

Service-based Business Concepts: Diffusion and Effects on Customer Companies in the German Manufacturing Industry

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Abstract

An increasing number of manufacturing companies are shifting their focus from offering products to an integrated offer of products and services. Customers no longer pay for a product, but for its performance. The challenges for the providers of service-based business models have been extensively examined in academic research. The customer side, however, has received much less scientific attention by comparison. Whilst the diffusion of product-service bundles on the provider side has been examined in many qualitative analyses and a few empirical studies, only some case studies have investigated the effects of these offers on the customer side. Our paper aims to provide insights into the actual application of advanced services concepts in the German manufacturing industry. Data is drawn from the broad empirical database of a sample of 1,484 companies from German manufacturing industry conducted in 2009. The analysis presented in this paper indicates that 25 % of the responding manufacturing companies actually use advanced service offers. Furthermore, for a selected set of specific service-based business offers insights are provided into which operational cost categories customers were able to realize reductions. Finally, insights into the character of industrial customers of advanced services could be gained by investigating the internal attitude towards risk management and life cycle cost methods.

Keywords: Service-based business concepts, quantitative analysis, manufacturing industry

Introduction

The trend in manufacturing industry from traditional manufacturer of products to solution provider remains unbroken. An increasing number of manufacturing companies are shifting their focus from offering products to an integrated offer of products and services. Terms like servitization (Vandermerwe and Rada, 1988), product-service systems (Goedkoop et al., 1999), industrial-product-service systems (Mont 2002) or hybrid products (Velamuri et al., 2010) describe this phenomenon. Research literature is quite unanimous in promoting the positive effects of incorporating services into the core

product offering (Oliva and Kallenberg, 2003). The factors most mentioned in the literature are: higher margins realized through services (Oliva und Kallenberg, 2003), growth opportunities in mature markets (Brax, 2005), extended customer relationships, balancing of economic cycles and the differentiation potential against low-cost competitors. In addition to positive effects for the industry, product-service offers have also been promoted as a means to reduce environmental impact by decoupling economic success (Baines et al., 2007).

Due to the different requirements for offering services, product-oriented strategies and their operational implementation need to be adjusted to the new business concept. To support manufacturing companies in this transition from a product-based to a service-based business concept, various management aspects have been the object of academic analysis. Organizational changes (Oliva and Kallenberg, 2003) resulting from the enhanced service activities, specialties in services marketing (Davies et al., 2007) and controlling (Reichwald and Wegner, 2008) are just some examples that underline the intensive examination of the provider side of these new business concepts. The customer side, however, has received much less scientific attention by comparison. To the best of our knowledge, in the existing research on the effects on customers of service-based business concepts in manufacturing industry, only a few case studies have been carried out. Case study research is a highly valuable methodology as it allows in-depth exploration of benefits and risks related to industrial services. However, case study research alone cannot determine the representativeness of the findings. Thus, additional quantitative research is lacking in this field to provide a higher level of rigor on this research topic (Jacob and Ulaga, 2008).

Our paper aims to fill this gap by using a broad empirical database of manufacturing services to answer the following research questions:

- What level of diffusion of service-based business concepts is achieved on the customer side? How intensively are they used and which industry dominates in terms of application?
- What kind of costs could customers reduce through using service-based business concepts?
- How do concepts like risk management and life cycle costs affect the decision to use service-based business concepts?

This paper will answer these questions by utilizing the database of the German Manufacturing Survey (GMS) of 2009.

Empirical Research on Service-based Business Concepts

Advantages and challenges for the provider of an integrated offer of services and products have already been the subject of various academic studies. Besides qualitative research (Oliva and Kallenberg, 2003; Brax, 2005) quantitative studies have also examined this subject. By analyzing more than 10 000 firms using the OSIRIS database, Neely (2008) provided evidence that nearly 30 % of manufacturing companies incorporate service offerings into their portfolio. Empirical studies by Lay and Erceg (2002) found that product manufacturers realized the highest potential margins through adding services to their portfolio. Later analysis by Gebauer et al. (2005) and Fang et al. (2008) analyzed the specific margins achievable for the provider in more detail. Cusumano (2008) in his work empirically underpinned the significant impacts of the service shift in the software industry. The findings of these quantitative analyses

indicate the growing interest in advanced services in the manufacturing sector as well as their potential to realize higher margins.

The information gained for the provider side promotes adding services as a means to gain competitive advantage. However, information on the actual market demand for these services and benefits for the customer is missing.

Classification of Service-based Business Concepts

The term service-based business concept subsumes a myriad of possible product-service designs. To manage this multitude of concepts in a questionnaire, characteristic types of service-based business concepts need to be classified and prominent representatives identified. A widely acknowledged classification scheme of product-service bundles in scientific literature distinguishes these offers into product-oriented services, use-oriented services and result-oriented services (Tukker, 2004). Whereas product-oriented services describe traditional services offered as an add-on to the product, aiming to improve its functionality, use-oriented and result-oriented services characterize more advanced service offers. Both sub-categories require a deeper integration of the provider in the value generating processes of the customer, associated with a transfer of risks from customer to provider (Vargo and Lusch, 2004; Baines et al., 2007). Use-oriented services aim to increase the utilization capacity of a product. Prominent use-oriented service concepts are

- availability guarantees: this concept guarantees the customer a pre-defined level of availability for the product. The provider monitors the operating conditions of the product and/or extends this by comprehensive maintenance activities (Kim et al., 2007)
- guaranteed total costs of ownership (TCO): with this service concept the customer gets a guarantee of the total occurring operating costs of the product over its entire life cycle.
- continuous optimization: this service offer allows the customer to fully exploit the productive potential of the product, as the provider brings in his expertise by integrating and operating the product in the customer's specific production system.

By applying result-oriented services the customer buys the output produced with the product instead of the product itself (Tukker, 2004; Roy, 2000). Concepts that can be assigned to this category are:

- pay on production: with this concept the customer pays a preliminary fixed price for the output produced with the product (e.g., parts produced). All operational activities to produce this outcome are assigned to the product manufacturer.
- chemical management services: this service offers the customer the possibility to buy only the function of the chemical, not the chemical itself (Mont, 2002).

The five product-service bundles, in the following also referred to as hybrid products, have been selected through a literature review as prominent representatives of applied use and result-oriented service concepts and form the units of analysis in our study.

Database and Methodology

The analyses in the following sections are based on the “German Manufacturing Survey” database. It provides a large set of data on the use of service-based business concepts in manufacturing industries. The objective of this regularly conducted, questionnaire-based, mail survey is to systematically observe process innovation and the thereby achieved increase in performance perceived at company level. Thus it offers a unique opportunity in Germany to cover the current lacks of product-service research by complementing the well established qualitative research with quantitative analysis. The database covers 1,484 German companies providing a representative database for all manufacturing sectors. The survey targeted the sectors 15 to 37 according to the "Nomenclature statistique des activités économiques dans la Communauté européenne" (NACE) of firms with more than 20 employees and was conducted in 2009. 15,576 German manufacturing establishments were contacted. By August 2009, 1,484 establishments sent back a completed and usable questionnaire. The rate of return is thus approximately 10%. In order to ensure that the data sample is representative for manufacturing industry in Germany, the distribution of the responding companies was compared with data from the German Federal Statistical Office for their sector classification and size. The sample differs insignificantly from the official reported distribution of industry sectors, as Figure 1 shows. Only the return from the manufacturing, food, beverages and tobacco companies is below average. Also the comparison of the distribution of companies in the sample according to their size shows that the database adequately reflects the industry structure: the majority of manufacturing companies in Germany employ less than 100 employees, amounting to about 72% of the whole sector in the official statistics (Statistisches Bundesamt 2008, 2009) and 63% in the analyzed sample.

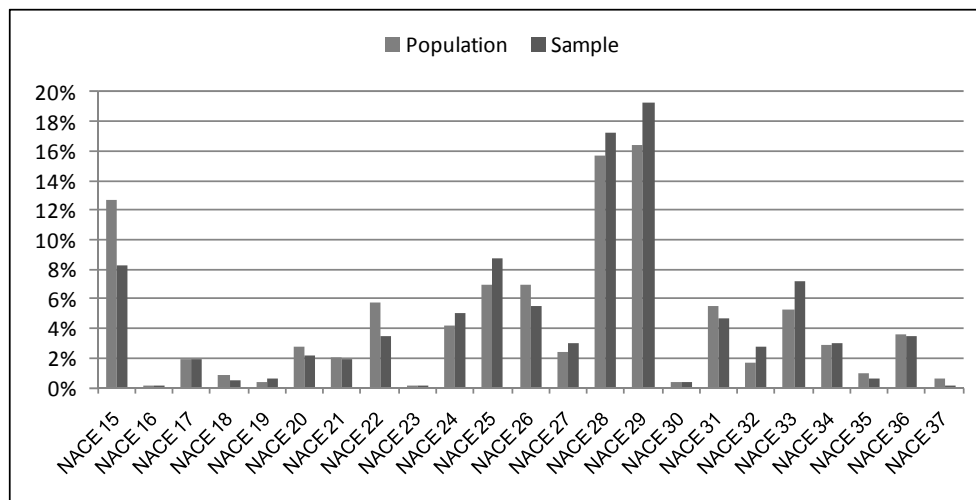


Figure 1: Comparison of sector distribution of sample and universe

Results

Extent of use of hybrid products

First of all, if we examine to what extent hybrid products have been used by client firms within the manufacturing sector up to now, it appears that 25 % of the businesses already utilize one product-service concept. Only few firms however resort to various hybrid products on a larger scale. For instance, only 2 % of all firms utilize at least three of the product-service concepts described and 6 % of all companies use exactly two. 17 % of the companies, however, state that they have applied only one of the hybrid

products examined here. These rates also highlight that the vast majority of all businesses in the manufacturing sector have not yet used one of these hybrid products in order to achieve higher availability, productivity levels and process quality improvements. Possible reasons for this poor diffusion could lie in the lack of service concepts specifically tailored to the needs of the client firm, or in the fact that customers estimate the advantages of these concepts for their production as too low.

In the following, hybrid products are examined more closely with respect to their utilization by industrial customers. It emerged that contracts based on availability are entered into relatively frequently. 12 % of all companies already use this form extensively, 4 % use it in the framework of pilot projects. If we examine how frequently availability guarantees are used in the various branches of manufacturing industry, then it appears that there are clear-cut differences between the individual sectors. Customers of this approach are often businesses from the sectors vehicle construction, the electrical and chemical industries.

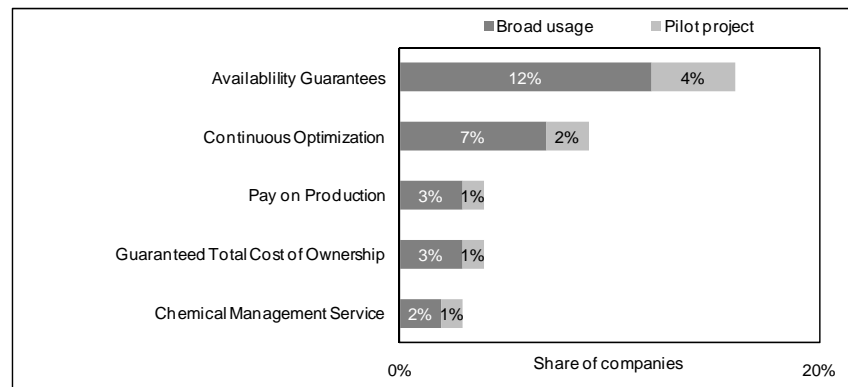


Figure 2: Usage of different Service-based Business Concepts

Continuous optimization of equipment appears to be the second most common concept demanded. 7 % of all companies extensively use it, whereas 2 % have just started applying this concept. The remaining concepts are not broadly distributed amongst customers. Three percent of industrial companies already have experience in using pay on production concepts as well as total cost of ownership, and 1% applies each of these concepts in pilot projects. Manufacturing customers apply the chemical management service least of all. 2% of customers report broad usage and 1 % use this hybrid product primarily in pilot projects. Most companies within these customer groups could be assigned to the manufacturers of transport equipment and manufactures of food products (see Figure 2).

Cost Reduction realized by Industrial Customers of Hybrid Products

By comparison with the traditional sale of the product, the provider remains in charge of the performance of its products after the point of sale. Through the changed payment structure, the provider has incentives to actively contribute his knowledge to optimize the productivity of the manufactured good during the use phase of the customer, or in some cases, over its complete life cycle which thus leads to reductions in operating costs (Lay et al., 2008). These reductions will be tested in this paper for the following operational cost categories: material/energy consumption, reduction of downtime, reduced costs for spare parts, cost for defective parts and costs for planning and organization. 36 % of the firms that submitted claims under the availability guarantee state that this reduced their costs for spare parts. One cause of these savings could be the

clauses often contained in contracts guaranteeing availability. These clauses guarantee the customer that he pays only to ensure the desired availability, regardless of the spare parts costs incurred by the provider to provide the service. To a comparatively small extent, the customers of availability guarantees stated that they had thereby reduced their planning and organization costs (19 %), scrap costs (18 %) as well as material and energy consumption (15 %). However, these shares should not be discounted as insignificant. Planning and organizational expenses can be reduced for example by transferring these activities to the area of repairs and maintenance planning. The reduction of the scrap costs can be due to the fact that production processes are stabilized through greater availability of the machines and equipment and therefore lower scrap rates and re-working costs occur. A reduction of the scrap rates can also have a positive impact on the material consumption of the customer (see Figure 3).

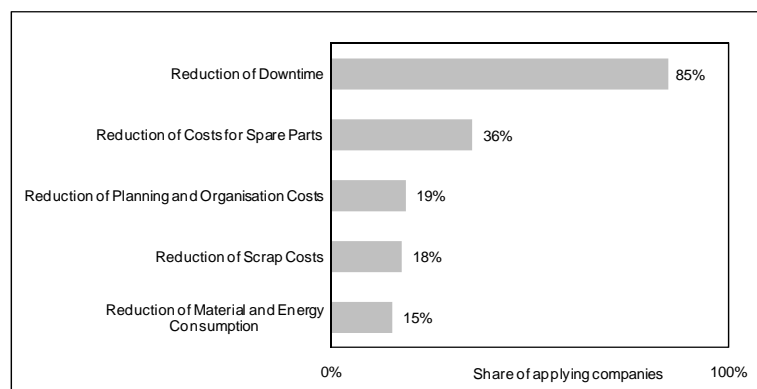


Figure 3: Customer Impacts of Availability Guarantees

The hybrid products "guaranteed TCO" and "contracts for continuous optimization" appear to affect the firms using them in very similar ways. 60 % of the clients using each of these concepts indicated that they had led to reductions in downtime in their production. Also in the dimensions reduced material and energy consumption, scrap costs as well as planning and organization costs the two offers differ only by a few percentage points (see Figure 4).

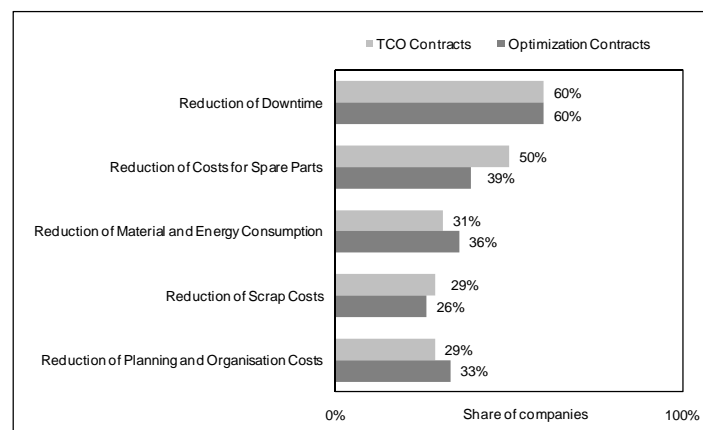


Figure 4: Customer Impacts of TCO and On-going Optimization Contracts

Only in the area spare parts costs were many more firms using the hybrid product "guaranteed life cycle costs" able to observe positive effects than companies that took advantage of services from the "contracts for on-going optimization". One explanation for this could be that commonly in hybrid products when guaranteeing life cycle costs

an upper limit for spare parts costs is defined. If the actual costs for spare parts exceed this limit, then they must be borne by the manufacturer.

The analysis further showed that most of the companies using pay on production concepts realized a significant reduction of planning and organizational costs. This can be because the provider is not bound to customer design regulations anymore for the way the production systems is set up, as the payment is based on the part produced (Lay et al., 2008). Furthermore, providers of this advanced service could be in charge of operating the product, procuring raw material or transporting the end product. The fact that all these additional tasks are performed by the provider reduces the organizational effort for the customer. By comparison, the contribution of pay on production concepts towards reducing downtime and scrap costs is rather low. Only 19% respectively 21 % of industrial customers reported savings in these cost categories. This might suggest that those operational cost categories are not a major target in this offer. 31 % of the firms on the other hand stated that they were able to save on material and energy costs by making use of this offer (see Figure 5). It is possible that the greater process know-how of the providers of pay on production concepts means that they can operate the equipment more efficiently with regard to material and energy than the customer. In addition, pay on production models can be so designed that certain costs for material or spare parts are no longer incurred by the buying firm but by the provider. This again leads directly to cost savings for the provider.

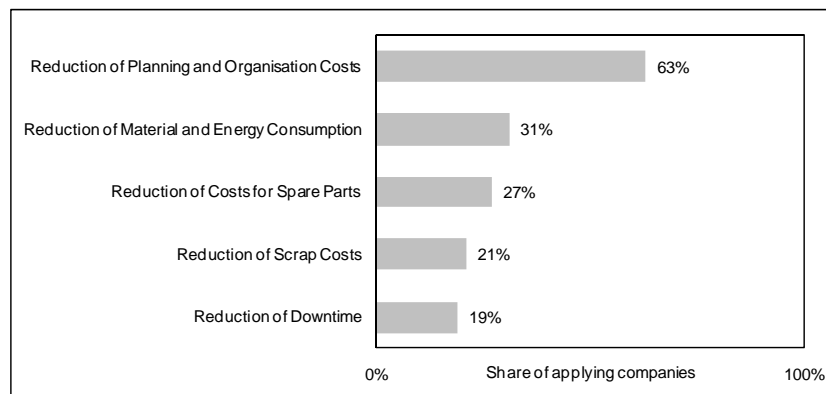


Figure 5: Customer Impacts of Pay on Production Concepts

The great majority of companies inquired about offers of chemicals leasing indicated that this approach led to savings, not only in chemical consumption, but also in the areas of organization and planning costs (63 %). Since in the chemical leasing model the customer pays for the chemical function, and not for the amount of chemicals required as in the sales model, the provider has an economic interest to achieve the specified performance with the minimum amount of chemicals. In addition, the provider of the chemical leasing decides on the best processes, ensures the proper use of the chemicals and handles the scheduling of the quantities required. Thus it is possible to reduce the planning and organizational costs compared with the sales-oriented model. Only very few firms indicated that savings could be realized in the areas of spare parts costs (27 %), scrap rate (21 %) and downtime costs (19 %) by using the hybrid product (see Figure 6).

Effect of Internal Applied Risk Management

Previous research could provide qualitative evidence that the transfer of risks through the redistribution of the property rights from the customer to the supplier is one of the

main characteristics of these models (Hockerts 2008). Thus, companies that have established an effective risk management system must be more aware of their risks and might use service-based business concepts more often in order to strategically reduce corporate risks. An analysis of the characteristics of companies concerning the scope of their risk management shows that manufacturing companies that are more aware of their risk management use service based-business concepts to a greater extent. A possible explanation could be that customers who are more aware of potential risks utilize these new business concepts to consciously lower their risks through transferring them to the provider. Furthermore, the value creation in service-based business concepts is realized through a co-operation of customer and provider in the value generating processes of the customer (Vargo and Lusch, 2004).

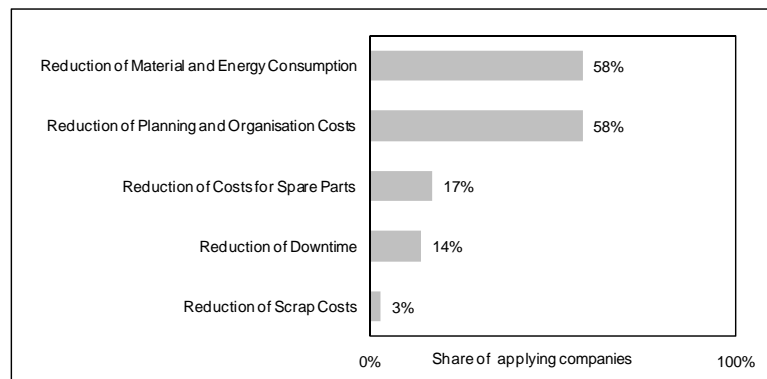


Figure 6: Customer Impacts of Chemical Management Service Concepts

Due to the required closer collaboration with suppliers, customers might be reluctant to realize these new business concepts as they fear revealing intimate knowledge of their operation (Gebauer et al., 2005). Those companies that include the risk of counterfeiting and losing know-how in their internal risk management apply service-based business concepts nearly twice as often (40 %) as companies which do not have this issue embedded in their risk concept (22 %).

Effect of Internal Applied Life Cycle Costing

It would be an advantage for the diffusion of hybrid products if companies were to utilize appropriate assessment procedures to calculate life cycle costs. This is the basis for a benefit comparison between the classical purchase of a machine, plant or chemical and the alternative of using a hybrid product, as well as for estimating the possible value added. An analysis of this relationship impressively confirms this correlation.

Thus firms which employ procedures to calculate the life cycle costs of investments utilize each of the analyzed hybrid products at least three times more frequently than companies which do not use these methods (Figure 7). However, currently only 14 % of firms calculate life cycle costs. Pioneers here are the vehicle construction industry with 28 % and the electrical industry with 26 % of companies calculating these costs. The present low diffusion rate for hybrid products appears to be correlated with the fact that many firms have not yet introduced a systematic collection and evaluation of the life cycle costs of their means of production. Recording and assessing the costs which arise during the usage period of a machine usually requires a comprehensive data collection, which is both time- and manpower-intensive. Without a structured investigation, however, the sum of costs which occur due to downtime, scrapping or the energy consumption of a plant often remains unnoticed. The increasing use of life cycle cost assessments, coupled with increasing firm size and correspondingly greater resources,

appears to confirm this explanation. Less than 7 % of the firms with less than 50 employees have such assessment procedures in place, compared with almost 29 % of the firms with 250 and more employees. Due to the current discussions about the growing relevance of the costs during the utilization phase of capital goods, not least because of the expected increases in material and energy prices, it can be anticipated that the concept of life cycle cost assessment will be of greater relevance in the future. If the results of the above analysis are confirmed, it can be expected that hybrid products will proliferate more in the future.

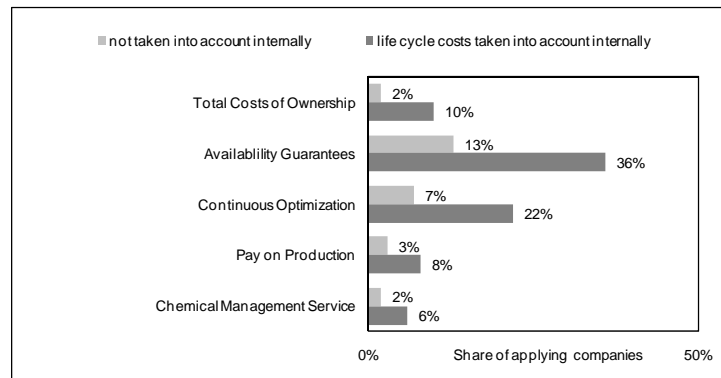


Figure 7: Usage of Life Cycle Cost Principles and Usage of Service-based Business Concepts

Conclusions and Need for Further Research

Our findings show that 25 % of the responding manufacturing companies use at least one of the selected hybrid products. Customers demand offers targeting the reduction of downtime and spare parts (e.g., availability guarantees) more often than service offers aiming to reduce planning and organizational costs or to reduce the level of material or energy consumption. In the end, it could also be shown that companies using internal accounting methods like life cycle costing to evaluate planned investments appear nearly three times more than customers of advanced services (i.e., industrial customers) who make no use of these evaluation methods. Our results provide a starting point for further quantitative studies on the customer side of service-based business concepts in manufacturing industry. The results, especially the reduction of different costs through applying a specific business concept, might help providers to target the right customer group according to their service offered. Furthermore, the results of this study provide insights on the efficient adoption of operational design to the requirements of services by analyzing to which extent customers are able to exploit the value proposition of concepts offered.

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