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TOWARDS A CONCEPTUAL FRAMEWORK OF ELECTRONIC PURCHASING CONSORTIA

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Abstract

In supply chain management literature, there has been little empirical research on consortium purchasing focusing on a detailed analysis of information and communication (ICT) based procurement strategies. Based on the exploration of academic literature and two surveys among purchasing organisations as well as e-Marketplaces / procurement service providers (PSPs) in the automotive and electronics industry sectors, the research methodology assesses the overall statement: 'Effective participation in electronic purchasing consortia (EPC) has the potential to enhance competitive advantage. Implementation requires a clear and detailed understanding of the major process structures and drivers, based upon the technology-organisation-environment framework'. Key factors and structures that affect the adoption and diffusion of EPC and the performance impact of adoption are investigated, which can be a valuable starting point to EPC research.

Keywords: E-Procurement, Electronic Purchasing Consortia, Demand Aggregation Strategies

Introduction to Electronic Purchasing Consortia

Pooled sourcing strategies are not a new concept, as co-operative purchasing has been practised in non-profit institutions in the public sector for more than a century. Due to the concentration on core competencies, the trend among industrial enterprises towards the formation of strategic demand aggregation alliances started mainly in the last two decades and is described as consortium purchasing (Essig, 1999). According to Hendrick (1997), a purchasing consortium is 'a formal or informal arrangement, where two or more organisations, who are separate legal entities, collaborate among themselves, or through a third party, to combine their individual needs for products from suppliers and to gain the increased pricing, quality, and service advantages associated with volume buying'. In the literature on purchasing consortium issues however, there has been little empirical research investigation focusing on a detailed analysis of ICT-based procurement strategies. Electronic purchasing consortia (EPC) enable purchasing organisations, to varying degrees, to electronically conduct tasks that are necessary for the management of demand aggregation of two or more legal entities, provide efficient ICT-based communication infrastructures and rely more on electronic communication than face-to-face contact. While some researchers (e.g. Arnold, 1996; Essig, 1999; Hendrick, 1997; Vigoroso, 1998) have explored purchasing consortia in more detail, limited attempts have been made to focus on the electronic procurement aspect in this field. Only Corsten and Zagler (1999) have proceeded with an action research project to electronic purchasing consortia and describe various tasks required for EPC management. However, their study did not include important research issues such as e.g. the empirical level of EPC adoption with regard to industry sectors' structures and anti-trust limitations, a categorisation of EPC management structures and scope, performance impact indicators, etc. that are explained and elaborated on in more detail in the following.

Theory Background

The theoretical foundation for EPC is complex, going well beyond the field of purchasing. Amit and Zott (2001) claim that no single strategic management theory can fully explain the value creation potential of e-Business. They note that rather, an integration of the received theoretical perspectives on value creation and a multi-perspective approach is needed, as '(…) virtual markets broaden the notion of innovation as they foster new forms of collaboration among firms (rather than merely new products or production processes) and involve new exchange mechanisms and unique transaction methods'. The resource-based theory (e.g. Barney, 1991) and the positioning stream (e.g. Porter, 1985) to competitive advantage have not addressed issues where industrial firms have not as such

developed critical resources and capabilities but in co-operation with other firms. This theoretical perspective suggests that competitive advantage can also be developed through inter-firm co-operation and links. That is why the theory of strategic networks and alliances (e.g. Gulati, 1998; Jarillo, 1988), which are based on a continuum between market and hierarchy, is very relevant to EPC as a further paradigm to competitive advantage. Recent research shows that relationships even develops between competitors (e.g. Nalebuff & Brandenburger, 1996).

Traditionally, lack of integration and communication infrastructures were regarded as one of the biggest barriers preventing the adoption and success of purchasing consortia. Electronic purchasing consortia, as a network enabler, can potentially offer a more efficient communication infrastructure with lower transaction costs (Corsten and Zagler, 1999). Electronic support can eliminate some inefficiency related to purchasing consortia. Corsten and Zagler (1999) state that electronic purchasing consortia may exploit synergetic potentials of economies of scale and scope without the diseconomies of increased transaction and communication costs. Symbiosis is the driver and a prerequisite for successful consortia (Essig, 1999). Rozemeijer (2000) argues that synergy is all the new value that can be added through organisation and the structure of interrelationships between independent units. However, EPC theory requires further integration of virtual structures in strategic alliance networks and virtual organisation (e.g. Bakos and Treacy, 1986; Malone et al, 1987), dis- and reintermediation (e.g. Wigand and Benjamin, 1996) as well as e-Procurement strategies (e.g. Gebauer and Zagler, 2000) to fully explain EPC. Metamediaries such as eMarketplaces and procurement service providers can enable firms to adopt EPC systems. Knudsen (2002), however, points out that there are still some uncertainties as to how the purchasing departments' overall performance can be improved by e Procurement. E-Procurement solutions and concepts are very diverse and have many different meanings. De Boer et al. (2002) note in that respect that the potential merit of those various e-Procurement concepts, such as e.g. electronic catalogue systems and software, electronic auctions, intelligent agent applications, electronic marketplaces, seems largely undisputed (e.g. Croom, 2000). However, with regard to the wide range of solutions available, many firms still struggle with assessing the suitability of e-Procurement for their purchasing processes and mainly adopt a 'wait and see' approach. Moreover, there is no one best way to organise for purchasing synergy and to improve inter-organisational demand aggregation and purchasing co-ordination practices. Therefore, more research into EPC is required.

Research Methodology

The research methodology follows a positivistic approach in order to assess the overall statement: "Effective participation in electronic purchasing consortia can have the potential to enhance competitive advantage. Implementation therefore requires a clear and detailed understanding of the major process structures and drivers." For the assessment of empirical data, an online survey instrument for e-Marketplaces and procurement service providers was implemented and pre-tested among academics and practitioners. Questionnaires were sent electronically to the population of 102 international active e-Marketplaces and procurement service providers in the automotive, electronics and closely related industries (e.g. metals, plastics). Reasons for the choice of the sectors derive from the background that both industries are pioneers and advanced in supply chain management and e-Procurement. A final response rate of 42% resulted from the survey on e-Marketplaces / PSPs. Most questionnaires were completed by managing directors (35%) as well as marketing managers (30%). Additional findings were achieved from a survey among 400 purchasing organisations in the automotive and electronics industry in Ireland and Germany, both multinationals as well as SMEs randomly selected from established industrial databases. The response rate could be increased to 128 organisations (i.e. a response rate of 32%), which were predominantly manufacturers and processing companies. The participants have been mainly purchasing managers (40%), followed by managing directors (16%), operational managers (15%) and IT managers (13%). Both response rates can be considered as satisfactory in comparison to other survey research (e.g. Bonaccorsi and Rossi, 2002). The survey data was tested for statistically significant differences in the responses of early and late returned surveys. No significant differences were found, suggesting that the sample is broadly representative for the population.

Discussion of Findings

A number of environmental characteristics and their impact on technology adoption have been studied in literature including e.g. external influence, government regulations, market uncertainty, trust, critical mass, etc. (e.g. Tornatzky and Fleischer, 1990). The surveys focused on the following characteristics of environment context for EPC: Industry fragmentation and pressures from business context. Most empirical studies recognised competitive pressure from the business context as an adoption driver (e.g. Grover, 1993). Coming from the literature review it was assumed that pressures from the business context could have a direct effect on EPC adoption and purchasing strategy of companies in different industry sectors (or external environments). Surprisingly, pressures from the business context (operationalised as a four-item construct with a Cronbach's alpha of 0.63) do not appear to have a significant impact on EPC adoption (F = 0.81, 1-p = 62.80%) or EPC importance to procurement strategy (R = 0.18, F = 0.41, 1-p = 61.80%). The finding here confirms Thong (1999) that competition does not provide a direct "push" for purchasing organisations to enhance their ICT systems. While business context pressures can not be identified to significantly affect EPC adoption, Rozemeijer (2000) claims that they can still trigger changes in corporate strategy and structure, which in turn then may stimulate companies to take measures to create competitive advantage in purchasing. For example, large purchasing organisations were well aware of EPC due to reasons such as e.g. their size, high level of investment budget and market share, but EPC adoption among large firms can be limited due to anti-trust issues.

According to the trade commissions, these legal limitations are amenable to traditional anti-trust analysis whether or not competition is affected by monopsonistic or oligopsonistic buyer power (Federal Trade Commission, 2000). The further EPC extend beyond the 'safe harbour', which under EU guidelines is fixed at 15%, the greater the risk of a negative competitive effect. In the US, if less than 20 percent of a market is affected by an exclusive arrangement, it will likely avoid regulatory scrutiny because it falls within the antitrust safety zone. Therefore, the degree of industry concentration / fragmentation and external view of competition was required to be integrated into the analysis of environmental context. Purchasing consortia can focus on both horizontal and vertical integration (in accordance with e.g. Powell, 1990). A vertical integration of EPC network structures (e.g. between manufacturers and first tier suppliers) can be identified in some cases from the survey data, while horizontal cross-industry EPC strategic alliances were found to be more relevant in practice. It can be argued that this is the main reason why it could not be statistically demonstrated that EPC offering is positively associated with industry sectors' level of fragmentation (assessed on a scale from 1 = very concentrated to 4 = very fragmented). Theoretically, the positioning stream would indicate a strong bond between the level of industry concentration, anti-trust legislation and EPC implementation. However, this direct link is not supported by the survey data in the automotive and electronics industry. It can not be concluded that the level of industry concentration significantly affects EPC adoption (F = 1.33, 1-p = 72.38%) or EPC importance to purchasing strategy (corr. coef. +0.02, 1-p = 8.10%).

The survey data revealed that EPC are often designed of cross-industry collaboration structures or for products (e.g. commodities) where potential anti-trust issues are not likely to arise. Therefore, anti-trust limitations still have an impact on EPC structure in dependence of factors such as e.g. size of co-operating members and buyer power in EPC, type and level of EPC network structure and number of competitors, EPC product spectrum and market share. For example, the survey results demonstrated that none of the consortia-led e-Marketplaces / PSPs offer any electronic purchasing consortia to date. Although they would already have finished decisive EPC collaborative phases such as e.g. finding partners, building up trust and commitment among the members, getting standardisation agreements in place, demand aggregation is mainly not pursued due to anti-trust limitations (as a result of their high level of market share and buyer power). EPC providers among e-Marketplaces / PSPs specified that the average number of competitors against non-competitors in EPC is 24%, while purchasing organisations identified that only 15% of EPC are made up of direct competitors. Co-opetition seems to occur in some context in EPC; however, a majority of EPC supply networks is established among non-competitors in order to avoid anti-trust issues, among other important reasons such as e.g. the potential loss of company-specific proprietary data to competitors. Overall, a direct link between the environmental context (based upon pressures from business context and level of industry fragmentation) and EPC adoption could not be statistically supported from the survey data. However, it

can be acknowledged that the environmental context and the positioning stream have an effect on the type and level of EPC co-operation and structure.

An inward focus on EPC resources and capabilities was analysed as well in terms of technological and organisational context. In literature, technology resource has been consistently demonstrated as an important factor for successful ICT adoption (e.g. Crook and Kumar, 1998; Grover, 1993; Kuan and Chau, 2001). Contrary to the organisational context and the environmental context, Tornatzky and Fleischer (1990) do not specify any particular attributes of the technological context, which facilitate or inhibit the adoption of technological innovations. The surveys focused on the overall adoption intensity of customised services (operationalised by a 11-item scale with a Cronbach's alpha of 0.83 including services such as e.g. tracking / tracing, accounts payables and receivables processing, collaborative design) in order to represent technological context. It was learnt from the survey data that many e-Marketplaces and PSPs still lack provision of customised services to date (also confirmed by Gebauer and Zagler, 2000). The survey results revealed that e-Marketplaces / PSPs in general plan to significantly increase the offering of customised services in future in order to further complement their service infrastructure. However, it could not be established that EPC providers offer more customised services than non-providers. The provision level of customised services is not positively related to EPC offering (F = 0.10, 1-p = 24.83%) and EPC importance (corr. coef -0.02; 1-p = 12.30%). On the other hand, the adoption level of customised services among purchasing organisations is positively related to EPC implementation (F = 15.35, 1-p = 99.98%) and to EPC importance to procurement strategy (corr. coef. +0.53, 1-p = >99.99%). EPC adopters among purchasing organisations implement a significant wider breadth of customised services and enabling technology than non-adopters and are ahead of them technology-wise.

However, strategic e-Procurement and electronic purchasing consortia are still in its infancy in Ireland and Germany. Only 7% of purchasing organisations have adopted EPC to date, while some groundwork appears to be in place with e-Marketplaces / PSPs (i.e. 44% EPC adoption rate). Only 27% of e-Marketplaces provide EPC in comparison to 82% of PSPs. The findings suggest that e-Marketplaces generally still have potential to develop and integrate EPC. The surveys also indicated that most companies (especially SMEs) are still in the early stages of developing and implementing a strategy to e-Procurement and are still trying to understand their many options (such as EPC), weighting up the pros and cons, or holding back until more is know about this fast-changing area. For the future, both purchasing organisations as well as e-Marketplaces / PSPs specified an increase in EPC integration. Nonetheless, only 18% of purchasing organisations plan to adopt EPC in future and therefore, EPC will not achieve a major breakthrough within the next five years.

Moreover, it is also important to analyse the organisational context and its impact and effect on EPC adoption. Organisational context was measured on the basis of the following specific indicators within the surveys: purchasing maturity, company size, intensity of purchasing spend, intensity of multi sourcing strategies and product pooling potential. Perry and Danziger (1980) showed that one of the most important factors in the adoption of ICT by local government was staff competence. They claim that when employees were not very well trained in using information technologies, this inadequate training resulted in resistance to change, resistance to use, and the inability to utilise information technologies to their capacity. The survey data statistically confirmed that purchasing maturity (the level of professionalism in purchasing, which was operationalised as a five-item construct with a Cronbach's alpha of 0.65), could be identified as an important process enabler and driver to EPC. EPC adopters are significantly more mature in purchasing than non-users (F = 17.43, 1-p = 99.99%). A multiple regression test also proved that the more mature the purchasing function, the more important are 1) EPC to procurement strategy (R = 0.69, F = 2.38, 1-p = >99.99%) and 2) further customised services to procurement strategy (R = 0.56, F = 0.22, 1-p = >99.99%). However, based on the results from the surveys, there is overall still much room for improvement in purchasing maturity among purchasing organisations, especially in the areas of EPC and e-Procurement training, development, implementation and co-ordination.

Another variable analysed within the organisational context was intensity of purchasing spend and its impact on EPC adoption. There is no statistical evidence for a positive correlation between purchasing

spend and EPC implementation (F = 2.41, 1-p = 88.11%) and importance (corr. coef +0.12; 1- p = 82.30%). It was statistically demonstrated that the size of purchasing organisations is positively related to EPC adoption to date (F = 6.31, 1-p = 98.72%), but not to EPC importance (R = 0.12, F = 0.82, 1-p = 54.20%). Due to their capital and skills resources, large organisations have better access to EPC adoption to date. Firm size has been consistently recognised as an adoption facilitator in literature. Large purchasing firms, since they operate closer to the technological frontier, are more often engaging in EPC, but also have to design, due to their buyer power, EPC structures that do not raise anti-trust issues. From the survey data it was confirmed that the size of purchasing organisations is a process driver for EPC adoption, while the size of e-Marketplaces / PSPs is not positively related to EPC offering (F = 0.00, 1-p = 7.39%) and importance ((R = 0.23, F = 0.58, 1-p = 11.60%). The survey data indicates that other factors such as for example the business and service strategy of e-Marketplaces / PSPs can be more relevant for the decision of EPC offering.

Within the organisational context, it was also anticipated from the literature review that an important driver for EPC adoption would be the degree of product homogeneity and pooling potential. While no significance could be established that the average pooling potential of the entire product spectrum is positively related to EPC adoption (F = 0.60, 1-p = 55.24%) and importance (corr. coef. +0.15, 1-p = 88.50%), the surveys' findings revealed that there is a significant amount of products that can be potentially pooled within almost all e-Marketplaces/ PSPs and purchasing organisations. EPC providers and users still have a good potential to increase their average present pooling of products. Statistically, it was concluded that EPC initiatives are not directly linked to the homogeneity of the underlying product specifications, but to company size and purchasing maturity. Therefore, EPC suitability of products can be regarded more as a filtering rather than an explanatory variable. Products that are characterised by a high degree of standardisation and homogeneity as well as a low level of asset specificity were identified to be well feasible for EPC. As custom products are traditionally very firm specific, not standardised and often very decisive for the overall success of purchasing organisations, EPC for custom products with high asset specificity may not have a high level of synergy potential and therefore may not result in a high level of co-operation among purchasing organisations. Complex modules with high asset specificity are more difficult to proceed by EPC because the parts are rarely sourced entirely on the basis of price, but on concept competition, supplier capabilities and in most cases single sourcing. Given the very nature of product sourcing processes with low asset specificity, it is significant that EPC are perceived to be more feasible for arm's length relationships than collaborative relationships with suppliers (Chi2 = 33.35, df = 1, 1-p = >99.99%).

Historically, the vast majority of buyer-supplier relationships have been conducted in an arm's-length mode. However, Clemons et al. (1993) argued that firms would move toward long-term relationships with a smaller set of suppliers. Their "move to the middle" argument emphasises that purchasing organisations tend to outsource more and reduce their number of suppliers, but develop more collaborative relationships with them. 95% of e-Marketplaces / PSPs acknowledged that collaboration between buyers and suppliers is becoming more important in future. However, there was no evidence that EPC adopters to date had a stronger tendency towards reducing their suppliers (F = 0.31, 1-p = 41.21%). A correlation test also confirms that the overall number of suppliers is not related to EPC importance (corr. coef. +0.01, 1-p = 14.60%). The findings suggest that a combination of co-ordination mechanisms is involved, in accordance with the mixed mode hypothesis (Holland and Lockett, 1993). According to them, firms operate on a continuum between markets and hierarchies and use combinations of market and hierarchy-type relations, which they maintain simultaneously. EPC adopters among purchasing organisations mainly take advantage of demand aggregation for a small proportion of overall purchases and for products with a lower level of asset specificity, that are predominantly sourced by arm's length relationships, while collaborative hierarchical sourced products are mostly left untouched. This conclusion is supported by the statistical analysis that the integration level of multi sourcing strategies is not positively related to EPC adoption (F = 1.32, 1-p = 74.91%) and importance (corr. coef. -0.10; 1-p = 75.80%).

Several further variables on EPC structures were also explored. 44% of purchasing organisations would opt for informal EPC management, whereas 25% would require a formal third-party management by members and 31% a neutral EPC management by specialised agent. It could not be

demonstrated that EPC are significantly associated with formal third-party reinfomediation (Chi2 = 1.66, df = 1, 1-p = 80.25%). EPC disinfomediation seems to occur in some context. However, it appears from the survey evidence that an electronic purchasing consortium can also well be associated with a third party organisation or infomediary that serves as a mediator between the firms in a network. Infomediaries can perform a variety of innovative services such as e.g. reverse auctions, consulting and moderation services, which are often complex, inconvenient or costly for EPC members to undertake. As a result, adaptation of metamediary roles, or EPC reinfomediation was found to be more common than disinfomediation. The majority of e-Marketplaces, according to the survey research, focus more on automating operational purchasing instead of strategic sourcing services. PSPs, the main group of EPC providers, direct their activities more closely towards strategic sourcing and are predominantly concentrating on the buy-side.

Variables to measure the EPC impacts on business performance were examined as well. Both tangible and intangible benefits and drawbacks to EPC have been identified in the surveys. The respondents indicated that the gross savings in most cases outweighed the costs related to EPC synergy initiatives. The average economies of scale and scope within electronic purchasing consortia could exceed the average diseconomies of increased transaction and communication costs. While a negative ROI occurred in some EPC context, an average positive ROI of 77% could be identified with an average net saving of 5.4% in purchasing costs. Apart from the positive ROI however, no significant correlation could be found between the overall level of efficiency and effectiveness of purchasing processes and EPC adoption (F = 0.44, 1-p = 48.42%) and EPC importance to procurement strategy (R = 0.09, F = 0.15, 1-p = 7.10%). This construct 'overall efficiency and effectiveness of purchasing processes' was built of a four-item scale with a Cronbach's alpha of 0.71. It could also not be established that EPC users have a significant amount of lower maverick purchases than non-users (F = 0.13, 1-p = 28.08%). The survey data also revealed that the sharing of intangible benefits such as purchasing knowledge across businesses seems to be still rather rare.

Purchasing organisations cite barriers to knowledge sharing and demand aggregation such as a not adequate training and education in e-Procurement, a low degree of information on change management and a lack of maturity in service offerings from e-Marketplaces / PSPs. Main drivers for non-adoption of EPC further include a 'wait and see'-approach to the selection of e-Marketplaces / PSPs, security concerns and opposition to data sharing with other companies, the non-feasibility of custom-made products for pooling initiatives, a lack of standardisation, confidentiality, trust and commitment among potential members. The overwhelming concern was also a perceived loss of control with EPC and exposure to anti-trust regulations. The surveys' results confirmed that barriers were predominantly organisational or human based rather than technical. EPC providers cited critical factors for EPC such as strong management support, a high level of trust among the members and a critical mass of EPC purchases. EPC non-providers underestimate in particular the minimum needs or critical mass of EPC purchases required (F = 7.75, 1-p = 99.12%).

On the other hand, most EPC adopters are quite satisfied and positive about electronic purchasing consortia and its contribution to competitive advantage and acknowledge that benefits can outweigh the drawbacks. Although there was also some scepticism from purchasing organisations and e-Marketplaces / PSPs, the overall consensus is positive that there is a wide array and potential for EPC applications in future. There is a growing realisation that over the longer term EPC can play a substantially more important role.

Conclusions

Though firms have been increasingly adopting ICT in their supply chain operations, there has been little empirical research on the adoption and diffusion of EPC, on the measurement of key factors and structures affecting the adoption and diffusion as well as the performance impact of adoption. The findings can make a contribution to EPC theory development and indicate that EPC is a rich, multi-faceted domain. The developed framework can be a fruitful starting point for further EPC research. From the research, it is apparent that EPC, despite limitations, can be a valuable strategic tool worth consideration inside an integrated supply chain model. EPC can represent a strategic procurement

direction for the future in supply chain management and is developing, due to its long history, in an evolutionary rather than in a revolutionary manner. New electronic metamediaries such as e-Marketplaces and procurement service providers have the potential to interpose themselves between suppliers and buyers by taking advantage of new types of economies of scale, scope and knowledge, enabled by ICT. However, much more academic and practical work still needs to be carried out if the use of this type of electronic network is to be more widely adopted.

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