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**E-Procurement Structures in
Purchasing Consortia:
Towards a Conceptual Framework**

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PhD Thesis in Supply Chain Management

**Dublin Institute of Technology
School of Business, Aungier Street**

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Prof Austin Smyth**

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Volume I of II

ABSTRACT

In the literature, there has been little empirical research investigation into purchasing consortium issues focusing on a detailed analysis of information and communication technology (ICT) based procurement strategies. While some anecdotal accounts of such advances in supply chain management can be found, there is a need to relate the term electronic purchasing consortia (EPC) to academic literature, thus empowering clearer theoretical analysis. 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. An overall statement was developed for the study of EPC:

“Effective participation in electronic purchasing consortia can have the potential to enhance competitive advantage. EPC implementation is dependent upon a clear and detailed understanding of the major process enablers and drivers. This understanding requires the development of a taxonomy and conceptual framework to EPC. One practical use of this taxonomy is the assessment of feasibility in given industry sectors.”

This overall statement is assessed by the exploration of academic literature, five multiple case studies and two surveys. 128 purchasing organisations as well as 43 e-Marketplaces / procurement service providers (PSPs) in the automotive and electronics industry sectors participated in the surveys. By adopting methodological pluralism and triangulation techniques, key factors and structures that affect the adoption and diffusion of EPC, based upon the technology-organisation-environment framework, and the performance impact of adoption are investigated.

The findings suggest that only 7% of purchasing organisations take advantage of EPC, but 44% of e-Marketplaces / PSPs offer them to date. Organisational size, purchasing maturity and technological competence are strongly associated with adoption of EPC, while the level of industry fragmentation, pressures from the business context, purchasing spend, intensity of multi sourcing strategies and product pooling potential are not.

EPC can enhance competitive advantage and have generated on average net reductions in purchasing costs of over 5% and a return on investment of over 70%. However, EPC do not necessarily lead to a higher level of purchasing effectiveness and efficiency, a lower level of maverick purchasing or a reduction in the number of suppliers. More conflict with EPC can arise in the automotive industry due to its OEM concentration, cultural and structural impediments (e.g. overcapacity, vertical integration) and technical factors (e.g. high level of modularised assembly).

Sophisticated employment of EPC is still very much at a developmental stage. The empirically derived original model for EPC represents a valuable starting point of EPC research within which to comprehend its current state and the directions for future studies.

DECLARATION

I hereby certify that this thesis, which I now submit for examination for the award of a Doctor of Philosophy (PhD), is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

This thesis was prepared according to the regulations for postgraduate study by research of the Dublin Institute of Technology and has not been submitted in whole or in part for an award in any other Institute or University.

The work reported on in this thesis conforms to the principles and requirement of the Institute's guidelines for ethics in research.

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Signed.....*Bernd Hübner*

Date.....*05/09/2005*

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More than four years of full-time research and preparation went into writing this PhD thesis which can be sometimes a solitary journey, however, it is not something you do completely on your own. The collaboration and assistance of many people are involved in producing a dissertation and they have in one way or another contributed to the completion of my thesis. I benefited from an enormous amount of help from a broad range of sources and I would like to take this opportunity to express my gratitude to the following people for their assistance in the completion of this dissertation. They have contributed through their encouragement or constructive criticism over the years and I would like to mention these in particular:

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LIST OF ABBREVIATIONS AND GLOSSARY

ASP	Application Service Providers offer organisations access over information and communication technologies to applications and services that would otherwise need to be located on their own enterprise computers.
Asset Specificity	Existence of significant and durable nonredeployable investments.
B2B	Business-to-Business.
B2C	Business-to-Consumer.
CAD	Computer Aided Design.
EDI	Electronic Data Interchange.
EPC	Electronic Purchasing Consortia 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.
E-Marketplace	Internet-based solution that links businesses interested in buying and selling related goods or services from one to another.
ERP	Enterprise Resource Planning.
HTML	Hypertext Mark-Up Language (see XML).
ICT	Information and Communication Technology.
Infomediary	Third-party providers of recurring services that facilitate the flow of information and ongoing interaction between buyers and sellers.
IOS	Inter-Organisational Systems are built around computer and communication technology that facilitates the creation, storage, transformation and transmission of information. An IOS differs from an internal distributed information system by allowing information to be sent across organisational boundaries.

Intermediary	Intermediaries do not fall into into the EPC continuum between markets and hierarchy, as intermediaries take ownership, store and resell products.
Maverick Purchasing	Rogue procurement or off-contract purchasing, which takes place when purchases are out of compliance with master contracts and when there is not a consolidated record of the total effect of such purchases.
Metamediation	General term that encompasses both infomediaries as well as intermediaries.
MNEs	Multinational Enterprises.
MRO	Maintenance, Repair and Operations.
OEM	Original Equipment Manufacturer.
ORM	Operating Resource Management.
PSP	Procurement Service Providers offer services for other organisations that could also be or typically have been provided in-house such as the identification of new sources of supply or the provision of EPC or reverse auctions.
RA	Reverse Auctions are buyer initiated quotation processes, where purchasers post a request for quotation (RFQ) for a product, while suppliers electronically bid against each other in a progressive way and compete in an online bidding event in order to achieve a sale for the requested product.
RFI	Request for Information.
RFP	Request for Proposal.
RFQ	Request for Quotation.
RFx	Request for Information, Proposal and Quotation.
ROI	Return on Investment.
SCM	Supply Chain Management.
SMEs	Small and Medium Sized Enterprises.
UN/SPSC	United Nations / Standard Products and Service Code.
XML	Extensible Mark-Up Language was developed as a meta-language that would overcome the complexity of HTML but also allow for the encapsulation of intelligent description of the language.

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CHAPTER I INTRODUCTION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

In this first chapter, the topic, background and rationale of the study is discussed, and an overview of the chapters is presented. Among academics, effective and efficient management of global procurement operations has become an increasingly important research issue. Globalisation forces multinational enterprises (MNEs) as well as small and medium sized enterprises (SMEs) to reduce costs and increase efficiency. Supply chain management is more and more recognised as a strategic weapon.

Therefore, competitive strategies drive companies to embrace innovative sourcing strategies – a paradigm on which the author has already set up his thesis “*Global Sourcing – Risks and Opportunities of Procurement Activities in North- and Southeast-Asia*” for completion of his undergraduate study.¹ It can be argued that companies’ concentration on core competencies has resulted in a rise of sourcing activities and in a diminution in manufacturing depth, thereby driving the augmented awareness of effective sourcing strategies (Huber, 2002b).

Most salient to sourcing strategies is cost efficiency. Gadde and Hakansson (2001) note that purchasing costs constitute the majority of the total costs of products sold in both the private and public sectors. In order to emphasise this phenomenon, purchasing literature usually provides a classical example (similar to the following): If a company’s pre-tax net profit margin on total turnover was five percent, it would have to sell 2,000,000 euros more in merchandise to equal the effect of a 100,000 euros cost saving in purchasing.

This is why Segev et al. (1998, p. 1) argue that procurement savings hold significant business value, given the fact that most organisations spend at least one third of their overall budget to purchase goods and services. However, there can be a point when companies have negotiated to the lowest procurement price available according to purchasing volume. It then also becomes necessary to look at other sourcing possibilities, such as forming purchasing consortia.

¹ See Huber, 2000.

*“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”.*²

Purchasing consortia may help add procurement volume leverage, due to the increased pressure on costs, particularly at times of economic depression (Huber, 2001b). Globalisation challenges purchasing organisations to increase the level of effective sourcing strategies and to analyse as well as to make use of efficient procurement technologies.

Weele (2000) notes that both academics and practitioners have become very innovative in developing new strategic procurement concepts (such as just in time scheduling, early supplier involvement and partnership, simultaneous engineering or formation of purchasing consortia) in order to administer buyer-supplier relationships more effectively.

Essig (1999a) notes that a purchasing consortium may be just one, but an important element of a supply strategy and may be combined with other effective sourcing strategies such as global sourcing, single sourcing, system sourcing, and other strategies.³ The selection of available sourcing concepts characterises the supply strategy (see Table 1).

² Hendrick, 1997, p. 7.

³ For example, single sourcing is in many cases chosen for complex parts, modules or systems that require closer supplier-customer relationships.

Table 1: The Sourcing Toolbox

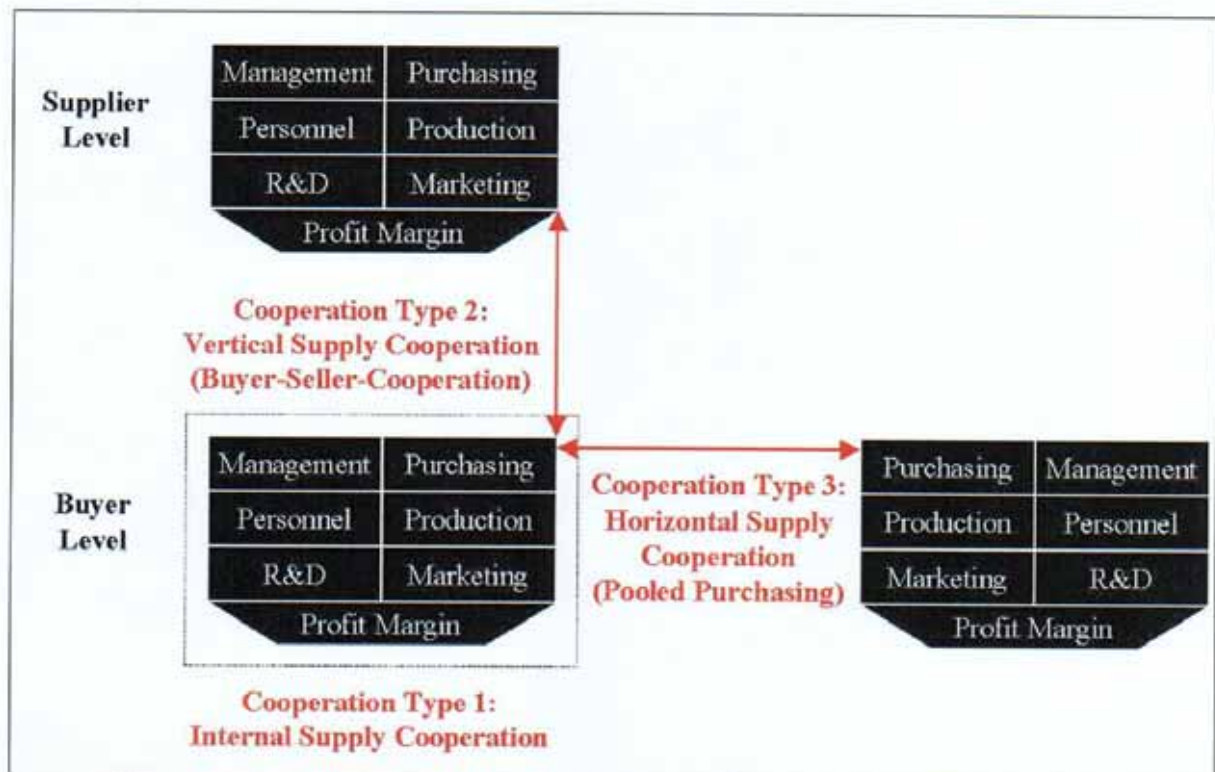
Sub-strategy	Sourcing Concepts			
Supplier Sub-Strategy	Sole Sourcing	Single Sourcing	Dual Sourcing	Multiple Sourcing
Object Sub-strategy	Unit Sourcing		Modular Sourcing	
Area Sub-Strategy	Local Sourcing	Domestic Sourcing	Global Sourcing	
Time Sub-Strategy	Stock Sourcing	Demand Tailored Sourcing	Just-in-Time	
Site Sub-Strategy	External Sourcing		Internal Sourcing (Factory within a Factory-Approach)	
Subject Sub-Strategy	Individual Sourcing		Consortium Approach	

Source: Essig (2000b)

Essig (2000b) regards pooled purchasing as a strategic task of purchasing management that should be firmly rooted in the purchasing processes, procedures and policies of the corporation.⁴ Within the policies and strategies, Arnold (1996a, p. 1369) states that three types of co-operation can be differentiated in supply management. He declares the internal supply co-operation within the departments of a focal company as the first co-operation type and as an integral part of any company's purchasing activity. What follows is a vertical supply co-operation between buyer and seller, which is described as the second co-operation type. Arnold further continues to define a purchasing consortium as a horizontal supply co-operation, which he calls the third type of co-operation in supply management (see Figure 1).⁵

⁴ Arnold (1996a) specifies single goal purchasing alliances and multiple goals purchasing alliances. He explains that single goal co-operations are working together in either (1) a defined procurement region or (2) in a single field or the procurement process or (3) on one category of procurement items. Whereas single item purchasing consortia concentrate on the settlement of a part of the purchasing process (e.g. supplier market analysis), a multiple item purchasing consortium fully include all major process steps.

⁵ See Arnold, 1996a, p. 1369.

Figure 1: Types of Co-operation in Supply Management

Source: Derived from Arnold (1996a), p. 1359.

In supply chain management literature, research has been primarily carried out on internal supply co-operation within the divisions of a focal company or on vertical buyer-supplier co-operation, while rather limited research has been conducted on external horizontal purchasing consortia.⁶ In particular, there has been little empirical research investigation into purchasing consortium issues focusing on a detailed analysis of information and communication (ICT) based procurement strategies.

With the advent of ICT, better entry options for the formation and management of purchasing consortia may be provided in order to enhance their effectiveness and efficiency level. Huber, Sweeney and Smyth (2004b) specify that 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.

⁶ See a literature classification in the bibliography section.

ICT may partly automate the creation and management of inter-company co-operation between two or more legal entities. For example, Raisch (2001) points out some elements where Internet-based systems replace traditional trust systems (see Table 2).

Table 2: Traditional vs. Internet-Based Value Trust Systems

Traditional	Internet-Based
Paper-based documents	Electronic documents
Photo ID	Authentication
Handwritten signature	Digital signature
Handshake	Email acknowledgement
Physical meetings	Videoconferencing
Qualification	Digital certificate
Authorisation	Rule-based access, public key infrastructure
Business card	Signature file
Key	Password
Fingerprint	Biometrics

The main platforms for electronic purchasing consortia may be Business-to-Business (B2B) procurement services providers (PSPs) and electronic marketplaces, which are

*“ (...) a distinct system of suppliers, distributors, commerce services providers, infrastructure providers and customers that use the Internet for communications and transactions ”.*⁷

Most academic literature approaches concentrate on the overall benefits potentially provided by these e-Marketplaces and PSPs.⁸ Few attempts have been made to relate purchasing consortia to existing theory and of those that have, they predominantly do not

⁷ US Federal Trade Commission, 2000, p. 2.

⁸ See e.g. Anoraganingrum, 2000; Aus, 2000; Berlecon Research, 1999; Brack, 2000; Brenner et al., 1999; Daum et al., 2000; Dolmetsch, 2000; Einsporn, 2000; Ezholer, 1999; Fingar et al., 2000; Kuglin & Rosenbaum, 2000; Niehus, 1999; Raisch, 2000; Sculley, 1999; Schorr, 1998; Timmers, 2000; Whyte, 2000. For example, Rozemeijer (2000b) states that e-Marketplaces / PSPs are a recent development that may have a significant impact on purchasing because they may reduce two major inefficiencies. First, by gathering together the purchasing power of many buyers they can negotiate significant price reduction. Secondly, e-Marketplaces / PSPs can reduce procurement transaction costs by outsourcing the procurement function (see also Kaplan and Sawney, 2000).

investigate electronic purchasing consortia in any great detail.⁹ The rather limited literature available on electronic purchasing consortia is primarily consulting oriented and often not based on scientific research (e.g. A.T. Kearney, 2000, Droege & Comp., 1998). Therefore, the intent of this research thesis is based on the development towards a conceptual framework to EPC, which is missing in academic literature.

1.2 THEME OVERVIEW

In order to reduce this investigation gap and to challenge information scarcity, horizontal pooled sourcing strategies, driven by new technologies, will be conceptually elaborated. For example, Internet technologies emerged as a medium, which can influence interaction and communication forms and create new co-operative procurement models.

Replacing expensive EDI solutions governed by only one buyer in a closed system, low entry costs, fast return on investment and protection of existing EDI investment, recent developments in XML-programming¹⁰, are all reasons for the transformation of the supply chain into a network by Internet technologies (Richmond et al., 1998).

*“The aggregating power of the Internet can overcome circumstances where otherwise the cost of information gathering outweighs the value of the surplus”.*¹¹

This leads to the business concept that Nalebuff and Brandenburger (1996) called “*co-opetition*”. They explain as the commercial world becomes ever more competitive, the best value chains will only be developed by greater co-operation, even with competitors.

However, SMEs, in particular, were reluctant in participating in horizontal sourcing partnerships in the past. Information sharing with suppliers, other purchasing organisations or even competitors, requires extensive trust building initiatives.

⁹ A literature overview on electronic purchasing consortia is provided in the bibliography section.

¹⁰ XML is becoming a de facto standard for B2B applications and transactions in many industries. The authors of XML planned to develop a meta-language that would overcome the complexity of HTML but also allow for the encapsulation of intelligent description of the language. The Worldwide Web Consortium created XML in early 1998; XML is a vendor-neutral data exchange language for passing not just data, but information.

¹¹ Federal Trade Commission, 2000, p. 7.

Less than 20% of the Fortune 500 firms in the USA were involved in at least one purchasing consortium (Hendrick, 1997). Vigoroso (1998, p. 18) also confirmed that very few purchasing organisations use the leverage of purchasing consortia to negotiate lower purchasing costs. He indicates that only one in four organisations have participated in some type of purchasing consortium, and of the 75% who do not participate in demand aggregation, 41% have never even considered the idea.

Traditionally, lack of integration and communication infrastructure were some of the biggest barriers preventing the success of purchasing consortia to date. Corsten and Zagler (1999, p. 140) indicate that the transaction costs of forming and managing a purchasing consortium proved to be very high and a barrier to future activities. Information and communication technologies may reduce these transaction costs. Electronic purchasing consortia, as a network enabler, can potentially offer a more efficient information and communication infrastructure operating at lower transaction costs (Huber, Sweeney and Smyth, 2004d).

Therefore, one central question is to investigate if better entry options actually exist for purchasing consortia in information and communication technology based markets. For example, MacDuffie and Helper (2000) explain that the Internet is a powerful tool for promoting fast, asynchronous communication among large groups of people, without a need to invest in a specific asset.¹² Electronic purchasing consortia may exploit the potentials of economies of scale and scope without the diseconomies of increased transaction and communication costs (Corsten and Zagler, 1999, p. 141).

As Hoffmann (2002) puts it:

“Before the emergence of the Internet, buyer aggregation was limited to people or businesses with a wide network of contacts. One had to know other entities, which were willing to join a group buy, had the need for the same products and had enough trust in the other party to do business with them. The most common case was the CEOs or purchasing agents of a company calling each other, trying to figure out a way to merge their demand to obtain

¹² The Internet is often seen as having two types of impacts on commerce: (I) aggregation of buyers and suppliers and (II) facilitation of information exchange.

better pricing. The existence of such a network and with that the successful aggregation of demand was limited to relatively old businesses in every market that knew each other for a while. Aggregated buying was a matter of knowledge, relationships and trustworthiness. Consequently it mostly occurred in large international and well-established companies, like e.g. automotive manufacturers. With the emergence of the Internet and with it a new concept of aggregated buying, the knowledge of other parties that are interested in buyer aggregation is provided online. (...) Aggregated buying is no longer a privilege of well-established companies."

EPC implementation can be more attractive to SMEs in order to compensate structural competitive disadvantages in purchasing volume. For example, Corsten and Zagler (1999, p. 140) report that among 79 SMEs (in the machining industry in Switzerland and Germany) horizontal co-operation in purchasing was given the highest potential (71%), followed by sales and R&D (each 43%) and production and logistics (each 36%). Vigoroso (1998) further investigated that 62% of buyers say consortium purchasing has met initial expectations.

Large organisations typically have a high level of buyer power and can, therefore, profit less from economies of scale and scope. They also have to design EPC structures that do not raise anti-trust issues. However, SMEs are often short of resources, which directly affects their capability to improve their competitiveness. That is why SMEs are still trying to understand their many options in e-Procurement or are holding back until more is known about this quickly changing area. Most SMEs use the Internet as a basic communications facility, but only a minority reap significant benefits from the Internet (e.g. Poon and Swatman, 1997).

Monczka et al. (1998) identified purchasing consortia as a key trend for purchasing in the next century, and forecasted a growing number of firms will become members of consortia as means to realise lower purchase costs. According to Corsten and Zagler (1999), forming or becoming a member of a purchasing consortium is becoming less and less problematic due to the rapid developments in Internet technology. This background clearly stresses the potentials of ICT-based purchasing consortia and makes more original and empirical research necessary.

Furthermore, electronic reverse auctions will also be explored in more detail in this study. Purchasing consortia can deliver the required volume (especially for SMEs) to carry out reverse auctions (Huber, 2002a). An electronic reverse auction is a buyer initiated quotation process, where purchasers post a request for quotation (RFQ) for a product, while suppliers electronically bid against each other in a progressive way and compete in an online bidding event in order to achieve a sale for the requested product.¹³

Reverse auctions are based on game theory and are dynamic price applications used to streamline the RFX-process.¹⁴ Only pre-qualified suppliers might be allowed to bid electronically for a specific demand. Reverse auctions may work in practice if the supplier base is known well and an up front analysis work has been done (Huber, 2002c).¹⁵ Reverse auctions may make a contribution to the EPC sourcing process when the addressed markets are fragmented; a critical mass and global sourcing expertise is needed; standardisation of products is desired; and transactions costs are high. The request for quotation process may potentially be shortened and market transparency enhanced by reverse auctions (Huber, 2002e).

However, implementation of reverse auctions has not been without controversy, because they can be contradictory to the long-term benefits associated with collaborative buyer-supplier alliances (CAPS Research, 2003). This perceived conflict is primarily caused by the emphasis of reverse auctions on awarding business based on aggressive price competition and increased supplier transparency instead of long-term total cost of ownership considerations. Logic alone suggests that purchasing organisations cannot

¹³ EPC may be combined with electronic requests for quotation or reverse auctions. Most of the work surrounding a reverse auction takes place prior to this bidding event. Tasks include identifying adequate suppliers, pre-qualifying them, inviting them to participate, and informing them about the technology being used. Quality, delivery terms, payment terms, quantities, lot sizes, etc. need to be specified upfront.

¹⁴ The term RFX describes any process for sourcing or liquidation. The three types of RFX commonly used for sourcing include RFI (Request for Information), RFP (Request for Proposal), and RFQ (Request for Quotation). Woods (2000) explains that RFIs typically involve a potential buyer asking a seller to provide additional information on a product or process. RFQs involve a potential buyer requesting a specific price for given items, while RFPs tend to include both a quote and a qualitative description of the work to be done.

¹⁵ A variety of parameters such as the level of suppliers' quality, warranty or customer service are typically pre-qualified by purchasers and integrated into reverse auctions by multimode codings. When competition in reverse auctions would be based on purchasing price alone, suppliers are traditionally anxious about decreased profit margins or lack of opportunity to provide value-added services.

expect to save significantly on repeated buys for the same good and have the supplier, or even supply base, stay in business.

The companies in the study of CAPS Research (2003) all suggested that they did not expect to maintain the same percentage of cost savings on repeated buys. Nonetheless, several companies had experienced substantial cost savings on the second reverse auction for the same good. Longer term, most firms indicated the savings will level off and become more driven by the supply-demand conditions at the time of the reverse auction. Thus, future results could be price increases rather than price decreases (CAPS Research, 2003). The efficiency gains from reverse auctions may be less visible on the supplier side and hardly achieved. Generally, suppliers asked to participate in reverse auctions, especially incumbent suppliers, often do so reluctantly for fear of losing business. Therefore, reverse auctions may not be sustainable in the longer term.

Nonetheless, innovations such as e-Marketplaces and PSPs can generally enable organisations to e.g.

- aggregate product catalogues of many suppliers in one format and generate more transparency,
- help reduce transaction, manufacturing and other costs,
- check unmonitored corporate spending (i.e. maverick purchasing¹⁶) and centralise purchasing spend,
- co-ordinate efficient collaborations for such projects as joint product design,
- facilitate supply chain management and aid dynamic pricing concepts such as electronic purchasing consortia or reverse auctions in B2B transactions (Huber, 2001a).¹⁷

However, academic research in purchasing consortia overall and, in particular, in EPC is therefore quite limited because purchasing consortia have traditionally not been very well adopted within industry. Conceptual and empirical articles are scarce. Few researchers

¹⁶ Maverick buying, or also called rogue procurement or off-contract purchasing, takes place when purchases are out of compliance with master contracts and when there is not a consolidated record of the total effect of such purchases. Neef (2001) explains that only few companies fully appreciate the cost associated with non-contract buying.

¹⁷ Business-to-Business (B2B) differs from Business-to-Consumer (B2C): In B2B, relationships between customers and suppliers are much more complex, often contractual, long term and involve larger order amounts than B2C.

have analysed purchasing consortia: For example, Essig (2000b) examined research in purchasing consortia both in the Anglo-Saxon countries and in Germany, whereas Hendrick (1997) has analysed a blueprint for the formation of purchasing consortia by survey research among the Fortune 500 in the United States. While these authors do not discuss the ICT domain to purchasing consortia in any detail, Quayle (2002a) surveyed SMEs to comment on the feasibility and desirability of a purchasing consortium using e-Commerce. There was a mixed reaction to the concept. Some 70% of respondents thought that such a consortium was desirable but 60% of those considered that it might not be feasible.

Reasons for the non-feasibility of EPC may include opposite e-Procurement views and practices among SMEs and large firms. For example, Chan and Lee (2002) note that most SMEs still heavily rely on traditional procurement tools (e.g. phone, fax, face-to-face) and that they are still in the beginner's level of e-Procurement adoption. They also indicate that SMEs are still waiting for the existence of a critical mass of e-Procurement adopters and require some role models to follow in carrying out successful e-Procurement.

Trust in the technology is a significant factor that affects the intention to adopt e-Procurement. This is especially obvious in the SME sector, as small companies tend to have a lower level of technological competence and are in many cases unaware of e-Procurement (Chan and Lee, 2002). They are also faced with a plethora of standards and technologies, so from a technology point of view, participation is difficult for them. Therefore, most SMEs just adopt a 'wait and see' approach to the adoption and selection of e-Procurement tools such as EPC.

Corsten and Zagler (1999) describe various tasks required for EPC management. They report about an action research project on purchasing consortia and Internet technologies. The starting consortium consisted of seven industry partners, predominantly from the machining industry in the Lake Constance area. The intention was to develop an Internet platform where SMEs can exchange knowledge, pool demand and attract suppliers.

While these findings are very useful and are integrated into the literature review of this study, a range of important EPC research issues are not covered in these approaches, such as the empirical level of EPC adoption with regard to industry sectors' structures and anti-

trust limitations, a categorisation of EPC network scope and management, revenue models, economies of scale / scope vs. transaction costs in EPC, which required further analysis. Generally, the lack of studies that focus on synergy structures in ICT-supported purchasing consortia provides room for improvement in both managerial and academic research to EPC. Quayle (2002a) specifically asked for further research to establish key elements and disciplines of continuous improvements in SMEs with a particular focus on their electronic supply chain management capability and the scope for SME purchasing consortia. For example, Quayle (2001) recommended that research is required to investigate the operational characteristics and constraints of such consortia. These realities and preliminary literature findings stimulated the author to initiate the research project on this topic.

1.3 JUSTIFICATION FOR THE RESEARCH: PROBLEM AND OVERALL STATEMENT

The first two sections already indicated that many developments are taking place in the field of purchasing and ICT. However, research in e-Procurement is still in theoretical as well as conceptual flux. The lack of empirical adoption and diffusion information at the firm level further adds to the scarcity of managerially and academically relevant studies on electronic purchasing consortia. E-Marketplaces / PSPs are still in their infancy, and still many organisations are not fully aware of e-Procurement (Huber, 2002d). That is why this research aims to construct a conceptual framework of electronic purchasing consortia within the advent of rapidly changing information and communication technologies, and also point out modes of practice and process studies.

Traditionally, purchasing lacks strategic capacities. Re-conceptualising purchasing consortia, as such, requires further research and co-ordination. Operational purchasing may become more automated as consortium and third party purchasing may become more prevalent in the future. However, Duffy (1998, p. 2) argues at the same time that purchasing is increasingly recognised as a crucial subset and structural-purchasing departments will not be eliminated.

Rozemeijer (2000) states that a growing number of firms recognise the potential opportunities of pooling (common) product requirements and of implementing purchasing

strategies. He further explains that firms are also increasingly consolidating volumes across international business units rather than domestic units only. However, he also indicates that only a moderate level of consolidation actually occurs, even when major opportunities exist to realise cost savings through purchase volume consolidation. The ways in which EPC resolve issues that are related to achieve potential synergies are still rather unclear.

The author elaborated on an overall theme or central concept-oriented statement for the research, which is aimed to build a body of knowledge and evidence to EPC. At the same time, the overall statement set out below also reflects the explorative character of this research on EPC, which tries to cover a relatively new field in the literature.

“Effective participation in electronic purchasing consortia can have the potential to enhance competitive advantage. EPC implementation is dependent upon a clear and detailed understanding of the major process enablers and drivers. This understanding requires the development of a taxonomy and conceptual framework to electronic purchasing consortia. One practical use of this taxonomy is the assessment of feasibility in given industry sectors.”

Related to this particular overall research theme and statement, important concepts, hypotheses and theories have been identified. Careful decision had to be made as to what to concentrate on and what to omit from the literature review. The research on EPC is complex, going well beyond the field of purchasing theory (Huber, Sweeney and Smyth, 2004c). Saunders (1997) agrees that the body of literature in the field of purchasing is not isolated from other areas, for it borrows concepts and theories from other disciplines such as economics, information and communication systems, operations, anthropology, strategy and management science, marketing and organisation theory.

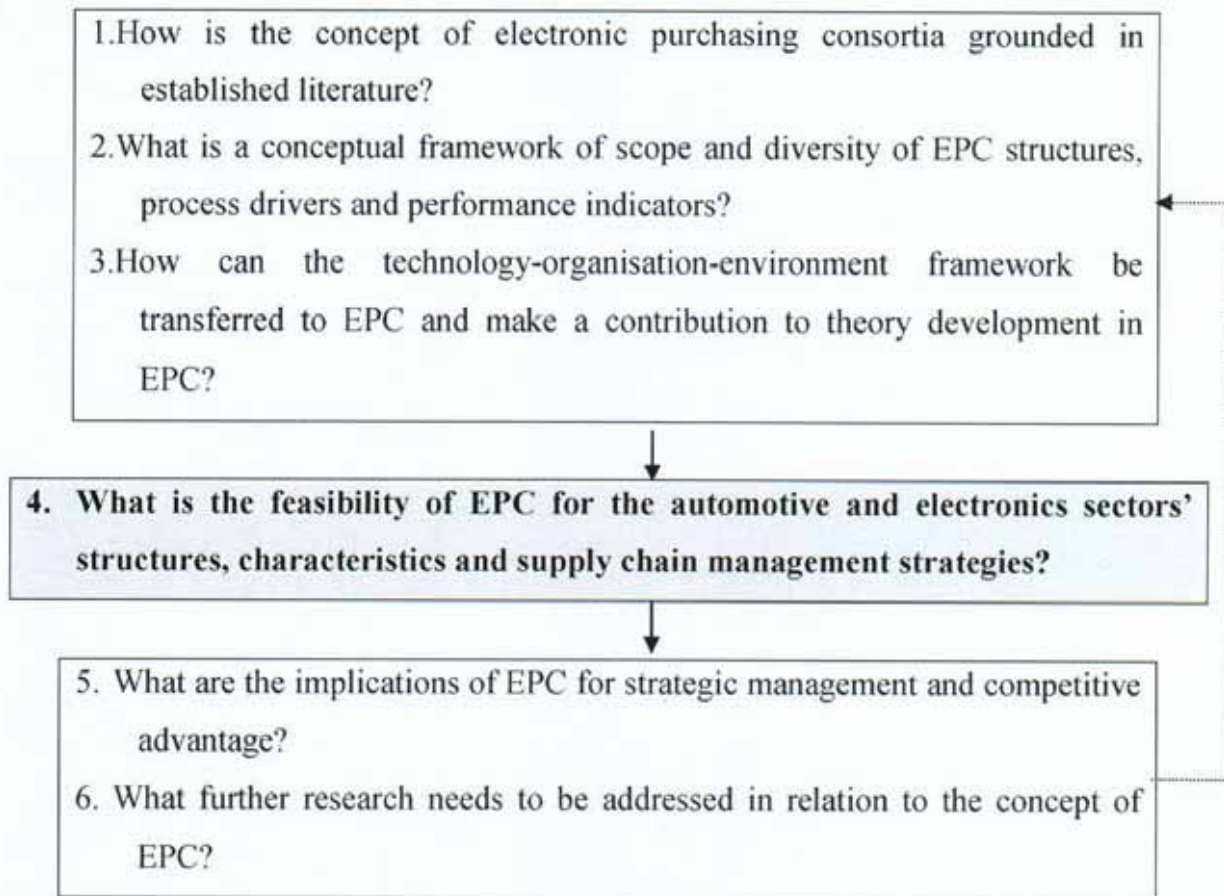
A detailed examination of EPC related concepts within the literature review is required to explain EPC and to establish a grounding to a conceptual framework of EPC structures and scope. This integration is critical to address the complexities of electronic purchasing consortia. The size of the research project and the scope of a PhD thesis mean that decisions had to be made about the level of analysis and the scope of the research.

It was found that strategic management is an important issue that requires consideration when researching electronic purchasing consortia. The literature review needs to address the concept of competitive advantage, which is the fundamental element in the field of strategic management. It has to be explored in more detail if and in which way EPC can contribute to a sustainable competitive advantage. While a quite extensive and broad range of literature to strategic management and competitive advantage has been published up until now (e.g. Amit and Schoemaker, 1993; Barney, 1991; Day & Wensley, 1988; Porter, 1980; Rumelt et al., 1991), this study is grounded in the premise that a closer examination of the sources of competitive advantage in the context of specific industries, i.e. the automotive and electronics, can provide academic insight into strategic process enablers and drivers related to electronic purchasing consortia.

However, literature has not addressed in which way EPC are formed, managed, which process drivers and enablers emerge and how a conceptual framework can be established. Strategic management theory alone is not enough to develop towards this framework. Virtual structures in strategic alliance networks and strategies in integrated supply chain linkages as well as adoption and diffusion theories in inter-organisational systems (IOS) and e-Procurement have a profound impact on how EPC may add to competitive advantage. However, this value can be limited due to anti-trust limitations. Therefore, the positioning or industry paradigm to competitive advantage also forms an important element to this study.

An integration of different theories and concepts is vital to assess the overall statement and to recognise the practical aspects of this research, as they relate to the feasibility of EPC in the automotive and electronics industry sectors. Therefore, the research questions for this study were defined as follows:

Key Questions in the Research Design



The research questions indicate the linkages between the more explicit academic research and the empirical work undertaken within the industry sectors. They also highlight the overall importance of the assessment of EPC feasibility for the automotive and electronics sectors' structures, characteristics and supply chain management strategies. This assessment is of central significance and placed within a wider theoretical framework; the findings from the EPC literature review, from the conceptual framework of EPC structures, process drivers, performance indicators, and from the implications for competitive advantage and further research are added value and are required to inform and give answers to the EPC feasibility.

Appropriate diffusion of EPC in industry can be hampered by lack of systematic research on factors and processes impacting diffusion, utilisation, and performance assessment of EPC technologies. The contribution of the research is to provide an academically and managerially relevant analysis into EPC. The author takes the stance that it is relevant to study EPC from a scientific point of view, with explicit reference to theory building from this explorative research. It addresses industry professionals and academics alike, as it

attempts to provide empirical information and conclusions with practical relevance as well as to contribute to research by conceptualising EPC. The study is aimed to provide a valuable starting point of further research.

1.4 CONTEXT AND SCOPE OF THE STUDY

The research, carried out over more than four years, was mainly conducted in Ireland and Germany. These economies attract a lot of international investments, e.g. especially in software and other high-tech industry branches. Reasons for this attraction are for example that Ireland is the only wholly English speaking country in the European monetary union and offers a high-skilled labour force as well as a low corporate tax scheme, which made Ireland a good surrounding to investigate new technologies in procurement operations.

E-Commerce and e-Procurement have been very well received and greeted with a lot of media interest and optimism world-wide. This media attraction for e-Procurement seemed to be necessary to first build up the awareness of potential cost savings in procurement and as a next step to carry out actions. However attractive the signs, take-up and efficacy of e-Procurement remain highly complex and under researched issues. So far, we are still in the first stages of increasing the recognition of e-Procurement. The recent decline of activity in the ICT sector has further increased the practice of most companies adopting a 'wait and see' approach to many aspects of e-Business. Many expectations concerning e-Business have not yet come to fruition, dot.com valuations sank on a large scale.

Reasons for the poor uptake include the problem that practical solutions were partly missing on how to actually profit from e-Business. Therefore, the objective of the study is to understand the scope of EPC and to identify and assess the drivers and barriers being experienced by organisations. E-Procurement and more specifically EPC can be rapidly developing business tools in all industries and further research is necessary.

The Irish and German economies consist of up to 95% small and medium sized companies, most of which, historically and culturally, may have had little or no willingness to participate in horizontal sourcing consortia. A very interesting question, therefore, is whether or not purchasing organisations could find it easier to participate in

electronic purchasing consortia. The research can examine the structural transition of purchasing consortia to the EPC domain, analyse the willingness, or indeed non-willingness, for EPC adoption and investigate specific performance outcomes.

In general, attitudes seem to be positive with many companies understanding e-Procurement as one of the more eminent business practices of the future. However, what appears to remain vague is exactly how this type of technology can be integrated within specific companies and between supply chain partners. SMEs, in particular, have more difficulties than large organisations in bearing the risk of new technology adoption. The return on investment arising from adoption of inter-organisational systems such as EPC is subject to considerable uncertainty. Adoption, therefore, is likely to be particularly problematic for SMEs.

The author hopes that the results, conclusions and recommendations of this study will help organisations and academics understand how EPC may impact on business strategy. The principal motivations for this study stem from the lack of cohesive and empirical information, and the realisation that the purchasing function may exert a significant influence in future. Intensive desk research and exploratory interviews with purchasing managers encouraged the author to choose EPC as an object of research.

1.5 STRUCTURE OF THE STUDY

In this first chapter, the study was introduced and the background and context explained. The study is a nested approach: The second chapter will start the literature review with a detailed approach to the concept of competitive advantage and strategic management, which is discussed within major strategic developments in purchasing theory. The range of applicable theory and current research is identified in the context of EPC. A broad-based assessment of EPC research at a number of different conceptual level of analysis is conducted. This leads to an understanding of terms and structures of EPC. The review focuses on a theoretical lens of various types of sources of competitive advantages based on the main paradigms of competitive advantage.

Competitive advantage is traditionally analysed in the literature by the resource-based view (e.g. Barney, 1986, 1991; Dierickx & Cool, 1989; Peteraf, 1993; Rumelt, 1984;

Teece, 1984; Wernerfelt, 1984) and the positioning stream (e.g. Cool, Dierickx & Martens, 1994; Ghemawat, 1991; Porter, 1980, 1991). The resource-based view postulates that firms are primarily idiosyncratic, and over time accumulate unique combinations of resources and skills, which enable them to garner rents on the basis of '*distinctive competence*'. The positioning stream or industry view, for explaining superior firm performance, is rooted in the concepts of industrial organisation economics and comparative advantages of nations and is more directly related to the firm's environment (external view of competition).

The paradigms to competitive advantage are complementary and will be linked in the second chapter to strategic developments in supply chain management and procurement in the sectors chosen for this research, namely the electronic and automotive industries. According to Porter's (1985) model on the value chain with five primary activities and five support activities, purchasing is claimed to be capable of being a source of competitive advantage.

However, firm specific and location specific advantages are not the only source for competitive advantage and are insufficient to fully explain EPC. Mata et al. (1995) confirm that a variety of factors have an important impact on the ability of firms to obtain sustained competitive advantage, including the relative cost position of a firm (e.g. Porter, 1980), a firm's ability to differentiate its products (e.g. Caves and Williamson, 1985; Porter 1980), and the ability of firms to co-operate in strategic alliances (e.g. Kogut, 1988). This theoretical perspective suggests that critical firm resources are also accumulated and developed through inter-firm co-operation and links. That is why the strategic network approach as a further paradigm to competitive advantage is very relevant to EPC and requires to be analysed in more detail.

An extensive literature analyses the importance of complementarities in the formation of networks (e.g. Charan, 1991; Ford, 1990; Gomes-Casseres, 1994; Gupta, 1992; Hakansson and Johanson, 1992; Hakansson & Snekota, 1995; Jarillo, 1988; Johanson and Mattsson, 1987; Knoke and Kuklinski, 1983; Kogut, 1988; Miles and Snow, 1992; Park, 1996; Powell, 1990; Yanagida, 1992; Webster, 1995) or strategic alliances (e.g. Chung, Singh, and Lee, 2000; Doz and Hamel, 1998; Gulati, 1998; Osborn and Hagedoorn, 1997;

Ring and Van De Ven, 1994; Rothaermel, 2001; Spekman et al., 2000). The literature implications for electronic purchasing consortia need to be discussed in detail.

EPC are based on a continuum between market and hierarchy (e.g. Dobler, 1996; Powell, 1990; Malone et al., 1987; Rank and Wald, 2000; Williamson, 1990). Humphreys et al. (2001) note that the transaction cost approach is intended to explain the choice of governance structure for different markets and hierarchies, and is done by analysing the economic activities from a transaction cost perspective. Thus, EPC and the theory of competitive advantage will also be linked to synergy structures (e.g. Ansoff, 1968; Coming, 1998; Mahajan and Wind, 1988) and the theory of economics of scale / scope (e.g. MacPherson, 1998; Montgomery and Wernerfelt, 1988) and transaction costs in purchasing (e.g. Coase, 1937; Williamson, 1975).

However, the three paradigms to competitive advantage and synergy structures still cannot fully explain EPC. Mata et al. (1995) specify that information and communication technologies have also been mentioned for the possible role in creating sustained competitive advantages for firms in the literature (see e.g. Barney, 1991; 1996; Clemons, 1986; 1991; Clemons and Kimbrough, 1986; Clemons and Row, 1987; 1991; Feeny, 1988; Feeny and Inves, 1990; Loveman, 1994; Roach, 1987; Strassman, 1990). However, academic work on this topic is relatively underdeveloped, both empirically and theoretically. As stated by Amit and Zott (2001), e-Business may have numerous potential sources of value creation that might be difficult to capture through a unique particular paradigm. No single strategic management theory can fully explain the value creation potential of e-Business. Amit and Zott (2001) 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."

Virtual markets are characterised by the importance of information goods and a high level of network connectivity (e.g. Hagel and Armstrong, 1997; Shapiro and Varian, 1999).

Therefore, due to the fragmentation of theory, research must integrate different perspectives in order to improve the understanding of the ways in which EPC can generate value.

Based on this background, the literature review of EPC will also need to address, as a next logical step, the concept of virtual structures and virtual organisation (see e.g. Ahuja and Carley, 1999; Bakos, 1991; Bakos and Nault, 1997; Bakos and Treacy, 1986; Davidow & Malone, 1992; Hopland, 1995, Malone et al., 1989; Palmer and Speier, 2000; Venkatraman and Henderson, 1998) such as dynamic strategic alliance networks (see e.g. Miles and Snow, 1986; Sieber, 1998) which form an essential part for the analysis of EPC. Also, the concept of dis- and reintermediation (e.g. Bakos, 1998; Gellman, 1996; Hermanns and Sauter, 2001; Lucking-Reiley and Spulber, 2000; Swan and Watson, 1998), where key providers of EPC such as e-Marketplaces and procurement service providers (e.g. Bakos, 1991; Wigand and Benjamin, 1996; Malone et al., 1987; 1989; Malone and Rockart, 1991) can be based on, needs to be elaborated on in this respect.

Moreover, inter-organisational systems (IOS) that are part of ICT and relevant to EPC will be discussed in terms of adoption and diffusion models in more detail. Inter-organisational systems are defined by Cash and Konsynski (1985) as automated information systems shared by two or more companies. Johnston and Vitale (1988) define IOS in the following way:

“An automated information system shared by two or more companies. An IOS is built around information technology, that is, around computer and communication technology that facilitates the creation, storage, transformation and transmission of information. An IOS differs from an internal distributed information system by allowing information to be sent across organisational boundaries.”

IOS have been used since the 1970s to link one or more organisations to their suppliers or customers through private value added networks such as electronic data interchange (Archer and Yuan, 2000; McIvor and Humphreys, 2004). The technology-organisation-environment framework, developed by Tornatzky and Fleischer (1990), is a very widely accepted and recognised model in research for explaining IOS adoption and diffusion. A

classification and categorisation of e-Procurement instruments and strategies within IOS (e.g. Boer, Harink and Heijboer, 2002; Croom, 2000; Gebauer and Zagler, 2000; Smeltzer and Ruzicka, 2000; Van Weele, 2000) is also required to provide some grounding to new electronic procurement techniques.

However, e-Procurement strategies such as EPC can be limited due to buyer power concentration and resulting legal or anti-trust considerations (see e.g. Federal Trade Commission, 2000; Johnston, 1993; OECD, 1981; Weinschel, 2000). Buyer power is defined as

*“(...) a situation which exists when a firm or a group of firms, either because it has a dominant position as a purchaser of a product or service or because it has strategic or leverage advantages as a result of its size or other characteristics, is able to obtain from a supplier more favourable terms than those available to other buyers”.*¹⁸

Buyer power is an important element in the economic analysis of industry structure (e.g. Inderst and Wey, 2002; Horn and Wolinsky, 1988; Stole and Zwiebel, 1996; Snyder, 1996). Abuse of market power to obtain non-cost related advantage over other purchasing organisations is a matter for concern as societal welfare may be adversely affected by actions such as EPC. That is why this concept forms the last part of the detailed literature review in the second chapter before describing more closely which parts in relation to EPC have not been covered in the literature and require more research by this study.

In the third chapter, the author describes the research design and points out the research methodology, methods and instruments as well as a time plan. The study contains both inductive and deductive reasoning processes as well as both quantitative and qualitative research. The research strategy for this original project is, therefore, principally one of methodological pluralism in order to develop a rich, complex description of EPC. Five explorative multiple case studies were selected to highlight the commonalties and differences in EPC structures, adoption motivators and performance indicators, while two surveys were developed for hypotheses testing. The combination of case study and

¹⁸ OECD, 1981.

survey research can be regarded as a triangulated research strategy, which can increase the overall data reliability and the process of gathering it.¹⁹

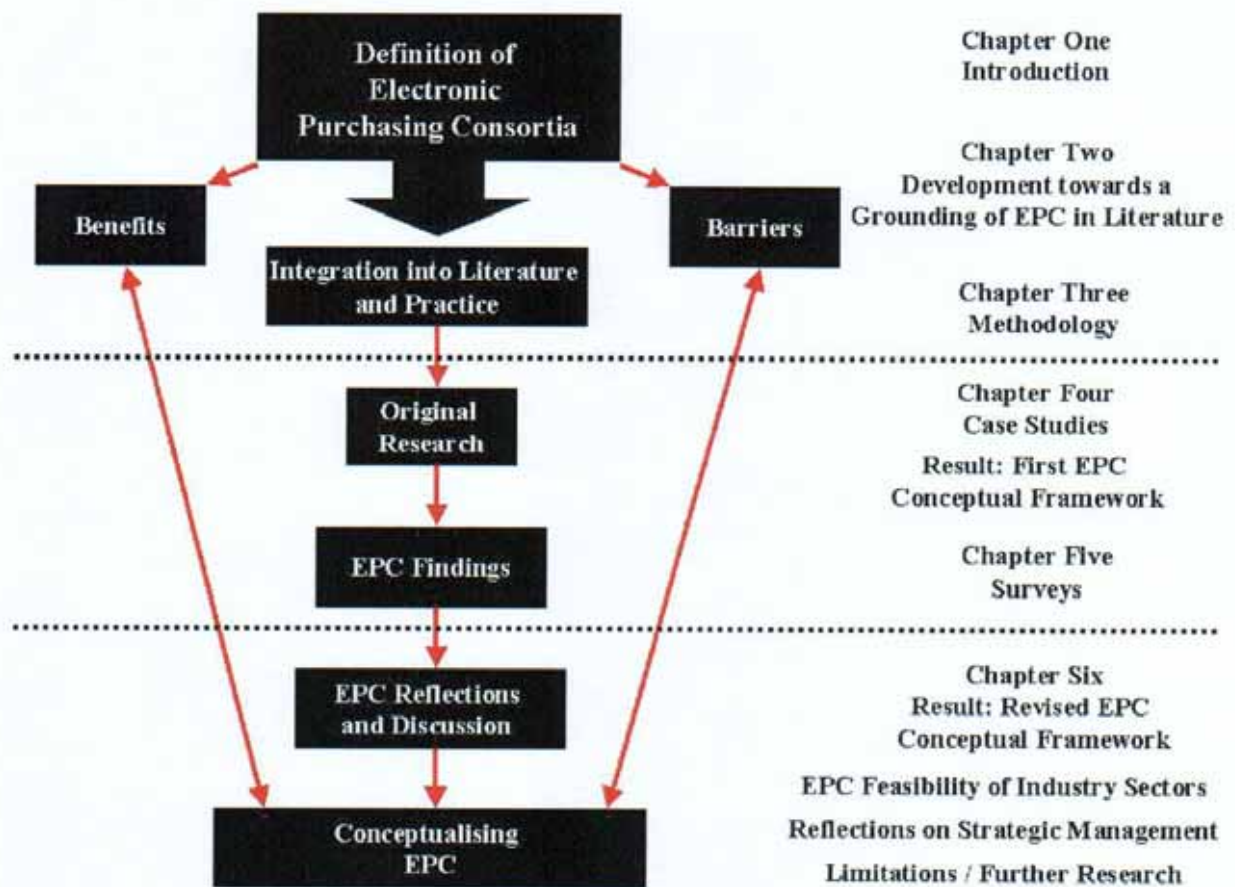
The field research starts with chapter four, where the five explorative EPC case studies in the automotive and electronics industry sectors are presented. A first EPC conceptual framework is discussed and EPC trading mechanisms and structures are analysed. Based on the data obtained from 128 purchasing organisations and 43 e-Marketplaces / procurement service providers, the fifth chapter then continues to describe the results and findings of the two research surveys.

Chapter six starts with a discussion and reflection of the original research and illustrates the development towards a revised second conceptual framework of EPC in terms of the methodological triangulation. The objective of this revised taxonomy is to construct a theoretical framework within which to understand and assess EPC by case study and survey linkages, to comprehend the scope of EPC within given industry sectors and to identify the drivers and barriers being experienced by organisations.

Chapter six also describes the feasibility of EPC for the automotive and electronics industry and presents implications and conclusions for EPC and strategic management. It will then conclude with the limitations of the research and recommendations for further studies. The figure below gives a schematic overview of this thesis.

¹⁹ Triangulation originates from navigation, where it is used to determine the precise position of a ship by using several orientation points at the same time, instead of just one fixed point on the shore.

Figure 2: Research Map



In order to explore the research questions related to electronic purchasing consortia, the research path was schematically mapped in Figure 2. After the set up of a detailed definition of electronic purchasing consortia with its strategic implications and a thorough literature review and definition of the methodology, case studies are aimed to build a first EPC conceptual framework within which to understand and assess EPC. Subsequent surveys are designed to re-examine the findings from the case studies, from which a second EPC taxonomy is developed. Carrying out both surveys and case studies can help reveal changes as well as provide a framework to conceptualise theory and practice of electronic purchasing consortia. The revised taxonomy may allow theory generation in EPC adoption, structures and performance indicators and provide reflections on EPC for strategic management.

CHAPTER II LITERATURE REVIEW AND RESEARCH BACKGROUND

2.1 INTRODUCTION TO LITERATURE REVIEW

In the first chapter, it was concluded that EPC is a research field worthy of study. This second chapter will present the literature review to electronic purchasing consortia in more detail. The author was posed with the important question as to how to reconcile between the vastness of literature written on strategic management and purchasing, network systems and strategic alliances, ICT and e-Procurement and relate electronic purchasing consortia within this context. Therefore, from the very outset, it is necessary to further clarify concepts and definitions for the different terms used in this study in order to ensure a better understanding.

2.2 COMPETITIVE ADVANTAGE – A REVIEW

The means by which some organisations achieve and sustain a competitive advantage over other firms is the central research focus of strategic management. However, the field of strategy is vast, fragmented and the strategic domains accounted in this study should be seen as a condensed list. For more than two decades, the dominant research paradigm has been based on Porter's (1980) competitive forces model, which postulates that the competition intensity determines the profit potential for individual companies.

A firm must continually adapt its mix of internal strengths and weaknesses to the opportunities and threats of its external environment. Hoffman (2000) explains that interestingly, no formal conceptual definition of competitive advantage was provided by Porter in his discussion. Barney (1991, p. 102) has presented the following definition:

"A firm is said to have a sustained competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors and when these other firms are unable to duplicate the benefits of this strategy".

Hoffman (2000, p. 1) offers the following formal conceptual definition:

“A sustainable competitive advantage is the prolonged benefit of implementing some unique value-creating strategy not simultaneously being implemented by any current or potential competitors along with the inability to duplicate the benefits of this strategy.”

In this study, competitive advantage is defined as the condition which enables a legal entity to operate in a more efficient or higher-quality manner than the legal entities it competes with, and which results in benefits accruing to that entity. Sustainability is achieved when the competitive advantages of the firm resist erosion or imitation by competitor behaviour in the long run (Porter, 1985). A sustainable competitive advantage is typically meant lasting beyond any competitor’s success at circumventing the advantage by the imitation or substitution of the rent generating features of a firm.²⁰ This proposition assumes that a particular competitive advantage is idiosyncratic (i.e. that it can only be possessed by a single firm).

Porter (1996) argues that while asset sharing may only direct to short term enhancements of performance as sharing is comparably unproblematic to imitate, achieving fit between complementary activities leads to sustainable competitive advantage, because *“rivals will get little benefit from imitation unless they successfully match the whole system”* (Porter, 1996).

Strandskov (1999) explains that in the strategic management literature there are at least two main paradigms (with various sub-fields) for explaining competitive advantage of the firm (e.g. Hansen & Wernerfelt, 1989; McGrath, MacMillan & Venkataraman, 1995). Iversen (2000) confirms that the first paradigm, the resource-based view, is looking for advantages in firm’s endowments of resources (e.g. Barney, 1986, 1991; Peteraf, 1993) and the configuration of activities (e.g. Porter, 1996), and the second paradigm, the positioning stream, is exploring the posture and positioning of firms vis a vis their competitors (e.g. Ghemawat, 1991; Porter, 1980, 1985, 1991).

²⁰ The concept of sustainability does not, however, imply anything about the chronological duration of a competitive advantage although it may be considered infinite in the absence of imitation, substitution and innovation. Even when the competitive advantage is no longer being challenged, it may persist.

A third paradigm, however, for explaining firm performance may be added (Strandskov, 1999). The business network approach (e.g. Ford, 1990; Hakansson & Snekota, 1995) argues that a competitive advantage of the firm cannot be analysed independent of the specific business relationship it is a part of. Therefore, creating and sustaining competitive advantages are embedded in business relations (e.g. buyer-seller relationships, co-operative arrangements). In the following sections, the paradigms to competitive advantage are summarised.

2.2.1 The Resource-Based Perspective on Competitive Advantage: Firm Specific Advantages

The resource-based view is a broad paradigm, with its roots in Penrose (1959), that attempts to understand and explain sustainability of competitive advantages, the nature of rent creating and the origin of heterogeneity of firms (e.g. Barney, 1986, 1991; Dierickx & Cool, 1989; Peteraf, 1993; Rumelt, 1984; Teece, 1984; Wernerfelt, 1984). According to this theory in strategic management, bundles of resources at the firm level, rather than industry-wide structural characteristics, lie at the core of competitive advantage. In particular, the non-tradeable resources and capabilities (so-called perfect immobile) which can develop and accumulate within the firm are of central interest to the resource-based theory (see Dierickx & Cool, 1989).

The implication is that the firm's endowment of resources and capabilities is expected to be the main source of its competitiveness and consequently the key determinant of its business performance. A firm's resources and capabilities include all physical, financial, human, and organisational assets used by a company (Barney, 1996). The important distinction between resources and capabilities is that resources constitute the inputs to the production of a firm, whereas capabilities are what create value with the resource inputs through a complex pattern of co-ordination between people and other resources (Grant, 1991). Day and Wensley (1988) characterise superior skills as the distinctive capabilities of a firm's staff that set them apart from the staff of competing firms and superior resources as more tangible requirements for advantages that enable a firm to exercise its capabilities.

Mata et al. (1995) confirm that the resource-based view is anchored in two underlying assertions: 1) that the resources and capabilities possessed by competing firms may differ (resource heterogeneity) and 2) that these differences may be long lasting (resource immobility).²¹ Barney (1991) confirms that resources and capabilities must possess four attributes to generate Ricardian rents due to inelasticity of supply: rareness, value, inability to be imitated, and inability to be substituted (see also Amit and Zott, 2001).

The resource-based perspective emphasises the importance to scrutinise the resources and capabilities in order to find true core competence and capabilities. Prahalad and Hamel (1990) specify that firms can integrate their resources and skills into core competencies, defined as that which a firm does uniquely well in relation to competitors. The increased reliance on outsourcing may be seen as a clear trend, which bears at least partly on core competence and resource-based perspective of strategic management. Therefore, firms may succeed in gaining a sustainable competitive advantage by the combination of skills and resources in unique and stable ways. Thereby, firms can focus on collectively learning how to co-ordinate efforts to facilitate growth of specific core competencies (Hoffman, 2000). Ghemawat (1991) call these resources, and the competencies created, 'sticky'. They can remain bound to a firm and develop a higher value than if they were used outside.

However, Ferguson et al. (1995) argue that firm specific advantages of the focal company cannot really be analysed independently of the specific industry or relationships it is a part of. To quote Collis and Montgomery (1995, p. 120):

"Resources cannot be evaluated in isolation, because their value is determined in the interplay with the market forces. A resource that is valuable in a particular industry or at a particular time might fail to have the same value in a different industry or chronological context."

That is why firm performance can be also related to the location of a firm in the industry structure or national environment.

²¹ Peteraf (1993) further explains that ex-post limits to competition guarantee heterogeneity not to be a short-lived phenomenon. There must also be ex-ante limits to competition for a firm to have

2.2.2 The Positioning Stream's Perspective on Competitive Advantage: Localisation Specific Advantages

The difference between the resource-based view and positioning stream (or also called market or environmental based view of the firm) is deep. The resource-based perspective removed the two elemental assumptions on which the environmental models are built: (1) Homogeneity of resources and opportunities among firms operating in the same industry; (2) Perfect resource mobility. This positioning stream has its origins in the neo-classic microeconomics and postulates that industry structure impacts corporate strategy, which in turn affects firm performance.

The positioning stream's explanatory logic was invented through the Harvard School approach and Porter (1980). The guiding framework for assessing the competitive position of a business is the value chain (Porter, 1985). Porter also sought to offer a framework for the identification of positions, which offered protection from competition forces. Porter states that there are two basic determinants of the profitability of a business: (1) the structure and attractiveness of the industry in which a firm operates; and (2) the competitive positioning of the business within that industry.

The positioning stream argues that sustainable competitive advantage results from the ability to protect a desirable position within an industry by erecting barriers to competition. Protection from competition would allow firms to gain competitive advantage compared to companies in possession of less attractive positions. The nature of competition (i.e. the market or industry structure) is expected to have an impact on the strategy of the firm.²²

According to the positioning stream, a firm will generate different levels of performance depending on the degree of rivalry it faces, which depends on the location of other competitors (Cool, Dierckx & Martens, 1994). Porter (1986) claims that "*industry is the arena in which competitive advantages is won or lost*". The industry structure strongly dictates the conditions and competitive rules for a company and also the potential

competitive advantage, i.e. that there must be limited competition for any source of superior performance before any firm acquires it.

²² Within the industry structure firms with high absolute or relative market shares are expected to be more profitable than firms with low shares (see e.g. Scherer, 1980).

strategies available. Consequently, the competitive value of resources can be enhanced or eliminated by changes in input prices, technology, vertical integration, buyer needs etc. which an inward focus on resources and capabilities (i.e. firm specific advantages) would overlook.

In order to understand the industry structure, Porter suggested using the five forces model, which includes entry barriers, threat of substitution, bargaining power of buyers, bargaining power of suppliers, and rivalry among industry incumbents. Two broad sets of resources facilitate the attainment of competitive positional advantages in the form of 1) superior customer value through a differentiated product/service, and/or 2) lower relative cost through cost leadership and/or 3) the generic strategy of focus²³ (Porter's value chain, 1985). The challenge is to organise and manage the firm to optimise whichever particular positioning strategy is employed, and to make certain that the firm avoids being "*stuck in the middle*" performing none of the strategies well (Porter, 1985).

However, the analysis of competitive positions within the industry view would be static if not stressed on resource developments, because behind every product market position of the firm there is a collection of resources (Wernerfelt, 1984). Whereas firm resources and capabilities are intrinsic to firms, industry specific factors are more directly related to the environment in a broad sense and can result in localisation specific advantages.

2.2.3 Insights from the Resource-Based and the Positioning Stream's Perspectives: Interaction Effects

Research (e.g. Hansen and Wernerfelt, 1989; McGahan and Porter, 1997; Rumelt, 1991) found that both industry and firm-level indicators have a significant impact on firm performance, thereby suggesting that the positioning stream and the resource-based perspective are complementary. Iversen (2003) argues that both perspectives have developed from the same basic insight from industrial organisation, but barriers to competition enable rents to be earned at different levels.²⁴ Rents may derive from the

²³ Focus rests on the choice of a narrow competitive scope and on the selection of a segment or group of segments within an industry in order to tailor strategy to serving them to the exclusion of others. The focus strategy has two variants. In a cost focus a firm seeks a cost advantage in its target segment, while in a differentiation focus a firm seeks differentiation in its target segment.

²⁴ These different levels of barriers to competition are interconnected and form a chain of causality explaining competitive success (Porter, 1991).

uniqueness of offerings or processes (i.e. Schumpeterian rents²⁵), whereas superior positions to competitors may create monopoly rents, while scarce natural resources in fixed supply may grant Ricardian rents.²⁶

The main difference between the two perspectives is the source of the barriers, which is either ascribed to factor market imperfections or the existence of market power (product market imperfections). Whereas the positioning stream states that environmental competition and the ability to react to threats and opportunities are the prime determinants of firm success, the resource-based perspectives postulates that idiosyncratic and firm-specific sets of imperfectly mobile resources determine sustainable competitive advantage. While the positioning stream has contributed insights into which resources a firm needs to accumulate in order to stay competitive (e.g. industry specific critical factors), the resource-based perspective has added knowledge into the conditions surrounding the efficient employment of resources and skills (e.g. Barney, 1986, Dierickx and Cool, 1989).

Rozemeijer (2000) points out that procurement resources and skills, in particular, are increasingly recognised as a crucial subset and purchasing started to play an increasingly important role in firms' strategies (e.g. Brandes, 1994; Carter and Narasimhan, 1996a,b; Chadwick and Rajagopal, 1995; Ellram and Carr, 1994; Gadde and Hakansson, 1994; Keough, 1992; Morlacchi and Harland, 2000; Spekman et al., 1994; Tully, 1995). Carter (1996b) empirically demonstrated the positive relationships between strategic purchasing activities and business performance.

The increased strategic importance of the purchasing function produced a shift from the 'traditional' purchasing role to 'supply management' that only started in the late 1980s (e.g. Reck and Long, 1988; Freeman and Cavinato, 1992). Very few of the early business strategy researchers included purchasing in their concepts before that. However, today's business strategists stress that purchasing is included as an important enabler for implementing business strategies successfully and emphasise the importance of strategic

²⁵ Amit and Zott (2001) point out that Schumpeter introduced the notion of "creative destruction". Following technological change certain rents become available to entrepreneurs, which later diminish as innovations become established practices in economic life.

purchasing to competitive advantage. For example, Porter (1985) states that purchasing is claimed to be capable of being a source of competitive advantage.

Humphreys et al. (2001) explain that Porter's model on the value chain depicts five primary activities and five support activities within the entire value chain. The five primary activities, which are inbound logistics, operations, outbound logistics, sales and marketing as well as services, are basically sequential in nature. The five support activities – administration, human resource and management, product/technology development and procurement – are operated in parallel, supporting each of the primary activities. Therefore, strategic supply management and procurement can be a resource for superior skills that may result in differentiation or cost leadership. The developments in strategic supply chain management and purchasing are presented and definitions introduced in the following sections.

2.3 STRATEGIC MANAGEMENT DEVELOPMENTS IN SUPPLY CHAIN MANAGEMENT AND PURCHASING

2.3.1 Definition and Evolution of Strategic Supply Chain Management and Purchasing

Strategic and integrated supply chain management is a very broad term and has become the subject of interest in recent years. It can be defined as

*“ (...) the planning, steering and controlling of the whole flow of materials and services in a network of collaborating companies ”.*²⁷

It encompasses all activities associated with the supply and movement of goods and services starting from the raw material phase to the end-user stage. Christopher (1992) defined supply chain management as the management of:

²⁶ If a resource is only temporarily in fixed supply, as with e.g. unique equipment, that can be duplicated within a reasonable period of time, excess returns to this input have been referred to as temporary rents (Schoemaker, 1990) or quasi-rents.

²⁷ Eyholzer and Hunziker, 2000, p. 335.

“ (...) the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer.”

Stevens (1989) provides a similar definition:

“A supply chain is a system whose constituent parts include material suppliers, production facilities, distribution services and customers linked together via a feedforward flow of materials and the feedback flow of information”.

This accepted, the author notes that information runs both ways along the supply chain. Streamlining business operations and diminishing inefficiencies, as well as making a contribution to achieve competitive advantage, are major objectives of supply chain management. Integrated supply chain management has generated much interest dating back to the 1960's (e.g. Forrester, 1961) because actions taken by one member in the supply chain can influence the profitability of all others members. However, the lack of ICT hindered the implementation of a more 'systems-oriented' approach in the starting phase. Supply chain integration, supported by ICT, is defined as the extent to which all activities within an organisation, and the activities of its suppliers, customers, and other supply chain members, are integrated together (Wood, 1997; Narasimhan and Jayaram, 1998). Isolated firms are placing themselves at competitive disadvantage (Wood, 1997). Burt and Doyle (1993) argue that supply chain management is a new process responsible for the design, development, optimisation, and management of both the internal and external components of the organisation's supply system. Carter and Narasimhan (1996a) identify integrated supply chain management as one of the primary future trends for purchasing professionals.

Purchasing, procurement and sourcing are important elements of integrated supply management. Purchasing is the act of and the functional responsibility for managing materials, parts, supplies, and services and was once looked upon as primarily a service function. Purchasing is defined as a rather operational and administrative activity, beginning with needs identification, conducting commodity analysis, performing market

research, developing appropriate contracts and negotiations, transmitting future needs to suppliers and ending with the tracking of purchasing activities (Eyholzer and Hunziker, 2000). Purchasing is a part of materials management. Cavinato (1984) explains that materials management is the term applied to the planning and management of all inbound goods and services into a firm. It encompasses all activities necessary for the efficient flow of goods and services into a firm at the lowest total system cost and best timing possible.

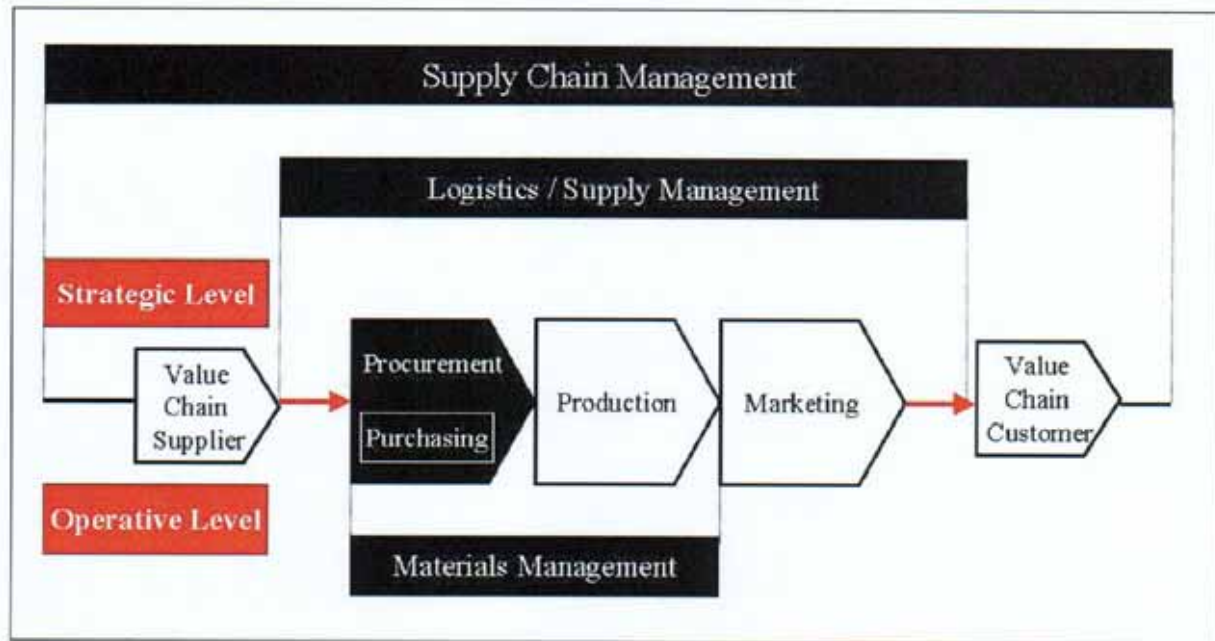
Ellram (1995, p. 2) states that purchasing and materials management stand at a crossroad of its evolution as many activities that were once the mainstream bulk of purchasing are being eliminated and automated. Sourcing is a long-term oriented process that becomes much more prevalent in terms of strategic relevance. Gebauer and Zagler (2000) explain that sourcing activities include e.g. demand forecast and planning, finding and choosing the right suppliers for a product, requests for information, proposal and quotation (RFx), negotiation of terms of contract or supplier management. This process is usually carried out in a cross-functional and cross-enterprise process which requires input from many different functions such as purchasing, engineering, marketing or other departments (Eyholzer and Hunziker, 2000). Sourcing involves improving and integrating supplier capabilities into organisational processes and includes activities such as identification, evaluation, selection, development and integration of suppliers.²⁸

Sourcing underpins procurement that is described as being broader in scope than purchasing. The term procurement indicates a strategic arrangement to co-ordinate reverse marketing, innovative activities and purchasing of components.²⁹ It includes activities of strategic relevance, such as sourcing, negotiating with suppliers and co-ordination with R&D. Procurement's strategic relevance is shown in Figure 3.³⁰

²⁸ Hahn / Kaufmann (1999, p. 8) describe sourcing as an integrative management approach to designing all supplier relations in the sense of a total relationship management.

²⁹ According to Biemenas and Brand (2002), firms increasingly realise that altering market conditions require major changes in their purchasing functions. In many organisations, procurement is progressively becoming more pro-active and more strategically important. This strategic phenomenon is also sometimes referred to as reverse marketing in the literature.

³⁰ See Eyholzer and Hunziker, 1999, p. 2.

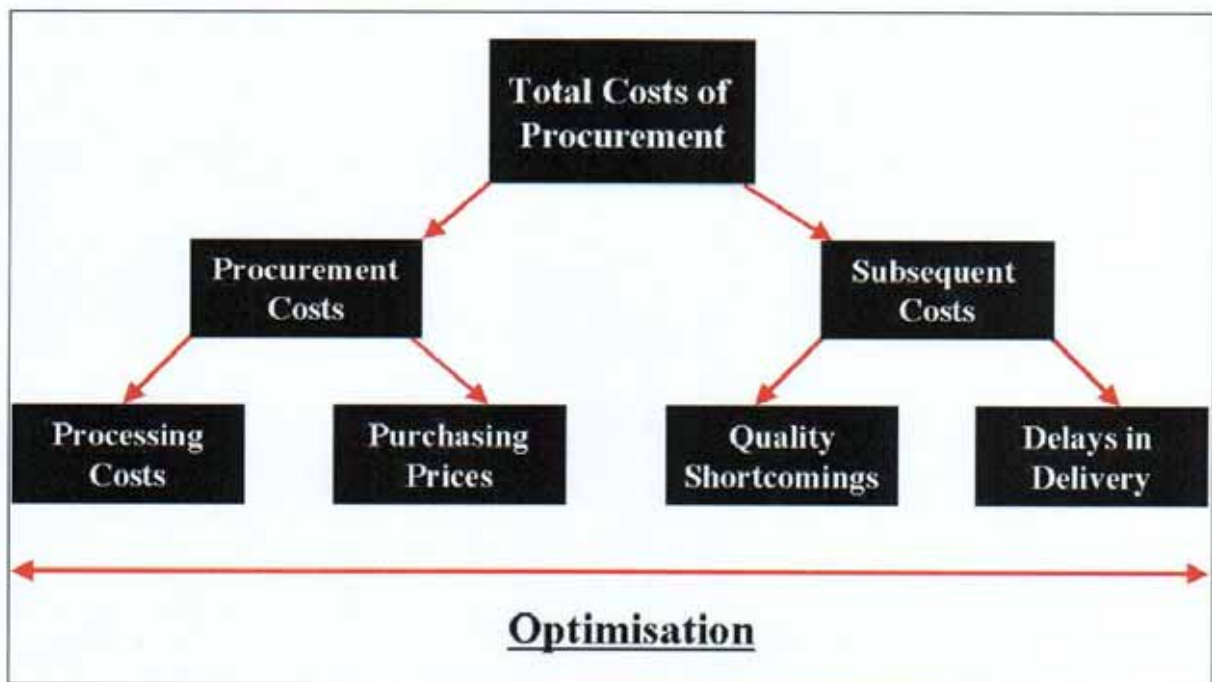
Figure 3: Supply Chain Management Topology

Source: Derived from Eyholzer and Hunziker, 1999, p.2

“Procurement encompasses all activities involved in obtaining material and services and managing their inflow into an organisation toward the end user. (...) Positioned between an organisation's internal customers in need of material to fulfil their tasks and external suppliers providing goods and services, this function has to bridge multiple gaps in order to simultaneously manage external and internal relationships, and to balance participants' different goals.”³¹

A major strategic task of procurement is to optimise the total cost of procurement (total cost of ownership). Segev et al. (1998, p. 68) investigated that the biggest opportunities for improvement in procurement lie in reducing the overall cost of the products bought and in shrinking the time to procure the products (as shown in Figure 4). A total cost of ownership is wider than traditional costs as it includes the costs of e.g. unreliable deliveries, excessive inventories or quality and service shortnesses. Components of total costs should be optimised:

³¹ Segev et al., 1998, p. 11.

Figure 4: Total Cost Components in Procurement

The total cost of procurement concept has gradually evolved with the purchasing function. Scheuing (1997) as well as Carter and Narasimhan (1996) agree that there has been a shift in industry from what was formerly purchasing to a greater emphasis on the sourcing to procurement functions, which itself suggests necessary expertise in identifying, monitoring, and improving the performance. Rozemeijer (2000) points out that although purchasing has traditionally been an important function in firms, very little was done to formalise its role until the end of the 19th century.³² Until the mid 1980s, purchasing research concentrated predominantly on the improvement of activities executed by the purchasing department. In the past two decades, a more focused approach by companies consistent with emphasis on core competencies and resource-based strategy has shrunk many firms' degree of vertical integration and raised the relative cost component of externally sourced products. This development raised the strategic focus of procurement.³³

³² According to Henderson (1975, p. 44), procurement was even regarded by executive management as a "negative function". In this outdated view, purchasing could hinder the company if not done well, but could make little positive contribution.

³³ Since 1988 there has been a steady flow of ideas from academics and consultants regarding the stage-like development of purchasing toward a strategic business function (e.g. Bhote, 1989; Burt and Doyle, 1993; Cammish and Keough, 1991; Chadwick and Rajagopal, 1995; Freeman and Cavinato, 1990; Keough, 1993; Monczka and Trent, 1995; Reck and Long, 1988; Syson, 1989; Rozemeijer, 2000b; Van Weele, 1994).

Hahn and Kaufmann (1999) explain that after business process management developed to a central focus in theory and practice, the focus shifted towards the procurement function and the management of a cross-functional supply chain of purchasing activities. The UK Department of Trade and Industry states:

“Purchasing and supply can no longer be treated as a second-order function. The way forward lies with integrated materials management, pulling together suppliers, production and distribution. In the years ahead, those who have not got their purchasing and supply operations right will not be competitive.”³⁴

Rozemeijer (2000) indicates that the evolution in the purchasing function from simply being a paper processor, to the architect of commercial supply relationships, suggests more than just a change in the name from ‘buying’ to ‘supply management’ (see also Kraljic, 1983). Hahn and Kaufmann (1999, p. 6) even suggest to use the terms supply management, procurement, and sourcing interchangeable, as all terms imply the strategic relevance.

Consequently, Rozemeijer (2000) states that purchasing managers are increasingly involved in more strategic activities including early supplier involvement (so called forward sourcing), cross-functional teams, total cost supplier selection, or integrated information system linkages with suppliers. Many firms have established strategic supplier alliances with a few selected suppliers to exploit the synergetic effects of a more collaborative approach to supply arrangements. Based on these strategic developments in purchasing, Rozemeijer (2000) provides an overview of the evolution of academic purchasing literature in the following table.

³⁴ UK Department of Trade and Industry, 1989.

Table 3: Purchasing Development and Maturity Models

Author	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Reck and Long (1988)	Passive	Independent	Supportive	Integrative	--
Syson (1989)	Clerical (transactional)	Commercial	Strategic (proactive focus)	--	--
Bhote (1989)	Confrontation	Arms-length	Goal congruence	Full partnership	--
Freeman and Cavinato (1990)	Buying (at low prices)	Purchasing	Procurement	Supply acquisition	Facilitate networks
Cammish and Keough (1991)	Serve the factory	Lowest unit cost	Co-ordinated purchasing	Strategic procurement	--
Van Weele (1992)	Operational / administrative orientation	Commercial orientation	Logistic orientation	Strategic orientation	--
Burt and Doyle (1993)	Reactive	Mechanical	Pro-active	Strategic supply management	--
Keough (1993)	Serve the factory	Lowest unit cost	Co-ordinated purchasing	Cross functional purchasing	World class supply management
Monczka and Trent (1995)	Manufacturing support	Price buying	Consolidation	Integrated strategic sourcing and supply chain management	--
Chadwick and Rajagopal (1995)	Clerical	Commercial	Supportive	Strategic	--
Van Weele et al. (1998)	Transactional orientation	Commercial orientation	Purchasing co-ordination	Process orientation	Supply and value chain orientation

Source: Rozemeijer, 2000

Developments in strategic purchasing emphasise its potential contribution to achieve competitive advantage. Sourcing, procurement and reverse marketing may become a more and more important strategic activity, employing state-of-the-art tools. One such tool is the formation of horizontal purchasing consortia demonstrated in some academic research.³⁵ Moss Kanter (1989) linked external interfirm co-operation to competitive advantage. Rozemeijer (2000) claims that effective purchasing synergy management and

³⁵ See e.g. Arnold/Essig, 1997; CAPS, 1996; Guetter, 1996; Hendrick, 1997; Pye, 1996; Quayle, 2002a; Sickinger, 1996; Corsten et al., 1998; Moncka/Trent/Harfield, 1998.

competitive advantage can occur, provided that distinctive resources, skills and purchasing maturity, i.e. the level of professionalism in the purchasing function, are developed in some degree. Keough (1993) claims a direct causal relationship between the industry a company is in and the stage of development of the purchasing function.

The overall statement in this study highlights that EPC are analysed in terms of the feasibility in given industry sectors. Therefore, it is vital to describe the strategic supply chain management and procurement developments in the specific sectors chosen for this research, namely the automotive and electronics industry. The specific industry structure and its supply chain management characteristics need to be explained in more detail with regard to EPC.

Reasons for the choice of the industry sectors include that both of them are already advanced in SCM and strategic procurement techniques, streamline the infrastructure around the supply chain with ICT, belong to the pioneers in e-Procurement and can provide EPC examples in practice. A sectoral approach is of essence to identify key strategic industry supply chain management characteristics and to provide an initial understanding in how EPC may be integrated within the sectors and make a contribution to competitive advantage. This sectoral approach is presented in the following sections.

2.3.2 Background to Strategic Supply Chain and Procurement Management in the Electronics Industry

"High-tech OEMs in the electronics industry are not competing anymore against each other. It's their supply chains."³⁶

This statement gives a hint that the electronics supply chain has developed towards a broad and complex industry that includes a variety of end-markets and participants ranging from manufacturers of silicon raw material to OEM customers.³⁷ The companies in this industry can include e.g. distributors, contract manufacturers, electronics, communications or other equipment manufacturers.

³⁶ Christopher, 1998.

However, defining the electronics industry is difficult. The electronics industry is multi-faceted, embracing many diverse sectors within its scope. All industry participants deal with a diverse array of product characteristics, manufacturing types, and supply chain constraints. In the electronics industry, there is a complex market segmentation as well as high volatility in demand patterns and technical design. Many key sectors are in turmoil and sectoral boundaries are changing rapidly. For lack of a better alternative, products, key technologies and services are traditionally used as a proxy definition in the literature.³⁸ Table 4 shows a breakdown of the major segments, including types of products.

Table 4: Structure of the Electronics Industry

Raw Material Suppliers	Component Manufacturers	Enclosure Manufacturers	Contract Manufacturers	Electronics Distributors	OEM/End -Markets
Products / Services	Semiconductor	Design Services	Design Services	Semi-Conductors	Computers
	Resistors	Enclosure Fabrication	PCB Assembly	Passives	Networks
	Capacitors	System Integration	Box Build	Electro-mechanical	Telecom / Datacom
	Connectors	Other	Logistics	Computer Products	Industrial
	PCBs		Other	Other	Consumer
	Power Supplies				Other
	Other				

Source: Derived from Adexa (2000), *The Electronics Supply Chain: Winning in a Virtual Environment*, available at: <http://www.adexa.com/pdf/electronics.pdf>

³⁷ Encyclopaedia Britannica defines electronics as a "branch of physics that deals with the emission, behaviour, and effects of electrons (as in electron tubes and transistors) and with electronic devices."

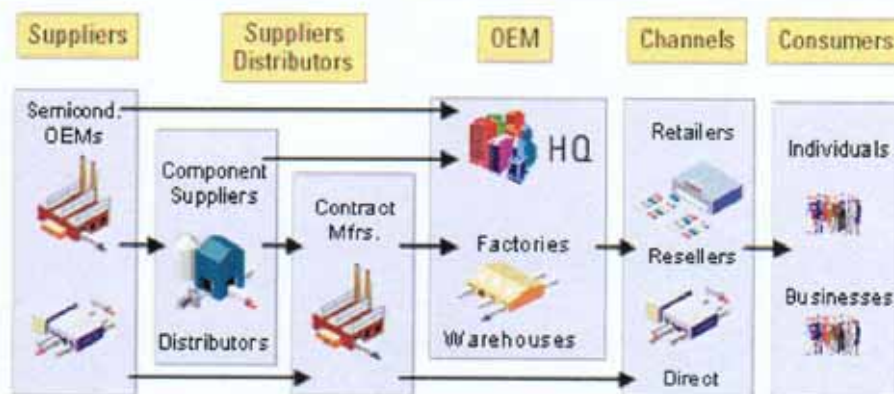
³⁸ This study focuses on the hardware side, e.g. electronics equipment and components. However, a broader definition of the electronics industry would include in addition information services, software, and also a variety of recently emerging markets that result from the convergence of audio and video, digital information, and communication technologies (Internet services, etc.). A broader definition of the electronics industry reflects a shift away from hardware and components towards ICT systems, software or knowledge-intensive services (see Ernst, 2000, at <http://www.tik.uio.no/Innovation/economics.PDF>).

Adexa (2000) notes that changing market forces, constant demand for improvements in technology and as a result short product life cycles have transformed the electronics industry into one of the most competitive and fastest growing business sectors to date.

“No other industry is challenged by a combination of mass customisation, rapidly shrinking product life cycles, rapid inventory depreciation, supply and demand misalignment, complex multi-sourced supply chains, and rising expectations of retailers and consumers.”³⁹

Demand for electronics is highly volatile to date and the electronics industry transformed to a dynamic character. Electronics companies have progressively turned to supply chain management techniques to remain competitive. The industry increasingly evolved from its traditional vertically integrated structure to a variety of multi-stage supply chain configurations. However, all of the product segments in this industry exhibit some similar supply chain structure, extending from component suppliers, contract manufacturers, and OEMs, to channel entities that include distributors and retailers, as shown as in Figure 5.

Figure 5: The Supply Chain in the Electronics Industry



Source: <http://www.i2.com/Home/SolutionsbyIndustry/HighTechConsumerElectronics/>

Figure 5 illustrates the multiple links and interactions between participants across the electronics supply chain and its complex network of participants linked to multiple end-markets. A variety of significant strategic challenges the industry has been facing during this evolution are pointed out in the following sections.

³⁹ Adexa, 2000.

Extensive Globalisation and Tendencies to Concentration and Co-operation

Globalisation, economies of scale and scope and high sunk costs due to highly complex capability requirements are important drivers of concentration and co-operation in the electronics industry. High sunk costs are results of the stream of new product innovations. Sunk costs may deter potential new entrants and also force electronics companies to increase their market share. Therefore, the electronics industry experienced that a high degree of globalisation may well proceed in tandem with increasing concentration and strategic alliances. However, the electronics industry fails to operate like a stable oligopoly, even when concentration and co-operation is high and still increasing. Its market positions are highly volatile, new entry is still possible, and globalisation is an important driver in the electronic industry.⁴⁰

Build-to-Order and Mass Customisation

Customers increasingly demand electronics companies to produce highly customised-to-order products rapidly and at a low cost. As a result, there is a significant pressure on electronics companies to date to generate responsive as well as cost-effective supply chains. Therefore, they also have turned to postponement strategies: subassemblies configuration after receipt of an order.⁴¹ Where appropriate, electronics companies are directing their strategies in production and inventory from make-to-stock (MTS) to build-to-order (BTO). Along with the BTO concept, product life cycles are shrinking in the electronics industry.

Shrinking Product Life Cycles

Despite built-to-order strategies, products in the electronics industry become more and more commodity items at the same time. Bourgeois and Eisenhardt (1988) specify that the microcomputer industry, which is part of the electronics industry, is embedded in a high velocity environment, in which there is prompt and discontinuous change in demand, competition, technologies or regulation, so that information is often inaccurate, unavailable, or obsolete. OEMs are forced to make regular new product innovations and introductions to preserve competitive advantage. Constant innovation leads to very short product life cycles, thereby complicating the prediction of consumer demand as new

⁴⁰ See Ernst, 2000, at <http://www.tik.uio.no/Innovation/economics.PDF>

products may have specifications that are untested.⁴² Life cycles of high technology products continually decline and the compression has made new product launches the norm in the electronics industry.⁴³

Short product cycles are an important source of market volatility. Shrinking product life cycles have forced electronics companies to globally outsource key portions of their engineering, manufacturing or delivery systems. New product introductions and manufacturing processes are literally colliding together.⁴⁴ At the same time, the electronics industry is a material constrained industry. Manufacturers have to use inventory as soon as possible to maintain margins due to the rapid depreciation. Short supply and material allocation is a challenge in the electronics industry because of factors such as material shortages or key components shared across multiple end-items. Inventory turnovers became a critical indicator of competitive advantage in the electronics industry. Therefore, Phillips and Meeker (2000) explain that the electronics industry with its high-velocity product cycles and swings in demand have aggressively embraced outsourcing and specialisation.

Outsourcing and Contract Manufacturing

As product lifecycles shortened, time-to-market is becoming critical to a greater extent. One of the most significant strategies for the electronics industry is the outsourcing of manufacturing and logistics. For example, electronics companies have partnered with third and fourth party logistics providers to provide the physical warehouse and to help manage replenishment processes. Outsourcing and contract manufacturing can offer some benefits to electronics companies, such as faster time to market, improved efficiency, enhanced flexibility or cost reductions. For example, outsourcing can enable electronics companies to sharpen their focus more on the design and the marketing of new products, while leaving operational production processes to the contract manufacturer. Contract

⁴¹ The fundamental challenge is how to postpone the production of finished goods until an actual order is received. This approach helps to minimise inventory and related obsolescence costs while at the same time acceptable product lead times and customer service may be provided.

⁴² One example of the short product life cycle is "Moore's Law", that the electronics industry has followed for more than 25 years. It was formulated by Gordon Moore, a co-founder of the electronics company Intel. Every 18 months the price of computing power was halved.

⁴³ Product life cycles in the electronics industry were once measured in decades, while they are measured in months to date. On average, a new product generation is launched every 9 months. This can guide to a rapid depreciation of assets and R&D (see Levin, 1996, at <http://www.informationweek.com/596/96elect.htm>)

manufacturing has emerged in recent years as a mode of production in the electronics industry.⁴⁵

Electronics companies were prepared to give up control over manufacturing in exchange for the chance to get time-sensitive products to market faster and to limit their financial risks. Contract manufacturing is different from traditional supplier-manufacturer settings in such a way that few very large contractors dominate the industry, which are predominantly in selling of manufacturing capacity and less in specific products. Traditionally, companies in the electronics industry are more willing to use contract manufacturing services for the optimisation of commodity products that are getting close to end-of-life status and try to keep their internal production for new products, until the demand has stabilised. Contract manufacturers are typically at their most efficient when achieving maximum economies of scale, thereby running at high volumes with minimal design changes.

For example, contract manufacturers can also aggregate demand of several purchasing organisations and achieve economies of scale and scope. Therefore, new options emerged for outsourcing, thereby transforming an erstwhile highly vertically integrated industry into more horizontally disintegrated and closely interacting market segments. The supply chains of the electronic industry have become more complex and interconnected.

Integrated Supply Chain and Global Production Networks

As product cycles are shrinking and growing in complexity at the same time, electronics companies also have become responsible for larger portions of their customers' finished products, requiring them to collaborate with customers on design and manufacturing issues. Managing multiple enterprises, plants, multi-staged supply chains and hubs has become a reality for many companies in the electronics industry. Globalisation in the electronics industry combines a strong and highly concentrated international dispersion of the supply chain with the spread of global modular production networks.⁴⁶

⁴⁴ See Karpinski, 2000, at <http://www.internetweek.com/transtoday01/ttoday080101.htm>

⁴⁵ Contract manufacturing has exponentially grown and traces its roots to the 1970s when several companies established to deal with the overflow of printed circuit board assembly.

⁴⁶ The networks are a reaction to the gradually more demanding co-ordination needs of geographic dispersion.

Sturgeon (2002) argues that this new form of network organisation was created as leading firms gradually outsourced more and more of their production in order to concentrate on establishing and defending their competitive position in fast-changing markets. This network typically combines a large, multi-divisional OEM with its subsidiaries, joint ventures, its alliances and a variety of co-operative agreements, its suppliers and subcontractors, its distribution channels and value-added resellers.⁴⁷ The OEM can achieve competitive advantage from its control over critical resources and capabilities, and from its capacity to co-ordinate transactions between the different network nodes in horizontally disintegrated, yet closely interacting market segments.

Summary of Strategic Supply Chain and Procurement Management in the Electronics Industry

Overall, factors such as mass customisation, shrinking product life cycles, high velocity, rapid product price erosion, globalisation and high inventory costs have forced companies in the electronics industry to re-engineer their supply chains. Commoditisation of electronic manufacturing, rapid time-to-market, hypergrowth, outsourcing, customer involvement in design, globalised manufacturing, and the resulting need for co-ordinated data communications were forcing electronics companies into integrated supply chain management strategies. The role of purchasing and supply developed to a more strategic approach due to globalisation, a shortening of the product life cycles and an increasing decentralisation, but central co-ordination of the enterprise functions. The strategy of core-competency has led to more and more outsourcing and international network structures (Hahn / Kaufmann, 1999, p. 5).

The availability of information and communication systems, in particular, provided electronic linkages within network structures and was one of the key enabler of the outsourcing model. ICT as well as e-Marketplaces and PSPs as facilitators of strategies in e.g. outsourcing, collaboration or electronic procurement can play hereby a crucial role. Leon (2001) describes that the electronics industry is deeply affected by new market metamediaries and that it is way ahead of other in experimenting with new tools such as

⁴⁷ Networks can break down the supply chain into a variety of discrete functions and can locate them in theory where they improve a firm's access to resources and capabilities, wherever they can be carried out most effectively, and where they are required to facilitate the penetration of growing markets.

e-Procurement, e-Marketplaces and PSPs.⁴⁸ Some of the identified strategic supply chain developments in the electronics industry can also be found in the automotive industry, which are presented in the following sections.

2.3.3 Background to Strategic Supply Chain and Procurement Management in the Automotive Industry

The automotive industry controls almost 9% of all economic activity. The industry sector is large and complex and many activities concerning electronic supply chain integration can be observed. Lapidus (2000) even argues that automobile manufacturing is “*the mother of all industries*” and that no other industry comes close to the level of technological, regulatory, volume, retail, and complexity. Carduck (1999) claims that the automobile industry is traditionally a forerunner in implementing new procurement and supplier management strategies. In recent years, automotive OEMs have changed their strategies in development and production and were undergoing fundamental changes (Dyer, 1996; Womack, Jones and Roos, 1990). Before discussing these changes in detail, a segmentation of the automotive industry needs to be provided. The global automotive market can be basically differentiated into three broad segments. These are:

- Original Equipment Manufactures (OEMs), which is comprised of passenger and commercial vehicle sales,
- Original Equipment Supply (OES), which is comprised of automotive parts and accessory sales through the OEMs,
- the aftermarket, that also consists of automotive parts and accessory sales, but through independent retailers and repair shops.⁴⁹

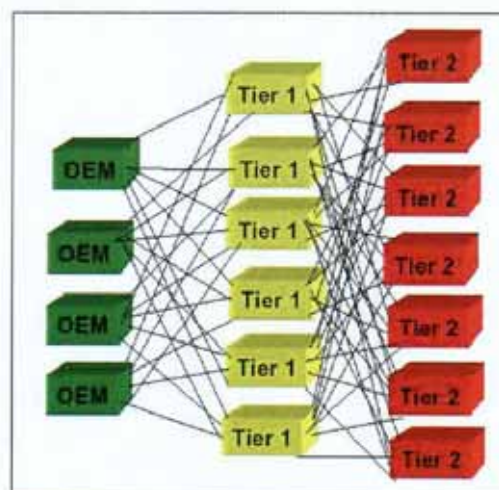
Each of these different segments has their own specific dynamics. However, it is change in the OEM and OES markets, which have the most profound impact on the automotive industry more broadly. Despite an automotive OEM oligopoly, the industry is a very competitive industry and strongly embraced integrated supply chain strategies and ICT strategies. It can be argued that, therefore, this industry sector, including its entire supply chain, is one of the pioneers of e-Business (Huber, Sweeney and Smyth, 2004a).

⁴⁸ See Leon, 2001, at <http://archive.infoworld.com/articles/hn/xml/00/09/11/000911hnetrend.xml>

Goldstein (2001) confirms that the automotive industry has traditionally been a forerunner in the incorporation of new management and organisational techniques, from concepts such as mass production Taylorism in the 1920s to lean manufacturing and just-in-time in the 1980s.

Lately, the automotive industry embraced integrated supply chain processes which require participants to share data or be given data visibility. Therefore, organisations increasingly form part of a network of organisations in which they collaborate with other organisations dynamically to fulfil market demand. This system is, as explained, already quite advanced in the electronics industry, but is increasingly adopted in the automotive industry. In the past, this was not the case in the automotive industry: There have been multiple processes and systems between trading partners, a point-to-point connectivity and a slow adoption down the tiers. Although mechanisms such as electronic data interchange (EDI) helped decrease transaction costs, they were limited to the establishment of bilateral relationships typically for manufacturers that could afford their implementation (Bailey, 2001).⁵⁰ Figure 6 illustrates the point-to-point and bilateral connectivity EDI has created over the tiers in the automotive industry.⁵¹

Figure 6: Point-to-Point Connectivity among Automotive Tiers



Source: Plumb (2001), "E-Commerce for the Automotive Industry", Eyeforauto Asia 2001, <http://www.eyeforauto.com/>

⁴⁹ See Barnes, 2000, at <http://www.kznbenchmarking.co.za/23.pdf>

⁵⁰ EDI is quite inflexible and only suitable for links between specific firms at high cost per contact. Goldstein (2001) points out that EDI, in its traditional form, offers limited functionality and is problematic because it has not been standardised world-wide.

⁵¹ Today, despite years of pressure from the OEMs, only an estimated 5% of the automotive value chain is connected to EDI (Roland Berger Consulting and Deutsche Bank, 2001).

By contrast to EDI, the wide array of ICT / IOS can contribute to a more multilateral information exchange and foster market-based exchanges in all transaction phases (Bakos, 1997). This evolution proceeded with the background that automotive OEMs focused their business activities on a global basis, which led regional suppliers to form strategic alliances and to merge globally. This development also contributed to the distinct tiering of the automotive supply chain.

Roughly 30,000 separate OES offer products and services to the global automobile industry. Global suppliers increased in size, while regional or local suppliers were integrated or became tier 2. Tier 1 suppliers consolidated, continued to make acquisitions of smaller competitors and to manage tier 2 suppliers by moving towards modular production.

OEMs have focused their strategies on core competencies and have partly shifted the responsibility for design onto tier 1 suppliers. This shift in responsibility requires tier 1 suppliers to operate as global systems integrators. Becker and Peters (1997) confirm that first tier suppliers to date are earlier involved in product engineering and development, receive more technical information and take advantage of longer-term contracts. According to MacDuffie (2001), there have been 2,500 tier 1 suppliers to OEMs worldwide in 1995. This overall number was reduced to about 180 tier 1 suppliers that control 80% of the value of supplied parts to date. A study by the Fraunhofer Institute (1998) found that 77% of tier 1 automotive suppliers expect the number of lower-tier suppliers they use for raw materials and parts to shrink significantly in the near future.

Factors such as lower total costs of ownership, the ability to supply automotive OEMs globally and just-in-time, faster time-to-market and the requirement for continuous innovation have strongly impacted the automotive supply chain. In trying to understand this change in the automotive industry, these drivers are identified in more detail:

Platform Concept

The principle of the platform concept that is widely spread in the automotive industry means that the production of different types of cars is set up on a common technical

base.⁵² A large number of models can be created of shared major systems and components, consisting of e.g. chassis, gearing, engine (Hahn and Kaufmann, 1999).⁵³ The platform strategy creates demand aggregation opportunities for common and standardised products in order to achieve economies of scale without giving up brand differentiation.

At the same time, the trend towards built-to-order concepts and an increased level of vehicle personalisation is becoming more prominent. While car body styles and marketing are used to preserve individual brands, purchased materials are the largest component of cost for automotive OEMs and OES. Therefore, the platform concept can result in synergies deriving from a reduction in parts diversity and lower development costs, a lower overall capital investment, and scale effects on material prices as a result of higher purchase volumes. Goldstein (2001) points out that the platform strategy is to reduce the number of vehicle platforms OEMs rely on, while trying to satisfy consumer demand for a multiplicity of new model variants.

Module Strategy and Outsourcing

In addition to the platform strategy, a module strategy is widely adopted in the automotive industry. OEMs have engaged tier 1 suppliers in the design, manufacturing and delivery of complete modular systems. Tier 1 suppliers developed towards being system integrators rather than component manufacturers. Therefore, the tiering of the automotive components industry took place due to lead source and modularisation tendencies. Hahn and Kaufmann (1999) note that modular sourcing implies that a buying organisation gives up at least one step in the production process, namely the assembly of single parts into a complex module.⁵⁴ By this 'design-in', the development and ownership role of tier 1 suppliers is increasing.

⁵² In order to realise economies of scale and synergies as well as to keep development costs down, Volkswagen was the first OEM to refine and develop the concept of common platforms. The mechanical and structural components under the chassis are identical in a Czech-made Škoda Octavia, or a German-made Audi, Golf or Volkswagen's new Beetle. With the decrease from 16 to 4 platforms, the Volkswagen Group managed to achieve 60% common parts in all cars.

⁵³ The platform concept typically involves systems that are not dependent on the size of the vehicle, such as brake systems, axle suspensions, locking systems, engine-transmission units, etc.

⁵⁴ Arnold (1998a) reports an extreme example of the module strategy, which was implemented first by Volkswagen through its "modular consortium" in Resende, Brasil, where employees from different suppliers work side by side on VW's final assembly line to integrate the modules to a complete vehicle.

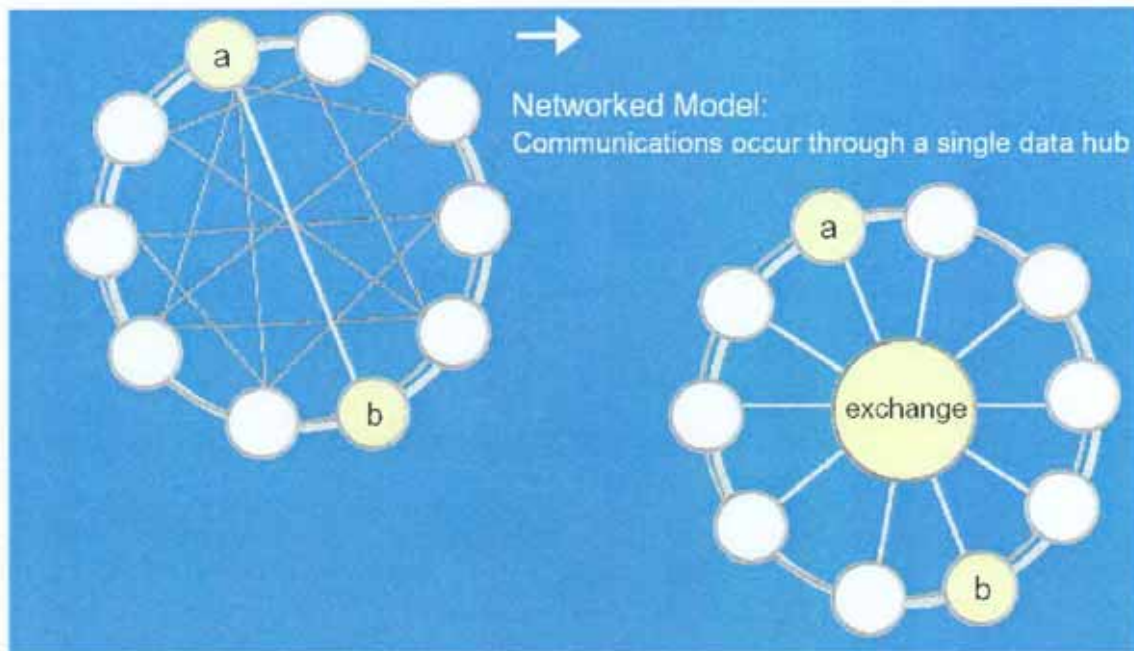
While the automotive industry was the pioneer for the lean supply concept, its principles have also been adopted in the electronics industry. By early involvement of only a few lead source tier 1 suppliers into product and process development projects and demand aggregation strategies from platform concepts, OEMs were able to generate significant economies of scale in their production processes (Hahn / Kaufmann, 1999, p. 12).

However, there is a wide variation on module boundaries and no industry agreement on how many modules a car should consist of. An industry-wide module standardisation was not developed so far. This background was one of the main reasons why industry consolidation took place.

Overcapacity, Globalisation and Total Cost Reduction Trends

The requirement for suppliers to produce systems and modules, in combination with the capability to supply on a global basis close to the OEM plants, has created a wave of strategic alliances across the oligopsonistic automotive industry. Acquisitions, mergers and strategic alliances facilitated suppliers to evolve into global systems integrators. The high level of competition due to overcapacities from car production in most international market segments and globalisation made a further contribution to the consolidation phase of the automotive industry. Manufacturers, faced with excess capacity and increasing competition, are aggressively pursuing cost reduction and outsourcing strategies and regard e-Business, in particular, as a method to achieve total cost reductions and competitive advantage.

The use of ICT / IOS to underpin a variety of business activities is supplementary accelerating the process of outsourcing non-core activities in the automotive industry. OEMs and their strategic partners are enabled to share dynamic information and aggregate this data by communicating over networks (shown in Figure 7). The more networked and integrated supply chain model developed in the automotive industry to improve for example cost efficiency in global sourcing processes.

Figure 7: Networked Supply Chain Model

Source: Plumb (2001), "E-Commerce for the Automotive Industry", Eyeforauto Asia 2001, <http://www.eyeforauto.com/>

Summary of Strategic Supply Chain and Procurement Management in the Automotive Industry

Industry drivers such as globalisation, competitive pressures and overcapacity, oligopoly structures, strategic alliances in various forms as well as platform and module concepts have made a significant impact on the automotive industry. The concepts of the 1990s including lean management, re-engineering or just-in-time have developed a complex hierarchical supply chain. To date, by contrast, the automotive industry seems to evolve towards a cross-functional direction and is more and more optimised in the context of the total networked supply chain. Presented industry drivers or generally the requirement for a more responsive and integrated supply chain emphasise that ICT systems play a key role in the automotive value chain due to the amount and complexity of required data and information.

2.3.4 Conclusions from the Literature Review on Strategic Supply Chain Developments

Important first conclusions from the literature and industry review can be drawn for EPC at this stage. Hidding (1999) distinguishes three different ecologies that evolve with different speeds: slow cycle, standard cycle, and fast cycle. The automotive industry

belongs to the standard cycle ecology, where products are renewed every 3-6 years. Standard-cycle industry environments are typically oligopolies and a key asset is volume or scale of operations. In a standard cycle ecology, critical strategy elements that drive uniqueness include standardising products and services (to exploit economies of scale), exploiting bargaining power, cutting cost, differentiating (standardised) products and services, and segmenting markets. In fast cycles such as the electronics industry, the key source of uniqueness is generating and delivering new products, which are renewed every 6 months to 2 years.

Strategic procurement has become very important in both the electronics and automotive industry sectors (see also Rozemeijer, 1999). Moreover, the importance of operational efficiency and outsourcing increased the significance of supply chain management. At the same time, both industries are increasingly finding themselves in a position characterised by globalisation, turbulence and complexity, paralleled with advancements in ICT. The product life cycles have become shorter, while this trend has been accompanied by a progressive fall of the available time-to-market for products (Brown and Eisenhardt, 1997).

Consistent with overall shorter product life-cycles and changes in both industry sectors, recently researchers have called for a more dynamic approach to strategy and started to focus on high-velocity environments, and to emphasise the continuous change that characterises them (e.g. Bettis and Hitt, 1995; Brown and Eisenhardt, 1997; D'Aveni, 1994; Hamel, 2000). D'Aveni cites for example factors such as more aggressive action-reaction patterns among rivals, more frequent emergence of new technologies and shorter product life cycles and lower barriers to entry that contribute to increased competitive pressures.

Eisenhardt and Martin (2000) even argue that the resource-based perspective breaks down in high-velocity contexts because the competitive advantage achieved by the current resource pool becomes unpredictable. In this respect, D'Aveni (1994) introduced the term 'hypercompetition' and developed a radical critique of the sustainability of competitive advantage (see also e.g. Bettis and Hitt, 1995; Brown and Eisenhardt, 1997; Hamel, 2000).

Hypercompetition can be traced back to Schumpeter's (1934) thoughts on 'creative destruction'. Central for this Austrian school is that it emphasises destructive creativity for finding and leveraging from temporary market unbalance that creates strategic windows where excess rents can be made. This perspective characteristically emphasises the importance of exploitation of temporary arbitrage opportunities in technology markets and entrepreneurial discovery. According to D'Aveni (1994), hypercompetition is not a dichotomy per se, but a continuum in which industry sectors exhibit varying degrees of hypercompetitive behaviour.

"Hypercompetitive behaviour is the process of continuously generating new competitive advantages and destroying, obsoleting, or neutralising the opponent's competitive advantage, thereby creating disequilibrium, destroying perfect competition, and disrupting the status quo of the marketplace".⁵⁵

According to this theory, firms that aim to construct sustainable competitive positions have to change and continually build up new competitive advantages. This allows the firm to prevent competitor imitation and sustain its successful position. The result is the creation of a series of short-term and temporary competitive advantages in a dynamic competitive pattern. Hypercompetition considers speed and innovation, where electronic procurement strategies can play an important role.

D'Aveni (1994) argues that organisations need to prepare for hypercompetition in an entirely different way, focusing on creating disruption, seizing the initiative, and creating a series of temporary advantages. Knudsen (2002) explains that there is no such concept as sustainable competitive advantage in hypercompetition. In order to be competitive in the long-term, the firm must string together a chain of unsustainable competitive advantages. Competitive advantage is continuously renewed through competence-generating strategic processes of comprehension and deftness (McGrath, MacMillan and Venkatraman, 1995). Eisenhardt (1989) explains that opportunities open and close in brief time-periods in high velocity environments and outcomes from fortunate decisions taken in one time period can be imperilled easily in the next.

⁵⁵ D'Aveni, 1994.

Agile organisational designs are being emphasised, such as team-based organisations or competency-based organisations, that effectively manage new product development. Hypercompetition assumes increased instability in the manager's environment and suggests the pursuit of more flexible organisational boundaries and strategies (Amit and Zott, 2001), as well as competitive advantage based on exploitation of short-term opportunities arising from greater environmental uncertainty. A dynamic capabilities perspective on strategy (Eisenhardt and Martin, 2000; Mahoney, 1995; Teece, 1988; 1990; Teece, Pisano and Shuen, 1997) suggests that persistently successful businesses, if any, emphasise entrepreneurs, adaptability to unstable and quickly changing markets, and adroit management of fluid assets and dynamic capabilities.

Organisations have responded to the imperatives of current business environments by using a variety of indicated approaches such as collaboration, partial outsourcing, module strategies, and others. Typically, these approaches are being executed in the context of modified organisational forms enabled by ICT, such as networked organisations, strategic alliances, virtual organisations (e.g. Chesbrough and Teece, 1996; Hammer and Champy, 1993). The literature review could identify these forms and trends in both industry sectors.

One of the conclusions is also that the unit of competition has evolved from independent firms to strategic value chains and value networks. The resource-based theory and the positioning stream have not addressed issues where a focal firm has not as such established critical resources and capabilities but in co-operation with other firms (such as EPC). Although the "*ability to integrate efforts of different actors*" (Grant, 1996) and the relevance of "*alliance and acquisition routines that bring new resources into the firm from external sources*" (Eisenhardt and Martin, 2000) have been taken up in the resource-based perspective, complex networks remain fairly unarticulated.

Strategic developments in supply chain management in both industry sectors need to be based on a multi-perspective approach to competitive advantage and must also be seen in connection with the contextual inter-firm and industry environment in which the sources of advantages are sought to be exploited. It was shown in the industry analysis that the creation of inter-firm alliances between two or more organisations is a popular trend in contemporary business. In the meantime, Klocke et al. (2002) state that inter-company

networks and alliances of companies are topics that receive lots of managerial and academic attention.

Humphreys et al. (2001) explain that focal firms need to restructure their relationships with their upstream and downstream firms along the entire supply chain in order to be able to achieve significant global performance improvement. Porter (1985) discusses the establishment of coalitions that enable activities sharing in order to support a firm's competitive advantage. However, Porter's value chain approach focuses on activities within a single firm. Dyadic and network interfirm activities can also foster each firm's sustainable competitive advantage. The positioning stream focuses on how a company can position itself against competitors. The resource-based perspectives focus on how to leverage internal resources and capabilities. Strategic networks and relationships theory focuses on creating competitive advantage by leveraging external contacts. That is why these so-called relationship specific advantages that stem from inter-organisational links and co-operation with other firms are highly critical to the analysis of EPC.

Zagler (2000) argues that the trend towards managing purchasing synergies does not only take place in intra-company but also inter-company relationships. Moss Kanter (1989) related competitive advantage to external co-operation and explain that it may not be sufficient for individual firms to develop resources as a basis for competitive advantage on a 'do it alone' basis. Eisenhardt and Martin (2000) continue to explain that there are signs that firms that have strong network capabilities are able to learn more rapidly and from a larger competence pool, made available from strategic partnerships they are involved in. Thereby, they would not only be able to survive change, but may create it and even have an impact on new path dependence through network orchestration.

Strategic networks allow firms to overcome the traditional separation between market and organisations, thereby creating new forms of organisations based on mutual collaboration and semi-hierarchical relationships.

2.4 RELATION SPECIFIC ADVANTAGES: THE STRATEGIC NETWORK VIEW OF COMPETITIVE ADVANTAGE AND ITS FOUNDATION FOR EPC STRATEGIES

2.4.1 The Concept of Strategic Networks and Alliances

Strategic management researchers increasingly identify that the source of competitive advantage may also lie in strategic networks of firms. The term network is adopted from exchange theory which refers to the sets of two or more connected exchange relations (Hakansson, 1987). The definitions of networks that can be found in the literature are manifold. Many authors have investigated strategic networks in detail (Charan, 1991; Gomes-Casseres, 1994; Gupta, 1992; Hakansson and Johanson, 1992; Jarillo, 1988; Johanson and Mattsson, 1987; Knoke and Kuklinski, 1983; Miles and Snow, 1992; Park, 1996; Powell, 1990; Yanagida, 1992; Webster, 1995).⁵⁶ Ebers (1997) specifies that all networks share some same basic characteristics:

"While networking can take different forms, all forms are characterised by recurring exchange relationships among a limited number of organisations that retain residual control of their individual resources yet periodically jointly decide over their use."

Gulati, Nohria and Zaheer (2000) define strategic networks as *"(...) stable inter-organisational ties which are strategically important to participating firms. They may take the form of strategic alliances, joint-ventures, long-term buyer-supplier partnerships, and other ties."*

According to the business network approach, the firm's target market typically consists of long-lasting relationships with specific customers, suppliers or other counterparts, rather than with anonymous markets (Axelsson & Easton, 1992). Klocke et al. (2002) confirm that a company has normally a set of relationships and these relationships are interconnected. This wider structure of connected relationships has been termed network (Hakansson and Snehota, 1995). Zornoza and Alcamí (1999) consider a network as a way of co-operation by which a group of companies can institute long-term bonds to obtain a

⁵⁶ Several of them (Easton, 1992; Hinterhuber and Levin, 1994; Miles, 1989; Thorelli, 1986) are convinced that networks are the organisational structures of the future.

higher level of competitiveness, without having subordinate relationships among them. The strategic network theory states that the locus of competitive advantage may be the network rather than the firm (Gulati et al., 2000).⁵⁷

The network perspective is largely concerned with trying to comprehend multifaceted and complex inter-organisational relationships. According to Easton (1992), relationships are the "*sine qua non of the network perspective*" and consist of mutual orientation and dependency as well as bonds and investments.⁵⁸ A basic hypothesis of networks of relationships is that one member depends on the resources controlled by another member, and all members of a network can win by resource pooling.⁵⁹ Powell (1990) notes that the 'layered rigging' of friendship, altruism and interdependence can become an integral part of a relationship.⁶⁰ Hahn and Kaufmann (1999) explain that the strategy of core competency with outsourcing has prompted more and more international network structures in industries. Therefore, firms have not only to optimise the flow of material, information and finances between two companies, but also to integrate an overall system perspective in order to obtain efficient and effective supply chains.

Bengtsson et al. (2000) state that the network approach and the literature about strategic alliances have provided new insights into co-operation between actors based on a value chain, but research shows that relationships and co-opetition also develop between competitors (see e.g. Easton, 1992; Nalebuff & Brandenburger, 1996). Interaction comprises complex patterns of information exchange concerning the firms' strategies, requirements or capabilities with regard to production, logistics, quality, etc. (Anderson, Hakansson & Johanson, 1994; Ford, 1990). In the business network view it is argued that business relationships may give access to critical resources or capabilities outside the boundary of the firm which may in some cases be more important than resources

⁵⁷ A negative perspective of strategic alliances is presented by Parkhe (1993). He defines strategic alliances as voluntary interfirm agreements, often characterised by inherent instability developing from uncertainty with regard to a partner's future behaviour and the absence of a higher authority to ensure compliance.

⁵⁸ Inter-firm relationships exert influence on networks and introduce opportunities and constraints, co-operation and interdependence, competition and conflicts, changes and variations, investment and knowledge, structure and regulation, complexity and volatility as well as certainty and stability to the business network (see Naude and Turnbull, 1998).

⁵⁹ There are different types of networks such as strategic networks, knowledge networks (Clark, 1999), innovation networks (Sternberg, 2000) and issue-based networks (Brito, 1999).

⁶⁰ Gadde and Hakansson (1993) argue that a network comprises a unique set of actors, resources and activities, which together constitute its identity.

developed internally (Håkansson & Snehota, 1995). Since interaction in network relationships is a matter of co-ordinating activities and resources this may in turn have an impact on the business performance of a focal firm.

Understanding (e.g. on how to co-ordinate activities), trust and commitment will often be established as the firms learn about each other's competencies and behaviour (Axelrod, 1984; Dwyer, Schurr & Oh, 1987; Morgan and Hunt, 1994). Trust can be seen as a precursor to commitment. Commitment is seen as governed by the four factors (1) relationship termination costs, (2) relationship benefits, (3) (lack of) opportunistic behaviour and (4) shared value (Morgan and Hunt, 1994). According to Jarillo (1988), the formation of governance mechanisms such as trust or perceived goal congruence are factors that can assist in the development of strategic networks (see also Lorenzoni and Lipparini, 1999). Jarillo specifies that trust is an elementary element to achieve effectiveness and efficiency in networks.⁶¹ If relationship and trust co-ordination is successful, the process may lead to an extension of more committed co-operative arrangements (e.g. purchasing consortia, joint production, etc.) that require larger investments in the relationship (Fiol and Lyles, 1985). Trust is believed important because of decreased perceived uncertainty and reduced need for control. According to Zucker (1986), a high degree of trust can decrease transaction costs as contractual and legal expenses to control and manage opportunistic behaviour can be avoided. According to Wigand (1997), trust enables network members to achieve competitive advantage vis a vis specific competitors outside the network by reducing both production and co-ordination costs.

More lately, also firms' networks have been considered an important resource, which, under specific conditions, can be valuable and also rare, unique and difficult to imitate, and thus yield competitive advantage (Galaskiewicz and Zaheer, 1999). Based on the discussion above, relationship specific advantages can be defined as those specific resources and capabilities, which have been acquired through the firm's accumulation of the ties with other business actors most often developed over time. The relation specific advantages are developed only if both network partners consider it profitable or

⁶¹ In this respect, Anderson, Håkansson, and Johanson (1994) have discussed the concept of network identity, which they define as the perceived attractiveness (or repulsiveness) of a firm as an exchange

worthwhile in any other form to engage in future exchanges. Since firms co-operate in business relationships in pursuit of profitability or some other payoff linked to business performance (e.g. co-operation may raise joint productivity of the relationship partners), it can be expected that the relationship-specific advantages have a positive impact on business performance. Inter-organisational relationships are relatively enduring transactions, flows and linkages that occur among or between an organisation and one or more organisations in its environment. Oliver (1990) posted six contingencies prompting organisations to establish interfirm relationships. These include:

- *Necessity: firms enter relationships to meet necessary legal or regulatory requirements.*
- *Asymmetry: firms enter relationships to exercise power or control over other organisations or their resources.*
- *Reciprocity: firms enter relationships to pursue common goals.*
- *Efficiency: firms enter relationships to improve their internal input/output ration.*
- *Stability: firms enter relationships to respond to environmental uncertainty.*
- *Legitimacy: firms enter relationships to appear in agreement with the prevailing norms.*

The contingencies proposed are the causes that prompt or motivate organisations to establish inter-organisational relations and explain the reasons why organisations choose to enter into relationships with one another. They are interrelated and may overlap, but can be adapted further to realise the intention of building relationships with other collaborative organisations (McIvor and Humphreys, 2004). For example, EPC may be formed to increase entry barriers and market power (asymmetry), to obtain synergies in technology or information sharing (reciprocity) or to increase economies of scale (efficiency). Therefore, the strategic network approach to competitive advantage is closely related to electronic purchasing consortia.

In this respect, Carr (1999) describes consortium purchasing groups as a type of network organisations where firms co-operate in their buying effort to achieve volume discounts. The definition of a network organisation can be associated with both horizontal and

partner due to its unique set of connected relations with other firms, links to their activities, and ties with their resources.

vertical patterns of interaction and exchange transaction between firms (Powell, 1990). According to Carr (1999), a consortium can be viewed as a third party organisation that serves as a mediator between the firms in the network.

The consortium purchasing approach is based on co-operation. Co-operation can combine the advantages of vertical integration and scale economies in resource integration, but still keep focal firms focused on core competencies. Arnold (1996b) refers to the paradox that increasing competition leads to more co-operation between companies.⁶² Arnold (1996a) further specifies that though co-operation is defined in different ways, there are some constitutional features:

- *Independence of co-operation members is a criteria used by law to distinguish co-operation from merger. That causes tensions between autonomy and dependence.*
- *The membership in a co-operation is voluntary; nobody should be forced to participate.*
- *The main interest of the co-operation is an ex ante matching of plans or co-ordination of single interest, normally in a company's function like purchasing etc.*
- *The main goal of a co-operation is to reach better economical results for all co-operation partners.*

Co-operation is based on a hybrid institution with both market and hierarchical elements, which are grounded in the transaction cost theory (Williamson, 1975).⁶³

2.4.2 Transaction Cost Theory and its Implications for Strategic Networks and Alliances

The transaction cost approach was introduced by Coase (1937) and further revised by Williamson (1975). The foundation of the transaction cost theory is to describe firms not in neo-classical terms (as production functions) but in organisational terms (as governance structures). It examines a host of problems related to contracting and

⁶² Concentration is different from co-operation: Concentration applies to the complete or partial integration of companies by mergers or acquisitions.

⁶³ McIvor and Humphreys (2004) cite Ring and Van de Ven (1992) that the transaction costs theory has been criticised for concentrating on the extremes of markets and hierarchies while neglecting intermediate network forms.

economic organisation by drawing on its interdisciplinary origins in law, economics and organisation. Coase (1937) proposed a powerful yet simplistic assumption that there may be decreasing returns from organising additional activities inside the firm. Therefore, equilibrium firm size can occur at a point where the operational synergies the focal firm can secure from bundling internally managed activities exceed the associated costs of organising them externally. Accordingly, firm size is thus determined by in-house servicing costs relative to the default position of market transactions (Williamson, 1975).

“Virtually any relations, economic or otherwise, that takes the form of or can be described as a contracting problem, can be evaluated to advantage in transaction cost economics terms.”⁶⁴

The transaction cost theory is concerned with the organisation of transactions of goods or services between stages of activity. It yields propositions about which organisational forms are appropriate for which types of transactions in such a way that the total of production and organisation costs is minimised in an economic way.

“Transactions, which differ in their attributes, are aligned with governance structures, which differ in their costs and competence, so as to effect a transaction cost economising result.”⁶⁵

This transaction cost perspective states that organisations select organisational forms in order to reduce uncertainty and transactions costs in terms of the costs of resource exchanges and the costs of managing exchanges inside the organisation. Humphreys et al. (2001) note that the transaction cost approach is intended to explain the choice of governance structure for different markets and hierarchies.

Amit and Zott (2001) confirm that the central question addressed by transaction cost research is why firms internalise transactions that might otherwise be conducted in markets. Williamson (1975) explains that the three dimensions of transaction cost are uncertainty, frequency of transaction and asset specificity. He argues that these three conditions are frequently present simultaneously in the market economies and their co-

⁶⁴ Williamson, 1985.

⁶⁵ Williamson, 1991.

existence is calling for a governance structure. For instance, if market uncertainty is high, the transaction cost becomes high and the market transaction is said to be less efficient.

Asset specificity is the degree to which investments are made that are specific to a particular product, process or relationship, and cannot easily be used again outside that context (Malone et al., 1987). Goods and services with high asset specificity cannot be used in other transactions without significant additional costs, since they cannot be amortised over a variety of customers and, therefore, raise production costs and decrease the cost advantage of markets. When asset-specific investments are needed, it is regarded as most likely that the activities will be carried out within a hierarchy. High asset specificity, low transaction frequency and high uncertainty stand for high transaction costs and are typically associated with hierarchical or vertically integrated transaction governance. Williamson (1975) explains that when transaction costs are high, firms choose vertical integration to control the transaction process through closer supervision. Melvor and Humphreys (2004) note that for simple, non-repetitive transactions involving no transaction specific investments, markets co-ordinated by the price mechanism are the optimal choice. Low asset specificity, high frequency and low uncertainty may result in lower transaction costs and are typically related with arms-length market relationships.

Another variable or factor is the risk of opportunism, i.e. that a party can withhold or manipulate data and information in order to take advantage of other parties (Williamson, 1975). Williamson notes that the risk of opportunism favours the use of hierarchies, where diverse interests are more closely aligned than these of separate firms in market relationships. Rank and Wald (2000) explain that markets organise value chain activities by means of arms-length transactions between independent firms or individuals, with decision based primarily on price. Within markets the participants act typically independent from each other, are equipped with equal rights and characterised by a limited rational and opportunistic behaviour. Market refers to an arrangement in which successive legal entities are not subject to manage from a common source. Terms and conditions of trade are formed through interaction between demand and supply. That is the reason why market-based relationships are suggested to be elusive and rather competitive.

By contrast, instruction among mutually dependent actors is the main co-ordination device within hierarchies. Hierarchical relationships are usually applied as long-term relations and are ideally co-operative. Hierarchy refers to arrangements where linkages are merely co-ordinated rather than negotiated within a free bargaining environment. Hierarchy usually occurs within vertically integrated multinational enterprises, where successive firms along an industry supply chain can be divisions of the same legal entity. In hierarchies, supply chain operations are directed by management either within a single firm or across interacting firms. There are a variety of different forms of hierarchical control, including partnerships or simply stable, long term buyer-supplier relationships. Long term relationships where trading partners adopt common values and operate on the basis of trust rather than legal contracts, represent hierarchical relationships as well. Markets are co-ordinated by supply and demand forces, while hierarchies rely on co-ordination by management decisions.⁶⁶

Co-operation is located on a continuum somewhere between market (outsourcing) and hierarchy (vertical integration) (e.g. Clemons, Reddi, et al., 1993; Holland and Lockett, 1997; Thorelli, 1986). Strategic networks can be differentiated from vertical integration by the relative independence of the participating organisations. This continuum or hybrid intermediate form typically starts at the market dimension with informal co-operation and moves on to e.g. a license or co-operation contract and ends with e.g. a joint venture or merger & acquisition (hierarchy dimension). Clemons, Reddi and Row (1993) found a “move to the middle” occurring, with companies deciding for neither market nor hierarchy, but something in between. EPC are a new kind of governance structure, a hybrid institution that combines market and hierarchical steering.⁶⁷ Essig (2000b) used network density techniques and confirmed the hybrid governance structure of purchasing consortia.

⁶⁶ Later researchers have extended the scope of transaction cost theory to include quasi-hierarchical and quasi-market structures as alternate governance forms that a firm can opt for (Gulati, 1995). However, the basic concept remains the same: a firm decides to rely on a governance form that is closer to the hierarchical end of the spectrum than the market end when the transaction costs from market co-ordination outweigh production cost benefits, which arise from economies of scale and scope by outsourcing to specialised firms.

⁶⁷ Arnold (1998a) points out that the characterisation of consortia as “hybrid institutions” is based on the transaction cost economics theory. Besides production costs, there have to be costs for finding a transaction partner, negotiating, contracting and controlling the contract fulfilment. The transaction costs in a wider sense exist I) When using market transaction costs in a closer sense and II) When using organisations (hierarchy costs) for handling transactions.

In this respect, Ireland et al. (2002) describe that co-operation based transaction costs include those governed with negotiating and writing contingent contract, monitoring partner performance relative to the contract and dealing with the breaches of contractual commitments. Co-operation can be more efficient than markets or hierarchies when it minimises the firm's transaction costs.

Powell (1990) maintains that a network is a 'third-type' organisational arrangement, with its own characteristics and properties and states that networks "(...) involve neither the explicit criteria of the market, nor the familiar paternalism of the hierarchy." Instead, one party is dependent on resources controlled by another and there are gains by the pooling of resources (see also Van Alstyne, 1997). The co-operation of network systems can be viewed as an alternative to vertical integration, since these practices are an attempt to manage and control channel efficiencies without combining ownership. Dobler (1996) points out that these networks are usually not legal entities, but rather mutually beneficial and open relationships wherein the needs of both parties are satisfied. Strategic networks may allow enterprises to intercept the skills of another. Also, they give the opportunity to close skill gaps faster than internal development would allow. The risks of vertical integration can be minimised, while the rewards and synergies can still be realised (Ellram, 1991).⁶⁸

McIvor and Humphreys (2004) note that networks depend on developing relationships embracing issues such as trust or stability. Networked and allied organisations can be faster to respond than hierarchies as they are characterised by buyers and suppliers engaged in reciprocal, preferential and mutually supportive actions. Trust reduces the perception of risks associated with potential opportunistic behaviour, it enlarges the confidence that short-term inequities will be resolved and it decreases the transaction costs in an exchange relationship (Ganeson, 1994).

Humphreys et al. (2001) explain that the value chain reflects a "*network of echelons*" that performs a variety of value added activities, while collaborating within the value chain and confronting threats due to the uncertainties that exist at various levels. They refer to this type of inter-organisational collaboration as strategic alliances or channel

⁶⁸ For example strategic alliances developed between auto manufacturers and their suppliers, as an alternative to expensive vertical integration.

partnerships, in which firms can achieve competitive advantage (see also Bensaou and Venkatraman (1996) and Park (1996)). Zornoza and Alcamí (1999) note that firms are able to configure a strategic alliance (or what both authors call conglomeration) where there are relationships of economical dependency between legally independent entities. These relationships can be directed towards joint actions to achieve synergy such as electronic purchasing consortia, whereby every firm can bring in its specific competence.

2.4.3 Strategic Networks and Alliances: The Foundation for Pooled Purchasing

Arnold (1998a) specifies that a purchasing consortium is a special form of co-operation in general. Co-operation can be formed horizontally or vertically. Within co-operation, Arnold (1998b) makes a distinction between networks and strategic alliances: Strategic alliances are horizontal co-operation forms, whereas networks can describe both vertical and horizontal co-operation forms between companies of different tiers within the supply chain.⁶⁹ The author follows Arnold's definition where purchasing consortia can occur horizontally in strategic alliances as well as vertically and horizontally in strategic networks.

Lynch (1993, p. 2) explains that the number of strategic alliances formed multiplied enormously. More precisely, Schertler (1995) specifies that strategic alliances are almost common practice in industries such as electronics or automotive, whereas they are not very much used in other industry sectors such as the wood industry (see also Beck, 1998). Schertler also notes that strategic networks and alliances can replace mergers and acquisitions to achieve traditional merger synergies and competitive advantage. Szuprowicz (2000) argues that strategic networks and alliances depend on the synergistic potential between two or more business partners that can approach a market jointly because their respective core competencies are complementary. Opportunities can then arise which they could not otherwise afford without putting their companies at risk. Strategic networks and alliances can offer long-term benefits without the associated equity risks of concentration processes.

⁶⁹ Horizontal relationships may be more informal and invisible than co-operative relationships between vertical actors that are built on a distribution of activities and resources among actors in a supply chain.

With regard to strategic alliances and networks in supply, Harland (1996b) points out that although some research on structural aspects of supply alliance networks has been in evidence in the 1990s, little about supply alliance networks and less about strategies for their creation and management has been formulated. Supply alliance network strategy is a large concept than includes aspects relating to more than one network player and the interaction between players.⁷⁰ Harland (1996a) specifies that supply networks can be defined “as a set of supply chains, embodying the flow of goods and services from original sources to end customers”. Harland (2002) provides a framework of systems levels for supply including:

- *The internal supply chain within an individual firm, organisation or site.*
- *The supply relationship between a buying and supplying organisation.*
- *Supply chains of firms / organisations or sites directly connected by supply activities.*
- *Supply networks of firms / organisations or sites directly connected by supply activities.*
- *Regional consortia of firms / organisations not directly connected by supply activities but sharing a common interest in supply, or a regional agency with responsibility for development across a geographic region.*
- *Nationally bounded sectoral consortia of firms, or a government departmental agency with a sector specific remit, such as the National Health Service Purchasing (NHS).*
- *National consortia of firms, or a national agency with broad cross sector remit, such as the UK Office of Government Commerce (OGC).*
- *International consortia such as the Tea Growers, or international agencies such as the United Nations or the Red Cross.*

Strategic alliance networks in supply and pooled purchasing among independent organisations are not a new idea or phenomenon. According to Essig (1999a, p. 117), the first literature sources referring to inter-organisational co-operative purchasing are Mitchell (1927) and Gushee and Boffey (1928). Various terms such as buying groups, co-operatives, consortium buying or joint purchasing are used in the literature to describe

⁷⁰ Harland (2002) notes that industrial networks and strategic alliances contain all the processes that occur between firms in networks relating to operational, innovation, learning and strategic exchange, and are not only focused on supply. Supply systems can be distinguished from the larger systems level of the inter-organisation.

pooled purchasing initiatives. However, terms are not always used in a uniform manner in the literature and the terminology is often used interchangeably. Therefore, the author follows Essig's (1999a) categorisation and uses the all-encompassing term "*pooled purchasing*" as the general term that applies to demand aggregation in all sectors.

When exploring the most relevant approaches to pooled sourcing in the literature in general, co-operative purchasing models in the public sector are primarily analysed.⁷¹ Co-operative purchasing has long been practised in non-profit institutions such as municipalities, libraries or universities. Already in 1769, a purchasing co-operative was formed by the labour movement in Fenwick, UK, aimed at decreasing the price of living for workers, through large scale buying. However, co-operative purchasing is but one of the entire global pooled procurement strategy terms. The trend among industrial enterprises towards the formation of strategic procurement alliances is described as consortium purchasing that only started in the early 1990s (Corsten and Zagler, 1999, p. 139).⁷²

"The consortium is an offshoot of the more traditional buying group, the co-operative".⁷³

Essig (2000b) notes that most companies sought to strengthen their contacts with outside resources. According to Essig (1999a), a purchasing consortium represents a hybrid institution because while partners combine their purchasing power they still continue to exist as separate companies. Purchasing consortia are for-profit buying teams with representatives from at least two different companies and use strategic networks to aggregate their particular product requirements, thereby leveraging their buyer power to create economies of scale in pricing and supply. Consortium purchasing is recognised as a hybrid co-operation form between market and hierarchy that is based on the model of transaction cost and production cost theory. Size and volume obviously effect economies of scale and scope.

⁷¹ See classification in the bibliography section.

⁷² Harland (2002) confirms that it was not until the 1990s that any substantive empirical research of supply across inter-organisation networks was undertaken.

Hendrick (1997) identified the following sub-objectives related to purchasing consortia:

1. *Suppliers' total costs for the goods and services supplied to the consortium members truly are reduced through this increased volume, which clearly justifies lower selling prices, higher quality, better service, and their investment in new technology to add more value to their products and services;*
2. *All real, potential, and perceived violations of anti-trust laws clearly are avoided;*
3. *Confidential and proprietary information, including costs, margins, and pricing, and real and intellectual property, is secure from current or potential competitors;*
4. *There are mutual and equitable costs, risks, and benefits to all parties to the consortium, including buying firms, supplying firms, third parties, and customers.*
5. *There is a high degree of trust and professionalism among consortium participants, as well as a strong similarity/compatibility of needs, capabilities, philosophies, and corporate cultures regarding buyer-supplier relations.⁷⁴*

The main goal, that applies to pooled sourcing strategies in general, is to save total costs by pooling purchasing power to gain high-volume prices. However, definitions, procedures, target members and ground rules might be different (Pye, 1996, p. 2). For example, differences between co-operative and consortium purchasing prevail. Scheuing (in Arnold, 1998b) explains that a purchasing consortium often brings together firms in different industries and the allies operate in the for-profit sector. They are likely to be limited in number, their relative size might be quite substantial and their co-operation in the acquisition of chosen products or services is intensive. Co-operative purchasing, on the other hand, is most common in the non-profit and government sectors. The relative size of the member organisation is usually limited and involvement in the joint purchasing process is generally quite restricted (Macie, 1996, pp. 20-23). Whereas co-operative purchasing serves only members that are from the same industry in a close proximity to each other, the membership in a purchasing consortium can be composed of firms from a variety of industry sectors that do not necessarily have to be geographically near one another. Suppliers that are participating in co-operative purchasing typically pay fees, whereas they usually don't to supply their products to a purchasing consortium.

⁷³ Major, 1997, p. 23.

⁷⁴ Hendrick, 1997.

The classification of pooled sourcing strategies into co-operative and consortium sourcing emerged because of the distinguishable differences between operations and management methods employed by both of them. Purchasing in the public sector is characterised by e.g. legislation or political agendas, which distinguish co-operate from consortium purchasing by the source of pressures, but that does not suggest that one is less complicated than the other. The idea to aggregate demand volume in order to obtain a stronger position in respect to the supplier side is often established in the public sector but not yet so much in industry.⁷⁵

Rozemeijer (2000) further explains that a great number of hospitals and other healthcare providers in the United States made use of favourable pricing and service for many years for e.g. pharmaceuticals, maintenance services or medical equipment. To achieve this, group purchasing organisations (GPOs) serve as independent third parties that negotiate with large suppliers in the healthcare industry. For example, 82% of pharmaceutical supply expenditures are negotiated through influential GPOs in the US (Rozemeijer, 2000). “Group purchasing” is sometimes taken as a synonym to “pooled purchasing”, but typically refers to intra-firm purchasing activities between independent or dependent divisions within one corporation. “Buying groups” or “buying offices” represent horizontal buying co-operations especially in the retail sector. Rozemeijer (2000) describes that many of the enterprises in the retail sector have been established to permit them to survive against powerful large food chains and general merchandisers. Essig (1999b) gives an excellent and systematised overview of the existing research literature to pooled sourcing strategies, which was further complemented by the author in the bibliography and theme classification section.

Essig (1999a) further explains that symbiosis and synergy are drivers and prerequisites for successful pooled sourcing. According to a study conducted by Hendrick (1997, p. 10), average firms in a purchasing consortium saved 13.4 percent of the amount they normally spend on goods and services. The possibility of the whole purchasing consortium withdrawing the business from the supplier provides an incentive for the supplier to negotiate with the consortium (Carr, 1999, pp. 1-2). However, the effects are

⁷⁵ Carduck (1999) notes that an increasing number multinational corporations operate international procurement offices (IPOs) in supply markets outsider their home country. IPOs provide the opportunity to bundle demand within inter-organisational boundaries.

diminishing with increased specificity of products bought. The concept of synergy in purchasing is closely related to strategic management and to the concept of electronic purchasing consortia. Monczka and Trent (1995) demonstrate that there has been an actual increase in the corporate-wide volume consolidation of purchasing and in the combination of purchases of common items or families of items across buying units since 1990. Zagler (2000) argues that the trend towards managing purchasing synergies does not only take place in intra-company but also inter-company relationships. Therefore, synergy structures are separately discussed in the following sections in order to analyse the implications of different types of synergies in relation to EPC.⁷⁶

2.4.4 The Concept of Synergy in EPC: An Overview

Iversen (2000) states that synergy is a concept fraught with ambiguity about its sources and effects. According to Sommer (1996), the word 'synergy' derives from a Greek work meaning 'working together'. Corning (1998) explains that the definition of synergy is often associated with the quote the whole is greater than the sum of its parts.⁷⁷ Synergy means behaviour of integral, aggregate, whole systems unpredicted by behaviours of any of their components or subassemblies of their components taken separately from the whole.⁷⁸

Corning (1998) states that there is recognition, now starting to become apparent, that synergistic functional effects are an elemental facet of effectively every scientific discipline. Ansoff (1968) describes synergy as a measure of joint effects and introduced the term synergy into management science. Iversen (2000) notes that it is generally believed that the diversity in assets and activities of diversified organisations can be exploited to achieve synergies, by sharing assets or associated activities subject to economies of scale or scope or by performing mutually adjusted (and therefore complementary) activities. Iversen (1997) states that exploitation of similarities between different lines of businesses has for long been at the centre of interest in the investigation

⁷⁶ Ansoff (1965) and Porter (1985, 1987, 1996) claim that synergies confer competitive advantage on diversified firms relative to non-diversified firms. However, competitors may be able to achieve similar advantages by diversifying their activities, in which case synergy only results in competitive parity.

⁷⁷ It may be more precise to say that the effects created by wholes are unlike from what the parts can produce on their own and alone.

of the managerial concept of synergy. However, Rozemeijer (2000) comes to the conclusion that synergy is a rather vague term and often ill defined in strategic management literature and in practice. He cites Mahajan and Wind (1988, p. 64) who argue that despite its significant intuitive appeal, synergy is one of the concepts that is most ignored in strategic management.

Hayden (1986) notes that synergy occurs when two or more business units are combined in a company's portfolio in order to make the effect of their joint strategy more valuable than the sum of their individual strategies. In simpler terms, in the case of synergy, 1+1 would not equal 2, but something greater. Because in practice both parties can win, but often one more than the other, Rozemeijer (2000) suggests a slightly different formula to illustrate synergy: $1+1=1.6+1.1$.

Iversen (1997) cites Ansoff (1968, p. 80) who describes four types of synergy:

- 1. Sales synergy which occurs when different products make use of common distribution channels, common sales administration, or common warehousing.*
- 2. Operating synergy, which includes higher utilisation of facilities and personnel, spreading of overhead, benefits of common learning curves, and large-lot purchasing.*
- 3. Investment synergy as a result of joint use of plants, common raw materials inventories, transfer of R&D from one product to another, common tooling and machinery.*
- 4. Managerial synergy, for instance when a new business venture faces strategic, organisational or operating problems, which are similar to problems that the management has dealt with in the past.*

Electronic purchasing consortia may result in operating and managerial synergy, thereby creating potential economies of scale and scope. According to Iversen (1999), synergies may be obtained by sharing assets between organisations if production based on these assets are subject to declining average unit cost (see also Montgomery and Wernerfelt, 1988). MacPherson (1998) explains that economies of scale occur initially in the

⁷⁸ Synergy is a ubiquitous occurrence in human societies and nature. A well known example is found in the emergence of self-organisation of social insects, via indirect or direct interactions.

production process, where, through the better use of facilities and resources, it is cheaper for one company to produce a good than it is for two companies.⁷⁹ Whereas economies of scale arise when the average costs of manufacturing a product decreases as output increases, economies of scope arise when the average costs of producing two or more different goods by one company is less than if the goods were produced individually by separate companies.⁸⁰ Iversen (2000) researched that synergy can be attributed to:

1. *Sharing of indivisible assets whose acquisition costs are amortised over multiple uses.*
2. *Optimisation of the fit among sequentially performed activities (vertical complementarities).*
3. *Combination of the outputs of mutually adjusted activities to achieve superior functionality of the combined output (horizontal complementarities).*

MacPherson (1998) points out that the ability to negotiate discounts through purchasing in large quantities is one of the primary features of economies of scale and scope and synergy.⁸¹ Faes and Matthyssens (1998) also confirm that synergy is a key consideration in many co-operative arrangements in the area of purchasing. By aggregating demand, different units can gain greater leverage over suppliers and can reduce the cost or even enhance the quality of products and services they procure (Goold and Campbell, 1998).⁸²

Rozemeijer (2000) emphasises that only when one entity (e.g. a corporation) puts the right parties and individuals together and let them co-operate on the right issues, in the right way and on the right time, then potential synergy might materialise. Therefore, synergy would not be generated automatically for everything that co-operates, it should be managed. If no potential synergy is available at all, there is no point trying to force co-

⁷⁹ Iversen (2000) cites Porter (1996) that efficiency gains can also be achieved by adapting different assets or activities to a common purpose by making them mutually supportive and eliminate waste from reworking of outputs.

⁸⁰ Arnold (1998a) notes that economies of scale refer to an external and an internal effect. Externally, suppliers are able to reduce costs per unit produced because of fixed cost degression. Internally, the order costs decline with larger batch sizes. Without bundling similar demands of the individual business units the whole company decreases its purchasing power and its economies of scale.

⁸¹ Demand aggregation can result in subsequent scale and scope economies achieved in e.g. production or distribution.

⁸² Rozemeijer (2000b) points out that synergy can also be related to the concept of symbiosis. The concept of symbiosis originates from the field of biology, but Essig (1999) also used this approach to pooled sourcing strategies to indicate a mutually advantageous relationship.

operation (Rozemeijer, 2000). Macie (1995, p. 249) points out that consortium members with substantial volumes may not realise such a significant price reduction as other members. However, Macie also argues that savings achieved in other commodities, where the leverage achieved from partnering is greater, may more than compensate this. Hendrick (1997, p. 9) claims that benefits have usually a leaning to balance out among members in a purchasing consortium as each participant brings their own comparative advantage for particular purchased products and services.

Essig (1999a) states that co-operation in purchasing enables a more efficient and effective use of human and technical resources. Kaufmann (1993) supports this theory and claims that through co-operation purchasers can learn and gain knowledge of from each other. Rozemeijer (2000) claims that synergy is all the new value that can be added through organisation and the structure of interrelationships between independent units. Also, Porter (1985) specifies that synergy is based on interrelationships, which fall into two main categories. Firstly, tangible interrelationships that can be generated largely from linkages in areas such as production, marketing, technology or procurement, and secondly, intangible interrelationships related to e.g. management experience, skills or knowledge in implementing a specific generic strategy.

Faes and Matthijssens (1998) continue to summarise, based on a survey, the top five of perceived advantages and synergy potentials of a co-ordinated purchasing consortium approach. According to them, co-ordination would lead in first instance to a better internal information exchange across business units and purchasing departments. Secondly, it would result in enhanced development of negotiation strategies. In the third place significant cost savings can be achieved and fourthly, more impact on monopolistic or oligopolistic supply markets may be obtained. Fifth, it would result in an improved insight into supply markets and and in an enhanced transparency of supplier cost structures.

However, Iversen (1999) claims that companies cannot exploit all opportunities for synergy because these may require co-ordination, which might add transaction costs that more than offset the advantages gained. Transaction costs or the costs of co-ordination may lead to dis-synergy because the resources spent on co-ordination more than offset the

gains in efficiency.⁸³ Corsten and Zagler (1999, p. 140) indicate that the transaction costs of forming and managing a purchasing consortium proved to be a very high barrier.

For example, a transaction design to purchasing consortia provides safeguards against the threats of opportunistic behaviour, based upon e.g. contractual agreements and trust building mechanisms. Centrally controlled mechanisms to realise synergy can strand in very high complexity and co-ordination costs in a network organisation. However, lack of proper co-ordination may also prevent the realisation of synergies because no sharing or complementarity is achieved. Vizjak (1994, p. 25) explains that the failure to realise synergy stems from the inability of purchasing organisations to understand the benefits of inter-relationships and the way to implement them systematically.

Rozemeijer (2000) cites Wissema (1992, p. 169) who states that realising synergy in a network has two sides, a 'hard' side and a behavioural 'soft' side. The 'hard' side embraces important factors that can be 'arranged' such as making plans together, a good information and communication system or the design of a structure that encourages communication and solves its own conflicts. The soft side comprises what is typically termed 'management style' or 'corporate culture'. A set of shared values and beliefs provides an central key to implementation of synergetic effects because it is a significant force for providing focus, motivation, and norms (e.g. informal rules) (see also Schein, 1992). Therefore, intense communication is important in order to reach the common goals and plans.

Rozemeijer (2000) defines purchasing synergy as the increase in purchasing performance (i.e. efficiencies and effectiveness) that is realised when two or more business units combine their forces and / or share functional resources, knowledge and information in a network system (see also Essig, 2000b). Purchasing consortia have to be organised as symbiotic structural relationships between purchasing companies, according to Essig (2000b). Purchasing consortia are only successful if their co-operative structure is a symbiotic one. Consortium members have to take care to install a symbiotic system instead of commensalism or a parasite relationship.

⁸³ The cost of co-ordination depends on the organisational context, because it affects the way the sources of synergies must be co-ordinated.

2.4.5 Conclusions from the Three Paradigms to Competitive Advantage and the Concept of Synergy: Integrative Effects for EPC

Although synergy has traditionally been discussed in relation to diversification studies, it is also important in connection with competitive strategy and electronic purchasing consortia. One way of generating a competitive advantage is through exploiting synergies between the different assets and activities of the firm. These synergies, therefore, tend to be firm specific and more related to the resource-based perspective.

However, inter-firm synergies and the network approach are closely related to electronic purchasing consortia. This report is aimed to provide a deeper understanding of the major process and enablers of EPC. Instead of explaining only two important paradigms of firm competition which traditionally have been applied in most studies (the resource-based view and the industry/positioning view), this study tries to develop this further by including a third theoretical rationale, i.e. the business network view of firm competition.

With the increasing standardisation of Internet-based applications and the availability of low cost public ICT infrastructures, inter-organisational network alliances such as EPC can proliferate. That is why the three presented paradigms to competitive advantage and the concept of synergy are not yet enough to provide a sufficient literature grounding to EPC.

The importance of linking information technology and strategic management is broadly accepted. Mata et al. (1995) explain that ICT has also been mentioned for its possible role in creating sustained competitive advantages for firms (see also e.g. Barney, 1991; Clemons, 1986; 1991; Clemons and Kimbrough, 1986; Clemons and Row, 1987; 1991; Feeny, 1988; Feeny and Inves, 1990), but academic work in this is relatively underdeveloped, both empirically and theoretically. Amit and Zott (2001) explain that no single strategic management theory can fully explain the value creation potential of e-Business. Virtual markets, with their unprecedented reach, connectivity, and information processing speed, open new possibilities for EPC value creation through the structuring of transactions in novel ways (Amit and Zott, 2001). They may create value through unique transaction methods, new exchange mechanisms and new forms of collaboration among

firms (such as EPC). ICT systems can also decrease transaction costs in the creation and management of purchasing consortia. As such ICT is a critical component.

Barney (1996) specifies that a firm may use ICT resources to aid implement a wide range of strategies, including cost leadership, product differentiation, strategic alliance strategies, diversification strategies, and vertical integration strategies. Mata et al. (1995) discuss whether or not access to capital, proprietary technology, technical ICT skills and managerial ICT skills can lead to a sustained competitive advantage within the resource-based view. They suggest that only ICT managerial skills are likely to be a source of sustained competitive advantage and that, for researchers, the search for ICT-based sources of sustained competitive advantage must focus less on ICT per se, and more on the process of organising and managing ICT within a firm. Internet-based information technology has become widely available to competing firms and consequently, resources in this context can at best be regarded as a temporary source of competitive advantage.

Amit and Zott (2001) observe that the potential value creation in e-Business can go beyond the value than can be realised through the exploitation of firm-specific advantages within the Schumpeter and resource-based view, the configuration of the value chain or the formation of strategic network among firms. Rather, Amit and Zott (2001) integrated this range of different theories into a business model. According to them, a business model describes the way in which the elements of market exchanges are combined and structured, i.e. the way in which the flow of goods and information among participants is co-ordinated to enable transactions. The business model as a unit of analysis has a wide scope, since it encompasses capabilities of multiple firms in multiple industry sectors.

Hedman and Kalling (2001) argue that the concept of the business model is becoming increasingly popular within strategy theory, ICT research, and in the emergent body of literature in the field of e-Business (e.g. Afuah and Tucci, 2001; Allen and Fjermestad, 2001; Applegate, 2001; Cheng et al., 2001; Rappa, 2002; Rayport and Jaworski, 2001; Timmers, 1998; Venkatraman and Henderson, 1998). Within strategy research, the concept is used more sparsely (e.g. Amit and Zott, 2001), although strategy research covers several theoretical components that are included in the business model concept (Hedman and Kalling, 2001). However, theoretical literature concerning the business model is still relatively scarce. Porter (2001) criticised the empirical use of the concept

for being superficial, not well defined and not theoretically grounded. The multiple use of the term, often without a clear or consistent definition, creates ambiguity about its meaning. Timmers (1998, p. 4) confirms that the literature about e-Commerce is not very much consistent in the usage of the term 'business model'.⁸⁴ He defines a business model as

- *An architecture for the product, service and information flows, including a description of the various business actors and their roles; and*
- *A description of the potential benefits for the various business actors; and*
- *A description of the sources of revenues.*⁸⁵

Petrovic et al. (2001) define a business model as "*the conceptual and architectural implementation of a business strategy and the foundation for the implementation of business processes and information systems*". Venkatraman and Henderson (1998) characterise a business model as a co-ordinated plan to design strategy along three vectors: customer interaction, asset configuration, and knowledge leverage. It embodies the strategic logic on which the organisation was founded and facilitates the performance of its productive activities (Winter and Szulanski, 1998). Rappa (2002) defines a business model as a method of doing business by which a firm can sustain itself, i.e. revenue generation.

Hedman and Kalling (2001) note that ICT must be fit with other resources, aligned and embedded within organisations in a unique way and understood and used by individuals. Any improvements in activities should be materialised by an offering that increases customer-perceived quality and / or shrinks cost per unit. All these factors and their causal interrelations require to be understood for any specific, empirically defined business model.

The author shares the underlying assumption of the business model that an integration of comprehensive existing strategic management theories and emergent related research into

⁸⁴ Alt and Zimmermann (2001) explain that despite an intuitive understanding, a more thorough analysis reveals a confusing and incomplete picture of the dimensions, perspectives, and core issues of business models. Many definitions begin with the transition from the industrial age into the information age and introduce a business model that consists of increased networking among multiple partners.

ICT and e-Business is required to explain EPC. Due to the fragmentation of theory to strategic management, research must integrate different perspectives in order to improve the understanding of the ways in which EPC can generate value. So far, there have been lacking abilities to integrate and unite finer disparate aspects of strategy to EPC. For example, the EPC concept draws on the network theory by building upon the insight that unique combinations of inter-firm, co-operative arrangements can create value. At the same time, however, a range of different theories have to be used and integrated including value chain analysis and positioning stream, resource-based view, transaction cost economics and virtual organisation strategies in order to understand the drivers behind value-creation in EPC.

The strategy field is very fragmented and presented paradigms to competitive advantage juxtapose with each other, since they focus on different aspects of strategy. "Older" theories such as the positioning stream should be applied alongside more recent approaches and cannot be replaced, as none of the approaches can claim to offer a comprehensive framework. The theory foundation to EPC is characterised by an integration and interdependency of various theoretical perspectives.

Amit and Zott (2001) additionally reveal four primary and inter-related value drivers of e-Business: novelty, lock-in, complementarity (synergy), and efficiency. Schumpeter (1934) has articulated in his creative destruction model the value creation potential of novelty and innovations. Amit and Zott (2001) explain novelty which describes how e-Businesses can create value through innovative activities in the way business is conducted. Examples of such innovations are new ways of structuring transactions like e.g. EPC or reverse auctions. These examples show that e-Business can combine previously unconnected parties by utilising new transaction technologies and by creating new markets.

The value-driver lock-in explains that the value-creating potential of e-Business is enhanced by the extent to which strategic partners have incentives to maintain and improve their associations and by the extent to which customers are motivated to engage in repeat transactions. Lock-in is based on the concept of switching costs and direct and

⁸⁵ Timmers, 1998, p. 4.

indirect network externalities.⁸⁶ The Metcalfe Law (1996) states that, under certain conditions, the utility of a network increases with the square of the number of users. Mata et al. (1995) explain that switching costs have come to be known as the “create-capture-keep” paradigm (Clemons and Kimbrough, 1986; Clemons and Row, 1987; Feeney and Ives, 1990). Novelty and lock-in are linked, because the major innovation of some e-Business models is related to the complementary components of transactions.

According to Amit and Zott (2001), complementarities describe the value potential of firms, which co-operate in an e-Business strategy and integrate their products and services, technologies and activities. This combination can then create value to customers as a result of decreased costs related to finding and ordering products and services, as well as to business partners as a consequence of utilising markets interconnectivity and process integration. Amit and Zott (2001) further explain that efficiency suggests that transaction efficiency increases when the costs per transaction decrease. ICT systems are believed to lead to a reduction in the costs of co-ordinating and managing transactions and to add to synergistic structures.

With the advent of ICT, technology providers have developed innovative solutions as regards communications and the management of business processes. While Essig (1999b) provides a framework for further research on purchasing consortia, he does not deeply discuss the capabilities of pooled sourcing strategies in ITC-based markets, thereby researching only closed networks of EDI-based systems in a limited extent. EDI data is usually exchanged in batch fashion, which makes it complicated to handle exceptions. EDI is also ineffective for allowing multiple enterprises to make use of common data and process models of the whole supply chain. Process-level integration between multiple enterprises is, therefore, complex to implement because the data produced by one organisation’s EDI applications is frequently processed by dissimilar application sets by the receiving organisation.⁸⁷

⁸⁶ Amit and Zott (2001) note that network externalities are usually understood as positive consumption externalities in which the utility that a user derives from consumption of the good increases with the number of other agents consuming the good (see also Katz and Shapiro, 1985)

⁸⁷ EDI provided only limited success in this context. Internet technologies can potentially move beyond the limited EDI transaction sets in order to automate the data flows across the supply chain.

Opposite to alliance networks in supply as stable networks, the Internet for example allows co-operation in dynamic alliance networks and electronic purchasing consortia that can be more short-term based and project-oriented. Therefore, further literature, concentrating on electronic purchasing consortia, is added to Essig's (1999a) overview on the research literature, trying to combine the knowledge of existing pooled sourcing strategies and ICT systems.⁸⁸

McIvor, Humphreys and Huang (2000) cite Roberts and Mackay (1998) that electronic linkages in the value chain are already fundamentally changing the nature of inter-organisational relationships. Teamwork is highly dependent on communication (e.g. Morgan et al., 1986). The usage of information and communication technologies, mainly by the Internet, may well be a critical factor for the success of alliance networks because it enables the synchronisation of working processes between partners. Sieber and Griese (1999) explain that the reasons for organising activities in such virtual network organisations come down to an growing need for flexibility and efficiency by sharing resources and core competencies with other external partners (see Prahalad and Hamel, 1990).

Miles and Snow (1986) introduced the dynamic alliance network as an organisational form. Within this organisation, different business functions that are typically performed within a single organisation are conducted by independent organisations. The links between independent organisations are established on ICT systems, where suitable partners can be located and assembled into specific business groups based on the concept of the virtual corporation (Carduck, 1999, p. 38).

The virtual corporation is a dynamic network that is flexible and fluid since the partnership configuration can frequently change. The basic idea of the virtual corporation concept is that legally independent firms pool their resources in order to develop core competencies. Furthermore, the partnership is temporary as the virtual corporation is formed in respond to any opportunity and can disband again as soon as its purpose has been reached, e.g. the completion of the project. Research findings of Sieber (1998) show

⁸⁸ All literature related to pooled purchasing is classified in the references section.

that dynamic alliance networks generally can act as a reference point for the flexible creation of temporary virtual enterprises, e.g. electronic purchasing consortia.⁸⁹

The networks can be fluid and a firm can be in more than one network at a time. Virtual enterprises consist of a pool of enterprises that work together when necessary. Strong information networks enable companies to identify potential project partners. While the traditional strategy theories have been found very relevant to explain EPC, it is also essential to discuss virtual enterprises and structures in relation to purchasing consortia in order to make a contribution to theory development by elaborating on a classification and conceptual framework of EPC.

2.5 TOWARDS VIRTUAL STRUCTURES IN PURCHASING CONSORTIA: AN OVERVIEW

2.5.1 Virtual Structures in Strategic Alliance Networks and Implications for EPC

Electronic information links have resulted in disintegration of industrial structures, thus consequencing “virtual corporations” or “networked organisations” (e.g. Rockart and Scott Morton, 1993). A growing stream of research in organisational theory and management science has begun to address the importance of the virtual corporation to contemporary management (e.g. Ahuja and Carley, 1999; Bakos, 1991; Bakos and Nault, 1997; Bakos and Treacy, 1986; Davidow & Malone, 1992; Hopland, 1995, Malone et al., 1989; Palmer and Speier, 2000; Venkatraman and Henderson, 1998). In this study, the author uses the term virtual organisation to refer to the inter-organisational establishment where a group of independent firms work towards a common goal typically, but not exclusively, by the usage of ICT systems.

Virtual enterprises are based on the concept of dynamic alliance networks which can be described as an informal or formal pool of independent, specialist legal entities, subsets of which establish project based virtual enterprises together in order to suit existing customer needs or to exploit identified market opportunities (see e.g. Davidow & Malone, 1992; Hopland, 1995). Weele and Rozemeijer (1996) claim that alliance network structures and their respective electronic implementation may well be one of the most

⁸⁹ Virtual organisations may consist of temporary organisations with temporary resources and staff. Organisations can go into into short-term alliances without having legal entanglements of rather long-

central elements of business strategy in the next decade. Evans and Wurster (2000) predict that in the near future, traditional business definitions and organisation boundaries can hardly be taken for granted, as organisation within a firm and across firms increasingly might become variations on the same thing.

Ahuja and Carley (1999) define a virtual organisation as a geographically distributed organisation whose members are bound by a long-term common objective or interest, and who co-ordinate their work and communicate through ICT. Therefore, a constitutional element of virtual enterprises is ICT that gives members the ability to work together at a distance across organisational boundaries. Szuprowicz (2000) points out that especially the advent of the low-cost, ubiquitous Internet is creating the necessary infrastructure to operate virtual corporations.

Palmer and Speier (2000) state that the emergence of the virtual organisation as an organisational form has evolved from a formerly futuristic model to an identifiable structure across a range of organisations. Boehler and Schatz (cited in Liebl, 1999) explain that a virtual organisation is an alternative organisational form for (legally independent) companies, institutions, or individuals to cope flexibly with the dynamic changes in the business landscape, which uses a minimum of investment and organisational structure and a high level of ICT support. To an outstanding observer a virtual organisation may appear as one single corporation.

According to Duffy (2000), the term 'virtual' stems from the concept of virtual teams, where several individuals work together for e.g. a project, although they are not together in a physical sense. Taking this concept, purchasing takes on a virtual quality if portions of its responsibilities are assigned or shifted to a variety of other business units or enterprises. The virtual aspect results in the procurement procedures being handled not by any isolated purchasing department, but by process steering groups, which are comprised of members from the various business functions, business units or organisations. In this instance, a virtual organisation may be an umbrella for several outsourcing operations with the vision of together fulfilling a mutually agreed-on mission. It is virtual in the sense that it is typically not "tangible" (Duffy, 2000) and not necessarily a physical entity.

Scheuing (1997) notes that a virtual organisation is a lean, agile, highly productive organisation at the hub of a network of strategic alliances. Palmer and Speier (2000) confirm that the virtual organisation is a temporary network of independent entities linked by ICT systems to share costs, skills and access to one another's markets without any hierarchy or vertical integration.⁹⁰ Boehler and Schatz (cited in Liebl, 1999) continue to point out that virtual organisations cannot be associated with the hierarchical co-ordination mechanism, where the exercising of managerial authority and the formation of business institutionalise recurrent interchange long-term. They claim that a virtual organisation will have neither central office or organisation chart. It is more an interim form between market and hierarchy, which enjoys the benefits of both principles.

Definitions of the virtual organisation share the common perspective of different firms coming together as a newly defined unit. Sieber and Griese (1999) specify that an organisation may have a number of characteristics which make it more or less virtual and, therefore, it is better to speak of aspects of virtualness. Virtual organisations may possess the following aspects of virtualness:

- *Advanced information and communication technology.*
- *Flexibility: Impermanence of their own structures allows virtual organisations to link with and dislink from partners as opportunities change.*
- *Borderless linkages: National boundaries as well as traditional distinctions between suppliers, competitors, and customers lose meaning as networks synergistically combine inputs into value-added outputs.*
- *Dependence: No longer self-contained and autonomous, virtual organisations cannot function without their partners who contribute vital inputs to the network.*
- *Excellence: The single most powerful force in virtual organisations is the unrelenting commitment to excellence, which orchestrates the unique competencies of several organisations for world class outputs.*

⁹⁰ The formation and removal of virtual enterprises is aimed to occur quickly and without the implementation of additional co-ordination positions and specified contracts. In this way, irreversible costs can be avoided, and the virtual enterprise may deliver the same results like a real, fully integrated organisation without having the necessary overhead costs.

Tetteh (1999) confirms that a continuum of virtual business formats ranges from co-operating firms with high virtualness (e.g. when they are engaged in information intensive supply chains and operate within a very dispersed and network) to these with rather low virtualness (e.g. where they have a predominantly physical value and engage in rather limited co-operative efforts in a small geographical location).

Different types of virtual organisations can be distinguished. One type consists of legally independent companies that co-operate in the form of a stable network or a kind of pool. This type of virtual organisation benefits from mutual trust built up and is enlarged by repeated co-operation. Entities of the pool also realise the standardisation of enterprise interfaces to each other in the pool, because due to the repetition they amortise their investments more easily than with a single co-operation. Another type is composed of a mix of pooled entities and firms drawn from the market, when the pool in itself lacks the core competencies required. During any new mission new external partners are temporarily integrated in the pool. Besides these two types, mainly based on long-living relations, another virtual type is a combination of companies that come together spontaneously and disperse after the opportunity is grasped. All three types are appropriate for electronic purchasing consortia.

Palmer and Speier even (2000) suggest four distinct virtual organisational types: permanent virtual organisations, virtual teams, virtual projects, and temporary virtual organisations. For example, organisations can form EPC in virtual projects to get complementary enterprises together in meeting market opportunities. These established alliances call on markets from an array of organisations to respond more efficiently and effectively to market opportunities. Commonly these organisations are formed around similar industries or company types. EPC can be joined to take on multiple purchasing projects. When a purchasing opportunity has ended, so has the virtual purchasing consortium. By providing a distinctive focus, virtual communities can accelerate the process of aggregating purchasing power.

The quality of the output critically hinges on the efficacy of the collaborative process. Yeomans (1999) states that ICT / IOS can assist in communication and collaboration. According to Ahuja and Carley (1999), a key feature of virtual organisations is a high

degree of informal communications. Because of their lack of formal procedures, rules, reporting relationships, and norms, more extensive information communication is required.

Researchers have borrowed theories from other academic fields in the hope of enriching their theorising about the implementation and use of ICT / IOS by human actors (Johnston, 2001). Klein (1996) notes that all multiparty work systems such as virtual organisations or EPC have technical, human and social aspects and these are interdependent, thereby forming a “socio-technical system”. This term was introduced in the 1960s by Fredrick Edmund Emery and Eric Trist, although Klein (1996) explains they are already contained in the work of Karl Marx. This term describes the complex nature of large human-machine organisational systems and the integration of human and organisational factors with the work of technology development and implementation (e.g. Emery and Trist, 1960).

Trist and Bamforth (1951), in the first public usage of the concept of socio-technical systems, distinguished between the technological system and the “*social structure consisting of the occupation roles that have been institutionalised in its use.*” Technology can diffuse information and communications and can promote transformations in existing organisational arrangements (Morgan, 1989). Organised relations between people and face-to-face interactions can become more widely replaced by relations within and between computer programs or ICT in virtual organisations.

For example, Morgan (1989) explains that technology allows tools, machines and human beings to be endowed with an information-processing capacity that enables increased intelligence, adaptability and self-direction. It can also dissolve the need for proximity as a basis for interaction, thereby creating new possibilities for communication and co-ordination. Technology implementation involves bounded social choice (Miles, 1996), but technological and social sides often ignore each other, while the combination is required (Feher, 2005). Attempts to optimise for either the technical or the social system alone can result in the suboptimisation of the socio-technical whole.

A conceptual reframing was, therefore, proposed by Emery and Trist (1960), when the socio-technical concept arose as a new field of inquiry in conjunction with the first of several field projects undertaken in the coalmining studies of the Tavistock Institute. This project was based on the diffusion of innovative work practices and organisational arrangements. The original formulation of social and technical relations had been made in terms of generating the best match or “goodness of fit” between the two (Trist, 1981).

“The technical and social systems are independent of each other in the sense that the former follows the laws of the physical sciences, while the latter follows the laws of the human sciences and is a purposeful system. Yet they are correlative in that one requires the other for the transformation of an input into an output.”⁹¹

EPC are inter-organisational systems and, therefore, socio-technical systems with human and machine components to fulfil economic tasks. IOS such as EPC enable and drive new organisational forms (such as virtual organisations), fulfil certain tasks in the inter-firm context and allow firms to collaborate on the basis of information and communication technology, e.g. to improve processes within the value chain (e.g. Zimmermann, 2005).

However, while having recognised that the early socio-technical systems theory notion of joint optimisation of the social and technical is very valid, it can prove too static for specific tasks (Johnston, 2001). That is why researchers in ICT (e.g. Orlikowski and Robey, 1991; Shanks, 1997) have also sought more recently to borrow from the social sciences further dynamical theories of human intentional action and its relation to social structures, for example Giddens’s structuration theory (Giddens, 1984).⁹²

⁹¹ Emery and Thorsrud, 1969, cited in Trist, 1981.

⁹² The tenets of structuration theory can be applied to help understand the relationship between ICT and organisations (Rose, 1998). According to Johnston (2001), the actions (i.e. social practices or routines) of agents are determined by a structure and vice versa. Therefore, there are “attractors” or “fixed-points” as a result of the interaction and interlinkage between structure and action (Johnston, 2001). This process of reciprocal reproduction of structure and action is what Giddens (1984) calls “structuration” or the “duality of structure”. According to Orlikowski and Robey (1991), the duality of technology is expressed in its constitutive nature and role. ICT is the social product of subjective human action within specific structural and cultural contexts, but ICT is simultaneously an objective set of rules and resources involved in mediating (facilitating and constraining) human action, and hence contributing to the creation, recreation and transformation of these contexts. However, Johnston (2001) notes that application of the structuration theory has not been without difficulty. Because structuration is a theory particularly about social action, incorporation of ICT is not entirely natural

In this respect, community has become a catchword to illustrate greatly interactive alliance networks with common interests and objectives of human beings that get together online. What can start off as a network drawn together by common goals or interests can conclude in a group with a critical mass of purchasing power, partly due to the fact that communities can permit members to exchange information on subjects such as product price or quality.

Shaw et al. (2000) specify that a virtual community represents the collective experience, knowledge and information available to the community members in the particular subject (such as EPC). They present an opportunity to exploit the network effect, as each interaction of a member of a virtual community increases the knowledge of the whole community. Any virtual community lives as long as there is communication between the members about specific subjects and interests.

E-Marketplaces and procurement service providers can facilitate virtual structures in procurement and can position themselves as mediators of e-Procurement and EPC. Bakos (1998) explains that intermediaries enable the matching of purchasers and sellers and facilitate transaction exchanges. E-Marketplaces and PSPs have the potential to leverage ICT to perform these transaction exchanges with enhanced efficiency and effectiveness, resulting in more efficient, 'friction-free' markets. A frictionless market may provide low transaction costs, where purchasers can easily switch to another supplier without incurring prohibitive extra costs. Malone et al. (1987) and Bakos and Brynjolffson (1997) further argue that ICT can reduce the risk of opportunistic behaviour by allowing better monitoring of partners in a strategic network relationship.

(Orlikowski and Robey, 1991). This aspect of the theory still presents a challenge to researchers wishing to apply it to technology issues such as the implementation and adoption of ICT / IOS.

Bakos (1991) further states that

- 1) e-Marketplaces / PSPs can reduce costs of acquiring and communicating information about prices and products,
- 2) benefits to e-Marketplace / PSP participants increase as more organisations join the e-Marketplace / PSP
- 3) e-Marketplaces / PSPs can impose significant switching costs on participants,
- 4) e-Marketplaces / PSPs typically require large capital investments and offer substantial economies of scale and scope, and
- 5) participants in e-Marketplaces / PSPs face substantial uncertainties in the benefits to be achieved by joining.

E-Marketplaces can create value by e.g. facilitating the search and choice of trading partners, by creating spatial and temporal market liquidity, by aggregating trade volumes and by reducing transaction costs (e.g. Barua et al., 1997; Kambil and Heck, 1998; Kaplan and Sawhney, 2000). That is why the concept of e-Marketplaces / PSPs and dis- or re-intermediation strategies are more closely monitored and related to EPC in the following sections.

2.5.2 The Concept of Dis/Reintermediation and its Relation to EPC

Humphreys et al. (2001) cite Malone (1987) who suggests two types of effects from e-Business in general. The “electronic brokerage effect”, the first type, connects buyers and suppliers electronically through a database network, whereby it adds value to the supply chain by providing services such as filtering, transaction management, and active on-line marketing. The electronic brokerage effect predicts that ICT will facilitate technologically capable intermediaries to replace more traditional middlemen. By using electronic networks to reduce the costs of searching for appropriate products and transactions costs, firms can achieve an electronic brokerage effect.

The second type is termed the “electronic integration effect”, which is generated when buyers and suppliers extend their information processing capabilities to penetrate the interface between the value-added stages (see Humphreys et al., 2001). The electronic integration effect predicts that ICT will enable purchasers and suppliers to create joint interlinked processes. Supportive of this effect, Malone et al. (1987) postulates that

electronic markets may develop towards electronic hierarchies. The authors clarify that since ICT enables the sharing of databases and the integration of physical and electronic processes, their implementation will be customised to the buyer-supplier relationship. This increased integration will lead to hierarchical rather than market relationships. By using electronic networks to reduce the costs of tightly integrating particular buyers and sellers, firms can achieve an electronic integration effect.

Bakos (1991) posited also an electronic communication effect that electronic markets will decrease communication costs, facilitate electronic aggregation of demand and supply, and enhance a firm's ability to more closely co-ordinate their economic activity. These effects are also inherent to the analysis of dis- and reintermediation.

The research on traditional intermediation has analysed that intermediaries provide services that promote trade between buyers and suppliers, including: a) matching buyers and sellers, b) enabling trust by a neutral position, c) facilitating market exchanges by supporting certain transaction phases, and d) aggregating buyer volumes and seller information (Bailey and Bakos, 1997). Hendrick (1997) explains that intermediaries grant a mechanism for consolidating demand from a variety of purchasing organisations and, with the objective of offering 'one-stop-shopping' for their customers, earn revenue by sharing savings with their customers. Intermediaries earn profits by reselling products to purchasers at a price higher than what they are able to extract from suppliers, but at a large enough discount to what those buyers would obtain had they acted individually.

While traditionally intermediaries take ownership, aggregate, store and resell goods, the development of new ICT systems and virtual structures in purchasing have brought informational intermediation to the forefront in business practice. Metamediatio is the general term that encompasses both infomediaries as well as intermediaries. Metamediaries can provide multiple services in multi-vendor and multi-product environments and employ ICT capabilities and business rules to facilitate inter-organisational relationships.⁹³

⁹³ Schubert (1999) calls online metamediaries as cybermediaries, which are organisations that operate in electronic markets to facilitate exchanges between producers and consumers by meeting the needs of both producers and consumers.

Peterson et al. (1997) distinguish between three types of metamediaries: Distribution intermediaries achieve distribution economies by supplying products of several producers (e.g. supermarkets). Transaction intermediaries (e.g. wholesalers and retailers) assume control over price setting and merchandising, and provide services such as risk management (e.g. returns, warranties). Infomediaries are third-party providers of recurring services that facilitate the flow of information and ongoing interaction between buyers and sellers such as product research and certification, information dissemination, tracking market demand, advertising, price discovery, guidance on products or services to help purchasing organisations make informed sourcing decisions, as opposed to intermediation services such as taking ownership, storage, exposition or delivery of products.

Bakos (1991) argues that ICT would reduce the costs of transacting with business partners relative to internal co-ordinations costs. Thus he predicts the shift from hierarchical arrangements to more market-type relationships among firms. The argument is that the use of ICT decreases both the asset specificity and complexity of many products, facilitating them to be more effortlessly supplied through market transactions. Wigand (1997) also argues that ICT can reduce co-ordination costs, thus favouring markets over hierarchies. An overall lessening in the 'unit costs' of co-ordination should lead to markets becoming more advantageous in arrangements where internal transactions were previously favoured. Thus the greater price transparency associated with e-Marketplaces and PSPs is hypothesised to decrease the prices of products traded by these metamediaries (Bakos, 1997). This impact is expected to be more significant in the case of commodity goods and services.

Although this argument recognised that electronic hierarchies might be attractive when asset specificity is on a high level, the overall impact of ICT would be towards increased use of market outsourcing. However, co-ordinating complex business processes across firm boundaries may require expensive and difficult efforts to integrate disparate ICT systems, adding to the transaction costs inherited in a market relationship. Thus, by contrast, the tendency of complex processes to favour the use of hierarchies may be reinforced by the application of ICT. In network relationships, the emphasis is on integration and collaboration as opposed to brokerage (Malone et al., 1987). Researchers (Clemons et al., 1993; Sarkar et al., 1995; Holland and Lockett, 1997) have also

emphasised the “move to the middle” hypothesis, which states that many organisations have downsized and outsourced more with rather few suppliers in network relationships, but still keep many suppliers in arms-length market-type relationships.

Generally, a third party may be more efficient to facilitate purchasing processes than buyers or suppliers. Lucking-Reiley and Spulber (2000) note that metamediaries can diminish transaction costs in such a way that they can e.g. decrease the costs of search, provide guarantees for buyer or seller commitments, certify product quality or mitigate communication costs. Although metamediaries introduce an additional layer of costs, these can be offset by cost savings due to e.g. bulk buying discounts, reduced search costs or more efficient delivery systems. Swan and Watson (1998) explain that the role of a metamediary could be defined as one of engagement in the process of network development and one of co-ordination. They identify the role of the metamediary as one of co-ordinating and bounding relationships and state that the total cost of administering the network for the participants can be decreased. Their model described is in essence a trade model. The essential point is that members of a network have strong positive expectations about the metamediary, which they may typically not have about each other. With regard to maintaining the network these bonds of trust imply that resources can be co-ordinated between entities which would not otherwise interact at this level.

Therefore, it is not unexpected that academics who concentrate on the soft side of virtual corporations and metamediaries emphasise the necessity of trust (e.g. Fuehrer and Askanasy, 1999; Handy, 1995). Swan and Watson (1998) describe that metamediaries provide the ‘knowledge bandwidth’ for opening transactions to take place. Metamediaries can provide an extensive offering of facilities to support the development of e-Procurement and EPC. They can bring companies together that have not known about each other before and reduce the costs of a streamlined electronic supply chain (Net Profit, 2000, p. 9).

Lucking-Reiley and Spulber (2000) continue to explain that popular discussions often propose that efficiencies in e-Business are obtained by disintermediation. Wigand (1997) defines disintermediation as “*the displacement or elimination of market intermediaries, enabling direct trade with buyers and consumers without agents*”. Hermanns and Sauter (2001) explain that disintermediation, the potential elimination of ‘middlemen’ by

supplanting presumably costly metamediaries with direct transactions and the realisation of lower transaction costs by ICT, is also called first-order effect.

According to the already explained theory of transaction costs (Williamson, 1975), a variety of co-ordination costs are associated with various aspects of inter-company transactions, e.g. costs in searching, negotiating, monitoring or settling transactions and after sales services. Disintermediation is based on the assumption that metamediaries contribute significant costs to the supply chain and that the ability of ICT in the reduction of transaction costs enables suppliers to internalise operations and activities that have been traditionally performed by metamediaries (e.g. Wigand and Benjamin, 1996). If parts of savings resulting from the bypass are transferable to customers in the form of price reductions, direct exchanges between purchasers and suppliers may more than compensate for the costs of metamediaries and could become a preferred alternative.

However, lower transaction costs and less expensive intermediation do not necessarily stand for fewer metamediaries. Metamediaries can perform a variety of services that are often complex, inconvenient or costly for the buyers and sellers to undertake. As a result, adaptation of metamediary roles, or re-intermediation has been more common than disintermediation (according to Clarke, 2001). ICT systems can produce new classes of metamediaries based on information (see also Amit and Zott, 2001; Sarkar, Butler, Steinfield, 1995). According to Barratt and Rosdahl (2001), the key benefit of new metamediaries is that they offer increased visibility and transparency in terms of product data and information, availability and price and support exchanges between suppliers and purchasers by aggregating transactions to generate scale / scope economies. New figures and roles of metamediation can emerge, with different intensities of commercial functions as progressive or supplementary forms of traditional distribution. Reintermediation describes the process whereby suppliers and consumers, instead of transacting directly, invite a new class of metamediaries into the value-chain under new rules of engagement.

Hermanns and Sauter (2001) specify that if B2B e-Business encourages outsourcing to replace some transactions previously internal to a company, or if firms can use metamediaries to outsource some of their purchasing and sales efforts, or if firms can employ specialised metamediaries to avoid inefficient one-on-one direct communications between purchasers and their suppliers, the end result would be a larger number of

metamediaries (reintermediation or also called second-order effect). New forms of electronic collaboration (such as EPC) can provide evidence of the continued need for infomedia services in e-Business.

Therefore, ICT systems can endanger traditional middlemen, but can also create new metamediaries. According to Hermanns and Sauter (2001), these metamediaries can be classified into filters, agents and proxies. Filters usually just offer a selection of possible suppliers, whereas agents look for the best offer of the best suppliers. Proxies develop this further and aggregate the demand of several buyers and suppliers. With the increased volume proxies try to achieve better terms and conditions with the suppliers.

Distribution channels that are inherently inefficient, such as the wholesale-retail chain, may be re-intermediated by new metamediaries equipped with e.g. Internet exchange technology. By definition per se, however, intermediation falls into the market dimension and not into the EPC continuum between markets and hierarchy, as intermediaries take ownership, store and resell products. By contrast, infomediaries can manage purchases for their customers by using information about purchasing leverage so that network interaction is based on the market / hierarchy continuum. Therefore, the terms EPC dis- and reinfomedia are used in this study.

Suitable partners from different organisations must be located and assembled into specific business groups for EPC (Carduck, 1999, p. 38). This task is usually assumed by infomediaries or brokers who play a lead role in bringing together partners and can also act as service providers to the independent groups within the networks. Metamediaries of a new genre such as e-Marketplaces and procurement service providers are representing new approaches of reinfomedia.

Bakos (1998) explains that market transactions require the establishment of a certain degree of trust, which protects purchasers, sellers and metamediaries from opportunistic behaviour of other market participants. Trust is a qualitative and broad concept which includes shared expectations, semantics and beliefs of parties. As Figallo (1998) puts it: *"Trust is the social lubricant that makes community possible"*. Personal relationships can guide to trust establishment between parties involved in an economic exchange, which in

turn reduces the likelihood of opportunistic behaviour (e.g. Uzzi, 1997). Infomediaries can act as third-party providers of trust.

As a summary, it has been argued in the literature that as 'friction-free' metamediaries can decrease the cost of market transactions, it can become easier to match purchasers and suppliers, and as a result the role of metamediaries may be reduced, or even eliminated (see also Gellman, 1996). However, new types of electronic metamediaries can evolve that perform functions such as matching purchasers and suppliers, providing product and marketing information, aggregating information goods or providing trust relationships (Bakos, 1998). Therefore, it is vital to analyse more literature concerning the supporting role of infomediaries for e-Procurement and EPC strategies. In the following sections, the terms e-Procurement, e-Marketplaces and PSPs are defined, explained and classified in more detail.

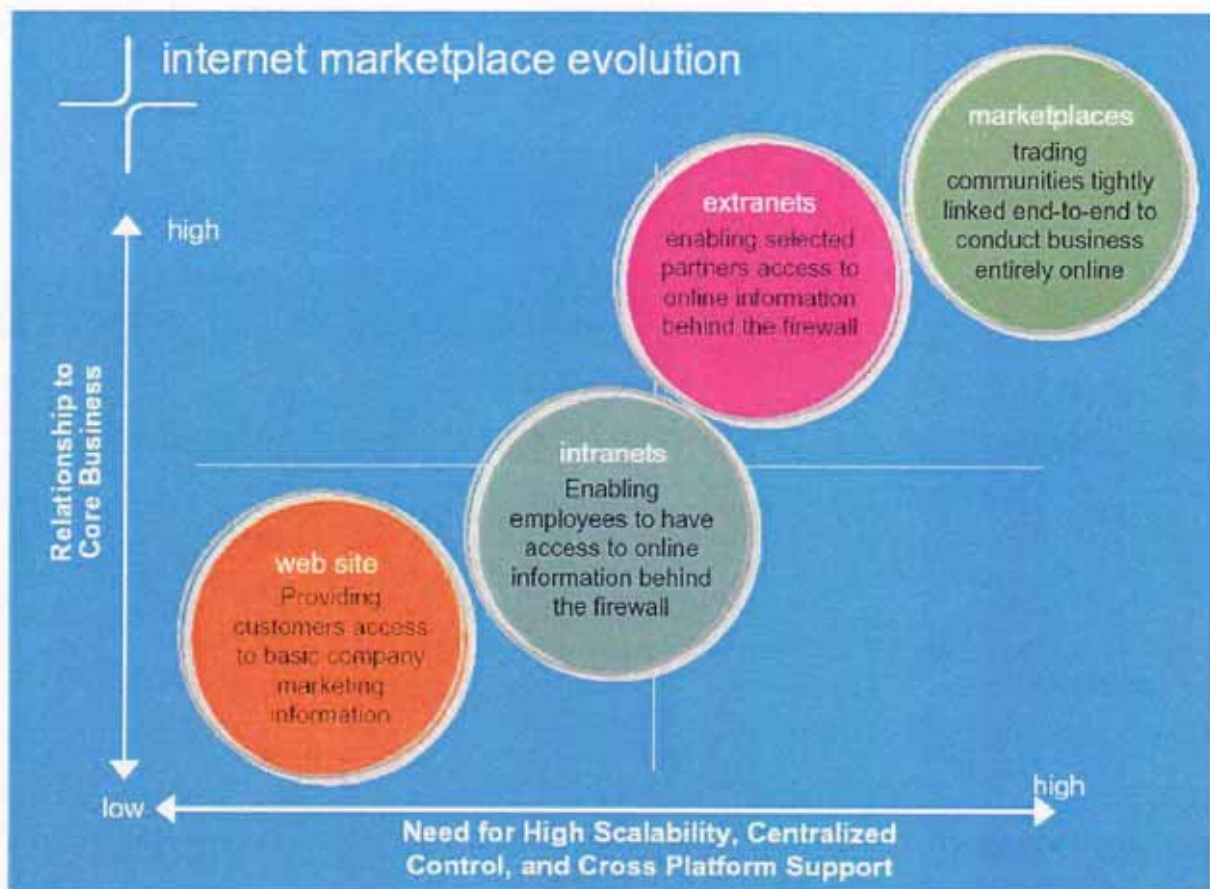
2.5.4 The Supporting Role of Metamediaries for E-Procurement and EPC – A Classification

E-Procurement can be defined as using information and communications technology (especially the Internet) in the purchasing process (Boer, Harink and Heijboer, 2002) or as

*“ (...) a category of software that uses Internet technologies to improve on purchasing and supply, and ERP back-office solutions ”.*⁹⁴

These definitions also include the use of Intranet and Extranet applications. In general, Plumb (2001) explains that e-Commerce evolved in four stages, which can be applied to e-Procurement as well (see Figure 8):

⁹⁴ See Whyte, 2000, p. 24.

Figure 8: The E-Commerce Evolution

Source: Plumb (2001), "E-Commerce for the Automotive Industry", Eyeforauto Asia 2001, <http://www.eyeforauto.com/>

In the first stage, purchasing organisations used the Internet to order directly on supplier websites. First generation applications (e.g. online catalogues) mainly helped reduce costs by removing manual and paper-based elements in purchasing systems. As a next step, purchasing organisations launched product / service requests on their own websites. The third generation was the evolution of Intranets and Extranets, closely followed by e-Marketplaces and PSPs as the fourth generation. Unlike first generation solutions that were typically catalogue-based, these new infomediaries can offer a variety of services and functionality.

Various names for e-Marketplaces such as B2B exchanges, B2B websites, virtual marketplaces, purchasing hubs or e-hubs exist in the literature. The Fraunhofer ALB (2000) calls e-Marketplaces as virtual nets, at which any number of buyers and sellers (openly) trade goods and services and exchange information. In this research, the term e-Marketplace is used and is defined as an

*"Internet-based solution that links businesses interested in buying and selling related goods or services from one to another."*⁹⁵

A procurement service provider (PSP) is similar to an application service provider (ASP) that offers organisations access over ICT to applications and services that would otherwise need to be located on their own enterprise computers. PSPs and ASPs can become an important alternative in providing a cost-effective way to procure applications and services over networks for both SMEs and MNEs on a continuum between insourcing and outsourcing. Procurement services for other companies can be provided that could also be or typically have been provided in-house. PSPs offer services such as supplier relationship building, provision of catalogue content, EPC or reverse auctions, quantification of total cost of ownership or identification of new sources of supply. Procurement service providing can transfer ASP's benefits to the area of electronic procurement. PSPs are able to make e-Procurement solutions accessible to a large number of companies and overall costs can then potentially be allocated to several companies. Therefore, the PSP model can be, in particular, attractive to SMEs, which are offered the option of procurement outsourcing to a PSP or remaining in control of the procurement procedure by taking advantage of the appropriate procurement services.

McIvor and Humphreys (2004) note that the connectivity associated with e-Marketplaces / PSPs and ICT has the potential to bring an industry's customers and suppliers into a unified and economically perfect marketplace. They also explain that it is now possible for an organisation to establish links with other organisations at significantly lower costs than with previous technologies. Metamediaries like e-Marketplaces or PSPs may play a major part for the realisation of virtual structures in purchasing consortia and e-Procurement solutions. Neef (2001) argues that these metamediaries can essentially negotiate discounts on their collective behalf, creating economies of scale normally reserved for large and powerful firms.

Thereby, e-Marketplaces / PSPs can focus vertically (operating in only one specific industry), but also focus horizontally (across various industries). Horizontal e-Marketplaces are often well suited to buy indirect inputs such as operating resource

⁹⁵ IDC, 2000.

management (ORM, e.g. office products or travel services) or maintenance, repair, and operations (MRO, e.g. replacement parts).⁹⁶ ORM or MRO items tend not to be industry specific. Vertical e-Marketplaces / PSPs, by contrast, are well suited to buy direct or strategic goods that are incorporated into the final product (McIvor and Humphreys, 2004).

Porter (1989) defines co-operations within one activity as Y-co-operations (thereby providing economies of scale) and co-operations interacting between several activities as X-co-operatives (thereby providing economies of scope). When applying these terms to an ABC-classification of products procured in purchasing consortia, Arnold (1996a) defines Y-co-operations in the way that their procurement fit and item homogeneity is high. Therefore, they do not only refer to economies of process and information (X-co-operatives) but also to economies of scale. Referring to this definition, Y-co-operative may be more likely to occur for A-parts⁹⁷ purchasing consortia and X-co-operatives for C-parts purchasing consortia. Y-co-operatives are more likely to appear in vertical markets whereas X-co-operatives are more likely to be found in horizontal markets.

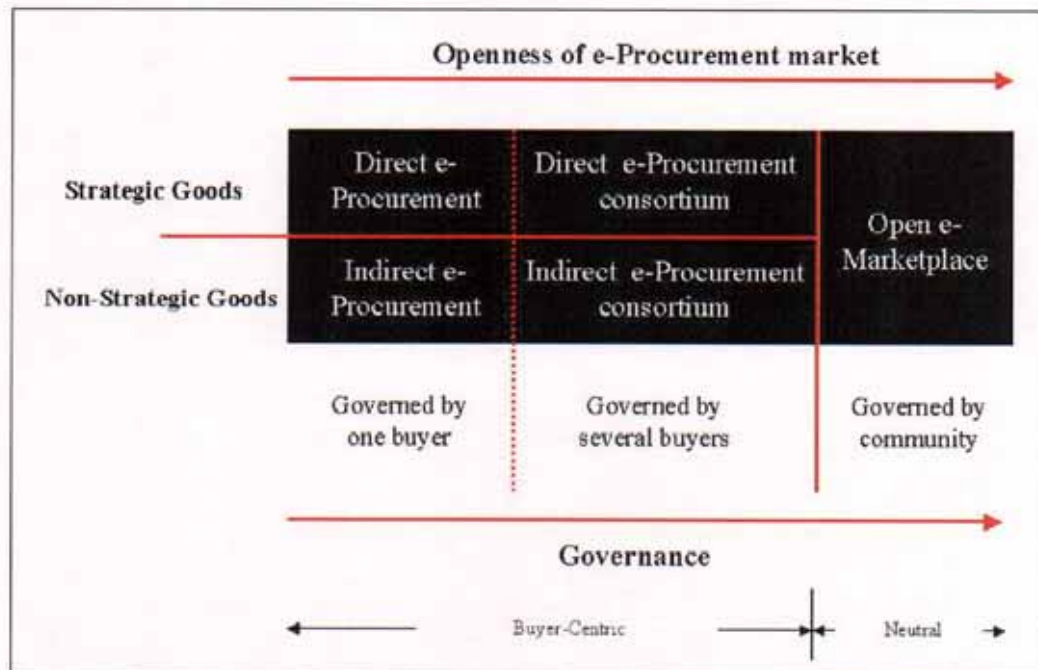
E-Marketplaces / PSPs may also support a specific type of buyer or a specific type of product category across multiple industries, e.g. when SMEs aggregate their orders into one larger order, which is then bid for by multiple sellers in electronic reverse auctions. Another classification of e-Marketplaces / PSPs can be done into buy-side, open or sell-side systems. Open e-Marketplaces / PSPs can be distinguished from a buy-side system insofar as it must be a neutral community not only to buyers, but also to sellers, thereby considering the interests of both purchasers and sellers (Fraunhofer ALB, 2000). Buy-side solutions are governed by one or several buyers and are set up to support the purchasing processes (McIvor and Humphreys, 2004). A sell-side solution is typically composed of a supplier and multiple buyer market hierarchy and is initiated by major suppliers and distributors to support their sales processes. Sell-side solutions can be direct ordering on

⁹⁶ Indirect (or non-critical) materials are any commodity or service purchases that do not directly result in finished goods. Direct (or so-called strategic) materials are directly related to the production of finished goods in the manufacturing supply chain.

⁹⁷ A-Parts are the components and material that account for a large portion of spending, are strategic, or provide key product differences. B-Parts are goods that represent an important but lesser amount of volume. C-Parts represent a low percentage of the total volume but a significant number of transactions and suppliers.

supplier websites or seller-led e-Marketplaces. Figure 9 illustrates private (single buyer-driven), consortium and third-party intermediaries (Brooks and Dik, 2001).

Figure 9: Buy-Side vs. Open e-Marketplaces / PSPs



Baldi and Borgman (2001) even identified four different ownership structures for e-Marketplaces / PSPs:

- Private e-Marketplaces / PSPs are owned and managed by a single company or a network of non-competing companies. A single owner creates an e-Marketplace / PSP for buyers and sellers with the objective to improve the core business of the owner.
- In consortia-led e-Marketplaces / PSPs the ownership is shared between firms that can compete outside of this electronic market.
- A third-party e-Marketplaces / PSP is owned by a group of non-competing companies or a single company that is not considered to be a trading partner, often a start-up company. Usually a third-party e-Marketplace / PSPs is independent and neutral, where the owner is not a trader.
- A meta-e-Marketplace / PSP is formed by a group of independent market providers who collaborate and exchange requests and offers by interconnecting their e-Marketplaces / PSPs to increase liquidity.⁹⁸

⁹⁸ Baldi and Borgman, 2001.

The evolution of such e-Marketplace / PSP models has proceeded both in the electronics and automotive industry sectors. The electronics industry has been among the earliest movers into e-Marketplaces / PSPs since much of the industry and its supply chain constituencies were already relatively well prepared to using ICT for work processes. As outlined previously, there have been major changes in business processes in the industry, including outsourcing of manufacturing, adoption of more complex demand-driven production and modular production networks (see also Sturgeon, 2002).

Therefore, numerous e-Marketplaces / PSPs have emerged for the electronics industry in the boom time of Internet start-ups, catering to different sectors of the industry. Approximately 50 e-Marketplaces / PSPs were founded in the electronics industry in the starting phase. However, the electronics sector was also on the forefront of the consolidation trend and approx. 25 e-Marketplaces / PSPs have been left in the electronics industry to date.⁹⁹

In spite of the large ICT investments made throughout the electronics industry and the industry's reputation as a leading user of ICT, Dedrick and Kraemer (2002) come to the conclusion that its value chains are still linked by an uncoordinated mixture of ICT systems, ranging from e.g. EDI to web-based applications, e-Mail, faxes or phone calls. They explain that there are few common standards across the industry, and SMEs often still have minimal ICT capabilities. This lack of standardisation was of the main drivers of the electronic industry effort to establish XML-based standards for information exchange across the supply chains and to increase the efficiency of business-to-business integration.

Moreover, two major consortia-led exchanges have emerged in the electronics industry, where the owners spend an estimated 700 billion euros a year.¹⁰⁰ The rise of these consortia-led e-Marketplaces have left independent e-Marketplaces and PSPs struggling to win enough purchasing organisations and suppliers in order to build a liquid market.

⁹⁹ In the electronics industry, public e-Marketplaces live side-by side with private exchanges (see Cullen, 2001, at <http://www.eb-asia.com/EBA/issues/0105/0105instat.htm>). Open public e-Marketplaces are in use largely for procurement of commodity materials. Private e-Marketplaces are formed to support the complex and multi-tier supply chains that link OEMs with contract manufacturers, suppliers, and other outsourced services.

¹⁰⁰ See Roberti, 2000, at <http://www.e-gateway.net/infoarea/news/news.cfm?nid=678>

That is why several smaller neutral e-Marketplaces / PSPs have merged and co-operated to achieve a critical mass of participants in market niches.

In the automotive industry, similar developments could be observed. A large collaborative e-Marketplace was formed by five OEMs, while other manufacturers rather pursued separate, private initiatives. Therefore, there are several automotive B2B trading hubs, when most suppliers would probably have preferred a unified structure. However, some OEMs argue that private e-Marketplaces can offer more control and design opportunities, which potentially can result in e.g. faster processes of legacy system integration, as compromises with other OEMs are not required.

With this constellation of various OEM e-Marketplaces, the OES market was confronted with multiple platform interfaces. In response to this development, tier 1-driven e-Marketplaces have been formed in order to establish common standards for exchange of communication and transactions between tier 1 and tier 2 suppliers as complementary approaches to the OEM initiatives. There are also a number of after-market sites serving the wider automotive industry and other e-Marketplaces / PSPs devoted to trade in products such as new and used tyres. The panorama is even more complicated if the interactions with other related horizontal e-Marketplaces are considered. One initiative was, therefore, the creation of a collaboration and unification platform on standards among 16 European automotive manufacturers and 4 national automotive associations.

Given the wide diversity and variety of e-Marketplaces / PSPs in both industry sectors, integration, harmonisation and standardisation are major issues and companies have to carefully consider whether to develop a private buy-side procurement solution or to use a consortium-led or third party managed e-Marketplace solution. According to the research firm e-Marketer, it appeared from press releases that consortium-centric and neutral e-Marketplaces have been implemented more widely than independent efforts governed by single purchasing organisations. However, eMarketer found that more than 93% of B2B e-Commerce is being transacted through private e-Procurement systems.¹⁰¹ One explanation can be that firms may perceive that e.g. information exchange with suppliers, support systems or capacity management can be more easily integrated with existing

¹⁰¹ See <http://www.emarketer.com> (the figure includes e-Procurement software and private e-Marketplaces)

business processes. However, the business buyer is, thereby, forced into a content maintenance role that can become extensive and burdensome. Standardisation, content and syntax checks can require a lot of resources for a single company.

Baldi and Borgmann (2001) explain that a consortium-based e-Marketplace sets a standard for communication and co-ordination between participants that would get wider acceptance in the industry. They also argue that market participants have reduced infrastructure costs since they only build one connection to the e-Marketplace instead of several interfaces to all the e-Marketplaces.

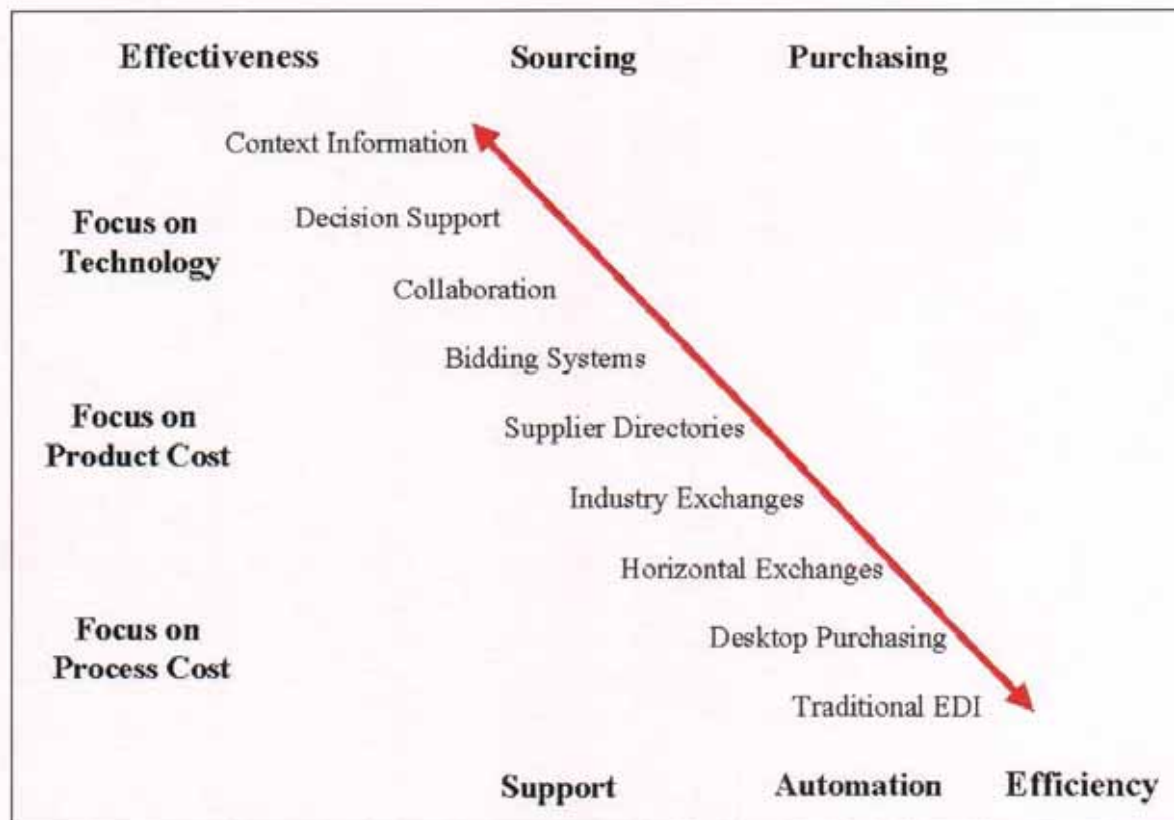
Electronic purchasing consortia may be built up e.g. by a small number of significant industry players participating as equity owners, thereby securing a tailored buy-side procurement solution. MNEs may enjoy enhanced efficiencies from increased collaboration. EPC can also be established by commercial investors as open e-Marketplaces / PSPs, thereby allowing both a variety of purchasing organisations and suppliers to form consortia. SMEs could benefit since many of their purchases are trivial and often considered as being irksome. SMEs are able to use e-Marketplaces / PSPs for these purchases and make the information electronically retrievable to aggregate demand. Purchasing consortia may well appear in open e-Marketplaces, as they are less likely to raise anti-trust concerns because of its neutrality in the ownership and control. Therefore, purchasing organisations have to carefully consider their infomediary options for EPC.

Despite this development of infomediaries such as e-Marketplaces and PSPs, Boer (1998) cites Stekelenborg (1997) who concludes after intensive research on ICT and purchasing, that there is still a lack of adequate systems for supporting the more tactic and strategic purchasing tasks. Davenport and Short (1990) state that ICT systems are one of the most powerful devices to shrink co-ordination costs in network approaches. Therefore, the success of electronic purchasing consortia may be impelled to a large degree by advances in information and communications technology. Van Weele (2000) also confirms that most organisations lack an effective communications and information infrastructure, which may organise, support and facilitate the highly complex and often rapidly changing interfaces among the organisational entities and disciplines involved in purchasing processes.

Hahn and Kaufmann (1999) point out that the larger the psychic / cultural distance, the more difficult it usually becomes to co-operate effectively. ICT / IOS and the Internet, in particular, as the 'network of networks' can, therefore, be an enabler of information and communication exchange. Internet technologies can be implemented on an incremental basis to provide new methods of communication and collaboration. Thereby, it has the potential to cross boundaries without the need for major inter-company reorganisations as with more traditional ICT / IOS systems.

Therefore, the configuration and co-ordination necessary for e-Procurement strategies have of late received an increasing amount of research attention. However, Knudsen (2002) 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 tools are still remarkably diverse. Knudsen (2002) argues that the concept e-Procurement has many different meanings and ranges from shopping on the web via reversed auctions to collaborative initiatives taking place in virtual meetings, among others. Boer, Harink and Heijboer (2002) note in that respect that the potential merit of various e-Procurement forms, such as electronic catalogue systems and software, electronic auctions, intelligent agent applications, electronic marketplaces, seems largely undisputed (see also Smeltzer and Ruzicka 2000, Croom 2000). However, given the wide range of solutions available, many organisations struggle with assessing the suitability of the different solutions for their specific commodities and portfolio of purchasing requirements.

To provide an overview of the available e-Procurement tools, Gebauer and Zagler (2000) have combined two dimensions, sourcing versus purchasing into a single framework of B2B-solutions. By combining the two dimensions outlined, a matrix is derived that helps position available B2B solutions (see Figure 10).

Figure 10: Positioning B2B-Solutions in Procurement

Source: Similar to Gebauer, J., Zagler, M. (2000), "Assessing the Status Quo and Future of B2B E-Commerce", Fisher Center for IT & Marketplace Transformation, Haas School of Business, University of California

Boer, Harink and Heijboer (2002) have further identified and described six forms of e-Procurement applications. E-Sourcing is the process of finding new potential suppliers using the Internet in general or more specifically, a B2B e-Marketplace or PSP, with the aim to decrease the cost of searching new suppliers. Identifying new sources of supply increases the competitive forces during the tendering process. E-Tendering is the process of sending RFx to suppliers and receiving the responses by using ICT systems. In this respect, reverse auctions can be used as well. E-MRO and also web-based ERP systems focus on the process of creating and approving purchasing requisitions, placing the orders and receiving the products ordered by the use of a software system based on information and communication technologies. E-MRO and web-based ERP can reduce transaction costs, improve process efficiency and reach internal customers in order to ensure compliance to the organisation's purchasing strategy (see Knudsen, 2002). E-Informing is a part of e-Procurement that does not involve transactions, but instead it handles gathering and disseminating of purchasing related information and can take place anywhere in the procurement process.

E-Procurement solutions in general are seeking to enhance supply chain effectiveness and efficiency by the automation of business processes such as order management, procurement and fulfillment. For example, e-Marketplaces and PSPs are offering services to facilitate collaboration and supply chain information sharing such as order forecasts and inventory planning, automate requisition and purchase order creation, integrate payment processes or help organisations develop plans for managing sourcing and logistics. Therefore, e-Procurement can allow a shortening of the purchasing process and a centralisation of purchases within a company and externally with other companies (see Figure 11).

Maverick purchasing, i.e. sourcing that occurs outside the purchasing department's negotiated terms, can be prevented more easily by e-Procurement. Strategic e-Sourcing applications can aid firms analyse their purchasing spend and then determine how to decrease the total cost bound in these expenditures. Internal aggregation of orders within a focal firm and subsequently external aggregation with consortium members may be enabled. E-Procurement can drive traditional purchasing to a more strategic approach, that is based on activities such as qualifying suppliers, negotiating contracts or finding the right partners.

"Online procurement processes will eliminate much of the low value-added administrative work now associated with purchasing. The rich database of online material requirements and transactions will enable material costs reduction by aligning material specifications, co-ordinating and leveraging volume scale across the entire supply chain, and consolidating the buy with cost-advantaged suppliers."¹⁰²

In the sourcing process, cost savings may be achieved by demand aggregation strategies, facilitated through the information and communication made available by various e-Procurement tools. For example, demand aggregation and sourcing decisions can be supported by e-RFx or auctions. While auctions may take several different forms, they commonly can be differentiated by the two categories of forward or reverse auctions. Suppliers that post products or services and accept the highest bid initiate forward

¹⁰² Lapidus, 2000, p. 2.

auctions; reverse auctions (as explained in the previous chapter) are initiated by buyers by posting RFx for a product in an online bidding event and accepting the most favourable responsive bid.

Industrial material purchasing has always incorporated some form of bidding processes. First generation auctions focused on price-only characteristics, which were constrained in not incorporating e.g. quality or customer service levels of suppliers. Advanced reverse auction systems provide a wider range of options for accepting and evaluating non-price bid information, leading to better supplier selections based on the total value of the relationship (i.e. multi-attribute reverse auctions). In addition to providing quotations and terms for individual items in reverse auctions, bids are allowed which express a willingness to provide additional discounts for being awarded contracts for multiple items (i.e. bundle reverse auctions). The simplest and most common example of bundling is allowing suppliers to bid an overall price for supplying all of the items in the reverse auction (Ariba, 2001). Scoring and ranking of incoming bids can help purchasing managers evaluate the total value of offers in situations when that depends on more than price.¹⁰³

After bidding and after supplier contracts (so called master agreements) are stipulated and the sourcing process has been finalised, the operative purchasing or replenishment process can be decentralised to a high degree and automated by e-Procurement (see Figure 11). Operational purchasing transactions involve issues such as replenishment ordering, confirmation of payments and billing, arrangements for transportation or acceptance of delivery. The pre-negotiated master contracts can be electronically integrated into a desktop purchasing catalogue or online catalogue, which are typically customised by including specialised pricing or product selections.

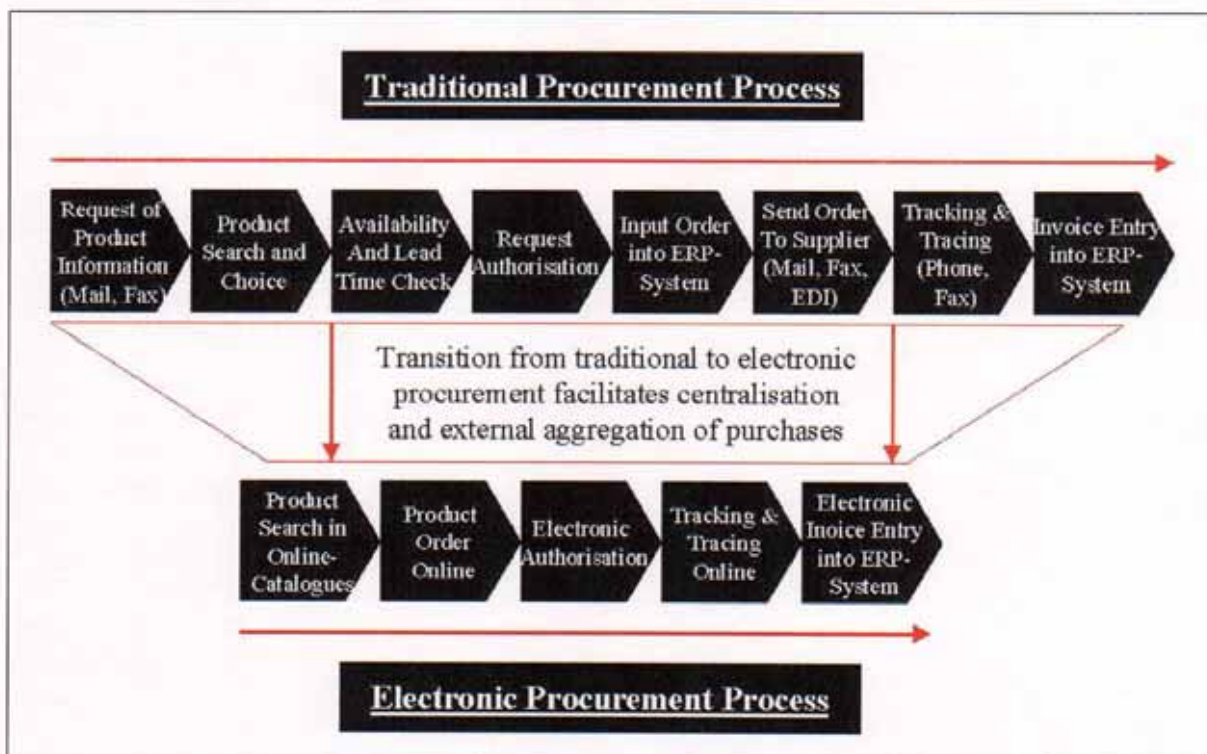
Gebauer and Zagler (2000) argue while purchasers have traditionally covered the entire range of purchasing operations and activities, recent trends show a transition of short-term oriented operational activities towards end-user requisitioners. E-Procurement can

¹⁰³ Before beginning a bidding event, purchasing managers typically choose the method and scoring function to be employed to evaluate suppliers' bids. The bids are shown in a list sorted by the supplier's rank and, if permitted, suppliers can see their score compared to the best current score both during and after bidding.

enable them to order in online catalogues or desktop purchasing systems whereby the requisitioner's authorisation is electronically checked. The order information can electronically pass through various checking procedures, i.e. authorisation by the relevant managers or directors. Once cleared, the order can be aggregated with others to the same destination and issued electronically to the supplier. This process flow may reduce operational costs, may deliver greater centralised control over purchasing and may increase negotiating power with suppliers through order consolidation and electronic purchasing consortia (see Figure 11).

E-Procurement can facilitate the leveraging of volume scale because it can provide digitised data on which to base decision support systems for procurement (Huber, 2002d). Therefore, it can become easier to identify sourcing and EPC opportunities because tools and data can perform more in-depth analysis on the total spend.

Figure 11: Traditional vs. Electronic Procurement Process



Gebauer and Zagler (2000) note that early initiatives to introduce e-Procurement concentrated on the automation of very structured processes. Desktop purchasing systems can be better suited to facilitate end-user empowerment and self-service and can extend traditional EDI systems. Based on a central data repository, they are well suited to automate highly repetitive operations as they prevail in the category of process-cost

oriented procurement, i.e. low-value items purchased at high frequencies. The operational gains from reduced transaction costs can enable procurement professionals to focus their resources on strategic sourcing activities and to increase interaction with suppliers.

*“The heightened interaction between buyers and suppliers may facilitate supply chain management, potentially reaching multiple tiers of suppliers, reducing cycle times and forecasting”.*¹⁰⁴

However, as attractive the benefits may seem, McKinsey and CAPS Research (2000, p. 3) investigated that more than half of e-Marketplaces / PSPs provide only short-term value to purchasing organisations. The study indicates that one of the main reasons for providing only short-term value is the split of e-Marketplaces / PSPs into different e-Procurement business models, thereby not offering long-lasting benefits to buyers and suppliers as fully integrated service providers.

Cherian (2001) identified at least 33 business models in e-Business, Applegate (2001) categorised 22 e-Business models and Timmers (1998) discussed 11 specific business models. Several authors (Barratt and Rosdahl, 2001; Berryman et al., 2000; Dai and Kauffman, 2001; McKinsey and CAPS Research, 2000; Sculley, 1999) classify e-Marketplaces / PSPs. Berryman et al. (2000) classify e-Marketplaces by control structure positing three types of seller-controlled, buyer-controlled, or neutral e-Marketplaces (as described before). Sculley (1999) defines an open e-Marketplace as a B2B exchange and recognises four different business models in B2B exchanges.

Shridharani (2000) differentiates two categories, market-making and process-enabling solutions. Whereas process-enabling business models enable the buying and replenishment processes, it is the market-making solutions that can be categorised according to Sculley (1999):

¹⁰⁴ Federal Trade Commission, 2000, p. 7.

1. *Trading Hubs*, building up buyer and seller communities for multiple verticals.
2. *Post and Browse Markets* where buyers can post expressions of interest to buy especially non-standardised products.
3. *Auction Markets* where buyers and sellers bid competitively on a contract.
4. *Fully automated exchanges* being a centralised trading network or spot market for standardised products where price levels are free to move in response to supply and demand.¹⁰⁵ Exchanges match buy and sell orders and provide post-trade information to multiple buyers and sellers. Exchanges share the feature of dynamic pricing with auction-based markets.

According to Woods (2000), the unique feature of exchanges is that they gather multiple buyers and sellers (in virtual sense) in one central market space and enable the participants to interact with each other at a price which is determined dynamically. Woods (2000) also explains that these dynamic price-setting mechanisms are increasingly used by e-Marketplaces / PSPs, due to the Internet's ability to interconnect companies at a lower cost than previous ICT systems.

Additionally, Barratt and Rosdahl (2001) provide another layer of classification to e-Marketplaces and PSPs: MRO hubs are mainly established to improve the efficiency of procurement of regularly purchasing non-core items. Yield managers, on the other hand, focus on spot buying¹⁰⁶ of non-core activities, thereby trying to alleviate the volatility in the operation for buyers and sellers. Catalogue marketsites are established as a means to improve supply chain management, in terms of streamlining systematic sourcing by automating the entire process. The products are rarely commodities, but instead highly specialised items with a high degree of product specification.

Furthermore, McKinsey and CAPS Research (2000) contributed another classification and identified five distinct e-Marketplace / PSP business models and functional profiles:

¹⁰⁵ Sculley, 1999.

¹⁰⁶ Barratt and Rosdahl (2001) specify that systematic sourcing often involves negotiated long-term contracts with pre-qualified suppliers, whereas spot sourcing involves an immediate need for a specific good.

1. *Project / Specification Managers, specialising in design and planning support. This model helps customers to achieve financial results across most dimensions of the purchasing process. However, this model generally plays a minimal role in actually reducing the price paid. Project / specification managers can help to reduce operating costs by, for example, streamlining communications or ultimately reducing inventory.*
2. *Supply Consolidators, identifying the relevant supply base for a customer and conduct the purchasing transaction. This model provides tools that aid in product evaluation and selection, but not necessarily help to lower the price paid to a given suppliers. It can help to reduce the transaction costs of searching through multiple paper-based catalogues and managing several supplier accounts.*
3. *Liquidity Creators, establishing the terms of purchases and providing liquidity for products that were previously too low-volume or non-standard to warrant off-line exchanges. The liquidity creators help to reduce purchase prices, by providing real-time transparency across a wide base of suppliers. In addition, they can decrease revenue by helping customers to access hard-to-find parts more efficiently.*
4. *Aggregators, combining demand within and across buying enterprises and then using this combined market power to achieve lower prices from suppliers.*
5. *Transaction Facilitators, improving purchase order efficiency and automating back-end financial management by the transaction and execution of purchases. The value of this model is in its reduction of complex, paper-based transactions. Though it helps to reduce transaction and other operating costs, it provides minimal functionality in terms of selecting products or creating market efficiencies.¹⁰⁷*

E-Marketplaces / PSPs can also be hybrids and not cleanly fall into any one of the categories. In particular, it is one of the aims of this research to develop a sub-categorisation of EPC or aggregators, which is not available in the literature. Multiple functionality can be a prerequisite for value-chain integration, collaboration, and virtual business communities of EPC.

In this respect, Corsten and Zagler (1999) make a distinction between project-independent and project-dependent tasks as well as consortium-internal and consortium-external tasks

¹⁰⁷ McKinsey / CAPS Research, 2000, p. 2.

for EPC. According to them, project-dependent tasks are required in planning, executing and controlling collective purchasing decisions. Project-independent tasks are intended to support and promote the EPC network at all times. Internal tasks include all tasks necessary for the preparation and co-ordination of the interaction between potential and actual consortium partners. External tasks are concerned with all tasks associated with external preparation and co-ordination of the interaction with potential and actual suppliers.

'Knowledge tasks' are project-independent and internally focused, e.g. to develop a platform for EPC, to facilitate general knowledge exchange or to develop common virtual product catalogues, standard practices and procedures for EPC such as contracts, rules or exit strategies. 'Marketing tasks' are project-independent and externally focused, e.g. to develop an extranet-site for supplier access, to advertise the consortium to potential suppliers or to register potential suppliers or to certify potential suppliers. 'Pooling tasks' are project-dependent and internally focused, for instance to search the platform internally for partners, to form consortia and elect project co-ordinators, to facilitate specific information exchange or to co-ordinate the consortium and to pool demand among partners. 'Quotation tasks' are project-dependent and externally focused such as the preparation of RFQs, the comparison and negotiation of quotations or the management of contracts.

Corsten and Zagler (1999) further point out that ICT / IOS and metamediaries can strongly support these tasks. However, Kurnia and Johnston (2002) note that the adoption of inter-organisational systems, in particular, has proved to be considerably more difficult than technology adoption within an organisation, because such systems span organisational boundaries. IOS such as EPC require collaboration and the concerted actions of the participants of e.g. a supply chain or industry. Therefore, the literature review also needs to embrace adoption and diffusion theories in technology innovation and inter-organisational systems and relate them to EPC.

2.5.5 Technology Adoption / Diffusion Theories and Linkages to EPC

Overall, literature in diffusion of innovation has sought to explain individual innovation adoption decisions or intentions and dates back to the 1940's. It developed out of attempts to comprehend the effectiveness of various diverse public policy initiatives and has more recently been used studying various inter-organisational systems and ICT phenomena.

The work of Rogers (1976; 1995) is viewed as seminal in the diffusion of innovation literature. He defines innovation as "*an idea, practice, or object that is perceived as new by an individual or other unit of adoption*". Adoption of an innovation is defined to take place in a singular unit e.g. an organisation (Rogers, 1995; Tornatzky and Fleischer, 1990). Adoption is according to Rogers (1995) "*(...) a decision to make full use of an innovation as the best course of action available and rejection is a decision not to adopt an innovation.*"

When adoption proceeds across a business community then diffusion of an innovation is taking place (Rogers, 1995). Rogers (1995) specifies that "*(...) diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system.*" Kwon and Zmud (1987) argue that while adoption refers to the decision to invest resources required to accommodate the change effort, diffusion refers to the spread over time of an innovation within a unit or to other units.

Hall (2003) and Rosenberg (1982) point out that diffusion is not only the instrument by which innovations become valuable by being spread within a population. Diffusion is also an intrinsic element of the innovation process, as effects from learning, imitation, and feedback that arise from diffusion can enhance the original innovation.¹⁰⁸ This background contributes to the slowness with which diffusion can proceed, as the relative advantage of the initial innovation is typically below that for the innovation in the later stages of diffusion.

¹⁰⁸ Hall (2003) explains in the context of technology diffusion that in 1953, a young female Macaque monkey in the south of Japan washed a muddy sweet potato in a stream before eating it. This obvious improvement in food preparation was imitated quickly by other monkeys and in less than 10 years it became the norm in her immediate group. By 1983, the method had diffused completely. The example

Hall (2003) further explains in this context that in terms of technology adoption an S-curve for diffusion against time is generated, with a logistic curve as the mathematical form commonly adopted (so called adopting curve, which is the evolution in time of the total number of adopters).

The S-shape reflects a slow start as only a small number of innovators adopt, followed by a more rapid spread and eventually by a levelling off as full diffusion is reached. This type of curve can be explained by the risk and uncertainty about the outcome of innovation adoption. Observation of early adopters can be a device for decreasing this uncertainty. Therefore, risk tends to force the gaining of more information or reassurance about the outcome of the adoption. When the number of adopters increases in a network, the pressure for adoption increases (Rogers, 1995). Therefore, a critical mass is required, which is the needed number of adopters to propagate the innovation to the final rest of the population.

Based upon this background, Rogers (1995) explains that *“innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system. There are five adopter categories or classifications of the members of a social system on the basis on their innovativeness: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards.”*

Moore (1991) notes that innovators are a very small group (2.5%) in the population, which pursue technology aggressively and out of pure interest. Early adopters (13.5%) appreciate the potential benefits of technology and will take advantage of technology when they see that its benefits match their requirements. The early majority (34%) is interested in technology but is driven by practicality whether or not a technology delivers on its promises to the early majority. The late adopters (34%) differ from the early majority in this respect that they are not very comfortable with technology and will wait until it has become largely standardised. The laggards (16%) may adopt only when there is hardly any alternative.

illustrates that innovations of how to do things will usually spread via time and via a 'learning by observing' process.

Rogers (1995) also focuses on presenting the adoption process on a time scale where the potential adopter becomes aware of the innovation until the innovation is taken up among a group of users. His classic model distinguishes five key stages in the innovation diffusion and was further modified by Onsrud and Pinto (1991):

- Awareness: an agent becomes aware of the existence of the innovation, gets a general perception of what it entails and gains some understanding of how it functions.
- Persuasion: the agent becomes progressively interested by the innovation and forms a favourable or unfavourable attitude toward the innovation.
- Trial : the agent tests the innovation on a small scale.
- Adoption: the agent engages in decision making activities that lead to a choice to adopt or reject the innovation.
- Consolidation: the agent seeks reinforcement on his decision or rejects it.

Rogers (1995) theory frameworks on diffusion of innovation strongly focuses on the micro-level. On a macro-level, Ryan and Gross (1943) and subsequently e.g. Bass (1969) contributed with mathematical models for modelling the diffusion process. A third dimension of innovation diffusion, the spatial level, originates from the work of Hägerstrand (1967). The spatial level focuses on the relation of the rate of innovation and the distance from the point of origin. Hägerstrand was the first to develop a mathematical model in order to explain how an innovation should be considered to diffuse over space and time, whereas other research concentrates mainly on the time dimension.

Hägerstrand pioneered a simulation approach in terms of spatial diffusion where the tendency for an innovation to diffuse from one adopter to another was equated as a probability function that decreased with geographical distance from the previous adopter. He describes a four stage model of what he termed 'innovation waves', based upon the study of maps of the diffusion of diverse innovations in Sweden, ranging from bus routes to agricultural models.

In the primary stage of the diffusion process, there is a relatively strong contrast in the adoption level between the centre of adoption and remote areas, reflected in the steep decline of the adoption level curve beyond the origin. The diffusion stage then marks the start of the actual spread process and results in a flattening of the slope of the proportion

of adopters' curve. In the following condensing stage, the relative diffusion increase is equal in all locations and the acceptance curve moves in a parallel fashion. Finally, the saturation phase is marked by a slowing and final cessation of the diffusion process.¹⁰⁹

While spatial diffusion research typically concentrates on the effects of space as a major variable and requires spatial data simulations, innovation diffusion research is concerned primarily with identifying factors and processes most critical to the innovation process in any particular instance.

Specifically with reference to inter-organisational system adoption and diffusion, research in innovation diffusion needs to integrate more considerations: Entities within a supply chain or industry often have different and conflicting objectives and interests and, therefore, complex interactions between a focal organisation attempting to adopt inter-organisational systems and other external entities normally occur before adoption can take place (Gregor and Johnston, 2000).

Furthermore, adoption is mediated by the capability of trading partners and other industry wide conditions, such as the existence of industry standards. According to Kurnia and Johnston (2002), adoption of IOS involves significant changes in organisations' culture, structure, business practices, trading relationships, power relationships and other relationships, which further complicates adoption by organisations.

“What makes IOS adoption special compared to other organisational adoption: IOS projects are inherently more risky than traditional internal IT projects because there is less control due to the uncertainty of external trading-partner actions. Additionally, since inter-organisational systems often have interdependent benefits, the way in which a trading partner implements a system may affect the benefits realised by the other party.”¹¹⁰

¹⁰⁹ Hägerstrand also draws attention to time-geographical constraints and distinguishes: (I) capacity constraints (when the individual does not have the physical, economic, or social means to realise certain acts), (II) coupling constraints (the potential activities are constrained since individuals cannot be engaged in various activities or projects or be at different locations simultaneously), (III) steering constraints (e.g. rules, laws, etc., that are created with the intention of limiting or giving increased access to time-space).

¹¹⁰ Riggins and Mukhopadhyay, 1999.

Regardless of the mechanism details that generates the probability distribution of adoption times, the question in inter-organisational systems' adoption and diffusion is what factors affect the adoption and diffusion rates. Onsrud and Pinto (1991) further explain that by identifying critical factors and processes in the adoption and utilisation of a technology, decision making responses may be forecasted and predicted and, therefore, may also be redirected by prescriptive strategies.

Theoretical models, commonly referred to as technology diffusion models, have been constructed to better comprehend the role of these factors in the adoption and diffusion of certain types of technology (Nelson et al., 2003). Generally, studies employ either a process or a factor approach (Prescott and Conger, 1995).

A process or stage approach involves an in-depth study of the sequence of events leading to an adoption-decision within a firm. The process research stream focuses on activities related to social change rather than technical activities (Kwon and Zmud, 1987). It is an interpretative approach that focuses on inter-organisational interactions between parties involved in technology, the time element of the adoption process, the importance of multi-level unit of analysis, and the context and the content of change introduced by IOS.

As opposed to this longitudinal approach, the factor approach examines a cross-section of firms in an attempt to isolate significant characteristics governing adoption (Cooper and Zmud, 1990). The factor approach attempts to identify static forces which lead to adoption whereas the process approach focuses on the dynamics of adoption and implementation, examining the behaviour of stake-holders over time (Cooper and Zmud, 1990).

The factor (or also called variance research stream) focuses on identifying the variables being potentially relevant for ICT/IOS adoption and implementation effectiveness (Markus and Robey, 1988). This approach assumes that innovation adoption is affected by the characteristics of the adopters, the change agents, the technology or / and the environment (also known as factors) which are identified at a single epoch. The main purpose of the factor approach is to provide explanations for phenomena in terms of relationships among independent and dependent variables (Langley, 1999).

One of the objectives of this study is to identify factors and variables that motivate EPC adoption and diffusion. Therefore, this research will employ the factor approach in more detail, which is more widely used and accepted in research of adoption and diffusion of technology (Prescott and Conger, 1995). According to Kurnia and Johnston (2002) only very few studies employ the processual approach. The author regards the search for explanatory variables for EPC adoption of EPC as more relevant than an examination of processes leading to adoption. However, the differentiation between these two approaches is of higher theoretical than practical value since the two types of views and the phenomena related to the approaches in practice are intertwined (Langley, 1999).

Within the factor approach, Tornatzky and Fleischer (1990) developed the seminal technology-organisation-environment framework, which identified three aspects of a firm's context that influence the process by which it adopts and implements technological innovation. Tornatzky and Fleischer consider the three explanatory contexts to be interconnected. This framework has been widely accepted in research and examined by a number of studies in IOS domains. For example, Iacovou et al. (1995) examined this framework on EDI adoption; Kuan and Chau (2001) developed a perception-based technology-organisation-environment framework incorporating six factors as EDI adoption predictors, and could confirm the usefulness of the technology-organisation-environment framework for studying adoption of inter-organisational systems. The author followed this framework more closely than the process or stage approach, but special efforts had to be devoted to a transfer of the framework to particular EPC characteristics.

The technology-organisation-environment framework is comprised of organisational factors (e.g. organisational structure, firm size, organisational culture, organisational readiness, and management support to technological adoption). Furthermore, technological context describes both internal and external technologies relevant to a firm, including existing technologies inside a firm as well as the pool of available market technologies. Tornatzky and Fleischer (1990) did not specify variables within the technological context. Few studies investigated characteristics that promote the adoption of the technology according to Rogers (1995): Technical and organisational compatibility to adopt (consistency with existing tasks, needs, prior experiences and processes of adopters), perceived relative advantage over current practice or systems (determined primarily by the benefit / cost ratio of adopting new technology), trialability, complexity

(ease of use or learning) and observability (the extent to which relative advantage or gains are clear).

Roger's framework focuses on adoption and diffusion of general practices and mass-produced items rather than complex inter-organisational information technologies and is, therefore, imperfect for this study (Chau and Tam, 1997). Therefore, own variables to measure the technological context in EPC adoption were created in this research study.¹¹¹

With complex technologies like EPC, institutional arrangements, industry factors or the business context are also posited to influence IOS adoption and diffusion in addition to the organisational or technological context. Two major aspects of the organisational environment were identified to potentially have an influence on EPC adoption: competitive pressure and anti-trust limitations. As competitive pressure increases in an industry sector, purchasing organisations may be forced to adopt EPC in order to maintain their competitive position. Competitive pressure is expected to be a very influential factor for EPC adoption.

Moreover, very specifically with reference to EPC, legal and anti-trust limitations might arise that can prohibit EPC adoption. Potential anti-trust exposure and presence of buyer power has always been a typical concern for a purchasing consortium. Abuse of buyer power to obtain non-cost related advantage over other purchasing organisations is a matter for concern as societal welfare might be adversely affected by such activities.

According to the European Commission, buyer power may force suppliers to "*reduce investment in new products or product improvements, advertising and brand building*" (EC, 1999). This is even on the rise with EPC because of fears of attempts to capture efficiency gains from ICT, to consolidate market power and ultimately handicap competition. Anti-competitive consequences need to be considered in the economic examination of industry structure (e.g. Chipty and Snyder, 1999; Inderst and Wey, 2002; Horn and Wolinsky, 1988; Stole and Zwiebel, 1996; Snyder, 1996).

¹¹¹ Please find more details in the development of the conceptual framework for EPC.

Blair and Harrison (1993) address the economic theory of buyer power. The most straightforward buyer power case is that of a single purchaser facing (perfectly) competitive sellers – so-called “*pure monopsony*”.¹¹² Monopsonists or oligopsonists can exert buying power by the restriction of demand and, thereby, procure at less than the competitive price. Therefore, competition may be affected by monopsony or oligopsony power, by the extent of which information is shared and by whether consortium sourcing or exclusionary practices are implemented (FTC, 2000).

Generally, any sharing of competitive information among competitors raises a host of anti-trust concerns. Even absent a formal agreement on price or output, the exchange of transaction-related information through any e-Marketplace / PSP may facilitate tacit collusion. With regard to consortia-led e-Marketplaces anti-trust enforcers are particularly concerned about the type of information that may be shared.

The US Federal Trade Commission (FTC, 2000) issued an important report on the anti-trust limitations raised by e-Marketplaces and PSPs. Recognising that numerous efficiencies were potentially achievable through such metamediaries, the FTC also identified certain structural, participation and management issues that could raise competitive concerns.¹¹³ Weinschel (2000) explains that this report reflects the view of most anti-trust law commentators that no special anti-trust rules are needed for e-Marketplaces / PSPs. Rather, anti-trust law should be applied in its usual common-law fashion as purchasing consortia were evaluated in the past.

Bara (2002) notes that principal anti-trust concerns can be seen under the rubrics of collusion, exclusion, and fusion. Collusion concerns arise when rivals use e-Marketplaces / PSPs to engage in price fixing or other anti-competitive horizontal conduct. Fusion involves foreclosing competing e-Marketplaces / PSPs. This might result for example from ‘locking up’ key customers or suppliers through exclusive dealing arrangements or similar devices. Exclusion concerns arise when membership is denied to an e-Marketplace / PSP.

¹¹² The economic analysis of this case is directly analogous to that of pure monopoly, which has traditionally been the subject of more research efforts.

¹¹³ The FTC report, named “Entering the 21st Century: Competition Policy in the World of B2B Electronic Marketplaces”, gives a synopsis on the public B2B exchange workshop (US Federal Trade Commission, 2000).

“By suppressing competition at the exchange level, a B2B exchange could acquire market power that raises costs, or could create difficulty for others to innovate or otherwise operate efficiently.”¹¹⁴

Competitive concerns can arise when several major players in an industry jointly own any e-Marketplace and control who may participate, thus potentially placing horizontal competitors at a disadvantage. A concern raised in this situation is that the e-Marketplace will become an essential facility in the marketplace, so that

- (I) “excluded competitors cannot buy or sell the relevant product, or*
- (II) included participants are forced to accept discriminatory operating rules that favour the owner-participants of the exchange.”¹¹⁵*

These practices could leave competitors with reduced functionality, higher costs, or a limited ability to participate in a competitive market. According to the FTC (2000), competitive concerns are, in general, more likely to magnify

- (I) the greater the market share of the e-Marketplace owners*
- (II) the greater the restraints on participation outside the e-Marketplace*
- (III) the less the interoperability with other e-Marketplaces.¹¹⁶*

Specifically with reference to purchasing consortia, the trade commissions recognise that certain information sharing will generally be necessary to achieve the pro-competitive benefits of a B2B e-Marketplace / PSP. However, the concern expressed is that competitors could use highly competitively sensitive information to reach actual or tacit agreement regarding prices or price levels.

¹¹⁴ Weinschel, 2000.

¹¹⁵ Weinschel, 2000.

¹¹⁶ US Federal Trade Commission, 2000, p. 34.

Therefore, the trade commission follow the anti-trust assessment whether or not the e-Marketplace / PSP:¹¹⁷

- *is in more concentrated markets;*
- *is among competitors;*
- *is current or prospective rather than historical;*
- *is not available through other channels; and*
- *involves competitively sensitive data.*

Purchasing consortia by competitors may increase bargaining leverage over suppliers for potential buyer power abuse (e.g. by scaling back purchases in order to reduce purchase prices), and accordingly raises anti-trust issues of some sensitivity.¹¹⁸ One of the critical facts in this analysis is the combined market share of the purchasers of a specific product. The trade commissions acknowledge that anti-trust challenges have traditionally been relatively rare. Johnston (1993, p. 1) argues that consortium purchasing properly conducted presents minimal risks under the US and Europe federal anti-trust laws. Nevertheless, due to developments in ICT, they also specify that what is past may not be prologue.

*"(...) Future concerns about collective purchasing will not differ in essence from those raised today. However, as e-Market collaboration by competitors in oligopoly industries becomes more common, the ability to distinguish the bad (monopsony) from the good (buying power) will become more critical."*¹¹⁹

¹¹⁷ For example, under the US health care statements, the safety zone allows health care providers to participate in written surveys of prices for health care services and wages of employees, provided that: 1. A third party manages the survey; 2. The information collected by the survey is more than three months old; 3. There are at least five providers reporting the specific data requested by the survey; 4. No individual provider's data represents more than 25% of the respective statistic; and 5. The information is aggregated and reported in a way to not allow the competitors to identify prices charged or compensation paid by any particular health care provider. See Health Care Anti-trust Statements § 6A, available at <http://www.mobar.org/journal/2001/julaug/dajani.htm>.

¹¹⁸ Historically, the commissions have had to worry more about supplier co-operations to keep sales prices artificially high. Joint purchasing is treated more leniently than joint selling under the anti-trust laws.

¹¹⁹ Deloitte Research, 2000, p. 22.

The anti-trust concerns of e-Marketplaces, due to its collaborative nature, while evolving, are amenable to traditional anti-trust analysis (Deloitte Research, 2000, p. 9).¹²⁰ Properly established and managed EPC operate legally.¹²¹ MNEs have traditionally sought consultation with their legal departments in the specific case of consortium purchasing.

In the US, purchasing consortia will not challenge (absent extraordinary circumstances) anti-trust issues when they meet two conditions: 1) they account for less than 35 percent of the total sales of the product within the relevant market; and 2) the cost of the jointly purchased products or services account for less than 20 percent of the total revenues from all products or services sold by each competing participant in the purchasing consortium arrangement (Pye, 1996, p. 34).

An alternative, but similar, numerical measure is also available in the US Competitor Collaboration Guidelines. In there, unless an agreement is illegal per se, an anti-trust safety zone is established generally for collaborations where the “(...) *market shares of the collaboration and its participants collectively account for no more than 20 percent of each relevant market in which competition may be affected.*” In Europe, this safety zone is established by the European Commission when market shares account for no more than 15%. These safety zones simplify anti-trust analysis when the participating members collectively account for a relatively small share of total purchases in the relevant market. These findings from the literature review suggest analysing EPC anti-trust limitations in more detail within the environmental factor.

¹²⁰ In the US, the Robinson Patman Act was designed to prevent price discrimination that reduces competition in interstate commerce. The Robinson-Patman Act requires that favourable prices received by the purchasing group must also be available to comparable purchases, unless the pricing differential is cost-justified or granted to meet a competing supplier's price. The Robinson-Patman Act sought to eliminate the buying advantage of a large buyer over a smaller one, except where the price difference could be justified by true differences in the seller's costs from volume manufacturing, packaging, delivery or sale, or by the seller's good faith effort to meet competition. However, Hendrick (1997) explains that Robinson-Patman regulations do not seem to be justified dreads since economies of scale and scope and long-term commitments are broadly accepted causes of cost savings. In Europe, purchasing consortia do not infringe the law unless the buyer power becomes such that they have the effect of distorting the market.

¹²¹ Furthermore in the US, the Sherman Act's prohibition against agreements in restraint of trade also concerns purchasing organisations. Partners in a purchasing consortium must allow competing suppliers a fair opportunity to serve them and should make membership available to other purchasers based on published objective criteria.

In the overall technology-organisation-environment framework, research studies normally only examine a few of potential factors. For example, Hart and Saunders (1997) assessed the impact of technological and environmental factors. Grover (1993) explored in a study on consumer based IOS that an internal push and a proactive technological orientation are key facilitators. Prekumar and Ramamurthy (1995) investigated the influence of organisational and environmental factors on IOS adoption and found that top management support, competitive pressure, exercised power and internal need are important factors influencing EDI diffusion.

Trist and Wilson (1951) explain that the concepts of co-ordination and control become key executive functions. Emery (1980) notes that in designing a social system to operate efficiently, the key problem is that of creating self-managing groups to man the interface with the technical system and how much autonomy these groups can have. Critical factors for EPC may, therefore, include whether or not the tasks are well enough understood to enable others EPC members to judge the advances made and if there is enough communication to generate group pressure.

Emery (1980) argues that an information system is an intrinsic requirement to a group's self-management to measure progress against targets. Although there may be limitations, sophisticated and properly directed IOS should ideally offer members of EPC the right type and amount of information and feedback "*(...) to enable them to learn to control the variances which occur within the scope of their spheres of responsibility and competence and to anticipate events which are likely to have a bearing on their performance.*"¹²² Potential reward and trust of management can affect the acceptance of responsibility.

While top management support was found to be important for IOS adoption (e.g. Prekumar and Ramamurthy, 1995) and creation of purchasing synergy (e.g. Rozemeijer, 2000), Morgan (1989) argues that ICT tend to be most effective when they are designed and driven by the people that ultimately have to use them. ICT that are imposed on organisations by external consultants or top management would appear to be nowhere near as successful as those that are designed bottom-up (Morgan, 1989).

¹²² Cherns, 1976.

Human inertia and lack of change management practice, however, can hamper bottom-up approaches. Therefore, top management should be committed leaders of (cultural) change, but also involve employees and end-users (Feher, 2005). Diamond (1986) outlines that the problem of psychological resistance to change is well known. In particular under stressful and anxiety-provoking circumstances (the imposition or inevitability of change representing such circumstances), individuals who otherwise appear adaptive and competent may respond defensively and, therefore, whether intentionally or unintentionally, resist any change in the status quo (Diamond, 1986).

“Both the psychoanalytic psychologist’s conception of unconscious defensive techniques as modes for adaptation and the cognitive psychologist’s notion of limited learning and of contradictions in what people say and what they in fact do, illustrate compulsive, repetitive, security-oriented, error-inducing and self-sealing human behaviour.”¹²³

Employees typically employ defensive behaviour tendencies and resist change, because they have to give up the usual processes of work and behaviour, and have to form a new personal contract with the organisation (Feher, 2005).¹²⁴ Diamond (1986) reviews change management from a developmental perspective, whereby the self emerges from infancy with basically two contradictory behavioural tendencies: the tendency towards learning and change and the tendency to protect one’s self against the risk of change as a result of learning. He explains that the first tendency is crucial to the development of self-identity, maturity and autonomy; the second tendency is vital to the construction of defensive techniques for avoiding anxiety and maintaining security (e.g. Kohut, 1977).

Failure of intervention strategies in organisation development will most frequently occur whenever these contradictory human factors are ignored (Diamond, 1986). Socio-technical analysis should be, therefore, involved in the planning processes (Emery, 1980). The recognition is needed that technological systems require a social system to integrate the activities of the individual people who operate, maintain and renew it (Cherns, 1976).

¹²³ Diamond, 1986.

¹²⁴ In order to achieve the commitment of employees, they have to be persuaded within three dimensions to accept changes, otherwise they will resist, block the changes or leave the organisation (Strebel, 1996): formal dimension (e.g. job description, tasks and processes), psychological dimension (e.g. equity of work and compensation) and social dimension (e.g. unwritten rules, values).

Amado and Ambrose (2001) introduced the transitional approach to organisational change in this context, which is derived from Winnicott's theory of transitional space and infant development (Winnicott, 1971).¹²⁵

*"Transition is a process in which a previously established structure or set of structures that composed the system is modified or even relinquished, new forms of structure may emerge, and the mutual alignment of structures within the whole is altered."*¹²⁶

The transitional approach draws attention "(...) to the importance of psychological factors 'inside' the individuals who, in collaboration with others, are engaged in trying to bring about fundamental change in the external factors."¹²⁷

This perspective begins with the assumption that one cannot make people change, but that one can only create the conditions to increase chances that people will make the changes themselves (Amado and Ambrose, 2001). Members of groups (such as EPC) should recall and explore the group's past experiences first (if available), move on to examine situations in order to comprehend their complexity, analyse conflicts and not just the ways to avoid them, work on paradox and acknowledge each participant's role and the contribution made to the global evolution of the group.

The direction of the change process is defined, but the multiparty process is sufficiently emergent, unpredictable and open-ended, whereas in other change management approaches the end status and vision is readily known.¹²⁸ The transitional approach

¹²⁵ Winnicott (1971) observed the transition of the relationship of an infant and his mother from a state of near fusion, to the distinction 'me-not me'. Transitional objects (e.g. a blanket) belong to the first 'not me' possessions and help the child to make the transition from a magical, omnipotent control over his environment based on illusion, to a more suited experience with the real world. Another characteristic is the frequent presence of the 'good enough' mother who meets the physiological needs of the infant, and who provides security. In this 'holding environment', which is an important condition for the transition, the mother provides time and space to play (Prins, 2004).

¹²⁶ Amado and Ambrose, 2001.

¹²⁷ Ibid.

¹²⁸ The transitional approach allows for cultural creation through dialogue and negotiation between diverse cultural realities, rather than imposing cultural standardisation and instilling the cultural traits necessary for success. The transitional approach is, therefore, not judging or normative, but acknowledges the struggle of collaborative processes that are full of potential and pitfalls (Prins, 2004).

recognises the complexity of people and takes into account unconscious and ‘dark’ processes within and between individuals and groups (Prins, 2004).¹²⁹

However, transitional processes can provoke insecurity and a facilitator (the ‘good-enough’ mother) needs to establish a minimal structure (e.g. ground rules), stipulate the importance of not judging members of the group (including oneself), help the participants to cope with the tension and openness of the processes and to become aware of the psychosocial side of the change process. The facilitator / moderator should try to set up a secured and safe atmosphere and see to the fact that the framework remains a place for creative exchange on a constant basis. It can also help structure the understanding and presentation of situations, derived from the cultural analysis of participants (Amado and Ambrose, 2001). This is very applicable to consortium purchasing constellations, as members should go through a cultural bonding (Hendrick, 1997).

Implementation of new technological systems involves adoption of new solutions, which can require rigorous organisational change.¹³⁰ Researchers (e.g. Sherer, 2004) have also found that successful projects tend to conform to Lewin’s theory of planned change (Lewin, 1951), which suggests three sequential phases of the change process. The first stage, “unfreezing”, creates a climate for change. The second stage, “moving”, involves analysis, design, and installation. The third stage, “refreezing”, institutionalises the change. “Unfreezing” and “refreezing” are the main responsibility of senior management, as high risk often occurs in these processes associated with change (Sherer, 2004).

Change management involves effectively balancing forces in favour of a change over forces of resistance. Senior management should ensure that incentives are put in place and that change forces are rewarded greater than resistance forces. However, the key to effective change designs is to create systems that still allow the parts, for example the members of EPC, to remain separate yet integrated (Morgan, 1989).

¹²⁹ Participants are included in developmental learning processes and sufficient safety and containment to enable participants to freely express their thoughts and feelings. Transitional processes require responsible self-management within the system (Amado and Ambrose, 2001).

¹³⁰ Kotter (1995) further analysed the possible failure factors of change processes and identified eight steps of the change management process. A required condition is the feeling of urgency for change that is able to initiate the change process by giving power to step out of the status quo. The other steps are as follows: forming a good team (supportive coalition), create a vision of change, communicate the vision, remove obstacles, change fast (create short term wins), consolidate results and keep on changing while embedding changes into culture (Feher, 2005).

In consideration of this background, the technology-organisation-environment framework (Tornatzky and Fleischer, 1990) was considered as a means for broadening the scope by inclusion of other explanatory factors motivating adoption of EPC. The Tornatzky and Fleischer model was, therefore, transferred to EPC and operationalised in case studies and survey instruments. For example, Rogers (1995) does not specifically target his model for organisational and environmental factors, which the author considered as essential adoption drivers for EPC. The purpose of this operationalisation was, besides the development of a theoretical EPC framework, to be able to statistically analyse the different types of motivators for adoption within the three contexts.

A set of key environmental, organisational and technological factors which are likely to affect EPC adoption and diffusion, are identified in the following sections. In a search for the most suitable theoretical model that would fit EPC characteristics, e.g. anti-trust limitations that are not covered in other IOS research, the Tornatzky and Fleischer (1990) model for EPC adoption decisions was considered to be the best option.

2.6 CONCLUSIONS FROM LITERATURE REVIEW AND EPC RESEARCH CONSTRUCTS ADDRESSED IN THIS STUDY

To prepare for the constructs and the methodology to be addressed in this study, the author conducted a literature study. An integration of presented concepts within the literature review was required to explain EPC in the literature and establish grounding for the assessment of the overall research statement:

Overall Statement:

“Effective participation in electronic purchasing consortia can have the potential to enhance competitive advantage. EPC implementation is dependent upon a clear and detailed understanding of the major process enablers and drivers. This understanding requires the development of a taxonomy and conceptual framework to electronic purchasing consortia. One practical use of this taxonomy is the assessment of feasibility in given industry sectors.”

Related to the overall statement, that is explored with purchasing organisations as well as e-Marketplaces and procurement service providers in the automotive and electronics industry sectors, is a series of constructs and research questions, which will be analysed

in detail in this research. There is a gap in knowledge of EPC in many areas. Relevant empirical data needed to be gathered and analysed in order to explore the overall statement.

From the findings in the literature review, a series of not yet researched constructs were defined in the following sections to be addressed in this study. It was found that case studies and two cross-sectional written questionnaires were required to be developed for purchasing organisations as well as for e-Marketplaces and PSPs in the automotive and electronics industry sectors in order to analyse the overall statement. The reason for two questionnaires is to detect any significant differences between purchasing organisations and e-Marketplaces / PSPs.¹³¹

Cooper and Schindler (1998, p. 57) have analysed that the most important steps within the research process are the proper definition of the research design. That is why this section will focus on the research design and the constructs that are addressed in this study. The research constructs that are required to answer the research questions are identified and the linkages to the methodology presented in the following sections. The final survey results will be listed in the same order as the following research constructs.

¹³¹ Both questionnaires are similar in context, but reflect specific EPC constructs for purchasing organisations and e-Marketplaces / PSPs that have been identified to explore the overall statement.

Linkages of Literature Review, Research Questions, Research Constructs and Methodology

<u>Construct 1)</u>	Industry sectors and take-up of electronic purchasing consortia
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H1a:	The industry sector's level of fragmentation is positively related to EPC offering and importance.
Hypothesis H1b:	Higher perceived pressures from the business context have a positive impact on EPC adoption and importance to purchasing strategy.

Reasons for selection of H1 and linkages between case studies and surveys:

Essig (2000b) notes that purchasing consortia, traditionally, have not been very well adopted within industry. However, according to a study of Porter (2000) in the USA, 74% of companies cited purchasing consortia as a critical consideration in e-Procurement and e-Market-making solutions. By using two questionnaires for e-Marketplaces / PSPs and purchasing organisations, this research issue will allow a first quantitative insight into how well electronic purchasing consortia are integrated in the automotive and electronics industry.

The determination of industry sectors plays an important role. Phillips and Meeker (2000, p. 9) explain that each industry has a different balance of power, degree of transparency, and need for discovery. Sectors are not homogeneous entities, comprising highly differentiated supply chains, e.g. in a study of Roland Berger Consulting (2000, p. 20) it was investigated that the wholesale and retail sector is much more professional in procurement than the service sector. This research concentrates on purchasing organisations and e-Marketplaces / PSPs in the automotive and electronics industry sectors as the population of interest or unit of analysis. Reasons include, among others, the findings from the literature review that both industry sectors are already advanced in SCM and strategic procurement techniques, belong to the pioneers in e-Procurement and can provide examples of EPC in practice.

What is the impact of the environmental or industry context on EPC adoption? Competitive pressure from the business context has been identified through various researchers as an important determinant of ICT / IOS adoption, e.g. EDI diffusion (Banerjee / Golhar, 1993; Prekumar / Ramamurthy, 1995; Webster, 1995) or e-Business adoption (Zhu et al., 2002). The author would expect that this is true for EPC as well. Organisations that are first movers in employing EPC could tend to derive a competitive advantage and, therefore, pressure from the business context may force firms to adopt EPC earlier.

In this respect, it is also necessary to investigate the current level of e-Procurement involvement of firms and whether or not they are planning to introduce an e-Procurement strategy or solution. Moreover, which e-Procurement solutions are mostly used to date and in future (e.g. e-Procurement software, seller-centric, buyer-centric, open e-Marketplaces)? Which type of e-Marketplace or PSP is more suitable for the take-up of EPC? Case studies cannot provide empirical data for the overall adoption of EPC in both industry sectors. The results from the surveys concerning this particular research construct were used, however, to select further case studies for EPC. This research construct is crucial to establish a first useful empirical analysis into sectoral EPC take-up.

At the same time, it is essential to explore the anti-trust limitations for EPC within the industry-sectors as another environmental factor. Are consortia-led e-Marketplaces developed by the market leaders within one single sector that do not form purchasing consortia due to anti-trust concerns? The surveys are also designed to assess the fragmentation / concentration of both industry sectors and whether or not purchasing organisations and e-Marketplaces / PSPs requested legal approval when forming EPC. To deepen the knowledge of the industry structure and EPC anti-trust limitations, case studies are developed to explore the effects which potential compromises to sensitive competitive information and potential violations of anti-trust regulations have upon membership makeup. Theoretically, in fragmented industry sectors purchasing consortia seem to be more likely to occur than in concentrated markets. What are the anti-trust limitations to EPC and how is EPC implementation impacted by industry structures? This investigation allows to elaborate on the EPC industry feasibility and to contribute in which way EPC are impacted by environmental factors.

<u>Construct 2)</u>	Relationship between firm size and adoption of electronic purchasing consortia
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H2a:	The size of purchasing organisation is positively related to EPC adoption and EPC importance.
Hypothesis H2b:	The size of e-Marketplace / PSP is positively related to EPC offering and importance.

Reasons for Selection of H2 and linkages between case studies and surveys:

One of the key objectives here is to investigate how significantly the organisation's size influences an organisation's decision to conduct electronic purchasing consortia and to adopt an e-Procurement system. Mata et al. (1995) explain that access to capital to develop and apply ICT has been suggested as a source of sustainable competitive advantage. However, they specify that access to capital for ICT investments is not likely to be a source of sustained competitive advantage for firms, as not all ICT investments are large or risky. Access to capital rather contributes to a temporary competitive advantage.

Current studies show that most SMEs use the Internet as a basic communications facility, but only a minority reap significant benefits from the Internet (e.g. OECD, 1998; O'Connor et al., 1997; Poon and Swatman, 1997). In the literature it is noted that large organisations are more willing to invest in ICT systems than smaller organisations. According to the literature review, however, EPC anti-trust limitations might hinder the participation of larger companies. The surveys can provide a first quantitative analysis whether or not the greater the purchasing organisation's size, the more likely electronic purchasing consortia and e-Procurement systems are used. E-Marketplaces and PSPs are also analysed as to how their gross sales volume, number of participating purchasing organisations and suppliers as well as purchase orders placed correlate with EPC offering.

The case studies can qualitatively provide examples in which way larger and smaller organisations can integrate EPC. This research construct can provide an useful analysis for both the EPC taxonomy as well as the EPC feasibility in the selected industry sectors.

The research construct can also contribute to an analysis of EPC adoption within the organisational context.

<u>Construct 3)</u>	The level of awareness and importance of electronic purchasing consortia and further customised services
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H3a:	The provision level of customised services is positively related to EPC offering and importance.
Hypothesis H3b:	The adoption level of customised services is positively related to EPC implementation and importance.
Hypothesis H3c:	Purchasing maturity is positively related to EPC adoption as well as to importance of EPC and further customised services.

Reasons for Selection of H3 and linkages between case studies and surveys:

This research construct also tries to investigate empirical data on the acceptance and importance of electronic purchasing consortia among organisations. Are electronic purchasing consortia growing in membership and volume of purchases? The surveys are aimed to provide quantitative and empirical data to this research construct (e.g. purchasing organisations and e-Marketplaces / PSPs are asked to assess the future implementation of EPC and further ICT-supported customised services and to score the level of importance on a five point likert scale).

What percentage of e-Marketplaces / PSPs and purchasing organisations has considered the feasibility of electronic purchasing consortia and reverse auctions? The causality for the level of importance of EPC is more closely elaborated in research constructs 7) and 9). The case studies can analyse in more detail and more qualitatively how important EPC and further ICT-supported customised services are to procurement processes. It is essential to analyse which additional services e-Marketplaces and PSPs offer and of which, if any, purchasing organisations make use. According to Barratt and Rosdahl (2001), e-Marketplaces and PSPs will survive based upon their ability to deliver value-adding customised services such as collaborative planning, collaborative design, financing, settlement, fulfilment or market intelligence. They define value-added

functionality as services, which supplement the actual transaction, cataloguing and search capability. E-Procurement services can automate steps of the purchasing process e.g. in requisitioning, approval, payment, tracking / tracing or receiving workflows.¹³²

Which services do e-Marketplaces and PSPs offer? What is the importance of these services to both purchasing organisations as well as e-Marketplaces / PSPs? Automating each step of the purchasing process can potentially deliver significant savings in operating costs. Is there a convergence of electronic purchasing consortia and described functionality? Is there any significance that providers and users of EPC implement more customised services than non-providers and non-users?

Which impact has purchasing maturity and the level of professionalism in purchasing on adoption of EPC and further customised services? As purchasing becomes maturer, it is expected that purchasing organisations increase their efforts to manage EPC and to create competitive advantage in purchasing. This research construct is necessary for the development towards a conceptual framework of EPC in order to elaborate which services are required to be integrated with EPC. At the same time, the construct can contribute to an assessment of the impact of technological and organisational aspects on EPC adoption.

¹³² There are many other specialised services and this listing just represents a selection of all available services. Other services functions include for example transport and storage services, insurance and risk management, factoring and trade financing, scheduling and forecasting or order fulfilment.

<u>Construct 4)</u>	Management structures, trading mechanisms and scope of EPC
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H4:	EPC are positively correlated with formal third-party reinfomediatioin.

Reasons for Selection of H4 and linkages between case studies and surveys:

This research construct is based upon an initial categorisation of the different types and structures of EPC. Both surveys are aimed to deliver some general quantitative insight, which form of infomediatioin is more likely to be accepted in relation to EPC. As EPC are based on the continuum between markets and hierarchies, intermediaries do not fall into this definition per se. Academic literature has raised questions whether the future will hold a place for metamediaries, given that new ICT systems can facilitate direct links between market players. Both surveys try to assess quantitatively the legal structure and implementation time of EPC.

Trist and Bamforth (1951) explain that any particular technology could usually be used within the context of a variety of organisational forms. They note that there is no deterministic link between technology and organisation and that the introduction of new technologies always presents an occasion for organisational choice. Easton (1994) found the phase models of network development from “community” to “informal network” that moves on to “formal network” and “club”, until it disappears and is reborn.

The literature review identified that other researchers have focused on a classification of e-Business models (e.g. Applegate, 2001; Barratt and Rosdahl, 2001; Berryman et al., 2000; Cherian, 2001; Dai and Kauffman, 2001; Sculley, 1999; Timmers, 1998). However, there is no approach in the literature to a categorisation of EPC structures. What is the scope for EPC? Which dynamic pricing tools are supported?

In the case studies, innovations associated with Internet-based group-buying trading mechanisms are introduced as well as the operational aspects of dynamic pricing mechanisms for EPC characterised. A single standardised process of creating and

managing EPC cannot be formed. The case studies identify and categorise different highly innovative trading mechanisms such as EPC with e-RFQ or reverse auctions, time limited buy cycles, buy cycles with rebate schemes or demand aggregation price curves. Purchasing organisations may accept the offering of procurement service providers to conduct demand aggregation and reverse auctions on their behalf or may establish their own specific e-Marketplace to form electronic purchasing consortia. The question is assessed whether or not EPC are positively correlated with reinfomediation.

The case studies try to make a further qualitative contribution to the legal structure and scope of EPC. Hendrick (1997, p.9) as well as Corsten and Zagler (1999, p. 139) report that most purchasing consortia exclude competitors although the inclusion of competitors is not considered a threat and focus on indirect items. Therefore, the surveys also try to explore the further possibilities of how new members are recruited and to investigate the average mix of competitors and non-competitors in EPC. Membership requirements usually include the member's creditworthiness and capital. The higher the procurement fit between purchasing partners, the higher is traditionally the degree of demand bundling. Case studies also address the issue of the mix of competitors vs. non-competitors in EPC. The causality for this mix can be partly found in research construct 1) and 2).

This research construct can make a strong contribution to theory development with regard to the virtual network view and can elaborate on which form of co-operation and legal structure is most appropriate for EPC. This research construct is absolutely crucial to develop towards a taxonomy and categorisation of different EPC trading mechanisms and critical for the EPC feasibility of industry sectors.

Construct 5)	Revenue models for electronic purchasing consortia and reverse auctions
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H5:	The importance of transaction fees is positively related to EPC offering and importance.

Reasons for Selection of H5 and linkages between case studies and surveys:

Highly significant for a conceptual framework to EPC is the structure of revenue models and funding options to EPC. Amit and Zott (2001) note that a revenue model refers to the specific modes in which a business model enables revenue generation. Business models refer primarily to value creation whereas revenue models are primarily concerned with value appropriation (see also Brandenburger and Stuart, 1996). The revenue models can be based upon e.g. subscription costs, commissions or transaction fees, advertising and sponsoring revenues, among others. Hendrick (1997) investigated that in most cases of traditional less ICT-based purchasing consortia total costs are accumulated and divided equally among members. Is there a shift to the payment of expenses based on a percentage of purchases and a fixed fee for each member in electronic purchasing consortia? Are suppliers charged, too?

Barratt and Rosdahl (2001) explain that the seller transaction fee seems to be the most predominant source of revenue, where the buyer transaction fee is less popular. Additionally they explain that very few companies seem to cover their costs through subscription. Advertising and selling market information is also regarded as a major source of income. Thus the case studies are directed to assess the level of funding options to EPC among the different EPC trading mechanisms. Surveys can expand on the findings developed from the case studies and quantitatively revise which EPC revenue models are adopted. This research construct aims to add to a conceptual framework of EPC. Significant differences in industry sectors in relation to funding options are not expected, but were optionally taken into consideration.

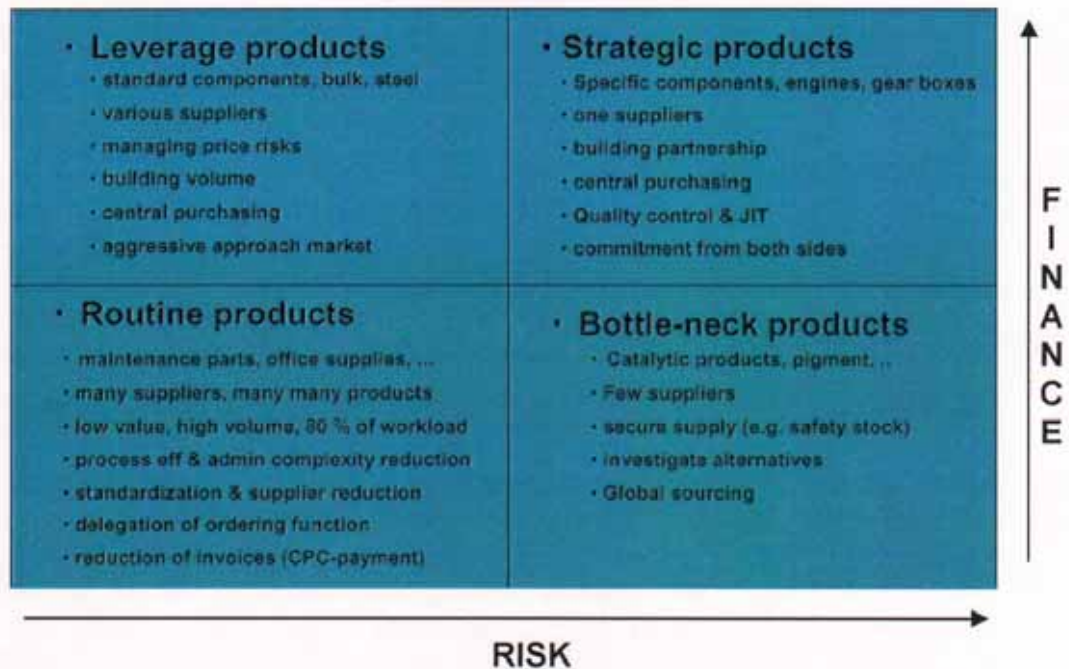
Construct 6)	Relationship between purchasing spend, sourcing strategies and product feasibility to EPC.
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H6a:	Purchasing spend is positively related to EPC adoption and importance.
Hypothesis H6b:	The integration level of multi sourcing strategies is positively related to EPC adoption and importance.
Hypothesis H6c:	The average product pooling potential is positively related to EPC adoption and importance among purchasing organisations and e-Marketplaces / PSPs.

Reasons for Selection of H6 and linkages between case studies and surveys:

Essig (1999a) notes that a purchasing consortium may be just one, but an important element of a supply strategy and may be combined with other effective sourcing strategies such as global sourcing, single sourcing, system sourcing, and other strategies. What is the relationship between electronic purchasing consortia and the sourcing strategies that companies adopt? How does this correlate with the willingness to conduct electronic consortium purchasing? What is the total purchasing spend? Is there a significance that the higher the purchasing spend on goods and services, the more likely electronic purchasing consortia are used? These variables are quantitatively researched by the survey for purchasing organisations.

A central question in this research construct is also to quantitatively illustrate by the surveys which kinds of items are most frequently sourced by EPC. The objective here is to find out what products and services, if any, are best suited to purchase through electronic purchasing consortia, e.g. strategic or non-strategic products and services. Asset specificity is the degree to which investments are made specifically with reference to a particular product, process or relationships, and cannot easily be used again outside this context (Malone et al., 1987). This research helps to investigate the relationship between asset specificity and EPC. Products with low asset specificity are traditionally commodities, which are characterised by mature technology, undifferentiated performance across suppliers, and a broad supply base. Kraljic / McKinsey (1983) developed a matrix for product classification (see Figure 12).

Figure 12: Kraljic- McKinsey Product Matrix



Source: Modified from Kraljic, 1983, p. 111

The surveys also quantitatively elaborate on the actual and potential percentage of products that are pooled and aggregated by e-Marketplaces / PSPs as well as purchasing organisations. Case studies qualitatively investigate which kinds of products and services can be best integrated to the identified EPC trading mechanisms outlined in the previous research construct. The case studies also embrace whether or not electronic purchasing consortia occur for permanent systematic use or for single projects only (i.e. spot sourcing to fulfil an immediate need, according to Kaplan and Sawhney, 1999). Again, this research construct is very critical towards developing answers to the research questions.

Construct 7)	Level of benefits and drawbacks of electronic purchasing consortia to purchasing organisations
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H7a:	The effectiveness and efficiency level of procurement activities is positively related to EPC adoption and importance.
Hypothesis H7b:	The level of maverick purchases is negatively related to EPC adoption and importance.

Reasons for Selection of H7 and linkages between case studies and surveys:

In this research construct, the perceived opportunities and drawbacks to EPC are quantitatively and qualitatively analysed by both case studies and survey instruments. It was elaborated in the literature review to synergy that both tangible and intangible benefits might occur to EPC. Rozemeijer (2000) notes that sharing knowledge such as information, experiences, insights and best practices across independent business units and companies can also lead to intangible synergies and to competitive advantage with the network paradigm. Barratt and Rosdahl (2001) list perceived benefits of e-Marketplaces to purchasing organisations and suppliers without any quantitative or qualitative discussion.

The surveys are aimed to quantitatively contrast (in five point likert scales) the advantages and drawbacks to EPC, perceived by both purchasing organisations as well as e-Marketplaces / PSPs. The aim is to research whether or not the level of EPC benefits to purchasing organisations can outweigh the level of drawbacks. The surveys, however, also address open-ended questions to the benefits and drawbacks. Findings should include whether or not users of EPC assess benefits and drawbacks in a different way than non-users. For example, the survey for purchasing organisations is aimed to quantitatively analyse the effectiveness and cost efficiency of purchasing activities and the relation to EPC adoption. This investigation allows a conclusion whether or not users of electronic purchasing consortia judge their procurement processes as being more efficient and effective to a higher degree than non-users do.

The survey for purchasing organisations also helps to explore whether or not EPC adopters carry out maverick purchasing less often than non-adopters. The National Association of Purchasing Managers (NAPM) estimates that one third of all corporate purchases are out of compliance with purchase agreements. On average, maverick buyers pay 18-27% above the actual pre-negotiated price (according to the US National Association of Purchasing Management). EPC can create options to reduce maverick purchasing and increase leverage that may not be available to individual companies. With more purchasing volume, consortium members can create more supply market options and break bottleneck situations.

In this respect, Quayle (2002a) investigated in a survey that some 70% of respondents thought that a purchasing consortium in combination with e-Commerce was desirable but 60% of those considered it might not be feasible. The prime concern held by many were competitors in the consortium (40%) and whether there would be sufficient commonality of purchases to provide some purchasing power for the consortium (38%). There were no significant concerns about cost (3%) or purchasing expertise (2%).

However, a concern may be the opportunity for firms to attain information about supply requirements of their competitors, suppliers and customers. In order to take full advantage of EPC, users must generally provide competitively sensitive information, such as procurement needs, purchasing prices or capacity and order status. However, E-Marketplaces and PSPs can, in theory, manage competitively sensitive information flow problems by limiting access. E-Marketplaces and PSPs can allow members to control restrictions such as which other party can have access to their data and also for what purpose the data may be used.

What are the main reasons holding companies back in participating in e-Marketplaces / PSPs and EPC? Too much emphasis on reduction of purchasing prices could lead to a degradation of non-specified quality factors and there might be the risk that the short-term benefits of electronic purchasing consortia and reverse auctions outweigh the long-term risks. Too much focus on costs may lead to drawbacks for suppliers that may make them reluctant to participate in electronic purchasing consortia. Also, the terminology in technical specifications provide difficulties in conducting electronic consortium

purchasing.¹³³ Case studies can reveal more qualitatively in the respective context the benefits and drawbacks to EPC. This research construct is aimed to provide a quantitative and qualitative framework whether or not the benefits to EPC can outweigh the drawbacks.

Construct 8)	Relationship between ROI and electronic purchasing consortia / reverse auctions
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Quantitative
Hypothesis H8:	The average economies of scale and scope within electronic purchasing consortia exceed the average diseconomies of increased transaction and communication costs.

Reasons for Selection of H8 and linkages between case studies and surveys:

Important for the analysis of EPC in which way they can contribute to achieve competitive advantage is the knowledge of the relationship between ROI and EPC. Hendrick (1999, p. 8) investigated that the average cost to run a traditional purchasing consortium without any Internet-based communication infrastructure was \$300.000. However, this cost returned savings of \$2.3 million on average annual consortium purchases of about \$17,443 million. The average savings have been 13.43%. The reported return on investment was 767 percent!

Based on a research project in Germany, Essig (1999a) reports an average volume increase ranging between 800% and 1200% for the 13 companies participating in the consortium purchasing arrangement. This volume increase was resulting in savings ranging from 1% to 15% for the thirteen participating companies.¹³⁴ Vizjak (1994) estimates that cost reductions of up to 10% are attainable by the co-ordination of activities, information exchange and concentration of buyer power. Boer, Harink and Heijboer (2002) state from a financial perspective solely, only if the integral purchasing

¹³³ The XML-programming language might help to set clear definitions of technical items. Goldstein (2001) states that XML specifications define a standard model to add mark-up to documents in order to improve the sharing of data and information. However, there are proprietary XML solutions evolving at the moment. The question whether or not one common XML standard can be agreed on remains to be seen.

¹³⁴ In his study, Essig (1999a) also reports a correlation coefficient of 0.7546 between "volume increase" and "purchasing savings", which indicates the potential value of increasing buying power.

costs in a new structure (such as the implementation of EPC) are lower than in the current structure, it may be sensible to implement electronic procurement.

Devine (1996, p. 38) argues that “(...) *cost reduction must offset consortium administration and legal costs, as well as affiliation fees. The unit cost reduction factor should be given a high weigh, in the point system for supplier selection in a purchasing consortium*”. Corsten and Zagler (1999, p. 140) indicate that the transaction costs of forming and managing a purchasing consortium proved to be very high and a barrier to future activities. ICT systems can, in theory, reduce these transaction costs.

It has been indicated that ICT research tends not to be able to exactly measure the bottom-line contribution of ICT investments, the so-called IT Productivity Paradox (e.g. Loveman, 1994; Powell and Dent-Micallef, 1997; Strassman, 1985; Sambamurthy, 2000). Therefore, the author delineates the specific effects of EPC adoption on ROI by the analysis whether the potentials of economies of scale and scope within EPC can exceed the diseconomies of increased transaction and communication costs. The case studies can provide ROI examples within the different EPC trading mechanisms. Both surveys try to quantitatively assess the ROI to EPC and reverse auctions.

How do the customised services, which e-Marketplaces and PSPs offer, correlate with general net savings in purchasing costs achieved by e-Marketplaces and PSPs? Is there a significant relationship between the adoption level of customised services and general net savings in purchasing costs? How do these services contribute to the general net savings achieved by purchasing organisations and Marketplaces / PSPs in purchasing costs? Surveys are used to quantitatively respond to these questions on ROI. This research construct enables a grounding into the conceptual framework of EPC on the experienced savings and investments with EPC.

Construct 9)	Level of benefits and drawbacks for suppliers that participate in electronic purchasing consortia
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H9a:	EPC are positively correlated with the arms-length (exit) buyer-supplier relationship.
Hypothesis H9b:	Supplier reduction is positively related to EPC adoption and importance.

Reasons for Selection of H9 and linkages between case studies and surveys:

Similar to research construct 7), this research construct is aimed to investigate whether or not the level of EPC benefits to suppliers can outweighs the level of drawbacks. The surveys make a quantitative contribution by five point likert scales to the level of benefits and drawbacks of EPC to suppliers. Suppliers involved in electronic purchasing consortia may be rewarded with larger future volume requirements from the EPC members and may improve quality based on input from these relationships. Suppliers also may see advantages in timely and dependable orders and ensure an opportunity to serve a large group of customers.

However, suppliers may fear that EPC and data-driven cost transparency can accelerate the commoditisation of products, reduce margins and break down traditional supply arrangements. That is why Sickinger (1996, p. 4) explains that suppliers are afraid of expensive concessions and may try to jeopardise the purchasing consortium members' relationship with each other by playing one member against another. Unless suppliers can't benefit from increased market share, they don't find any incentive to participate in electronic purchasing consortia and see limited opportunity to improve their cost structure.¹³⁵

Electronic purchasing consortia may enable that most aspects of the supplier relationship other than price remain under the individual purchasing member's full control. Therefore,

¹³⁵ Phillips and Meeker (2000, p. 35) quoted a supplier that summed up the potential drawbacks for suppliers: "Let's see, you want me to put all my products and prices online so my customers can beat me about the head and shoulders. Then I can commoditise myself even more to take my razor-thin margins down to microscopic level. Finally, I get to pay transaction fees for this privilege. What am I missing?"

the surveys also explore the level of influence of electronic purchasing consortia on the supplier-buyer relationship. Research on strategic supplier-buyers alliances is manifold and well developed (e.g. Bensaou, 1999; Cox, 1996b; Ellram, 1990; Ellram and Cooper, 1990; Helper, 1993; Kraljic, 1983; Olsen and Ellram, 1997; Werani, 2001). Purchasing organisations may face the dilemma in switching from existing supply relationships to EPC because these actions might imperil their relationships with existing suppliers (e.g. Christiaanse and Markus, 2002; Dai and Kauffman, 2001). This research construct is crucial to investigate in which way EPC support arms-length or strategic collaborative buyer-supplier relationships.

General characteristics that distinguish between co-operative and non-co-operative buyer-supplier relationships are e.g. frequency of interaction, long-term orientation, intensive mutual co-ordination of partners, degree of information sharing, change of contact persons or mutual exchange of personnel between the partners (see e.g. Ellram, 1990; Ganesan, 1994; Heide and John, 1990), relationship-specific investments (e.g. Hakansson and Snehota, 1995; Troendle, 1987), asset specificity (e.g. Bensaou, 1999; Cox, 1996; Williamson 1985) and the adoption of norms (e.g. Heide and John, 1992; Kaufman and Stern, 1988; MacNeil, 1980).

The strategic domain of competitive forces or positioning stream has similarities with the arms-length supplier relationship (exit model, according to Helper, 1991). This is due to its focus on lowest price, fierce supplier competition and no hesitation to switching suppliers. In contrast to that, the resource-based perspective can be connected to close supplier relationships as it highlights resource linkages and collaboration (voice model, according to Helper, 1991). This research construct is aimed to investigate whether or not EPC are positively correlated with the exit or voice buyer-supplier relationship. This question is also crucial to be explored by the surveys whether or not users of electronic purchasing consortia have a stronger tendency to reducing their suppliers than non-users (Clemons et al., 1993, "move to the middle" argument). Case studies elaborate qualitatively on the assessment whether or not supplier benefits to EPC can outweigh the drawbacks.

Construct I0)	Critical factors in creating and managing electronic purchasing consortia in future
Research Method:	Case Studies Questionnaires for 1. E-Marketplaces / PSPs 2. Purchasing Organisations
Research Type:	Qualitative + Quantitative
Hypothesis H10:	Non-providers of EPC underestimate the critical factors involved in creating and managing EPC.

Reasons for Selection of H10 and linkages between case studies and surveys:

For the development towards an EPC taxonomy, it is vital to know what factors are considered to be important and critical in creating and managing successful electronic purchasing consortia. Rozemeijer (2000) explains that in general most development models in purchasing have been based on a set of parameters and critical factors, such as:

- Top management commitment i.e. the degree to which top management demonstrates active interest and is actively involved in purchasing strategy and supply matters.
- Functional leadership relating to the management style which is employed, the way change management is being applied.
- Purchasing activities covering the extent to which the purchasing department is involved in product development, supplier selection, contract management, order handling en supplier evaluation.
- Purchasing strategy relating to the degree of formalisation with which plans have been made, the extent to which purchasing strategies have been integrated in overall business planning, the actual contents of purchasing strategies and plans.
- Supply management relating to the way supplier relationships are being managed within the company.
- Organisational issues such as reporting relationships, communication structures, information systems being used in purchasing and supplier relationships, role and position of purchasing departments within the organisation.
- People issues such as degree and characteristics of training and education, career development, buyer skills profiles.
- Performance measurements (e.g. quality, cost savings, delivery, cycle time, vendor rating).
- Information systems (e.g. information and communication technology, data availability).

Doucette (1997) explains that a review of literature concerning inter-organisational, intra-organisational, and inter-personal relationships identified five potential influences on group purchasing member's commitment in the health care sector: satisfaction with the group purchasing organisation; the perceived commitment of other members; the suitability of alternatives to membership; the degree of information exchange between member and group purchasing organisation; and trust in the group purchasing organisations. Gerstein and Reisman (1982) note that successful strategic information systems depend on managerial involvement and knowledge (see also Bell, 1998).

Therefore, it is vital to know what factors are considered to be important and critical in creating and managing successful electronic purchasing consortia. Both surveys are aimed to quantitatively assess selected critical factors. Are minimum percentages or a critical mass of participants' total needs required to have a product purchased through the electronic purchasing consortium? Traditionally purchasers want to make sure that partners are compatible and bring a certain volume. However, it is not mandatory by law to purchase through the consortium. Is the critical mass of requirements diminishing to have a product purchased through the electronic purchasing consortium? ICT / IOS can facilitate the sharing of process data, thereby providing better entry options for consortium sourcing.

How important are trust and management support as well as a cultural approach to the formation of electronic purchasing consortia? Within the network approach to competitive advantage, Kasper-Fuehrer and Ashkanasy (2001) explain that issues such as communication of trustworthiness by reliable ICT, establishment of common business understanding, and strong business ethics are necessary to build trust in inter-organisational relationships. The concept of a cultural approach and interpersonal trust to the domain of inter-organisational relations is well developed in the literature (e.g. Blois, 1999; Doney and Cannon, 1997; Ring 1997; Sako and Helper, 1998). Trust has been touted as the 'social lubricant' or 'magic ingredient' of collaborative activities (Koza and Lewin, 1998). Lack of a trusting environment can contribute to low use of ITC for collaboration, information sharing, and knowledge dissemination (Fulk, 1993). Rockart and Short (1991) note that in the transition to a more networked approach, increased interpersonal skills are necessary. Social ties and individual role and skills can play a crucial role in value creation in EPC (e.g. Bakos and Nault, 1997). The surveys try to

assess if non-users of EPC underestimate the critical factors involved in creating and managing EPC. However, case studies are strongly required to explain and describe critical factors to EPC in more detail.

Also, the general satisfaction with electronic purchasing consortia can be investigated at this stage. The surveys are aimed to quantitatively explore the satisfaction of purchasing organisations and e-Marketplaces / PSPs. Vigoroso (1998) explored that 83% of those who have bought collectively say joining a traditionally understood consortium was a smart business decision for their company. What does the future hold for purchasing consortia and e-Procurement? Case studies try to enhance the investigation to this research construct by qualitative research in order to deepen the body of knowledge around the future of EPC. At the same time, surveys qualitatively assess in open text questions the future of EPC. Surveys also are aimed to consider the biggest challenges that procurement organisations as well as e-Marketplaces and PSPs are facing today. How does that reflect on the future of EPC processes? This research construct is very significant in view of the network approach to competitive advantage.

2.7 FINAL REMARKS TO LITERATURE REVIEW

In the second chapter, a literature review on EPC was conducted to investigate what is published about purchasing development, the creation of symbiosis and alliance network structures in general and in purchasing more particular to achieve competitive advantage. The transition to virtual structures and e-Procurement instruments was further evaluated. Both strategic management as well as purchasing literature has been studied and linked to developments in virtual structures in purchasing, dis- and reinfomediation, e-Procurement strategies and information sharing systems as well as adoption and diffusion theories. The overall statement, constructs and hypotheses to be researched were identified. Table 5 summarises the developed variables, constructs and contingencies as well as the literature sections from which they emerged.

Table 5: Variables and Contingencies Identified in Literature

Variables and Constructs	Contingencies	Broadly Informed by Literature Review Issues
<u>Environmental Drivers</u>		
Construct 1	<p>Level of Industry Fragmentation</p> <p>Pressures from Business Context</p> <ul style="list-style-type: none"> ▪ Increased Pressure to Reduce Costs ▪ Increased Concentration in Supply Markets ▪ Increased Concentration in Customer Markets ▪ Increased Pressures to Innovate 	<p>Positioning Stream (Sec. 2.2.2)</p> <p>Transaction Cost Theory (Sec. 2.4.2)</p> <p>Pooled Purchasing Concept (Sec. 2.4.3)</p> <p>Virtual Organisation (Sec. 2.5.1)</p> <p>Metamediatio n Theories (Sec. 2.5.2)</p> <p>E-Procurement Strategies (Sec. 2.5.4)</p> <p>IOS Adoption Theories (Sec. 2.5.5)</p> <p>Resource-Based Perspective (Sec. 2.2.1)</p> <p>Positioning Stream (Sec. 2.2.2)</p> <p>Strategic Procurement Literature (Sec. 2.3)</p> <p>Transaction Cost Theory (Sec. 2.4.2)</p> <p>Pooled Purchasing Concept (Sec. 2.4.3)</p> <p>E-Procurement Strategies (Sec. 2.5.4)</p> <p>IOS Adoption Theories (Sec. 2.5.5)</p>
<u>Organisational Drivers</u>		
Construct 2	<p>Firm Size of Purchasing Organisations</p> <ul style="list-style-type: none"> ▪ Number of Employees ▪ Turnover <p>Firm Size of E-Marketplaces / PSPs</p> <ul style="list-style-type: none"> ▪ Turnover ▪ Number of Suppliers ▪ Number of Purchasing Organisations ▪ Number of Purchase Orders 	<p>Strategic Procurement Literature (Sec. 2.3)</p> <p>Transaction Cost Theory (Sec. 2.4.2)</p> <p>Pooled Purchasing Concept (Sec. 2.4.3)</p> <p>Concept of Synergy (Sec. 2.4.4)</p> <p>Virtual Organisation (Sec. 2.5.1)</p> <p>Metamediatio n Theories (Sec. 2.5.2)</p> <p>E-Procurement Strategies (Sec. 2.5.4)</p> <p>IOS Adoption Theories (Sec. 2.5.5)</p>
Construct 3	<p>Purchasing Maturity</p> <ul style="list-style-type: none"> ▪ Purchasing Relates to Strategic and Cross-Functional Process ▪ Professionalism in Purchasing Management ▪ Intensive Buyer-Supplier Relationships ▪ Top Management Support ▪ Skills, Competencies and Capabilities of Purchasing Personnel 	<p>Strategic Procurement Literature (Sec. 2.3)</p> <p>Strategic Networks (Sec. 2.4.1)</p> <p>Transaction Cost Theory (Sec. 2.4.2)</p> <p>Pooled Purchasing Concept (Sec. 2.4.3)</p> <p>Virtual Organisation (Sec. 2.5.1)</p> <p>E-Procurement Strategies (Sec. 2.5.4)</p> <p>IOS Adoption Theories (Sec. 2.5.5)</p>
Construct 6	<p>Purchasing Spend (as a % of Turnover)</p> <p>Intensity of Multi Sourcing Strategies</p> <p>Product Pooling Potential</p>	<p>Strategic Procurement Literature (Sec. 2.3)</p> <p>Pooled Purchasing Concept (Sec. 2.4.3)</p> <p>Concept of Synergy (Sec. 2.4.4)</p> <p>IOS Adoption Theories (Sec. 2.5.5)</p> <p>Strategic Procurement Literature (Sec. 2.3)</p> <p>Pooled Purchasing Concept (Sec. 2.4.3)</p> <p>Concept of Synergy (Sec. 2.4.4)</p> <p>E-Procurement Strategies (Sec. 2.5.4)</p> <p>IOS Adoption Theories (Sec. 2.5.5)</p> <p>Strategic Procurement Literature (Sec. 2.3)</p> <p>Strategic Networks (Sec. 2.4.1)</p> <p>Transaction Cost Theory (Sec. 2.4.2)</p> <p>Pooled Purchasing Concept (Sec. 2.4.3)</p> <p>Concept of Synergy (Sec. 2.4.4)</p> <p>Virtual Organisation (Sec. 2.5.1)</p> <p>E-Procurement Strategies (Sec. 2.5.4)</p> <p>IOS Adoption Theories (Sec. 2.5.5)</p>

<u>Technological Drivers</u>	<p>Construct 3</p> <p>Number of Offered ICT Services among E-Marketplaces/PSPs</p> <p>Number of Adopted ICT Services among Purchasing Organisations</p>	<p>Strategic Procurement Literature (Sec. 2.3) Pooled Purchasing Concept (Sec. 2.4.3) Virtual Organisation (Sec. 2.5.1) Metamediatio n Theories (Sec. 2.5.2) E-Procurement Strategies (Sec. 2.5.4) IOS Adoption Theories (Sec. 2.5.5)</p>
<u>EPC Structures</u>	<p>Construct 4</p> <p>Third-Party EPC Reinfomediation</p> <p>Construct 5</p> <p>Importance of Transaction Fees</p> <p>Construct 9</p> <p>EPC Buyer-Supplier Relationship</p>	<p>Strategic Procurement Literature (Sec. 2.3) Strategic Networks (Sec. 2.4.1) Transaction Cost Theory (Sec. 2.4.2) Pooled Purchasing Concept (Sec. 2.4.3) Virtual Organisation (Sec. 2.5.1) Metamediatio n Theories (Sec. 2.5.2) E-Procurement Strategies (Sec. 2.5.4)</p> <p>Transaction Cost Theory (Sec. 2.4.2) Pooled Purchasing Concept (Sec. 2.4.3) Metamediatio n Theories (Sec. 2.5.2) E-Procurement Strategies (Sec. 2.5.4)</p> <p>Resource-Based Perspective (Sec. 2.2.1) Positioning Stream (Sec. 2.2.2) Strategic Procurement Literature (Sec. 2.3) Strategic Networks (Sec. 2.4.1) Transaction Cost Theory (Sec. 2.4.2) Pooled Purchasing Concept (Sec. 2.4.3) Concept of Synergy (Sec. 2.4.4) Virtual Organisation (Sec. 2.5.1) Metamediatio n Theories (Sec. 2.5.2) E-Procurement Strategies (Sec. 2.5.4)</p>
<u>Performance Indicators</u>	<p>Construct 7</p> <p>Effectiveness / Efficiency of Procurement</p> <ul style="list-style-type: none"> ▪ Purchasing Effectiveness of Strategic Goods ▪ Purchasing Effectiveness of Non-Critical Goods ▪ Purchasing Efficiency of Strategic Goods ▪ Purchasing Efficiency of Non-Critical Goods <p>Level of Maverick Purchasing</p> <ul style="list-style-type: none"> ▪ Maverick Purchasing of Strategic Goods ▪ Maverick Purchasing of Non-Critical Goods <p>Construct 8</p> <p>Average Net Savings and ROI</p> <ul style="list-style-type: none"> ▪ Achieved Economies of Scale and Scope ▪ Investment Costs <p>Construct 9</p> <p>Supplier Reduction</p>	<p>Strategic Procurement Literature (Sec. 2.3) Transaction Cost Theory (Sec. 2.4.2) Pooled Purchasing Concept (Sec. 2.4.3) Concept of Synergy (Sec. 2.4.4) Virtual Organisation (Sec. 2.5.1) Metamediatio n Theories (Sec. 2.5.2) E-Procurement Strategies (Sec. 2.5.4)</p> <p>Strategic Procurement Literature (Sec. 2.3) Transaction Cost Theory (Sec. 2.4.2) Pooled Purchasing Concept (Sec. 2.4.3) Concept of Synergy (Sec. 2.4.4) E-Procurement Strategies (Sec. 2.5.4)</p> <p>Strategic Procurement Literature (Sec. 2.3) Transaction Cost Theory (Sec. 2.4.2) Pooled Purchasing Concept (Sec. 2.4.3) Concept of Synergy (Sec. 2.4.4) E-Procurement Strategies (Sec. 2.5.4)</p>
<u>Critical Factors</u>	<p>Construct 10</p> <p>Degree of Trust Top Management Support Cultural Approach Critical Mass / Minimum Needs</p>	<p>Strategic Procurement Literature (Sec. 2.3) Strategic Networks (Sec. 2.4.1) Transaction Cost Theory (Sec. 2.4.2) Pooled Purchasing Concept (Sec. 2.4.3) Concept of Synergy (Sec. 2.4.4) Virtual Organisation (Sec. 2.5.1) Metamediatio n Theories (Sec. 2.5.2) E-Procurement Strategies (Sec. 2.5.4) IOS Adoption Theories (Sec. 2.5.5)</p>

Focusing on the detailed investigation of these variables and contingencies that have not been researched yet, important conclusions can be drawn from this study. The surveys and case studies are closely inter-connected in order to address the developed hypotheses. The case studies are aimed to provide a first conceptual framework to EPC. By supplementing the case study data by surveys' data, a second conceptual framework to EPC can be revised. Whereas the surveys generate more quantitative data to the research questions, the case studies allow a more qualitative approach to EPC structures. Each case study has been particularly chosen to illustrate the diversity of trading mechanisms and scope of EPC. The subsequent surveys are aimed for rigorous hypotheses testing and to address 'constructs unanswered' from the case studies. In order to increase the research reliability, the author has followed a two-fold strategy and has related the research hypotheses to EPC adoption / non-adoption (based on yes / no) as well as to EPC importance to strategy (based on a five-point likert scale). The justification for both surveys and case studies as well as the methodology chosen is presented in the following research methodology section.

CHAPTER III RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

After having identified the constructs that are relevant to the study in focus on EPC, the research design, methodology and plan will be described in more detail in this chapter. Rozemeijer (2000) quotes Ramsey (1998) that the academic purchasing world stands at

“(...) the threshold of an enormous increase in empirical work intended to improve our understanding of what purchasing functions are doing, why they do the thing they do, and how that activity might be improved.”

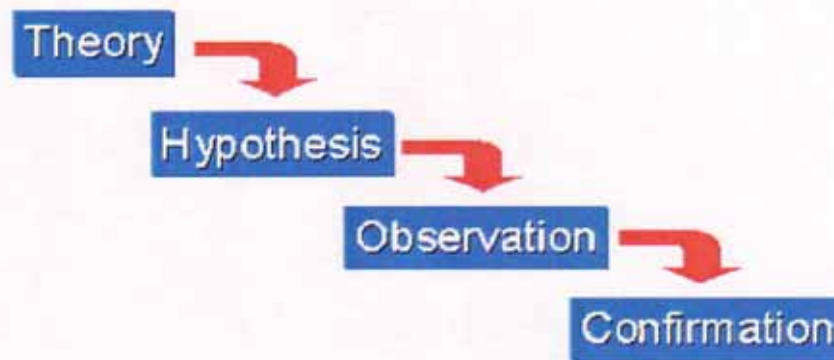
Ramsey argues that it is important that this increase is directed by a coherent grasp of the methodological issues that underlie empirical research, particularly when applied in social systems like companies.¹³⁶ Ramsey's argument emphasises the importance of the research design methodology and makes this section also an important one, as it explains the different data collection methods and analysis techniques. A good research methodology and procedure enables research validity and reliability and other researchers to repeat the research and generate comparable results.

3.2 DEDUCTIVE/INDUCTIVE APPROACH AND RESEARCH PLURALISM

The deductive, or 'top-down', approach starts with the general themes, and then expands upon them with time (Trochim, 2002).¹³⁷ It begins with thinking up a theory about a topic of interest, which is narrowed down into more specific statements that can be tested. The narrowing down continues when observations are collected to address the statements. Eventually the deductive approach leads to test the statement with specific data whether or not it is a confirmation of the original theories.

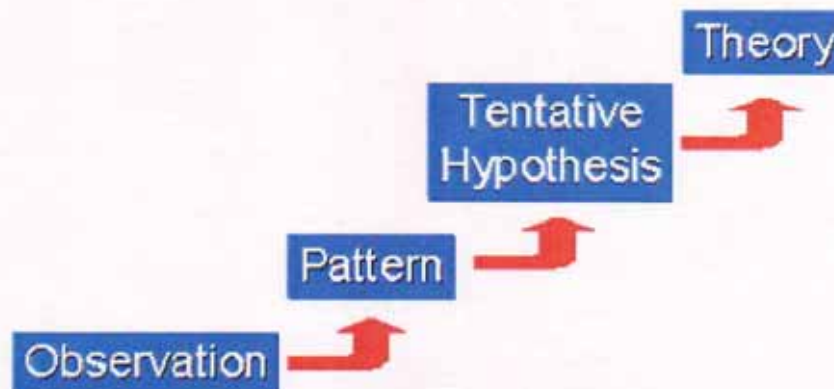
¹³⁶ Ramsey (1998) does not suggest that researchers must all become expert methodologists, but they ought to be aware of the way in which their chosen methodology affects the nature of any conclusions that they can draw from their research.

¹³⁷ See Trochim, 2002, at <http://trochim.human.cornell.edu/kb/dedind.htm>

Figure 13: Deductive Approach

Source: Trochim, 2002, at <http://trochim.human.cornell.edu/kb/dedind.htm>

By contrast, an inductive approach, also called ‘bottom up’ approach, moves from specific observations to broader generalisations and theories. An inductive approach begins with specific observations and measures, and continues to detect regularities and patterns. It can formulate then some tentative hypotheses to be explored, and eventually closes by developing some general conclusions or theories.¹³⁸

Figure 14: Inductive Approach

Source: Trochim, 2002, at <http://trochim.human.cornell.edu/kb/dedind.htm>

An inductive approach, by its very nature, is more exploratory and open-ended, particularly at the start. Deductive reasoning is narrower in its nature and its prime concern is to test or confirm hypotheses. Malhotra and Grover (1998) argue for a middle ground that involves a symbiotic interaction between deductive and inductive approaches, theory building and testing, as well as exploratory and explanatory research.

¹³⁸ The inductive approach is closely related to qualitative research.

This research, as most social research, includes both inductive and deductive reasoning processes as well as both quantitative and qualitative research at some times. It follows the 'empirical cycle' of Van Aken (1999): observation, induction, deduction, testing and evaluation. Even in very constrained experiments, researchers may observe regularities or patterns in the data that lead them to develop new theories. However, there is a strong element of the positivist view of research in this study with strong emphasis on validity and reliability and when the process is directed toward the development of theory, which is generalisable across settings.

The positivist perspective is founded on an ontology in which an objective physical and social world exists independently of humans' knowledge of it. Positivist research focuses on the empirical testability of theories in order to discover the general principles or laws, which govern the natural and social world (Orlikowski and Baroudi, 1991). Research within this stream is designed and evaluated according to criteria of the natural science model of research: controlled observations, controlled deductions, replications and generalisability (Darke et al., 1998). In general, positivist research attempts to test theory in order to increase the predictive understanding of phenomena, based upon the evidence of formal propositions, quantifiable measures of variables and testing of hypotheses, as well as inference drawing about a phenomenon from a sample to a population.

In the interpretivist approach, on the other hand, reality is subjective and a social product is constructed and interpreted according to beliefs and value systems. Unlike positivism that attempts to separate social values from facts and provide empirically verifiable explanations of reality, interpretivism accepts the bond between values and facts and attempts to comprehend reality within a social context. Myers (1997) notes that interpretive researchers begin with the assumption that reality access (given or socially constructed) is only possible through social constructions such as language, consciousness or assigned meanings. Although interpretive research is not limited solely to the employment of qualitative methods, they are recognised as the methods most typically used. Interpretive research does not predefine dependent and independent variables, but attempts to gain a deep understanding of the phenomena being investigated, and acknowledges their own subjectivity as part of this process (Kaplan and Maxwell, 1994).

This research follows more closely the positivist epistemology in an attempt to augment the predictive understanding of the EPC phenomena. However, there are also some elements of the interpretivist approach in the case studies and the research strategy for this original project is, therefore, principally one of methodological pluralism.

The study tries to combine deductive and inductive and quantitative and qualitative approaches. Both surveys and case studies have been chosen as instruments in order to develop original research on EPC. Strauss (1987) and Van Maanen (1988) stress that a rich, complex description of the specific research should evolve. That is one of the reasons why case study and survey approaches have been selected for the research study. Five explorative multiple case studies with replication logic based on the research constructs were chosen to highlight the commonalties and differences in EPC structures, adoption motivators and performance indicators, while the surveys were developed for hypotheses testing.

Malhotra and Grover (1998) explain that there is an increasing pressure on business research to generate 'relevant' research. This recognition has triggered the importance of field-based research in which information is gathered from the social setting or business context in which practice occurs. By moving the study to a PhD level, all approaches available for undertaking quantitative and qualitative field research and their suitability to this study had to be evaluated.

3.2.1 Case Studies

McCutcheon and Meredith (1993) make the case that the gap between what academics were assuming and the real condition of operations management led to growing disparities between operation management research's prescriptive advice and workable answers for managers (see also e.g. McKay et al., 1998, according to McCutcheon and Meredith). They continue to argue that a prime means of developing well grounded theories is through empirical, field-based research.

The author regarded case studies as one methodological approach to electronic purchasing consortia. McCutcheon and Meredith (1993) argue that, under the circumstances, where there is little theoretical background and where the researcher might

not know which conditions are relevant or important, the case study approach may be the only available means of investigating a problem. In the specific case of EPC, there is very little literature to build on and that is one of the reasons why the case study approach has been selected.

In case studies the creative research process proceeds in a constantly iterating cycle of deduction and induction and final verification. Yin (1994) describes case studies as empirical inquiries that investigate contemporary phenomenon within real-life contexts where the investigator has little control over events. Bell (1992) explains that case study research operates very similar as other research approaches:

"Evidence is collected systematically, the relationship between variables is studied and the study is methodically planned".

A case study approach is particularly appropriate in new topic areas (Yin, 1994; Eisenhardt, 1989). According to Feagin, Orum and Sjoberg (1991), a case study approach is an ideal methodology when a holistic and in-depth investigation is required. Tellis (1997) notes that Yin (1993) recognised the specific types of exploratory, explanatory, and descriptive case studies.¹³⁹ The research design in this study focuses on descriptive and exploratory case studies. Descriptive and exploratory case studies generally provide a starting point where there is relative lack of theory. Due to the current gaps in academic analytical literature concerning EPC, five multiple case studies of exploratory investigation were developed, aiming to identify main characteristics and major parameters regarding the emergence and development of EPC in the automotive and electronics sectors.

A descriptive case study seeks to express the context of a research event and presents a picture of its specific details.¹⁴⁰ Exploratory case studies are typically regarded as a prelude to social research and may have, as McCutcheon and Meredith (1993) put it, a priori theory that is used to select case studies and the constructs to be examined. An exploratory case study's goals are to elaborate a well-grounded picture of occurrences, to

¹³⁹ Stake (1995) included: Intrinsic (when the researcher has an particular interest in the case); Collective (when a group of cases is studied); Instrumental (when the case is used to understand more than what is obvious to the observer).

develop tentative theories and frame questions for further research. McCutcheon and Meredith (1993) further explain that exploratory case studies usually focus on theory development. They explain that it may be helpful to select several very different settings, through deliberate 'theoretical sampling'. For this reason, five multiple case studies were chosen with regard to different EPC trading mechanisms and parameters in order to contrast conditions that help to frame operational measures (McCutcheon and Meredith, 1993).

McCutcheon and Meredith (1993) cite Yin (1989) that explanatory case studies are designed to determine 'how' or 'why' events occur and for building causal investigations, thereby raising doubts about existing theories. Explanatory case studies could not be used for this particular study, because theory and constructs in the literature to EPC are not yet designed well enough. The author recognised that, due to the gaps in the literature concerning EPC, descriptive and exploratory case studies are needed in order to understand the context to EPC and generate theories.¹⁴¹

Yin (1989) states that explorative research with a variety of unknown elements is best conducted by means of a case study approach, using either a single case study or multiple case studies. Single cases may be employed to represent a unique or extreme research case or to confirm or challenge a theory (Yin, 1994). Single case studies can also be well suited for revelatory cases where a researcher may have access to a phenomenon previously inaccessible.¹⁴² Multiple-case studies may follow a replication logic.¹⁴³ Each

¹⁴⁰ See Stewart, 1999, at http://www.business.vu.edu.au/sapconf/Paper16_stewart.doc

¹⁴¹ Tellin (1997) explains that Yin also presented some other possible analytic techniques such as pattern-matching, explanation-building and time-series analysis. Pattern-matching compares empirically based patterns with predicted ones. In the case that patterns match, the internal validity of the research is enhanced. Explanation-building is considered a form, in which the analysis of a case study is carried out by developing an explanation of the case. This would imply that this approach is most useful in explanatory cases, but it is possible to make use of it for exploratory case studies as well as an element of a hypothesis developing process. Explanation-building techniques are focused on iterative processes that begin with a theoretical statement, then refine it, revise the proposition, and repeat this process from the beginning. Explanation-building is recognised to be one of the techniques, which is fraught with problems (e.g. loss of focus). Time-series analysis is a technique in experimental or quasi-experimental analysis. None of these additional analytic techniques were used in this research.

¹⁴² These studies can be embedded or holistic. Embedded occurs when the same case study contains more than one unit of analysis.

¹⁴³ This should not to be confused with sampling logic. This type of sample selection is usually inappropriate in a case study.

individual case is comprised of a 'whole' study, in which data is gathered from a variety of sources and conclusions and recommendations drawn on the data.

Bourgeois and Eisenhardt (1988) note that while a multiple case design is more demanding than a single case, it permits introduction of more reliable models. Explorative multiple case studies with replication logic were found to be most appropriate for this study to supplement survey data. They focus in this study on useful cases that can extend theory by filling conceptual categories, as outlined in the research constructs.

Eisenhardt (1989) proposes that, while there is not an ideal number of cases, a number of case studies between 4 and 10 cases is usually suitable. Wolcott (1994) speaks for single case studies and criticises multiple case studies because they would often diminish the total attention that can be devoted to an individual case and thereby forsake opportunities for a thorough study. While comparisons of multiple case studies might lead to new theory emergence in the form of general patterns, single case studies might lead to the building of more creative theory. However, external validity may be more difficult to achieve in a single case study.¹⁴⁴

Due to the complexity of the topic of EPC, the case studies may sometimes intentionally differentiate in context, thereby emphasising and documenting the diversity and complexity in the field of EPC. The case research shall be regarded as a means for empowering theory.¹⁴⁵ The case studies were chosen for their illustration of particular isolated constructs associated with EPC and follow the research construct framework. The main strength of the case study approach is that the observer can be enabled to find data of relevance for the investigation of a certain phenomenon, in this case EPC, and to use the data as knowledge that might help to add to the existing perspectives into, and concepts of purchasing consortia or ICT / IOS.

¹⁴⁴ Yin (1994) specified that external validity can be achieved from theoretical relationships. From these generalisations can be prepared.

¹⁴⁵ A case can then be more than a single example on existing theoretical points. It can be the driving force of conceptual developments.

Thus, the main rationale for having chosen the case study approach as research design is that it can be useful for enlarging existing theory and creating new insights.¹⁴⁶ In case studies empirical reality is typically studied in terms of only a few research objects, since the purpose is not to make statistical generalisations but the promotion of profound understanding and analytical generalisation.¹⁴⁷

Typically for case studies, the use of observation and interviews is employed for data collection. Yin (1994) named six sources of evidence for data collection: documentation, archival records, interviews, direct observation, participant observation, and physical artefacts. According to Bell (1992), the methods used for collecting data are typically selected with regard to the suitability of the task.¹⁴⁸ Not all sources of evidence have to be used in every case (Yin, 1994). In this study, direct observation, participant observation and physical artefacts were not relevant, because they are related to direct sociological investigation. Table 5 indicates the strengths and weaknesses of documentation, archival records and interviews:

Table 6: Types of Evidence for Case Study Research

Source of Evidence	Strengths	Weaknesses
Documentation	<ul style="list-style-type: none"> ➤ stable repeated review ➤ unobtrusive ➤ exist prior to case study ➤ exact names etc. ➤ broad coverage ➤ extended time span 	<ul style="list-style-type: none"> ➤ retrievability difficult ➤ biased selectivity ➤ reporting bias reflects author bias ➤ access may be blocked
Archival Records	<ul style="list-style-type: none"> ➤ same as above ➤ precise and quantitative 	<ul style="list-style-type: none"> ➤ same as above ➤ privacy might inhibit access
Interviews	<ul style="list-style-type: none"> ➤ targeted ➤ focuses on case study topic ➤ insightful ➤ provides perceived causal inferences 	<ul style="list-style-type: none"> ➤ bias due to poor questions ➤ response bias ➤ incomplete recollection ➤ reflexivity (interviewee expresses what interviewer wants to hear)

Source: Yin, 1994, p. 80.

¹⁴⁶ The case study approach enables a model to be constructed, which can illustrate patterns and relationships of interaction between variables. Case studies also allow the investigator to make use of “controlled opportunism” in order to flexibly react to new discoveries made while collecting new information or data (Eisenhardt, 1994).

¹⁴⁷ Case studies are based on multi-perspectival analyses. In this context, the investigator considers not only the voice and perspective of the actors, but also the related groups of actors and the interaction between them. This facet is a salient point in the characteristics that case studies have.

¹⁴⁸ Tellis (1997) states that no single source has a total advantage over the others. Rather, they can be used in tandem and complementary.

The data for the case studies mainly derived from interviews and discussions in various organisations, internal and external documents and press releases. Tellis (1997) cites Yin (1994) that documents could be any items that could add to the database such as study reports, letters, agendas or memoranda. The validity of all documents should be cautiously reviewed in order to avoid incorrect information or data being included in the case study. The potential for over-reliance on documents as evidence is a typical concern in case studies. There might be a danger of this occurrence in the case that the researcher is inexperienced and mistakes some document data for unmitigated truth (Yin, 1994). Archival records can also be useful in case studies since they may include e.g. maps, charts, lists of names, service records or survey data.¹⁴⁹

The author started with the analysis of documents and archival records. According to issues reflecting or informed by matters arising from gaps in internal data or documents with specific regard to the research constructs outlined, focused interviews have then been used to address the gaps. Interviews are regarded as one of the most important sources of case study data gathering and can take one of the three forms: open-ended, focused or structured.¹⁵⁰

As McCutcheon and Meredith (1993) recommend, interviews may be focused to ensure coverage of key topics but the interview format should generally be open-ended, thereby allowing the investigator to analyse areas that come to light during the course of discussion. In this way, focused case study interviews according to the outlined research constructs were conducted.

The case study approach provides an opportunity for the intensive examination of many specific details and for the gathering of rich information on EPC.¹⁵¹ The researcher also wished to gather descriptive, qualitative data in great detail in order to study and analyse electronic purchasing consortia. Careful case study selection was required to ascertain the validity of the conclusion from the studies (Yin, 1994). Case studies are often criticised as

¹⁴⁹ The researcher should be thorough in determining the origin of documents and archival records and their accuracy.

¹⁵⁰ In open-ended interviews, investigators can ask for the informant's opinion on facts or events. This could be useful to corroborate formerly gathered data.

¹⁵¹ Several papers give justification for using case study approaches as a methodology while researching aspects of the information technology field (e.g. Benbasat et al., 1987; Gillham & Buckner, 1997; Lee, 1989; Markus, 1983; Walsham & Waema, 1994).

some researchers consider that this method lacks rigour and provides little basis for scientific generalisation.¹⁵² But as the area of EPC is just evolving, the researcher utilised case studies to give an outline of what is currently and has most recently occurred in this particular field and would aid the research process.

Case studies are also traditionally criticised for their lack of standards. However, Stake (1995) expected that the information generated by case study approaches would frequently resonate with a large cross-section of readers and thereby facilitate a greater comprehension of a phenomenon.¹⁵³ The case research methodology was chosen because it fulfils the objectives of the research, can provide rich data and new insights into an area with a low level of theory and is appropriate to the nature of the problem. As McCutcheon and Meredith (1993) put it: *"(...) embracing a field investigation technique such as case studies is bound to make the individual researcher, and the field in general, richer and better prepared to solve real operations management problems."*

3.2.2 Survey Designs

Surveys may be defined as conducting research by the use of pre-coded written questionnaires or structured interviews. Survey designs are procedures in quantitative research in which researchers administer a survey to a sample or to the population in order to describe its attitudes, opinions, behaviours or characteristics. From the results of the survey, the researcher can describe conclusions and make claims about trends in the population. Rozemeijer (2000) points out that a typical survey usually involves a large number of participants (at least 40 to 50), generates more general than in-depth information, and on the data various quantitative (statistical) analyses can be performed (see also Tabachnick and Fidell, 1996).

Malhotra and Grover (1998) note that both exploratory as well as explanatory survey research is being conducted. The surveys in this study focus on both explorative and

¹⁵² Tellis (1997) notes that case studies as a research tool have not been listed in the major research texts in the social sciences and the issue of generalisation has appeared in the literature with regularity.

¹⁵³ Case studies can be reliable methodology approaches when executed with due care. Yin (1994) specified at least four applications for case studies: To clarify complex causal links in real-life interventions; to illustrate the real-life context in which the intervention occurred; to portray the intervention itself; and to discover the situations in which the intervention being analysed has no obvious set of outcomes.

explanatory research in order to address the literature gaps to EPC and provide a second conceptual framework. The concepts of interest to EPC need to be better understood and measured. The resulting data can then be refined to identify new possibilities and dimensions of interest (Malhotra and Grover, 1998). The explanatory part of the surveys is used to find causal relationships among variables. The results then can be interpreted and contribute to theory development with regard to the research questions.

Two cross-sectional written questionnaires were developed for purchasing organisations as well as for e-Marketplaces and PSPs in the automotive and electronics industry sectors. The reason for two questionnaires is to detect any significant differences between purchasing organisations and e-Marketplaces / PSPs, e.g. to contrast e-Marketplace / PSP offerings to companies' expectations.

In developing the questionnaires the author used an interactive developmental approach. At the beginning, the first draft questionnaires were specified based on the insights drawn from the literature study. Secondly, the draft questionnaires were discussed with a group of academics and tested among practitioners. Finally, the author came up with the final questionnaires. For questionnaires in general, there are two types of response alternatives: forced-choice (e.g. yes/no items, rank order scales or likert-type scales) or open-ended. Both forced-choice and open-ended text questions have been used in the surveys. Both surveys closely reflected the defined research constructs.

The survey instrument for e-Marketplaces and PSPs is a standardised questionnaire composed of 40 multiple choice questions, 13 numeric questions and 4 open-ended text questions (contact information not included).¹⁵⁴ The survey questions can be grouped into 5 categories of information: e-Marketplace / PSP profile; e-Procurement services; pricing tools; information on suppliers; e-Marketplace / PSP background.

The survey instrument for purchasing organisations in the automotive and electronics industry sectors is a standardised questionnaire composed of 45 multiple choice questions, 13 numeric questions and 2 open-ended text questions (contact information not

¹⁵⁴ E-Marketplaces / PSPs in the following industry sectors were included: automotive, electronics, metals, plastics, and ORM / MRO. Metals, plastics and ORM / MRO are closely related to the

included). The survey questions can be grouped into 5 categories of information: company profile; procurement spend analysis and organisational structure; e-Procurement take-up and pricing tools; information on suppliers; company background.

Questionnaires were electronically sent to the population of 196 international e-Marketplaces and procurement service providers in the specified industry sectors.¹⁵⁵ The Internet can dissolve boundaries and facilitated the connection to e-Marketplaces and PSPs on a global basis for the author. Therefore, a widespread international online census survey of e-Marketplaces and PSPs could be implemented.

A survey piloting among purchasing organisations was conducted, whereby a pilot sample of 60 randomly selected purchasing organisations in Germany and Ireland were invited by e-Mail to participate in the survey. A response rate of 13.3% resulted and the feedback indicated that the EPC variables in the questionnaire were sound. The sample size needed to be estimated in the design phase of the research. To take a larger sample than is needed to achieve the desired results is wasteful of resources, whereas very small samples often lead to no practical use in hypotheses testing. The statistics computed from the pilot sample helped in determination of the target sample. Observations used in the pilot sample were counted as part of the final sample, so that the computed sample size minus the pilot sample size is the number of observations needed to satisfy the total sample size requirement.

A total population of 3548 Irish and German purchasing firms in the automotive and electronics industry could be identified from established industrial database listings.¹⁵⁶ A sample size calculator was used to determine which sample size was required to get results that reflect the target population.¹⁵⁷ The author followed a 95% confidence level so that the results would be accurate within a +/- 8% confidence interval. A sample size of 144 firms was suggested based on these parameters. To determine how many surveys need to be distributed the above number was divided by the anticipated response rate of 40%. A required target sample of 360 purchasing organisations resulted and, therefore,

automotive and electronics industries because purchases in these sectors can represent an important element to purchasing strategy in the automotive and electronics industry.

¹⁵⁵ E-Marketplaces / PSPs were identified from the following databases:

<http://www.b2business.net/eMarketplaces/> as well as <http://www.berlecon.de/services/b2bdb>

¹⁵⁶ Databases included: www.kompass.com and www.goldenpages.ie

the author decided to include 400 firms in the target sample. Fornell (1983) argues that too large samples should be avoided, as in large samples any null hypothesis may be rejected and, thus, the goodness of fit statistic will always be significant.

Therefore, questionnaires were initially electronically mailed to the overall target sample of 400 purchasing organisations in the automotive and electronics industries in Ireland and Germany, both MNEs as well as SMEs selected by multistage sampling. This was to ensure expected response rates, as well as a wide geographical and industrial spread. Multistage sampling is a more complex form of cluster sampling and is based on probability or random sampling.¹⁵⁸ Both cluster sampling and stratified sampling have been used for the design of the sample target of purchasing organisations. Using the entire world-wide population of firms operating in the electronics and automotive industry would be prohibitively expensive in terms of resources.¹⁵⁹ Under these circumstances, multistage cluster sampling becomes useful, where two geographical clusters were first chosen (purchasing organisations in Germany and Ireland).

The goal was to achieve a target sample of 400 purchasing organisations in the automotive and electronics sector (100 in Germany and 100 in Ireland in each sector). Therefore, stratified sampling was used as a next step in order to partition the two clusters into the particular subgroups of interest. This method was used to select equal numbers from each of the identified subgroups and to enable comparisons between the subgroups. The purpose of stratified sampling was to guarantee the desired distribution of 100 targeted firms from each of the selected subgroups of the population of 108 Irish and 1347 German firms in the automotive industry and 228 Irish and 1865 German companies in the electronics industry (identified from the database listings). The subsamples were not proportional to their sizes in the population. This oversampling (or so called disproportional) stratified sampling was carried out to ensure reliable estimates for each stratum and to improve intergroup comparisons.

¹⁵⁷ Sample size calculator at <http://www.surveysystem.com/sscalc.htm>

¹⁵⁸ See Brannick and Roche, 1997.

¹⁵⁹ Successive approximations could be done from the database listings that a population of roughly 35,000 firms operate on a global basis in the electronics industry and approximately 30,000 in the automotive industry.

Deploying stratified cluster sampling, the target frame of 400 companies was chosen from the database listings by using a random number generating software.¹⁶⁰ Each firm in the respective stratum was given a number and the software generated 100 random digits between the population size of each stratum. The target sample in each stratum was identified by using the random digits.

Through careful design of data collection, the researcher attempted to decrease bias.¹⁶¹ Probability sampling techniques can augment the likelihood of accomplishing this goal. An essential element in probability sampling is random selection that was used to identify the target sample of purchasing organisations. Sampling procedures have not been necessary for the survey of e-Marketplaces / PSPs as they represented the population identified in online databases. At the end of the data collection, a data cleaning was conducted to check inconsistencies and ranges. To detect differences, a range of tests (such as chi-square, t-tests, analysis of variance, Pearson correlation, multiple regression or logistic regression) were employed to calculate the significance of differences and relationships for hypotheses testing.

For the interpretation of statistical tests, the conventional rules of thumb for social sciences were followed. The following lists the interpretations for various correlation coefficients: 0.8 to 1.0 = very strong; 0.6 to 0.8 = strong; 0.4 to 0.6 = moderate; 0.2 to 0.4 = weak; 0.0 to 0.2 = very weak. In addition, the significance probability was also checked to ensure that the correlation found cannot be explained away as merely a chance happening. The F-statistic is a test of significance used as analysis of variance tool and also as a regression tool. The p-value for the F test statistic was based on less than 0.05 in order to provide evidence against the null hypothesis. The significance tests assume a normal distribution of the type bell-shaped, which can be assumed for the distribution of variables in the total population. Cronbach's alpha was assessed for all latent constructs to ensure research reliability. When unidimensionality of latent constructs was required, convergent and discriminant validity were tested. The main software packages used for the survey data were Sphinx-Survey and SPSS.

¹⁶⁰ Software at <http://www.randomizer.org/form.htm>

¹⁶¹ The goal when obtaining a sample is to choose elements from the population in such a way that the chances of the sample being representative for the population can be enhanced.

In addition to the surveys and case studies, other data collection methods have also been evaluated for the research methodology. The study contains small elements of both action research and ethnography as well:

3.2.3 Action Research

Action research is more oriented towards a practical and problem-solving approach to research and is typically carried out over a longer period of time (Bell, 1992). The action researcher is immersed in the setting and becomes involved in intervening in a situation and attempting to bring about change (Checkland and Holwell, 1998). Action research is most useful for studies which request specific knowledge for specific problems within specific situations or environments. It is frequently used as an element of a problem solving approach in research (Silverman, 1993). In most of its forms action research uses cyclic or spiral processes which alternate between action and critical reflection. In the later cycles, methods, data and interpretation are continuously refined in the context of the understanding formed in the earlier cycles. Therefore, it is an emergent process, that takes more and more shape as understanding increases. It is also an iterative process that converges towards a better analysis of what happens.

Typically, action research is also qualitative and participative as change is more often than not easier to attain when the people affected by the change are involved. Traditionally action research is more used within organisational or educational research than within information technology (Myers, 1997). In one case study, the author did not only conduct interviews, but also actively participated in workshops initiated at the firm level to improve EPC practice. Therefore, there is also a small element of action research in the research.

3.2.4 Ethnography

Ethnographic research is derived from the discipline of social and cultural anthropology in which an ethnographer needs to spend a significant amount of time in the research field. Therefore, the main difference between case studies and ethnographic research is the extent to which a researcher immerses himself or herself in the life of a social group under study. Ethnographic designs are qualitative procedures for describing, analysing,

and interpreting a cultural group's mutual patterns of language, behaviour or beliefs, and are developed over time. The ethnographer can also situate the group within its setting, thereby exploring issues or themes as the group interacts and detailing a portrait of the group. Typically, anthropologists wishing to research aspects of society or culture in depth originally developed the ethnographic approach to research. By the use of participant observation the investigator would try to integrate with the unit by emerging himself or herself in the field under study to analyse phenomenon within its context and environment (Silverman, 1997).

To date this approach is not longer restricted to anthropological studies and is also used within other scientific fields (Myers, 1997). The financial costs and time allocation can turn out to be quite significant for this approach. Therefore, the ethnographic approach was not very much suitable for the area under study. However, there is still a small ethnographic element in this study. The information required for this work was collated with the need for in depth interviews with purchasing and e-Marketplace / PSP managers.

3.2.5 Grounded Theory

Grounded theory is a methodology approach for building theory that is based on systematically collected and analysed data (Strauss & Corbin, 1994). Theory is developed through the repeated interaction of analysis and data collection. Silverman (1993) explains this process in three stages:

1. *There is an initial attempt to develop categories for analysis.*
2. *These categories are then 'filled' with cases to demonstrate the relevance of these categories.*
3. *Once filled, these categories are developed into more generalised, analytical frameworks.*

In the grounded theory of analysis, Strauss (1987) states these three aspects of inquiry are referred to as induction, deduction, and verification.¹⁶²

¹⁶² Verification is the total or partial qualification or negation of a hypothesis.

"Few working scientists would make the mistake of believing these stood in a simple sequential relationship.... Many people mistakenly refer to grounded theory as "inductive theory"... All three aspects of inquiry (induction, deduction, and verification) are absolutely essential" (Strauss, 1987).

Grounded theory is based on systematic and qualitative procedures that researchers make use of to develop a theory that illustrates, at a rather broad conceptual level, a process or interaction about a substantive issue. The procedures for generating this theory comprise collecting primarily interview data. The data is used to develop and relate categories (or themes) of information, and compose a figure or visual to portray the theory. By doing so, the theory is "grounded" in the data from participants.¹⁶³ Grounded theory can be of assistance in situations where relatively little is known about a topic or problem area. It also can generate new information in settings that have become static or stale. Charmaz (1990, p.38) explains on how grounded theorists construct theory from data.

"By starting with data from the lived experience of the research participants, the researcher can from the beginning attend to how they construct their worlds. That lived experience shapes the researcher's approach to data collection and analysis. In comparison, more traditional logical-deductive approaches explicitly derive hypotheses from pre-existing theories, what fundamentally structure both the data collection and analysis toward verification or refutation of these hypotheses."

By grounded theory, the research attempts to derive a theory by taking advantage of multiple stages of data collection and the respective refinement of categories of information (Strauss & Corbin, 1994).¹⁶⁴ The derivation of codes, concepts and categories is a complex process. Whereas traditional research designs rely on a review of literature leading to the formation of hypotheses, Glaser and Strauss (1967) insisted that a grounded theory research should have no pre-conceived ideas or hypothesis. Theory is then grounded in the data because it came from nowhere else. Critics of grounded theory argue that it fails to acknowledge implicit theories and is more precise about the generation of

¹⁶³ From the theory the researcher can construct hypotheses and predictions.

the theme than the tests itself (Silverman, 1993).¹⁶⁵ Therefore, the grounded theory approach was not chosen for this study.

3.2.6 Triangulation and Mixed Method Designs: Justification for the Methodology

The concept of triangulation argues for a combination of methodologies in the study of the same phenomenon and is based upon the assumption that any bias could be neutralised when used in conjunction with other data sources, investigators, and methods.¹⁶⁶ The justification for the use of multiple sources of information is the triangulation of evidence, which can increase the overall data reliability and the process of gathering it. Denzin (1984; cited in Tellis, 1997) identified four types of triangulation:

“Data source triangulation, when the researcher looks for the data to remain the same in different contexts; Investigator triangulation, when several investigators examine the same phenomenon; Theory triangulation, when investigators with different view points interpret the same results; and Methodological triangulation, when one approach is followed by another, to increase confidence in the interpretation.”

Data and methodological triangulation was chosen to ensure internal validity. With a mixed-methodology design, the researcher can mix aspects of qualitative and quantitative paradigms. The combination of surveys and case studies is important to resolve some ‘power driven’ research. Surveys usually give a rather broad view and generalised knowledge, whereas case studies provide rich and in-depth information. Eisenhardt (1989) notes that the qualitative data from the case studies are particularly useful for understanding why or why not emergent relationships hold. In surveys, the scope of information is often emphasised at the expense of depth. By the combination of both case studies and surveys the author tries to examine EPC from two different angles in order to provide a better conceptual framework of EPC. The author decided that the research

¹⁶⁴ Two primary characteristics of this design are the constant comparison of data with emerging categories and theoretical sampling of different groups or maximise the similarities and the differences of information.

¹⁶⁵ A high level of the researcher’s theoretical sensitivity is a fundamental requirement for successful studies that make use of grounded theory.

carried out in the process of gathering data is based on a multi-method mix, which is strongly supported in the literature (e.g. Eisenhardt, 1989; Gable, 1994; Galliers, 1991; Lee, 1991; Ramsey, 1998; Ragin, 1987; Robey, 1996). By the combination of qualitative and quantitative data a synergistic perspective of evidence can be achieved (Eisenhardt, 1989). The multiple data collection methods may strengthen the theory grounding by the triangulation of evidence.

Ramsey (1998) warns for embracing only quantitative methods, as in his opinion unfortunately many established disciplines have done. Researchers often decide to pursue either a purely qualitative or a purely quantitative approach of data collection and analysis. In deciding on the methodology for this research the author was well aware of the benefits and limitations of either methodological approach. For example, case studies and other qualitative forms have long been criticised for their limitations in terms of generalisability to a larger population and the lack of sampling controls. By choosing a multi-method mix for the research the author hopes to minimise the disadvantageous effects of either approach, while taking advantage of the creative potential of qualitative techniques as well as the analytics of quantitative techniques.

The author also preferred to carry out the research, at least for a large part, through studying real life cases in order to understand the complexity of the problems related to realign EPC and help to develop directions for improvement. However, Rozemeijer (2000) points out that in the field of purchasing and ICT there are many publications based predominately upon authors' own experiences to date, for which there is a generalisation problem on what to learn from this experience for other situations. Quite a number of publications are largely anecdotal and do not provide a systematic framework to electronic purchasing consortia. Also, there are an increasing number of publications by consultants, for which there is traditionally a justification problem. The consultants' publications may perhaps be very relevant, but may not be of high academic quality. To

¹⁶⁶ According to Rozemeijer (2000b) and Ramsey (1998), combining different research instruments is perhaps the most powerful method of testing the reliability and validity of research finding on open social systems like purchasing organisations and e-Marketplaces / PSPs.

achieve the required academic quality, the author has deliberately chosen different research approaches for studying EPC, data collection methods and methodologies.¹⁶⁷

Using more than one data gathering approach can increase the reliability of the research results. Moreover, the author consulted practitioners and academics involved in the research for feedback, stayed closely connected with state-of-the-art literature and presented and discussed the findings in several refereed journal publications and international research conferences. The following chronological time frame illustrates the overall development of this study and its methodology.

3.3 RESEARCH TIME PLAN

Phase I (Oct. 2000 to April 2001) Preliminary Literature Review:

The initial research and preliminary literature review was conducted in phase I. It was investigated that substantial research gaps existed with regard to the relationship of purchasing consortia and ICT / IOS. Therefore, an extensive review was conducted on how to situate and explain EPC in academic literature. Appropriate international literature was classified in the bibliography section. A detailed research proposal was set up.

Phase II (May to Oct. 2001) Statement Development and Questionnaire Design:

On the basis of the initial literature review, the overall statement and its respective constructs were identified and set up. Two questionnaires were developed and designed for purchasing organisations as well as for e-Marketplaces and PSPs in the automotive and electronics industry sectors. Both questionnaires were pre-tested with purchasing and ICT-professionals for comprehension, clarity and logical flow. This process led to slight adaptations and clarifications in relation to the wording and structure of the questionnaires. Furthermore, the interviews provided insight in developing of an online survey. The pre-testing was the proving ground for question wording and style, sequence and physical layout. A shortening of the questionnaires has been done in the testing phase. The longer the questionnaires, the more likely it is that respondents get frustrated and speed up with a potential decline in data quality. In addition to a reduction of questions, several of the question wordings were revised after reviewing pre-test

¹⁶⁷ For the interpretation process, the researcher has to speculate about the data in order to generate ideas, link ideas with those of others and move conceptually from the research setting to a more general

respondents' reactions. A number of format and other minor changes were also made following the pre-tests.

Phase IV (Oct. to Dec. 2001) Coding and Set up of Internet Questionnaires:

On the basis of the outcomes of the interviews, content, format and style of both questionnaires were further improved to address the overall statement and respective research constructs. A co-operation with the Irish Institute of Purchasing and Supply (IIPMM) was initiated. Questionnaire testing was continued by means of face-to-face interviews and consultation with various experts in the field of e-Procurement and purchasing consortia. The framework for statistical data analysis was prepared. All questions were coded in a database to facilitate the analysis. Both questionnaires were set up online on the NITL and IIPMM websites for continuous data investigation. Participants could fill out the questionnaires remotely with an assurance that responses would remain confidential. The data could be automatically collected and transferred to appropriate statistical packages (Sphinx-Survey and SPSS).

Phase V (Dec. 2001 to Dec. 2002) Data Collection:

The databases with the contact addresses of e-Marketplaces / PSP and purchasing organisations were created. Questionnaires were electronically sent to the population of 196 international e-Marketplaces and procurement service providers in the selected industry sectors. The survey piloting among 60 randomly selected purchasing organisations started and the feedback indicated that the EPC variables in the questionnaire were sound. Therefore, electronic questionnaires were mailed to the overall target sample of 400 purchasing organisations in the automotive and electronics industries in Ireland and Germany, both MNEs as well as SMEs selected by multistage cluster sampling. To keep survey bias under control and measurable, the sampling was done by a random method. To cover the population adequately or accurately, duplicate listings (elements appearing more than once on the sampling frame) were deleted. Provisions were made for dealing with non-response. Some non-response, both through refusals and non-contacts, is unavoidable, but there are ways of reducing its magnitude of estimating the effect of the non-response that remains upon accuracy of the results. Techniques to encourage maximum participation included the following:

- The inclusion of a short introduction to the survey (see appendix A).
- The willingness to schedule appointments to conduct the interview by phone at the convenience of eligible respondents.
- The offering of a free mailing of results and key findings.

Repeated reminders and follow-ups by e-Mail have been carried out to increase the response rate. Exclusively for the survey of purchasing organisations, a second follow-up has been done by sending the questionnaire by mail to non-respondents.¹⁶⁸ The last follow-up comprised telephone interviews. The procedure to increase the response rate and to obtain non-response tests was an integrative process. As there is not sufficient secondary data available to enable a non-respondent analysis, they were contacted to provide data for the level of current and future EPC implementation. This process could provide the grounding for a non-response analysis. In the case that the population of interest developed a genuine interest in the findings of the surveys and could be encouraged to fully participate in the surveys, the response rate for the surveys could be increased. The final data set facilitated a comparison between respondents / non-respondents. Significance comparisons between the means of the two groups had to be made. An alternative route to non-response was assessed by comparing between the early and late respondents (Armstrong and Overton, 1976). While the author regards this latter alternative route as being weaker to resolve validity and reliability issues, the time consuming combination of both routes enabled a satisfactory non-response test. Besides the data collection, a further literature revisit was conducted.

Phase VI (Dec. 2002 to Aug. 2003) Statistical Analysis of Survey for e-Marketplaces/PSPs and Development of Case Studies:

Data collected as a result from the survey of e-Marketplaces / PSPs drew first conclusions. Responses for the survey of purchasing organisations were still received in this stage. A statistical analysis was carried out based on the observations from the e-Marketplace / PSP survey. In this phase, extensive case study interviews were conducted and the foundation was prepared for three EPC case studies. Document analysis and focused interviews have been carried out in terms of the research constructs. The research literature was again revisited.

¹⁶⁸ The author felt that a traditional mailing of the questionnaire to purchasing organisations was necessary because they are less used to Internet technologies than e-Marketplaces / PSPs.

Phase VII (Sep. 2003 to Feb. 2004) Statistical Analysis of Survey for Purchasing Organisations:

Responses for the survey among purchasing organisations were finally received in this stage. This phase included the statistical analysis of the survey of purchasing organisations and the comparative investigation between both questionnaires, the development of two more in-depth case studies on EPC and a detailed revisit of the research literature. This level facilitated the inclusion of detailed data analysis and comparative work. The case studies and the comparison between both questionnaires generated important findings for a conceptual framework of EPC.

Phase VIII (March 2004 to Sep. 2004) Interpretation of Research Findings and Development of Final Conclusions

Both the completion of the statistical analysis and the elaboration of in-depth case studies could provide a more holistic view to EPC and original research generation. Final conclusions, limitations and recommendations were prepared in this phase. The research outcomes of both surveys and case studies were presented in various journals and publications (e.g. International Journal of Electronic Markets, Journal of Supply Chain Practice, Logistics Solutions, Supply Management) and presented on various conferences (e.g. IPSERA, Logistics Research Network, European Transport Conference).¹⁶⁹

3.4 FINAL REMARKS TO RESEARCH DESIGN AND METHODOLOGY

This study is aimed at generating information and knowledge of creating competitive advantage by EPC. This relatively new area asks for a specific methodology. There is academic literature available on e.g. strategic management, purchasing consortia, the concept of synergy and inter-company networks, ICT / IOS and virtual organisation, or anti-trust limitations. However, the combination of those research areas is rare and there is not much academic research available specifically with reference to EPC. By combining different methodological instruments the author expected to lay a grounding to the academic knowledge of EPC that is highly valid and relevant at the same time.

¹⁶⁹ See publications in the bibliography section.

CHAPTER IV ELECTRONIC PURCHASING CONSORTIA EXPLORED IN PRACTICE – CASE STUDIES

4.1 INTRODUCTION

A series of case studies was conducted to obtain a first understanding of a conceptual framework to electronic purchasing consortia. The selection of cases was made to discover the whole variety of EPC trading mechanisms. A number of focused interviews (structured according to the outlined research constructs) have been made, designed to encourage the respondents (which were predominantly purchasing and IT managers) to talk freely around each topic. In many cases an open discussion evolved, but the researcher tried to steer the conversation back towards the identified EPC areas in these open-ended discussions. Data was gathered via 14 face-to-face interviews within the premises of the organisations. The author also did 15 telephone interviews with the case respondents. All interviews lasted an average of approx. 1.5 hours.¹⁷⁰

While most of the data was obtained from these interviews, some of the information has also been collected from secondary sources, such as various internal (e.g. internal reports, presentation material) and external documents (e.g. annual reports, press releases, company documents). The researcher integrated and triangulated facts from the aforementioned data sources in order to achieve a very low level of misinterpretation. A major intend of this thorough data collection was to achieve the best possible insight into EPC, both formal aspects (written data) and informal aspects (personal interviews, observations). The objective of the case studies is not to test the presented hypotheses or to draw inferences to the population, but to develop a first conceptual framework to EPC.

Following the work structure of Flyvbjerg (1998) this thesis introduces the case studies at a quite early stage in the presentation of the dissertation. The purpose is to create a frame of reference and EPC practice for the later sections where the theoretical framework is revised by surveys. The use of the case studies in such a way also illustrates the exploratory approach.

¹⁷⁰ The interviews for the case studies have not been tape recorded. The author found that tape recording can adversely affect the interviewee's openness (particularly for sensitive subjects), can inhibit some responses and reduce overall reliability. Interviewees also regarded the given information as highly confidential. Therefore, tape recording was skipped after the first not very satisfactory trials.

The choice of industry sectors for the case studies was informed on the basis of the literature review findings. Every business sector has a different balance of power, supply chain configuration, degree of transparency, and need for discovery (Phillips and Meeker, 2000). Keough (1993) and Rozemeijer (2000) claim a direct causal correlation between the industry sector and the stage of development of the purchasing function. For example, the electronics industry is more advanced in purchasing than the banking sector (Rozemeijer, 2000). Extensive co-operation and strategic alliances are almost common practice in the automotive, electronics or aerospace industry (Schertler, 1995), whereas they are not very widely used in other industry sectors such as the wood industry (see also Beck, 1998).

The automotive and electronics industries were selected because both of them are very advanced in SCM and strategic procurement techniques, streamline the infrastructure around the supply chain with ICT, belong to the pioneers in e-Procurement and can provide EPC examples in practice. These sectors have been among the earliest movers into e-Marketplaces / PSPs since they were already relatively well prepared for ICT investment and supply chain management. Goldman Sachs (2000) explains that industries that are “B2B inclined”, exhibit the following characteristics: the supply chain is highly diffuse; techno-innovators dominate the culture; process represents more than 20% of total costs; expense pressure is intense; products exhibit complex configurations. Despite its longstanding history in co-operative purchasing, the author’s experience indicates that the public sector is currently lagging somewhat behind the automotive and electronics industries in terms of electronic implementation and was not selected for the research.

Case studies A and B mainly focus on the automotive industry, whereas the cases C and D derive from the electronics sector. Case study E deals with EPC examples in procurement of indirect material, which is an important part of supply management in the automotive and electronics industries. All cases represent major EPC initiatives, identify the whole variety of EPC trading mechanisms available to date and can make a contribution towards a conceptual framework to EPC.

4.2 CASE STUDY A IN THE AUTOMOTIVE INDUSTRY

Purchasing organisation A belongs to one of the large automotive OEMs and achieves a turnover of approx. 150 billion euros with 350,000 employees. Company A was going through a merger with another OEM, which was mainly initiated due to synergy potentials in functional areas and due to drivers from the business context such as globalisation, strong competition and automotive industry concentration (i.e. the trend towards an oligopsony with few large OEM competitors and strong market positions). The pressure to reduce operating costs was specified as very high in company A.

After the merger, the two firms gradually integrated their organisations and took on a new corporate identity. While cross-company cultural differences had first to be overcome, the purchasing function was kept on a decentralised operational level, but was centrally coordinated. Top management formulated that the exchange of information, expertise and best practice should be stimulated and purchasing more professionalised throughout the different business units. According to A, the merger provided the opportunity to look critically at both purchasing department's 'best practices' in order to create a more effective and efficient corporate purchasing.

About 65% of the turnover is related to purchasing in A. Therefore, top management in A reveals very high interest in the purchasing operations, as purchasing savings are recognised to have a significant effect on the organisations' overall profit. Due to this background, the purchasing function was gradually evolved and reached a high level of purchasing maturity within organisation A. It has significantly reduced the overall number of its suppliers, developed collaborative buyer-supplier relationships and early design involvement for strategic material. A very large part (about 50%) of overall purchases is single-sourced. The operational order-function and replenishment process was already electronically decentralised at an early stage before the merger. This decentralisation process enabled the purchasing department to concentrate more on strategic sourcing activities. It also resulted in rather low maverick purchasing. A specified that none of the strategic material and only 3% of indirect materials are sourced outside corporate compliance.

The merger already resulted in increased negotiation power and significant savings due to demand aggregation within corporation A. Co-ordinating purchasing company-wide and working with key suppliers has substantially improved performance. However, A was also aware that there was still a potential for further savings by means of demand aggregation in inter-company networks with other legal entities. An opportunity to implement EPC arose for A at the time when its top management agreed with four other large automotive OEMs to build a consortium-led collaborative e-Marketplace.

At first all OEMs had planned separate competing e-Marketplaces, but suppliers were unsatisfied about the cost and inefficiency of having to join multiple exchanges. Negotiation started between A and other OEMs to consolidate their individual e-Marketplace initiatives into one industry-wide trading exchange. Finally, A and four other OEMs decided that rather than pursue private and separate e-Marketplace initiatives they would co-operate to create a consortium-based e-Marketplace.

However, not the whole population of automotive OEMs was willing to participate in the collaborative e-Marketplace and quite a few proceeded with their own initiatives due to arguments such as that private e-Marketplaces could be integrated in a quicker way with internal legacy systems, that it would be difficult by the use of consortia-led e-Marketplaces to keep proprietary data confidential or that additional savings by demand aggregation would be complicated to achieve due to buyer power and anti-trust limitations. The consortium e-Marketplace model, on the other hand, was envisaged to provide participants an industry standard and to make information accessible and visible. Each of the five OEMs co-operated by bringing together its individual e-Marketplace initiatives to avoid that suppliers would have to interact with redundant proprietary systems.

Therefore, the consortium-led e-Marketplace was set up as a formal third party infomediary for profit to cover functional areas for the participating OEMs and suppliers: In e-Procurement, the e-Marketplace was designed to enable industry participants to trade both production and non-production material and services. Auctions, catalogues, requests for quotes as well as a management tool for idle assets were included to streamline purchasing processes. In supply chain management, the e-Marketplace engaged in allowing individual organisations to analyse the present and future status of their supply

chains' material flows, inventory levels, and capacity constraints. Trading partners can communicate and develop production and shipment schedules using standardised information systems. In electronic collaborative product design, a virtual product workspace was constructed to allow real time collaboration and integration among various partners via the Internet in order to help synchronise the members' product development community around a common set of objectives, aiming at faster time-to-market and better product innovation capabilities.

Purchasing organisation A specified that the consortium-led e-Marketplaces offers a wide range of customised services, that are essential to support A's purchasing strategy and operations. However, the importance of further customised services would be still increasing. Further customised services will be added in future, in particular, more functionality in e.g. production and capacity planning, demand forecasting, supply-chain transaction automation, work flow visualisation and collaborative development tools. The intent to integrate electronic purchasing consortia was considered by the five collaborating automotive OEMs. By leveraging the buyer power of the collaborative OEMs, additional purchasing cost savings could be achieved, according to company A.

However, while A acknowledged that the Internet offers a more efficient mechanism for demand aggregation and data exchange by enabling communication, this had heightened the risk of anti-competitive price co-ordination. The combined buyer power of the five OEMs would be significant and could have provided the opportunity for OEMs to dictate pricing in the automotive industry. The concentration rate of the OEMs in the automotive industry has increased substantially in general over the past years with mergers and acquisitions. Within the structure of the oligopsonistic automotive industry, there are only very few large automotive OEMs each having a significant buyer power.

By partnering in EPC within this consortia-led e-Marketplace, several OEMs would dominate the automotive purchasing share world-wide. Unlike neutral or independent e-Marketplaces, this collaborative exchange was starting with guaranteed volume, as the five collaborative OEMs hold a total world purchasing share of 61% among 30,000 suppliers in this consortium. Purchasing organisation A contributes 11% to the world purchasing share among all automotive OEMs. Therefore, the collaborative e-

Marketplace came under investigation from the anti-trust departments of the European Commission and the U.S. Department of Justice almost as soon as it was established.

The regulators feared that A and other member OEMs would use the e-Marketplace to dictate pricing on suppliers. Company A had to face the argument that it cannot be assumed that EPC implementation within the e-Marketplace does not cause competitive concerns as the e-Marketplace founders represent such a large share of the automotive market.

The trade commissions recognised within this collaborative e-Marketplace both the pro-competitive and anti-competitive potential of EPC. On the positive side, they acknowledged that EPC could decrease transaction costs through economies of scale in purchasing, lower manufacturing or warehousing costs, and other efficiencies. The aggregated buying power of the consortium and market liquidity could suggest lower production costs due to lower costs for suppliers. While the trade commissions acknowledged this pro-competitive effect, too much buyer power, however, could eventually result in damage of the supplier market. The European Commission provided the following statement:

“(I) the continued acceptance of market efficiency arguments for the creation of e-Marketplaces and (II) the focus on discrimination/foreclosure and “bundling” of purchases/sales can result in circumstances where negative effects could outweigh positive ones.”

A boycott could be constituted if several companies agree not to buy a product from a particular company. The trade commissions were concerned that A and other OEMs would use the consortium-led e-Marketplace to increase their buyer power and to proceed with anti-competitive actions. A argued that also fewer suppliers are undertaking more supply functions due to OEM outsourcing, with the effect that suppliers might be able to achieve greater bargaining power and encounter increased OEM buyer power. However, the trade commissions specified that anti-trust concerns are increased when the collective buyer power is such that they are capable to depress purchase prices of inputs below efficient levels, thereby causing harmful effects in the input market. As a consequence, input producers may have to terminate business or may raise the price they charge to non-

monopsonistic purchasers. Purchasing organisation A specified that it is for the trade commissions of no difference if purchasing members organise EPC in a formal or informal tacit way. It is just the actual effect that trade commissions consider as results for the markets.

Moreover, the trade commission specified another potential anti-competitive effect within the consortia-led e-Marketplace: without the establishment of proper rules that would protect the confidentiality of individual purchase information, purchasing organisation A may be able to obtain data on the inputs of their competitors so that it could then make predictions on e.g. the level of production of its competitors. This was regarded as an issue only in this specific case when the EPC would involve direct automotive production input, not indirect inputs such as ORM / MRO.

The trade commissions acknowledged that if any electronic purchasing consortium involves indirect products, it represents only a fraction of the inputs necessary to produce a final product and, therefore, the potential for collusion is significantly reduced. For products with low asset specificity that are not highly differentiated, it is unlikely that EPC members could exert monopsony power over the suppliers. The trade commission specified that e-Marketplaces directed at joint purchasing will normally not raise serious anti-trust concerns unless they pool purchases accounting for a considerable percentage of the total market purchases of a relevant product (which would give rise to potential monopsony power) or the jointly purchased inputs represent a major element of the competing organisations' downstream output costs (which could potentially result in downstream price co-ordination).

These conditions prompted A and the other collaborative OEMs not to conduct electronic purchasing consortia for direct production input in future, but for indirect materials only. Due to regulatory issues, this consortium of large automotive OEMs were not allowed to pool their demand for production parts. In order to prevent any monopsony concerns and to obtain legal approval, company A chose to limit demand aggregation for indirect materials in correspondence with the collaborating OEMs. The consortium-led e-Marketplace provided following statement:

“First, we will not aggregate the purchases of one OEM with those of another OEM.

Second, we will not offer aggregated purchasing services for any automotive-specific parts or materials.

Third, our aggregated purchases of non-automotive specific parts (such as office supplies, cleaning supplies, etc.) will always be within the applicable competitive law guidelines in the market in which the purchases are made.”

The decision to adopt EPC in future for indirect input only and also the infancy of the e-Marketplace convinced the trade commissions in allowing this collaborative exchange to become operational. They attached no conditions to the collaborative e-Marketplaces so far, but will closely monitor it in future. The general approach of the European Commission is that the current anti-trust legislation still applies and is not about to be changed.

The European Commission has not taken any particular stance to date against the tendency of consolidation towards one e-Marketplace, as it happened in this example in the automotive industry. However, the European Commission is currently working on the dangers of unfair discrimination (including pricing practices), information exchange, foreclosure of competitors and joint buying and selling. It confirms that the further the purchasing consortium extends beyond the safe anti-trust limit or ‘safe harbour’, which is fixed at 15% under EU guidelines, the greater the menace of a negative effect on competition. In the US, if an exclusive agreement or arrangement affects less than 20 percent of a market, this practice will be very likely to avoid regulatory concerns because it falls within the anti-trust safety zone (as long as the arrangement is not otherwise illegal per se).

The EU approach to company’s A collaborative e-Marketplace indicated that any proposition of there being significant consortium purchasing for strategic goods would have prompted in it being treated with larger scepticism from the EU anti-trust perspective. By preventing OEMs from aggregating demand with each other for automotive-specific parts, the designed collaborative e-Marketplace chose to terminate

one of the primary monopsony concerns, i.e. competitors in a concentrated industry decreasing prices of industry-specific materials below the competitive level.

Therefore, company A and its collaborative OEMs chose a rather conservative and cautious approach to EPC. It can therefore be regarded as very cautious because the prevention of collective purchasing of automotive-specific parts or materials challenges OEMs' current practice to bundle demand with their tier 1 suppliers, e.g. in raw materials such as steel or plastics. Tier 1 suppliers can typically take advantage of master purchasing (i.e. piggyback on OEMs' purchasing power) to save purchasing costs, while OEMs can benefit from e.g. additional revenues for this service, lower product costs or better support of their supply chains. Purchasing organisation A confirmed that its current demand bundling with its major suppliers for raw materials has not moved to the e-Marketplace.

By requiring aggregated purchases to focus on indirect materials, the founding partners pledged not to take any legal risks and not to exceed applicable anti-trust limits. By getting not even close to the 20% US ceiling or 15% European ceiling for indirect purchases, company A tried to implement a secure legal approach for its aggregated purchases conducted on the e-Marketplace.

The EPC for indirect materials has not started yet, but will be implemented in future. Due to the very nature of indirect materials, company A acknowledged that demand aggregation will be used for mainly arms-length sourced products. Even when EPC for production materials would have been implemented, A specified that demand aggregation would have been predominantly used for commodity products with a lower level of asset specificity. Overall, A identified a product pooling potential of approx. 30% of its entire purchases. This part is mainly multi sourced in a transactional buyer-supplier approach. A specified that it has an interest in long-term collaborative relationships to first tier suppliers, which may have been damaged when forcing demand aggregation or reverse auction pricing structures upon them. A revealed that it routinely relies on early strategic supplier involvement and this facet cannot be offset only to the lowest price. Therefore, A would not use demand aggregation or reverse auctions for strategic suppliers, but only for suppliers of commodities.

While requisitioning of indirect goods is conducted via the catalogue system of the e-Marketplace, demand aggregation, sourcing and negotiation of indirect materials will be based on the data derived from the online transactions and conducted by sourcing professionals from each OEM. Within product pooling for indirect purchases, the collaborative e-Marketplace will then limit membership in the purchasing consortium once the group's purchases would reach 15% of the market for indirect purchases (which is not very likely to happen) by restricting the flow of communication or information.

A specified that the integration of a critical mass and high volume of all indirect purchases of the collaborative OEMs into EPC is a prerequisite to achieve significant future benefits. The main focus of this EPC is on tangible benefits, namely cost savings. A is confident that a significant ROI will be achieved in EPC of indirect purchases in future. In terms of finance models, the collaborative e-Marketplace plans a mixture of EPC revenue models, consisting of buyer transaction costs, fixed yearly fees and fees for additional services. Reverse auctions were already implemented within the consortia-led e-Marketplace and A paid an initial licence fee in order to run unlimited reverse auctions without any further e-Marketplace cost.

Due to the high concentration of OEM buyer power and market power, A does not expect any problems in supplier resistance to the aggregated purchases, despite the use of electronic request for quotations and reverse auctions. While supplier resistance to demand aggregation is not perceived as a main barrier, overall integration of suppliers into the e-Marketplace was identified by A as a major challenge. Whereas first tier suppliers could be mainly integrated to the e-Marketplace due to trusting OEM-first tier relationships, a significant amount of lower-tier suppliers still needs to be convinced of the benefits. Small suppliers were found to be very resistant to change and to electronic integration of their business.

Communication was outlined as essential for the supplier integration process. According to A, an atmosphere of trust is highly important that needs to be generated so that OEMs and suppliers would co-operate in exchanging and exposing proprietary data. Special regard was, therefore, devoted to security and verification processes on the e-Marketplace. In order to avoid potential collusion between the OEMs in culture and working practices for future demand aggregation of indirect supplies, the collaborative e-

Marketplace was set up as a neutral independent party. According to A, this legal structure would assist to achieve a high level of trust into the e-Marketplaces, both from a supplier and OEM perspective.

A further named other critical factors for future demand aggregation projects of indirect supplies: Active management commitment is regarded as highly important in order to sponsor the purchasing function, to define clear goals and frameworks, and to monitor the general progress of demand bundling initiatives. Top management will then also foster the willingness of purchasing employees to give up a part of their autonomy in supplier negotiation and sourcing for indirect supplies. While purchasing maturity is already perceived as very high at A, changes in the personnel structure or training and education of the people involved in EPC could further be necessary. A acknowledged that the training of human capital is a critical factor for the success of technology deployment. For example, the collaborative e-Marketplace has implemented an anti-trust compliance program directing the propriety of employees' conduct.

Although this EPC for indirect products was approved by the trade commissions, they specifically stated that clearance of the consortium-led e-Marketplace does not imply that an anti-trust violation may not have occurred and reserved their right for future action in case the e-Marketplace would develop contrary to the public interest. This first case study could provide some useful information for a conceptual framework to EPC, especially in the field of anti-trust limitations.

4.3 CASE STUDY B IN THE AUTOMOTIVE INDUSTRY

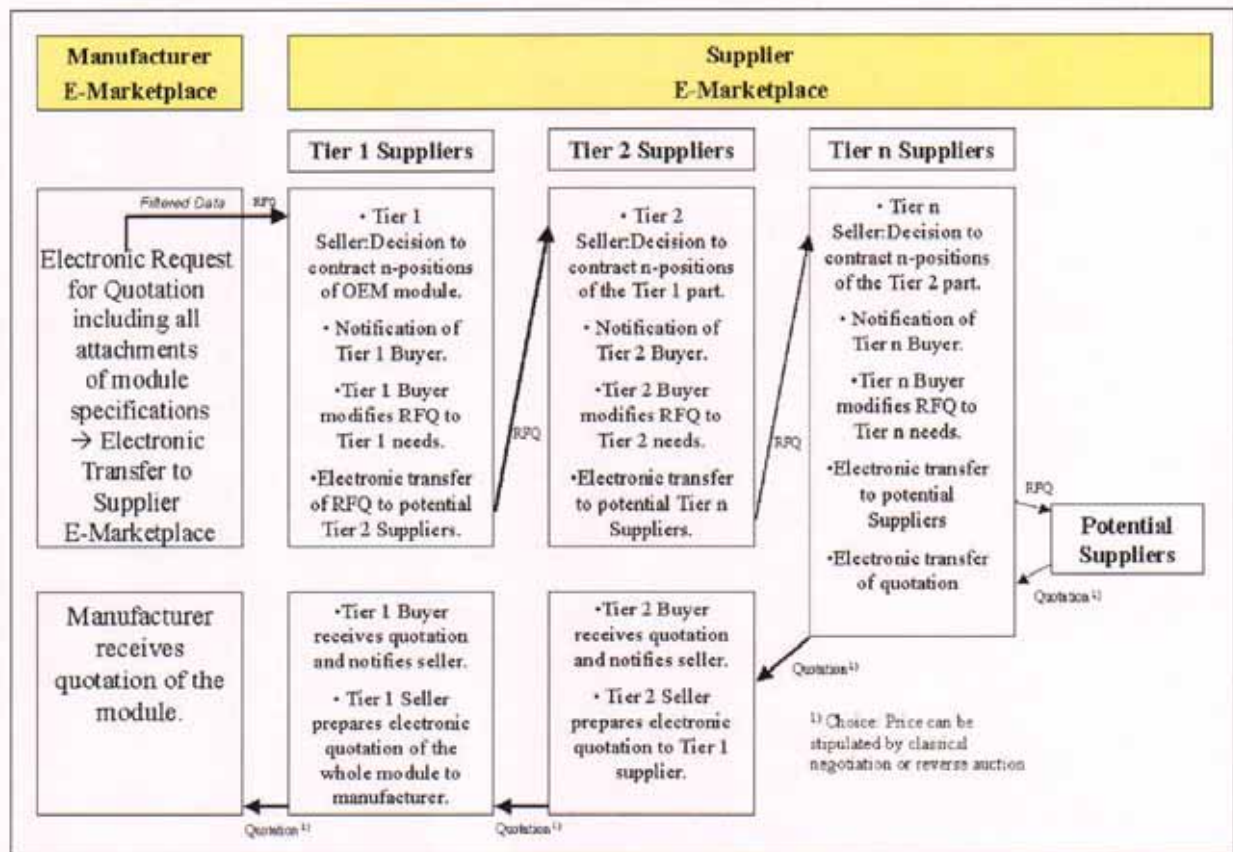
Purchasing organisation B is a medium-sized tier 1 supplier in the automotive industry with over 2000 employees and a turnover of approx. 330 million euros. B produces shock absorbers, towing devices as well as plastic components for automotive interiors, exteriors and engines, such as body mouldings or instrument panel components. The company operates in a very intense competitive environment. Its traditional markets are mature and show only small growth. The company has experienced pressures from OEM customers to engage more actively in R&D and to lower costs at the same time. B's management identified e-Business as one of the means to tackle costs.

Therefore, B decided to participate in a vertical OES e-Marketplace that was set up as an independently managed and profit-oriented infomediary for automotive suppliers. The core objective of this e-Marketplace is to optimise business processes by building an industry-wide procurement platform for automotive suppliers and to establish common standards for communication exchange and transactions between tier 1 and lower tier suppliers as a complementary approach to the e-Marketplace initiatives of OEMs. Company B specified that it wanted a system in place that would quickly improve communications between tier 1 and lower tier suppliers, as vehicle manufacturers are mainly working on OEM – tier 1 relations. B experienced that while electronic connections and transactions between manufacturers and tier 1 suppliers are well established, this number drops significantly between tier 1 and tier 2 suppliers and to a very low level between tier 2 and tier 3 suppliers.

Therefore, the e-Marketplace was designed to integrate lower tier suppliers, but to complement the standards of OEM e-Marketplaces by co-operating with OEMs on harmonisation issues. These standardisation efforts should enable B to proceed with business transactions with other suppliers as well as with OEM customers through their platforms. B considered standardisation and harmonisation of processes as an important prerequisite that B became involved in this OES e-Marketplace.

The e-Marketplace is structured into key modules with tiered functions. The general purpose is access control, document exchange and backend integration. Within procurement, catalogue buying and request for information and quotations as well as online reverse auctions are enabled. Moreover, logistics and collaborative engineering are supported. The e-Marketplace offers B also ‘common public services’ such as a business directory in which suppliers can make their key data and information available. Suppliers are verified by various aspects such as their respective size, market position, or customer feedback. The first harmonisation phase with OEM e-Marketplaces included the business directories and the RFQ processes. This harmonised standard enables B to proceed with a collaborative and electronic request for quotation (RFQ) process over the automotive tiers (see Figure 15).

Figure 15: Harmonised RFQ Process over the Tiers



B confirms that the harmonised RFQ process over the automotive tiers enables savings in processing costs and time. The process helps B to manage and track the sourcing process of specific parts online over the tiers. The harmonised sourcing process creates the opportunity for B to modify RFQs received from OEMs to its own needs and electronically forward them to its own suppliers. As this infrastructure has only been established quite recently, B makes use of the electronic RFQ just for approx. 15% of its purchases to date. According to B, it takes some transition time for purchasing staff to get trained to this new RFQ system.

Before a new sourcing project, purchasing managers at B can pre-screen suppliers listed in the business directory by using requests for information (RFIs). Suppliers are evaluated based on a broad range of criteria to assess supplier qualification and capabilities.¹⁷¹ B specifies that questionnaires and scorecards can be created to weigh up and document e.g. suppliers' quality or their financial stability. Qualified suppliers can advance to the RFQ

¹⁷¹ Those criteria may include quality certifications, manufacturing capacity, equipment capabilities, on-time delivery ratings, investments in research and development or environmental, health and safety compliance, among other things.

round of negotiations. B can then send the modified RFQ, that it received e.g. from an OEM module, to an individual assortment of potential suppliers by taking advantage of the e-Marketplace.

B can manage RFQs as projects and make RFQs selectively available to certain suppliers. Also, a RFQ target price can be specified and closed projects accessed for historical analysis. Projects may be visualised online, thereby containing summarised information, such as time-to-project completion, estimated project cost, RFQ supplier activity for any particular project or variance to project budget. By organising RFQs in projects, B confirms that it can more easily filter and sort through a number of RFQs.

B specifies, however, that it is a critical factor that the RFQ covers all required elements and that it can be electronically transferred in a secure way. The procurement process relies heavily on the timely and accurate information and communication exchange of technical information and specifications, e.g. CAD data, business or logistical issues. The main advantage of this process is according to B that less transposition errors occur, instead of having a variety of different versions and iterations of the data spread over numerous drafts and papers. For receiving the RFQ, B has the choice of conducting a negotiation by electronic request for quotations or alternatively reverse auctions. Reverse auctions were implemented as an additional tool for the RFQ-process.

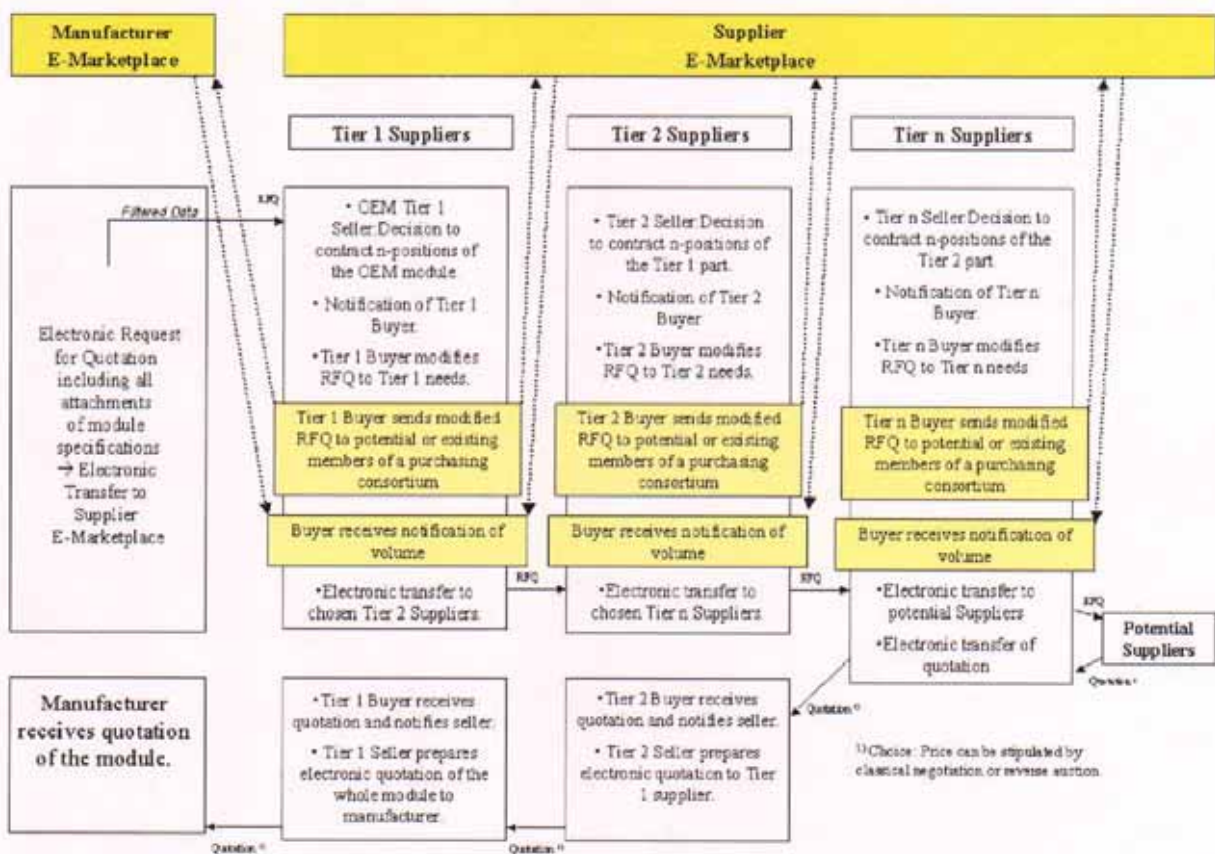
ICT support for SCM services and adoption of further customised services became gradually more important to B in order to fully integrate purchasing processes. B regarded the integration of a wide array of services as an important contribution. More functionality was, therefore, supplied by a procurement service provider and added to the e-Marketplace. New services added included EPC, decision support systems and spot buy services. While B was using the online RFQ-process, it soon became aware of the additional integration of the EPC service. The infrastructure in which harmonised electronic RFQ were processed over the automotive tiers suited EPC from an e-Marketplace view and B was offered to aggregate demand within this infrastructure.

Similar to case study A, purchasing organisation B has not yet taken advantage of the opportunity to aggregate demand with OEMs due to potential anti-trust consequences. The trade commissions are still reviewing the concept of bringing master buying to the e-

accept order substitutes or to change suppliers. Intelligent electronic agents are integrated in the e-Marketplace and can check whether or not other buyers have purchased similar goods or specified similar preferences. If B's potential purchasing partners see a need to also procure the item in question, the additional quantity can be added.

After all EPC members have reconfirmed the quantity, B can then aggregate the volume into a single purchasing RFQ and continue with the quotation process, but a link is still preserved to the original requestor of the respective portion of the aggregated RFQ. The e-Marketplace provides this demand aggregation facility for all suppliers, irrespective of the tier level. Figure 16 shows this EPC process:

Figure 16: Electronic Demand Aggregation within the Harmonised RFQ Infrastructure

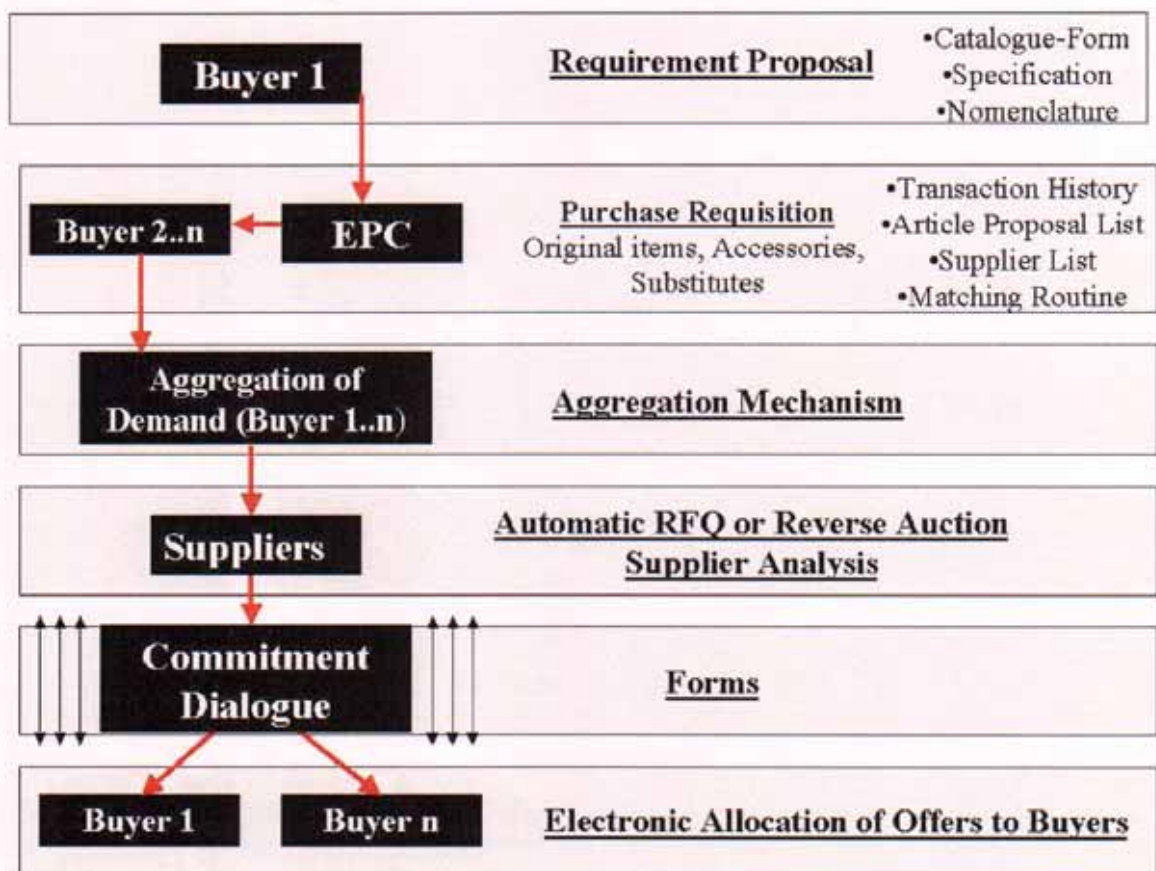


For a new sourcing project, purchasing managers at B additionally have the opportunity to access a catalogue-system or nomenclature of products and services. The demand can be specified in a form that indicates the relevant purchasing data (attributes, amount, etc.) and can present relevant suppliers in an electronic proposal list. B specifies that the joint purchasing process can contain more than just completely identical items. By using item

lists that are generated by the e-Marketplace system, original items, accessory items or substitutes may be transferred to the same RFQ. A basic product categorisation can, therefore, be enabled by the e-Marketplace system.

Based on the product categorisation and transaction information and history in the system, potential EPC members can be identified and invited to participate. In the case there are multiple purchasers for demand aggregation, the system does a matching and an aggregation mechanism. Figure 17 explores this demand aggregation system in more detail:

Figure 17: EPC Process Flow in Case B



According to B, once the requirement and demand aggregation has been specified, collaborative purchasing managers also have to agree on which type of negotiation process is used, i.e. e-RFQs or reverse auctions. According to B, a critical factor is that the content of the RFQ needs to find an agreement between the members in terms of standardisation issues. Therefore, B specifies that it uses this demand aggregation system exclusively for commodity-like parts, which are typically multi-sourced by B in an arms-length buyer-supplier relationship. According to B, the concentration on these products

for EPC projects helps to overcome inter-organisational cultural impediments more easily.

While B has not experienced any major supplier resistance to demand aggregation, since they can achieve an increase in the volume of orders, B found it sometimes difficult to achieve a compromise on a common sourcing strategy and product description. While the EPC system supports cross-referencing of article numbers and helps to create cross-reference tables in order to prepare a new RFQ with the aggregated demand¹⁷², the compromise on uniform specifications across purchasing organisations is a critical factor for EPC. Therefore, B has terminated inter-organisational demand aggregation in some sourcing projects and proceeded on its own with the sourcing process, when no agreement was in sight.

When B proceeds with an EPC sourcing project, suppliers bid for the requests based on the aggregated demand. The e-Marketplace system supports multi-item and multi-attribute RFQs that are evaluated on total cost rather than solely a purchasing price basis. When bids are received, a decision matrix can be used to assign weighting to the information. A spend analysis and decision support module can help purchasing managers to capture part and supplier data, as well as to analyse incoming bids. However, EPC members can communicate to suppliers how the aggregated demand is divided up among them and start a commitment dialogue. Instead of treating the requirements as fixed, suppliers can be encouraged to recommend changes in a commitment dialogue that may result in a lower total cost of ownership. Suppliers might suggest to shift due dates, permit multiple shipments, or procure additional parts from them to achieve a lower total cost. EPC members have the option to act as anonymous organisations in order to avoid suppliers' cherrypicking of individual demands.

Suppliers' quotes that were electronically received can then be compared, sorted and selected. Based on the decision, a contract module was implemented in the e-Marketplace that provides a summation of the terms and conditions. The contract management module enables B and other collaborating companies to turn negotiated awards from the RFQ process into company-specific contracts. At this point, EPC members have to commit whether or not they are going to proceed with the order of the aggregated demand. B

¹⁷² A project management module is integrated within the e-Marketplace that enables buyers to collaboratively plan and track specific tasks and to centrally access all project-related information.

experienced that potential EPC members were initially interested in demand aggregation for specific sourcing projects, but did not commit to the final contract based on the aggregated demand. In order to avoid opportunistic behaviour among EPC members and to encounter the 'fear of parasites', a history of previous commitments can be assessed.

Therefore, B always proceeds for a sourcing project that is feasible for demand aggregation, in a dual way: B requests two quotations, one based on its own needs and additionally another with the aggregated sourcing volume. If the outcome of the aggregated sourcing process is not satisfactory or a compromise cannot be reached, B will stick to the initial sourcing projects based on its own needs and sign the contract.

The RFQs' data can be made available as structured information for later use in negotiations and analyses phases. One of the primary goals of this decision support basis is to provide better visibility for future transactions. To accomplish this task, the e-Marketplace maintains a central archive of all transactions and all activities associated. The decision support system can perform sophisticated analytical tasks, e.g. B can learn how to better manage transactions and determine how to adjust future procurement activities to obtain rebates and preferred treatment from suppliers.

After having finalised the sourcing and negotiation process, B integrates the sourced products into a catalogue-system for replenishment processes. The catalogue system can be co-ordinated to reflect the aggregated pricing. B is working at the same time to integrate the e-Marketplace with its ERP-systems and accounts payables and receivables. The integration of catalogues and ERP-systems has significantly reduced the number of maverick purchases at B for indirect goods.

B acknowledges that some automation of the demand aggregation processes was facilitated by the e-Marketplace such as the identification and definition of overlapping requests, the consolidation of similar like products or services or the notification of buyers and suppliers by approval workflows. However, extensive training and education of B's purchasing managers was required to make them fully understand the system in order to accomplish benefits. Overall, B found that the more its purchasing managers got mature with the e-Marketplace and the processes, the better the effect on cost savings.

B also specifies that while the EPC technology was a facilitator for demand aggregation and could create a connection for electronic networks or virtual teams, it did not

necessarily lead to co-operation in the first place. While the reluctance of purchasing staff to use the demand aggregation system was initially high, B's top management stimulated and supported the use of EPC. They recognised that training in purchasing expertise was important to build confidence to use the EPC system. B specifies that the success of EPC is determined to a very large extent by the people that are involved who should have both the attitude and skills to work in teams.

B further acknowledged that it is not enough for EPC to only match buyers and suppliers, but also more importantly interaction must be supported and shared business processes facilitated. Formal management control was found to be important to monitor the progress of the EPC initiative and to confront resistance at the operational level (e.g. arguments such as "we do not want to change our suppliers"). This trust building initiative increased purchasing staff's receptiveness to EPC. After some successful tests, purchasing managers got the impression that they are gaining some sort of benefit from being a member of temporary EPC.

For example, purchasing managers stated that they sometimes had a benefit from data sharing that enabled collaboration across multiple locations for buyers and suppliers to react more quickly to demand and supply changes. For tangible benefits, B specified that EPC could save on average approximately 10% of its purchasing costs for specific sourcing projects. However, B could not provide any specific investment costs for the EPC system only. Demand aggregation came as an integrated package to the e-Marketplace and B invested in the e-Marketplace as a whole. Therefore, B could not specify any specific cost allocation of demand aggregation services only. B pays transaction costs and a monthly fee for all services of the e-Marketplace. B acknowledged that a positive ROI could already be achieved by participating in the e-Marketplace.

However, it also has to be considered that demand aggregation is just used in B for a fraction of the total purchasing spend to date (approx. 5% out of the total purchasing, which is about 59% of total turnover). While B specifies its overall product pooling potential to be as high as about 35%, purchasing managers at B would only aggregate demand for 'worthy' components where they find a good potential of cost savings and where a compromise with EPC members on product characteristics is easier to achieve. No minimum percentages of participant's total needs are required to have a product

purchased through the EPC system, but members listed in the e-Marketplace directory have typically more than 10 employees and bring in some purchasing volume.

However, B found it still difficult to achieve symmetric benefits due to differences across purchasing organisations as benefits may accrue more to one than another. Top management and purchasing staff at B were also concerned about demand aggregation among competitors. Therefore, B does not proceed with any demand aggregation project when a competitor is involved. Also, the e-Marketplace had to assure B that highly company sensitive data is secure and hold back to other organisations.

B stated that it would use the EPC and RFQ system more widely for further sourcing projects. However, demand aggregation, in particular, will still be used only for highly standardised products in future. B sees a better potential for the RFQ-process over the automotive tiers and is going to integrate this system more extensively into its purchasing processes.

4.4 CASE STUDY C IN THE ELECTRONICS INDUSTRY

Purchasing organisation C is a medium to large sized electronics company, whose main activity is large volume assembly of printed circuit boards and embedded computer technology. Company C achieves a turnover of approx. 170 million euros with about 1100 employees. C characterises its industry as a very competitive buyer market with a high level of overcapacity, where it has to compete predominantly on price. Industry trends such as short product life cycles can sometimes lead to price erosions of more than 15% annually.

This background demanded C to control and manage its costs. On its supply markets, suppliers were strengthening their bargaining positions relative to C through mergers and acquisitions. C's purchasing spend is about 67% of turnover, which can be considered as relatively high compared to other electronics companies. Therefore, the purchasing function was recognised to have an important effect on the (financial) result of the company and total cost reduction is regarded as an important strategic issue. Due to the high purchasing-to-sales ratio, top management considered purchasing and electronic implementation as a highly strategic activity.

Overall, C was confronted with more demanding customers and increasing pressures to improve purchasing and supply management practices. These conditions prompted C to develop purchasing maturity and centralisation of purchases within the organisation. However, C's management also had to look for other opportunities for purchasing cost reduction and had to face how to convert its current purchasing volume into buying power on its supply markets. For example, while C's suppliers improved quality and delivery issues, the best possible price structures and delivery conditions could not be achieved in comparison to larger competitors.

This setting led to several procurement decisions at C's management: First, C would further continue to intensify collaboration and co-operation with their partners and preferred suppliers (e.g. early supplier involvement) for highly strategic material. Second, in order to achieve a higher purchase volume, C would extend activities through joint ventures and acquisitions. Third, C would also participate in a purchasing consortium.

C started an analysis which purchasing consortium could be feasible and decided to further enquire a regional purchasing consortium that already included six other medium-sized purchasing organisations from a variety of industries, such as electronics, plastics, mechanical engineering, etc. No direct competitor was included in this consortium. A procurement service provider acted as moderator of the group.

C's management approached the procurement service provider for an analysis whether or not its potential participation in the purchasing consortium could provide any benefits to the partners involved. This first purchasing consortium initiative started off with an initial meeting between C's senior purchasing management and the procurement service provider to discuss e.g. how a formation into the purchasing consortium would look like, which goals should be set, which co-operation partners would be included, which costs and legal consequences might arise.

By approaching the procurement service provider first, the PSP could act as a neutral moderator and conciliator and could secure anonymity of data. While the purchasing consortium would have been established among non-competitors, sensitive data still played for C a vital role. C found that it had strong positive trust expectations about the metamediary, which it would not have had, at this level, about other participants in the

purchasing consortium. Without any moderator, C acknowledged that trust into the purchasing consortium would have been more difficult to achieve and that it may not have interacted with other organisations in the consortium.

After the first kick-off meeting, C and the procurement service provider agreed that participation in the consortium could be feasible. In order to proceed, C designated a project leader in the purchasing organisation who was responsible to attend several more meetings with the procurement service provider, develop a project proposal with a tentative schedule for a first project and to manage the specific pooling projects.

Based on the insights from more meetings, the procurement service provider and C formulated criteria whether or not C would fit into the consortium after extensive analysis and internal discussion. The moderator helped to assess information on company history, purchased products, product pooling potential, willingness to co-operate, etc. They also discussed which purchases would be suitable, which data could be handed over and in which material field could be co-operated. Both the project leader at C and the procurement service provider tried to assess whether or not some mutual procurement fit could be achieved in terms of strategic and cultural fit of members.

From C's perspective, there was considerable uncertainty as to the true nature of partner motives, capabilities, cultures and processes. According to C, the procurement service provider specified that a 'one size fits all' strategy would not be feasible. The group should not be too small, otherwise the net savings might not be achieved. However, the procurement service provider also specified that the more partners are taken into the EPC, the more the complexity and the more difficult it gets to combine the interests of all members. Based upon C's product pooling proposal and suitable product fields for demand aggregation, the procurement service provider elaborated on a proposal and listing which consortium members could be suitable for C to co-operate with. C could identify a good pooling potential for its commodity purchases of direct and indirect material.

The relationship with suppliers at C is differentiated as follows: Partner suppliers deliver strategic components, preferred suppliers deliver leverage and bottleneck components and commercial suppliers deliver routine components. Partner suppliers participate in the

product creation process and exchange business plans and technology roadmaps. In the past years, C has reduced its number of suppliers and has established early supplier involvement with its partner suppliers. With preferred suppliers mutual improvement objectives are formulated. All other suppliers are classified as commercial suppliers, for which traditional transactional purchasing is used. Approximately one third of the supplier population are partner suppliers or preferred suppliers for C, accounting for approx. 80% of the total purchasing spend.

While C was interested in increasing early-design collaboration with partner suppliers and preferred suppliers for bottleneck components, it did not propose, therefore, to include a major part of these supplies for demand aggregation activities. Moreover, some customers make it partly difficult for C to standardise components. It happens regularly to C that customers prescribe specifications and hence C does not have much control over the selection of suppliers. C experienced that while many products were identical in the function, they were not identical in the view of the customers. As a consequence, C found it difficult to include item groups for potential demand aggregation where customers prescribe specifications.

However, C could identify preferred suppliers of leverage components and commercial supplies of routine products as feasible for inclusion in a purchasing consortium. Overall, C recognised that approx. 25% of its total purchasing spend could be integrated into consortium purchasing. Based on the proposed product fields, the procurement service provider identified four suitable members from the consortium for demand pooling and reviewed potential anti-trust issues. While two of the members originated from an electronics industry background as well, no legal limitations could be identified, mainly due to the reasons that the organisations were only medium-sized, could not exert any oligopsonic buyer power and were not direct competitors. C and the moderator concluded that potential for demand aggregation was available. Based on the proposal of the procurement service provider, C decided to proceed with the demand aggregation project.

After that initial process with C, the moderator approached the other project leaders of the four proposed member organisations with a detailed background to C. They discussed the benefits and potential drawbacks of the potential new entry. The outcome of the discussion was that the project leaders agreed that an invitation to C to participate in the

purchasing consortium could be extended. Meetings were then initiated with the procurement service provider, project leaders and purchasing staff that were in charge of C's proposed products for the purchasing consortium. There they discussed open issues and tried to agree on objectives, principles, policies, procedures, and schedules for the demand aggregation initiative. According to C, the meetings helped to better structure the relationships and to attain a certain socialisation of the partners involved, aimed at building trust.

While all companies were located in the same region in close proximity to each other, expensive travel costs could be avoided and the meetings made a contribution to increase mutual trust and co-operation. A benchmarking process was initiated and opportunities of the potential co-operation discussed. In the meetings, the participants constituted item groups and item sub-structures and the procurement service provider tried to act as a conciliator between the parties. The participants proceeded with a spend analysis, identified opportunities for leverage, profiled the items groups and categories and identified and qualified the supply base and supplier candidates. They analysed the proposed product fields from the viewpoint of bundling and supply capability. The priority was to identify a potential harmonisation and standardisation and whether or not a supplier change would be necessary.

C experienced in the meetings that not all proposed products fields were feasible for demand aggregation. After the determination of priorities and the filtration of promising material fields, the teams evaluated and analysed common specifications, material attributes and complex dimensions of each part. Homogenous product groups were defined to work on uniform specifications across organisations. One of the tasks was to set standards and design rules for components with the specific intention to continuously improve commonality. When required, cross-functional teams worked together for specific sourcing projects, which were comprised of professionals in purchasing, but also from functions such as marketing, product distribution, finance, product design or research and development.

However, C experienced some difficulties to achieve compromises with other purchasing members on product commonalities. While many products were identical in the function, they were often not identical in the view of the consortium members. Some participants insisted that there are very real differences between competing suppliers even when the generic description suggests no such differences would exist.

C also acknowledged that since their purchasing managers are profit and loss responsible, some of them were very careful to become too dependent of other companies for their strategic supply. Some of them did not approve a compromise of relinquishing the choice of suppliers to other companies. Since they had to agree on a common strategy and qualified suppliers, agreements could not be achieved in a few cases. Therefore, C specified that the participants had to lose some of their traditional emphasis on independence and uniqueness in order to enable demand aggregation for certain material fields. According to C, finding a compromise is a very critical element to demand pooling, that requires active commitment of the teams, the willingness to give up some of their autonomy and a fair amount of mutual trust and group identity.

A confidentiality agreement was also signed by the consortium partners to protect proprietary information. Cultural issues also sometimes arose from the differences in management, organisation and level of purchasing maturity of the members. When cultural problems came up, the moderator was required to propose amendment measures in how to achieve the initial goals of the co-operation. For example, C acknowledged that active commodity management, assisted by the neutral moderator, is a critical factor. Purchasing consortia projects were more effective when members were willing to standardise or to accept alternate brands.

C also found that initially not all priorities were clearly set and some time was wasted for unimportant product groups where bundling ability and potential savings were low. Therefore, the teams decided to focus more on potential quick hits for standardisation and bundling and tried to concentrate on supplies where purchasing volume and leverage was high. Pooling initiatives only started when the aggregated request identified was more than 50,000 euros. That was to make sure that the expenditure for identifying low-profit contributions did not exceed the transaction costs.

Finally, the teams could agree on some product fields where demand aggregation promised success. C had initially proposed 25% of its entire purchasing spend for demand aggregation. At the end of the compromise, only 12% were included in the purchasing consortium. For these identified supplies, the teams had to agree on a common part number and coding system, in order to provide the capability to accumulate needed volumes by part number or part family, the calculation of requirements over time and time phased schedules of material requirements by part number.

Also, the teams discussed which member would become the lead-buyer or project leader for a particular item or sub-structure. They agreed that the member with the highest purchasing volume for a particular product would become the lead-buyer because it was found most likely that this buyer could be entrusted to negotiate with suppliers due to the buyer power. C became the lead-buyer for two item groups.

The individual demand of each item group was then collected and put together to a package for a request for bids. Again, the teams had to compromise with the help of the procurement service provider on the negotiation strategies and which sourcing strategy was regarded as best suitable for the item-group, e.g. local or global sourcing, e-RFQs or reverse auctions. According to C, the respective specifications had to be well elaborated, openly communicated and clearly presented. C also argued that sourcing requires negotiation of many different facets that can outweigh purchasing price alone. Therefore, the teams negotiated supplier strategies based on total costs and on multiple parameters such as purchasing price, quality, logistics capabilities or customer service.

According to C, it was critical that the independent moderator could establish trusting relationships and ensured that all members agreed to some compromise. C further specified that the moderator should be an independent expert that speaks the language of production planners, procurement professionals, and supplier product marketers.

For the supplier negotiation phase, C identified a high potential for electronic support in the purchasing consortium: Both electronic request for quotations or reverse auctions were offered and implemented by the procurement service provider, which helped the lead buyer to proceed with the supplier negotiation and to decide on a case-to-case basis whether or not to employ reverse auctions. Only suppliers who have previously been

approved by the teams can take part in the online negotiations in order to make sure that future supplies will be reliable.

According to C, it was an important factor that the used electronic sourcing system offered multi-variate and multi-parameter iterative negotiated sourcing (supported in multiple languages and currencies) in order to fully integrate all sourcing parameters required. For example, the teams used bids packaging and grouping of similar manufacturing processes: Therefore, e-RFQs and reverse auctions could include 1-100 articles at once, but contain individual requirements, framework agreements or monthly tenders. In the reverse auctions, suppliers were able to review competitive bids, but could not access the competitors' identity. The reverse auctions usually lasted 30 minutes and were automatically extended if new or better bids were submitted shortly before the end.

During the reverse auctions, the procurement service provider monitored the proper running of the online negotiation and rejected in some cases unserious bids and suppliers that did not adhere to the rules. Value adding services such as total cost of ownership comparisons or generic part information (e.g. item requirement from a specific supplier, equivalence of standardised equivalent) and logistical optimisation (e.g. costs benefit to consolidate orders) were also offered within the online supplier negotiation system.

C found that reverse auctions were useful when there was a high supplier market fragmentation for a particular item or sub-item. As this was the case in C's lead buyer roles, the teams and the procurement service provider agreed to proceed there with reverse auctions. C had a relative long-standing, but transactional relationship to the suppliers for the item groups where C was nominated as lead-buyer. According to C, the reverse auction proceeded in a relatively arms-length way. C specified that suppliers were somewhat suspicious of reverse auctions because of potential fictitious entities that could bid ruinously low to decrease legitimate suppliers' prices. However, the procurement service provider ensured that such fictitious bids would not happen and almost all of the qualified suppliers participated in the reverse auctions.

After the bids were received from the electronic quotations, the lead buyer and the procurement service providers reviewed the results of the supplier negotiation and awarded contracts to the winning suppliers, after presenting the results to the co-operating

purchasing organisations. The agreements and purchase orders were then issued and signed. According to C, a written commitment from the members was important to secure the aggregated order to awarded suppliers. Each member contracted directly on bilateral arrangements with the suppliers, but on the EPC basis of the jointly negotiated prices, specifications and terms.

Sourced products could then be integrated in online catalogues for replenishment processes, when this system was available at the focal EPC member. As C is only in the process of building an online catalogue-buying system, C was not yet ready to proceed with online replenishment processes. Requisitioners can then search the catalogue, which will be integrated to ERP back-end systems, and electronically order products according to the (demand aggregated) contracts in order to lower transaction costs and maverick purchasing.

In C's lead-buyer roles, the reverse auction led in one case to a change of supplier. A net saving by the combination of demand aggregation and reverse auction of approx. 22% could be achieved for the item-groups where C was lead buyer. While the gross saving was approx. 27%, the procurement service provider charged about 5% for its services. The purchasing consortium's fee structure is based on fixed monthly fees and also on a percentage of cost savings, when more than 10% savings in purchasing are achieved.

While not all demand aggregation projects resulted in such impressive savings, C specified that on average a net saving in purchasing costs of approx. 15% and a ROI of approx. 140% could be achieved. The savings and the ROI were based on the consortium fees only and did not include further transactions costs such as travel costs of purchasing staff or additional time in meetings. C specified that team members can spend a lot of their working time travelling to meetings and communicating with each other to develop strategies, solve conflicts or to make a compromise. Despite these further transaction costs, C acknowledged that significant savings could still be achieved.

In collaboration with the moderator, the teams proceeded with an ongoing evaluation process, where they assess the nature of the experience and determine the value and impact of the consortium continuously in monthly meetings. The evaluation phase includes both efficiency and efficacy of the results and of the processes. The teams also

evaluate supplier performance and communicate the findings to the suppliers, suggesting improvements, as appropriate. While C's management ensured sponsorship for the purchasing consortium and was quite satisfied with the net savings achieved in the pilot phase, intense management control was required to secure successful implementation of EPC at the purchasing staff level.

C's management had to strongly motivate purchasing staff to participate in the consortium. According to C, a voluntary character alone for purchasing staff would not have helped to foster positive results from the consortium. Purchasing staff came up with all kind of (irrational) arguments to resist participation in the purchasing consortium, e.g. the fear of loosing jobs or decision autonomy, doubts about common trust and cultural issues, or unfair blame for poor performance when they do not have full control over shared activities. However, based on the positive experiences in terms of purchasing cost savings in the pilot phase, C's management insisted to continue the EPC project and stated: "The best motivation for participation in purchasing consortia is measurable savings".

At the time of data collection, C was only a member of the purchasing group for a relatively short time and had just finished the pilot phase. Still, it was revealed that C's management needed to invest time and resources in ensuring that EPC projects were defined, selected, prioritised and controlled. It was critical that expectations, outputs and results were made explicit, and a manageable and agreed number of projects were supported.

C's management discussed the results of the first demand aggregation projects and, based on the achieved savings, recommended continuation and expansion of the EPC project. Overall, C's EPC pilot phase took place in successive integrated phases: formation, implementation and performance review. The pilot phase was regarded as successful for C, despite barriers in inter-organisational communication, supplier selection and limited number of demand aggregation projects. C could test the practical efficiency and effectiveness with the demand aggregation pilot projects. C also acknowledged that after the pilot phase some receptive attitudes for purchasing consortia could be encouraged and some elements of trust established, thereby driving C to become more educated in barriers

to inter-organisational purchasing co-operation. The overall more positive experiences from the pilot phase made C proceed to a routine phase.

This upcoming routine phase will integrate the co-operation activities more extensively into C's day-to-day business. Regular monthly meetings will be held with the teams and the moderator to ensure progress of the co-operation. C hopes that the EPC process can be institutionalised within the organisation, result in more than on-time projects and develop from the temporary event character. Based on the experiences, however, C expects that the efforts to standardise items between purchasing consortia members is an ongoing process that requires high (initially underestimated) co-ordination expenditures.

C also found a strict project management to be an indispensable prerequisite for the EPC success. A clear target setting within a cross-functional team and project and moderation management was experienced of being of essential importance. C acknowledged that EPC require the development of a reliable communication plan regarding project approach and schedules.

Overall, C found the process of implementing a purchasing consortium rather complex. Explicit synergy projects had to be identified, prioritised and decided on and necessary resources allocated. According to C, cultural and 'soft' issues play a major role in realising purchasing synergy. C explained that the demand aggregation initiative requires intensive communications between the partners. The meeting members must be actively engaged in building context. Good results were achieved when the teams had similar requirements and compatible goals, procedures and cultures, communicated frequently and co-operated closely, and protected proprietary information, which then could lead in last instance to a certain level of trust among the members.

C also specified that active involvement of suppliers, training of purchasing personnel and moderation is crucial for fostering efficient and effective EPC. According to C, the appointment of project leaders and a moderator helped to balance the interests of the partners in the consortium, because they lacked hierarchical co-ordination instruments like an authority to issue directives or guidelines. C and other members also adopted a written agreement to include nondisclosure terms and other agreed-upon policies, principles, and procedures. Developing a team culture and common procedures were felt to be crucial for the development of credibility and trust among team members.

C further expects that the relationship between the members will need a continuous re-production through the management of an ongoing communication process in order to create some kind of team-spirit and frequent information exchange. C specified that the key to EPC is regularity and ease of communications and information exchange. Therefore, C decided not only to further participate in meetings, but also tries to extend communication by the use of electronic communication tools such as e-Mail, video conferencing, discussion forums or virtual project rooms. C acknowledged, however, that in order to build up initial trust and personal networks in the consortium, initial face-to-face communication in the meetings was crucial to improve the success of the consortium.

These face-to-face meetings were important in dissolving cultural barriers and aided team members to get to know each other personally as well as professionally. C specified that these face-to-face meetings will serve as a basis for the team members to willingly contact each other by electronic communication tools. C does not regard electronic systems such as videoconferences as a substitute to face-to-face meetings, but as a facilitator to hold meetings more often. A hybrid model of face-to-face meetings and virtual communications is regarded as convenient. According to C, not all activities involved in EPC can be electronically supported. While electronic systems such as videoconferences can significantly reduce the transaction costs associated with personal communications, they provide the participants with fewer facilities for building physical, situational, and social context.

C felt that the reliance on virtual communication without face-to-face interaction would be detrimental to the consortium process and regarded the importance of having a good personal relationship with other members as essential to carry the network through the periods of electronic communication. Especially when it comes to cultural and standardisation issues across companies, C argues that more than electronic communications systems are required.

However, C also explained that purchasing staff involved became a bit 'synergy fatigue' from all the extra meetings, communication, and travelling. Therefore, electronic communication tools are envisaged to help decrease costs in transaction costs and to intensify information exchange and best practices. Overall, C's management is confident

that both the use of the purchasing consortium and the implementation of electronic communication tools can be expanded in future.

4.5 CASE STUDY D IN THE ELECTRONICS INDUSTRY

Company D is a procurement service provider and developer of EPC solutions for B2B applications. Infomediary D started its demand aggregation services at the advent of e-Business and, therefore, belongs to one of the pioneers in developing electronic purchasing consortia. D is not an intermediary that would take on physical inventory or delivery of products or play a role in exchanging products or financial transfers, but develops electronic systems to enable purchasing organisations to conduct EPC by exclusively using Internet technologies.

D's vision was to create a system where purchasing managers can achieve cost efficiency while they still have the choice of an individual supplier selection. D's EPC solutions are particularly used in the electronics industry (e.g. active and passive components, LCDs, monitors, notebooks, multimedia), but also partly in other industries such as steel and metal products, raw materials and plastics. D's long-term goal is to expand its EPC system across products and services in other major manufacturing industries.

In this context, D groups unrelated and anonymous purchasing organisations for standard products with standard customisation options by Internet technologies before the product is manufactured. In order to facilitate this demand aggregation system, D has developed a patent-pending technology for EPC to consolidate pre-production demand. D implements and manages online 'deal rooms' where buyer demand for products can be grouped and aggregated before products are produced. The deal rooms are private Internet locations that buyers or suppliers can access using passwords controlled by the sponsoring company or organisation. These sponsors determine who has access to virtual negotiation rooms, and the organisations that are admitted agree to the sponsor's conditions and terms. Within the deal rooms, data describing products, pricing arrangements and shipping dates is made available. D sets up and manages customised online deal rooms for different sponsors that license the EPC system.

Currently, D's EPC technology is mainly focused on suppliers as sponsoring parties that try to reduce total production costs by offering the same product with standard customisation options to a variety of customers at the same time. However, sponsorship models will also include purchasing organisations, associations, traditional purchasing consortia and e-Marketplaces in future. Thus, D envisaged being an independent procurement service provider, whose demand aggregation software can be used by buyer-centric, independent or seller-centric sponsoring parties.

A supplier-sponsored deal room is a site licensed by D to a supplier or distributor for conducting EPC. A supplier can post there online an open offer to a group of approved buyers and describe the products for sale including price-volume curves, shipping dates, payment terms and other data. The price-volume curve shows the ratio of lower purchasing price versus aggregated volume. Once granted access to the site by the sponsoring supplier, purchasing managers can analyse the price-volume curve for a particular product, including current prices with volume discounts, future ship dates or total capacity available.

Purchasing managers are able to evaluate, according to the order volume, the average price drops along the price curve submitted by the supplier. They can observe a graph with data on the aggregation status and savings accumulated at that time. Purchasing organisations also have the facility to conduct a cost / benefit investigation to conclude whether or not receiving the product on the proposed delivery date is more valuable than placing a standard order with typical lead times. According to D, suppliers usually post a series of ship dates over a period of time. Purchasing managers can then place smaller orders across these ship dates to keep overall inventory levels lower. In each case, purchasers can add to the initial order within the time frame specified by suppliers.

Sponsoring suppliers can list production schedules for selected parts by week, month, or quarter. They can also list capacity and purchasing prices to different segments of purchasing organisations for demand aggregation, add capacity to existing offers in order to enhance production runs and change prices to reflect current supply and demand curves. The addition of new products, changes in volumes, revised price curves or order minimums can be communicated to purchasing organisations. Sponsoring suppliers can

take advantage of multiple deal rooms and can offer different products and price-curves to different market segments and preserve existing distribution arrangements.

Therefore, the EPC system enables purchasing managers to place individual orders or aggregate their orders with other anonymous buyers for standard direct materials around a supplier's pre-set shipping date. All purchasers who place orders agree to accept the product at the time specified and to meet the minimum order quantity. The total volume ordered then determines the final purchasing price. After order placement, the EPC system automatically aggregates orders of all buyers within the same shipping date. Therefore, the EPC system can aggregate demand among unrelated buyers aggregated before the product has been produced.

According to D, a positive outcome can be that sponsoring suppliers can achieve lower total costs from the underlying production efficiencies while simultaneously offering the achieved efficiencies to the purchasers. Demand consistency and increased order visibility can help suppliers to manage inventory more efficiently, allowing them also to test market a product prior before it is fully manufactured or before inventory is built up. Other advantages outlined include that suppliers can potentially service SMEs in a better way and decrease minimum quantity rates, while lowering the manufacturing costs at the same time. Suppliers could also achieve a better production schedule and achieve economies of scale by the committed volume of orders, which could be more difficult to attain under approaches such as built-to-order or build-to-stock strategies.

For example, the number of production set-ups for a particular product can be reduced. In one example, D specified that a manufacturer set a production line for a particular product a total of six times per quarter. By using the EPC system, the manufacturer could shrink the amount of production set-ups to only twice a quarter. When production efficiencies were achieved, sponsoring suppliers have the chance of transferring a percentage of the cost savings to purchasing organisations and still increase their own profit margins. In one example, D specified that a capital-intensive manufacturer analysed that the cost savings of a longer production run were between 16 and 18%. Thus the supplier could offer a group of buyers a scheduled discount of 10% and took advantage of a 6-8% increase in the net profit margin, while the purchasing organisations received a discount above what they historically attained.

According to D, it is, therefore, a critical factor for sponsoring suppliers that they have detailed knowledge about the effects of changes in production runs and production time. Since this detailed knowledge is not available in every firm, D provides additional consultancy services to sponsoring suppliers in order to determine better production run times for achieving a lower per unit cost as well as a better frequency and schedules of production runs.

Suppliers that participate in this EPC system may benefit from increased capacity utilisation, better management of working capital and increased sales. Further benefits specified can include a better match between capacity and upcoming demand, more accurate advance scheduling and improved record keeping. Purchasing organisations could profit from lower purchasing prices that were traditionally reserved for only large buyers, but still focus on their existing suppliers. In one example, D experienced that the minimum orders for a specific product could be reduced from 50,000 pieces to 8,000 pieces.

However, lower purchasing prices are accompanied by a drawback: Inventory carrying costs are shifted from the supplier to the purchaser when this EPC system is used. Savings can be outweighed by the additional materials management costs. D had to acknowledge that purchasing organisations have to agree to supplier's ship dates in order to achieve savings. Therefore, the EPC system can result in additional inventory carrying costs for purchasing organisations, especially for products with a risk of future volatile demand.

D experienced that the ratio of savings in purchasing costs versus additional inventory carrying costs can vary. In one example, the demand aggregation saving for a purchasing organisation was 18%, and the buyer's inventory cost for the regularly used product was 2% per month. Therefore, the purchasing organisation could save purchasing costs by aggregating demand and ordering the product sooner, with all other variables held constant. However, in another example, the saving from demand aggregation was only 7% in purchasing price, but the purchasing organisation had additional inventory costs of approx. 10% due to unregular demand. For that reason it is a critical factor to intensively compare the trade-off between potential savings from EPC and additional inventory costs.

Overall, however, D experienced that the gross savings achieved from demand aggregation exceeded the additional inventory costs. With just-in-time requests of many industry participants, it is a significant challenge of the EPC system whether or not the advantages of a lower purchasing price can outweigh the additional scheduling needs and inventory carrying costs for buyers.

Closely linked to product inventory costs is product feasibility for D. Suppliers and purchasing organisations can only integrate standardised products with standard options into the EPC system. In order to provide a certain degree of product customisation, D provides a product aggregator, which enables a supplier to aggregate volume around a 'base' product platform common to different product configurations. Purchasing managers can, therefore, participate in the EPC system while taking advantage of the product configurator to specify options such as colour, label, length, size or special characteristics. Sponsoring suppliers can individually feature over 500 different options for every base product while purchasing managers can customise the product according to those options. For example, a sponsoring supplier can list a standard product (e.g. metal) with standard options (e.g. the grade of metal by diameter) at varying purchasing prices. Although this basic customisation is possible, D experienced that products fit best for the EPC system when they fit the below criteria:

- 1) Products produced in a capital intensive manufacturing process with high fixed costs and significant changeover costs.
- 2) Standard products with standard options and low asset specificity.
- 3) Products that have a fragmented buyer base.
- 4) Products that buyers repeatedly purchase.
- 5) Products where buyers are very price-sensitive.
- 6) Products where buyers can take additional inventory.

According to D, while both direct and indirect goods in the electronics industry can fit above conditions, its EPC system would be more suitable for organisations that employ the same manufacturing processes for several products and intend to utilise their facilities more efficiently. The more of the same product can be manufactured, the fewer production line changes have to be undertaken.

D further specified that the more cost-sensitive the buyer, the greater the opportunity for demand aggregation initiatives. D revealed in this context that about 50% of its sponsoring suppliers indicated that price savings would enable them to sell more of their finished product. The markets in the electronics industry addressed by D are traditionally very cost-sensitive and relatively fragmented.

Anti-trust limitations have so far not emerged. D tries to monitor the specific market circumstances the demand aggregation system is operating in and the respective anti-trust legislation. Suppliers and purchasing organisations of all sizes can participate in the EPC system. D ensures that purchasing organisations aggregate demand anonymously and that company-specific data is not revealed to other purchasing organisations.

Overall, D estimates that on average about 20% of purchasing organisations that anonymously aggregate demand can be considered as competitors. Without Internet technologies, D claims that it was hardly feasible to make pre-production price curves and demand aggregation opportunities available to potential buyers or even competitors in real time.

However, the integration of the EPC system into ERP-systems of sponsoring suppliers or purchasing organisations is not available. D calls its EPC system ‘non-invasive’, as it requires only a standard Web browser and not any custom software, hardware or any change to the internal business systems of sponsors or purchasing managers users. According to D, this would simplify and accelerate implementation and ensure that the EPC system would remain a ‘good neighbour’ to customers’ internal business systems. D focuses, therefore, on being a ‘low-budget’ EPC provider for SMEs.

The non-integration of ERP-systems represents a disadvantage for larger suppliers and purchasing organisations. When ERP-systems are not fully integrated to e.g. materials management, production planning or financial accounting systems, the EPC system would run parallel to ERP-systems, i.e. process cost benefits are often not taken advantage of. While D claims that its EPC system can benefit from investments made in ERP-systems by making use of data from e.g. scheduling, production, accounting or marketing, D also acknowledged that without a true integration, operative efficiencies are sometimes only partly realised. This lack of integration can make it especially for larger

companies too difficult to secure its planning efficiencies and results in further manual comparative work.

Furthermore, D has not integrated reverse auctions into its EPC system and calls its service 'supplier-friendly'. According to D, reverse auctions are closely linked to an arms-length buyer-supplier relationship, would press suppliers into strong competition and would deliver only very limited operational efficiencies to suppliers. D acknowledged that reverse auctions can help large purchasing organisations with specific product needs to achieve an improved pricing structure in a competitive environment and more market transparency. However, efficiencies would be assumed and price savings expected, though operational efficiencies would be hardly achieved for suppliers, thereby providing only a one time-effect in increased transparency and lower purchasing costs for buyers. High-volume contracts would be required in order to attract multiple supplier competition. D claims that reverse auctions would decrease purchasing costs for buyers but at the expense of sellers, whereas D tries to improve both sides of the transaction.

According to D, its EPC model is an 'antidote' for suppliers concerned with the rising role of reverse auctions in e-Procurement. Therefore, its EPC system was designed to help achieve operational savings and enable SMEs to order small quantities. However, D also had to acknowledge that purchasing organisations cannot actively take part in the supplier negotiation phase: Price-curves are stipulated by the sponsoring suppliers and, therefore, active price negotiations do not take place. Therefore, the negotiation dominance for further demand aggregation rests at the sponsoring supplier that stipulates the discount margins. Frequently, purchasing managers who traditionally focused on active supplier negotiation and Rfx processes were not willing to participate in D's EPC model.

Traditional practice in purchasing and reliance on bidding systems is a barrier for implementation of D's EPC system: Purchasing managers that are afraid to loose decision autonomy can be not co-operative and non motivated to participate when a sponsoring supplier approaches them with the EPC system. They also would often fear not adequate supplier market transparency or unfair blame for poor performance when they do not have full control over shared activities. It is, therefore, a critical factor for D that purchasing managers compromise to the loss of buyer power negotiation dominance and

to a consequent cultural change. D further specified that intensive training of purchasing staff and testing of the EPC system can help to overcome these barriers. Therefore, it is important, according to D, to grant a temporary access to purchasing organisations that consider membership in order to analyse exactly how the system works. The purchasing managers could decide on a case-by-case basis on a trade-off between a supplier bidding strategy or the supplier-sponsored EPC system, in dependence of e.g. the product structure or the fragmentation of the supply base.

Some reluctance from purchasing managers to participate in supplier sponsored and seller-centric EPC participation made D decide to expand its EPC services. Other sponsoring models will be offered as well in future that will concentrate more on the buy-side and integrate electronic request for quotations.

A buyer-sponsored system room will be licensed to corporations with multiple divisions. A corporation will be enabled to aggregate orders from a number of plant locations that purchase similar item groups. Further customised services will include to post product templates, provide categories and specifications of desired products, and invite suppliers to place open offer sheets for products on the site, including pricing schedules and shipping information. All divisions can then view open offers, place orders with the suppliers they choose and add to buyer power centralisation within the corporation. Contrary to the supplier-sponsored demand aggregation system, multi sourcing can be implemented.

While the buyer-sponsored system will be limited to one corporation with multiple business units only, electronic purchasing consortia will also be implemented with association-sponsored or consortium-sponsored deal rooms: These systems will be customised for associations or traditional purchasing consortia that have similar purchasing needs in order to electronically leverage the association's membership, aggregate buying power and integrate both e-RFQs and supplier-sponsored EPC. D argues that unlike traditional 'off-line' purchasing consortia, the EPC system can further contribute to enable real-time EPC.

D plans to sell the EPC system to associations and traditional purchasing consortia in such a way that they can require suppliers or purchasing organisations to pay a surcharge

for access or transaction costs for every order, providing revenue for the association or the purchasing consortium, or to alternatively offer the EPC system as a free tool as part of the membership. In the latter revenue model, buyers and suppliers are more flexible to decide how and when the EPC system can be used for their own applications. This option would enable members to remain independent from purchasing volume. Otherwise D argues that the fee per EPC transaction has to be compared with the sourced volume and might not be profitable. According to D, association or purchasing consortia can then remain 'neutral' throughout the EPC process and complement traditional services. Similarly, D will license exchange-sponsored EPC systems to e-Marketplaces. E-Marketplaces will be offered to use the EPC solution as a complementary feature to other types of e-Procurement offerings, including bid-ask systems, catalogues, auctions, collaborative design, among others.

D's fee structure is based on the model that the respective sponsor pays D a one-time set-up charge, along with a monthly maintenance and service fee and a transaction fee. Transaction fees are not the dominant revenue models for D. Instead, a variety and mixture of EPC financing models prevails. D also offers a consulting service for sponsors to help find new customers, additionally charged as a fee for value-adding services. Overall, D specified that it could set up deal rooms for approx. 50 suppliers, who have used the service to sell to about 280 purchasing organisations. According to D, some of the purchasing organisations indicated that they purchased more when they used the supplier-sponsored demand aggregation service, but most of them were still satisfied with the EPC system. On average, D specified that suppliers could realise net savings of about 12% and a ROI of about 100% by using supplier-sponsored DAS.

However, D also acknowledged that further efforts are required to get suppliers and purchasing managers used and trained to this new EPC process. At the same, D also tries to adapt its services more closely to traditional purchasing practice in future in order to ensure a wider spread of EPC models in the electronics and other manufacturing industries.

4.6 CASE STUDY E IN PROCUREMENT OF INDIRECT PRODUCTS

Procurement of indirect products such as ORM / MRO can represent a significant and important, yet sometimes underestimated amount of purchases in the automotive and electronics industry. This case study further presents and analyses four EPC trading mechanisms for procurement of indirect products in the following sections.

Company E1 started as an intermediary for ORM / MRO products and initially focused on developing a business-to-consumer e-Marketplace for pooled purchasing. At a later stage, E1 extended its demand aggregation services to the business-to-business sector and was leveraging an infomediation platform for potential purchasing consortia established in industry-specific e-Marketplaces. E1 belonged to one of the pioneers in the provision of EPC technology for public and private e-Marketplaces and terminated its operations to date.

E1 started electronic buying in the B2C sector by invisibly pooling consumers into time-limited pooled purchasing opportunities called ‘buy-cycles’ patented by E1. This buy-cycle was implemented as a specified period of time during which a particular product was for sale. Fixed starting and ending times were determined for the selling process by E1. During this period, the price of each product fell incrementally within a range¹⁷³ according to the number of purchasers, until the closing price was reached. Prices continually amended in pre-set increments as new orders were placed within an anonymous purchasing consortium.

E1 could notify buyers when a particular product within a buy-cycle reached a certain pricing tier or was about to close. Buy-cycles were closed either when the pre-determined timeframe ended, or when the maximum number of orders was reached. According to E1, buyers could sign up to purchase products at a current price or could indicate that they only intend to procure at a specified price. A graphical display, thereby, illustrated the price decrease according to the number of units that were sold and the current price that has been achieved. At the end of the bidding process the product was sold at a price according to the number of bids received and every purchaser in the buy-cycle was

¹⁷³ Kauffman and Wang (2001) call this range price change trajectory.

charged the final demand aggregated product price. According to E1, a volume discount could then be achieved from suppliers, which could further be passed on to buyers.

Once E1 had qualified suppliers listed in the e-Marketplace, it could set a price range within which it could manoeuvre. E1 charged a 3 to 10% transaction percentage from suppliers for this service. While E1 did not experience any anti-trust limitations due to the fragmentation of the sector and could take advantage of lower overhead and inventory costs due to Internet sales economies, several reasons prompted the failure of its EPC system.

E1 had to compete with a variety of other retailers that could negotiate better purchasing conditions due to their higher procurement volumes. E1's starting transaction volume was significantly smaller than those of traditional large discount and retail stores. Reasons such as the combined forces of competition from these stores, reluctant market interest on the part of consumers and not sufficient venture capital forced E1 to direct its strategic focus towards software licensing in B2B. E1 had to realise that its overall budget was not enough to justify the extensive consumer training and education, which E1 found was required for electronic pooled purchasing particularly in the business-to-consumer sector.

As a consequence, E1 decided to shift its strategy from the business-to-consumer sector towards supplying its EPC software to aggregate demand for SMEs. E1 expected that training and education among purchasing managers would be more developed and, therefore, more suitable for its aggregated buying services. However, while E1 experienced that acceptance from B2B e-Marketplaces / PSPs and purchasing organisations has been better than among consumers to its EPC system, it also did not succeed in this sector.

Several reasons could be identified: E1's EPC system could not provide instant order fulfilment and each buy-cycle remained open for a limited period. Therefore, the buy-cycle could be rather lengthy, with some taking several weeks to complete. Bids were considered non-cancellable once submitted. Therefore, E1 acknowledged that this EPC trading mechanism prevented in many cases impulse buying, due to the lengthy periods purchasing managers had to wait until the end of the buying cycles. They did in most cases not accept the time limited buy-cycle trading mechanism and regarded this process

as a kind of ‘gambling’ or ‘gamesmanship’ that would not effectively contribute to traditional procurement practices. While spot buys are very common for procurement of indirect materials, E1 found purchasing managers in the B2B sector not very much willing to wait a certain period of time until the final product price was announced and to experience latency for ordering processes.

E1 further acknowledged that its EPC system was only used for a limited selection of already manufactured and ready-to-deliver products. Product customisation was hardly feasible. As a consequence, suppliers could hardly benefit from efficiencies in pre-production demand aggregation and could not take advantage of more accurate and aggregated order forecasting and more operational production efficiency. Potential purchasers faced also difficulties to make purchase decisions based only on the limited product information and specifications made available by E1. In the end, the venture capital was not sufficient to continue the EPC service, as E1 could not reach a critical mass of participants and sales volume. This background led to the final failure of E1’s EPC system and the termination of EPC service provision.

Other EPC providers for indirect products closely monitored E1’s failure and tried to implement modified EPC trading mechanisms. Unlike E1, where the price of products was falling in line with the number of buyers, E2 tried to provide pre-negotiated wholesale purchasing prices upfront and to grant a rebate once the total number of purchasers has been finalised. To encounter E1’s time-consuming buy-cycles, E2 tried to set up an EPC process that would enable purchasing managers to receive ordered products immediately.

E2 regarded itself as a procurement service provider that offered customised supplier integration and hosting solutions to enterprises of all sizes, though the main focus was on SMEs. E2 argued that traditionally SMEs have little opportunity to move up the supply chain to achieve economies of scale and scope in purchasing. Therefore, E2 tried to combine the buying power of multi-industry companies with similar purchasing requirements for indirect products. Therefore, it provided consultancy services and operated a neutral independent e-Marketplace for small and medium-sized suppliers and buyers with the aim to be a one-stop shop using a consortium purchasing methodology for

SMEs' procurement of indirect goods, such as computer equipment, office products and utility services.

SMEs could purchase indirect goods and services from an Internet catalogue, which was hosted and updated by E2. SMEs could get access there to quotes based on E2's standard pre-negotiated wholesale prices for goods and services. E2 then calculated a rebate, which it obtained according to the amount that has been purchased from a particular supplier as well as the number of new customer introductions that a member generated. Thereby, E2 offered its members a cash back rebate scheme. As prices fell with increasing volumes, purchasing managers received a cash rebate at the end of each month that reflected the ratio of purchasing price versus volume. E2 designed this process to eliminate issues such as latency and waiting time for a pool to reach a certain size before an order is made that was experienced by customers of other EPC providers such as E1.

E2 argued that its EPC rebate system would get over the main drawbacks facing PSPs such as E1, namely that products have to be 'in bid' and the potential purchaser has to wait for the bidding to close. From the outset, E2's view was that e-Marketplaces / PSPs need tangible benefits for both buyers and suppliers. As such, E2 tried to form partnerships with pre-selected suppliers in order to avoid direct competition on product ranges, where order sizes would not warrant the deployment of e-RFQ or reverse auction strategies. According to E2, its e-Marketplace was built on a buy-side - sell-side independent system, because other models, according to E2's experience, would not provide enough supplier or vice-versa buyer participation.

E2 further argued that suppliers are loath to participate in e-Marketplaces that force them into commoditising their offering via a reverse auction or e-RFQ transaction methodology. In addition, E2 claimed that most SME purchasing managers would find using this methodology to buy simple indirect goods and services too cumbersome. Therefore, E2 tried to implement a 'supplier friendly' EPC system so that suppliers could have a benefit by delivering product description and content to a single organisation rather than to a multitude of SMEs.

E2 specified that average net savings of approx. 5% could be achieved for purchasing managers on indirect materials such as office products, stationery and office furniture,

technology, energy, logistics services or capital expenditures. For the provision of the EPC service, E2 charged fees that were success based, thereby providing suppliers the opportunity to decrease upfront fees associated with the creation and distribution of their transactable content to multiple purchasing platforms, while buyer and supplier membership was free. Revenues were generated through a percentage per transaction by taking a margin of the sale of goods and services and a software licensing programme of the EPC system to other e-Marketplace operators.

While E2 branded advantages for SMEs such as net savings in purchase price, a decline in administrative time and costs involved in order replenishment, a better review of historic buying patterns within their interest 'community' as well as fewer mistakes in purchasing decisions, E2 had to terminate its services after three years of operation. One of the main reasons for the failure included that E2 could not gain a critical mass of participants. E2 reported that among SMEs there is still a very conservative approach and slow adoption process to Internet procurement. While E2 identified potential 392,000 users, it could market to only 50,000 and converted only about one percent of this number into trading customers.

Another drawback was that E2's EPC negotiation process could create an administrative problem for SMEs. Purchasing organisations had to enter a purchase into their account payable system and had to generate another entry adjusting the price and thus, in effect, double the number of accounting inputs. Though instant order fulfilment could proceed, purchasing managers still had to wait for the final purchasing price, which could result in uncertainty in the procurement planning stage. At the end, E2 could not achieve the break-even or critical mass of customers and eventually new venture capital was not granted. This background mainly led to the termination of E2's EPC operations.

To counteract the latency in purchasing price determination, e-Marketplace E3 concentrated on a more traditional middleman role. E3 specified that within the EPC systems of E1 and E2, SMEs did not know the final product purchase price up-front, which could result in insecurity e.g. if a transaction happened or not. E3 argued that purchasing managers are traditionally unwilling to be left awaiting a lengthy price determination for non-critical items, where purchasing price would not always be the number one consideration. E3 specified that in some cases, purchasing managers would

even be prepared to pay a higher price in order to receive products sooner, or pay a premium for delivery certainty. According to E3, it, therefore, tried to develop a system that would match more closely common purchasing business practices.

E3's EPC system has similarities with the business model of a traditional intermediary, except that E3 does not hold inventory and is not responsible for delivery. E3 merely provides the communication infrastructure and transacts the order flow between suppliers and buyers. Therefore, E3 is not an intermediary that would take ownership of products. This arrangement can leave the infomediary E3 with the opportunity to lower overhead costs that are typically associated with other sales channels. E3 focuses on a neutral and independent service provision, which is based on a network among multiple unrelated purchasing organisations, that procure similar and alike products across multiple geographies. In this collaborative model all network members stay anonymous and are connected by Internet technology.

E3 aims to increase the efficiency of SMEs' procurement through reduced acquisition costs and simplified processes. E3 pre-negotiates purchasing prices with suppliers on the basis of aggregated demand from SMEs. Because of the volume and frequency of orders, E3 argues that its consortium purchasing e-Marketplace can pre-negotiate prices from suppliers that would not normally deal with SMEs. Within its EPC concept, no further rebates are granted after order confirmation. Purchasing organisations can access products in E3's catalogue system. The infomediary E3 hosts supplier catalogues and then displays the details of the products on its e-Marketplace in a relatively standardised way.

Suppliers' ERP-systems can be integrated with the e-Marketplace, so that when a purchasing manager places an order it can be transmitted into the ERP-system of the supplier responsible for despatching. According to E3, purchasing organisations can so receive the advantages of being directly linked with suppliers' customer services. Suppliers can also ship aggregated batches of product orders to strategically located cross-dock facilities. At the local cross-dock, bulk shipments can be broken down into individual shipments to the various customers. E3 argues that this process flow can also offer a way to garner efficiencies from transportation and logistics services. E3 notes that this process should be transparent as strict shipping parameters and sophisticated ICT systems are required to monitor parts in motion.

E3 concentrates on products with relatively low asset specificity such as office equipment and supplies, as well as vehicle rental and leasing, insurance, office refurbishment, mobile phones, and other products. According to E3, suppliers would be able to decrease sales expenses and planning costs by taking advantage of its e-Marketplace, thereby potentially allowing them to re-direct resources to more strategic activities. By aggregating the supply needs of SMEs, E3 tries to take advantage of economies of scale and scope, which can result in declared advantages such as improved reaction times, reduced costs, greater supply / demand visibility and lower inventory. For instance, billing proceeds from E3 to purchasing organisations, rather than several invoices from multiple suppliers. E3 charges a percentage per transaction of about 5% for its demand aggregation service and claims to achieve on average 10% net savings for purchasing organisations.

E3 sees its main strength and added value in the ability to manage information. However, E3 also identified significant challenges for the future, in particular, its ability to pre-negotiate significant savings from suppliers and raise SME awareness for its service. Furthermore, E3 experienced that its service requires more than an e-Marketplace and e-Business technology. E3 had to learn how to adopt to the reality of how SME business transactions are still conducted today: that is still, according to E3, a mix of phone, fax or Internet orders. A critical factor for E3 in future is, therefore, the need to educate the SME sector for new advanced e-Procurement and EPC techniques. While these barriers are critical to its success, E3 is positive for the future that adoption of its service among SMEs will further increase.

However, E3 experienced that some purchasing managers insist that procurement of indirect products should involve a negotiation phase. A procurement negotiation phase between purchasing managers and suppliers is not supported by E3's EPC system.

Company E4 strongly focused on the integration of a negotiation phase into its EPC service, namely e-RFQs and reverse auctions. E4 was an infomediary and neutral e-Marketplace for procurement of indirect products that had to terminate its operations. It offered a relatively broad product spectrum of business services including telecommunications, financial, personnel, logistics and more. The provided services ranged from cellular phones to web services, including retirement plans for staff.

Purchasing organisations could initiate consortium purchases for products or services they were searching for and could exchange product information with other organisations. Purchasing managers could hereby post the required specifications of a product recommended for consortium purchasing, the desired purchasing price or the number of orders that should be gathered for the product on E4's e-Marketplace. Purchasing managers could identify products where there was potential for aggregation and contact other potential buyers of these products for their interest in being a part of a potential purchasing consortium. Purchasing managers could indicate the highest purchase they were prepared to pay for a product. The request could then be aggregated with other demands from other buyers, and all combined constituted the purchase group.

E4 then forwarded this proposal around its network of suppliers, who could then act in response to the proposal if interested, with their own price or quantity at which they were ready to sell the specific product. A bidding event could be initiated for suppliers, where any bid made was regarded as a binding bid on the part of the supplier. Each supplier could analyse competitor's bids, but the competitor's identity remained unknown. At any time during the bid period, each supplier could improve on a previous bid.

E4 communicated to the purchasing consortium the conditions reached during the RFQ period and the group could make a selection. The selection was nonbinding to buyers. However, although buyers were not duty-bound to accept the winning supplier's bid, they were expected to complete the transaction. In dependence of the RFQ rules, buyers could award the contract either automatically or after further negotiation to the bidder with the best bid or to a predetermined number of best bidders. If both buyers and suppliers agreed, they signed an agreement under E4's supervision and business terms. The rest of the tasks (payments, credits, etc.) were discussed directly between buyers and suppliers.

Participants paid E4 transaction fees ranging from 1% to 10% of the total value. Customer data was not sold for advertising. E4 mainly specified buyer benefits such as a lower direct purchase price through a combination of discounts from supplier, as well as savings on freight, documentation and insurance. E4 named supplier benefits such as ease of transaction, single point of business to cater multiple buyers and increased market share.

However, one of the main reasons why E4 had to terminate its operations was that its demand aggregation process for a wide range of products and services were not focused and specific enough for both buyers and suppliers. Due to the broad range of offered products, it was difficult for E4 in practice to aggregate demand from postings of specifications that were often rather vague and not precise. E4 did not concentrate on taking care of active aggregation management and moderation among purchasing managers. Pooling of requirements was found to require active commodity management and commitment and more than just posting a requirement on the e-Marketplace.

In most cases not enough commonality in the purchases could be obtained and a critical mass of purchasing managers and suppliers could not be established, as minimum percentages of purchasing volumes were not required. Also, many SMEs did not have the patience to submit RFQs and wait for quotations for indirect products. Furthermore, as offered services were nonbinding to potential buyers, some suppliers and group members lost interest. Eventually, E4's was not granted any more venture capital.

The case on EPC models for procurement of non-critical parts and services has identified several insights. Common to all four examples is that anti-trust limitations did not occur for the procurement of indirect products due to the multiple industry focus as well as buyer and supplier fragmentation. Due to the commoditisation of indirect products and low asset specificity, arms-length buyer-supplier relationships were established with a focus on multiple sourcing in all four examples. Examples E1, E2 and E4 revealed that some EPC models procurement for indirect products have failed, which suggests a rather volatile EPC market for indirect products. Several reasons for this volatile market could be identified such as infrequency of SME procurement of indirect material, spot sourcing, latency in order fulfilment, missing training and education in procurement among SMEs, among others. Overall, this EPC case in indirect procurement could make a further contribution to a first EPC taxonomy developed in the following sections.

4.7 THEORETICAL DISCUSSION OF CASE STUDIES: TOWARDS A FIRST EPC TAXONOMY

This theoretical discussion is aimed to present case study reflections and conclusions. Case studies are traditionally not used for hypotheses testing, but could provide a first specific and detailed insight into EPC practice. Specifically, the case studies chosen and presented could identify all EPC trading mechanisms available according to the latest developments in ICT / IOS and could strongly contribute towards the development of a first EPC framework (see Figure 18).

Figure 18: Towards a First Conceptual Model of EPC				
<u>EPC Structures:</u>				
Type of EPC Market Mechanisms:				
EPC with e-RFQ or Reverse Auction: A, B, C, E4	Pre-Production Buy-Cycle: D	Time-Limited Buy-Cycle: E1	Buy-Cycle with Rebate Scheme: E2	Pre-Negotiated Infomediation: E3
Classification of EPC Infomediation:				
Laissez-faire Model: A, B, D, E4			Mediated Operating Level: C, E1-E3	
Industry-wide (Vertical) Focus: A, B		EPC Industry Focus: Cross-Industry (Horizontal) Focus: C, D, E1-E4		Geographical Area: C
Buy-side Focus: A, B, C, D Stable EPC Network: A, C		EPC Network Focus: Neutral: D, E1-E4		Sell-side Focus: D Dynamic EPC Network: B, D, E1-E4
EPC Sourcing Approach:				
Spot Sourcing: E1-E4			Systematic Sourcing: A, B, C, D	
EPC Revenue Fees:				
Mixture of Fees: A, B, C, D			Transaction Percentage: E1-E4	
<u>EPC Process Enablers and Drivers</u>				
Low				High
C, D, E1-E4	Co-opetition, Level of EPC Market Share (Buyer Power) and Anti-Trust Limitations			A, B
A, C	Level of EPC Anonymity			B, D, E1-E4
B, D, E1, E2, E4	Level of Additional Non-Electronic EPC Support			A, C, E3
A, B, E1-E4	Level of Support for EPC Product Standardisation Initiatives and Product Customisation (Homogeneity vs. Heterogeneity)			C, D
A, B, C, D, E3	Level of Barriers and Critical Factors: Leading to Termination of EPC Operations			E1, E2, E4

Based on the review of the case studies, the author proposes this preliminary framework that can aid in delineating the concept of EPC and in understanding the components. This framework is used to discuss the key observations and to serve as the basis for the survey research. In the case studies, innovations associated with electronic consortium purchasing were introduced as well as strategic and operational aspects of EPC presented. From the case research, it became clear that each EPC has its own characteristics and distinguishing marks governed by e.g. sourcing projects, industry sector, market position and buyer power, corporate strategy or structure.

However, five EPC trading mechanisms could be identified from the case studies and were depicted in the conceptual framework. As the cases were intentionally chosen to represent all available EPC trading mechanisms that the author came across in the marketplace to date, this finding can be generalised across settings and industry sectors.

The trading mechanisms can range from EPC with e-RFQ or reverse auctions (cases A, B, C, E4) to pre-production demand aggregation price curves (case D), time limited buy-cycles (case E1), buy-cycles with rebate schemes (case E2) to pre-negotiated infomediatioin (case E3). EPC with e-RFQs or reverse auctions were identified to have a buy-side focus and come closest, due to RFX integration, to traditional predominant procurement practices in industry. EPC might be combined with e-RFQ and reverse auctions when two supply base characteristics are met: the ability for multi sourcing and, beyond that, the presence of a critical mass of capable suppliers to comprise a competitive market. EPC with e-RFQ or reverse auctions can make a vital contribution to the sourcing process, particularly in the case when supply networks can gain access to a collaborative information and specification exchange (potentially supported by moderation techniques as shown as in case C) in order to achieve a detailed product standardisation and focus for demand aggregation (case E4).

However, other new EPC trading mechanisms such as pre-production buy-cycles (i.e. multiple buyers can electronically aggregate their orders around a supplier's pre-set and pre-production shipping date at the expense of additional inventory costs for purchasing organisations), time-limited buy cycles (i.e. prices continually amend in pre-set increments and time-frames as new group orders are electronically placed), buy cycles with rebate schemes (i.e. a rebate is granted once the total number of purchasers has been electronically finalised) and pre-negotiated infomediatioin (i.e. EPC providers pre-

negotiate purchasing prices based on aggregated demand and electronically link buyers and suppliers, but do not take ownership of products) also evolved by information and communication technologies.

For example, pre-production buy-cycles can make a contribution to the sourcing process when a buyer-supplier relationship has already been established and active buyer-supplier negotiation phases or multi sourcing strategies are not required. Cases E1 and E2 demonstrated that both time limited buy cycles and buy-cycles with rebate schemes could not achieve a critical mass of participants. A range of critical factors and barriers led to the failures, such as the order latency and waiting time for the final product price involved in time limited buy cycles, which can be perceived by purchasing managers as a kind of 'gamesmanship'. To counteract the latency in purchasing price determination, e-Marketplace E3 concentrated on a more traditional middleman role.

These EPC trading mechanisms are typically operated by neutral infomediaries by contrast to buyer-driven EPC with e-RFQ or reverse auctions (with the exception of case D, where a mixture of buy-side, sell-side or neutral focus is made available). All cases had in common that some form of infomediaries were used to establish specific exchange support such as trust and credibility mechanisms or extended service propositions.

While third-party intermediaries by definition per se do not cleanly fall into the EPC continuum between markets and hierarchy, the case study research found two categories of infomediaries that support EPC: The laissez-faire model, where the e-Marketplace / PSP typically acts as a lead source for purchasing organisations and suppliers and provides e.g. product information, customisation, specifications or exchange mechanisms in order to facilitate demand aggregation (cases A, B, D, E4). In this way, the laissez-faire e-Marketplace / PSP itself plays a passive role in negotiating on behalf of either seller or buyer, but provides the EPC infrastructure. The second mediated EPC operating model is one where the e-Marketplace / PSP acts as an active infomediary, which takes part in demand aggregation and negotiation strategies on behalf of buyers or suppliers (cases C, E1, E2, E3). Both the laissez-faire model and the mediated model represent an imprint exploration on how to classify the type of EPC infomEDIATION.

The findings from the case studies suggest that the fit and compatibility of the available infomediary's EPC technology with organisations' existing procurement practices play an important role in adoption decisions. The case study research further indicates that

purchasing organisations that plan to co-operate with each other in virtual EPC projects can benefit more when they are compatible in purchasing (e.g. quality and professionalism of the purchasers, role and position of the purchasing function). For example, case study C identified that EPC can require significant resources and efforts from an interfirm consortia to reach an understanding on how to realise purchasing synergy. The specific EPC trading mechanisms might require changes in the existing procurement operating practices and processes from purchasing organisations and incompatibility can decrease the likelihood of EPC adoption or successful EPC management.

Overall, the presented EPC trading mechanisms are subject to a variety of further process enablers and drivers and purchasing organisations have to decide on how EPC can be best integrated for particular sourcing projects. Purchasing organisations can implement, apart from the EPC trading mechanisms, different structural designs to EPC to stimulate inter-company co-operation. For example, these structural designs can have a regional, national or global scope or can also vary between co-operation that is voluntary, informal, and initiated bottom-up, and co-operation that is mandatory, formal and initiated top-down by top management (confirmed by Rozemeijer, 2000).

From the case studies and EPC trading mechanisms it was also learnt that different EPC sourcing approaches can prevail. Systematic sourcing typically involves long-term buyer-supplier contracts and was strongly integrated into EPC with e-RFQ and reverse auctions as well as pre-production buy-cycles. EPC for indirect products rather concentrated on spot sourcing to fulfil an immediate need. ICT facilitate the initiation of EPC spot sourcing and co-operation in dynamic alliance networks that can be more short-term based and project-oriented.

Therefore, EPC may range from long term institutionalised entities to ad-hoc agreements between independent organisations. While case studies A and C were examples of more stable EPC alliance networks with a rather pre-defined number of EPC partners, the other cases illustrated dynamic alliance networks where suitable partners from different organisations can be located and assembled into specific electronic purchasing consortia. The dynamic network can be more fluid and flexible since the EPC member configuration can frequently change. The EPC partnership is more temporarily and is established in respond to any sourcing opportunity and disbands when its purpose has been achieved.

Co-operation in dynamic EPC can be based on the completion of one sourcing project only. The case studies illustrated that dynamic EPC predominantly concentrate on commodities with rather low asset specificity and high product pooling potential. However, case study C demonstrated that the integration of a higher percentage of overall purchased products into EPC may require the establishment of trust and cultural compatibility among the partners, which might be more difficult to achieve by virtual co-operation and moderation only (see case study B).

While stable networks can benefit from the construction of mutual trust, repeated co-operation and standardisation, dynamic EPC networks can integrate new external partners temporarily during any new sourcing project. Dynamic EPC can call on markets from an array of organisations to potentially respond more efficiently and effectively to market sourcing opportunities and potentially operate at lower cost than stable networks, but at the expense of standardisation and trust building initiatives.

The level of anonymity between EPC partners is closely linked to the distinction between stable and dynamic EPC. When search costs and the advantages from long-term relationships are low, purchasers and sellers can interact with virtual anonymity, as is the case in highly liquid commodity markets. While EPC anonymity can potentially eliminate inefficiencies in the markets where product homogeneity prevails, there may be only limited opportunities for true anonymous EPC in the automotive and electronics industry since most products would be too complex.

In order to integrate a significant part of purchasing volume into EPC and to aggregate heterogeneous products among EPC members, it could be established from the case studies that active commodity management, product customisation and standardisation initiatives are required. A high level of collaboration between organisations can also require additional semi-automatic and non-electronic EPC support (e.g. moderation services, face-to-face meetings). The findings from the case studies suggest that the more purchasing volume is integrated into EPC initiatives, the higher the overall complexity.

Complexity can be an inhibiting factor to EPC diffusion and refers to whether or not EPC are difficult to understand and use. When EPC are fully integrated into an organisation's overall procurement processes and involve multiple consortia members (which may have e.g. culture or product related incompatibilities), they can become very complex operations. The case studies illustrated that all purchasing organisations have

implemented EPC only for a relatively small part of their overall commodity purchases. However, direct strategic products can potentially offer the most potential return and cost savings (as they are often not standardised and commoditised yet), but the highest degree of supply risk. Complexity increased in case study C when demand aggregation was expanded to a larger part of overall purchases and asked for additional face-to-face meetings and trust building initiatives.

Powell (1990) acknowledges that the 'layered rigging' of reputation, friendship, interdependence and altruism can become an integral part of the relationship. The findings from case C confirm Ahuja and Carley (1999) and Wiesenfeld et al. (1999) that stress the importance of face-to-face meetings and informal contacts in the shaping of virtual teams, since they are able to improve the willingness to transfer knowledge. It was found that ICT and IOS (e.g. the Internet, electronic conferencing systems) can support information sharing and can facilitate co-operation.

However, EPC can require communication and co-ordination of activities across multiple cultural and organisational contexts through channels, which can limit the formation of a team culture and the full exchange of context-embedded learning or tacit knowledge. Since the EPC partners would have no physical contact, some of the qualities of face-to-face communication may not take effect. For instance, Spar and Bussang (1996) confirm the absence of established rules on the Internet, which according to their view leads to an uncertainty about the possible behaviour of the business partner. Non-electronic or semi-automatic communications can be important as well to address standardisation initiatives in direct material procurement in order to retain contextual information of the consortium members (e.g. organisational and cultural information).

EPC and information sharing get more complex and critical when the members are geographically dispersed and culturally diverse. Case study C suggests that building and using inter-personal EPC networks can be important because of the social capital that is implanted in these relationships. Nahapiet and Ghoshal (1998) specify that social capital is the set of assets, which can be accumulated in the networks of relationships and used for a specific purpose. They also confirm the findings from case study C that face-to-face meetings can aid to accumulate social capital and serve to establish a common context and trust. Social capital and cultural fit can then be maintained by electronic support, e.g. EPC members can keep in close contact to ensure frequent and continual communication,

in order to better exploit resources. Challenges (such as shared understanding about EPC outcomes and how to achieve these outcomes or the integration of skills and knowledge across systems, boundaries and cross-functional teams) may be more salient in EPC with a high level of virtuality.

The emergence of EPC can further help purchasing organisations address issues of a higher degree of complexity and volatility. However, the case study data also pointed to the importance of training and education on how to support electronic purchasing consortia, identify incompatibilities between members and build virtual consensus. Emery (1980) confirms that in socio-technical systems the training of group members and their access to other skilled personnel is a critical factor.

These findings also suggest that integrated EPC workflow processes should be able to deal effectively with well-specified levels of co-operation potentials of partners and with heterogeneous workflow environments. They should also cope with stable and dynamic establishment of EPC collaboration and support frequent formal and informal interaction between members in order to realise purchasing synergy and to achieve a higher percentage of product pooling and aggregation.

Apart from this complexity, a low compatibility due to anti-trust limitations could also be identified as a reason why only a minor part of overall product volumes were integrated into EPC (cases A and B). Some conclusions can be drawn towards EPC anti-trust limitations from the case studies. Anti-trust limitations did not appear for cross-industry (horizontal) EPC co-operation (see cases C, D, E1-E4) or for a geographical area (case C). From an anti-trust point of view, industry-led e-Marketplaces / PSPs are noteworthy because they bring together powerful groups of buyers. EPC that adopt an industry-wide (vertical) focus (cases A and B) are reviewed in terms of the traditional trade commissions' competition rules.

While the level of co-operation was rather low in all cases, EPC with co-operative agreements between competitors, in particular, need to obtain guidance from the trade commissions. EPC implementation for direct purchases in a single industry is related to factors such as firm size and buyer power. The larger the purchasing organisations that seek to implement EPC with each other, the more likely EPC for direct purchases are prohibited by anti-trust law. Although the trade commissions provided general guidelines and regulations on the treatment of consortium purchasing by competitors, they have still

not ruled exactly on this issue for e-Marketplaces / PSPs. The legal conditions for EPC are still not fully clear and there is still some uncertainty as to how exactly the prohibition on illicit sensitive information exchange can and should operate with regard to EPC.

Nevertheless, despite these uncertainties, the approval of case A by the trade commissions constitutes positive regulatory developments for companies expanding into electronic purchasing consortia, although limited to procurement of indirect products only. Therefore, it can be concluded that e-Marketplaces / PSPs with industry dominating players will have to tread a fine line between procurement optimisation and restrictive behaviours such as forming an EPC monopsony or oligopsony. E-Marketplaces / PSPs and trade commissions have to verify that there are controls that can prevent the disclosure of price or other competitive sensitive information among competitors.

An understanding of the underlying EPC strategies is required to preserve incentives for market participants to be innovative and efficient in the long run. This understanding could help to employ optimised EPC sourcing strategies and not to opt for conservative EPC approaches only. For example, case studies A and B demonstrated that pooling initiatives between OEMs and first tier suppliers were not integrated into the e-Marketplaces. In order to make better use of this potential and avoid EPC anti-trust limitations in future, e-Marketplaces / PSPs may focus on safe-guards and choose to e.g. employ confidentiality and non-disclosure agreements, firewall or restrict sensitive information, provide anti-trust training to employees or restrict EPC membership when members' purchasing volumes approach 15% of the respective product market. In this respect, the ongoing dialogue between trade commissions, e-Marketplaces / PSPs and purchasing organisations is a prerequisite to fully take advantage of EPC potentials.

Another observation from the case studies is that pressures from the business context seem to drive purchasing organisations to take advantage of EPC potentials. Pressure to reduce costs was rather high in all cases. All purchasing organisations faced some business pressures (such as globalisation, price erosion, faster time to market) and these seemed to have stimulated purchasing organisations to become more receptive for the potential contribution that procurement and EPC can make to the overall profit. This increased management attention can pave the way for developing purchasing maturity and starting initiatives to realise purchasing synergy.

Purchasing synergy measures to what extent EPC can result in economic terms (e.g. net savings or a positive ROI) or in intangible benefits. While all cases studies reported a net savings from EPC (ranging from 5% to 15% on average) and a positive average ROI from EPC, some EPC sourcing projects did not result in expected net savings. Companies E1, E2 and E4 could even not continue their operations, mainly due to costs in marketing their EPC services and not sufficiently gained revenue fees. Tornatzky and Klein (1982) confirm that communicability, marketing and training is assumed to be positively related to the adoption of an innovation.

While EPC for indirect products mainly focused on a transaction percentage fee to cover the costs, a mixture of different fees prevailed in the other cases in order to take advantage of more flexible pricing strategies. A significant amount of investment fees for EPC can occur: For example, case study C showed that members can invest a significant amount of resources and efforts into EPC to communicating with each other, develop strategies, solve conflicts or make compromises. However, intangible benefits from EPC, e.g. knowledge sharing, information exchange and ubiquity, know-how transfer or benchmarking of best practices were also found to be more developed when frequent information sharing was integrated. Frequent interaction between EPC members can be regarded as a key element in realising purchasing synergy and result, apart from tangible benefits, in additional important intangible benefits.

The case studies suggest that purchasing organisations would first start with collaborative EPC pilot projects to achieve tangible and intangible EPC benefits. Therefore, they would first explore EPC trialability (i.e. the degree to which EPC can be pilot tested or experimented). When EPC benefits are observable (i.e. the extent to which relative advantages or gains can be achieved from EPC) and if a successful pilot test yielded good results, EPC projects can be gradually evolved and increased to a routine phase. Partners in successful EPC can then engage in interactive and iterative learning cycles.

During the case studies, however, many reasons why purchasing organisations do not co-operate effectively with each other in EPC could be identified. Most barriers are related to the human factor (e.g. insufficient leadership, unwillingness to co-operate, resistance to change, lack of trust, personal insecurity, fear of losing jobs, threat of being by-passed by technology, lack of motivation and professionalism, communications problems and difficulties in aligning the processes and cultures of partner companies), others are related

to structures, processes and systems (e.g. non compatible ICT and IOS systems or EPC trading mechanism, lack of resources in purchasing information systems, anti-trust limitations).

The findings from the case studies suggest that through the lack of top management support, technology is difficult to be successfully implemented (in accordance to e.g. Cooper and Zmud, 1990). The findings were also consistent with the study done by Kwon and Zmud (1987) who commented that successful technology implementation occurs when organisational resources are positively supported for initial motivation and implementation efforts.

Time, fear and lack of skills are critical factors in terms of EPC adoption. For example, purchasing organisations tend to wait for the existence of a critical mass of EPC adopters and require some role models and time to follow. Fear of the unknown, change and technology have also been posited as reasons why the uptake of technology is less for SMEs (e.g. Lewis, 2002). For example, purchasing organisations may remain uncertain about the security of transacting by ICT or in which way sensitive information may be used or disclosed to third parties or competitors.

Security risks make businesses reluctant to use the Internet or participate in online transactions and therefore could prevent them from obtaining the benefits promised by online commerce (US FTC, 2000). Concomitantly, the media has also created an additional barrier for adoption of EPC initiatives with saturation coverage of dot.com business consolidation since 2001 (Walker et al., 2003). Lack of skills and human inertia also appear to be significant barriers. Moreover, many SMEs in particular do not have a good understanding of the concept of EPC, are not e-Business ready and are in need of further information and assistance (e.g. Bode and Burn, 2002). Walker et al. (2003) found that a lot of SMEs acknowledge that they did need to up-skill, but that time was the critical issue.

EPC are collaboration and communication intensive and it is a prerequisite to have a standardised and easily accessible communications infrastructure, that facilitates complex inter-organisational processes such as know-how sharing, standardisation initiatives or demand pooling. In order to deal with critical factors, top management support or co-operation development and education concepts such as overcoming user resistance can be suggested to improve the likelihood of successful EPC adoption.

The case studies could highlight some important knowledge gains into the specified EPC research constructs within the automotive and electronics industries. The exploration into the different EPC trading mechanisms, process enablers and drivers asked for a multiple case study approach. This could also be used to enable a better understanding of the diversity of EPC approaches in practice. However, this first explorative EPC conceptual framework is not yet complete and will be further revised by survey research and hypotheses testing in the following sections.

CHAPTER V THE SURVEYS

5.1 INTRODUCTION

Armed with the insights from the literature review and a first EPC conceptual framework from the case studies, the author further explored EPC by surveys among purchasing organisations and e-Marketplaces / PSPs in the automotive and electronics industry. The objective of the surveys was to quantitatively and qualitatively research the current situation and future trends on electronic purchasing consortia according to the agenda of research constructs and hypotheses outlined in the second chapter. Hypothesis were tested and confirmed based on the significance level of $p \leq 0.05$. In this chapter the major findings and results from the data obtained will be illustrated.

5.2 RESPONSE RATE AND BACKGROUND INFORMATION TO PARTICIPANTS

5.2.1 E-Marketplace / PSP Survey

In order to receive data required from e-Marketplaces and PSPs, a full survey was conducted by electronically sending a seven-page questionnaire (see appendix B) to 196 B2B e-Marketplaces and procurement service providers in the automotive, electronics, their ORM / MRO industries and two closely related industry sectors (metals, plastics) world-wide.¹⁷⁴ All e-Marketplaces / PSPs were identified in two major established online databases.¹⁷⁵ After having segmented and explored the contact details of these e-Marketplaces and PSPs, all data was stored into a database, supplemented and updated by the author's own research.

However, the years 2000-2002 saw a strong consolidation phase and significant decrease in the population of e-Marketplaces / PSPs. Some of the e-Marketplace/ PSP websites were not any more accessible. After having electronically sent a letter of invitation for survey participation (that was linked to the online questionnaire) to the 196 e-Marketplaces and PSPs identified, a number of e-mail addresses were also no longer active and were invalid. 94 out of 196 e-Marketplaces / PSPs terminated their operations.

¹⁷⁴ The listings from the databases included 43 e-Marketplaces / PSPs in the automotive industry, 49 in the electronics, 47 in metals and plastics and 57 in ORM / MRO.

¹⁷⁵ Databases include: <http://www.b2business.net/eMarketplaces/> as well as <http://www.berlecon.de/services/b2bdb>

From the remaining 102 valid and active e-Marketplaces and PSPs, 14 filled in the online questionnaire in the first run i.e. a response rate of 13.7%.

There is no specific standard for a minimum acceptable response rate. However, Malhotra and Grover (1998) emphasise that the response rate should be over 20% in order to certify a meaningful statistical analysis. A sufficient response for statistical analysis (at least between 40 and 50 cases) and a non-response analysis are required for a strong and significant survey research (Malhotra and Grover, 1998). Therefore, the time-consuming procedure to increase the response rate and to obtain non-respondents' data was an integrative process.

First potential respondents were contacted four times during the response period by e-Mail. Potential respondents had the option to fully participate in the survey or to provide data only for the level of current and future EPC implementation. People who have refused to answer the lengthy questionnaire may yet be willing to respond to a few simple facts. This process could provide the grounding for a non-respondent analysis. This integrated procedure was also applied to the following phone interviews of non-respondents, where they were interviewed about the level of current and future EPC implementation. In many cases the population of interest developed a genuine interest in the findings of the survey and could be encouraged to participate in the full survey. 34 e-Marketplaces / PSPs were willing to provide data to these two questions, but could not be motivated any further for full survey participation.

Non-respondents were finally contacted up to four attempts by phone so that the coverage increased to a final response rate of 42.2% of the full survey (i.e. 43 responses). 24 e-Marketplaces / PSPs were not at all interested in the research. This response rate can be considered as very satisfactory in comparison to other survey research. For example, Runge (2002) achieved a response rate of 19% (71 respondents from a sample of 375); Bonaccorsi and Rossi (2002) specify that a response rate of 17% is very good for mail surveys in general.

Table 7: Calculation of the Coverage Rate of the E-Marketplace / Procurement Service Provider Survey

	<i>Number</i>	<i>Percent</i>
Total number of e-Marketplaces/PSPs identified (universe)	196	
Of these, number of inactive e-Marketplaces/PSPs (of universe)	94	48.0
Valid, active e-Marketplaces/PSPs (population)	102	
Full responses (of the population)	44	43.1
Not suitable for analysis (insufficient information)	1	
<u>Coverage rate of full survey</u>	<u>43</u>	<u>42.2</u>
Total number of non-respondents	58	56.9
Coverage rate for analysis of non-respondents	34	33.3
Total number of non-participating e-Marketplaces / PSPs	24	23.5

Therefore, the response rate achieved can be considered as relatively high and sufficient, in particular for a demanding survey of this level of detail needed.¹⁷⁶ Response and non-response analysis with sufficient information provided added up to a coverage rate of 75.5% of the population. The sampling error as a measure of a survey's accuracy could be assessed. The sampling error refers to the variability that occurs by chance because a sample rather than an entire population was surveyed.¹⁷⁷

Based on the full survey response rate of 42% measured in the population of 102 e-Marketplaces / PSPs and a given confidence level of 95%, the maximum calculated sampling error is 11.7% according to random sampling theory, which indicates its precision.¹⁷⁸ The most conservative estimate of response distribution was used, which is a 50/50 split in responses to the questions. With a sample of this size there is a 95% certainty that the results have a statistical precision of plus or minus 11.7% points of what they would be if the entire population had been surveyed with complete accuracy. This sampling error is within expected and acceptable parameters.¹⁷⁹

¹⁷⁶ The author would like to admit that it was difficult to encourage participation in this particular survey. According to estimates from e-Marketplaces / PSPs, they receive approximately 2-3 survey requests per day as they operate a very interesting and popular ground to business academics.

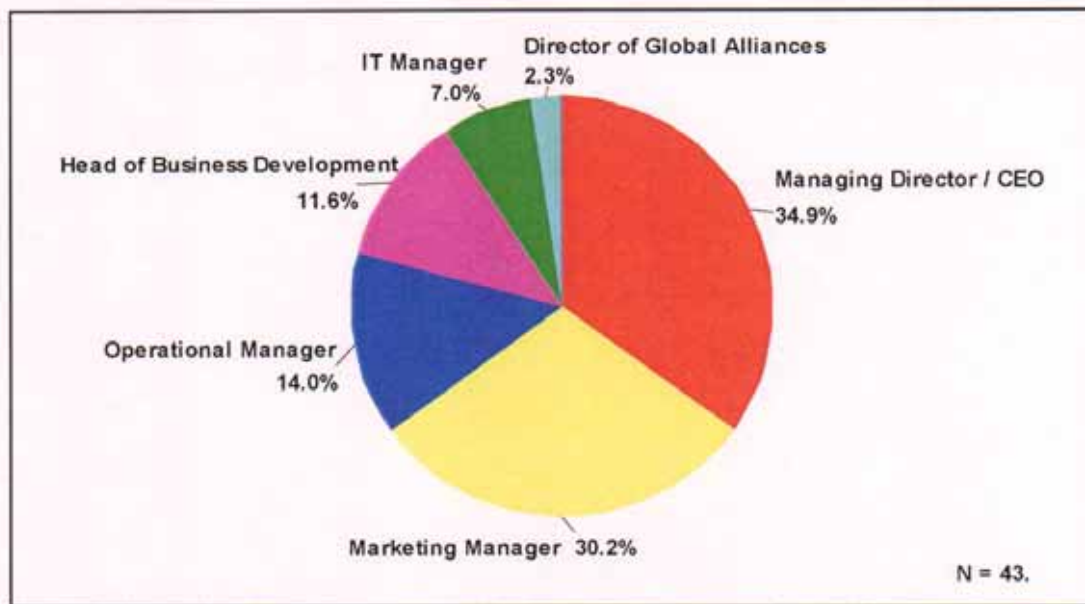
¹⁷⁷ Statistical Policy Working Paper 31, p. 1-5, at http://www.fcs.m.gov/01papers/SPWP31_final.pdf

¹⁷⁸ The software used to calculate the sampling error can be found at:
<http://www.dssresearch.com/toolkit/secalc/error.asp>

¹⁷⁹ See e.g.
http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/AC838E/AC838E03.htm

Most questionnaires were completed by managing directors (35%) as well as marketing managers (30%) and employees within functional areas (see Figure 19). The relatively high percentage of CEOs that participated in the survey suggests evidence of the high level of interest and significance of the research.

Figure 19: Job Description of E-Marketplace / PSP Respondents



The geographic distribution of responses is well spread and Figure 20 illustrates that most participation originated from Germany and the US, followed by the UK and Ireland. The US is the leading and most developed provider of e-Business (confirmed by e.g. Quayle, 2002a), with activity in Europe accelerating. In Europe, market researchers claim that Germany is well on its way to becoming the largest European e-Commerce market.¹⁸⁰ There was an excellent response rate from Germany, UK and Ireland, while it was lower from the US (given its population size of e-Marketplace / PSPs) and other countries. This may be explained in such a way that European e-Marketplaces / PSPs may have been more interested and more attracted to this survey due to proximity reasons. The database listings did not include e-Marketplaces / PSPs, which would concentrate on their local markets and not communicate in English. A detailed comparison of response and non-response rates of the overall population broken down by country is presented in appendix D.

¹⁸⁰ e.g. eBusiness made in Germany, see http://www.hamburg-newmedia.net/_en/new_text/download/pdf_neu/ebusiness.pdf

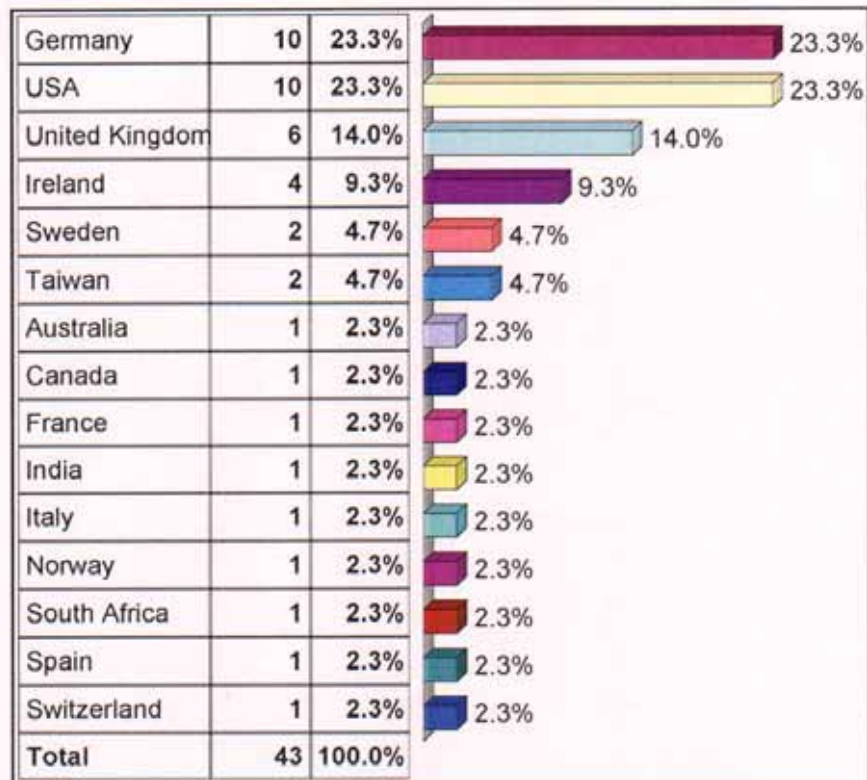
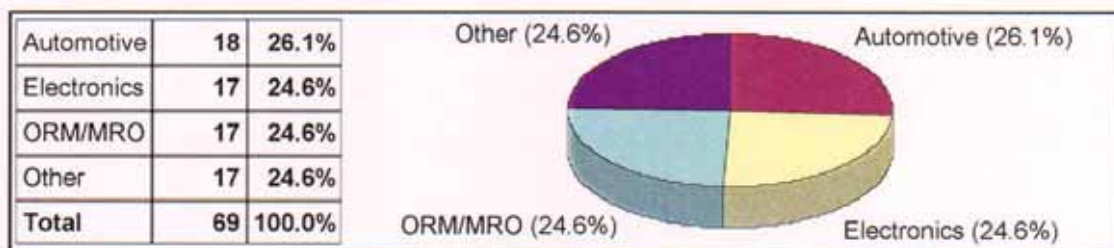
Figure 20: Participants' Country of Origin

Figure 21 illustrates the multiple industry sectors in which survey participants are operating. The results are quite evenly distributed within the sectors. Other industries that were specified included sectors that are in many cases related to the automotive and electronics industries, such as plastics, polymers, carbon and alloy steel, non-ferrous, scrap and raw materials, industrial equipment and machinery, mining, energy, metals and minerals, hard- and software.

Figure 21: Industry Sectors of Participating E-Marketplaces / PSPs

5.2.2 Survey among Purchasing Organisations

After having identified 400 purchasing organisations, both MNEs as well as SMEs (100 in the automotive and 100 in the electronics industries in both Ireland and Germany) by cluster and stratified random sampling from established industrial databases¹⁸¹, electronic mailing of pilot questionnaires started to a sample of 60 randomly selected purchasing organisations. A response rate of 13.3% resulted and the feedback indicated that the EPC variables in the questionnaire are sound.

Survey invitations were, therefore, electronically sent to the sample of 400 purchasing organisations and 47 filled in the online questionnaire in the first three e-Mail runs i.e. a response rate of 11.8% (pilot survey respondents included). The follow-up process consisted of systematic rounds of e-Mail messages, postal surveys and telephone calls. For those who did not reply within 2 weeks, a postal mailing including a letter of invitation and the questionnaire was prepared, backed up by two reminders via e-Mail. Respondents were given the option of either filling out the hard copy or the Internet-based instrument. By this procedure, the response rate could be increased to 92 responses for the full survey (23.0%). Potential respondents had the option to fully participate in the survey or to only provide data for the level of current and future Internet use and EPC implementation. This process could provide the grounding for a non-respondent analysis.

Those who have not responded after four weeks were contacted up to four attempts via phone. After these several follow-ups and repetitive contacting, 128 purchasing organisations finally fully responded to the survey (see Table 7). Again, the procedure to increase the response rate and to obtain non-respondents' data was an integrative process, where non-respondents were interviewed about the level of Internet use and EPC implementation. Apart from the 128 purchasing organisations that participated in the full survey, 84 purchasing organisations were willing to provide data for these two questions and lay the grounding for a non-response analysis, but could not be motivated for full survey participation. 188 out of 400 purchasing organisations were not interested and could not be convinced to participate in the research.

¹⁸¹ Databases included www.kompass.com and www.goldenpages.ie

Table 8: Response Rate Calculation of the Purchasing Organisations' Survey

	<i>Number</i>	<i>Percent</i>
Selected number of purchasing organisations (target sample)	400	
Responses (of the target sample)	132	33.0
Not suitable for analysis (insufficient information)	4	
<u>Coverage rate of full survey</u>	<u>128</u>	<u>32.0</u>
Total number of non-respondents	272	68.0
Coverage rate for analysis of non-respondents	84	21.0
Total number of non-participating purchasing organisations	188	47.0

The response rate of 32% can be considered as very satisfactory and sufficient for a six-page questionnaire, given the length of the survey and the level of detail required.¹⁸² It was to a large extent above the response rate obtained in comparable research. For example, Lai and Guynes (1997) achieved a response rate of 18.4% and Cox and Ghoneim (1996) 28%. Mithas et al. (2003) specify that their response rate of 22% or 152 responses from a target sample of 706 firms is reasonable and comparable to previous empirical studies. 20-30% response rates are considered to be good in Europe. Response and non-response analysis added up to a coverage rate of 53% of the target sample.

The higher response rate (42%) of the survey of e-Marketplaces and PSPs could not be achieved. The author obtained the impression from the interviews that e-Marketplaces and PSPs still try to promote their relatively new business and were still more willing to participate in surveys than purchasing organisations. It was experienced that managers of purchasing organisations were very difficult to motivate for participation in research studies mainly due to survey fatigue, among other reasons.¹⁸³

Based on this response rate of 32% measured in the target sample of 400 purchasing organisations within a total population of 3548 Irish and German companies in the

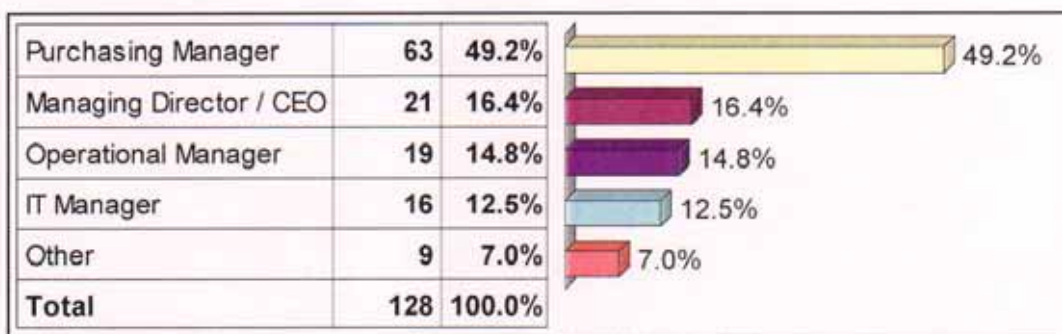
¹⁸² Please find the survey instrument in appendix C.

¹⁸³ In the feedback letters and emails as well as during the telephone calls, managers of purchasing organisations indicated the following main reasons for not responding: 1) no interest or not willing to spend time due to a lack of time 2) information requested was too confidential or too strategic 3) questionnaire too detailed. Although some individuals from practice are supporting research personally, company management is in many cases not willing to share any information with researchers.

automotive and electronics industry and a confidence level of 95%, the maximum calculated sampling error is thus 8.5% according to random-sampling theory, which indicates its precision.¹⁸⁴ The most conservative estimate of response distribution was used, which is a 50/50 split in responses to the questions. With a sample of this size there is a 95% certainty that the results have a statistical precision of plus or minus 8.5% points of what they would be if the entire population had been surveyed with complete accuracy.¹⁸⁵ This sampling error is within expected and acceptable parameters.¹⁸⁶

In this survey for purchasing organisations, the participants have mainly been purchasing managers (40%), followed by managing directors (16%), operational managers (15%) and IT managers (13%).

Figure 22: Job Description of Respondents among Purchasing Organisations



Other participants included corporate commodity managers, directors of global alliances, managers for R+D, marketing and sales managers, purchasing assistants and manufacturing engineers. Of the 128 participants, 62 (48%) originated from Germany and 66 (52%) from Ireland. The response rate was quite evenly distributed within both countries, which facilitated, in some context, a cross-country comparison.

¹⁸⁴ The software used to calculate the sampling error can be found at:
<http://www.dssresearch.com/toolkit/secalc/error.asp>

¹⁸⁵ The response rate for the total population of 3548 purchasing organisations in both countries is 3.6%. The findings are more reliable for the population of the 336 Irish purchasing organisations with a response rate of 19.7% than for the population of 3212 German purchasing organisations with a response rate of 1.9%.

¹⁸⁶ See e.g.
http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/AC838E/AC838E03.htm

Table 8 shows the industry sectors, which the participants are operating in. Purchasing organisations could be part of more than one industry sector.¹⁸⁷ Somewhat more participants operate in the electronics industry (47%) than in the automotive industry (35%).

Table 9: Industry Sectors of Respondents among Purchasing Organisations

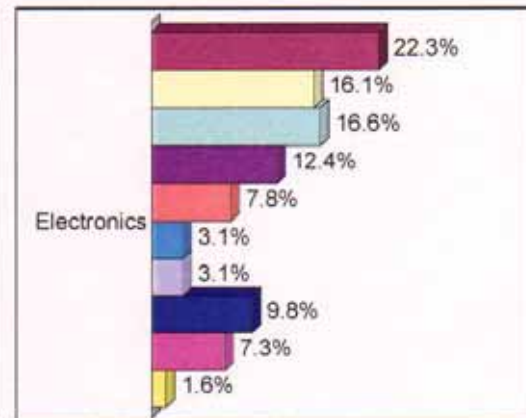
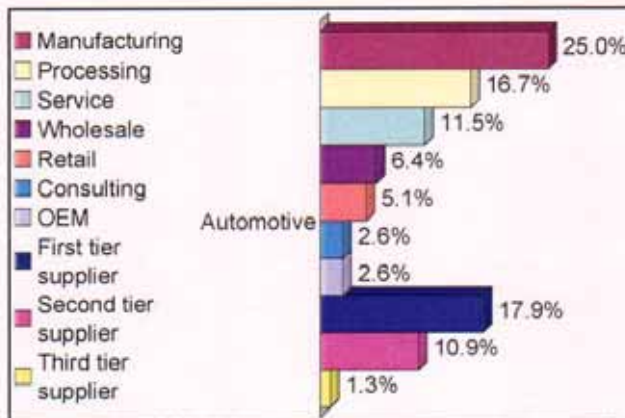
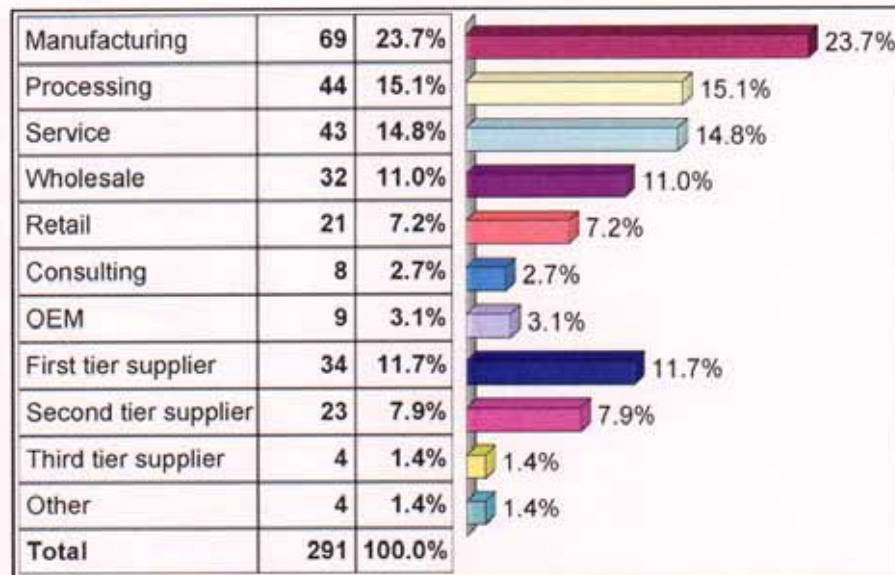
Industry Sector	Automotive	Electronics	Other	Total
Country				
Germany	46.1% (41)	43.8% (39)	10.1% (9)	100% (89)
Ireland	23.6% (21)	49.4% (44)	27.0% (24)	100% (89)
Total	34.8% (62)	46.6% (83)	18.5% (33)	100% (178)

Other sectors included the machining, metals, heavy engineering, plastics, powder painting and steel industries that were in most cases closely related to the automotive and electronics industry. Irish participants mainly derived from the electronics sector background, which is strongly developed in Ireland. The response rate from German purchasing organisations was quite evenly distributed within the automotive and electronics sector.

The survey distribution was also able to ensure a wide geographical and industrial spread and included a broad spectrum of firm types in the selected industries, which is reflected in Figure 23.¹⁸⁸

¹⁸⁷ The number of citations is greater than the number of observations, due to multiple responses. Table 7 is based on 128 observations. The percentages are calculated in relation to the number of citations.

¹⁸⁸ The number of citations is greater than the number of observations, as purchasing organisations can operate in more than one business segment.

Figure 23: Purchasing Organisations' Primary Business

The respondents were mainly manufacturers, processing and service companies in both industry sectors, while wholesale, retail and consulting organisations were fewer in survey participation. The participants were further mainly first and second tier suppliers.

Additionally, a classification into small, medium and large companies was prepared. Controversial arguments on how to define the SME sector have emerged in the past. In general, there is not one standardised or universal definition for classifying the SME sector. Typically, the definitions that emerged depend on the purposes. The author agreed to one of the more common definition practices. The results have been split into groups dependent on the number of employees in the entire organisation. The division finally decided upon was based on groupings of less than 50 employees (small company), 50 to 500 employees (medium company) and more than 500 employees (large companies).

Table 10: Participation Rate of Small, Medium and Large Companies

Industry Sector	Automotive	Electronics	Other	Total
Entire Organisation Employees				
Small company	30.6% (19)	42.2% (35)	54.5% (18)	40.4% (72)
Medium company	40.3% (25)	36.1% (30)	33.3% (11)	37.1% (66)
Large company	29.0% (18)	21.7% (18)	12.1% (4)	22.5% (40)
Total	100% (62)	100% (83)	100% (33)	100% (178)

Table 9 reveals that companies of all sizes are well represented in this survey. However, SMEs carry the largest part of business activity in the European economy. This background seems to be reflected in the response rate: More SMEs participated in the survey than large companies. The survey was still successful in achieving a sufficient split between small, medium and large companies in order to enable meaningful comparisons and cross-tabulations.¹⁸⁹

Having discussed the response rates and the background information for both surveys, further data was collected and collated according to the agenda of constructs previously specified in the literature review. The central themes and findings that emerged are organised in the following sections and results between both surveys compared:

5.3 EXPLORATION OF SPECIFIED RESEARCH CONSTRUCTS

5.3.1 Industry Sectors and Take-Up of Electronic Purchasing Consortia

Electronic purchasing consortia are offered by 19 of the total 43 participating e-Marketplaces and PSPs (44%). This relatively high percentage of EPC offering prompted the author to also check for sample selection bias in EPC offering and to carry out a non-response analysis. One concern of the survey was that information collected from respondents might have a non-response bias. 34 non-respondents could provide data to the specific question of EPC offering. An analysis of respondents / non-respondents in EPC offering is provided in Table 10:

¹⁸⁹ Nonprobability sampling methods were not used in this study. In nonprobability sampling, members are selected from the population in some nonrandom manner. These include convenience sampling, judgement sampling, quota sampling, and snowball sampling. In nonprobability sampling, the degree to which the sample differs from the population remains unknown. It is not possible to estimate sampling errors because of the absence of randomness. The interviewer may fail to secure a representative sample of respondents.

Table 11: Analysis of Respondents / Non-Respondents in EPC Offering to Date

Offering EPC to Date	Yes	No	Total
Respondents to Full Survey			
Yes	44.2% (19)	55.8% (24)	100% (43)
No	38.2% (13)	61.8% (21)	100% (34)
Total	41.6% (32)	58.4% (45)	100% (77)

While EPC offering among non-respondents (39%) is lower than among full survey respondents, this is statistically not significant ($\text{Chi}^2 = 0.28$, $\text{df} = 1$, $1-p = 40.12\%$).¹⁹⁰ The chi-square test indicates that the pattern of responses was reflective of the sample frame, thereby ruling out any bias in EPC offering to date.

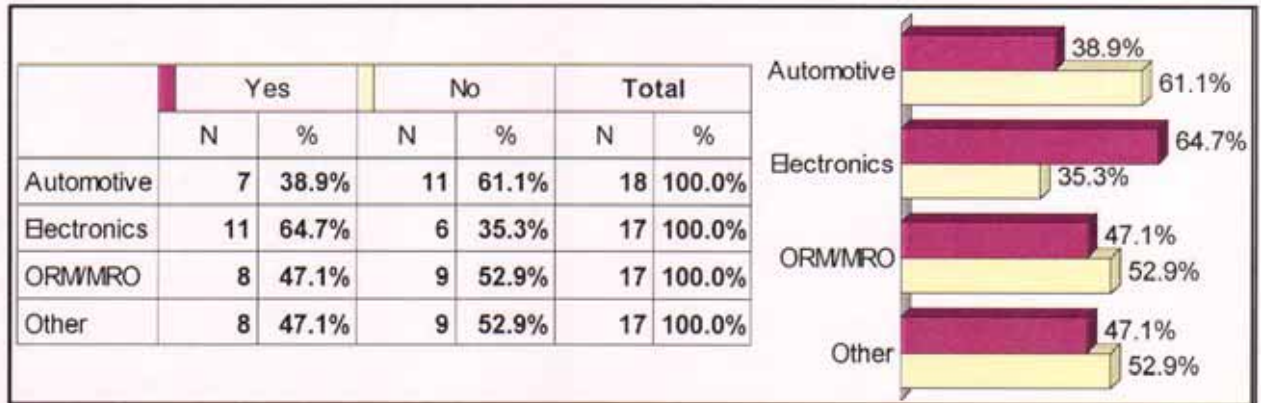
Additionally, to further investigate the possibility of non-response bias in the data, surveys were also tested for statistically significant differences in the responses of early and late returned surveys. The author divided the sample into two groups, 'early respondents' ($n = 22$) and 'late respondents' ($n = 21$). On the assumption that late respondents are similar to non-respondents, it could be concluded that the study does not suffer from non-response bias in EPC offering.¹⁹¹ Thus, from the analysis of both non-response tests, non-response bias does not appear to pose any significant problem in terms of EPC offering to date, which is, therefore, representative for the population.

A further distinction and cross-tabulation can be made with regard to EPC offering and industry sectors presented in Figure 24.

¹⁹⁰ The chi-square test gives satisfactory results for this test in the survey. Therefore, it can be assumed that the data collected and the sample size allow a cautious generalisation of the results. If the cases would have an estimated value of less than 5, the rules of Chi^2 would have been not really applicable. Therefore, the author made sure for all hypotheses tested in this research that the tests are valid and appropriate.

¹⁹¹ Please find this non-response analysis of early and late respondents in appendix D construct 1.

Figure 24: Offering of Electronic Purchasing Consortia by E-Marketplaces / PSPs (by Industry Sectors)

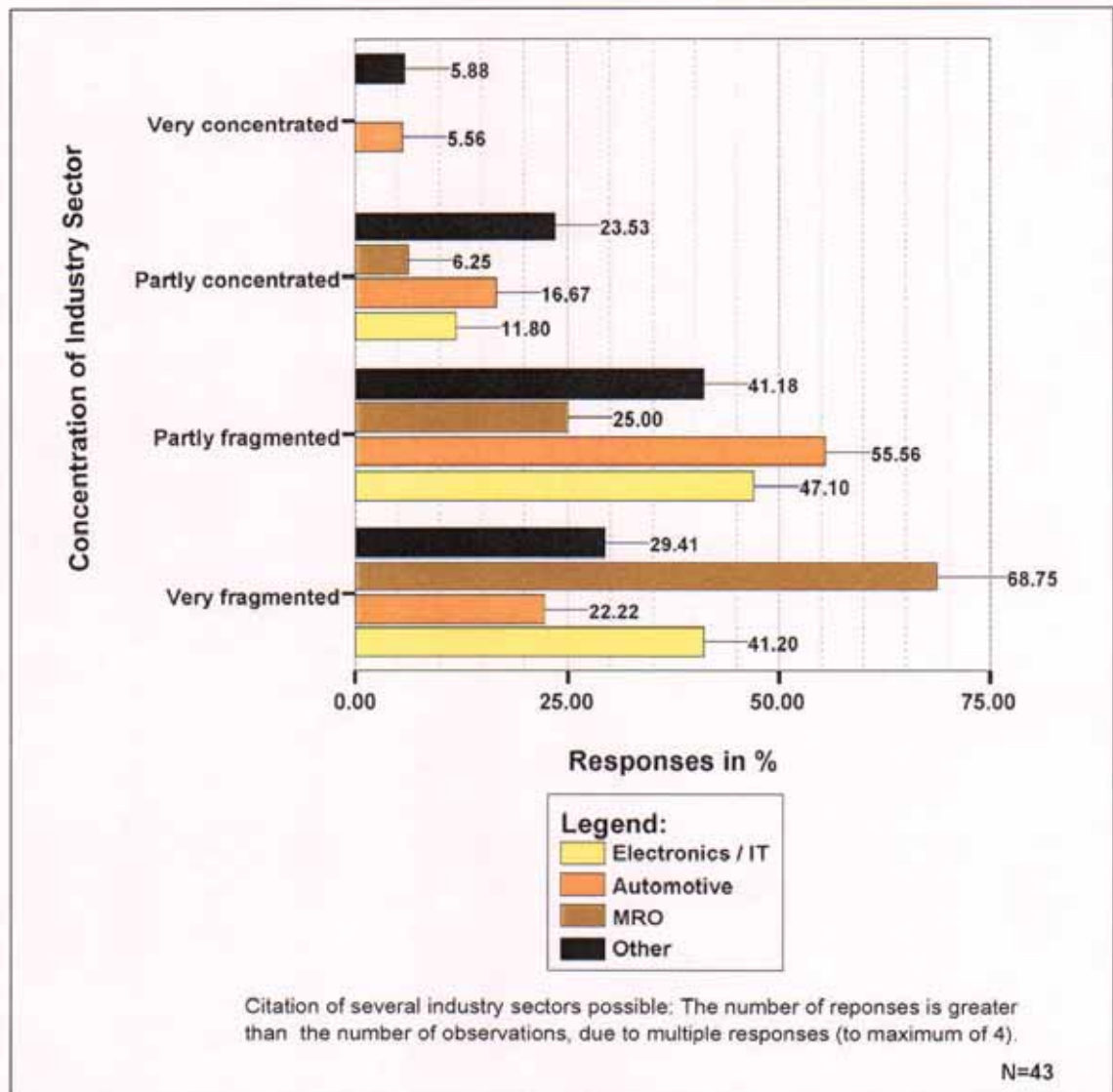


EPC are offered less in the automotive industry (39%) than in industries such as electronics (65%) and ORM / MRO (47%).¹⁹² However, the chi-square test shows that this dependence is not yet significant ($\text{Chi}^2 = 2.46$, $\text{df} = 3$, $1-p = 51.80\%$). Therefore, it cannot be stated that electronic purchasing consortia are more likely to appear in the electronics industry in general. However, the results could suggest that there is some correlation between EPC offering and fragmentation of the industry sector. For example, the case studies suggested that the automotive industry is more concentrated and potential anti-trust issues may arise which in turn could prevent EPC implementation.

Therefore, e-Marketplaces and PSPs were also interviewed in the survey as to how they would characterise their markets they address according to the level of industry concentration. Figure 25 illustrates the results: According to e-Marketplaces / PSPs, the ORM / MRO and the electronics sectors seem to be more fragmented, whereas the automotive and other sectors tend to be more concentrated.

¹⁹² The number of industry sectors that e-Marketplaces and PSPs operate in can be multiple.

Figure 25: Concentration of Industry Sectors



The level of industry concentration was coded (from 1 = very concentrated to 4 = very fragmented) and, based on the means, an analysis of variance could be set up to test H1a in Table 11. It reveals that EPC providers operate to a small degree in more fragmented industry sectors than non-providers. However, this tendency is not yet significant and cannot be assumed as significant from the analysis of variance with a very low F value ($F = 0.01$, $1-p = 12.75\%$).¹⁹³

¹⁹³ See details in appendix D construct 1.

Table 12: Interaction of Industry Sector, Offering EPC to Date and Average Industry Concentration

Industry Sector	Yes	No	Total
Automotive	3.00	2.91	2.94
Electronics / IT	3.36	3.17	3.29
MRO	3.50	3.44	3.47
Other	2.88	3.00	2.94
Total	3.21	3.11	3.16

A further correlation test of the variables ‘fragmentation level of markets addressed’ and ‘EPC importance to procurement strategy’ (based on a scale from 1 = no importance at all to 5 = extremely important) also revealed a very weak positive relationship, which is not significant (correlation coefficient: +0.02; $F = 0.01$; $1-p = 8.10\%$).¹⁹⁴ Therefore, hypothesis H1a – the industry sector’s level of fragmentation is positively related to EPC offering and importance - cannot be supported from the statistical analysis.¹⁹⁵

This accepted, the case studies illustrated that anti-trust limitations still can have, in dependence of factors such as the size of co-operating members or their overall buyer power, some impact on the structure of EPC offerings. For example, EPC providers can choose to focus on cross-industry EPC in the specific case that an industry sector constellation would be too concentrated for EPC and anti-trust limitations might arise.

For example, it could be explored from the surveys that 60% of EPC providers have requested legal approval before implementation. It could also be revealed in the survey for purchasing organisations that approx. 56% of EPC users have requested legal approval.¹⁹⁶ The results suggest that while the level of industry fragmentation could not be identified as a significant driver for EPC provision, anti-trust issues are still one element of consideration among others (see construct 7).

Further analysis into industry structure and EPC offering was elaborated on. A differentiation between e-Marketplaces and procurement service providers in the industry

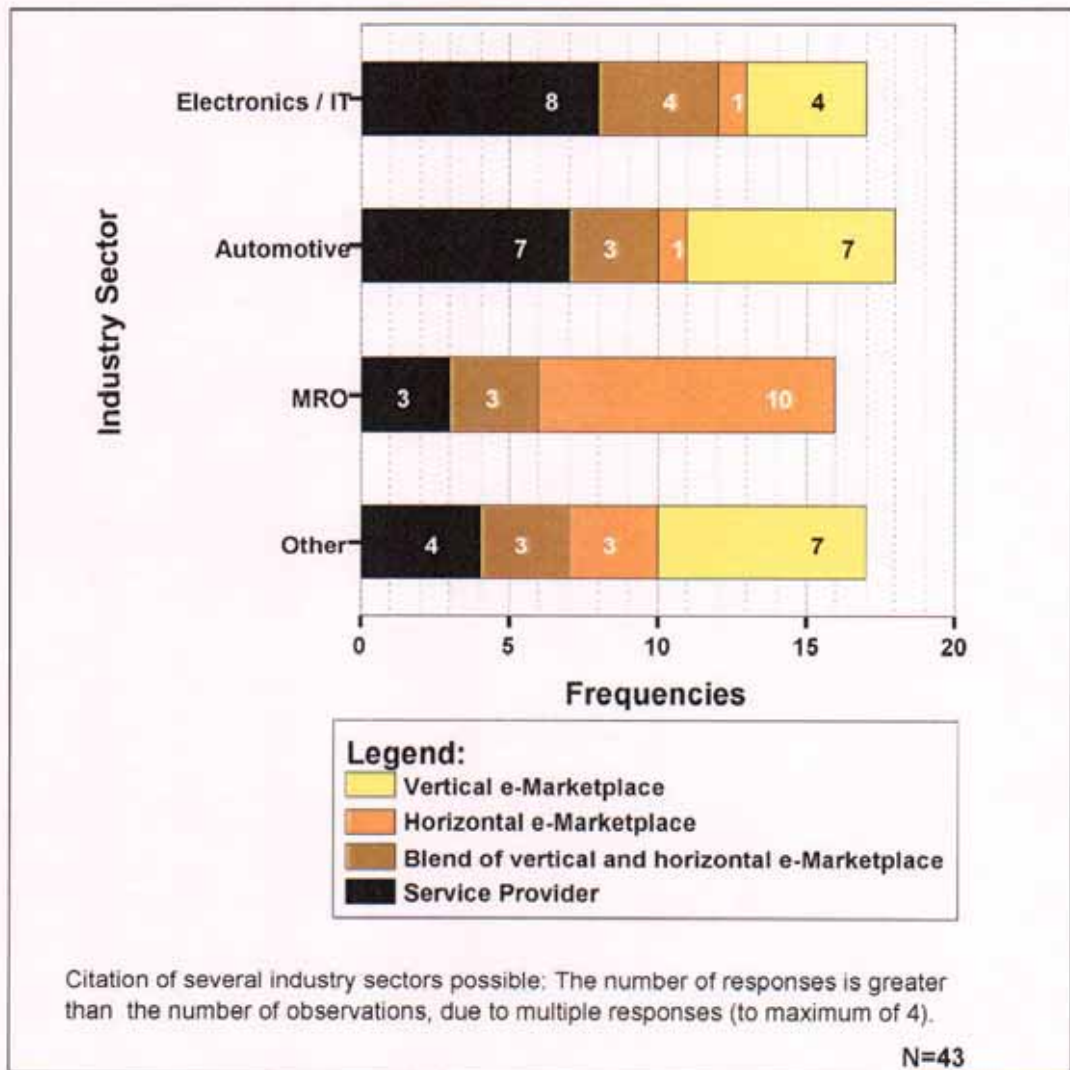
¹⁹⁴ See appendix D construct 1.

¹⁹⁵ The following four questions in the survey instrument for e-Marketplaces / PSPs addressed H1a: Which of the following is your company’s industry sector? How are your markets, being addressed, characterised? Do you offer EPC? Please score EPC according to the importance to your business strategy.

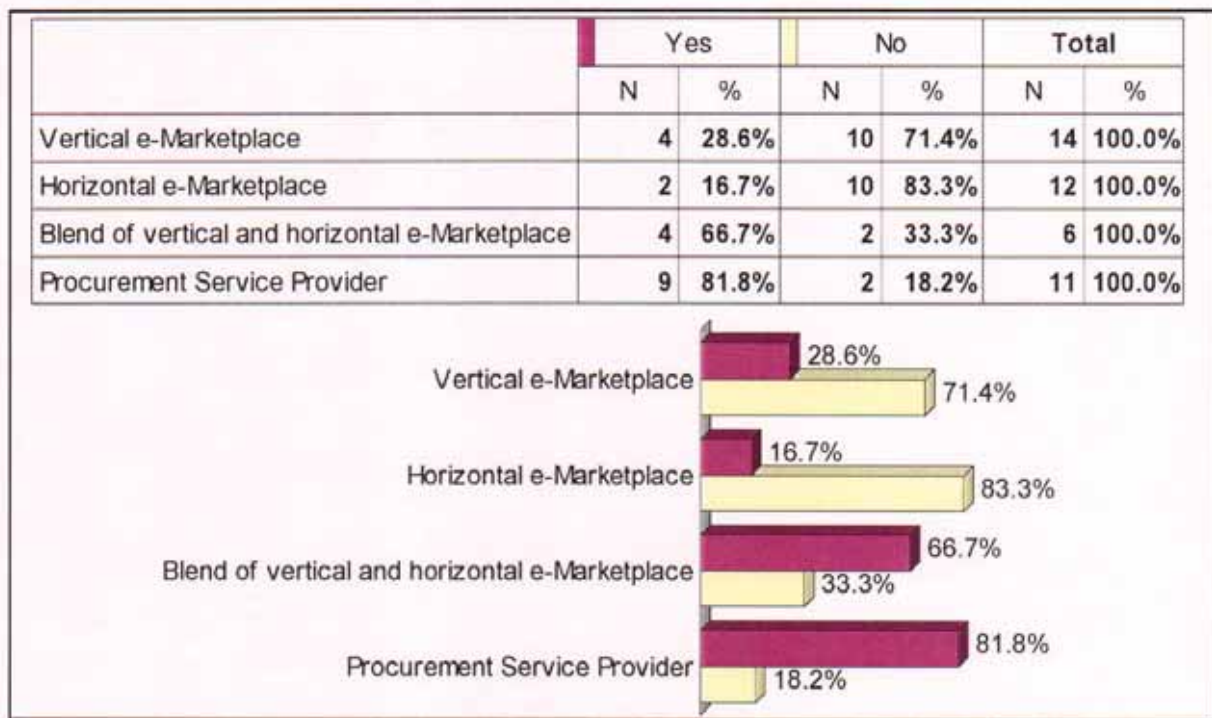
¹⁹⁶ See appendix E construct 1.

sectors in Figure 26 illustrates that the ORM / MRO sector is mainly operated by horizontal e-Marketplaces whereas vertical e-Marketplaces and PSPs dominate the automotive and electronics industry. This background can be to a large part explained by the ORM / MRO product structure that is used by a broad range of industries.

Figure 26: Differentiation of E-Marketplace / PSP Types in Industry Sectors (in Frequencies)



This differentiation enables a cross-tabulation of the variables 'e-Marketplace / PSP type' and 'EPC offering to date'. Figure 27 illustrates that EPC are mainly offered by procurement service providers.

Figure 27: EPC Offering and Differentiation of E-Marketplaces / PSPs

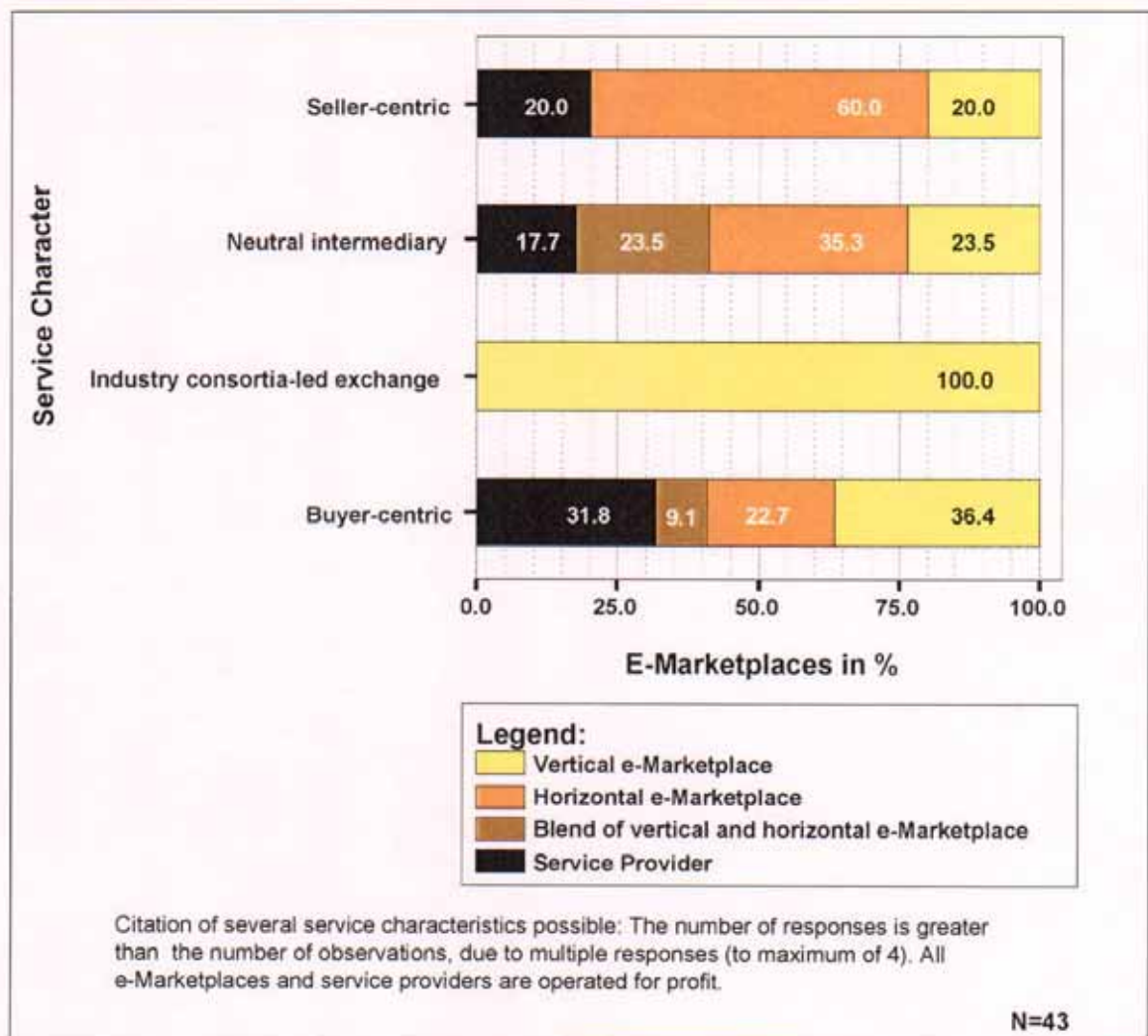
E-Marketplaces that offer electronic purchasing consortia are rather limited in number. Only 10 (31%) out of 32 e-Marketplaces provide EPC whereas PSPs have a much higher implementation rate (82%). E-Marketplaces generally still have a good potential to implement EPC in future.¹⁹⁷

Research construct 3 will show in more detail the reasons for this EPC diffusion among e-Marketplaces and PSPs. It is demonstrated there that PSPs focus predominantly on the support of strategic sourcing operations (such as EPC) and take advantage of semi-automatic or non-electronic communications tools as well that can assist in gaining purchasing managers' trust to participate in electronic purchasing consortia. Most e-Marketplaces currently concentrate their business services on automating purchasing and order replenishment processes instead of strategic sourcing activities such as EPC. This variance in business focus can explain the contrast in EPC offering between e-Marketplaces and procurement service providers.

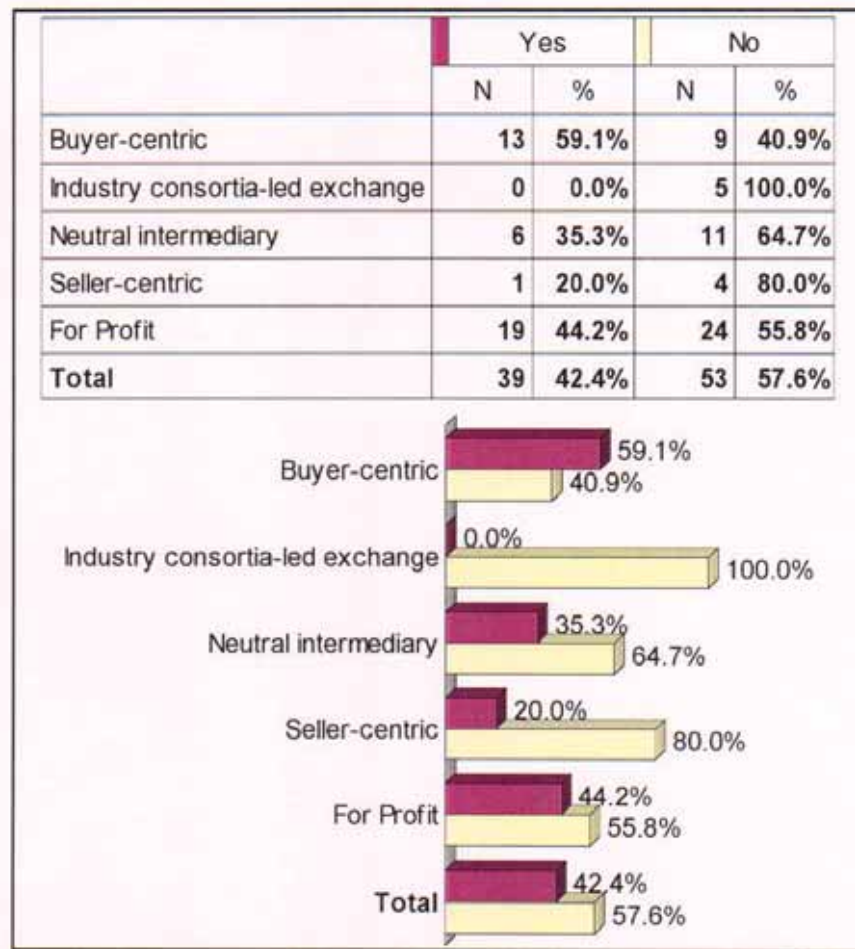
¹⁹⁷ The observation that 67% of the blend of vertical and horizontal e-Marketplaces provide EPC is only partly useful due to the relatively low population of this particular group. Therefore, it was checked for non-response bias if the description of e-Marketplaces / PSPs is representative for the population. No significant difference was found between the 43 respondents and the 34 non-respondents. The dependence is not significant ($\text{Chi}^2 = 0.81$, $\text{df} = 3$, $1-p = 15.23\%$). Please see the statistical analysis in appendix D construct 1.

Further findings from industry structures and EPC offering could be generated from a cross-tabulation of e-Marketplace / PSP type and service character. Thereby, it was investigated that all industry-consortia led exchanges are, due to their very nature, vertical e-Marketplaces within one specific industry. Horizontal e-Marketplaces tend to be more seller-centric or neutral intermediaries, whereas PSPs tend to be more buyer-centric (see Figure 28). All e-Marketplaces and PSPs are operated for profit; non-profit organisations did not participate in the survey.

Figure 28: Service Character of E-Marketplaces and Procurement Service Providers



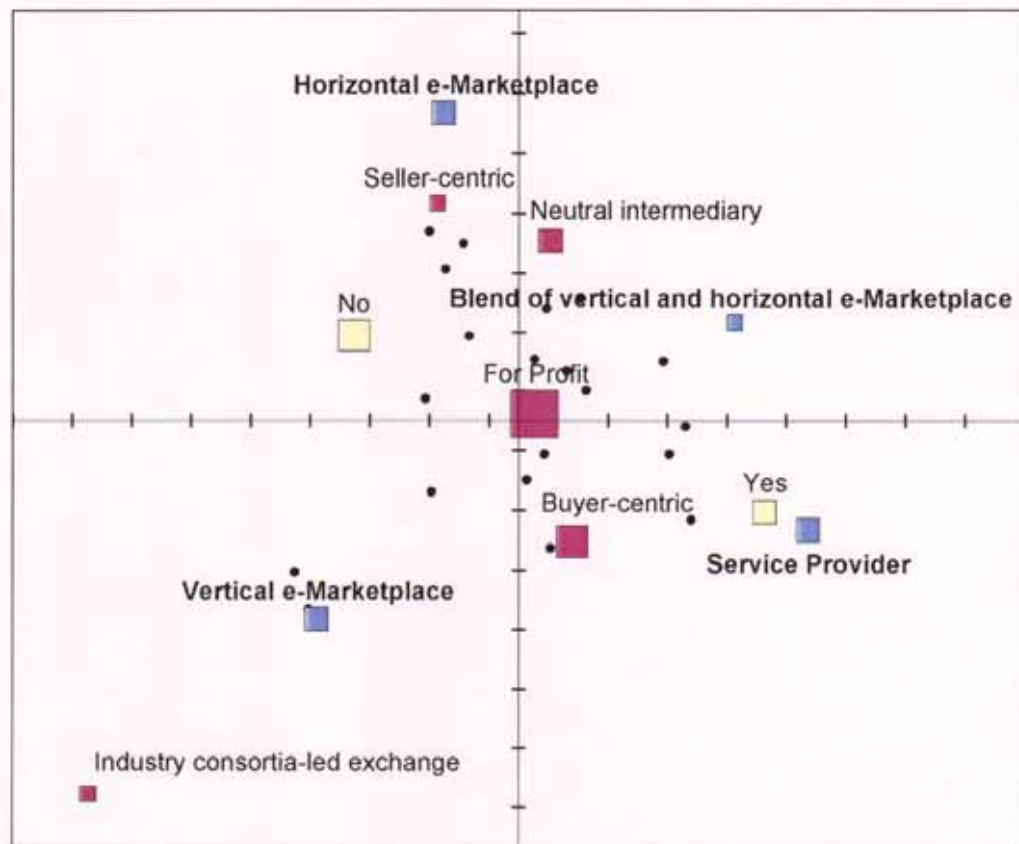
The question arose then which affinity group EPC providers would focus on. The cross-tabulation of e-Marketplace / PSP service character and EPC offering reveals that interestingly none of the industry consortia-led exchanges offer any electronic purchasing consortia to date (see Figure 29).

Figure 29: Correlation of Service Character and EPC Offering to Date

This finding seems to be quite remarkable and worth noting as industry-consortia e-Marketplaces would already have finished decisive collaborative phases such as finding partners, building up trust and commitment among the members or getting standardisation agreements in place. One explanation for this research finding can be that industry consortia-led exchanges are usually managed by major industry players and, therefore, as the case studies have illustrated, demand aggregation may not be pursued by industry-consortia e-Marketplaces due to buyer power and anti-trust legislation, among other reasons.

So while it was statistically demonstrated that EPC implementation is not directly positively associated with the level of industry fragmentation, there can well be specific contexts e.g. industry consortia-led e-Marketplaces, where EPC cannot be pursued due to anti-trust limitations. Figure 30 reveals that EPC providers are predominantly buyer-centric PSPs.

Figure 30: Multiple Factor Analysis on the Variables: 'Type of e-Marketplace / PSPs', 'Service Character' and 'Offering EPC to Date'



So how is this specific finding reflected among purchasing organisations? Purchasing organisations were surveyed for which e-Marketplace / PSP service character they would opt:

Figure 31: E-Marketplace / PSP Service Character and Preferences among Purchasing Organisations

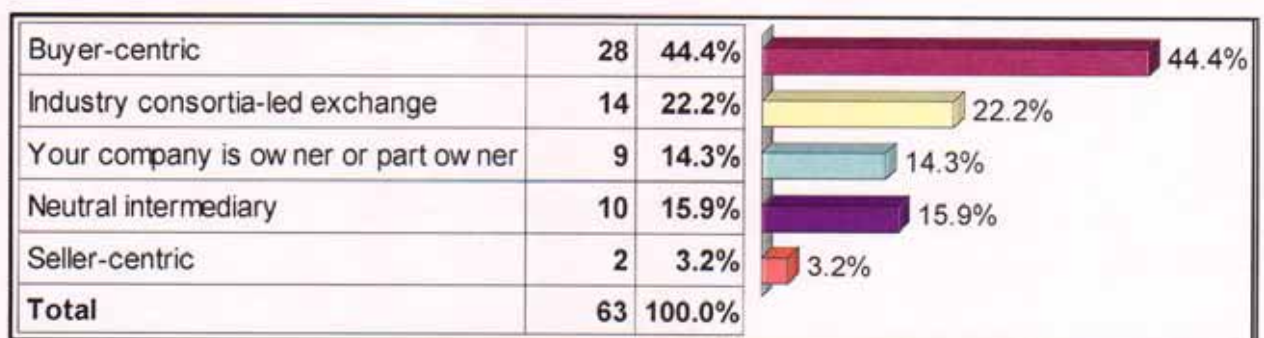


Figure 31 illustrates that purchasing organisations would mainly like to take advantage of buyer-centric (44%) or industry consortia-led providers (22%), while only a few of the purchasing organisations would prefer to be owner or part owner (14%). Few purchasing organisations (16%) would opt for neutral e-Marketplaces / PSPs, whereas seller-centric

e-Marketplaces and PSPs have not been much accepted by purchasing organisations (3%). The results can provide some background to e-Marketplace / PSP preferences of purchasing organisations.

However, a broader approach to e-Procurement and EPC is required. In the survey for purchasing organisations it was found that almost all purchasing organisations (95%) use the Internet for procurement to date. This surprising result shows that the Internet adoption rate steadily accelerated in recent years. Internet use is widely spread within all sizes of companies. However, the author was well aware of potential survey bias, as purchasing organisations that are more 'Internet-related' could be more likely to participate in this EPC survey. Therefore, 84 non-respondents have been interviewed whether or not they use the Internet for procurement operations.

Table 13: Analysis of Respondents / Non-Respondents in Internet Use for Procurement Operations

Internet Use for Procurement to Date	Yes	No	Total
Respondents in Full Survey			
Yes	95.3% (122)	4.7% (6)	100% (128)
No	90.5% (76)	9.5% (8)	100% (84)
Total	93.4% (198)	6.6% (14)	100% (212)

This non-respondent crosscheck did not reveal major differences. Approx. 91% of non-respondents among purchasing organisations take advantage of the Internet for procurement. However, this difference is not significant ($\text{Chi}^2 = 1.92$, $\text{df} = 1$, $1-p = 83.45\%$). Therefore, it cannot be stated that more 'Internet-related' purchasing organisations have participated in the full survey.

In the survey for purchasing organisations, the research constructs were initially planned to be analysed for three different user groups, (I) EPC adopters, (II) Internet Users and (III) Internet non-users. As almost all purchasing organisations take advantage of the Internet, the author focused on the classification (I) and (II). Despite the general relatively high Internet penetration rate among purchasing organisations, the current adoption of EPC among purchasing organisations is very low. While a considerable amount of e-Marketplaces / PSPs have already integrated EPC services, only 7% of purchasing organisations have taken advantage of EPC to date. Therefore, another non-respondent

crosscheck was conducted and the 84 non-respondents have again been analysed to check for bias in EPC adoption.

Table 14: Analysis of Respondents / Non-Respondents in EPC Adoption to Date

EPC Adoption to Date	Yes	No	Total
Respondents in Full Survey			
Yes	7.0% (9)	93.0% (119)	100% (128)
No	6.0% (5)	94.0% (79)	100% (84)
Total	6.6% (14)	93.4% (198)	100% (212)

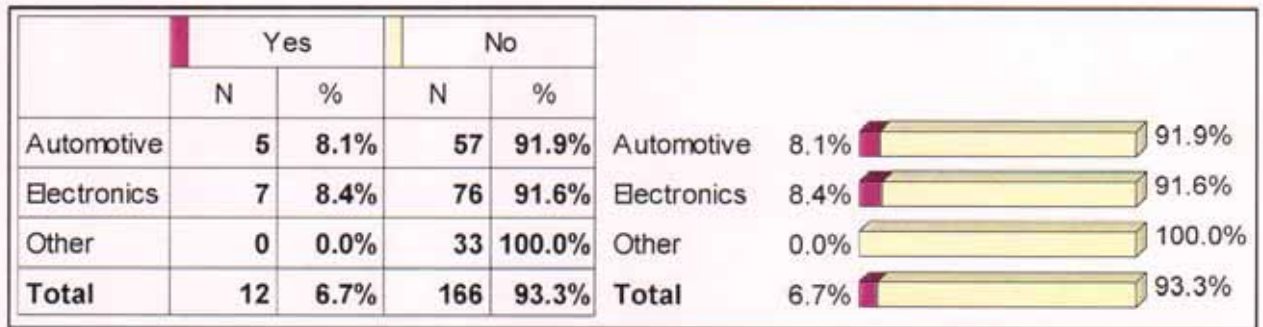
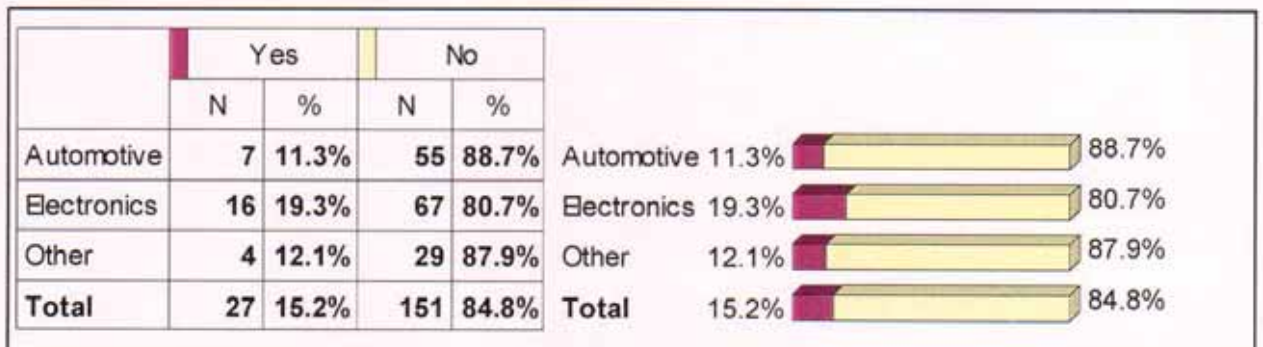
Although EPC adoption among non-respondents is slightly lower (4.8%) than among full-survey participants (7.0%), this difference is not yet significant ($\text{Chi}^2 = 0.45$, $\text{df} = 1$, $1-p = 49.94\%$).¹⁹⁸ The data was also tested for statistically significant differences in the responses of early and late returned surveys. The author split the sample into two groups on the basis of the timing of survey returns: 'early respondents' ($n = \text{less than } 65$) and 'late respondents' ($n = 65 \text{ and more}$). No significant differences were found and it can, therefore, be assumed that EPC adoption to date is representative for purchasing organisations in the automotive and electronics industry.¹⁹⁹

However, EPC adoption in the electronics industry is slightly higher than in the automotive industry to date and in future (see Figure 32 and 33). However, the difference is not significant (EPC take-up at present: $\text{Chi}^2 = 0.01$, $\text{df} = 1$, $1-p = 6.36\%$; EPC take-up in future: $\text{Chi}^2 = 1.70$, $\text{df} = 1$, $1-p = 80.72\%$).²⁰⁰

¹⁹⁸ The analysis of response and non-response was also broken down to industry sector in appendix E. No major differences were established.

¹⁹⁹ Please find this non-response analysis between early and late respondents in appendix E construct I.

²⁰⁰ See statistical analysis in appendix E construct I.

Figure 32: Industry Sectors and Take-Up of EPC to Date**Figure 33: Industry Sectors and Implementation of EPC in Future**

For the future (defined in this study as within the next 5 years), approx. 18% of the purchasing organisations specified that they would participate in EPC, which would represent a significant increase in comparison to 7% to date. Again, the author felt that it was necessary to check for non-response bias in Table 14.

Table 15: Analysis of Respondents / Non-Respondents in Future EPC Adoption

Future EPC Adoption	Yes	No	Total
Respondents in Full Survey			
Yes	18.0% (23)	82.0% (105)	100% (128)
No	14.3% (12)	85.7% (72)	100% (84)
Total	16.5% (35)	83.5% (177)	100% (212)

While future EPC adoption is slightly lower among non-respondents (14.3%), this difference is not yet significant ($\text{Chi}^2 = 0.50$, $\text{df} = 1$, $1-p = 52.01\%$).²⁰¹ Also, no major differences were found among early and late respondents.²⁰² Therefore, the results to future EPC adoption can be assumed as representative. Current and future EPC adoption

²⁰¹ The analysis of response and non-response was also broken down by country in appendix E. No major differences were established.

²⁰² Please find this non-response analysis between early and late respondents in appendix E construct I.

is quite equally distributed within German and Irish purchasing organisations.²⁰³ No major differences could be established in this cross-tabulation.

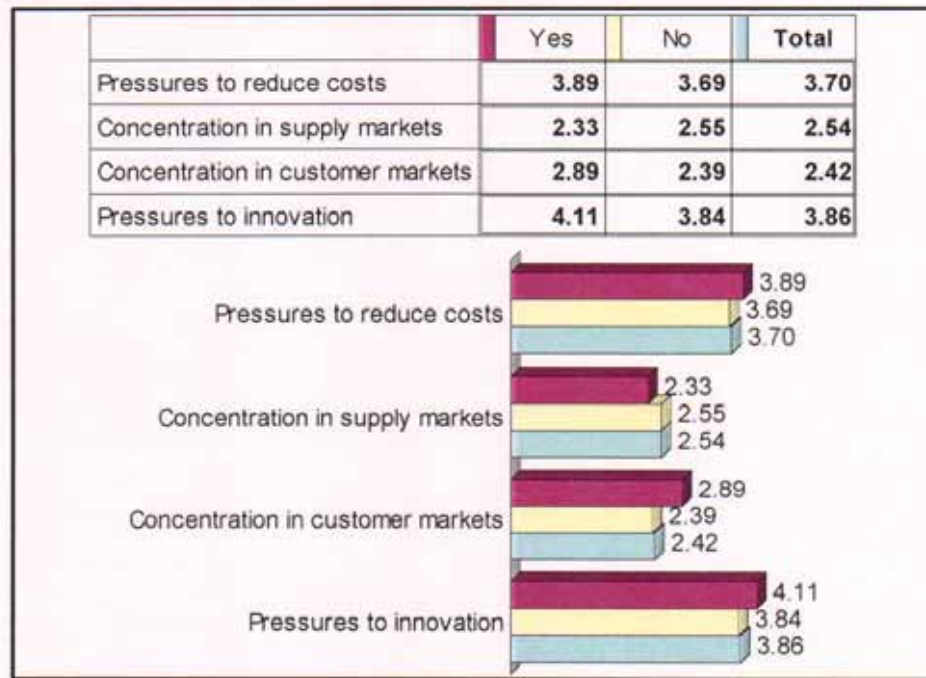
While EPC adoption was similar in both countries, it was also interesting to analyse the overall influence of the business context on EPC implementation and importance to procurement strategy. Hypothesis H1b states that higher perceived pressures from the business context have a positive impact on EPC adoption and importance to purchasing strategy. The variable 'pressures from business context' was constructed of four questions with a five-point scale (from 1 = completely disagree to 5 = completely agree).

An important step in instrument validation is to test the instrument for reliability to ensure measurement accuracy and to minimise the measurement error (Straub, 1989). Reliability refers to the state when a scale yields consistent measures over time (Straub 1989). The typical approach for the assessment of reliability of a scale is by computing the Cronbach's alpha coefficient. Cronbach's alpha indicates the homogeneity of a scale. This alpha generally varies between 1 (perfectly homogeneous scale) and 0 (absolutely non-homogeneous scale). A condition for properly conducted statistical analysis is an alpha between 0.60 and 0.90, although it may decrease to even 0.50 in exploratory research (Nunnally, 1978). The Cronbach's alpha for the 4-item scale of the latent factor pressures from business context is 0.63 and, therefore, above the 0.6 level, indicating adequate reliability. A latent variable is one that cannot be measured directly, but is assumed to be related to a number of measurable, observable and manifest variables. Furthermore, convergent and discriminant validity were assessed by oblique promax factor analysis to examine the unidimensionality of latent variables and scales and to show that each set of items was correlated with one latent construct (Rummel, 1970). Convergent validity refers to observed variables specified to measure a common underlying factor, which all have relatively high loadings on that factor, while discriminant validity refers to the distinctiveness of the factors measures by different set of indicators and to the extent to which a measure is novel and does not reflect some other variable. Nunnally (1978) propounded the minimum factor loadings of 0.30 criteria as a guideline for considering an item to be part of a factor. All items loaded highly on the appropriate factor (ranging from 0.361 to 0.731) and no item loaded on other designed

²⁰³ See statistical analysis in appendix E construct 1.

latent constructs, thus suggesting that convergent and discriminant validity were applicable for the latent construct 'pressures from business context' and thus providing evidence of validity and unidimensionality.²⁰⁴

Figure 34: Pressures from Business Context and Adoption of EPC at Present (Means)



Purchasing organisations perceived that they are mainly confronted with increased competitive pressures to reduce costs (mean 3.70) and to develop innovations (mean 3.86). Increasing concentration in supply markets (mean 2.54) and customer markets (mean 2.42) were regarded as less important competitive pressures in the business context. No major differences could be found that EPC adopters face a more competitive business context than non-users ($F = 0.81$, $1-p = 62.80\%$).²⁰⁵

A multiple regression test was also formed to test hypothesis 1b.²⁰⁶ Pressures from the business context have a weak regression to EPC importance to purchasing strategy and explain only 3.4% of its variance (multiple correlation coefficient: $R = +0.18$, $F = 0.41$, $1-p = 61.80\%$). Pressures from the business context do not directly affect EPC

²⁰⁴ See convergent and discriminant validity analysis in appendix E.

²⁰⁵ Pressures to reduce costs: $F = 0.41$, $1-p = 47.00\%$. Concentration in supply markets: $F = 0.49$, $1-p = 50.77\%$. Concentration in customer markets: $F = 2.31$, $1-p = 87.33\%$. Pressures to innovation: $F = 0.65$, $1-p = 57.31\%$.

²⁰⁶ For the detailed analysis see appendix E construct 1.

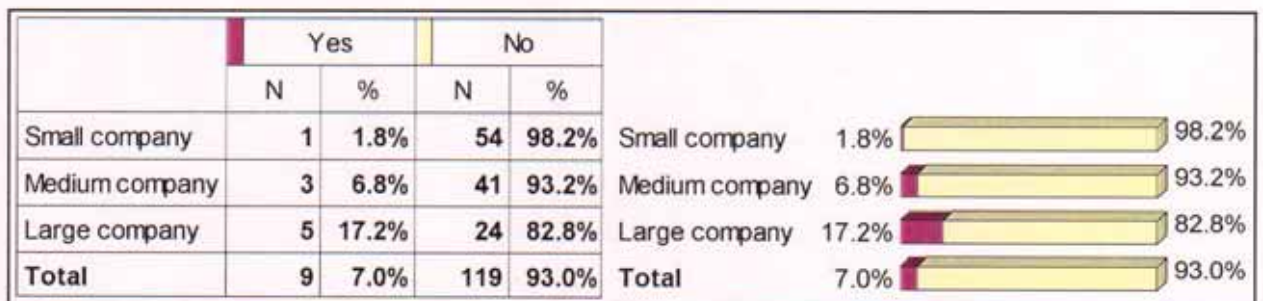
implementation and importance to purchasing strategy. Hypothesis H1b could not be supported.²⁰⁷

No significant effect of environmental factors (based upon pressures from business context and level of industry fragmentation) on EPC adoption and importance could be established. Therefore, the following paragraph focuses in more detail on one of the potential organisational drivers for EPC adoption, i.e. firm size.

5.3.2 Relationship between Firm Size and Adoption of Electronic Purchasing Consortia

The survey data reveals that it is especially the large companies (17%) that have adopted EPC. Almost all SMEs use the Internet as a basic communications facility, but only a very small minority tries to reap benefits from EPC adoption. Only 2% of small companies and 7% of medium companies have participated in EPC to date.

Figure 35: Size of Purchasing Organisation and EPC Adoption to Date



	EPC Adoption to Date			Analysis of Variance
	Yes	No	Total	
Average Turnover (in million euros)	19,371	1,872	3,142	F = 10.32 1-p = 99.82%
Average Employees	69,313	11,088	15,182	F = 6.31 1-p = 98.72%

Based on the statistical analysis in Figure 35, it can be strongly supported that EPC adoption is positively related to the size of a purchasing organisation. However, it could not be established from a multiple regression test that the importance of EPC is positively

²⁰⁷ The following three questions in the survey instrument for purchasing organisations addressed H1b: Please score the following statements in relation to your business context. Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

related to the size of purchasing organisations ($R = +0.12$, $F = 0.82$, $1-p = 54.20\%$).²⁰⁸ The average turnover and the number of average employees can only explain 1.3% of the variance of the importance of EPC. Therefore, H2a was only supported in such a way that the size of purchasing organisation is positively related to EPC adoption, but not to EPC importance.²⁰⁹

How can that difference be explained? Due to their capital and skills resources, large organisations may have better access to EPC adoption to date. This finding is consistent with the literature, where a variety of academic studies have identified company size as a driver to general ICT adoption.²¹⁰ However, smaller organisations have also recognised the importance of EPC as more benefits may accrue to them than to large organisations equipped with their already large purchasing volumes. However, access to capital or other resources in order to adopt EPC seems to be an entry barrier for SMEs.

The question arose whether or not it is a general phenomenon that large organisations are more engaged in e-Procurement activities in general than smaller organisations. Therefore, purchasing organisations have also been surveyed on the adoption level of e-Procurement software, e-Marketplaces / PSPs and reverse auctions.

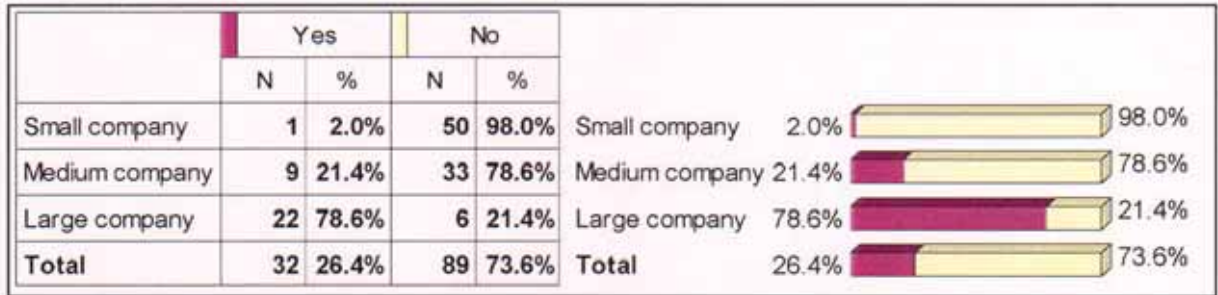
To date, only 26% of purchasing organisations take advantage of any e-Procurement software, specifically the large (79%) and partly the medium companies (21%) in comparison to only 2% of small companies (see Figure 36). The finding again seems to confirm that large organisations are more active in e-Procurement initiatives. E-Procurement software is traditionally used to automate replenishment and authorisation processes and is more suitable for complex group work. E-Procurement software typically involves significant investment that smaller companies often cannot afford.

²⁰⁸ Please find the test in appendix E construct 2.

²⁰⁹ The following four questions in the survey instrument for purchasing organisations addressed H2a: How many people are approx. employed in your entire organisation? What was your organisation's approx. total gross sales volume (in million euros) for last year? Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

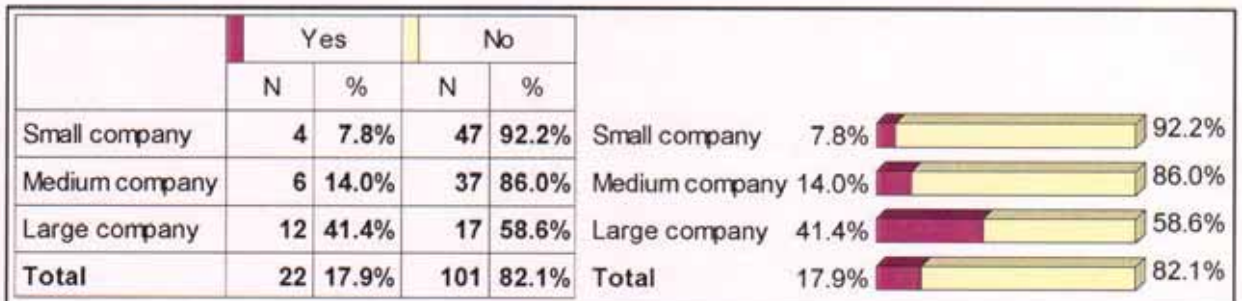
²¹⁰ Please see the second chapter for references.

Figure 36: Size of Purchasing Organisation and Use of E-Procurement Software to Date



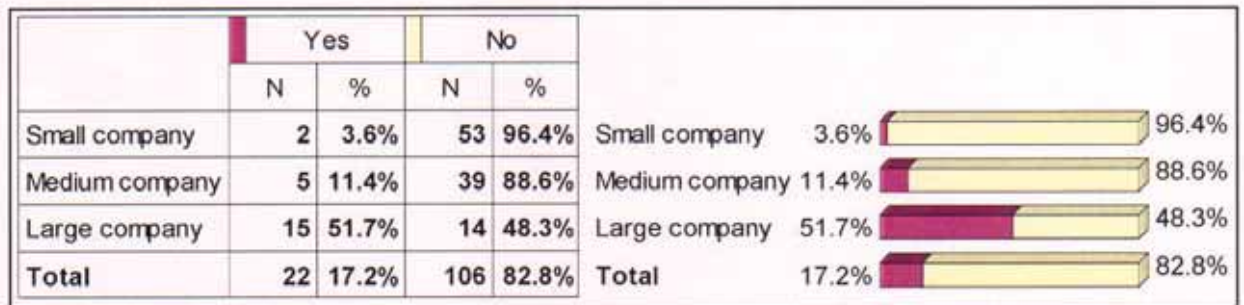
However, it is also mainly the large companies (41%) that take advantage of e-Marketplaces / PSPs at present (see Figure 37). Overall, only 18% of all purchasing organisations have adopted e-Marketplaces / PSPs to date. E-Marketplace / PSP adoption is overall lower than e-Procurement software implementation. Although many e-Marketplaces / PSPs claim to have lower investment costs (e.g. due to ASP-basis) than any e-Procurement software, the market penetration rate is still very low in small companies (8%) and low in medium purchasing organisations (14%).

Figure 37: Size of Purchasing Organisation and Adoption of E-Marketplaces / PSPs to Date



Company size as an organisational adoption driver is also confirmed when the size of purchasing organisation is cross-tabulated against the adoption of reverse auctions to date (see Figure 38). 52% of large organisations have already run reverse auctions at present in comparison to only 4% of small companies.

Figure 38: Size of Purchasing Organisation and Adoption of Reverse Auctions to Date



No significant sectoral differences in the adoption of e-Procurement software, e-Marketplaces / PSPs or reverse auctions could be identified.²¹¹ However, Irish purchasing firms are partly lagging behind German organisations in the implementation rate of e-Procurement services. 31% of German purchasing organisations have integrated an e-Procurement software (in comparison to 22% of Irish companies) and 24% of German organisations have participated in an e-Marketplace / PSP to date (in comparison to 13% of Irish companies).²¹² It is significant that only 9% of Irish companies have implemented reverse auctions in comparison to 26% of German companies (Chi2 = 6.28, df = 1, 1-p = 98.78%).

However, the author is cautious of these cross-country comparisons. The findings may be explained by the background that Irish survey participants were smaller in size than the German companies.²¹³ A segmentation into company size reveals that it is still mainly the large companies that have implemented e-Procurement services.²¹⁴

So are there any significant changes for the future in terms of company size and implementation of e-Procurement services? For the future, approx. 18% of the purchasing organisations specified that they would participate in EPC (see Figure 39). EPC adoption is not only limited to large and medium companies in future and company size will not be as important to future EPC adoption as it is to date.²¹⁵ Small purchasing organisations have also realised, to some extent, EPC opportunities and 13% plan to participate in EPC, although the majority of small companies has still no particular interest in future.

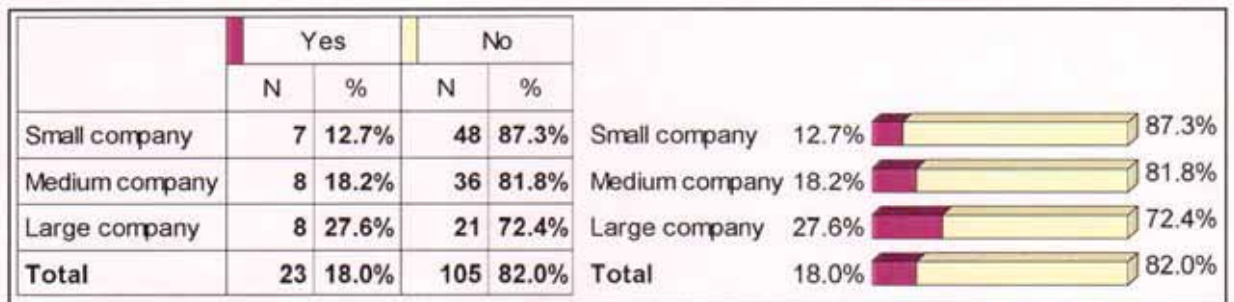
²¹¹ See statistical analysis in appendix E construct 2.

²¹² See statistical analysis in appendix E construct 2.

²¹³ See statistical analysis in appendix E construct 2.

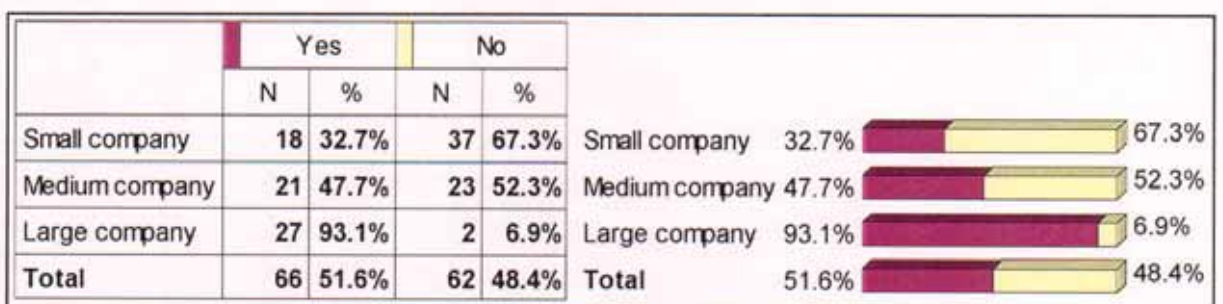
²¹⁴ See analysis in construct 2 in appendix E.

²¹⁵ Irish and German companies are on the same level in terms of EPC implementation to date and in future. See appendix E construct 2.

Figure 39: Size of Purchasing Organisation and Future EPC Adoption

Overall, purchasing organisations indicated an increase in the implementation of e-Procurement services, for example in adoption of e-Procurement software from 26% to date to 48% in future, specifically by large (93%) and by many of the medium sized companies (57%). Only 16% of small companies have explicit plans for e-Procurement software implementation in future.²¹⁶

Additionally, purchasing organisations claimed an increase in the adoption of e-Marketplaces / PSPs from 18% to date to 52% in future. Small companies (33%), in particular, are more interested in e-Marketplaces / PSPs in future than in any particular e-Procurement software (see Figure 40).

Figure 40: Size of Company and Adoption of E-Marketplaces / PSPs in Future

Moreover, purchasing organisations acknowledged a rise in the adoption of reverse auctions from 17% to date to 37% in future. Again, it was investigated that it is mainly the large companies (79%) that will take advantage of reverse auctions in future, but activity from small companies (20%) is accelerating. Overall, it can be stated that the implementation of EPC, e-Procurement software, e-Marketplace / PSPs and reverse auctions seems to be still remarkably dependent upon the organisation size within the next

²¹⁶ See statistical analysis in appendix E construct 2.

five years. However, the current adoption gap between large and small organisations is shrinking and SMEs' investment into e-Procurement services is increasing.

Economies of scale in development costs for e-Procurement services can increase market penetration, so that also more and more SMEs may afford activity in e-Procurement services. While the adoption of e-Procurement services is positively associated with the size of purchasing organisations to date, how does the size of e-Marketplaces / PSPs affect EPC offering?

Table 15 illustrates that the average²¹⁷ e-Marketplace / PSP achieves a turnover of 32 million euros, has a base of 2,336 suppliers and 973 customers and transacts 65,217 purchase orders. However, the range in the size of e-Marketplaces / PSPs is from very small to very large (see Table 15).

Table 16: Size of E-Marketplaces and Procurement Service Providers

E-Marketplace / PSP Size		How many suppliers have you got in total?	How many purchasing organisations are customers of your service?	What was your organisation's approx. total gross sales volume for last year in million euros?	How many purchase orders are placed per annum?
N	Valid	38	42	36	30
	Missing	5	1	7	13
Mean		2,336	973	31.5	65,217
Minimum		5	7	1	50
Maximum		10,000	8,000	146	1,000,000

Only very few e-Marketplaces and PSPs have gained a very large market share and penetration. An analysis of early vs. late respondents revealed that the size of participating e-Marketplaces / PSPs is representative.²¹⁸ A table of means was set up to explore differences in size between EPC providers and non-providers (see Table 16).

²¹⁷ When the author speaks about the average or mean response, it is the arithmetic mean (unless specified in another form, e.g. median).

²¹⁸ See statistical analysis in appendix D construct 2.

Table 17: E-Marketplace / PSP Size vs. EPC Offering to Date

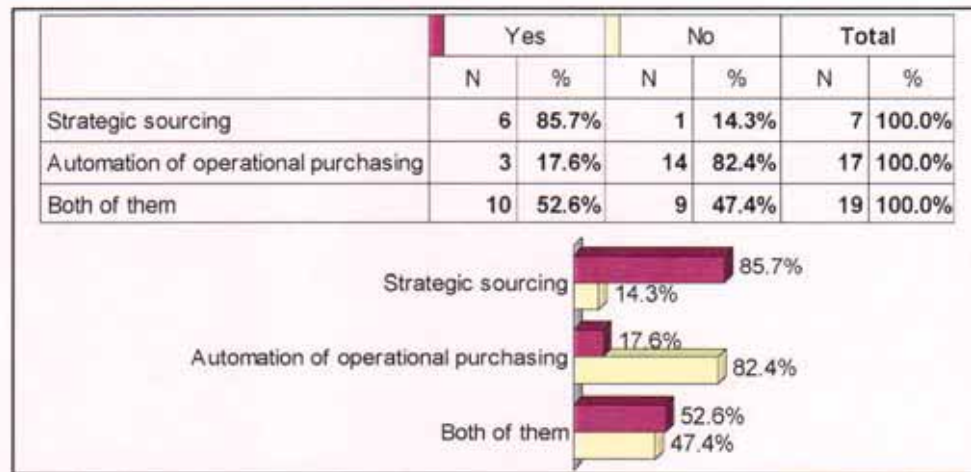
	EPC Offering to Date		Total	Analysis of Variance
	Yes	No		
Average Number of Suppliers	2,548	2,164	2,336	F = 0.21 1-p = 34.50%
Average Number of Purchasing Organisations	1,151	826	973	F = 0.47 1-p = 49.78%
Average Gross Sales Volume in Million Euros	31.76	31.32	31.53	F = 0.00 1-p = 7.39%
Average POs placed	49,662	77,112	65,217	F = 0.16 1-p = 31.08%

The survey data reveals that the size of e-Marketplaces / PSPs is not positively related to EPC offering. A multiple regression test does also not demonstrate a positive correlation between EPC importance and average number of suppliers, purchasing organisations, POs placed and average gross sales volume ($R = +0.23$, $F = 0.58$, $1-p = 11.60\%$). These 4 variables only explain 5.2% of the variance of EPC importance. Therefore, hypothesis H2b - the size of e-Marketplace / PSP is positively related to EPC offering and importance - cannot be supported.²¹⁹

Figure 41 demonstrates that EPC offering is more related to the strategic sourcing focus of e-Marketplaces / PSPs. EPC providers concentrate more on strategic sourcing, whereas non-providers focus more on automating the operational purchase transaction process.

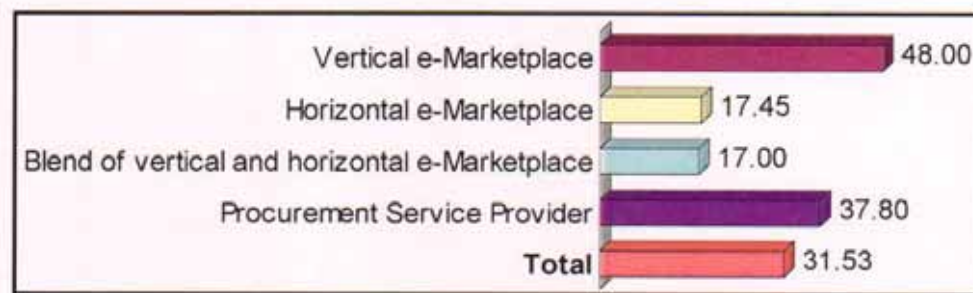
²¹⁹ The following six questions in the survey instrument for e-Marketplaces / PSPs addressed H2b: How many suppliers have you got in total? How many purchase orders are placed per annum? What was your organisation's approx. total gross sales volume for last year (in euros)? How many purchasing organisations are customers of your service? Do you offer EPC? Please score EPC according to the importance to your business strategy.

Figure 41: Focus on Strategic or Operational Purchasing vs. EPC Offering to Date



Despite this difference in the procurement focus, PSPs achieve a similar turnover as e-Marketplaces (see Figure 42).

Figure 42: Interaction of 'Type of E-Marketplace and PSP' and 'Gross Sales Volume in Million Euros'



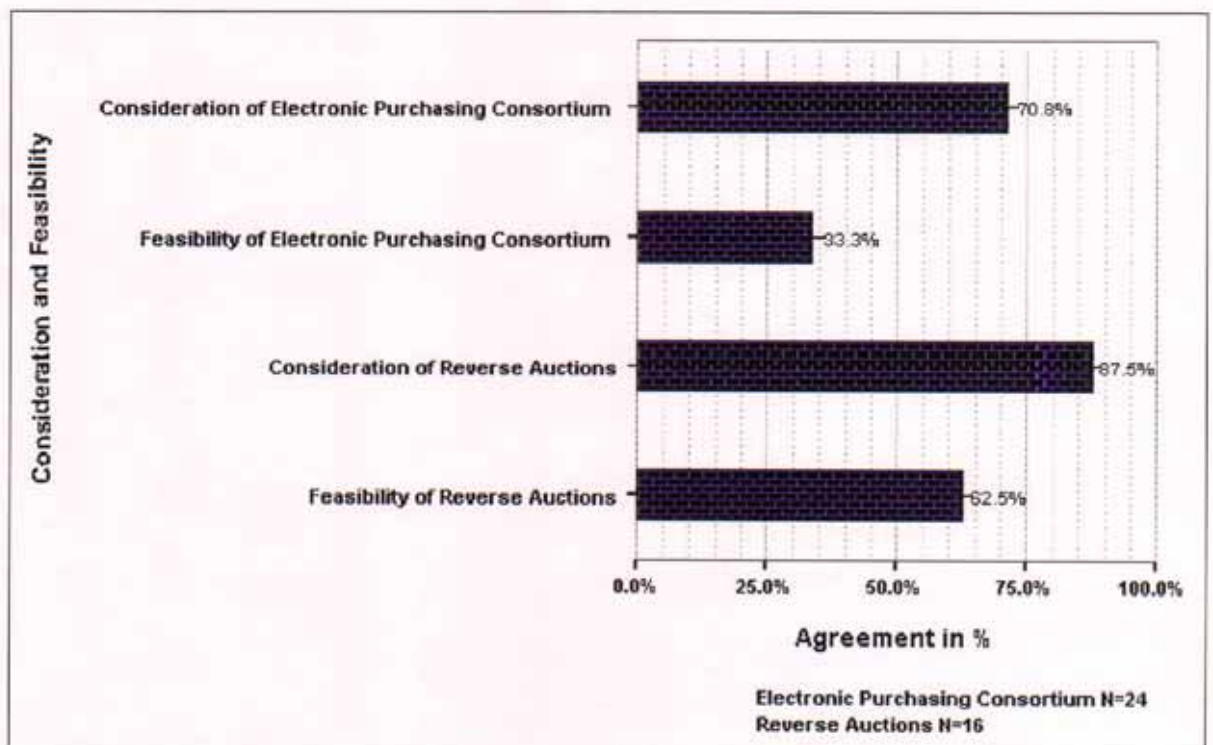
E-Marketplaces still have a good potential to integrate strategic sourcing services such as EPC. However, the size of e-Marketplace / PSPs is not an organisational EPC adoption driver. Further analysis of strategic and operational purchasing services is provided in construct 3.

5.3.3 The Level of Awareness and Importance of Electronic Purchasing Consortia and Further Customised Services

Of the 24 e-Marketplaces and PSPs that do not offer electronic purchasing consortia, 71% have considered the implementation of electronic purchasing consortia. However, only 33% of the EPC non-providers argue that EPC would be feasible for them.²²⁰

27 out of 43 e-Marketplaces and PSPs offer reverse auctions (63%). 88% of the 16 non-providers of reverse auctions have considered the implementation of reverse auctions and 63% think they are feasible for their business model. The findings demonstrate not only that reverse auctions are more often implemented within e-Marketplaces / PSPs and well accepted, but also reveal that both consideration and feasibility of reverse auctions are on a higher level than EPC.

Figure 43: Consideration and Feasibility of Electronic Purchasing Consortia and Reverse Auctions (among e-Marketplaces / PSPs)



The consideration and feasibility of EPC and reverse auctions is reflected in future offering: 26 out of 43 e-Marketplaces and PSPs are planning to offer electronic

²²⁰ Reasons for this non-feasibility may be found in constructs 7 and 9: Level of benefits and drawbacks of electronic purchasing consortia and reverse auctions.

purchasing consortia in future and even 34 out of 43 have plans for reverse auctions in future. This would be an increase in EPC offering from 44% to 61% and a rise in reverse auctions' offering from 63% to 79% of e-Marketplaces / PSPs in future. In order to avoid survey bias, a crosscheck with 34 non-respondents was conducted on EPC offering in future in Table 17:

Table 18: Analysis of Respondents / Non-Respondents in EPC Offering in Future

Future Plans EPC Offering	Yes	No	Total
Respondents in Full Survey			
Yes	60.5% (26)	39.5% (17)	100% (43)
No	52.9% (18)	47.1% (16)	100% (34)
Total	57.1% (44)	42.9% (33)	100% (77)

Although future EPC offering is slightly lower among non-respondents, the dependence is not significant ($\text{Chi}^2 = 0.44$, $\text{df} = 1$, $1-p = 49.23\%$), which suggests that future EPC offering can be regarded as representative for the population. Also, no significant differences could be established between early and late respondents.²²¹ Thus, non-response bias does not appear to pose any significant problem.

Only 28% of e-Marketplaces / PSPs offer a combination of both electronic purchasing consortia and reverse auctions at the same time to date. In future, 24 out of 43 e-Marketplaces and PSPs have plans to implement a combination of electronic purchasing consortia and reverse auctions. This would represent an increase from 28% to 56%, which clearly stresses the awareness of both electronic purchasing consortia and reverse auctions to e-Marketplaces and PSPs. A large number of e-Marketplaces, in particular, appear to have discovered EPC and reverse auction opportunities and plan to add these services to their business spectrum. The majority of PSPs, on the other hand, have already integrated both services to their offerings to date.

By contrast to strong EPC offering from PSPs, only 9 purchasing organisations in the survey have used EPC at present (7%). Of the 119 purchasing organisations that have not participated in EPC to date, 47% have at least considered the idea, but only 24% claim that EPC would be feasible for them. In future, approx. 18% of purchasing organisations

²²¹ See appendix D construct 3.

specified that they would adopt EPC. Consequently, EPC will not achieve a significant breakthrough among purchasing organisations in the foreseeable future.

The findings suggest that not only purchasing organisations are not yet fully aware of EPC, but they also see significant barriers in relation to the feasibility of EPC (highlighted in construct 7). 17% of purchasing organisations have run reverse auctions to date. Of the 106 purchasing organisations in the survey that have not run reverse auctions at present, 52% claim that they have considered the idea and 47% specify that reverse auctions would be feasible. In future, 37% of purchasing organisations claim to integrate reverse auctions. Therefore, the feasibility findings suggest that the barriers to reverse auctions are perceived on a lower scale than to EPC.

For the combination of both EPC and reverse auction, only 4% of purchasing organisations take advantage of this constellation at present. In future, the survey results predict that approx. 11% of purchasing organisations will implement a combination of EPC and reverse auctions. Again, the combination of EPC and reverse auctions will not achieve a major breakthrough among purchasing organisations.

The importance of both services can be further analysed by applying a five-point likert scale to assess their importance to procurement strategy. A response of 1 indicates 'no importance at all', 3 indicates 'somewhat important', 5 indicates extremely important, with 2 and 4 being further graduations. Purchasing organisations perceive reverse auctions (mean factor 3.1) as more important than EPC (mean factor 2.7). Large purchasing organisations with significant procurement volume, in particular, tend to perceive EPC and reverse auctions as more important than SMEs (see Table 18).

Table 19: Average Importance of EPC and Reverse Auctions to Purchasing Organisations (1 = No importance at all; 5 = Extremely important)

	Importance EPC	Importance Reverse Auction
Small company	2.62	2.68
Medium company	2.67	3.07
Large company	2.82	3.83
Total	2.68	3.08

No statistically significant differences could be established between the industry sectors. Purchasing organisations in the electronics industry perceive EPC more important (mean factor 2.74) than the automotive industry (mean factor 2.60), which is, however, not yet statistically significant.²²²

The survey results from purchasing organisations were compared to the survey data from e-Marketplaces / PSPs (see Table 19). E-Marketplaces / PSPs perceive EPC as more important (mean factor 3.05) than purchasing organisations (2.68). Also, reverse auctions are less important to purchasing organisations (mean factor 3.28) than to e-Marketplaces / PSPs (3.67).

However, the author felt that it is very relevant to build a larger construct, in which to assess the importance of more ICT-supported customised services to both purchasing organisations and e-Marketplaces / PSPs and to attain a cross-comparison (see Table 19).²²³

²²² Please see appendix E construct 3.

²²³ The construct 'importance of customised services' is a formative scale, where all item measures can be independent of one another since they are viewed as items that create the 'emergent factor'. Thus, reliability assessments such as Cronbach's alpha are not applicable.

Table 20: Comparison of Service Importance among E-Marketplaces / PSPs and Purchasing Organisations

Comparison of Service Importance	Mean Value E-Marketplaces / PSPs	Mean Value Purchasing Organisations
Electronic Purchasing Consortium	3.05	2.68
Reverse Auction	3.67	3.08
Collaborative Engineering	3.37	3.03
Handling warranty	2.79	2.40
Accounts payables processing	3.40	2.79
Accounts receivables processing	3.35	2.75
Tracking / Tracing	3.23	2.80
Product / Service request	3.40	2.74
Electronic authorisation	3.53	2.77
Request for quotations	4.42	3.83
Detailed information on existing suppliers	3.79	3.96
Search for new suppliers	4.00	4.18
Total:	3.50	3.09

Purchasing organisations score the level of importance of customised services in general lower (mean factor 3.09) than e-Marketplaces / PSPs (3.50). This result suggests that purchasing organisations may not yet be fully aware of the variety of offered customised services.

However, very important to purchasing organisations is the search for new suppliers (mean factor 4.18) and the information on existing suppliers (3.96), which e-Marketplaces and PSPs seem to underestimate. Purchasing organisations and e-Marketplaces / PSPs perceive the majority of customised services as more important than EPC. In fact, 'handling warranty and other problems' is the only service that is rated less important than EPC by both purchasing organisations and e-Marketplaces / PSPs.

However, EPC providers perceive the importance of EPC as more significant (mean scale 3.79) than non-providers (mean scale of 2.46). This difference is significant (1-p= 99.98%).²²⁴ This finding is confirmed by purchasing organisations: EPC adopters rated the importance of EPC on a higher level (mean scale 3.67) than non-users (2.61), which is also highly significant (1-p = 99.94%).²²⁵ Therefore, it can be concluded that EPC providers and users regard EPC as a crucial part of their procurement strategy.

²²⁴ For more details, please find appendix D construct 3.

²²⁵ See appendix E construct 3.

Moreover, the survey results show that integrated full service provision seems to be very relevant to e-Marketplaces / PSPs (see Figure 44). One of the potential reasons for the downturn and consolidation phase of e-Marketplaces / PSPs was the lack of functionality and customised services, which did not meet the expectations of purchasing organisations. Therefore, e-Marketplaces and PSPs are trying to integrate a higher level of functionality to develop towards full service providers. These integration tendencies are shown in Figure 44.

So far, the services 'search for new suppliers', 'detailed information on existing suppliers', 'request for quotation' and 'product / service request displayed on website' are already quite well integrated within e-Marketplaces and PSPs. Services with a remarkable increase in offering in future are 'collaborative product engineering'; 'accounts payables and receivables processing'; 'tracking / tracing' as well as 'handling warranty and other problems'.

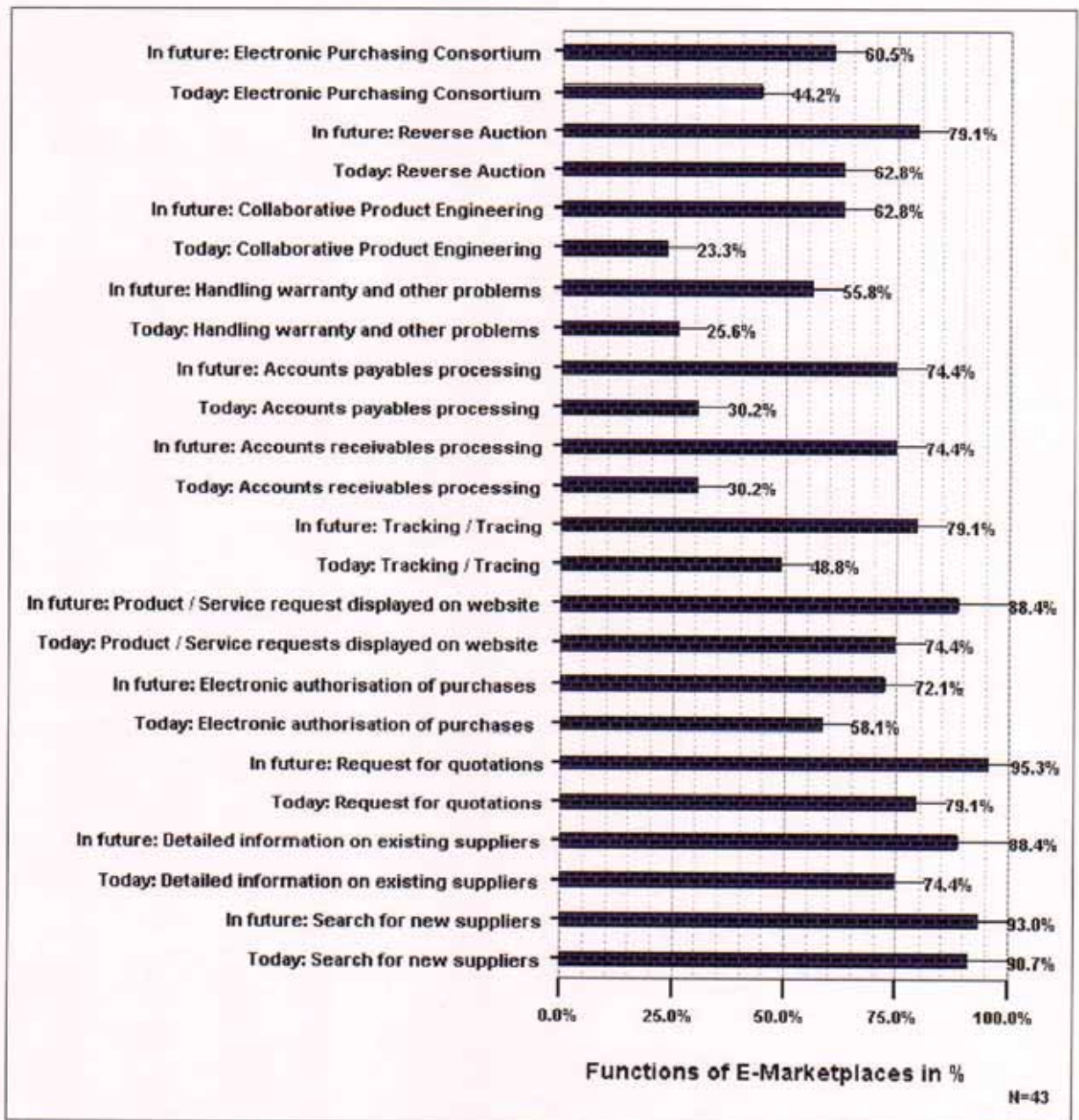
Figure 44: Services Offered by E-Marketplaces / PSPs to Date and in Future

Figure 44 reveals that the majority of e-Marketplaces and PSPs plan to add functionality and customised services in future in order to further complement their business strategy. Obviously, e-Marketplaces and PSPs have recognised that they have to increase the level of services in future. E-Marketplaces and PSPs try to expand their offerings to full service provision and plan to avoid building one-off, single-sided services.

Purchasing organisations also confirmed that they plan to increase the adoption level of customised services. Table 20 provides an insight into customised service adoption by comparing e-Marketplace / PSP offerings to purchasing organisations' implementation levels to date and in future.

Table 21: Service Adoption by Purchasing Organisations and E-Marketplaces / PSPs to Date and in Future

Comparison of Service Adoption to Date and in Future	Purchasing Organisations Adoption to Date	E-Markets / PSPs Offering to Date	Purchasing Organisations Future Adoption	E-Markets / PSPs Future Offering
Electronic Purchasing Consortium	7.0%	44.2%	18.0%	60.5%
Reverse auction	17.2%	62.8%	36.7%	79.1%
Collaborative engineering	21.8%	23.3%	49.2%	62.8%
Handling warranty online	23.4%	25.6%	57.5%	55.8%
Accounts payables processing	22.7%	30.2%	42.5%	74.4%
Accounts receivables processing	20.3%	30.2%	38.4%	74.4%
Tracking / tracing online	44.5%	48.8%	74.0%	79.1%
Product / service request on website	43.0%	74.4%	59.8%	88.4%
Electronic authorisation of purchases	25.0%	58.1%	46.5%	72.1%
Electronic request for quotations	39.1%	79.1%	63.0%	95.3%
Detailed information on existing suppliers	81.3%	74.4%	92.1%	88.4%
Search for new suppliers	92.2%	90.7%	96.9%	93.0%

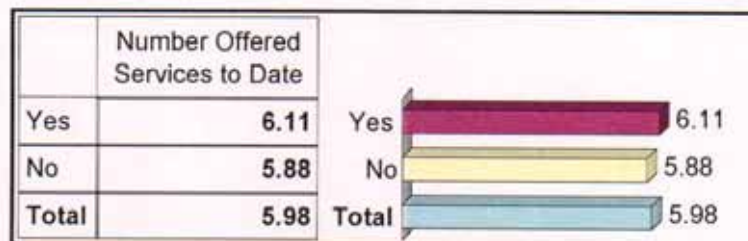
Only few purchasing organisations take advantage of EPC to date and only 18% plan to use this service in future, but 61% of e-Marketplaces / PSPs will integrate this service in future. Purchasing organisations have realised EPC opportunities on a lower level than e-Marketplaces / PSPs.

37% of purchasing organisations will implement reverse auctions in future and e-Marketplaces / PSPs are well prepared for this increase in adoption. This is also true for other customised services, where purchasing organisations plan to increase implementation significantly in the future. For example, only 45% of purchasing organisations track online the progress of goods ordered to date, whereas 74% of

purchasing organisations plan to do so in the future. E-Marketplaces / PSPs seem to have realised this potential and plan a significant increase (79%) in provision of online tracking / tracing services in the future. The data from both surveys indicates that the level of EPC implementation and further customised services will increase.

In order to expand the knowledge of EPC and customised services, a further question to explore was whether or not EPC providers offer more functionality to date than non-providers. For this test, the overall level of service provision, comprised of the 11 services as shown as in Table 20, was cross-tabulated against EPC offering to date. E-Marketplaces / PSPs have implemented on average approx. 6 of the 11 specified services to date.

Figure 45: Overall Service Offering to Date vs. EPC Offering to Date



However, EPC providers do not generally offer more functionality and customised services than non-providers ($F = 0.10$, $1-p = 24.83\%$).²²⁶ The level of offered services has a very weak negative correlation to EPC importance (correlation coefficient: -0.02 ; $F = 0.02$; $1-p = 12.30\%$), which is not significant. Consequently, hypothesis H3a – the provision level of customised services is positively related to EPC offering and importance - cannot be supported.²²⁷

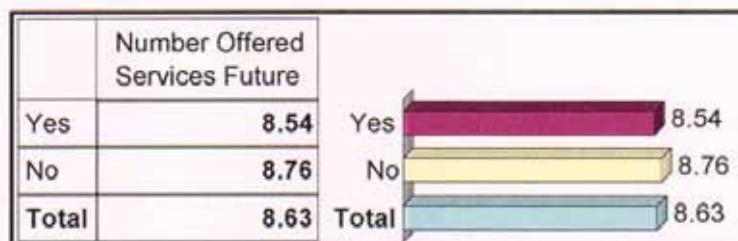
The question remains if there is any potential change in the future: Do future EPC providers offer more customised services than non-providers? Figure 46 illustrates a significant rise, where e-Marketplaces / PSPs plan to offer on average more than 9 of the 11 specified further services. Again, no significant differences could be found between

²²⁶ The null-hypothesis cannot be rejected. For more details, please see appendix D construct 3.

²²⁷ The following three questions in the survey instrument for e-Marketplaces / PSPs addressed H3a: Which services are your offering to date? Do you offer EPC? Please score EPC according to the importance to your business strategy.

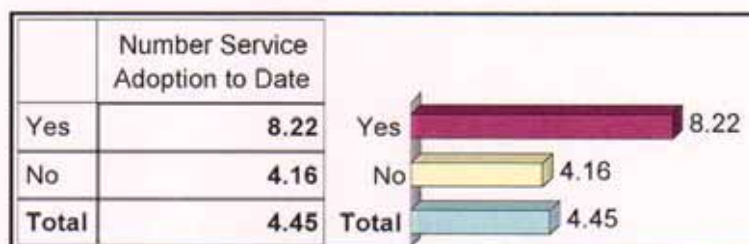
future EPC providers and non-providers in terms of level of functionality ($F = 0.11$, $1-p = 26.01\%$).²²⁸

Figure 46: Overall Service Offering in Future vs. EPC Offering in Future



The level of technology adoption was also assessed for EPC users and non-users among purchasing organisations. Figure 47 reveals that EPC adopters have implemented on average 8 of the 11 customised services in comparison to EPC non-users with an adoption level of 4 services on average.

Figure 47: Overall Service Adoption to Date vs. EPC Adoption to Date



This finding is highly significant with a rather strong F-value of 15.35 and $1-p = 99.98\%$. Apparently, purchasing organisations that have adopted EPC (mainly large organisations) are generally also more interested and receptive to other customised services as well. Also, future EPC users specify that they would adopt on average 9 services in the future, whereas future non-users of EPC implement only 6 of all specified 11 services ($F = 13.68$, $1-p = 99.96\%$).²²⁹

The statistical results demonstrate that purchasing organisations that adopt EPC are much more aware of other customised services and ahead of non-users technology-wise. This finding was also confirmed by a moderate positive correlation (28% of variance explained) between the adoption level of further customised services and EPC importance

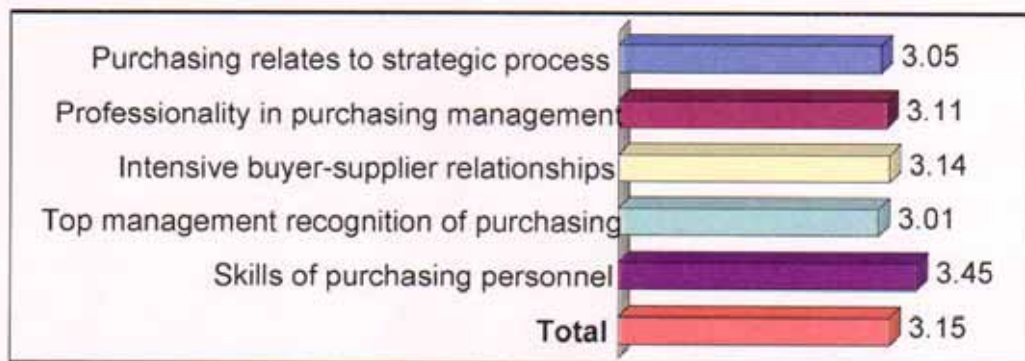
²²⁸ For more details, please see appendix D construct 3.

²²⁹ For more details, please see appendix E construct 3.

(correlation coefficient: +0.53, $F = 47.12$, $1-p = >99.99\%$).²³⁰ The equation is statistically significant at the 0.01 level of significance and hypothesis H3b could be confirmed: The adoption level of customised services is positively related to EPC implementation and importance.²³¹

Therefore, it was also tested whether or not the maturity of the purchasing function has a positive impact on the adoption level and importance of EPC and customised services. The construct purchasing maturity was created to test hypothesis H3c. Purchasing maturity is a five-item construct on a scale from 1 (completely disagree) to 5 (completely agree) with a Cronbach's alpha of 0.65. All five items loaded highly on the appropriate factor (ranging from 0.538 to 0.825) and no item loaded on more than one factor. Convergent and discriminant validity were, therefore, applicable for this latent construct and evidence of validity and unidimensionality could be provided.²³²

Figure 48: Average Purchasing Maturity among Purchasing Organisations



EPC adopters rated their purchasing maturity at an average of 3.80 in comparison to 3.10 among non-adopters. EPC adopters are significantly more mature in purchasing than non-users ($F = 17.43$, $1-p = 99.99\%$), which applies also to future EPC adopters.²³³ A strong multiple regression could also be identified that the higher the EPC importance to purchasing strategy, the more mature the purchasing function ($R = +0.69$, $F = 20.55$, $1-p = >99.99\%$), which is significant at the 0.01 level. Purchasing maturity can explain 47.0% of the variance of EPC importance.

²³⁰ For more details, please see appendix E construct 3. The statistical analysis also demonstrates that EPC importance is positively related to the importance of overall services.

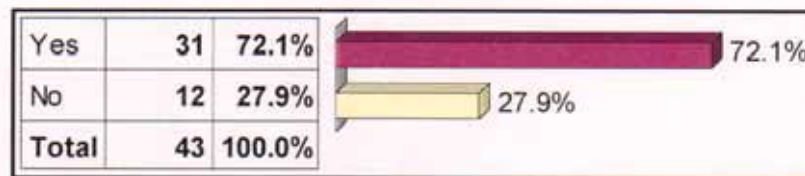
²³¹ The following three questions in the survey instrument for purchasing organisations addressed H3b: For which purposes, if any, do you use information and communication technologies? Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

²³² See convergent and discriminant validity analysis in appendix E.

Moreover, a regression test proved that purchasing maturity is also positively related to the adoption level of further customised services (correlation coefficient: +0.42, $F = 27.20$, $1-p = >99.99\%$) and their importance ($R = +0.56$, $F = 4.06$, $1-p = >99.99\%$).²³⁴ Hypothesis H3c could be supported.²³⁵

While the extract of customised services is just a selection of a wide range of further functionality, the research could present some significant findings to organisational and technological EPC adoption drivers. For example, a service that was not included into overall functionality was ERP-systems and back-end integration.²³⁶ 48% of purchasing organisations confirmed that they have adopted ERP-systems to date. 72% of e-Marketplaces and PSPs claim to offer integration or interfaces to customers' ERP-systems, but specify in most cases that integration is possible on request.²³⁷

Figure 49: E-Marketplace/ PSP Integration or Interface with ERP-Systems



Therefore, it was more difficult to decide for the author whether or not ERP-integration was actually offered. For example, arguments from e-Marketplaces / PSPs included:

- E-Marketplace can be integrated to all ERP-systems,
- Flexible for all systems, integration is possible on request,
- Interfaces are there, but they are hardly used,
- We can integrate to anything ,
- XML that can be interpreted by ERP-Systems,
- To be defined, we can do all but are most familiar with SAP.

²³³ For detailed analysis see appendix E construct 3.

²³⁴ For detailed analysis see appendix E construct 3.

²³⁵ The following three questions in the survey instrument for purchasing organisations addressed H3c: Please score the following statements in relation to purchasing in your company. Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

²³⁶ XML middleware software can develop links between e-Procurement solutions and back-office applications.

²³⁷ E-Marketplaces / PSPs specified following interfaces: SAP (91% of e-Marketplaces / PSPs), Oracle (48%), J.D. Edward (29%), Baan (19%), Microsoft BizTalk Server (19%), PeopleSoft (14%), Lawson (10%) and Movex (10%).

Therefore, ERP-system integration was not included in the analysis of customised services, but was understood by most participating e-Marketplaces / PSPs and purchasing organisations to be an important service in order to undertake e-Procurement projects.

Overall, it was learnt from the survey data that many e-Marketplaces and PSPs still lack customised services to date. The survey results revealed that e-Marketplaces / PSPs in general plan to significantly increase the offering of customised services in the future in order to further complement their service infrastructure. In terms of EPC it appears that e-Marketplaces can still learn from PSPs on how to integrate value-adding activities in strategic sourcing services. Purchasing organisations that have implemented EPC are ahead of non-adopters technology-wise and more developed in purchasing maturity.

5.3.4 Management Structures, Trading Mechanisms and Scope of EPC

In order to facilitate a deeper insight into EPC management structures, e-Marketplaces / PSPs were asked how long it took them to become operational for electronic purchasing consortia and reverse auctions.

Table 22: Implementation Time for EPC and Reverse Auctions

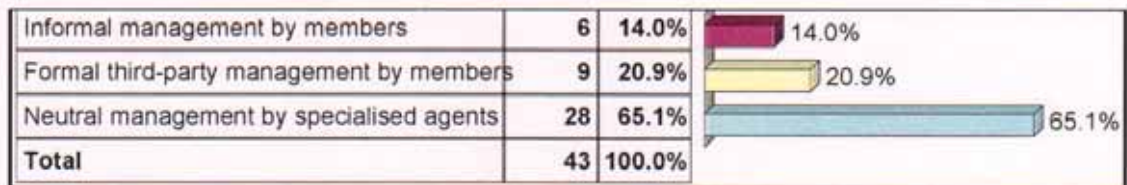
	Time to become operational for EPC				Time to become operational for reverse auctions			
	Purchasing Organisations		E-Marketplaces / PSPs		Purchasing Organisations		E-Marketplaces / PSPs	
	N ^o	Percent	N ^o	Percent	N ^o	Percent	N ^o	Percent
Less than 4 months	1	11.1%	6	42.9%	9	39.1%	9	56.3%
Less than 8 months	4	44.4%	4	28.6%	9	39.1%	5	31.3%
Less than 1 year	2	22.2%	2	14.3%	4	17.4%	1	6.3%
1-2 years	1	11.1%	2	14.3%	1	4.3%	1	6.3%
More than 2 years	1	11.1%	0	0.0%	0	0.0%	0	0.0%
Total Cit.	9	100%	14	100%	23	100%	16	100%

According to e-Marketplaces / PSPs, the average time to become operational for EPC was in most cases less than 8 months, whereas reverse auctions were implemented in a shorter time. 56% of e-Marketplaces and PSPs confirmed that reverse auctions could be implemented in less than 4 months and 31% specified less than 8 months. Both findings indicate a relatively quick set-up of EPC and reverse auctions. Only 29% of EPC providers indicated that it takes more than 8 months to adopt EPC.

56% of EPC adopters among purchasing organisations confirmed that EPC could be implemented within less than 8 months. For reverse auctions, purchasing organisations confirmed the relatively efficient implementation time. 78% specified less than 8 months to get operational for reverse auctions.

This first insight into the process implementation time can be expanded by highlighting the management structure of electronic purchasing consortia. EPC that are informally managed by members are not widely accepted among e-Marketplaces / PSPs (see Figure 50).

Figure 50: Desired Management Structure of EPC for E-Marketplaces / PSPs



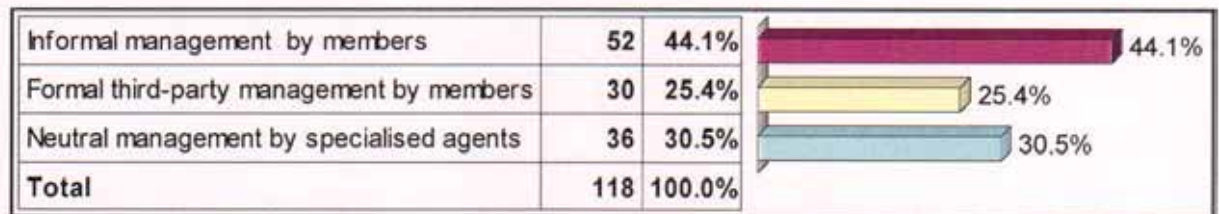
Due to the nature of their offerings, e-Marketplaces / PSPs may have stressed that EPC should be set up by neutral specialised intermediaries in order to promote their business. Therefore, this finding cannot contribute to the testing of hypothesis H4 whether or not EPC are positively associated with formal third-party reintermediation. Hence, H4 was tested by the analysis of survey data from purchasing organisations.

They are faced with the option between external third parties or informal or formal member-managed purchasing consortia and ultimately decide which EPC structure is chosen. The EPC management structure can range from simple to complex, from informal to formal, from insourcing to outsourcing.

Hendrick (1997) explored in his study on purchasing consortia among US Fortune 500 companies that only 12% of those consortia are managed by an independent third party. Therefore, the question arose in which way Hendrick's findings are still relevant in relation to electronic purchasing consortia.

The results from the survey among purchasing organisations could partly confirm Hendrick's findings. 44% of purchasing organisation would opt for informal EPC management, whereas 25% would choose a formal third-party management by members and 31% a neutral EPC management by specialised agents (see Figure 51).

Figure 51: Desired Management Structure of EPC for Purchasing Organisations



Disinfomediation in EPC occurs when two or more purchasing organisations join together to obtain better procurement terms and share information resources by relatively informal relationships. Members typically just agree to a few working rules for the demand aggregation task at hand and do not include a third-party such as an e-Marketplace / PSP.

Reinfomediation for EPC takes place when a formal contractual arrangement is required among the participants to institute and fund a third-party agency for the purpose of providing purchasing and demand aggregation services to the members. For the testing of hypothesis H4, informal management by members represented disinfomediation and formal third-party management as well as neutral management by specialised agents reflected reinfomediation. Intermediation by definition per se does not fall cleanly into the EPC definition between markets and hierarchy. The testing reveals that H4 - EPC are positively correlated with formal third-party reinfomediation – cannot be supported ($\text{Chi}^2 = 1.66, \text{df} = 1, 1-p = 80.25\%$).²³⁸ EPC adopters confirm that both dis- and reinfomediation have a significant impact on the choice of legal structures for EPC.²³⁹

Traditionally, purchasing organisations are keen to keep their independence. For example, it was learnt that, therefore, purchasing consortia often start with an informal co-operation: members informally meet to pool demand or proceed with electronic data exchange to aggregate demand, but settle contracts individually with their suppliers on

²³⁸ The following question in the survey instrument for purchasing organisations addressed H4: What should be the legal structure of the electronic purchasing consortium?

the basis of the increased volume. Powell et al. (1996) came to the conclusion that organisations tend to prefer these partners for new strategic alliances, which are in their established network or are at least connected to it over a few ties. This formation behaviour leads to cliques that are strengthened over time.

If the co-operation works well, a more formal (third party) structure is traditionally taken on. EPC providers confirmed that new member recruitment processes for EPC typically develop from the progression of a network relationship among purchasing organisations or are initiated by a direct approach from the e-Marketplace / PSP. Moreover, in this context, e-Marketplaces / PSPs and purchasing organisations were asked what they think would be the make-up of purchasing consortia, i.e. in which scope would purchasing organisations be willing to co-operate?

Table 23: Scope of Electronic Purchasing Consortia

Scope of EPC	Purchasing Organisations	E-Marketplaces / PSPs
	Percent/ N° cit.	Percent/ N° cit.
As a single sector	21.6% (39)	32.1% (17)
As multi-sectoral group, e.g. a disparate group with some common objective	51.1% (90)	41.5% (22)
As a group defined by other means, such as a geographical area	10.8% (19)	9.4% (5)
Master purchasing: As a group of companies, where larger companies offer smaller companies demand aggregation services for a fee	16.5% (29)	17.0% (9)
Total Obs.	100% (176)	100% (53)

While 22% of all purchasing organisations would define the EPC scope as a single sector, most of them (51%) would prefer a multi-sectoral group.²⁴⁰ EPC adopters confirm that 54% take advantage of a multi-sectoral group in order to avoid e.g. anti-trust legislation or competitors in the consortium, whereas only 31% operate the consortium in a single industry.²⁴¹ This finding may partly explain why EPC implementation is not positively related to industry sectors' level of fragmentation (see H1a).

²³⁹ See appendix E construct 4.

²⁴⁰ The number of responses is greater than the number of observations, due to multiple responses (to maximum of 4).

²⁴¹ See cross-tabulation in appendix E construct 4.

Perceptions within e-Marketplaces / PSPs are similar: 42% of all e-Marketplaces and PSPs would favour a multi-sectoral group and 32% a single sector as appropriate scope of electronic purchasing consortia. 50% of EPC providers have chosen a multi-sectoral group and 25% as single industry as EPC scope.²⁴² A geographical area was not widely accepted by both purchasing organisations and e-Marketplaces / PSPs.

Also, the concept of master purchasing (SMEs can piggyback on larger companies in order to take advantage of purchase price reductions from larger procurement volumes) was supported by only 17% of purchasing organisations and e-Marketplaces / PSPs respectively. Reasons for this finding may be that SMEs can have a limited voice in the contract and security issues in master buying constellations.

Cross-tabulations of industry sectors and EPC scope reveal that the automotive industry is more attracted to the master buying model than the electronics industry.²⁴³ This result may be explained by the existence of well built collaboration ties between OEMs and first tier suppliers in the automotive industry, where it is common practice that OEMs aggregate demand with first tier suppliers (as outlined in case study A and B).

The results from EPC scope prompted the author to further analyse the mix of competitors and non-competitors in EPC context. It could be explored from EPC providers that an average of 24% purchasing organisations are direct competitors in EPC, while EPC adopters among purchasing organisations specified an average of only 15%, due to reasons such as anti-trust legislation, protection of proprietary data, and other reasons explored in construct 7.²⁴⁴ The relatively low number of direct competitors in EPC further confirms that EPC are predominantly constructed by multi-sectoral groups.

The average number of competitors in EPC is similar to previous findings from Hendrick's research (1997) concerning traditional purchasing consortia among the Fortune 500 in the US. He explored there that typical consortia limit their membership to non-direct competitors (60% of respondents), while only 30% have a mix of non-competitors and competitors.

²⁴² See appendix D construct 4.

²⁴³ See cross-tabulations in construct 4 in appendix D and E.

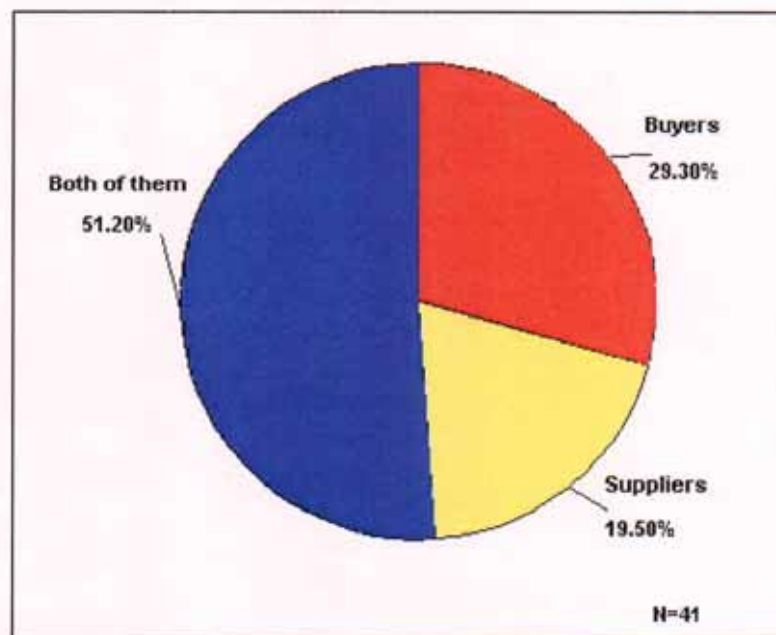
²⁴⁴ For the statistical analysis, please see appendix D and E construct 4.

A more detailed background to EPC management structures and scope could be provided from the survey results. Highly significant for a contribution to the conceptual EPC framework is also the knowledge of revenue models and funding options.

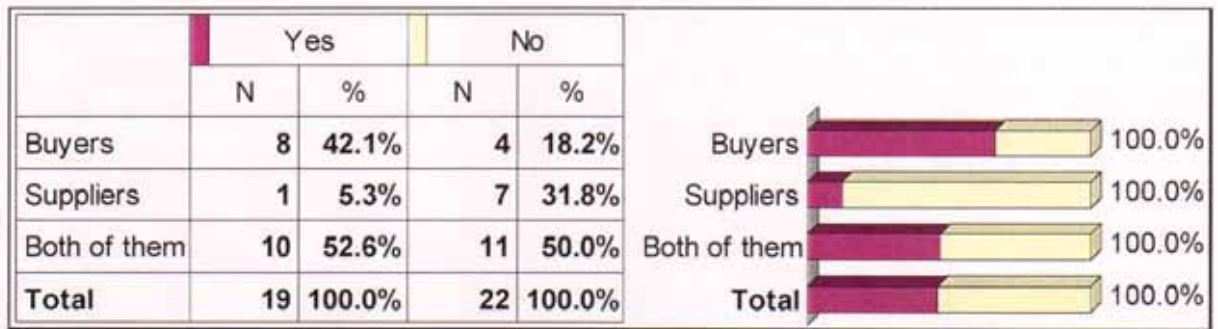
5.3.5 Revenue models for electronic purchasing consortia and reverse auctions

A first crucial question to explore is which party (buyer or supplier) bears the costs for e-Marketplace / PSP initiatives and activities. 51% of e-Marketplaces and PSPs interviewed specify that both buyers and suppliers pay fees to take advantage of their services (see Figure 52).

Figure 52: Fee Distribution

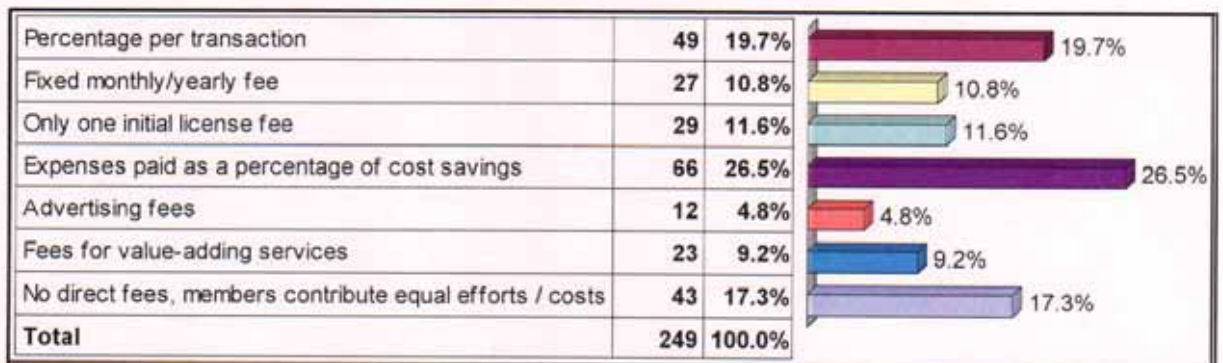


29% of e-Marketplaces / PSPs charge purchasing organisations and 20% impose fees on suppliers exclusively. Therefore, the cost focus is more on the buy-side. This finding becomes more obvious by a cross-tabulation of EPC provision and fee distribution (see Figure 53). EPC providers charge mainly buyers (42%) or both buyers and suppliers (53%).

Figure 53: Fee Distribution vs. EPC Offering to Date

This finding is consistent with the predominant fee distribution of traditional purchasing consortia (Hendrick, 1997) and emphasises that electronic purchasing consortia tend to be buyer-centric. It provides a distinction to co-operative purchasing in the public sector, where the fees are traditionally transferred to suppliers.

This first insight into EPC cost distribution facilitates the exploration into the structure of revenue models for EPC. Hendrick (1997) found that traditional purchasing consortia charge in most cases no direct fees: Each member contributes expense coverage, time and effort about equally. Therefore, it was important to investigate whether or not this traditional revenue model is still relevant to EPC. Purchasing organisations have been interviewed which type of EPC revenue model they would opt for (see Figure 54).

Figure 54: EPC Revenue Models and Preferences of Purchasing Organisations

Only 17% of all purchasing organisations would opt for that all members contribute equal efforts and costs for EPC. A transition to a mixture of EPC finance models took place, whereby 'expenses paid as a percentage of cost savings', 'percentage per transaction' and 'members contribute equal efforts / costs' are more relevant than others. Figure 54

illustrates the preferred EPC revenue models of all purchasing organisations, while Table 23 can reveal the current models of EPC adopters.

Table 24: Current Revenue Models among EPC Users

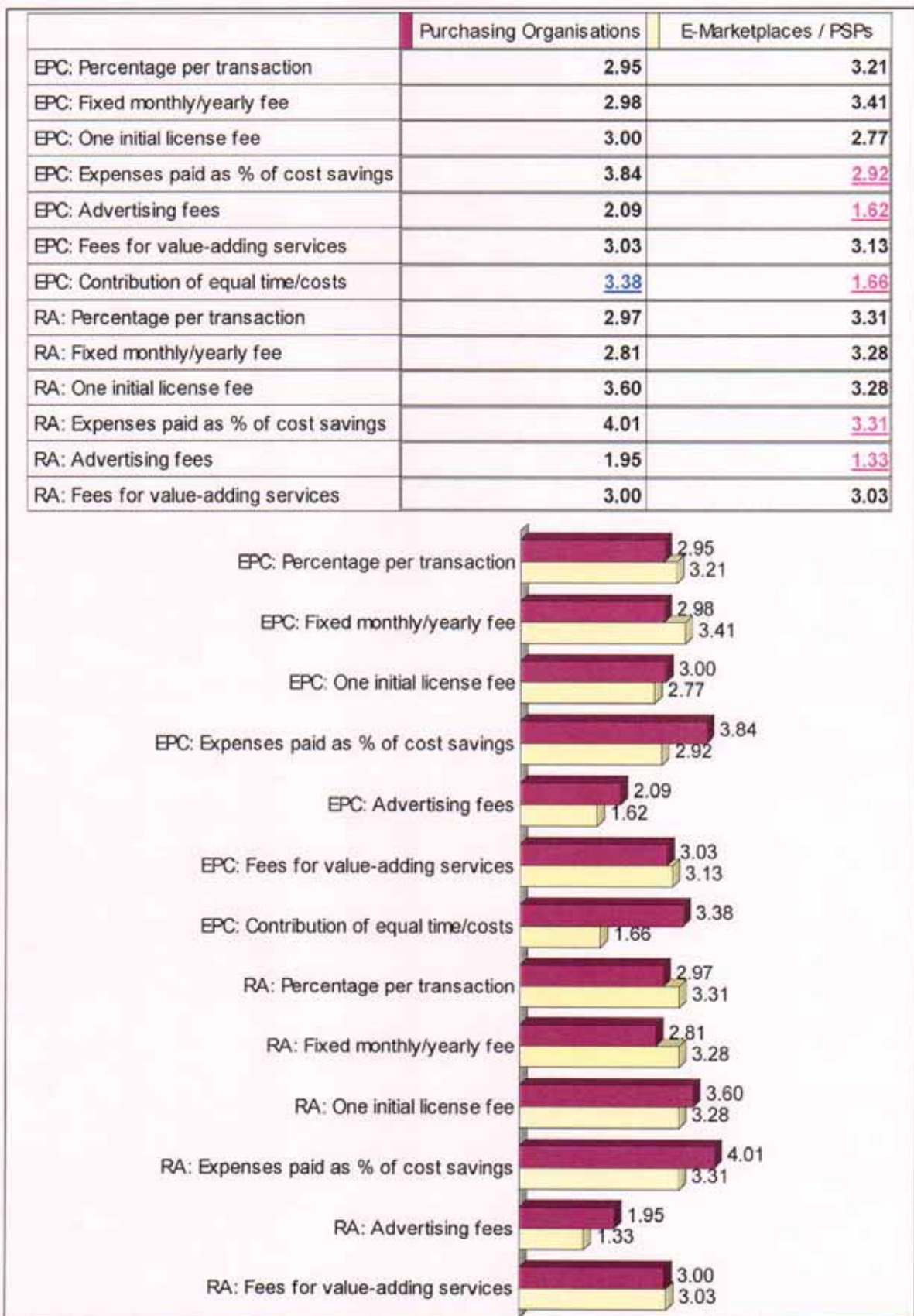
EPC Adopter 1	Percentage per transaction; Advertising fees; Fees for value adding services
EPC Adopter 2	One initial licence fee; Fixed monthly/yearly fee; Fees for value adding services
EPC Adopter 3	Percentage per transaction; Fixed monthly/yearly fee
EPC Adopter 4	One initial licence fee; Expenses paid as a percentage of cost savings
EPC Adopter 5	Members contribute equal efforts / costs
EPC Adopter 6	Members contribute equal efforts / costs; Advertising fees; Fees for value adding services
EPC Adopter 7	Fixed monthly/yearly fee; Expenses paid as a percentage of cost savings
EPC Adopter 8	One initial licence fee; Fixed monthly/yearly fee; Expenses paid as a percentage of cost savings
EPC Adopter 9	Percentage per transaction; Fixed monthly/yearly fee; Fees for value adding services

EPC adopters among purchasing organisations take advantage of a variety and range of different EPC finance models, whereby fixed monthly / yearly fees, fees for value adding service and transaction costs are mostly cited. There is a shift from the traditional total cost accumulation and equal division among members in purchasing consortia to a greater variety and mixture of EPC revenue models.

However, more conclusions with regard to the level of importance of single revenue models need to be drawn. Both purchasing organisations as well as e-Marketplaces / PSPs have further been interviewed about the importance and feasibility of presented revenue models for EPC and reverse auctions and the results have been compared in Figure 55. The importance of revenue models was weighted on a scale from 1 (no importance at all) to 5 (extremely important).²⁴⁵

²⁴⁵ The construct 'importance of EPC revenue models' is a formative scale, where all item measures can be independent of one another since they are viewed as items that create the 'emergent factor'. Thus, reliability assessments such as Cronbach's alpha are not applicable.

Figure 55: Comparison among Purchasing Organisations and E-Marketplaces / PSPs on Criteria Evaluated: Average Importance of Specific Revenue Models



Purchasing organisations and e-Marketplaces / PSPs agree that the EPC revenue models 'percentage per transaction', 'fixed monthly/yearly fee', 'initial license fee', 'expenses paid as a percentage of costs savings' and 'fees for value-adding services' are very relevant and important. Advertising fees are not very much appreciated by both parties.

However, some differences were also identified: E-Marketplaces / PSPs did not perceive the revenue model 'members contribute equal efforts and costs' as important (1.66) in contrast to purchasing organisations (3.38). The most vital revenue model for purchasing organisations is 'expenses paid as a percentage of cost savings'. One explanation for this finding can be that the fees paid, as a percentage of cost savings, can have more immediate benefits and ROI for purchasing organisations. Less financial risk can be involved and outsourcing can take precedence.

E-Marketplaces / PSPs underestimate the importance of the revenue models 'expenses paid as a percentage of cost savings' and 'equal costs / time' to purchasing organisations.²⁴⁶ E-Marketplaces / PSPs focus on a mixture of transaction costs, fixed monthly / yearly fees as well as fees paid for value-adding services. Hendrick (1997) reported that very few purchasing consortia finance expenses by paying a percentage of purchases. For EPC, however, transaction costs seem to be somewhat important factor with a mean scale of 3.21 according to e-Marketplaces / PSPs and 2.95 to purchasing organisations. However, transaction fees are not the dominant revenue model.²⁴⁷ There is no evidence from the e-Marketplace / PSPs survey data that the importance of transaction fees is positively related to EPC offering ($F = 0.55$, $1-p = 53.09\%$) and importance (very weak negative correlation coefficient: -0.08 ; $F = 0.27$; $1-p = 39.10\%$). Hypothesis H5 could not be supported.²⁴⁸ This finding is also confirmed among purchasing organisations for EPC adoption ($F = 1.24$, $1-p = 73.36\%$) and importance (correlation coefficient: -0.04 ; $F = 0.15$; $1-p = 30.00\%$).²⁴⁹

²⁴⁶ No significant differences among providers and non-providers of EPC and reverse auctions in terms of specific revenue models could be identified. See appendix D construct 5.

²⁴⁷ Please see the statistical appendices with the detailed listing of statistical tests.

²⁴⁸ The following three questions in the survey instrument for e-Marketplaces / PSPs addressed H5: Which funding options for EPC do you prefer? Do you offer EPC? Please score EPC according to the importance to your business strategy.

²⁴⁹ No significant differences in terms of importance of distinctive revenue models between EPC users and non-users could be established. See statistical appendix D and E construct 5.

It is also a mixture of finance models for reverse auctions. Whereas purchasing organisations and e-Marketplaces / PSPs do not widely accept advertising fees, they acknowledge the equal importance of 'percentage per transaction', 'fixed monthly/yearly fees', 'one initial license fee' and 'fees for value adding services'. The most important finance model to purchasing organisations in reverse auctions is again 'expenses paid as percentage of cost savings'. Except this finance model, no significant deviations between e-Marketplaces / PSPs and purchasing organisations could be detected.²⁵⁰

Overall, no dominant single revenue model could be identified. While the findings can contribute to the conceptual EPC framework, more knowledge is required to analyse potential organisational EPC adoption drivers such as purchasing spend, sourcing strategies and product pooling potential.

5.3.6 Relationship between Purchasing Spend, Sourcing Strategies and Product Feasibility to EPC

One of the organisational issues to explore is whether or not there is any significance that the higher the purchasing spend on goods and services, the more likely electronic purchasing consortia are used. Theoretically, it would be rational that the more purchasing organisations procure, the higher the focus on tools to reduce cost.

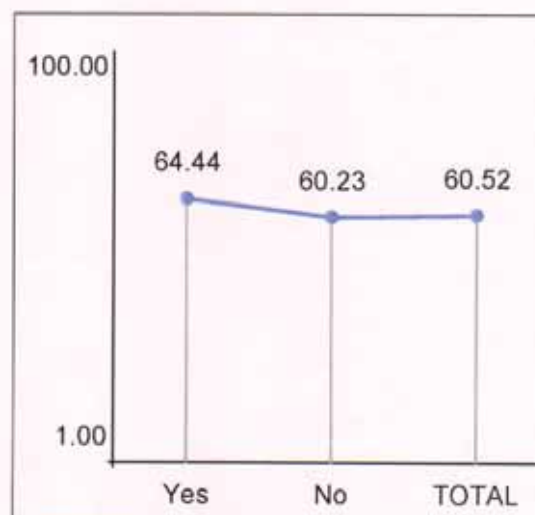
The percentage of purchasing spend is relatively even within the automotive and electronics industry sector. Both industry sectors have focused on core competencies in recent years, reduced insourcing and averages of 60% purchasing spend (of turnover) in the automotive industry and 61% in the electronics industry could be identified (see Table 24).

²⁵⁰ See statistical appendix D and E construct 5.

Table 25: Purchasing Spend in Industry Sectors

Purchasing Spend (in % of Turnover)	Small company	Medium company	Large company	Total
Automotive	56.58	57.96	65.22	59.65
Electronics	59.89	58.97	67.28	61.16
Total	58.72	58.51	66.25	60.51

Large companies, in particular, have a more significant purchasing spend (on average 66% of turnover) than SMEs (59%). Earlier survey findings revealed that large purchasing organisations constitute the main group of EPC adopters to date. That may be one reason why the purchasing spend of EPC participants is higher than that of non-participants (see Figure 56).

Figure 56: Purchasing Spend (in % of Turnover) and EPC Adoption to Date

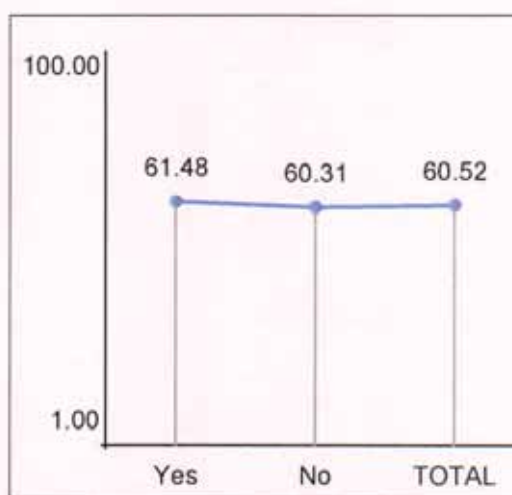
Although there is evidence from the survey data that EPC users spend approximately 4% more on purchasing (as a percentage of turnover) than non-users, this result is not yet significant ($F = 2.41$, $1-p = 88.11\%$). Purchasing spend was additionally correlated to the overall importance of EPC to further increase the research reliability. This correlation test also confirms that purchasing spend is not a main adoption driver for EPC (very weak correlation coefficient: $+0.12$; $F = 1.78$, $1-p = 82.30\%$).²⁵¹ Therefore, hypothesis H6a - purchasing spend is positively related to EPC adoption and importance – cannot be confirmed.²⁵²

²⁵¹ See appendix E construct 6.

²⁵² The following three questions in the survey instrument for purchasing organisations addressed H6a: What is the purchasing spend of your entire organisation as a percentage of turnover? Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

It was statistically demonstrated in research construct 2) that it is the company size to date that makes large purchasing organisations invest in e-Procurement and EPC services at an earlier stage than smaller companies. Figure 57 reveals that purchasing spend has also no significant influence on future participation in EPC ($F = 0.41$, $1-p = 46.81\%$). Overall, it can be stated that EPC adoption in EPC is positively related to purchasing company size at present, but not to purchasing spend in the automotive and electronics industry sectors.

Figure 57: Purchasing Spend (in % of Turnover) and Future EPC Adoption



It relation to purchasing spend and EPC it also seemed appropriate to investigate the adopted sourcing strategies and the respective purchase value proportions of sole / single sourcing and multi sourcing. Sourcing strategies are dependent on the respective product market and on material availability and price. Purchasing organisations have to decide of how many sources they take advantage for the supply of a given component and its total number of suppliers.

Single sourcing is traditionally pursued to enhance buyer-supplier partnerships for customised products and to build e.g. mutual understanding, simultaneous engineering and extensive strategic co-operation. However, single sourcing carries the risk of creating a supply monopoly (i.e. sole sourcing) or being open to pressure over price, quality or delays in delivery. Quayle (2002b) notes that sole sourcing is the result of being forced to purchase from one supplier only as a result of such market factors as location, exclusive design rights, customer specifications, and quite possibly buyer inertia. One alternative strategy is to have two or more suppliers for each purchased product. Multi sourcing can provide the flexibility of having several suppliers available in the choice of materials.

According to Quayle (2002b), his research suggests that buyers are more likely to single source when they perceive it to be a buyer's market, when there is a poor delivery from suppliers, when faced with a price increase, and when organisational policy is to single source. Conversely, purchasers are more likely to multi source when they try to achieve a price reduction, a decrease in purchasing costs, and when continuity and security of supply is important.

The survey data analysis of which sourcing strategies are used for the total purchasing spend demonstrates that average purchasing organisations spend about 46% of the total purchasing spend on sole / single sourcing. Broken down to industry level, no major differences could be established (see Table 25). Approx. 53% is spent on multi sourcing. The electronics sector (55%) exceeds the automotive sector in this respect (50%).

Table 26: Interaction between Sourcing Strategies (in % of Total Purchasing Spend), Industry Sectors and EPC Adoption to Date

EPC Adoption to Date	Sole / Single Sourcing			Multi Sourcing		
	Yes	No	Total	Yes	No	Total
Automotive	45.80	49.02	48.73	54.20	49.44	49.85
Electronics	43.43	43.29	43.30	56.57	54.38	54.57
Total	44.42	45.70	45.59	55.58	52.26	52.55

There is no distinctive evidence that EPC adopters would have any preference for a particular sourcing strategy in comparison to non-adopters. On a theoretical basis it was expected that EPC adopters would have a larger proportion of multi sourced products as Hendrick (1997) explained that they are more feasible for demand aggregation than customised products. Multi sourcing is traditionally used for commodities with low asset specificity, where a high level of market transparency and competition prevails.

To a small degree, EPC adopters (56%) tend more to multi sourcing strategies than non-users (52%). However, this finding is not yet significant ($F = 1.28$, $1-p = 74.05\%$).²⁵³ The level of multi sourcing was additionally correlated to the overall EPC importance to procurement strategy in order to further increase the research reliability. This correlation test also confirms that the level of multi sourcing is not a main driver for EPC (very weak

²⁵³ Please see Fisher tests in appendix E construct 6.

negative correlation coefficient: -0.11; $F = 1.39$, $1-p = 75.80\%$).²⁵⁴ Therefore, hypothesis H6b - the integration level of multi sourcing strategies is positively related to EPC adoption and importance - cannot be confirmed.²⁵⁵

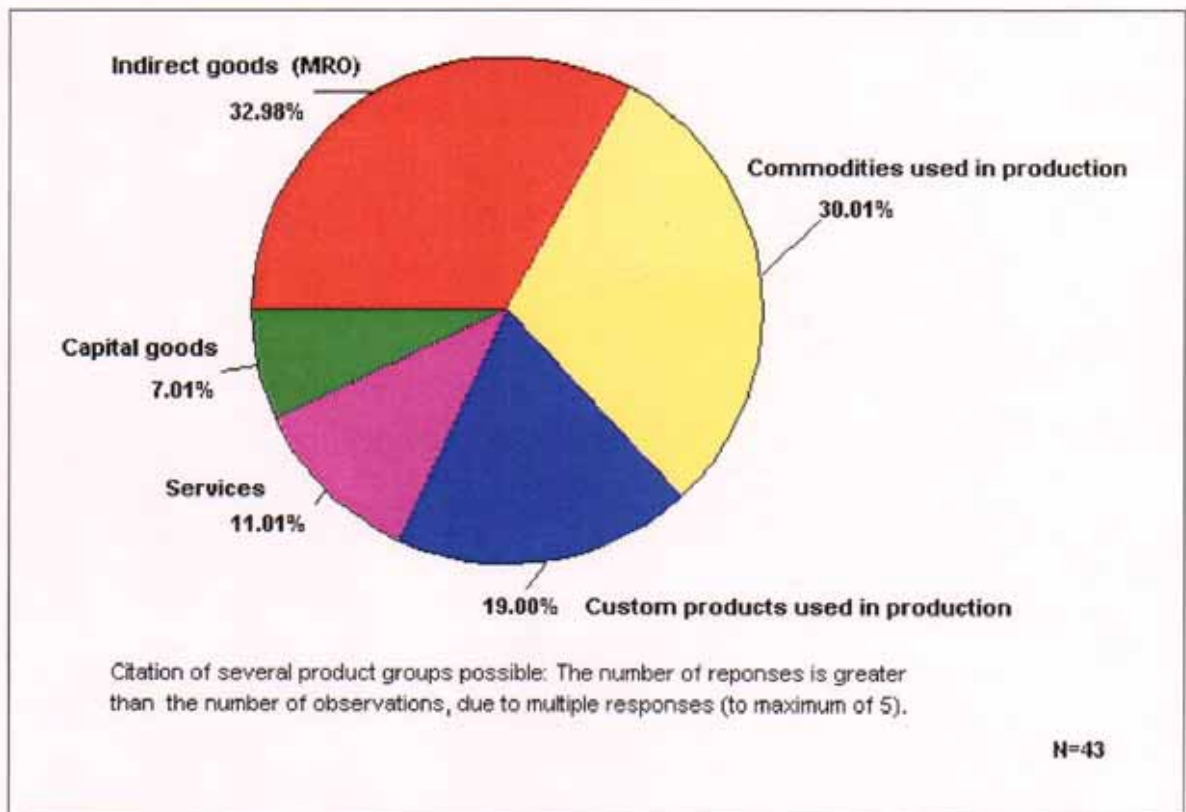
While there was no significance that EPC users would adopt more multi sourcing strategies per se, they still have the option to use EPC for specific sourcing projects only where demand aggregation seems appropriate (see case study findings). For example, purchasing organisations could decide to take advantage of EPC for their multi sourced product spectrum, but not for sole or single sourced items. Therefore, it was important to base this analysis on product pooling potential and product structure as well.²⁵⁶

For example, e-Marketplaces and PSPs have been interviewed which products they trade. Indirect goods, such as ORM / MRO (33%), and commodities used in production (30%) are specified in most cases, as shown in Figure 58. However, custom products (19%) have also been partially integrated into the day-to-day trading by e-Marketplaces / PSPs. Services (11%) and capital goods (7%) are traded on a lower scale and difficulties for electronic integration can arise, as the nature of these products requires explanation, moderation and customer services on a larger scale.

²⁵⁴ See appendix E construct 6.

²⁵⁵ The following three questions in the survey instrument for purchasing organisations addressed H6b: Which sourcing strategy do you adopt in relation to your purchases? Please indicate the respective purchase value proportion. Have you participated in EPC? Please score EPC according to the importance to your procurement strategy. A similar finding was revealed when the future EPC participation level is cross-tabulated against multiple sourcing strategies. See cross-tabulation in construct 6 in appendix E.

²⁵⁶ Further efforts are devoted to the analysis whether or not EPC are positively associated with the collaborative buyer-supplier relationship (traditionally single sourcing) or the arms-length buyer-supplier relationship (typically multi sourcing) in construct 9.

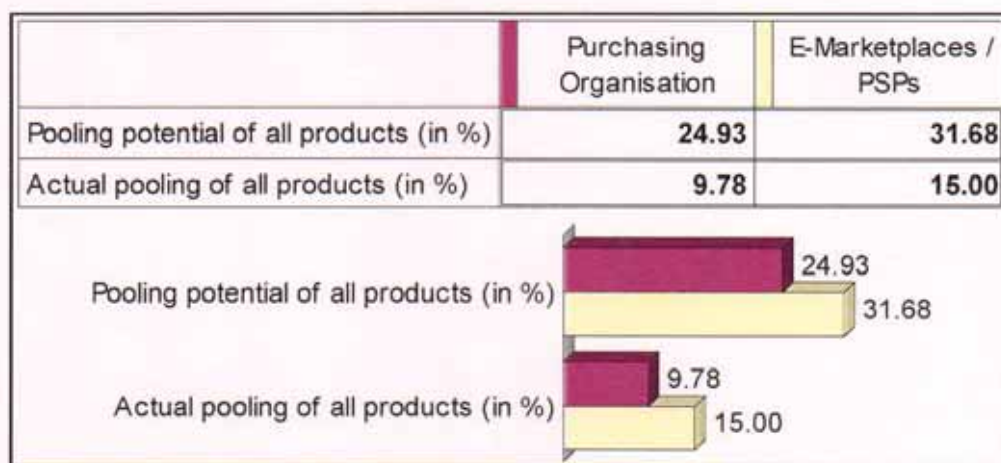
Figure 58: Products Traded on E-Marketplaces and by PSPs

The statistical analysis of which products are more suitable for electronic purchasing consortia shows that there is a leaning towards commodities used in production, indirect goods as well as services.²⁵⁷ The case studies also demonstrated that EPC tend to be more feasible for products, which can be used in a variety of companies and which are characterised by a high degree of standardisation and homogeneity as well as a low level of asset specificity. Due to the vary nature of demand aggregation, EPC are less feasible for complex individual systems and sub-systems.

Hendrick (1997) confirms that most purchasing consortia include ORM / MRO items, services, direct materials used in production and capital goods. This kind of product spectrum is best represented in the Kraljic-McKinsey product matrix by leverage and routine products, that can create a good potential for co-operation strategies. 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.

The case studies also demonstrated that products feasible for EPC should be discrete with features that are measurable and describable. The more generic the product, the more it can be traded by means of EPC. And the more specific it is, the less it would be traded by this means.²⁵⁸ Therefore, it was interesting to see which percentage of products is actually pooled by EPC providers and users. The survey data also enabled a comparison of the actual product pooling and demand aggregation to the product pooling potential (see Figure 59).

Figure 59: Potential vs. Present Pooling of Demand (in % of Entire Product Spectrum)



In general, e-Marketplaces and PSPs estimated that approx. an average of 32% of all their products traded could be pooled and aggregated.²⁵⁹ EPC providers specified 31% and non-providers 33%, but this difference is not significant ($F = 0.03$, $1-p = 15.71\%$).²⁶⁰ However, EPC providers only aggregate demand for an average of 15% of their entire traded product spectrum to date. The results demonstrate that (1) there is a significant amount of products that can be potentially pooled and (2) EPC providers still have a good potential to increase their average product pooling and demand aggregation.

The product pooling potential can also be analysed with regard to the type of e-Marketplace / PSPs. Within vertical e-Marketplaces, the potential pooling of products is approx. 22% on average, whereas horizontal e-Marketplaces specified an average of

²⁵⁷ See appendix D construct 6.

²⁵⁸ For the statistical analysis, please see appendix D construct 6.

²⁵⁹ The median of average pooling is 25%.

²⁶⁰ See cross-tabulation in construct 6 in appendix D.

almost 40% and PSPs 30%.²⁶¹ This finding seems to confirm that demand aggregation has a better potential for metamediaries that traditionally trade with more commodity-like and standardised products. No significant differences could be established between the product pooling potential and industry sectors.²⁶²

Purchasing organisations identified an average product pooling and demand aggregation potential of approx. 25% (see Figure 59). Specifically, EPC users indicated an average potential pooling of 29%, which is slightly above the average potential pooling of 25% among non-users. However, this finding is not yet significant ($F = 0.60$, $1-p = 55.24\%$).²⁶³ The average pooling potential was additionally correlated to the EPC importance among purchasing organisations (very weak correlation coefficient: $+0.16$, $F = 2.53$, $1-p = 88.50\%$) as well as e-Marketplaces / PSPs (very weak correlation coefficient: $+0.19$, $F = 0.61$, $1-p = 55.60\%$). These correlation tests also confirmed that the average product pooling potential is not a main driver for EPC importance.²⁶⁴

Hypothesis H6c – the average product pooling potential is positively related to EPC adoption and importance among purchasing organisations and e-Marketplaces / PSPs – cannot be supported from the statistical analysis.²⁶⁵ To date, EPC users aggregate demand for only an average of 10% of their entire product spectrum with other purchasing organisations. Therefore, future product pooling still has a good potential for both EPC users and providers.

The question arose why EPC adopters have not used EPC for a higher percentage of their purchasing demand, when they could identify product pooling potentials. Therefore, it appeared crucial to investigate in more detail the background to the decisions made by purchasing organisations and e-Marketplaces / PSPs with regard to EPC, i.e. the level of benefits and drawbacks from different perspectives.

²⁶¹ See appendix D construct 6.

²⁶² See appendix D construct 6.

²⁶³ See cross-tabulation in construct 6 in appendix E.

²⁶⁴ See appendix D and E construct 6.

²⁶⁵ The following three questions in the survey instrument for e-Marketplaces / PSPs addressed H6c: On average, what would be the percentage of total purchases you think you could be pooled for demand aggregation? Do you offer EPC? Please score EPC according to the importance to your business strategy. The following three questions in the survey instrument for purchasing organisations addressed H6c: On average, what would be the percentage of total purchases you think you could pool

5.3.7 Level of Benefits and Drawbacks of Electronic Purchasing Consortia to Purchasing Organisations

From the very outset, e-Marketplaces / PSPs were interviewed to comment on the main benefits purchasing organisations would have to participate in their service. The following listing represents an extract of interesting statements:

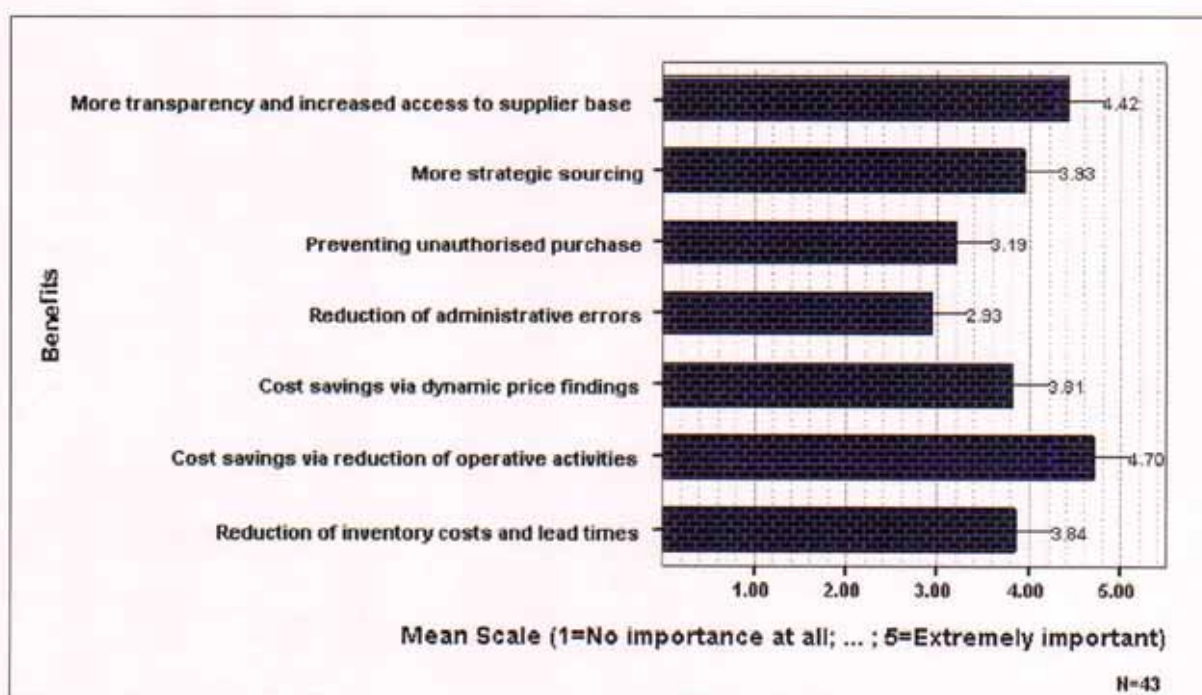
- Faster than traditional procurement; wider choice of products and suppliers; cost savings by auctions.
- Getting new suppliers/products; easier to find products; true market pricing.
- Market transparency; competition increases; time savings.
- Reduced process costs; time reduction; single point of entry.
- Reduction of procurement costs; shorter processes; complete automation.
- Synergies in supplier management; better prices; time savings.
- Testing a new procurement tool for comparison reasons; value savings in terms of productivity and price; check new contacts, potential suppliers and markets.
- Transparency; bundling possible; know-how exchange.
- Aggregation of content; reduction of processing costs; cheaper products.
- Control of spending; paperless environment; and most importantly more efficiency to do more productive tasks.
- Larger supplier base; cost reduction; more information; less mistakes.
- Platform independence; real time online auctioning; saving the customer money via no cost (suppliers pay service).
- Reducing inventory costs and lead times; standardisation; improved sourcing.
- Transparency increases; process costs and prices decrease; cost savings in business processes and cost savings in catalogue management.

Cost and time savings as well as more information and transparency were mostly stated as benefits from e-Marketplace / PSP adoption. In order to provide some quantification, e-Marketplaces / PSPs have been asked to score a pre-defined list of benefits on a scale from 1 (no importance at all) to 5 (extremely important).²⁶⁶

demand with other companies? Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

Figure 60 demonstrates that ‘cost savings via reduction of operative activities’ (mean factor 4.70) and ‘more transparency and increased access to supplier base’ (4.42) are perceived by e-Marketplaces / PSPs as the most important advantages of their services to purchasing organisations.²⁶⁷ The benefits ‘preventing unauthorised purchases’ (3.19) and ‘reduction of administrative errors’ (2.93) are not perceived as key advantages. No significant differences were found between EPC providers and non-providers.²⁶⁸

Figure 60: E-Marketplace / PSP Perception of Benefits Provided



Moreover, e-Marketplaces and PSPs were asked to describe their core competencies by which they try to achieve the specified benefits for purchasing organisations. EPC providers see their main strengths in strategic sourcing support and their statements include: value priced solutions, consulting, back-end integration, one stop shop, catalogue management, real-time processing, industry product and suppliers base knowledge, professional sourcing know-how, europe-wide support / regional support, profound experience in online bidding events.

²⁶⁶ The Cronbach's Alpha for this 7-item scale is 0.62.

²⁶⁷ Mitchell (2002) found that in a survey on 60 organisations that implemented indirect e-Procurement applications, the ROI came from demand aggregation and more transparency, not process efficiency.

²⁶⁸ See appendix D construct 7.

Non-providers of electronic purchasing consortia focus more on the automation of operational purchasing and replenishment processes as well as on the integration of the transactional work into the back-end systems. Core competencies provided by this subgroup are interoperability with all standards, supplier enablement and service, neutrality, aggregation of PSPs, covering the whole purchasing process from ordering via payment to logistics, full service including search, pricing, procurement, warranty and financing.

While these arguments applied very much to e-Marketplaces / PSPs in general, some efforts were also devoted to explore the benefits and drawbacks of EPC in more detail. Purchasing organisations were asked to comment on EPC. Following EPC benefits were included:

- Cost reduction opportunity through bundling in consortia; Internet makes the necessary communication possible/easier.
- Pooling allows to aggregate demand, to achieve better purchasing prices and to improve customer relationship.
- Higher volume; better prices; new customers.
- Entry ticket for e-Marketplaces is low price; therefore, all tools have to be considered.
- This is a good way to get a company started on e-Procurement to quickly see benefits. One of the most important functions to impact bottom line results.
- Bundling allows better prices for items with small volumes; Internet makes real reverse auction easier/possible.
- Leveraging buying power and price reduction; availability of obtuse product or stock run-out.
- Establish longer-term relationships with buyers; drive customer base towards self-service.
- Receptive to this solution. Cost-efficient information exchange and improved company image.
- EPC and reverse auctions increase transparency, supplier competition and savings.
- We know our supplier base fairly well and, therefore, it is easy for us to choose the appropriate suppliers for EPC and reverse auctions.
- Good benchmarking improves transparency; cost reduction; immediate ROI.
- Good opportunity to achieve purchasing cost reduction for commodities.

- Information exchanges facilitate EPC and improve purchase terms and conditions.
- Simpler stuff works with external members to achieve economies of scale.
- Strength in numbers for purchasing allocated materials at best price/delivery.
- Drive down standard cost through 'pooling' resources. Reverse auctions have been also quite effective for us but the necessity for companies to be categorised in accordance to their product requirements or supply capability is essential. In that way, RFIs can be directed at appropriate recipients. The importance of the buyer being in control of responding is essential.
- Time savings; shows market price; lower prices.
- Faster process; lower price; more transparency.

Purchasing organisations regarded potential cost savings as the main benefit from EPC adoption. They confirmed that information and communication technologies could provide a cost-efficient infrastructure for information exchange among EPC members in order to enhance market transparency, demand pooling and know-how transfer. However, purchasing organisations also identified a range of drawbacks in terms of EPC at the same time. The following verbatim listing resulted, which was organised into human, structural, supplier and finance resource issues.

Human resource issues:

- Consortia success is based on commitment of all users and the usage of consortia as their primary procurement solution for a given range of products.
- Missing motivation to use new tools.
- Company independence is endangered; confidentiality and trust is an important factor.
- Confidentiality, trust and supplier partnerships need to be in place.
- EPC and reverse auctions in particular do not teach purchasers and sellers how to jointly solve problems.
- Training and education among us buyers is still missing; slow e-Procurement take-up in our company with only a fraction of our suppliers actually operating in an e-Marketplace.
- Technical complexities; fear of new processes; lack of knowledge about process costs; not enough personnel.

- New technology and therefore limited understanding; barriers in organisation; security.
- Human inertia; lack of information on the benefits; hard to perceive benefits; no current ERP integration.
- Lack of trust in the technology and lack of knowledge; immature in purchasing.
- Change management; install technology; unwanted transparency could lead to reduction of staff.
- Poor communication infrastructures; no clear understanding of benefit.
- Lack of experiences; no liquidity; no real value proposition.
- Misunderstanding of 'challenges'; lack of information.
- Fear of the unknown; perceived loss of control; supplanting of authority and position of purchasing department (there is a status quo to be maintained).
- Attitude to information sharing and trust issues.
- Insufficient understanding and insufficient interaction with ERP partners.
- Lack of knowledge of the overall benefits of such systems.
- Loss of power and control.
- We are suspicious of new technology.
- Management attitude and missing know-how; security reasons.
- Our own infrastructure, changing our mindset.
- Attitude to risk, uncertainty and openness to change.
- Tail wagging the dog syndrome. Reluctant to get sucked in.
- Transparency results in fear of job losses.
- Staff resistance (not yet familiar); training and willingness to use new technology.

Structural issues:

- Sceptical when it comes to power-buying as it is a gamesmanship; consulting and moderation services required.
- Company secrets are not kept confidential.
- This would create anti-trust problems in a vertical marketplace, and we want to encourage suppliers to use our system to market their products.
- Consortia expect collusion in a capitalist economic model.
- Not sure about their potential: Must prove liquidity, suitable only for high value items.

- Only possible for almost standardised products; the e-Marketplace we participate only deals with built-to-order/drawing parts.
- Advantages might be exploited by members without own benefit.
- Different standards make EPC not come easy; different opinions among the members.
- Highly customised requirements in niche industry, EPC not feasible.
- A standardisation and unified coding systems should be in place to make EPC work. In MRO, EPC are only of limited importance.
- Not interested in co-operation with competitors. We would like to have a better cost structure than our competitors. There is no advantage for large companies when co-operating with smaller ones in EPC.
- Our product demand is very specific and therefore not very suitable for aggregation.
- High volume members pull out of a deal.
- Run our own marketplace, we do not want to share figures with competitors.
- The high value items we buy are industry specific, and we want control on designs.
- Purchases too small and specialised.
- We do not feel that this concept would be beneficial to us. We have enough market power. Co-ordination and implementation of processes would take longer.
- Appropriate tool for some products, not all. Access more appropriate to global players.
- Components must be purchased in a large enough volume to justify EPC and reverse auctions. Difficult to get level playing field.
- We mainly do single sourcing. EPC and reverse auctions are not a strategic tool for that.
- When systems change, EPC will come.
- We already have a good leverage and other firms would benefit parasitically on our leverage.
- Our industry is too specific for EPC, which could lead to disastrous results.
- EPC and reverse auctions bring only short-lived one-time benefits and need all the terms and conditions. Therefore, they are not relevant to our business.
- We are looking for success stories and try to maintain all options; there is still a phase of orientation.
- Marketplaces are not mature in their offerings; general distrust in security of Internet applications; depending on the industry in focus, not used to the Internet medium.

- Decision inside the organisation: We hardly purchase standard commodities, almost everything is customised and requires technical interaction with supplier.
- There is still a lot of room for improvement in usability of e-Procurement initiatives: too broadly based and too many choices.
- Our product is customised to client needs. Difficult to interact with ERP partners.
- Currently e-Procurement software used. Not enough product or services specified in the systems so far for EPC.

Supplier resource issues:

- Do not think it would be possible to find a suitable consortium. Supplier changes may result in explicit and inexplicit costs.
- Suppliers try to confuse the group and offer their best price only to the most powerful buyer.
- Squeeze the suppliers. Suppliers try to impose deals on different companies.
- EPC may be possible in the future if suppliers become more electronic transaction oriented.
- Reluctance to change; want to bring on established suppliers; suppliers tell us that we should just stick to their vendor catalogues.
- Company policy; anxious of negative effects on supplier relationships; anxious of losing control and power.

Finance resource issues:

- Too long start-up lag before cost savings can be realised.
- Integration with ERP systems cause costs; different formats; EPC and outsourcing not accepted.
- Uncertainty; waiting for more confidence; cost of integration, budget problems.
- Fear of the new; bad examples (real + constructed); fear of being shown the cost savings.
- Volatility of present providers; unknown which system will be 'market leader'; continuously amended packages, costs associated with upgrades, etc.
- Change management; cost of technology and cost to enable systems.
- Have not found a real benefit yet; initial costs too much.
- Availability of financial resources. Our purchasing is too small and specialised to bother with the overhead.

- Size of company in comparison to cost of developing abilities to operate efficiently in EPC.
- High costs; functionality not yet advanced; fear of technology and the unknown; waiting to see what happens and who survives.
- Unconvinced of the potential benefits; subscription costs.
- Multitude of e-Marketplaces; missing liquidity; process change; high costs of implementation.
- Time & costs & safety in funding transfer; continuity of service of e-Marketplace; consolidation of technology already purchased.

Purchasing organisations listed a wide array of impediments to EPC adoption and included mainly arguments such as not adequate training / education, a low degree of information on change management and a lack of maturity in e-Marketplace / PSP service offerings. Moreover, they outlined reasons such as the adoption of a 'wait and see'-approach to the selection of e-Procurement initiatives, a high level of investment costs, security concerns and a lack of ERP-system integration. Further reasons included the non-feasibility of custom-made products for pooling initiatives, a lack of standardisation among potential members and opposition to data sharing with other companies. In addition, a lack of confidentiality, trust and commitment among companies was identified. The overwhelming concern is also a perceived loss of control with EPC and exposure to anti-trust regulations. There is also the fear that suppliers can try to break off EPC.

In order to achieve a more quantitative listing of the drawbacks to EPC and reverse auctions, e-Marketplaces / PSPs and purchasing organisation were interviewed concerning the importance of selected drawbacks (on a scale from 1 = no importance at all, to 5 = extremely important).²⁶⁹ Figure 61 demonstrates that both purchasing organisations as well as e-Marketplaces perceive reluctant supplier co-operation as a somewhat important drawback to EPC and as an important one to reverse auctions.²⁷⁰ Whereas e-Marketplaces / PSPs do not regard the lack of communication infrastructures

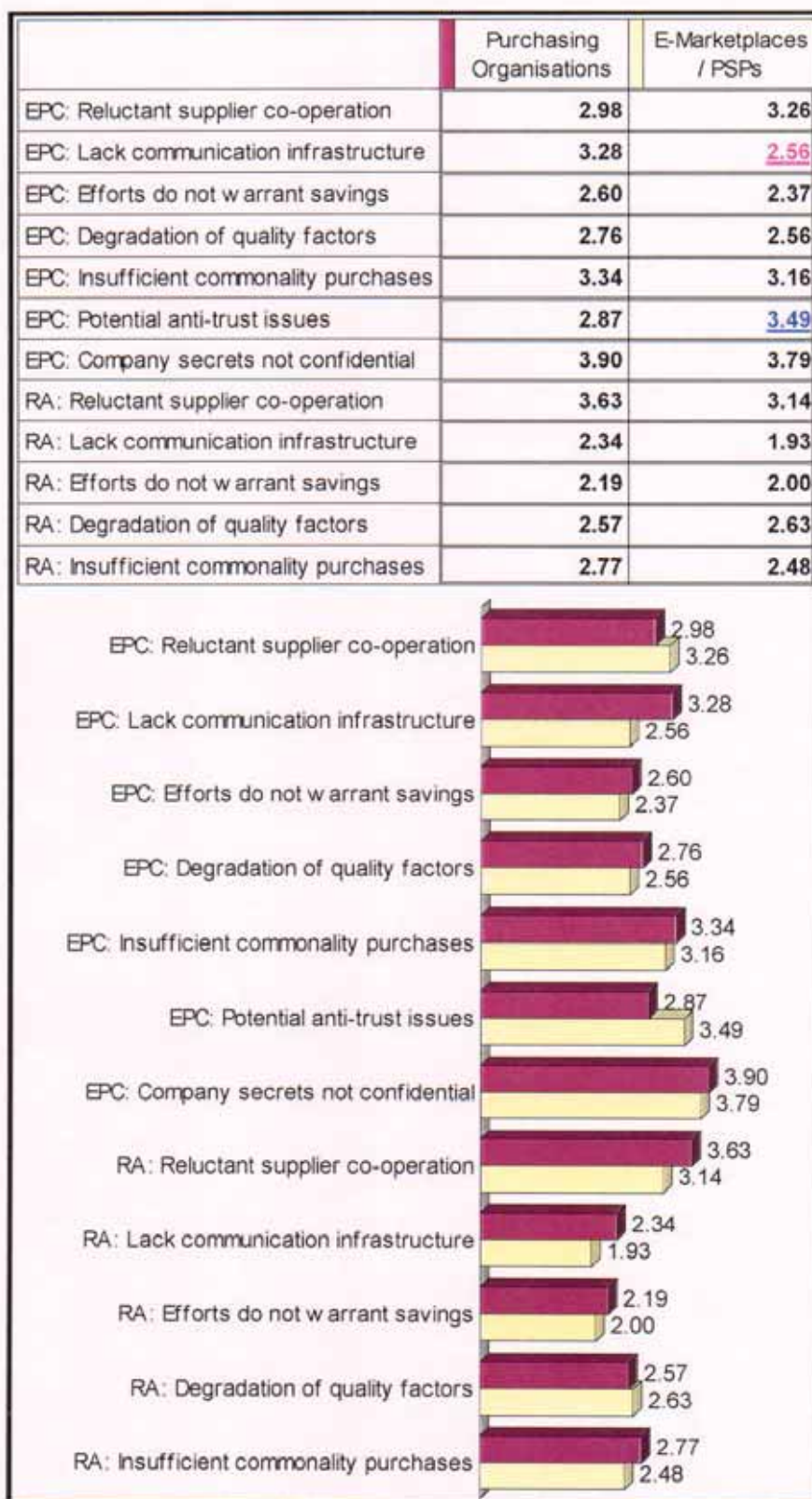
²⁶⁹ The Cronbach's alpha for the 7-item scale of EPC drawbacks is 0.63 (for purchasing organisations) and 0.70 (for e-Marketplaces / PSPs). For the 5-item scale of reverse auctions' drawbacks, the Cronbach's alpha is 0.66 (for purchasing organisations) and 0.69 (for e-Marketplaces / PSPs).

²⁷⁰ Reasons may be found in benefits and drawbacks for the suppliers in construct 9.

to EPC as significant (mean factor 2.56), purchasing organisations disagree (mean factor 3.28). Obviously, EPC providers still have to promote their EPC services and expand the communication infrastructure. A lack of communications infrastructure could not be identified as a major impediment for reverse auctions (see Figure 61).

Moreover, the drawbacks 'efforts do not warrant savings' and 'degradation of quality factors' were not perceived as important obstacles to EPC and reverse auctions. However, an insufficient commonality and terminology of purchases was identified as a somewhat important drawback to EPC. Quayle (1999) argues that it is a major problem that there is often not a sufficient commonality of purchases to provide some purchasing power for a consortium. However, the survey data demonstrated in research construct 6) that there is a significant amount of average pooling potential available. Apparently, not all e-Marketplace / PSPs and purchasing organisations perceive this potential as sufficient. Moreover, standardisation efforts in product terminology are still work in progress, for example product classification systems such as eCl@ss, UN/SPSC, NIGP or Thomas Register or catalogue formats such as BMEcat, cXML, XCBL or RosettaNet.

Anti-trust issues are perceived as somewhat important (2.87) for purchasing organisations (possibly due to a strong survey participation of SMEs), while e-Marketplaces / PSPs regard them as an important factor. The most important drawback to EPC is the level of trust: Company secrets are perceived not to be kept confidential to competitors. Hendrick (1997) explains that firms that collaborate, even with non-competitors, may fear that sensitive competitive information could directly or indirectly find its way to their competitors. Major buyers may also resist co-operation and price transparency, since they may regard data about their procurement practices and costs as a source of competitive advantage that they would not like to have revealed to competitors. Both purchasing organisations and suppliers may also be reluctant to give up control over pricing.

Figure 61: Average Level of Drawbacks of EPC and Reverse Auctions

Overall, the survey data from purchasing organisations as well as e-Marketplaces / PSPs indicates that reverse auctions can be associated with less obstacles, conflicts and challenges than EPC. However, more quantification to EPC benefits and performance measurement is required.

Therefore, it is also vital to know whether or not users of EPC judge their procurement activities as more effective and more efficient than non-users. 52% of purchasing organisations described their procurement of strategic goods as very cost efficient and 45% as partly efficient.²⁷¹ Only 3% stated that it is not cost efficient. For the procurement effectiveness of strategic products, 69% of purchasing organisations stated that it is very effective and 31% partly effective. Not any purchasing organisation indicated that it is non-effective. The results reveal that most purchasing organisations are rather satisfied with the current procurement effectiveness of strategic goods, although some more cost efficiency could be achieved.

A different picture was identified in relation to the efficiency and effectiveness in procurement of non-critical products. 75% of purchasing organisation consider this as only partly efficient and 76% state that it is only partly effective. Even 9% of purchasing organisations state that their procurement of non-critical products procurement is not cost-efficient. It can be concluded that the improvement of procurement efficiency and effectiveness for non-critical products has still a good potential. The question arose if there is any significance that EPC users regard their procurement activities as more cost-efficient and more effective than non-users. Table 26 illustrates this relationship (based on a scale from 1 = not efficient or effective; 2 = partly efficient or effective; 3 = very efficient of effective).

Table 27: Procurement Effectiveness and Efficiency vs. EPC Adoption to Date

EPC Adoption to Date	Effectiveness strategic goods	Cost efficiency strategic goods	Effectiveness non-critical goods	Cost efficiency non-critical goods
Yes	2.78	2.56	2.33	2.11
No	2.68	2.49	2.22	2.06
Total	2.69	2.49	2.23	2.06
p-values	F = 0.36 1-p = 44.44%	F = 0.12 1-p = 27.51%	F = 0.57 1-p = 54.28%	F = 0.09 1-p = 24.36%

No major difference could be investigated between EPC users and non-users in terms of perceived efficiency and effectiveness levels in procurement of strategic and non-critical products ($F = 0.44$, $1-p = 48.42\%$).²⁷² The construct 'overall efficiency and effectiveness of purchasing activities' was built of the above 4-item scale with a Cronbach's alpha of 0.71. All five items loaded highly on the appropriate factor (ranging from 0.698 to 0.781) and no item loaded on more than one factor. Convergent and discriminant validity were, therefore, applicable for this latent construct and evidence of validity and unidimensionality could be provided.²⁷³

A multiple regression test proved that no significant correlation could be found between the EPC importance to procurement strategy and the overall level of efficiency and effectiveness of purchasing activities (very weak $R = +0.09$, $F = 0.15$, $1-p = 7.10\%$).²⁷⁴ Hypothesis H7a - the effectiveness and efficiency level of procurement activities is positively related to EPC adoption and importance – could not be supported.²⁷⁵ The result demonstrates that EPC adopters are also very critical in relation to their procurement activities and still have to consider future improvements.

The author further expected that EPC adopters would have a strong transparency of all purchases within their own organisation and a low level of maverick purchases in order to be able to aggregate demand with external purchasing organisations. Therefore, it was also analysed whether or not there are any differences with regard to maverick purchasing among EPC users and non-users.

Purchasing organisations specified a mean maverick purchasing of 3% for strategic products and 17% for non-critical products. Obviously, as many companies may have organised their procurement organisation for strategic products on a relatively centralised basis, the percentage of maverick purchasing is very low. Non-critical products, on the other hand, may still provide a good basis for future enhancement.

²⁷¹ See statistical analysis in appendix E construct 7.

²⁷² For more details, please find the cross-tabulation in construct 7 in appendix E.

²⁷³ See convergent and discriminant validity analysis in appendix E.

²⁷⁴ Please see the detailed listing of the tests in appendix E construct 7.

²⁷⁵ The following six questions in the survey instrument for purchasing organisations addressed H7a: How cost efficient is your purchasing for 1) strategic and 2) non-critical goods? How effective is your purchasing for 3) strategic and 4) non-critical goods? Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

Table 28: Maverick Purchases and EPC Adoption to Date

EPC Adoption to Date	Maverick Purchases Strategic Products (in %)	Maverick Purchases Non-Critical Products (in %)
Yes	2.75	15.50
No	3.02	17.18
Total	3.00	17.05
p-values	F = 0.03, 1-p = 16.47%	F = 0.13, 1-p = 28.08%
Correlation to EPC Importance	cor coef: +0.09; F = 0.79; 1-p = 62.20%	cor coef: -0.04; F = 0.13; 1-p = 27.50%

It could not be established that EPC adopters have a significant amount of lower maverick purchases than non-adopters.²⁷⁶ The level of maverick purchases was additionally correlated to the EPC importance to procurement strategy. These correlation tests also confirm that maverick purchases are not related to EPC importance.²⁷⁷ Hypothesis H7b – the level of maverick purchases is negatively related to EPC adoption and importance – could not be confirmed.²⁷⁸

While the survey data already provided an insight into qualitative EPC benefits and drawbacks as well as performance indicators, more quantification in terms of average net savings and ROI is required in this context.

5.3.8 Relationship between ROI and Electronic Purchasing Consortia / Reverse Auctions

First of all, e-Marketplaces and PSPs were surveyed as to what average percentage of purchasing costs they felt could be saved for purchasing organisations when they participate in their service. The term ‘profit’ or net savings²⁷⁹ in purchasing costs is used in this study to specify the difference between gross savings and investment costs (both as a percentage of purchasing costs). The author was aware that e-Marketplaces and PSPs might well be very optimistic in their specified savings in order to promote their business.

²⁷⁶ For more details, please find the cross-tabulation in construct 7 in appendix E.

²⁷⁷ See appendix E construct 7.

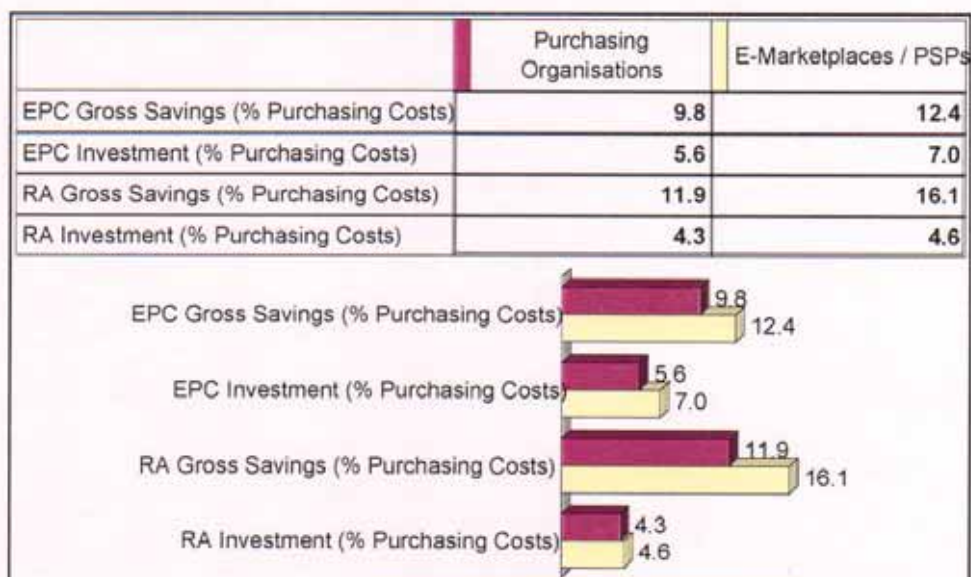
²⁷⁸ The following three questions in the survey instrument for purchasing organisations addressed H7b: What percentage of total purchases are maverick purchases for 1) strategic and 2) non-critical goods? Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

²⁷⁹ Savings achieved on basis of the historical individual price have been specified. The historical price is not unproblematic: For example, effects of inflation, market and technology changes or accounting

That is why purchasing organisations were interviewed as well about potential e-Procurement savings and the results were compared. This analysis could provide some first useful indicator in relation to overall net savings.

Purchasing organisations expect to achieve on average a net saving of approx. 15% in overall purchasing costs by e-Procurement adoption in the future, whereas e-Marketplaces and PSPs specify average net savings in purchasing costs of 21% for purchasing organisations. The results demonstrate that organisations expect e-Procurement to have a significant impact on cost reduction. While this finding can provide some background information, average gross savings and investment costs for EPC and reverse auctions were investigated in more detail in Figure 62:

Figure 62: Gross Savings and Investment Costs for EPC and Reverse Auctions (as a Percentage of Overall Purchasing Costs)



The results on average gross savings and investment costs enabled a calculation of net savings and return on investment from the adoption of EPC and reverse auctions (see Table 28). According to EPC providers, a gross saving in purchasing costs of 12.4% can be achieved on average by EPC. However, member companies would have to invest an average of 7% of purchasing costs for setting-up and managing the electronic purchasing consortium. As a result from the EPC providers' data, an average profit or net savings of 5.4% and a ROI of 77% can be calculated for companies that participate in EPC.

changes etc. are not taken into consideration. However, the historical price can serve as a simple comparison value and is used in this study as an indicator.

EPC adopters among purchasing organisations confirmed an average ROI of 75% by EPC. However, they specified a lower gross saving (9.8%) and at the same time a lower investment cost (5.6%) than e-Marketplaces / PSPs. Therefore, the average net saving achieved was lower among EPC users (4.2%) than among EPC providers (5.4%). Although both specified net savings are in close proximity, e-Marketplaces / PSPs seem to be a bit more optimistic for the average net savings achieved by EPC.

There have also been a few single observations in the survey data where the gross savings have not exceeded the investment costs for EPC (subject to reasons such as inexperienced EPC management, EPC initiative just started, among others identified in the case studies and construct 7 and 9). However, the results from the data analysis of both surveys prove that hypothesis H8 – the average economies of scale and scope within electronic purchasing consortia exceed the average diseconomies of increased transaction and communication costs – can be supported.²⁸⁰

²⁸⁰ The following two questions in the survey instrument for e-Marketplaces / PSPs addressed H8: Which average gross savings (in % of purchasing costs) do you achieve with EPC? Which percentage (of purchasing costs) do companies invest for EPC on average? The following two questions in the survey instrument for purchasing organisations addressed H8: Which gross savings (in % of purchasing costs) do you achieve on average? What percentage (of purchasing costs) do you invest for EPC?

Table 29: Gross Savings, Investment Costs, Net Savings and ROI for EPC and Reverse Auctions

Gross Savings, Investment, Net Savings and ROI	Provided by e-Marketplaces / PSPs	Provided by Purchasing Organisations
EPC:		
Average Gross Savings (in % of purchasing costs) with EPC	12.4%	9.8%
Average Investment for EPC (in % of purchasing costs)	7.0%	5.6%
Average Net Savings (Profit) with EPC (in %)	5.4%	4.2%
Return on Investment ²⁸¹ of EPC	77.1%	75.0%
Reverse Auctions:		
Average Gross Savings (in % of purchasing costs) with Reverse Auctions	16.1%	11.9%
Average Investment for Reverse Auctions (in % of purchasing costs)	4.6%	4.3%
Average Net Savings (Profit) with Reverse Auctions (in %)	11.5%	7.6%
Return on Investment of Reverse Auctions	250.0%	176.7%
Survey Figures of both EPC and Reverse Auctions:		
Average Gross Savings (in % of purchasing costs)	28.6%	21.8%
Average Investment (in % of purchasing costs)	11.2%	10.8%
Average Net Savings (Profit) (in %)	17.4%	11.0%
Return on Investment	155.4%	101.9%

The net savings achieved by reverse auctions are more impressive: Providers of reverse auctions indicated an average gross saving (in % of purchasing costs) for buyers of 16.1% and an average investment of 4.6%. A profit or net saving of 11.5% and a ROI of 250% results according to e-Marketplaces / PSPs. Again, users of reverse auctions among purchasing organisations are more cautious in identifying net savings than providers of reverse auctions, but still an impressive ROI of 177% results with a net profit of 7.6%.

²⁸¹ Simple ROI = (Gross Savings - Investment Costs) / Investment Costs

Both purchasing organisations and e-Marketplaces / PSPs agree that a considerable amount of net savings can be achieved by reverse auctions.

However, there usually is a cut off point or minimum amount of a sourced product to conduct a reverse auction effectively. In Table 29, providers of reverse auctions specify that there should be an average minimum amount of 51,000 euros of a specific sourced product to start a profitable reverse auction. However, the median illustrates that this amount can be lower, i.e. 37,000 euros. This finding reveals that electronic demand bundling can well be a prerequisite for smaller purchasing organisations in order to obtain the required purchase volume for a profitable reverse auction.

Table 30: Minimum Amount of a Sourced Product for Starting a Reverse Auction Initiative (in Euros)

N	Valid	12
	Missing	31
Mean		51041.67
Median		37500.00
Minimum		500
Maximum		200000
Percentiles	25	10000.00
	50	37500.00
	75	87500.00

Providers of both EPC and reverse auctions claim to achieve average savings (in % of purchasing costs) of 28.6% by the combination of EPC and reverse auctions. The average investment (in % of purchasing costs) for both EPC and reverse auctions is 11.2%. Consequently, an average profit of 17.4% and a ROI of 155% results by the combination of both reverse auctions and electronic purchasing consortia.

Adopters of both EPC and reverse auctions among purchasing organisations specified a lower net saving (11.0%) and a lower ROI (102%) than providers of both EPC and reverse auctions. However, the findings still demonstrate that the adoption of the tandem EPC and reverse auctions can result in significant net savings and ROI.

Hendrick (1997) specified in his study into traditional purchasing consortia among US Fortune 500 companies an average saving of 13.4% and a ROI of 767%. Though EPC have the potential to be a more cost-efficient approach than traditional purchasing

consortia, the ROI levels explored from the surveys do not reach the level of Hendrick's ROI. A reason might be that Hendrick's study was focused on Fortune 500 companies that already had, due to their very large size, adequate centralised purchasing processes and infrastructures. Therefore, they specified a relatively low (in relation to savings and their overall purchasing volume) average cost of \$300,000 USD to the formation and management of purchasing consortia and consequently, a high ROI resulted. In this study into EPC, the investment costs were identified to be on a higher scale.

A reason for this finding may be that EPC providers and users have to set up collaborative e-Procurement infrastructures and platforms, which seem to require a significant amount of investment. However, the average economies of scale and scope could still exceed the diseconomies of increased investments (such as transaction and communication costs). The findings demonstrate that the combination of electronic purchasing consortia and reverse auctions have a good potential to achieve significant savings. With regard to the ROI, reverse auctions have a better potential than EPC.

The question also arose if EPC providers and users specify general net savings from e-Procurement adoption on a higher scale than non-providers and non-users (see Table 30).²⁸²

Table 31: EPC Adoption to Date on the Criteria evaluated: General Net Savings by E-Procurement Adoption

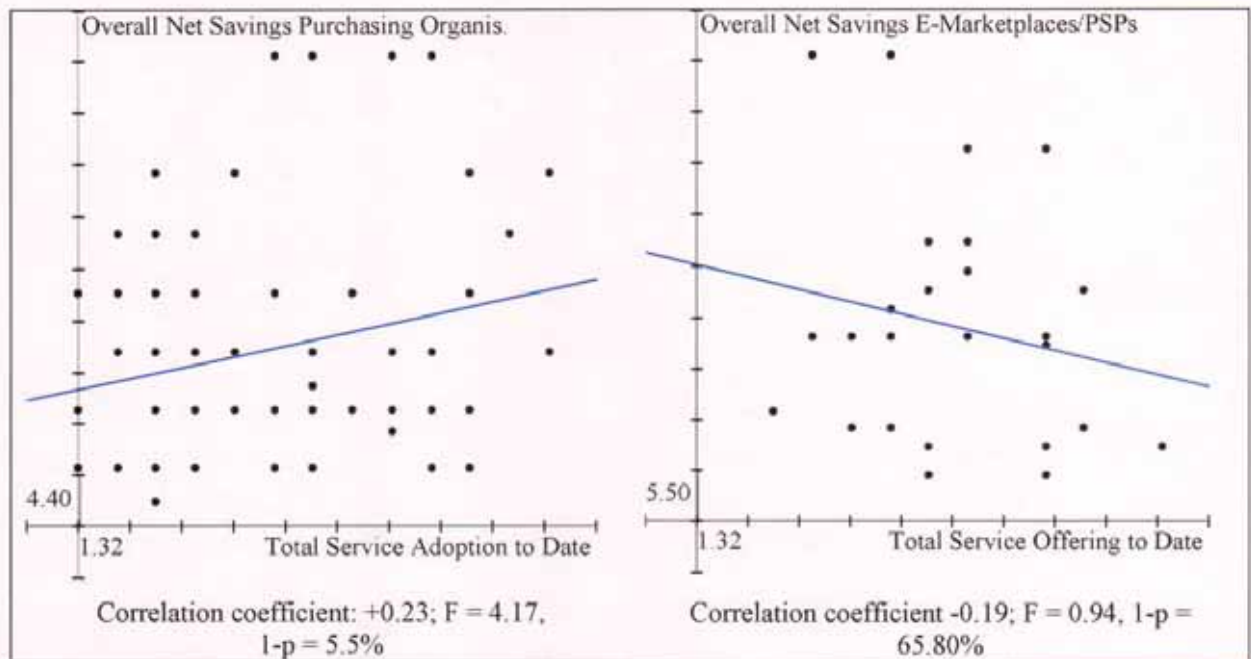
Implementation EPC Today	Net Savings by E-Procurement Adoption	
	Purchasing Organisations	E-Marketplaces / PSPs
Yes	19.00%	21.69%
No	14.49%	21.00%
Total	14.96%	21.35%
p-value	1-p = 80.04%	1-p = 13.67%

While EPC providers specify the average net savings from e-Procurement adoption on a higher level (21.7%) than non-providers (21.0%), this is not statistically significant. From these overall net savings of 21.7%, EPC can achieve 5.4%. The average net saving of 17.4% from providing both EPC and reverse auctions forms the major part of overall net savings (21.4%) achieved by e-Marketplaces and PSPs.

EPC adopters among purchasing organisations confirm that a significant amount of overall net savings (19.0%) by e-Procurement adoption can be obtained by the combination of EPC and reverse auctions (10.8%).²⁸³ Given that procurement savings hold a significant business value due to their bottom-line profit impact, EPC and reverse auctions have a good contribution potential.

This finding further led to the question if there is any significant relationship between the adoption of all 12 customised services listed in research construct 3) and the net savings achieved (see Figure 63).

Figure 63: Correlation of Overall Average Net Savings in Purchasing Costs and Number of Services Offered and Used to Date



The correlation graphs reveal that there is no significance that the more services are used by purchasing organisations or offered by e-Marketplaces / PSPs to date, the higher the general net savings. Although e-Marketplaces / PSPs as well as purchasing organisations confirm that the need for further customised services is increasing in future, general net savings cannot be directly related to the multitude of value-adding services. This result demonstrates that the depth of and core competency in service adoption and provision is also highly relevant.

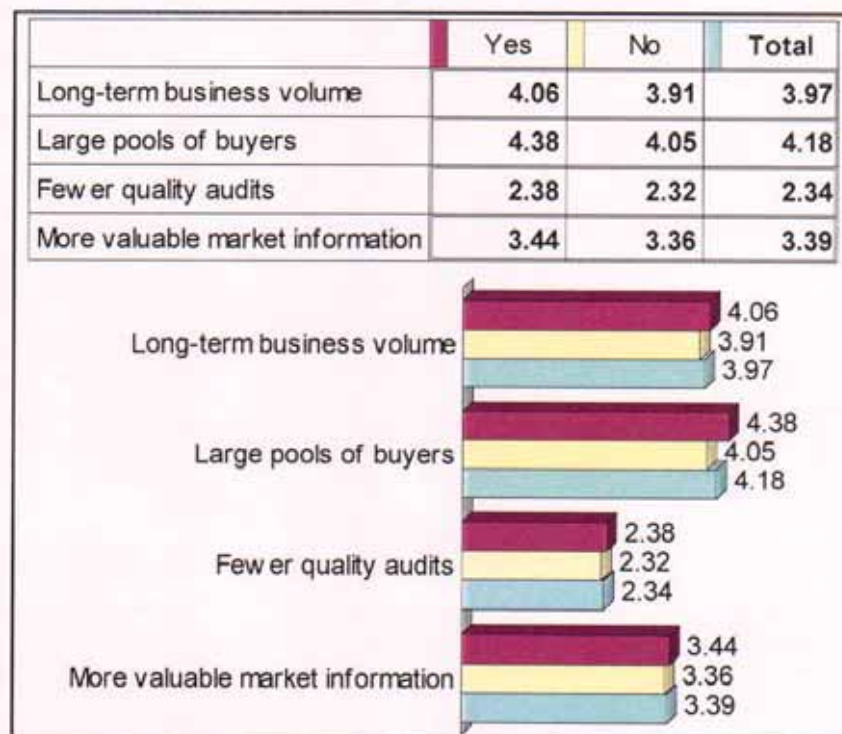
²⁸² No significant differences could be established between average net savings, industry sectors and type of e-Marketplaces / PSPs.

Overall, the research findings revealed that a significant net saving and ROI can be achieved with both EPC and reverse auctions. However, it appears decisive to monitor the effect of EPC on the supply-side as well. Otherwise, savings could be based on only a short-term effect and suppliers could resist participation in EPC. Therefore, the analysis of EPC benefits and drawbacks for suppliers is presented in more detail in the following sections.

5.3.9 Level of Benefits and Drawbacks for Suppliers that Participate in Electronic Purchasing Consortia

One of the previous findings was that suppliers can be reluctant to participate in e-Marketplaces / PSPs and e-Procurement in general. While this was found common to EPC as well, a more detailed analysis of the reasons was required. First of all, e-Marketplaces and PSPs were surveyed to assess the importance of benefits that could occur for suppliers when they participate in electronic purchasing consortia (on a scale from 1 = not important at all to 5 = extremely important).²⁸⁴

Figure 64: Importance of EPC Benefits for Suppliers (Perceived by EPC Providers and Non-Providers)

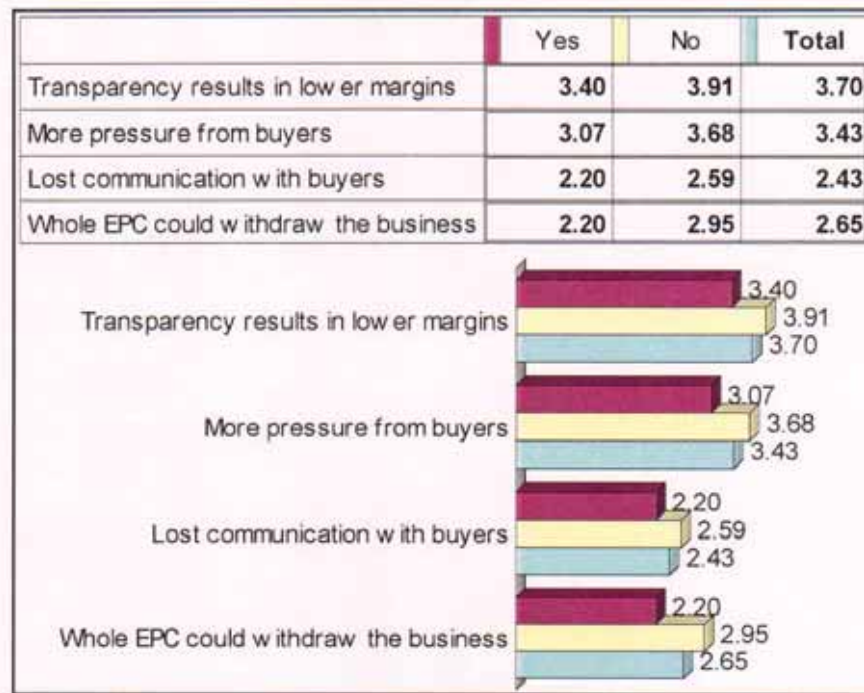


²⁸³ Overall, EPC users identified a higher level of overall net savings (19.0%) than non-users (14.5%), which is, however, not yet significant according to the Fisher test (see appendix E).

²⁸⁴ The Cronbach's Alpha for this 4-item scale is 0.61.

E-Marketplace / PSPs perceive as most important EPC benefits for suppliers 'quick access to large pools of buyers with lower sales costs' (mean factor 4.3) and 'long-term business volume' (4.0). E-Marketplaces and PSPs do not consider fewer quality audits as a crucial supplier benefit (2.3). More valuable market information is regarded as just somewhat important (3.4). Overall, Figure 64 demonstrates that EPC providers perceive EPC benefits for suppliers on a not statistically significant higher scale than non-providers.²⁸⁵ While EPC providers and non-providers acknowledged potential significant EPC benefits for suppliers, they were also interviewed concerning EPC drawbacks for suppliers in Figure 65.²⁸⁶

Figure 65: EPC Drawbacks for Suppliers (Perceived by EPC Providers and Non-Providers)



E-Marketplaces / PSPs felt that the most important supplier drawbacks from EPC are lower profit margins (mean factor 3.7) and more pressure from purchasing organisations (3.4). That is why Hendrick (1997) explains that powerful suppliers, particularly of highly strategic items, may resist participating in EPC. By keeping the members of an EPC as separate customers, they potentially can extract higher margins. Therefore, suppliers can have various strategies to deteriorate the effect of a purchasing group such as a discount

²⁸⁵ See statistical analysis in appendix D construct 9.

²⁸⁶ The Cronbach's Alpha for this 4-item scale is 0.82.

offering to a part of the group members with the aim to disrupt the purchasing consortium.

While the risk of EPC withdrawing the whole business was considered as somewhat important (2.7), lost communication with purchasing organisations was not regarded as a major problem (2.4). EPC providers regard EPC drawbacks to suppliers on a not statistically significant lower scale than non-providers.

Overall, e-Marketplaces and PSPs acknowledged both EPC benefits and drawbacks for suppliers. While more pressure from EPC seems to develop on suppliers, they can also benefit from a potential larger sales volume. However, the level of benefits and drawbacks are dependent and subject to e.g. the specific EPC setting, the specific sourcing projects, the supplier market position or the buyer-supplier relationships. For example, the effect of EPC on the buyer-supplier collaboration was explored in more detail.

Collaboration with suppliers and other companies is perceived by 95.3% of all e-Marketplaces and PSPs that it is getting more important in the future. Non-providers of electronic purchasing consortia comment on collaboration with statements such as

- EDI and closer co-operation in the production and manufacturing contribute to better quality, market penetration, and less operational problems.
- Collaboration is key to ensure that electronic enablement is done smoothly.
- E-Marketplaces will further improve collaboration.
- Design change is accelerating, and communication up and down the chain is vital to manage it.
- It is a two way street where co-operation and mutual benefit are the keys.
- E-Procurement allows both buyers and suppliers to re-examine their relationship and to communicate on different levels.
- Scarcity and lead-time of some of the components necessitates relationships to guarantee quality supply at right terms.
- We have pretty complex products and try to involve suppliers in simultaneous engineering processes. Therefore, a close relationship is vital.

EPC providers acknowledged collaboration as being more important in future as well, but also provided rather critical statements:

- Relationship will loosen up; customer loyalty will decrease.
- A win-win situation is important.
- The Internet is not changing the relationships between people and companies.
- Networking becomes essential to reduce costs.
- Collaboration does not work very much for SMEs.
- The transition to new models has to be managed by both parties in order to uphold trust.
- A complete integration of ERP-systems would certainly help collaboration, but few companies are willing to invest and make their core competencies visible.
- Collaboration is needed for survival.
- It is important to strive to become an extension of the buyer/broker/supplier relationship. As a broker, we bring these two parties together through improved EC communication producing a closer relationship.
- The Internet will force companies to collaborate.
- Market forces have acted against the supplier/buyer relationship in the last two years. We are looking at a flat market for the next year so any new initiative should be explored.

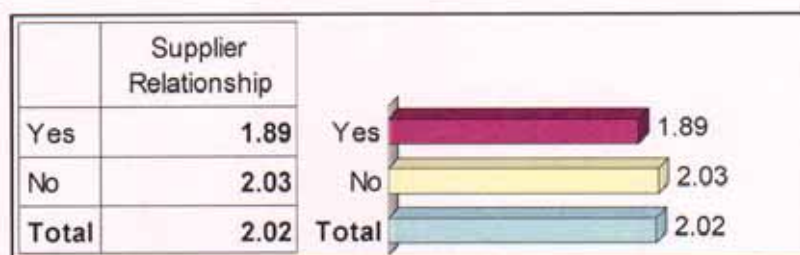
In order to further evaluate these arguments, e-Marketplaces / PSPs and purchasing organisations were surveyed on how electronic purchasing consortia impact on collaboration and supplier-buyer relationships. Results from the survey among purchasing organisations indicates that most purchasing organisations have close relationships to only few suppliers (24.6% of purchasing organisations) or to only some suppliers (50% of purchasing organisations). 23.8% of purchasing organisations specified that they would have close relationships to many suppliers, whereas only 1.6% indicated a close relationship to almost all suppliers.²⁸⁷

A scoring model was applied to the values (from 1 = close collaboration with few suppliers to 4 = close collaboration with almost all suppliers). It was explored in Figure

²⁸⁷ See attached statistical analysis in appendix E construct 9.

66 that EPC adopters among purchasing organisations have on average a statistically not significant lower level of close relationships to suppliers ($1-p = 41.92\%$).

Figure 66: Relationship to Suppliers vs. EPC Adoption to Date



Therefore, the question arose from this finding whether or not EPC are more closely associated with the arms-length (exit) or the close collaborative (voice) buyer-supplier relationship. Table 31 demonstrates that the majority of purchasing organisations (77%) as well as e-Marketplaces / PSPs (78%) think that electronic purchasing consortia are associated with an arms-length buyer-supplier relationship.

Table 32: Impact of Electronic Purchasing Consortia on Buyer-Supplier Relationship

Impact of EPC on Buyer-Supplier Relationship	Perceived by Purchasing Organisations		Perceived by e-Marketplaces / PSPs	
	N° cit.	Percent	N° cit.	Percent
Arms-length buyer-supplier relationship	91	76.5%	32	78.0%
Close collaborative buyer-supplier relationship	28	23.5%	9	22.0%
Total Obs.	119	100%	41	100%
Chi2-Test	Chi2 = 33.35, df = 1, 1-p = >99.99%.		Chi2 = 12.90, df = 1, 1-p = 99.97%.	

It is significant that EPC are perceived to be more feasible for arms-length relationships than collaborative relationships with suppliers. A cross-tabulation of EPC adoption and the impact on the supplier-buyer relationship confirmed hypothesis H9a that EPC are positively correlated with the arms-length (exit) buyer-supplier relationship.²⁸⁸

²⁸⁸ The following question in the survey instrument for e-Marketplaces / PSPs addressed H9a: Do you think that electronic purchasing consortia tend to an arms-length (transactional approach) or to a close long-term buyer-supplier relationship (relational approach)? The following question in the survey instrument for purchasing organisations addressed H9a: Do you think that electronic purchasing

Traditionally, not every purchase requirement is worth the effort required to develop, nurture, and manage complex relationships. Dobler and Burt (1996) explain that historically, the vast majority of buyer-supplier relationships have been conducted in an arms-length mode. In many cases, these relationships were adversarial. Knudsen (2002) cites Emiliani and Stec (2002) who also confirm that frequent use of reverse auctions might lead to frequent changes of suppliers and, thus, long-term relationships might be hard to develop. Unintended consequences from reverse auctions may consist of reduced long-term competitiveness of both buyers and suppliers as it may degrade current capabilities or discourage the development of new competencies.

This background explains that the majority of EPC and reverse auction purchases would be conducted in a rather arms-length relationship, which competes with the trend towards more collaborative buyer-supplier relationships. The “move to the middle” argument (Clemons et al., 1993) emphasises that purchasing organisations tend to reduce their number of suppliers, but develop more collaborative relationships with them.

It was explored that 95% of e-Marketplaces / PSPs acknowledged that collaboration between buyers and suppliers is becoming more important in future. With regard to the number of suppliers, it could be explored from the survey data that about 54% of purchasing organisations (especially large companies) in the automotive and electronics industry sectors have reduced their suppliers in the past. 24% of purchasing organisations have increased their number of suppliers, whereas 22% specified that there was no change to the number of suppliers.²⁸⁹ For the future, only 9% of purchasing organisations plan an increase in the number of suppliers. 38% plan a decrease, while 53% revealed that the number of suppliers would remain stable. Overall, the findings confirm the “move to the middle” argument.

However, with special regard to EPC, more collaborative buyer-supplier relationships could not be confirmed. There was also no evidence that EPC users today had a stronger tendency towards reducing the suppliers in the past (see Table 32). In order to test this

²⁸⁹ consortia tend to an arms-length (transactional approach) or to a close long-term buyer-supplier relationship (relational approach)? See attached statistical analysis in appendix E.
See appendix E construct 9.

relationship, a scoring model was applied to the parameters (1 = decrease in number of suppliers; 2 = same number of suppliers; 3 = increase in number of suppliers).

Table 33: Number of Suppliers vs. EPC Adoption

EPC Adoption to Date	Changes in Supplier Number Past	Future EPC Adoption	Number of Suppliers in Future
Yes	1.56	Yes	1.61
No	1.72	No	1.73
Total	1.70	Total	1.70
p-value	F = 0.31 1-p = 41.21%	p-value	F = 0.66 1-p = 57.62%

There is no evidence for a stronger reduction of the supplier number among EPC adopters.²⁹⁰ A correlation test also confirms that the overall number of suppliers is not related to EPC importance (very weak positive correlation coefficient: +0.02; F = 0.03; 1-p = 14.60%).²⁹¹ Hypothesis H9b - supplier reduction is positively related to EPC adoption and importance - cannot be confirmed.²⁹²

While the 'move to the middle' argument was found to be very relevant to purchasing organisations overall, the concept of EPC is not very much considered to support a more collaborative buyer-supplier relationship to date. With regard to the number of suppliers, no significant differences between EPC users and non-users could be established. This background explains that there is, besides the 'move to the middle', also a trend toward dynamic pricing for specific products, in which cost minimisation can take priority over collaboration and relationship building with suppliers.

5.3.10 Critical Factors in Creating and Managing Electronic Purchasing Consortia in Future

Lipnack and Stamps (1997) explain that it is generally more complicated for virtual teams to be successful than for traditional face-to-face teams. For example, the case studies have demonstrated that misunderstandings, powerplays, leaderlessness or lack of trust can

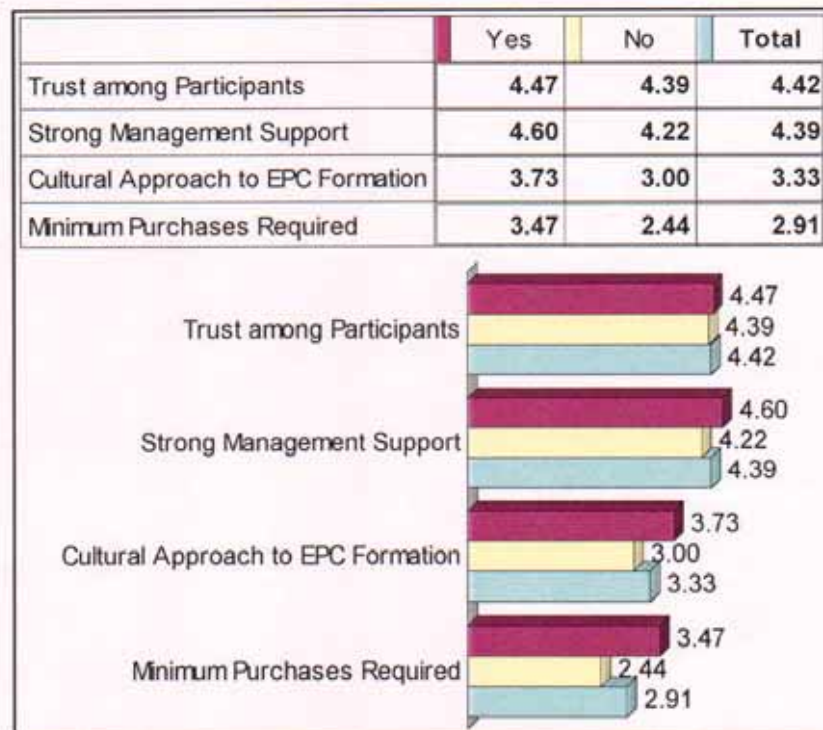
²⁹⁰ See attached statistical analysis in appendix E.

²⁹¹ See appendix E construct 9.

²⁹² The following three questions in the survey instrument for purchasing organisations addressed H9b: Have there been changes in the number of suppliers during the last 3 years? Have you participated in EPC? Please score EPC according to the importance to your procurement strategy.

weaken the success of EPC. Therefore, e-Marketplaces and PSPs have been interviewed about several critical factors in creating and managing electronic purchasing consortia, which are presented in Figure 67 (based on a scale from 1 = no importance at all to 5 = extremely important). The Cronbach's alpha for the 4-item scale 'critical factors' is 0.63, indicating adequate reliability. An unrotated factor analysis was further performed to assess unidimensionality and convergent validity.²⁹³ The designated latent construct shows a high level of factors loadings (ranging from 0.496 to 0.837) and yielded strong convergent validity.

Figure 67: Critical Factors for EPC vs. EPC Offering to Date



A high degree of trust among all EPC members (mean factor 4.42) and a strong management support for EPC (4.39) are considered as highly critical factors for electronic purchasing consortia. Trust is one factor that has been strongly suggested as having an important role in facilitating purchasing consortia by reducing the risk that some organisations try to exploit other members. As Lipnack and Stamps (1997) put it: "*In the networks and virtual teams of the Information Age, trust is a "need to have" quality in productive relationships.*" For example, case study C demonstrated that trust creation can

²⁹³ See the convergent validity analysis in appendix D construct 10. The assessment of discriminant validity was not required, as only one latent variable emerged in the e-Marketplace / PSP survey, which required unidimensionality.

be especially important at the beginning of a collaboration project. Trust may also equally become orientated towards the EPC system and the members. However, it is beyond the scope of this research to elaborate on the meaning and application of trust.

While a strong management support for EPC is perceived as important to help establish collaborative goals among members and aid the EPC progress, it is also a cultural approach to the formation of an electronic purchasing consortium that is still regarded as a somewhat critical factor (mean factor 3.33). Brenner / Hamm (1996) claim that negotiation processes are heavily human-centred even if they are Internet-supported. Research especially from the field of organisational buying behaviour and from negotiation theory has shown that negotiations are typically multiperson, multidepartmental, multiphase, and multiobjective processes. A cultural compatibility between EPC members and an atmosphere of co-operation is perceived to support EPC.

The larger the cultural distance, the more complicated it usually becomes to co-operate effectively. A cultural approach to the formation implies that participants have similar philosophies on a wide spectrum of management goals. Hendrick (1997) specifies that members should go through a cultural bonding in order to create in last instance a high level of trust. Although ICT can enable standardised modes of communication, a cultural approach is still considered by EPC providers as important factor to the formation of EPC.

'Minimum percentages of member purchases are required for EPC' is perceived as the least important of the four selected critical factors (mean factor 2.91). ICT facilitate the dissemination of information and, therefore, the author originally assumed that a critical mass of product volume requirements for EPC would become less important. However, this factor is still perceived as a very important prerequisite for successful EPC management by EPC providers, which non-providers underestimate ($F = 7.75$, $1-p = 99.12\%$).

Hypothesis H10 – non-providers of EPC underestimate the critical factors involved in creating and managing EPC – cannot be confirmed in general.²⁹⁴ A multiple regression test of EPC importance and critical factors did not reveal any significant findings.²⁹⁵ A segmentation is required: Non-providers of EPC underestimate the minimum needs of products purchased in EPC.

Other critical factors for EPC that were mentioned in the survey data included authoritative strong management support and interest for pooled purchasing; efficient management of timing, allowing for time delays; hedging against fraud and limiting the confidentiality issues to a minimum; standardisation; frequent operating level contact and logical correct structures; sensitivity, empathy and commitment for the other parties; separation of strategic pooling and operational replenishment processes.

Apart from these critical factors to EPC, e-Marketplaces / PSPs named further challenges for their operations. Comments provided include:

Human resource issues:

- Lack of training and understanding by senior management of the benefits of professional procurement; unwillingness to adopt change; poor educated purchasing staff.
- Internal processes and organisation; attitude and experience of purchasing departments concerning e-Purchasing tools.
- Technical know-how; customer base; continuity in customers relationship.
- Adoption of new processes and systems; change management and training of people.
- Buyers have not yet reached the level of e-Procurement; change management; fast adoption of community logistics and fulfilment.
- Fear of technology, integration and co-operation; integrated supply chain management and integration of ERP-Systems.
- Logistics, lack of understanding, lack of funding, make RFQ process transparent.
- Market centering (buyers do not trust); supplier readiness (no e-catalogues).

²⁹⁴ The following three questions in the survey instrument for e-Marketplaces / PSPs addressed H10: What are the critical factors enabling successful EPC? Do you offer EPC? Please score EPC according to the importance to your business strategy. See statistical analysis in appendix D construct 10.

²⁹⁵ See statistical analysis in appendix D construct 10.

- More structural purchasing and motivation of buyers; technical efficiency of purchasing personnel; overcome difficulties in acceptance.
- Globalisation; amalgamation of companies; confidence in e-Business systems.

Structural resource issues:

- A-goods may be too complex for e-Marketplaces and have to be personally explained; allocated material, excess material w/o demand.
- B2B process integration; catalogue management; customer/supplier with different ERP-Systems.
- No aggregated view of information; integration/interfaces for desk top purchasing systems and catalogue management systems.
- Change the way organisations purchase goods / adoption rate; education; potential impact of dot.com downturn will have on e-Procurement.
- Process optimisation; reducing cycle time; reducing spend.
- Small/medium size business being able to join the e-Procurement cycle / budgetary restrictions.
- SMEs are reluctant and not very much motivated to participate in e-Marketplaces; specialisation in niches; technology does not provide yet what it promises.
- Standardisation; change management in companies; overall reduction in process costs.
- Transition from multinationals to SMEs when it comes to e-Procurement.
- Keeping up with a changing global marketplace; reducing stock holding costs; reducing delivery times.
- Assurance of lead time/deliver; backend integration of e-Procurement platforms; introducing a common ERP-System and supplier development.
- Set uniform rules and procedures for the way of design, release and global component ITC-systems.
- Improved ordering system and improved stock control by Internet and supply chain management, e.g. reduction of account payables.
- SMEs not prepared for e-business yet. Logistics/skills required to handle global issues of currency, freight etc.
- What is the new upcoming technology?

Supplier resource issues:

- Finding qualified manufacturers; increasing the efficiency of RFQs; trusting a new supplier.
- Managing the supplier base; clients to adopt the necessary new processes; ensure implementation of results.
- Supplier adoption and outreach; change management / processes; supplier readiness.
- Supplier relation management; more information; better decision making.
- Supplier fear; supplier management; supplier readiness for e-Procurement.
- Find best suppliers world-wide for best total cost of ownership.
- Identifying suppliers with right capability and cost mix and agreement on longer-term commitments.
- Identifying suitable suppliers; establishing continuity of supply.
- 99% electronic connections to suppliers.

Finance resource issues:

- Manage cost situation; implement new processes; change management.
- Identifying the ROI; establishing how to pay for it; establishing the need for it when companies are reluctant to change.
- Maximise bill of materials cost reduction that exceeds the average market price erosion.
- Getting away from fire fighting; cost control; on-time deliveries; freight costs; delivery time and stock finance.
- Lower process costs, minimise inventory, order planning, reacting to upside demand, material lead-time, competitive pricing, target costing supplier management.
- To be effective and efficient in negotiating terms of stock control; training of purchasing personnel; establishing a base product cost.
- Keeping the cost down. Order in bulk and move the products swiftly off the shelves. Critical mass for volume discounts.

Overall, process optimisation in purchasing and integrated supply chain management were mostly cited as forthcoming challenges. Training and enablement of purchasing staff, management concern for e-Procurement initiatives and change implementation, supplier readiness and acceptance, standardisation and B2B process integration issues as well as a transition from MNEs to SMEs in e-Procurement are challenges to consider for

the future. With special regard to the future of electronic purchasing consortia, purchasing organisations provided additional comments:

Positive for the future of EPC:

- E-Procurement in general is here now; the only stumbling block being education, induction, scepticism, security myths, disclosure but these will be overcome when significant success stories become available.
- Difficult co-ordination of consortia but Internet technology will increase communication level and, therefore, make consortia easier.
- Electronic purchasing consortia will increase in importance, e.g. powerbuying.
- Purchasing consortia and reverse auctions will become standard and day-to-day tools. Tendency to exchange.
- Electronic purchasing consortia will become more important in future. Technical and flexible organisation structures should be implemented at the beginning. More responsibilities for buyers, e.g. supplier management, content management.
- Demand aggregation is increasing in future; e-Marketplaces will further co-operate.
- There's room for development - especially with small businesses on the purchasing side (no anti-trust implications).
- Electronic purchasing consortia can make a good service contribution.
- Centralisation and demand bundling will become more important in the future.
- Electronic purchasing consortia definitely will happen.
- New levels of competitive advantage will be achieved through innovative sourcing tools such as EPC and reverse auctioning.
- Collaboration over the tiers will increase.
- Virtual centralisation of procurement processes will become more important in future. Processes should become easier.
- Consortia are going to accelerate. Particularly with respect to MRO items.
- EPC: Definitely some potential and a new way. The western world is currently sales driven, and I look forward (hope, not expect) to a demand driven world.
- EPC result in greater access to suppliers, exert greater pressure on existing supplier base and ensure all suppliers are e-enabled.
- Supplier and contract management is time-consuming and requires specialist skills. Savings and efficiencies might result from aggregation into consortia.
- The industry will move in this direction, volume gets more important.

- We will use EPC to purchase commodities / high volume products.
- With consortia, suppliers might be more willing to tailor interfaces.

Undecided for the future of EPC:

- Depends strongly on the goods to buy and relations between people and network management.
- It is too early to judge due to the low penetration currently, but if there are significant cost savings to be made, it will be taken up.
- Electronic purchasing consortia are considered as a great idea in industry. However, companies still just mistrust each other too much to agree on a bundling strategy. Internet and competitive pressure will change this, but this will take time. For buyers, electronic purchasing consortia is just talking about the future.
- Future of purchasing consortium is good for standard item purchases. Where items are non-standard there will be difficulties.
- EPC has and will have a huge affect on the future of purchasing, but a lack of knowledge would stop a lot of people using it.
- Never considered this previously. Not sure how it would work for a distribution company like ours.
- Not sure given the close relationships we have. With many of our suppliers as to whether the trust element would be there. Maybe with time it would.
- Purchasing consortia are not very much feasible for multinationals, more suitable for SMEs.
- No opinion, as we will probably continue to purchase goods in the same manner.

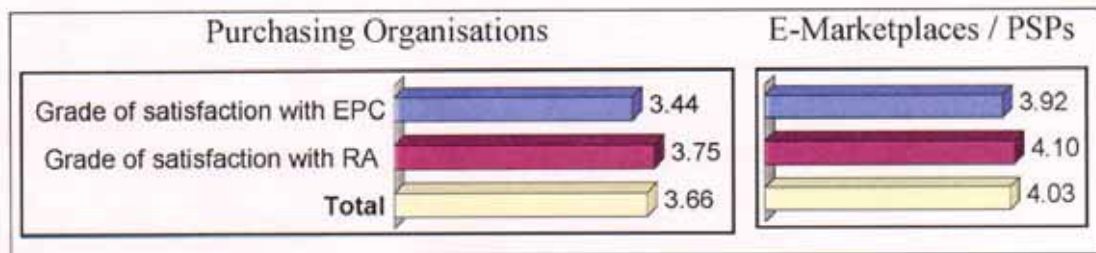
Sceptical for the future of EPC:

- Electronic purchasing consortia may be more useful for multinationals. SMEs cannot profit that much.
- Don't think this is a viable method. Centralised purchasing within a company often has difficulty imposing its contracts internally; an outsourced service would have even greater difficulties.
- Good idea but not likely to happen.
- With the downturn in the e-Marketplace economy the importance is not any more that strong.

- Enablement of staff and suppliers, a proper economic model and workflow design would be required for EPC.
- In our business, electronic purchasing consortia probably will not play a major role, cause our requirements are too specific (no commodity goods).
- Collection of the necessary data from members in the consortium is too time-consuming.
- Challenge of getting information on suitable/capable suppliers, pricing and quality efficiently and effectively.
- EPC: No big deal.
- Would require a lot of manual steps that are time consuming and error prone.
- Not so important in industry where product being purchased is being custom-designed or where a high degree of technical specification required.
- Our management is not interested in Internet and e-Procurement; EPC would require a change of the mindset for opportunity recognition and speed.
- Don't think EPC has a future. EPC are not suitable for our automotive business.

Some purchasing organisations are also sceptical about the future of EPC and perceive that EPC are not beneficial to their purchasing practice in future due to frequently cited reasons such as mistrust in potential partners, too specific purchase requirements or lack of knowledge and training among purchasing managers. However, despite some scepticism, all in all those statements demonstrate that electronic purchasing consortia will become more important in the future. The overall consensus is positive that there is a good potential for EPC applications in future. The qualitative statements can confirm the earlier findings from the survey data that both purchasing organisations and e-Marketplaces / PSPs will increase EPC adoption in the future.

Moreover, EPC users and providers were also interviewed concerning their level of satisfaction (based on a scale from 1 = very dissatisfied to 5 = very satisfied). The results are presented in Figure 68:

Figure 68: Average General Satisfaction with EPC and Reverse Auctions

For EPC, the grade of satisfaction ranges from dissatisfied to very satisfied. While this finding reveals that not all EPC initiatives have met expectations, the larger part were perceived as satisfactory. EPC providers specified an average grade of satisfaction of 3.9, while EPC users were only just somewhat satisfied with a mean factor of 3.4. This finding is also reflected in the result that 95% of e-Marketplaces / PSPs and 78% of EPC adopters among purchasing organisations plan to continue their EPC operations.

Vigoroso (1998) confirms that 62% of buyers specified in a survey that consortium purchasing has met initial expectations. However, users and providers of reverse auctions point out a higher level of satisfaction (mean factors 3.8 and 4.1). This study revealed that reverse auctions could provide a faster ROI and higher savings than EPC.²⁹⁶ Overall, it can be concluded from the surveys that both EPC and reverse auctions (1) can in most cases meet the expectations and (2) become more significant in future, despite some scepticism. However, a range of critical factors need to be considered for successful adoption and management.

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²⁹⁶ See attached statistical analysis in appendix D and E construct 8.