

December 2002

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THE ROLE OF BILATERAL B2B E-PROCUREMENT IN THE EUROPEAN AUTOMOTIVE INDUSTRY: RESULTS FROM AN EMPIRICAL SURVEY

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Abstract

What role does a consistent e-business strategy play for the usage of modern information and communication technologies in supply (chain) networks? In this paper, we present the results of an empirical survey conducted in late 2001 with enterprises in the European automotive industry. Using e-procurement as an example, it is shown how the scope of a firm's e-business strategy correlates with efficiency gains. Also, the amount of transaction cost and purchasing cost for procurement processes depending on type of goods and services (direct vs. indirect) and e-business strategy is analyzed. Surprisingly, there appears to be no correlation between the existence of an e-business strategy and the reduction of transaction and purchasing costs in e-procuring goods and services.

Keywords: E-business, e-business strategy, b2b e-procurement, automotive industry, empirical survey

Introduction

The automotive industry is one of the largest industrial sectors world-wide. Through the internationalization of markets, manufacturers and suppliers are increasingly forced to intensify their business relations. Particular intricacies result from the industry's extraordinarily complex process structures and dependencies (Verband der Automobilindustrie 2001). The usage of innovative techniques and concepts of information processing is the foundation for handling this challenge. E-business technologies offer new and significant opportunities to achieve competitive advantages for companies, people, and public institutions.

The term e-business can be characterized as the support of the several distinct phases of a business transaction through information systems that use the Internet as a communication medium (Becker 2001). In all its different facets e-business is likely to lead to fundamentally new organizational and co-operative structures that will change current ways of doing business. What e-business can provide for automotive manufacturers and suppliers has been well stated and has become a sort of mantra: improved product quality, reduced costs, and shortened time-to-market cycles. These gains can be achieved via the Internet's boundless architecture, permitting the free flow of information and ideas in real time among OEMs, suppliers, and dealers. The benefits of e-business are more than just a mere incantation, however, since to a greater extent virtual technologies are being used for supply-chain management, product development, customer relations, and e-procurement (Gehm 2002).

To gain information about the status quo of e-business, especially standardized business software (e.g. ERP-systems), EDI, supply-chain management, electronic markets and bilateral e-procurement, the Institute of Information Systems at the University of Frankfurt and the PA Consulting Group conducted an empirical survey in the automotive industry. In this article we focus on selected survey results about the usage of *bilateral* e-procurement (without intermediation) for direct and indirect goods and services.

In the following we first give an overview about e-procurement in literature and a definition of terms relevant for this article. After a description of the survey design, we present empirical results about the existence of e-business strategies and the usage of e-procurement in the automotive industry. The paper ends with a summary and a prospect.

Literature Review and Definition of Terms

In research and practice, a wide variety of definitions are used to describe the terms procurement and e-procurement (Wirtz 2001). In order to ensure a better understanding of the following issues, it is necessary to provide exact definitions of the terms relevant to this paper.

Procurement encompasses all activities involved in obtaining goods and services and managing their inflow into an organization (Segev et al. 1998). Traditionally the corporate function of procurement is separated into strategic and operational tasks. Whereas the strategic tasks include sourcing activities, supplier management, and design and implementation of buying procedures, operative tasks embrace all transaction-oriented activities such as the excitement of purchase orders (Kaufmann 1999; Gebauer and Segev 2001).

Another classification can be made using the type of goods and services. The literature distinguishes between direct (production-oriented) and indirect (non-production) items respecting procurement. Direct procurement refers to the purchasing of goods and services that immediately enter a manufacturing process, such as the parts that are assembled into an automobile (Gebauer and Segev 2001). Compared to direct goods and services, the procurement of indirect items covers a wider range of products, typically involves a larger number of buyers (possibly every employee), and is much less predictable with respect to buying volume and frequency.

The term e-procurement results from the electronic support of procurement activities between a purchaser and a supplier through information and communication technologies (Chaffey 2002). ERP systems and EDI were for a long time the primary source of connecting manufactures and suppliers electronically, most in a bilateral way (Wirtz 2001). EDI-based designs increasingly fail when confronted with globalized networks of partners and customers, because of the variety of different, often industry-specific, business process scenarios and EDI standards. Caused by high implementation and operating costs the integration of small and mid-sized enterprises is difficult. Internet enabled capabilities (e.g. procurement) are discussed as an approach solving these problems. According to (Rayport and Jaworski 2002; Eyholzer 2000) we understand e-procurement as the usage of Web-based functions and services (e.g. catalogue management, requisition, control and approval, receiving and exception processing, financials and payment processing and logistics and supply-chain management (Thomson and Singh 2001) that allow employees of a buying organization to purchase goods and services and allow suppliers to manage and communicate the fulfillment of purchase orders submitted. In most cases less special software (e.g. catalogue software) and hardware are needed to set up so that small and mid-sized enterprises can participate more easily in electronic processes.

The potential benefits and characteristics of e-procurement, especially for indirect goods and services, are described and proved in a huge number of articles and studies (see e.g. Eyholzer and Hunziker 2000; Gebauer and Segev 1998). The main results are that e-procurement decentralizes operative tasks and centralizes strategic procurement processes. This eliminates the so-called maverick-buying and reduces transaction costs (e.g. decreasing process time and media discontinuities or reducing personnel expenditures) (Dittler et al. 2000) and purchasing costs (e.g. through grouping effects and/or a reduction of the number of their suppliers) (Arthur Andersen 2000; Dolmetsch 2000; Niehus 1999; Wirtz 2001).

E-procurement can generally be conducted with intermediation through electronic marketplaces or catalogue brokers or without intermediation through bilateral connections between business partners. In this article we focus on bilateral e-procurement without intermediation.

Currently research is seldom focused on a specific industry and direct goods and services. As stated before, EDI is used for a long time to support inter-organizational cooperation's. Therefore an analysis if and how Internet-enabled capabilities are used for

bilateral supplier-customer (point-to-point) relations instead of EDI and their role in the future becomes interesting. E-procurement was initially aimed at indirect goods and services only and so less data about its usage for production oriented items exist. Large software vendors like SAP have just started supporting Internet-based procurement of direct items. Previously the European automotive industry, predicted as progressive with regards to the usage of IS, has not been systematically analyzed. Industry-specific studies offer a better comparability (e.g. cost reduction, procurement volume, used functions to support business processes etc.) because of the parity and similarity of business processes and business relations. Accordingly, a detailed analysis of characteristics of direct procurement and its differences to indirect procurement including all the associated possible dimensions becomes essential.

Design of the Study

In order to obtain data about the status-quo of e-business, the Institute of Information Systems at the University of Frankfurt and the PA Consulting Group conducted in late 2001 a comprehensive empirical survey in the automotive industry. Subjects of investigation have been standardized business software, EDI, supply-chain management, electronic markets and bilateral e-procurement. A questionnaire containing about 45 questions on 9 pages (two focused on bilateral e-procurement) was sent to 800 suppliers and manufactures in the European automotive industry. Prior to mailing the questionnaire, each company was contacted by phone to identify the responsibility to which the questionnaire was then directly addressed. 125 relevant questionnaires from 9 countries were returned. This is equivalent to a rate of return of more than 15%.

The goal of the study for the area of bilateral procurement was to answer the following main questions:

- How many companies in the automotive industry use Internet-based applications and technologies for purchasing direct and indirect goods and services?
- Do companies with an e-business strategy use e-procurement more intensively than companies without an e-business strategy?
- Which software functions and services are currently used to procure direct and indirect goods and services?
- What are the potential cost advantages associated with e-procurement?
- How does the procurement differ concerning direct and indirect goods and services?
- Of what importance are various criteria (implementation costs, personal contacts etc.) for the implementation of e-procurement-solutions?

Survey Results

In this section we first outline the basic demographic information (country, size and supply chain level) of the participation enterprises. Subsequently, we present selected survey results about the existence of e-business strategies and the usage of bilateral e-procurement in the automotive industry.

Demographic Data of the Participating Enterprises

125 European companies responded to the questionnaire (see figure 2). As illustrated in figure 1, the sample is dominated by Germany (48.0%), followed by Austria (16.0%), France (12.8%), Scandinavia (Norway and Sweden) (9.6%), Benelux (Netherlands and Belgium) (7.2%) and others (England and Switzerland) (6.4%).

We used the volume of annual revenues to classify the companies into small enterprises (> 50 < 250 Mio. €), mid-sized (> 250 < 500 Mio. €), and large enterprises (> 500 Mio €). On the whole, 48% of the 125 participants were small companies, 18.4% mid-sized, and 33.6% large enterprises (see figure 2).

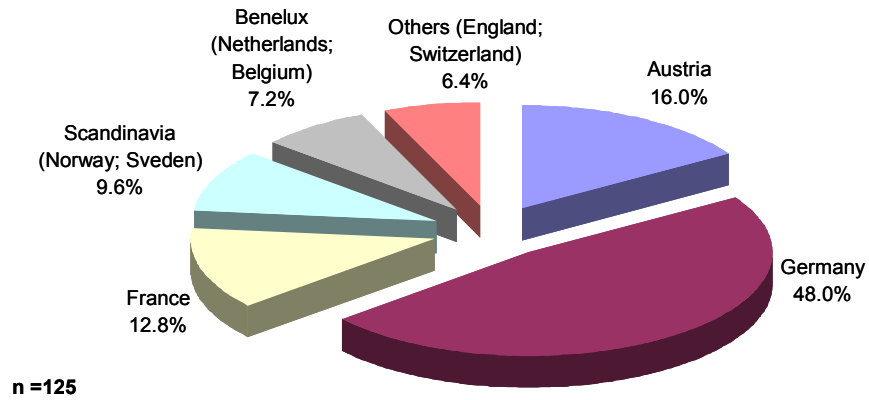


Figure 1. Participating Companies by Country

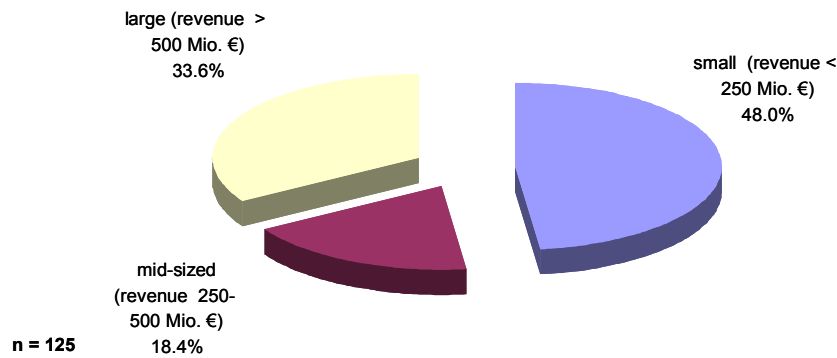


Figure 2. Size of the Responding Enterprises

To clarify the role of the participants in more detail, we distinguished between manufactures (OEM origin equipment manufacturer) and different tiers. The term tier describes the level of a supplier in the supply chain in the view of an OEM. As figure 3 shows, our sample is dominated by 1st tier suppliers. The other participants belong to the categories 2nd tier (19.2%), 3rd tier (8.0%), and OEM (8.0%). Further companies (7.2%) (e.g. logistics services provider) are summarized in the category others.

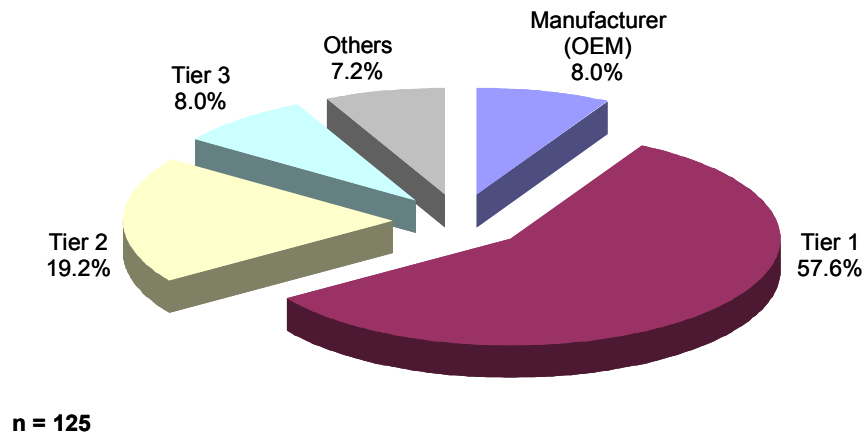


Figure 3. Supply Chain Level of the Respondents

E-Business Strategies

The advent of the internet has changed traditional business models and business processes (Fritz 2000). A firm's successful business strategy, especially with regard to the usage of new information and communication technologies, has to consider these influences in order to maintain its competitive position. This might include a reconstruction of inter-organizational relationships and co-operations. To carry this out, changing intra- and inter-organizational parameters and legalities have to be identified and analyzed first. In this context, the necessity to develop a consistent e-business-strategy is **obvious**.

Analysts estimate that only 25-30% of all companies have a consistent e-business strategy today (Weitzel and König 2001; Wamser 2001). According to a survey of automotive/manufacturing companies, conducted by KPMG and the Economist Intelligence Unit in June and July 2000, e-business has unarguably become an integral element in the business and engineering strategies of manufacturers and suppliers in the automotive industry (Gehm 2002). We believe that due to a higher availability of resources (Wirtz 2001) large enterprises especially belong to this kind of company. These large, technically capable suppliers and manufacturers are increasingly taking on the responsibility for systems and modules and will play a key linking role in the deployment of automotive e-business.

Hypothesis 1: Large companies employ e-business strategies more often than small and mid-sized companies.

To evaluate our thesis, the first question of the survey addresses the existence of e-business strategies in the automotive industry. We distinguished between a consistent company-wide e-business-strategy and a consistent strategy for sub-areas (e.g. for a division) as well as the lack of an e-business strategy. 33.1% of the responding enterprises have a consistent company-wide strategy and about 28.2% of the respondents have a consistent e-business strategy for sub-areas, while 38.7% have no e-business strategy. As shown in Figure 4 (Switzerland and England are not included (n = 8)), Austrian (70.0%) and German (66.7%) enterprises use e-business strategies (company-wide and for sub-areas) most. With 26.7% France is on last position. =

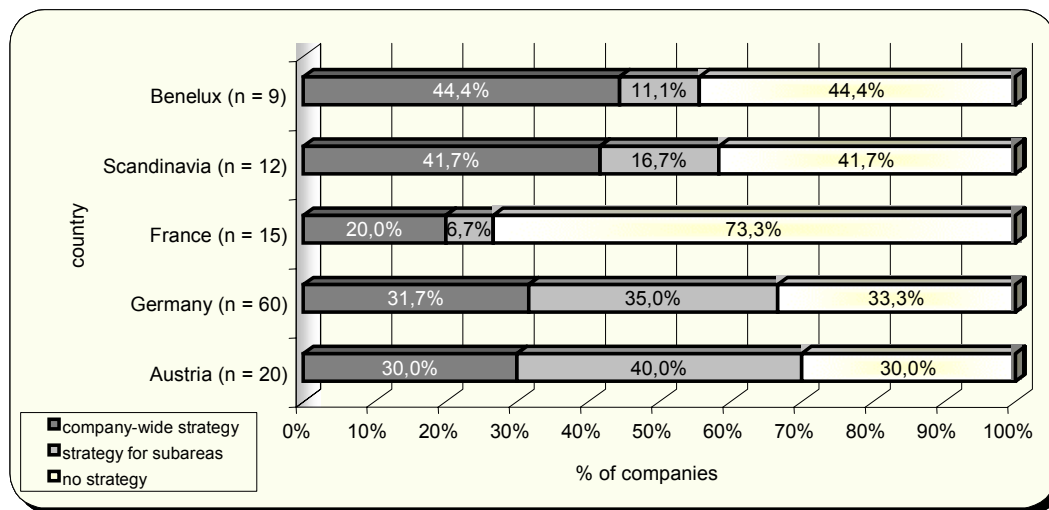


Figure 4. E-Business Strategies by Country

Looking at the different company sizes, it is obvious that companies with revenues of more than 500 Mio. Euro use e-business strategies more than small and mid-sized companies. Furthermore, we can see that small enterprises have less developed e-business strategies. Figure 5 shows how often the responding companies use e-business strategies according to their revenue category.

To analyze the dependencies between the characteristics of thesis 1, we have categorized small and mid-sized companies to the group *SME*, and all companies with a company-wide strategy and a strategy for sub-areas to the group *consistent strategy* into a 2x2 cross-table. The exact Fisher-Test was calculated for examination. With an error-probability of $p < 0.0001$ a significant correlation was found for our sample. Therefore, we can accept the hypothesis that large companies use e-business strategies most.

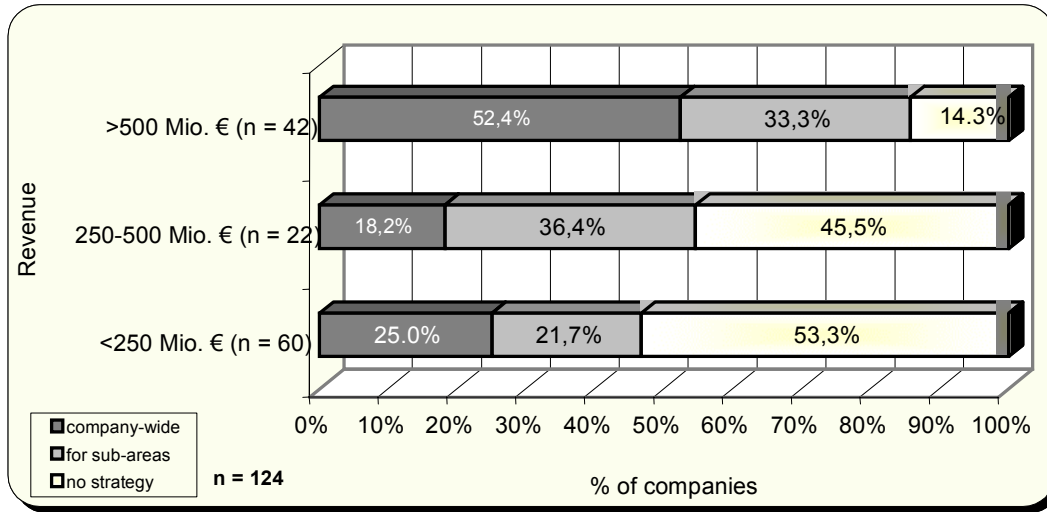


Figure 5. E-business Strategies According to Company Size (Revenue)

To identify reasons for a lack of e-business strategies and reasons why companies just employ a strategy for sub-areas, the respondents (with the exception of those who have a company-wide strategy) were asked about barriers (multiple answers were possible).

54.9% of the respondents without a company-wide e-business strategy see “missing strategic importance” as the main barrier. Only 11.5% of the companies include currently planning or evaluating a consistent e-business-strategy. The findings illustrate that the importance of e-business is not wildly spread in the management of companies. According to the responding managers, other barriers are difficulties in the development (17.7%), the rollout (9.8%) of a consistent e-business strategy (e.g. through the variety of business units or the independence of a division), as well as missing support by the management (3.9%). 16.4% named different other reasons.

The Usage of Bilateral E-Procurement

The respondents were asked if they purchase goods and services from their suppliers using bilateral connections. Only 23.2% of the European suppliers and manufacturers in the automotive industry use e-procurement. An additional 23.2% plan a utilization (time horizon is between ½ and 1 ½ years), and about 53.6% do not use or plan e-procurement (see figure 6).

The utilization of e-procurement increases if we look at indirect goods and services. 40.0% of all company’s still use e-procurement, about 13.9% plan the usage, and 46.1% do neither use nor plan e-procurement for indirect goods and services (see figure 6). The stronger use of Internet-based applications and technologies to procure indirect items results from the traditional indirect e-procurement focus.

As described before, we have asked the respondents if they have a consistent e-business strategy in their companies. We believe that companies with a consistent e-business strategy do use the internet for purchasing more intensively than companies without an e-business strategy.

Hypothesis 2 and 3: Companies with a consistent e-business strategy use e-procurement for direct (2) and indirect (3) goods and services more intensively than companies without an e-business strategy.

40% of the responding enterprises with a consistent company-wide e-business-strategy, about 29.4% with a consistent e-business strategy for sub-areas and, remarkably, only 2.4% of all companies without a strategy use e-procurement in the area of direct goods and services. Figure 7 summarizes the results for utilization and planning.

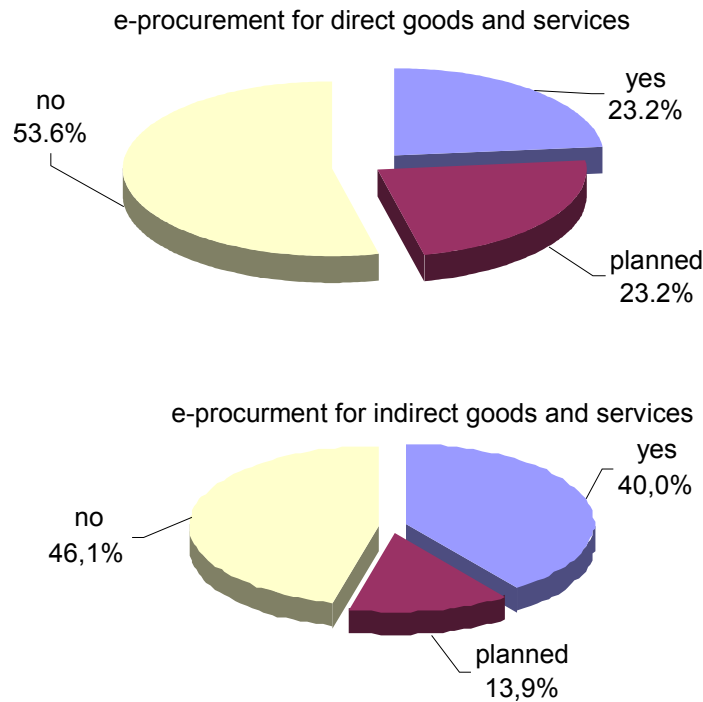


Figure 6. E-Procurement for Direct and Indirect Goods and Services

To verify our thesis (2) we calculated the Fisher-Test again. The examination showed an error probability of $p < 0.001$. This means that we can be sure that companies with a consistent e-business strategy use e-procurement for direct goods and services more intensively than companies without a business strategy.

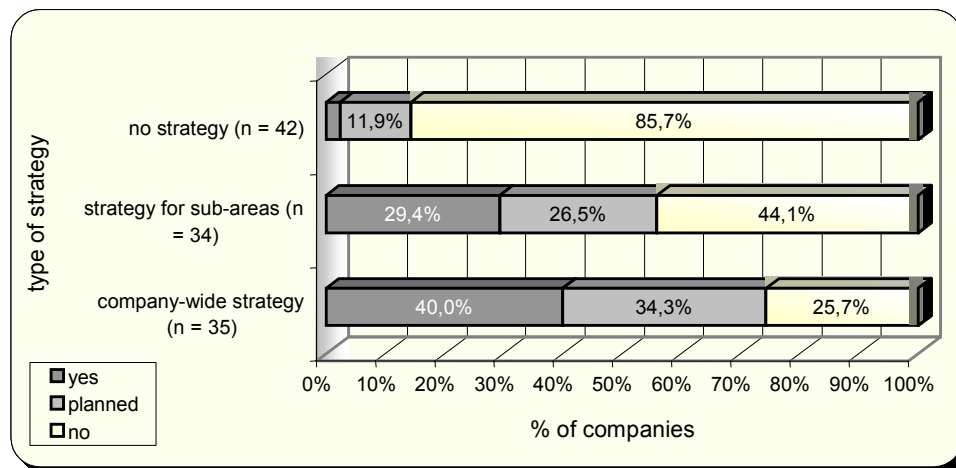


Figure 7. Utilization and Planning of E-Procurement for Direct Goods and Services According to Strategy

In the area of indirect goods and services the respondents have given the following answers (see figure 8). 50.0% of the responding companies in the automotive industry with a company-wide e-business strategy, about 41.2% with an e-business strategy in a sub-area and 31.1% with no strategy use the internet for purchasing goods and services.

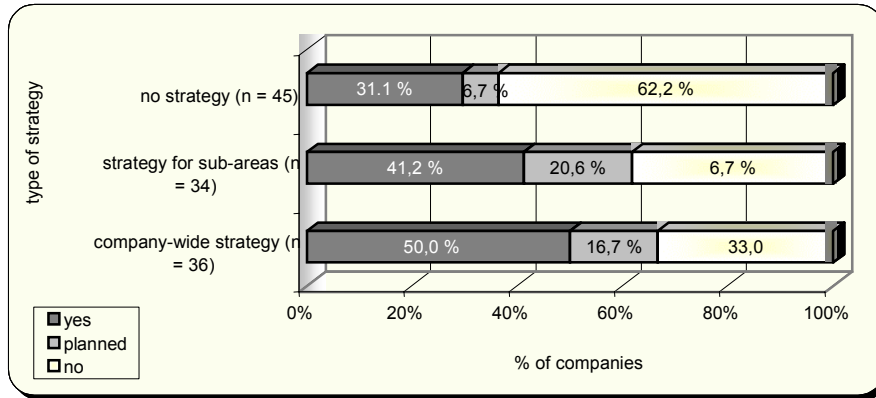


Figure 8. Utilization and Planning of E-Procurement for Indirect Goods and Services According to Strategy

With an exact one-sided significance of $p = 0,086$ our hypothesis (3) for the area of indirect goods and services must be rejected. Unlike the field of direct goods and services, no significant dependency between the characteristics could be found. As a result, this can be explained by the differences between both e-procurement concepts. Whereas the procurement of direct items is often determined by special software applications (buy-side solutions) and standards (e.g. xCBL) needed to access a seller's system (sell-side solution) (Weller 2000) and restrictions (e.g. permanence of a business relation), the procurement of indirect products is less complex. Frequently, no specific software application is required so that the purchasing process can be carried out with a simple Web-browser. Beyond that, the indirect procurement is less restrictive.

Purchased Goods and Services

In particular, e-procurement is suitable for simple and standardized goods and services (e.g. office supplies). Most of these items can be characterized as being easily describable. Hence, we believe that e-procurement of direct products in the automotive industry currently focuses on simple and standardized goods and services.

Hypothesis 4: e-procurement for direct materials in the automotive industry focuses on simple and standardized goods and services.

The companies already using e-procurement were asked which goods and services they purchase using Internet-based applications and technologies. Multiple answers were possible.

72% of the respondents purchase catalogue parts (DIN parts e.g. screws) and about 80% simple external parts (e.g. synthetic parts, metal parts, electronic components). Only 12% supply complex external parts (> 20 part numbers, e.g. processed cast parts with assembly parts) and another 12% so called systems (> 40 part numbers). Services have not been named at all. The results show that simple and standardized products are purchased more often than complex parts and therefore confirm our thesis. Figure 9 summarizes the results.

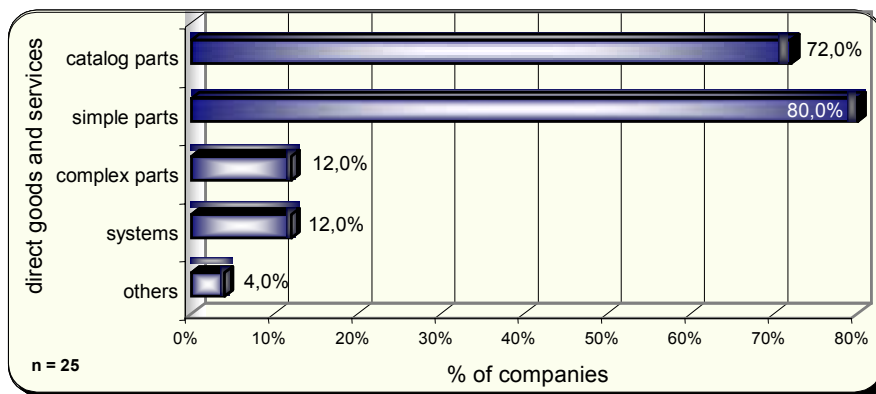


Figure 9. Direct Goods and Services

To get an overview about the differences between purchased direct and indirect goods and services we have analyzed the area of indirect items too. Due to its small complexity, office supplies (93.3%) dominate the area of indirect procurement. 46.6% of the responding companies supply spare parts, about 33.3% maintenance (e.g. lubricants, oil, lacquers), 31.1% services and 17.8% other things (e.g. flight tickets) (see figure 10).

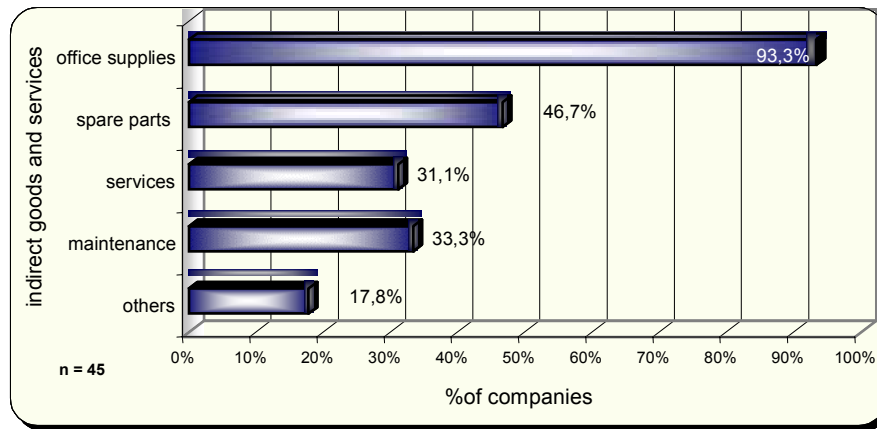


Figure 10. Indirect Goods and Services

Functions and Services Used to Support Business Processes

In a very general sense, business transactions can be distinguished in four core phases: the information phase, the negotiation phase, the settlement phase, and the after-sales phase (Gebauer and Segev 1999; Schmid 1993; Ware 2000). Each phase is electronically supported by different functions and services. In the first phase, customers identify their needs using services to search products or functions to check the ability of a product. Subsequently, suppliers and customers negotiate the terms of a deal by identifying possible solutions, e. g. using auctions. Strictly availability checks can also be assigned to the negotiation phase. The settlement phase is supported by the exchange of documents (e.g. shipping notifications), electronic payment, and functions to control the processing of orders, whereas the support of the after-sales processes is minimal to non-existent today (Narisco 1998).

Focusing on the Internet-based support of business processes, we wanted to know which software functions and services are used by the companies in the automotive industry. Multiple answers were possible. Figure 11 shows how often the different Web-based functions and services were chosen.

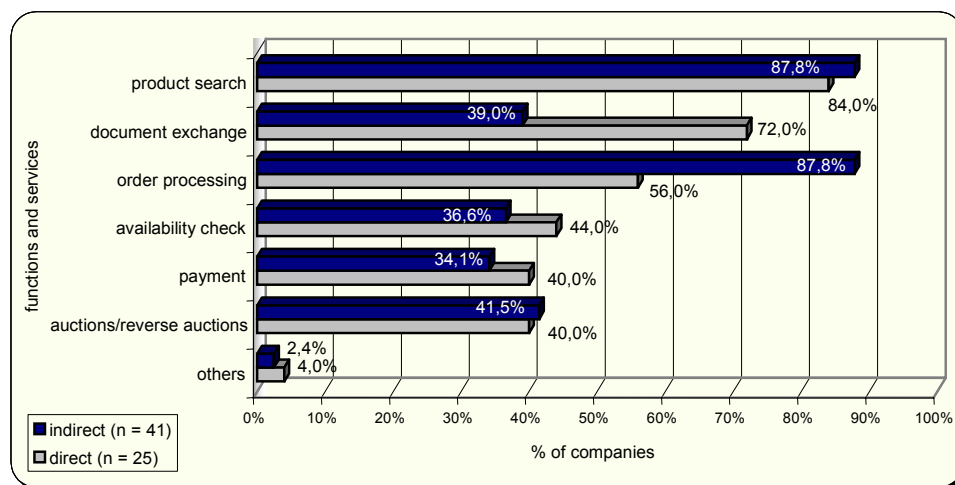


Figure 11. Web-Based Functions and Services

84% of those companies who utilize bilateral e-procurement for direct goods and services use the possibilities to search products in the seller's system. Remarkably, 72.0% use services to exchange documents, about 56.0% use services for the processing of

orders (e.g. order status tracking), and 44.0% use availability checks. 40.0% of the responding enterprises use electronic payment as well as electronic auctions/reverse auctions.

Compared to this, 87.8% of the respondents apply services to search products in the field of indirect goods, about 39.0% to exchange documents, 87.8% use services to process orders, and 36.6% use availability checks. About 34.1% of the responding companies employ services to support electronic payment and moreover 41.5% use auctions/reverse auctions. A usage of functions to support after-sales processes was not named. The empirical results show that there is no clear difference between the usage of functions and services for direct and indirect products except the exchange of documents. It is obvious that the exchange of documents is used more frequent if required items belong to the core competences of a company. Furthermore, availability checks are applied more often for direct goods and services.

The respondents were also asked about the percentage of their procurement volume. Exactly 50% of the responding companies supply about 5 percent, 29.2% between 5 and 15 percent, 16.7% between 15-30 percent, and about 4.2% between 30-40 percent of their direct purchasing volume using bilateral e-procurement. This is equivalent to an average volume of 13.5%. In the field of indirect products 42.5% of the companies in the automotive industry supply 5 percent of their purchasing volume, about 40.0% between 5 and 15 percent, 10% of the companies between 15 and 30 percent, and 7.5% between 30 and 40 percent. With 14.1% the average purchasing volume of indirect items is marginally higher than for direct items.

Transaction and Purchasing Costs

To quantify the effects of Internet-based purchasing, we asked the participants if the use of bilateral e-procurement leads to a reduction in transaction cost (tc) and/or an improvement of their purchasing conditions representing with respect to purchasing costs (pc). Figure 12 shows the reduction of transaction costs and purchasing costs for direct and indirect goods and services for our sample.

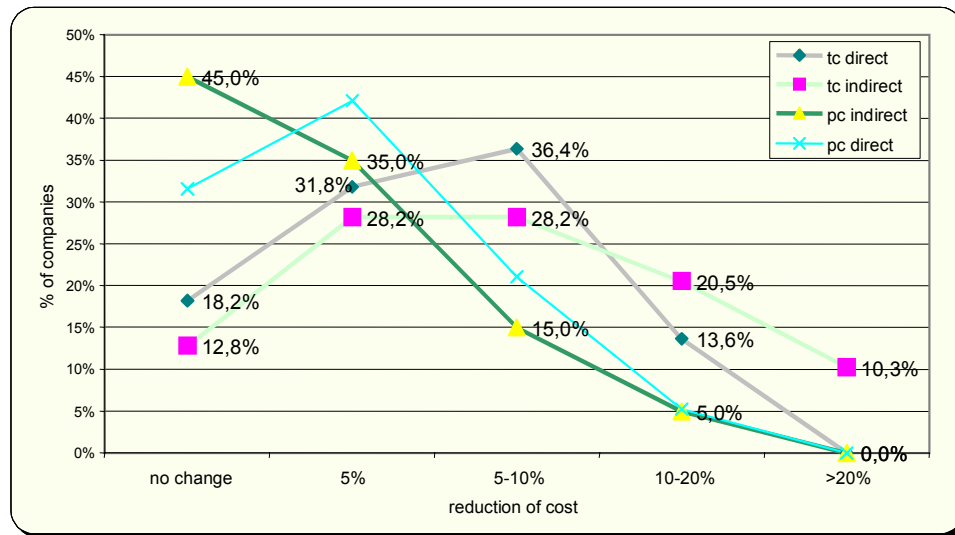


Figure 12. Reduction of Transaction Costs and Purchasing Costs

We believe that enterprises with a consistent e-business strategy achieve a reduction of transaction and purchasing cost more frequently than enterprises without a e-business strategy.

Hypothesis 5 and 6: Enterprises with a consistent e-business strategy achieve a reduction of transaction cost (5) and purchasing cost (6) more frequent than enterprises without a e-business strategy.

More than 80% of the respondents achieve a reduction of transaction costs for direct goods. Only 18.2% have not been successful. Exactly 55% of the responding enterprises have also reduced their purchasing cost. Only 45% have not achieved a positive effect.

For the procurement of indirect products the results are as follows: more than 85% have reduced transaction cost and more than 65% have also reduced their purchasing costs. On average, the companies have reduced their transaction costs for direct (indirect)

procurement by 7.9% (11.4%) and their purchasing cost by 5.3% (4.3%). The positive effects must be qualified because the expenditures (e.g. implementation costs) necessary to rate the benefits of the companies in total were not analyzed in our study.

To analyze if companies with an e-business strategy are more cost effective than companies without a strategy, we have combined effects and strategy in a cross table (see table 1).

Table 1. Transaction Cost Reduction by E-Business Strategy

Strategy cost reduction	Consistent company-wide strategy (n=12)	Strategy in sub-areas (n=9)	No strategy (n=1)
0 %	0,00 %	33,30 %	100,00 %
5 %	58,30 %	0,00 %	0,00 %
5-10 %	25,00 %	55,60 %	0,00 %
10-20 %	16,70 %	11,10 %	0,00 %
>20 %	0,00 %	0,00 %	0,00 %

As table 1 shows, all enterprises with a company-wide-business-strategy and more than 66% with a strategy in sub-areas have reduced their transaction costs by 5% to 20%. It is also obvious that only 1 company without an e-business strategy has experiences with e-procurement for direct goods and services.

Table 2. Purchasing Cost Reduction by E-Business Strategy

Strategy Reduction	Consistent company-wide strategy (n=11)	Strategy in sub-areas (n=8)	No strategy (n=1)
0	36,40 %	50,00 %	100,00 %
5 %	36,40 %	37,50 %	0,00 %
5-10 %	18,20 %	12,50 %	0,00 %
10-20 %	9,10 %	0,00 %	0,00 %
>20 %	0,00 %	0,00 %	0,00 %

Table 2 shows the results for purchasing costs. More than 63% of all enterprises have reduced their purchasing conditions and exactly 50% with an e-business strategy for sub-areas. The results show a trend that companies with an e-business-strategy benefit more often from e-procurement than companies without a strategy. A significant correlation to validate thesis 5 and 6 however was not found for our sample.

Barriers of Implementation

Apart from less complex e-procurement using browser functionality, the implementation of specialized software applications, e.g. SAP Business-to-Business Procurement, is combined with a redesign of processes between multiple enterprises (Siemens 2000). We finally asked the respondents where they see/have seen the largest barriers for the use of e-procurement between companies. Multiple answers were possible (see figure 13).

56.4% of the responding managers see the main barrier of e-procurement for direct goods and services in the integration of new applications with existing in-house systems. 49.5% of the responding companies complain about unclear cost-benefit relations, and 45.5% name insufficient systems on the side of their business partners as a problem. 37.6% of the respondents fear that personal contacts cannot be replaced by electronic media, about 32.7% of the respondents see problems concerning the missing know-how in their companies, 29.7% see implementation cost as a difficulty, and just 21.8% name a missing acceptance by employees.

In the field of indirect procurement, the integration of in-house systems (56.0%) is also seen as the main barrier, followed by unclear cost-benefit relations (46.4%) and insufficient systems on the supplier side (46.4%). About 36.9% of the companies name missing know-how, 32.1% implementation costs, 28.6% the missing acceptance of employees, and just 23.8% of the responding

managers think that personal contacts can not be replaced electronically. It is very obvious that personal contacts between suppliers and buyers play a more significant role in the field of direct than indirect products. Surprisingly, implementation costs (29.7% for direct, 34.1% for indirect) are not a very important argument. Figure 14 shows all parameters named by the responding managers.

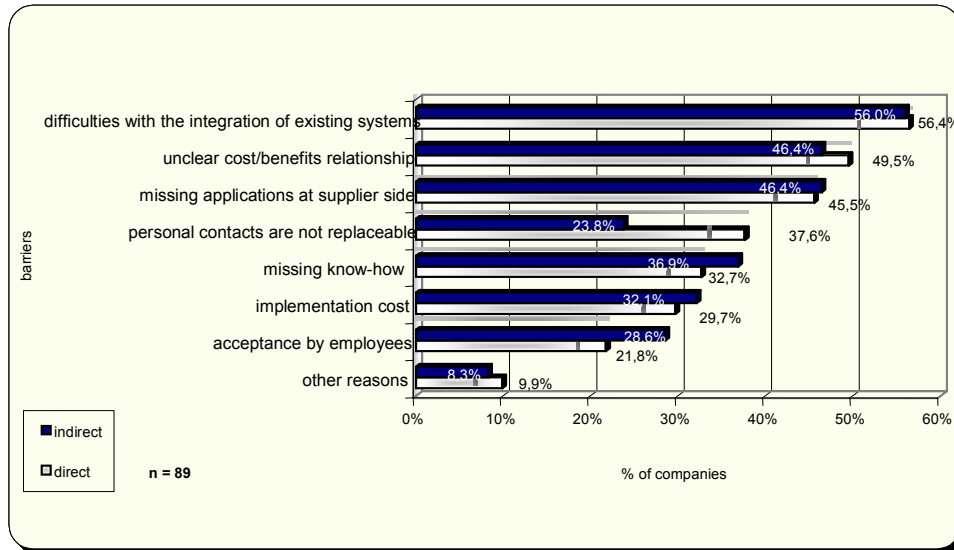


Figure 13. Barriers for Implementation and Utilization of E-Business Software

Summary and Prospect

In this paper we have analyzed the existence of e-business strategies and the use of e-procurement for direct and indirect goods and services in the European automotive industry. In addition to the status quo of e-procurement we proved statistically that e-business strategies are more familiar in large than in small and mid-sized enterprises. We also proved that companies with a consistent e-business strategy use e-procurement for direct goods and services more intensively than companies without an e-business strategy. For the field of indirect goods and services this could not be substantiated. Surprisingly, there appears to be no correlation between the existence of an e-business strategy and efficiency gains in e-procuring goods and services.

If we compare the procurement of direct and indirect items we sustain the following results: e-procurement is used more frequently for indirect than for direct items. Except for the exchange of documents there is no significant difference in the functions and services used for e-procurement in the automotive industry. In both areas only a minor part of the total purchasing volume is done using e-procurement, with a higher percentage of e-procurement in the area of indirect goods. Compared to the area of direct goods and services, the average transaction cost reduction for the procurement of indirect products is marginally higher. The situation changes if we look at purchasing conditions. Because of missing implementation costs the achieved effects cannot be rated at all. Therefore we will analyze these input factors in the future to make a detailed cost/benefit analysis possible. The greatest barrier for implementing buy-side solutions in the automotive companies is the integration with company-internal systems. Except for excluding personal contacts, other barriers in both areas are almost identical. It is obvious that personal contacts can not as easily be replaced for direct than for indirect goods and services.

The small volume of enterprise using e-procurement for production-related items illustrate that currently bilateral e-procurement plays a minor role for supply-chain management in the automotive industry.

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