasing operations through system integration with e-marketplace systems.

(2) What is the relationship between benefits and are they simultaneously attainable? Our study found these two benefits can be simulta-

neously improved. However, we also found that the relative strength of benefits is subject to the buyer's governance type with e-marketplaces.

(3) Are buyers better off committed to one or multiple e-marketplaces for MRO procurement? Our study found that buyers can be better off in e-marketplaces with the appropriate governance: purchasing price is improved with market-based governance and so multiple e-marketplaces, whereas purchasing efficiency is better with relational governance and one e-marketplace.

We are not concerned with developing transaction governance with vendors, but with e-marketplaces. Each e-marketplace contains multiple vendors at its site so that close relations with a particular e-marketplace do not necessarily lead to a tight link with a particular vendor. An e-marketplace could work as a procurement agent for buyers so the relationship between buyer and vendor remains indirect. As agents of procurement, e-marketplaces provide both price reduction and purchasing efficiency. Such benefits are contradictory when buyers directly contact vendors. Therefore, buyers have reasons to use e-marketplaces as procurement agents.

We also provide implications for the survival of e-marketplaces: to realize both supplier externality and system integration for buyers. These seemingly contradictory benefits (from the perspective of off-line SCM) are possible in e-marketplaces. The survivors in the competition between e-marketplaces will be those which can be better in helping both benefits.

A major contribution of our paper is that it takes the standpoint of the buyer and investigates how e-marketplace clients can obtain benefits. This is the first empirical study that explores the trade-off between benefits which results from the governance mechanism with e-marketplaces. Our study also complements traditional studies of the procurement of direct materials. SCM in the realm of indirect materials involves different transaction mechanisms, e.g. due to the high standardization of items in transaction compared to direct materials. We call for further studies to pay more attention to this important area of SCM.

Appendix: Questionnaire

Relational exchange

How does your organization use e-marketplaces?

1 = Selects one e-marketplace and continuously uses that e-marketplace

2 = Selects two e-marketplaces and purchases after comparing them

3 = Selects three e-marketplaces and purchases after comparing them

4 = Selects four e-marketplaces and purchases after comparing them

5 = Selects more than four e-marketplaces and purchases after comparing them (in this case, what is the number of e-marketplaces you are using now?)

6 = Does not pre-select e-marketplaces but purchases from a random one in every transaction

Supply externality

Please indicate the extent to which you, as a manager of the purchasing organization, agree or disagree with the following statements about your experience in moving from off-line purchasing to e-marketplace purchasing.

To what extent did the number of products that you could choose increase?

1 = reduced, 2 = no change, 3 = slight increase, 4 = increase, 5 = great increase

To what extent did the number of vendors that you could choose increase?

1 = reduced, 2 = no change, 3 = slight increase, 4 = increase, 5 = great increase

System integration

What is your organization's level of system integration with e-marketplaces?

1 = Use e-marketplaces only for making orders while purchasing records are managed separately by the purchasing company

2 = Use the accumulated transaction records provided by e-marketplaces' websites to manage purchasing operations

3 = Receive a weekly or monthly transaction record by email from e-marketplaces

4 = Automatic processing of transaction information in the company's internal program which is connected to e-marketplaces

5 = Automatic processing of transaction information in the company's various internal programs that are all connected to e-marketplaces (possibly an ERP system)

Purchasing performance

Please indicate the extent to which you, as a manager of the purchasing organization, agree or disagree with the following statements about your experience in moving from off-line purchasing to e-marketplace purchasing.

To what extent did your department decrease purchasing price?

1 = increase, 2 = no change, 3 = slight decrease, 4 = decrease, 5 = heavy decrease

By how much did you reduce purchasing price? Please fill in the blank.

( ) per cent

To what extent did your department reduce searching time?

1 = increase, 2 = no change, 3 = slight decrease, 4 = decrease, 5 = heavy decrease

To what extent did your department reduce ordering time?

1 = increase, 2 = no change, 3 = slight decrease, 4 = decrease, 5 = heavy decrease

To what extent did your department reduce the number of employees?

1 = increase, 2 = no change, 3 = slight decrease, 4 = decrease, 5 = heavy decrease

To what extent did your department reduce the amount of work?

1 = increase, 2 = no change, 3 = slight decrease, 4 = decrease, 5 = heavy decrease

Experience with e-marketplaces

What is your organization's level of experience with e-marketplaces?

1 = We have recently started to use e-marketplaces and are beginning to learn how to do business through them

2 = We have learned a lot about the way to do business in e-marketplaces but there is still much more to learn

3 = Our comfort level with doing business in e-marketplaces is improving with every day

4 = We are comfortable with our e-marketplace operations and are aware of the ins and outs of these operations. Our dealings with

e-marketplaces are a regular part of our business, and we think that there is not much new to learn

5 = We do virtually no business through e-marketplaces but are still listed as a member of an e-marketplace and will continue to be listed with an e-marketplace

References

Aldrich, H. E. (1979). *Organizations and Environments*. Englewood Cliffs, NJ: Prentice-Hall.

Asvanund, A., K. Clay, R. Krishnan and M. D. Smith (2004). 'An empirical analysis of network externalities in peer-to-peer music-sharing networks', *Information Systems Research*, **15** (2), pp. 155–174.

Bakos, J. Y. (1991). 'A strategic analysis of electronic marketplaces', *MIS Quarterly*, **15** (3), pp. 294–310.

Bakos, J. Y. (1997). 'Reducing buyer search costs: implications for electronic marketplaces', *Management Science*, **43** (12), pp. 1676–1692.

Barua, A., P. Konana, A. B. Whinston and F. Yin (2004). 'An empirical investigation of net-enabled business value', *MIS Quarterly*, **28** (4), pp. 585–620.

Bhargava, H. K. and V. Choudhury (2004). 'Economics of an information intermediary with aggregation benefits', *Information Systems Research*, **15** (1), pp. 22–36.

Brunn, P., M. Jensen and J. Skovgaard (2002). 'E-marketplaces: crafting a winning strategy', *European Management Journal*, **20** (3), pp. 286–298.

Brynjolfsson, E. and C. F. Kemerer (1996). 'Network externalities in microcomputer software: an econometric analysis of the spreadsheet market', *Management Science*, **42** (12), pp. 1627–1647.

Campbell, C., G. Ray and W. A. Muhanna (2005). 'Search and collusion in electronic markets', *Management Science*, **51** (3), pp. 497–507.

Cannon, J. P. and C. Homburg (2001). 'Buyer–supplier relationships and customer firm costs', *Journal of Marketing*, **65**, pp. 29–43.

Cannon, J. P. and W. D. Perreault Jr (1999). 'Buyer–seller relationships in business markets', *Journal of Marketing Research*, **36** (4), pp. 439–460.

Carmines, E. G. and R. A. Zeller (1979). *Reliability and Validity Assessment*, Sage university paper series on quantitative applications in the social sciences No. 07-107. Beverley Hills, CA: Sage.

Chatfield, T. A. and N. Bjørn-Andersen (1997). 'The impact of IOS-enabled business process change on business outcomes', *Journal of Management Information Systems*, **14** (1), pp. 13–40.

Chin, W. W. (1998a). 'Issues and opinion on structural equation modeling', *MIS Quarterly*, **22** (1), pp. 1–10.

Chin, W. W. (1998b). '*The Partial Least Squares Approach for Structural Equation Modeling*'. In G. A. Marcoulides (ed.), *Modern Methods for Business Research*, pp. 295–336. Mahwah, NJ: Lawrence Erlbaum.

Chin, W. W. and T. A. Frye (1998). *PLS-Graph,* Version 3.0. Soft Modeling Inc.

Choudhury, V. and K. S. Hartzel (1998). 'Uses and consequences of electronic markets: an empirical investigation in the aircraft parts industry', *MIS Quarterly*, **22** (4), pp. 471–503.

Clemons, E. K., S. P. Reddi and M. C. Row (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), pp. 9–27.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*, (2nd edn). Hillsdale, NJ: Lawrence Erlbaum.

Devydov, M. M. (2001). *Corporate Portals and e-Business Integration*. New York: McGraw-Hill.

Diamantopoulos, A. and H. M. Winklhofer (2001). 'Index construction with formative indicators: an alternative to scale development', *Journal of Marketing Research*, **38** (2), pp. 269–277.

Diamond, P. (1982). 'Aggregate demand management in search equilibrium', *Journal of Political Economy*, **90**, pp. 881–894.

Driedonks, C., S. Gregor, A. Wassenaar and E. von Heck (2002). 'Electronic and social analysis of the adoption of B2B electronic marketplaces: a case study in the Australian beef industry', *International Journal of Electronic Commerce*, **9** (3), pp. 49–72.

Dwyer, F. R., P. H. Schurr and S. Oh (1987). 'Developing buyer–seller relationships', *Journal of Marketing*, **51** (2), pp. 11–27.

Eccles, R. G. (1981). 'The quasi-firm in the construction industry', *Journal of Economic Behavior and Organization*, **2**, pp. 335–357.

Economides, N. (1996). 'The economics of networks', *International Journal of Industrial Organization*, **14** (6), pp. 673–700.

Economides, N. and A. Siow (1988). 'The division of markets is limited by the extent of liquidity: spatial competition with externalities', *American Economic Review*, **78** (1), pp. 108–121.

Eisenmann, T. R. (2002). *Internet Business Models: Texts and Cases*. Boston, MA: McGraw-Hill.

Emmelhainz, M. (1990). *Electronic Data Interchange – A Total Management Guide*. New York: Von Nostrand Reinhold.

Eng, T. Y. (2004). 'The role of e-marketplaces in supply chain management', *Industrial Marketing Management*, **33**, pp. 97–105.

Falk, R. F. and N. B. Miller (1992). *A Primer on Soft Modeling*. Akron, OH: University of Akron Press.

Farrell, J. and G. Saloner (1986). 'Installed base and compatibility: innovation, product preannouncements, and predation', *American Economic Review*, **76** (5), pp. 940–955.

Fornell, C. and D. F. Larcker (1981). 'Evaluating structural equation models with unobservable variables and measurement error', *Journal of Marketing Research*, **18**, pp. 39–50.

Frazier, G. L., R. E. Spekman and C. R. O'Neal (1988). 'Just-in-time exchange relationships in industrial markets', *Journal of Marketing*, **52**, pp. 52–67.

Gallaugher, J. M. and Y. Wang (2002). 'Understanding network effects in software markets: evidence from web server pricing', *MIS Quarterly*, **26** (4), pp. 303–327.

Garbade, K. and W. Silber (1976). 'Technology, communication and the performance of financial markets', *Journal of Finance*, **33**, pp. 1840–1975.

Gebauer, J. and P. Buxmann (2000). 'Assessing the value of interorganizational systems to support business transactions', *International Journal of Electronic Commerce*, **4** (4), pp. 61–82.

Granot, D. and G. Sosic (2005). 'Formation of alliances in Internet based supply exchanges', *Management Science*, **51** (1), pp. 92–105.

Grewal, R., J. M. Comer and R. Mehta (2001). 'An investigation into the antecedents of organizational participation in business-to-business electronic markets', *Journal of Marketing*, **65** (3), pp. 17–33.

Grieger, M. (2003). 'Electronic marketplaces: a literature review and a call for supply chain management research', *European Journal of Operations Research*, **144**, pp. 280–294.

Gundlach, G. T. and E. R. Cadotte (1994). 'Exchange interdependence and interfirm interaction: research in a simulated channel setting', *Journal of Marketing Research*, **31**, pp. 516–532.

Hart, P. J. and C. S. Saunders (1998). 'Emerging electronic partnerships: antecedents and dimensions of EDI use from the suppliers' perspective', *Journal of Management Information Systems*, **14** (4), pp. 87–111.

Heide, J. B. and A. S. Miner (1992). 'The shadow of the future: effects of anticipated interaction and frequency of contact on buyer–seller cooperation', *Academy of Management Journal*, **35**, pp. 265–291.

Hess, C. M. and C. F. Kemerer (1994). 'Computerized loan origination systems: an industry case study of the electronic markets hypothesis', *MIS Quarterly*, **18** (3), pp. 251–275.

Jarvis, C. B., S. B. MacKenzie and P. M. Podsakoff (2003). 'A critical review of construct indicators and measurement model misspecification in marketing and consumer research', *Journal of Consumer Research*, **30** (2), pp. 199–218.

Kaplan, S. and M. Sawhney (2000). 'E-hubs: the new B2B marketplaces', *Harvard Business Review*, **78** (3), pp. 97–103.

Katz, M. and C. Shapiro (1985). 'Network externalities, competition, and compatibility', *American Economic Review*, **75** (3), pp. 424–440.

Katz, M. and C. Shapiro (1994). 'Systems competition and network effects', *Journal of Economic Perspectives*, **8** (2), pp. 93–115.

Kauffman, R. J. and B. Wang (2001). 'New buyers' arrival under dynamic pricing market microstructure: the case of group-buying discounts on the Internet', *Journal of Management Information Systems*, **18** (2), pp. 157–188.

Kendall, W. A. (1999). 'Buyer–supplier performance: the role of asset specificity, reciprocal investments and relational exchange', *British Journal of Management*, **10**, pp. 113–126.

Laudon, K. C. and C. G. Traver (2007). *E-Commerce: Business, Technology, and Society*, 3rd edn. Upper Saddle River, NJ: Prentice Hall.

Lee, N. and G. Hooley (2005). 'The evolution of "classical mythology" within marketing measure development', *European Journal of Marketing*, **39** (3–4), pp. 365–385.

Luke, R. D., J. W. Begun and D. D. Pointer (1989). 'Quasi firms: strategic interorganizational forms in the health care industry', *Academy of Management Review*, **14** (1), pp. 9–19.

Mahadevan, B. (2003). 'Making sense of emerging market structures in B2B e-commerce', *California Management Review*, **46** (1), pp. 86–100.

Malone, T. W., J. Yates and R. I. Benjamin (1987). 'Electronic markets and electronic hierarchies', *Communications of the ACM*, **30** (6), pp. 484–497.

Mohr, J. and R. Spekman (1994). 'Characteristics of partnership success: partnership attributes, communication behavior and conflict resolution techniques', *Strategic Management Journal*, **15**, pp. 135–152.

Nambisan, S. (2003). 'Information systems as a reference discipline for new product development', *MIS Quarterly*, **27** (1), pp. 1–18.

Noordewier, T. G., G. John and J. R. Nevin (1990). 'Performance outcomes of purchasing arrangements in industrial buyer–vendor relationships', *Journal of Marketing*, **54**, pp. 80–93.

O'Reilly, P. and P. Finnegan (2005). 'Performance in electronic marketplaces: theory in practice', *Electronic Markets*, **15** (1), pp. 23–37.

Perlman, K. I. (1990). *Handbook of Purchasing and Materials Management*. Chicago, IL: Probus.

Ramsdell, G. (2000). 'The real business of B2B', *The McKinsey Quarterly*, **3**, pp. 174–184.

Riggins, F. and T. Mukhopadhyay (1994). 'Interdependent benefits from interorganizational systems: opportunities for business partner reengineering', *Journal of Management Information Systems*, **11** (2), pp. 37–57.

Rochet, J.-C. and J. Tirole (2002). 'Cooperation among competitors: some economics of payment card associations', *RAND Journal of Economics*, **33** (4), pp. 549–570.

Rossiter, J. R. (2002). 'The C-OAR-SE procedure for scale development in marketing', *International Journal of Research in Marketing*, **19**, pp. 305–335.

Sarkar, M. B., B. Butler and C. Steinfield (1998). 'Cybermediaries in electronic marketplace: toward theory building', *Journal of Business Research*, **41**, pp. 215–221.

Schneider, G. P. (2007). *Electronic Commerce*, 7th annual edn. Boston, MA: Thompson.

Sculley, A. B. and W. W. A. Woods (1999). *B2B Exchanges: The Killer Applications in the Business-to-Business Internet Revolution*. Hong Kong, Bermuda: ISI Publications.

Sirdeshmukh, D., J. Singh and B. Sabol (2002). 'Consumer trust, value, and loyalty in relational exchanges', *Journal of Marketing*, **66**, pp. 15–37.

Skjott-Larsen, T., H. Kotzab and M. Grieger (2003). 'Electronic marketplaces and supply chain relationships', *Industrial Marketing Management*, **32**, pp. 199–210.

Sokol, P. K. (1989). *EDI: The Competitive Edge*. New York: McGraw-Hill.

Spekman, R. and W. Johnston (1986). 'Relationship management: managing the selling and buying interface', *Journal of Business Research*, **14**, pp. 519–532.

Srinivasan, K., S. Kekre and T. Mukhopadhyay (1994). 'Impact of electronic data interchange technology on JIT shipments', *Management Science*, **40** (10), pp. 1291–1304.

Standing, C., P. E. D. Love, R. Stockdale and D. Gengatharen (2006). 'Examining the relationship between electronic marketplace strategy and structure', *IEEE Transactions on Engineering Management*, **53** (2), pp. 297–311.

Street, C. T. and D. B. Meister (2004). 'Small business growth and internal transparency: the role of information systems', *MIS Quarterly*, **28** (3), pp. 473–506.

Swatman, P. M. C., P. A. Swatman and D. C. Fowler (1994). 'A model of EDI integration and strategic business reengineering', *Journal of Strategic Information Systems*, **3** (1), pp. 41–60.

Truman, G. E. (2000). 'Integration in electronic exchange environments', *Journal of Management Information Systems*, **17** (1), pp. 209–245.

Wheeler, B. C. (2002). 'NEBIC: a dynamic capabilities theory for assessing net-enablement', *Information Systems Research*, **13** (2), pp. 125–146.

Williamson, O. E. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: Free Press.

Wise, R. and D. Morrison (2000). 'Beyond the exchange: the future of B2B', *Harvard Business Review*, November–December, pp. 86–96.

Yoo, B., V. Choudhary and T. Mukhopadhyay (2002). 'A model of neutral B2B intermediaries', *Journal of Management Information Systems*, **19** (3), pp. 43–68.

Zaheer, A. and N. Venkatraman (1994). 'Determinants of electronic integration in the insurance industry: an empirical test', *Management Science*, **40** (5), pp. 549–566.

Zhu, K. (2004). 'Information transparency of business to business electronic markets: a game-theoretic analysis', *Management Science*, **50** (5), pp. 670–685.

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