

Working Papers



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*Zukunft in
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***A critical review of the value
chain concept and a proposal
for a revised version***

Abstract

The scientific aim of this working paper is to review the well-known concept of the value chain and to evaluate the different activities under the current conditions and circumstances. The main question of research is to find out if the classification and composition of the various activities is still up-to-date.

Methodologically, both a conceptual and an analytical approach are chosen. Using latest literature, statistical data and logical conclusions, the value drivers are critically under revision.

The main finding is that the impact of innovation and procurement on the cost and value position of a company is related to the primary activities. On the other hand, the findings suggest that logistical activities should be classified as supporting activities.

Keywords: value chain, competitive advantage, innovation, primary activities, supporting activities, logistics, procurement

A critical review of Porter's value chain concept and a proposal for a revised version

Günter Hofbauer, Anita Sangl

1. Introduction

The reason for doing the research in this working paper is, that processes, organizations and business models have been changing rapidly during the last three decades. There are changes in business activities and operations on a large scale and with high impact. Significant examples are automation, digitalization, big data, artificial intelligence and considerable changes in business models, global supply structures and real net output ratios. Consequentially management concepts and analytical tools, which are oriented towards the past, should be replaced or at least adapted to current conditions and trends.

Competitive advantages are decisive prerequisites for companies in order to create value. The value chain concept of Porter served for more than three decades now as a well proven tool to analyze competitive advantage of companies, based on business activities. During the last 35 years we have been able to observe that activities, operations, business models, companies and all other business-related processes have been transforming and changing in a very fast and inexorable way.

According to Porter competitive advantage can be achieved, when a company earns profit by creating and offering value. A higher competitive advantage can be gained in providing more value to the customers. So the critical issues under research should be first the value creating (primary) activities. For these activities budgets should be allocated according to their significance and impact. Following this logic, value should be created and cost should be cut and kept low – a basic economic principle.

The impetus of this research topic was the changing role of procurement. Originally, procurement was characterized as a secondary activity (Porter 1985). But during the last decades the impact of procurement has changed considerably (Hofbauer and Bauer 2004; Hofbauer 2017). The role of procurement for example is not any more just the supportive ordering department.

Procurement has changed into a value creator, by integrating the various internal activities and combining them directly with the value creating activities of the suppliers.

It is a matter of fact that procurement is meanwhile of essential importance in the value chain of a company and contributes to value creation within the value chain of a company (Hofbauer and Sangl 2017). This becomes clear, if we take a deeper look into a typical cost structure. The cost breakdown for the automotive industry shows exemplarily that the share of the external sourced material is about 70% of gross production value. Products, their performance and particularly the price, which a company offers to its customers, are mainly determined by procurement activities. Adequate levels of successful vertical and horizontal supplier integration will be shown in this article (Hofbauer, Mashhour and Fischer 2016).

The value position is more driven by innovations coming from sourcing markets than by price reductions. This perception leads directly to the question how to integrate innovation management activities into the value chain. Undoubtedly innovations have a high potential to create value. In this article statistical data will show the significance of innovation management. Furthermore, the relevance of open innovation will be justified.

The primary activities are not only analyzed whether all relevant activities are included, in addition, existing activities are examined whether they still create value or if they should better be shifted to the secondary activities. In the case of logistics, it will be demonstrated that these activities are not any more contributing to value creation. This will be substantiated by statistical data in combination with basic principles about unnecessary activities.

As time changes, reality changes and the management literature has to keep up with the time. Hence the purpose of this article is to provide a revised, contemporary, clear and well-structured concept of the value chain. The benefit of this working paper is the presentation of an updated conceptual basis for the revised configuration of primary and secondary activities and reveals perspectives for further applications. The research will be continued with the analysis of business-related activities on an empirical basis.

2. Analysis of Primary Activities

The basic question is, how a company is able to manage the transformation of business inputs into business outputs and create value, which is higher than the cost of creating that output. This value added indicates the margin. This margin is defined as: Value Created and Captured minus Cost of Creating that Value.

In this article this basic economic principle will be followed and taken under research with a contemporary view on all the activities necessary to create value. First the initial situation will be shown (2.1). Second the problems will be formulated and the working hypotheses will be stated (2.2). Third the questions of research will be discussed and reasons will be given in order to answer the questions of research (2.3; 2.4 and 2.5). Chapter 3 will show an interim result for the primary activities. The secondary activities will be explained in chapter 4. A solution will be provided in chapter 5 and a proposal will be given including all critical issues under research. The conclusion is provided in chapter 6.

2.1. Initial Situation of Porter's Value Chain

Porter introduced a general-purpose model of the value chain (Porter 1985), which can be used by companies to examine the valuable activities of a company. The value chain is a combination of business activities a company carries out in order to create value. The value can be differentiated in value to and value from the customer. The way in which these activities are carried out determines the cost and value proposition and in the long run affects the profitability and competitiveness of a company.

The value chain helps managers to understand what factors are determining the value. Porter's value chain is one of the most cited management concepts of the last decades. In the well-known value chain model (Figure 1) the value activities are split into primary activities and support activities.

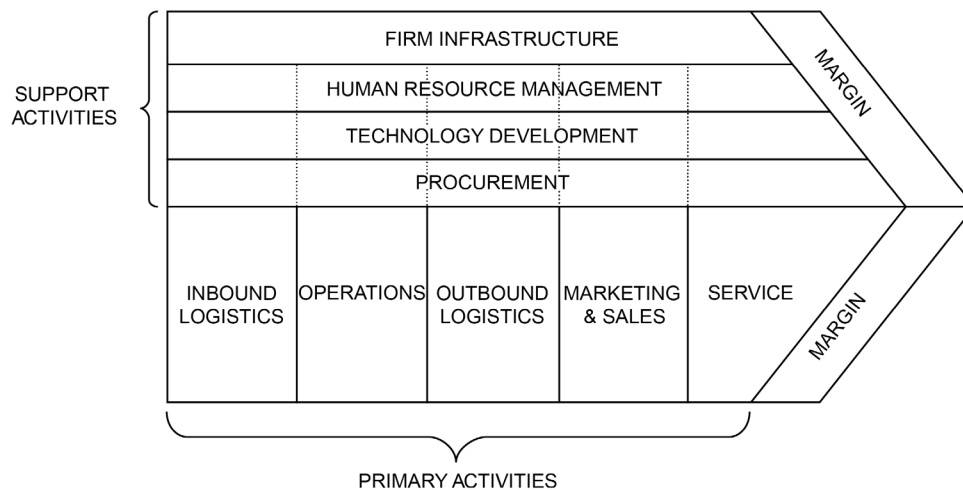


Figure 1: Porter's Value Chain (Porter, 2004)

This working paper focuses on primary activities. Following Porter, primary activities directly relate to the physical creation of a product (Porter, 1985). In the original proposal, those primary activities consist of:

Inbound logistics: these activities cover receiving and storing as well as the internal distribution of inputs, such as warehousing, vehicle control, material handling, inventory control and returns to suppliers.

Operations: the operational system creates value in transforming the inputs into valuable outputs, which can be sold to customers. Numerous activities have to be carried out like machining, assembly, testing, printing, packaging and facility operations in order to get the final product.

Outbound logistics: these activities are necessary to delivered the products to the customers. These activities include material handling, storage, collection and physical distribution of products to buyers, warehousing, order processing, scheduling and delivery vehicle operations.

Marketing and Sales: these activities are essential for identification, acquisition and retention of customers, willing to buy the company's products rather than products of competitors. All activities related with providing goods to customers and inducing them to do so like advertising, sales force, channel management and pricing are included here.

Service: Service activities refer to maintain or even enhance the value of the product, such as product installation, adjustment, repair, refurbish, and spare parts supply.

2.2. Problem formulation and working hypotheses

The value chain displays the different steps of creating and accumulating value of a product in a structured string of process activities. The characteristic of primary activities is that they are creating value, this means that they initiate more value than the cost of these activities. Within this logic the secondary activities use resources without creating value, nevertheless they are important supporters of the primary activities.

To be considered as one of the primary activities, an activity has to be involved in the physical creation of the products, its sale to the buyer or in the products' aftersales assistance and have to be clearly assigned (Porter 2004).

The following hypotheses shall serve for research:

Hypothesis no. 1: All primary activities are listed completely. If any so far neglected activity is verified to create value, then this activity has to be considered as a primary activity!

Hypothesis no. 2: All included primary activities are relevant. If any primary activity should not be relevant any more, then this activity has to be considered as a secondary activity!

2.3. Consideration of Procurement as a Value Creator

According to Porter's statement, procurement -in the context of the value chain- is one of the so called secondary or supporting activities. In contemporary practice procurement can be recognized of being involved right from the very early beginning into the development and sourcing process of a new product (Hofbauer 2017; Hecht and Goldbach 2017). Thus, we can suggest, that through accurate specification and selection of co-developers, suppliers, production materials and manufacturing processes also the procurement activity takes over a significant role to a product's concept and design and accordingly to its physical creation and value generation.

Porter recognizes the value contribution of procurement departments for companies. According to Porter the cost proportion of procurement activities are usually quite low or even a negligible portion of total costs (Porter 2004). Even though the pure cost of the procurement department have a quite small share in total cost, the responsibility of this activity however is quite high and sums up to a share of 70.5% of total cost (see Fig. 4) depending on the industry. Thus, nowadays procurement has a huge impact on the company's overall costs, quality, innovativeness and its differentiation as well. The improved purchasing and procurement activities can strongly affect the cost and value proposition.

Furthermore, they have also a lasting effect on other activities, which continue to use the inputs and interact with the suppliers. This leads to the basic research question of this paper, which is to identify the impact of procurement in creating value.

The transformation from purchasing to procurement forms the scientific basis for this paper. In former times the operational buying execution was recognized as an assisting activity for other managerial functions within the value chain of a company. So previously the main goal was only operationally executing orders and focused on cost optimization. Since the late 1980s, when the competitive potential of procurement was emerging, the matter and meaning of procurement has been subject to constant change (Hofbauer 2013; Lingohr and Kruschel 2011, p. 87). This change is particularly due to the ongoing and increasing concentration on core competencies of the original equipment manufacturers (OEMs) and as a consequence thereof the reduction of steps in the own production process as well as on different research and development levels. Instead of producing all the necessary parts and components by the OEMs, these parts were more and more sourced from suppliers, which are able to produce those parts and modules often more economically (Hofbauer, Mashhour and Fischer 2016). Up to now the generation of value became more and more important.

Figure 2 shows the transition of procurement.

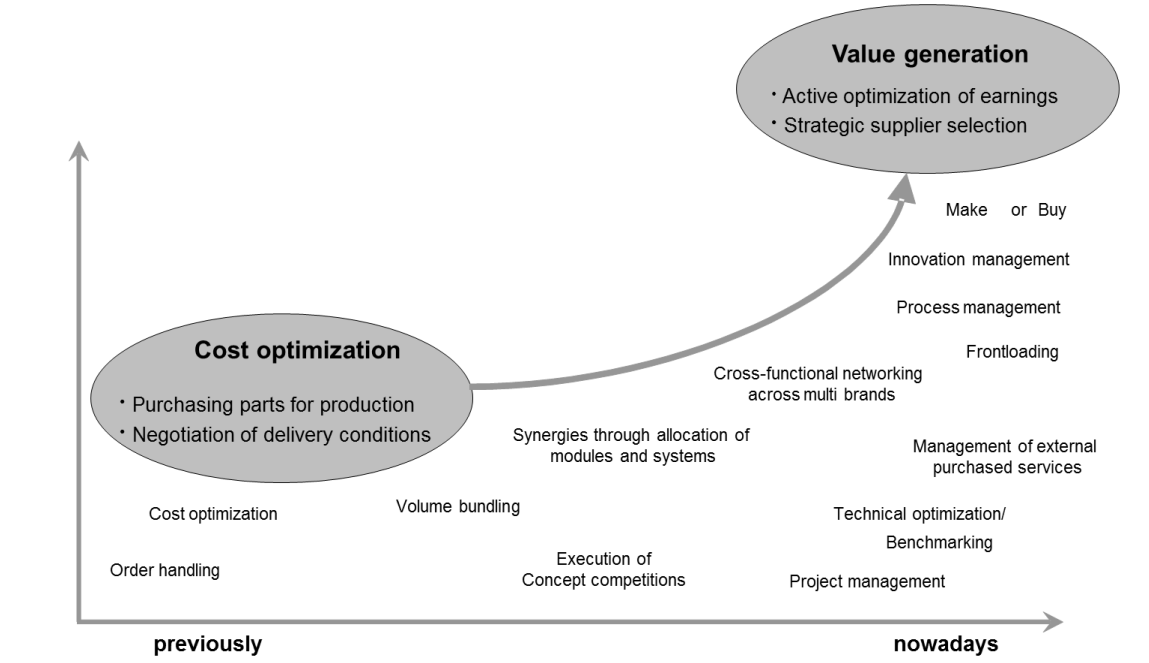


Figure 2: Transition of procurement (Hofbauer, Mashhour & Fischer 2016, p. 3)

The change of targets and substance was increasing over time. At the very beginning the purchasing department had to buy parts at the lowest price. The main task was cost optimization. The next step was the introduction of a structured process within the company in order to execute the buying process in the most efficient way. After this process optimization the procurement focused on the suppliers (Hofbauer, Mashhour & Fischer 2016). The scope was to combine the value chains of the suppliers with the interface of the own supply chain of the company. The scope was to improve the performance of suppliers and to avoid discontinuities in the supply chains. The latest step was the integration management (Hofbauer and Sangl 2017). The suppliers have to be integrated into various activities over the whole value chain.

Figure 3 shows the different steps of evolution, achieving more and more potential of value.

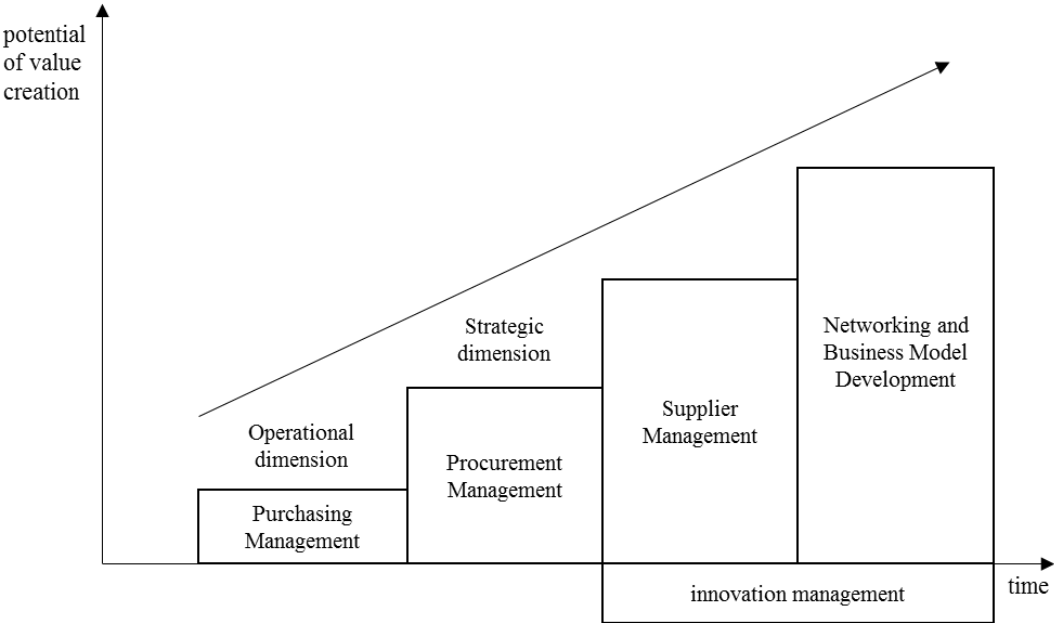


Figure 3: Evolutionary steps of procurement over time (Hofbauer, Glazunova and Hecht 2015, p. 3)

Market saturation, decreasing prices and margins as well as increasing competitive pressure enforce the turnaround away from traditional purchasing towards a modern and strategic oriented procurement management (Hofbauer 2016; Hofbauer 2017; Kerkhoff 2008) and will rise new scientific challenges. The main task however to create value is unchanged and to a greater extent in the focus of the management.

Four different arguments can be mentioned for the relevance of procurement in creating value. These arguments are quantitative, qualitative, gradual and structural:

Quantitative arguments

The enhanced importance of procurement for creating value can be illustrated by a numerical example in terms of the volume. According to the German Federal Statistical Office (Statistisches Bundesamt 2018) the share of sourced material including trading goods in the automotive industry was constantly growing over years and represents nowadays about 70.5% of gross production value.

Figure 4 shows the proportion of sourced material. So, the major lever to optimize a company's cost position is the position of material costs. This can be stated over all industries.

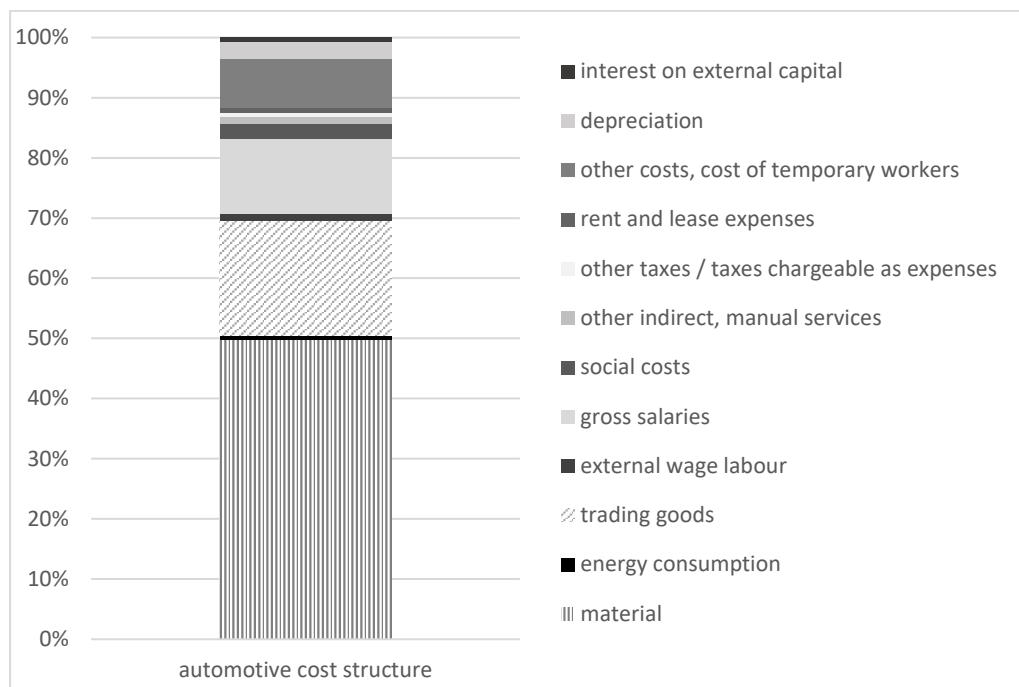


Figure 4: Proportions of material costs in the automotive industry (proportion to gross production value) Source: own graph, based on data from Statistisches Bundesamt, 2018

Procurement represents the interface between companies and sourcing markets.

Procurement can contribute to competitive advantage and the relevant objectives of procurement can be derived from the corresponding entrepreneurial objectives (Hofbauer and Hecht 2017; Janker 2004, p. 17-18; Koppelman 2004, p. 112-115; Hofbauer 2017; Hofbauer 2013, p. 17-20).

As positions of material costs have a direct impact on a firm's profitability, cost objectives have a remarkable importance.

A meaningful example underlines this statement: a decrease of material costs of only 3% causes the same impact on profit as an increase in sales of 60% (assumptions: calculatory expected return 3%, share of costs of materials 60%) (Wildemann 2008, p. 3).

Qualitative arguments

Some enterprises recognize very well the leverage effect of procurement. In 2015 a survey of BAK Basel Economics and Deloitte among about 400 enterprises in the Swiss Mechanical and Electrical Engineering Industries emphasizes the high importance of procurement activities: 60% indicate, that optimizing and increasing the efficiency of the procurement process will play a dominating role to enhance efficiency and achieve substantial cost reduction (Deloitte and BAK Basel Economics, n.d.). In order to manage these challenges, there has to be a qualitative change in tasks of procurement.

One of the main tasks is to ensure the quality of sourced parts. Continuous supply and reliable quality of raw-material and other sourced parts, modules and systems is indispensable. Last but not least the increasing flexibility is a procurement objective as well (Janker 2004, p. 18; Koppelman 2004, p. 117).

In addition to the management of rising volume there are more tasks arising for procurement management. Regarding its function in a company, procurement can be split into a strategic part and an operational one (Dölle 2013, p. 4; Hofbauer, Mashhour and Fischer 2016 p. 9; Bundesverband Materialwirtschaft 2008, p. 116). In this context strategic procurement provides the framework for the operational business and determines the direction. Topmost objective is to ensure reliability of supply (Hofbauer, Mashhour and Fischer 2016, p. 10). Figure 5 shows the main tasks, which can be linked to this objective (Müssigmann 2007, p. 11).

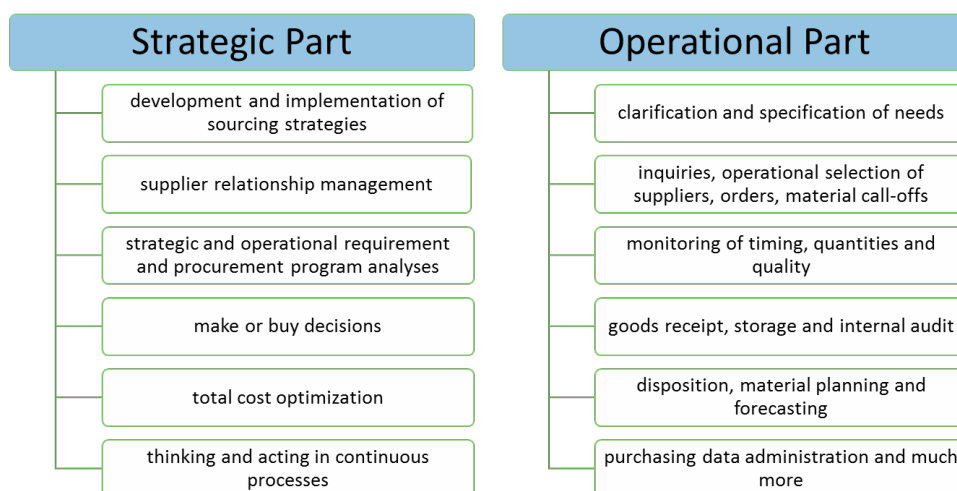


Figure 5: Strategic and operational tasks of procurement

According to empirical results, companies, which do not seize the opportunity of early material and supplier decisions, will suffer from strategic disadvantages (Kerkhoff 2008, p. 56). Companies need to change their thinking, they have to get off from reactive purchasing execution towards proactive procurement management. In doing this, the main task is to secure a close alignment with the sourcing market. There is a very early possibility to set the course in doing the right decisions for the technical specification and physical arrangement of parts, modules and systems for a perfect fit of the subsequent production process. Differences and variations to the original technical specifications or vague requirements can result quite fast in uncontrollable higher expenses. Such inaccurate conditions will directly influence the return of the product and accordingly will have an impact on the value added. In that case value for the company will be destroyed. The task of the procurement department is to create competitive advantage, this means to assure a stringent supplier management on the one hand and to ascertain an internal regulating factor on the other hand.

Gradual arguments – vertical integration

The role of procurement will exceed the pure supplier management and proceed further on towards the management of a network. With an increasing level of integration in value creation, tier structures (performance bundling) and outsourcing (solution bundling) will gain importance. As a consequence, the selection of suppliers to be integrated will become a key success factor (Hofbauer and Sangl, 2016). Figure 6 shows this direction of evolution.

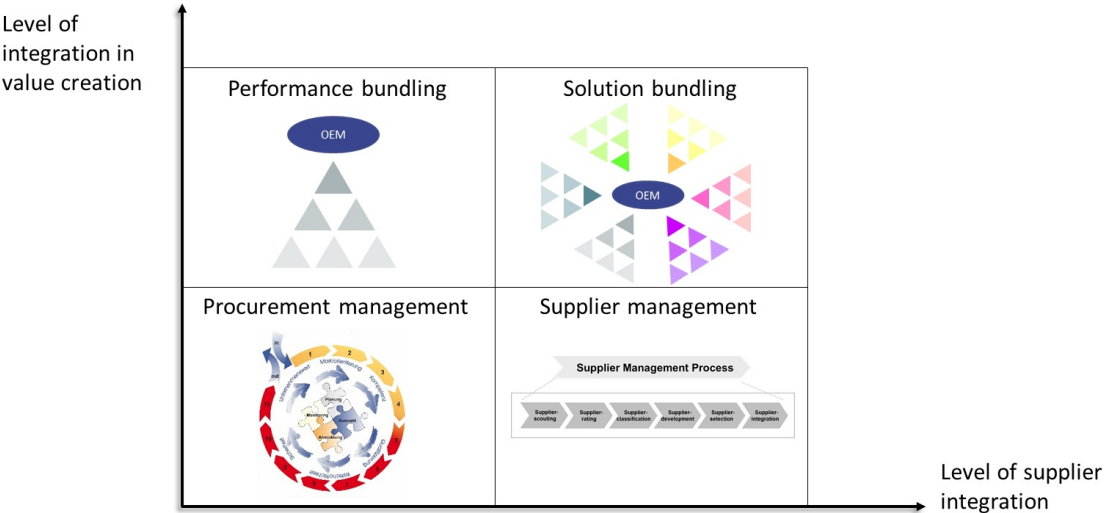


Figure 6: Vertical integration of procurement (own graph)

The initial position of contemporary procurement is a well-structured procurement management process (Hofbauer 2017). In the next steps, the suppliers are involved more and more to improve the performance (Hofbauer, Mashhour & Fischer 2016). After having improved the capabilities of the suppliers, some of them are able to take more responsibility. They will evolve into tier-1 suppliers and they will receive a higher level of integration and value creation. In this case the focus is on performance bundling. All steps of the processing depth and of total added value of a specific system or module are covered by one single supplier. The next step is solution bundling, all the different parts, components, modules and/or systems are delivered by different tier-1 suppliers. The OEM (Original Equipment Manufacturer) has outsourced all upstream activities (research and development, logistics, manufacturing, testing), but the downstream activities (sales and marketing) are done under the own brand.

Structural arguments – horizontal integration

New business models generate new challenges for the procurement activity. These business models combine products and services in the horizontal dimension as service providers. A car manufacturer for example does not only sell just cars anymore, but provides mobility services. These mobility services shall support the core business in selling and providing cars. To gain a competitive advantage, these mobility services include information about navigation, guidance, traffic warning, hotels, parking, restaurants, points of interest and even booking and payment services.

All these changes provide new possibilities for creating value, combining different inputs and contributions to a complete benefit bundle on the highest value-added level. A completely new dimension is provided in the space between a higher "level of supplier/partner integration" on the x-axis and the "level of integration in value creation" on the y-axis. Suppliers become more and more partners in providing a specific bundle of benefit. For this reason, the role and meaning of the procurement management is changing again. All the different contributions of that bundle have to be identified, specified, analyzed and procured from the providers of the sourcing market. The principal methods of procurement have to be applied to objects and services on a higher level of integration.

Figure 7 illustrates the aspired space of new business opportunities at a higher level of integration. There will be higher potential of business and a higher extent of differentiation towards the customers, but also higher investment required.

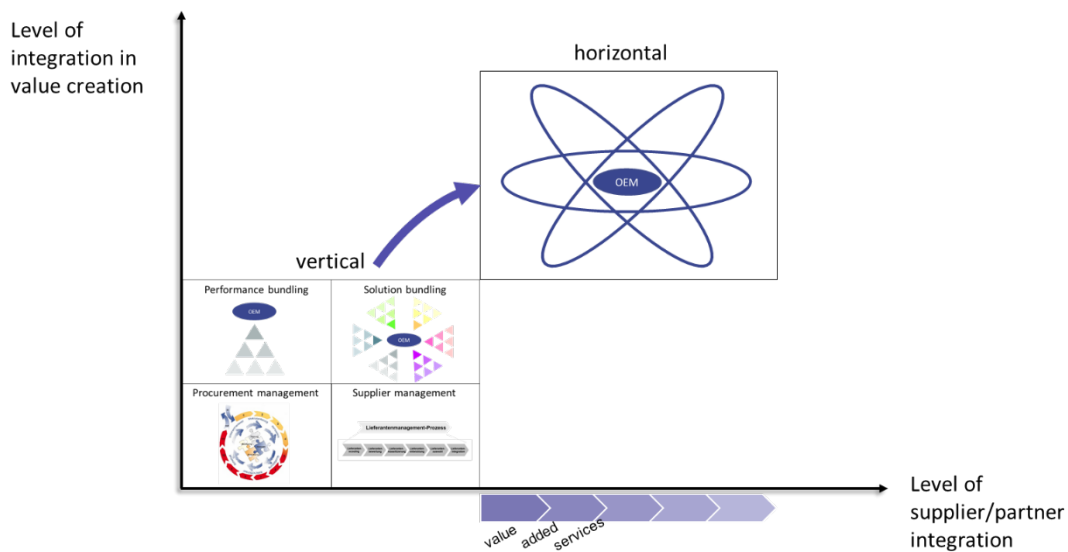


Figure 7: Evolution of procurement towards horizontal integration (own graph)

In summary the statements made in terms of quantitative, qualitative, gradual and structural arguments show that the working hypothesis no. 1 has to be refused. The primary activities are not listed completely, the results approve that the procurement activity has to be allocated as a primary activity.

2.4. Consideration of Innovation Management as a Value Creator

Innovations are indispensable prerequisites of modern and successful companies. As Peter F. Drucker already stated in the year 1955 in his definition about the purpose of a company:

"There is only one valid definition of business purpose: to create a customer. (...) Because it is its purpose to create a customer, any business enterprise has two -and only these two- basic functions: marketing and innovation. They are the entrepreneurial functions."

The transmission between these two functions can be interpreted in terms of value.

Innovation has to create the value and marketing has to sell the value. An innovative company may be characterized by means of: entering new markets, development of additional potentials, increase of market share, enlarge of sales and profit, introduction of new products and so on (Hofbauer and Sangl 2018, pp. 71-76). Hence all activities refer to the value of the company, which is based on the value of the customer.

Innovations are driving forces of competitive advantage (Hofbauer et al. 2009). Innovation management in turn is driven by R&D activities. The outcome of R&D activities are goods, products and services, which represent a special benefit for the customers.

If the benefit is high, the customer is willing to pay more for it, if the benefit is higher as that one of the competition, the customer will choose the product with the highest benefit and in doing that he creates value for the company (Hofbauer and Gandhi 2016).

In combination with the forward sourcing task of procurement there is a strong interrelation between R&D and procurement (Hofbauer and Wilhelm 2015). Both have to deal with R&D duties and challenges, both have to deal with innovations. Internal innovations have to be integrated into specifications for goods to be sourced from outside. Furthermore, the procurement activity has to look for external innovations to be applied for utilization in new products.

Innovation management at a glance

The internal R&D mostly focuses on exploitation, whereas the exploration is more and more done by external sources (Hofbauer and Hofbauer 2016). Companies know that they have to exploit their existing knowledge and resources to achieve competitiveness.

Open innovation (Hofbauer and Brening, 2017) is a major opportunity to get beneficial innovations quickly done, without limitations in thinking and problems coming up with a slow-acting and sometimes calcified organization.

In this chapter the powerfulness and influence of innovation will be displayed in terms of facts and figures. Large budgets are invested in innovations and there is a huge impact of innovation management on the success and competitiveness of a company.

At a highly aggregated level the Global Innovation Index depicts the innovative ability of countries worldwide. In 2017 Switzerland is the leading country on position 1 with 67.69 points, Germany rose in rank from position 10 to 9 with 58.39 points.

This Global Innovation Index is a very important indicator for the innovativeness of countries, which is a prerequisite and breeding ground for innovative companies to create value and to foster the wealth of nations in the long run. Table 1 shows the innovativeness of countries.

Table 1. Innovativeness of countries (Cornell University, INSEAD and WIPO 2017)

position	score	country	position	score	country
1	67.69	Switzerland	6	58.70	Denmark
2	63.82	Sweden	7	58.69	Singapore
3	63.36	Netherlands	8	58.49	Finland
4	61.40	U.S.	9	58.39	Germany
5	60.89	Unit. Kingdom	10	58.13	Ireland

At lower levels countries, sectors and companies can be analyzed. Table 2 shows the total innovation expenses for Germany in the years 2016, 2017 and estimated for 2018. With a total amount of 158.8 bn EUR in 2016 the innovation expenses are a serious economic factor, though representing only a fraction of 3% of total sales. The forecast is estimated with an increasing tendency up to 170,0 bn EUR in 2018 (ZEW 2017).

Table 2. Total innovation expenses, source ZEW 2017

year	2016	2017	2018 (estimated)
total expenses for innovation (bn EUR)	158.8	160.5	170.0
variation against previous year	+ 2%	+ 1.1%	+ 5.9%

A look on all companies in Germany shows more details about activities. There are 106.200 innovative companies. This counts for a share of 36.1%. Table 3 shows also figures about product and process innovation as well as novelties and cost reduction.

Table 3. Innovators in Germany (2016), source ZEW 2017

	in 1.000	percentage
Total number of companies	293.9	100.0
Companies with innovation	106.2	36.1
... with product innovation	78.0	26.5
... with process innovation	65.2	22.2
focus on novelty	24.1	8.2
focus on cost reduction	23.4	8.0

The results of these innovation activities for German companies are summarized in Table 4. These data show again the huge impact of innovation activity on economy. In 2016 the total sales with innovative products reached the amount of 719.0 bn EUR, this figure increased 3% compared to previous year and represents 13.6% of total sales.

Table 4. Figures of success based on innovation activities in 2016 (source ZEW 2017)

	in bn. EURO	variation to previous year	percentage of total sales
Total sales with product innovation	719.0	+ 3.0%	13.6
... therein novelties	154.1	- 3.8%	2.9
... therein imitation	564.9	+ 5.1%	10.7

In addition, a differentiation is made between novelty (154.1 bn EUR; 21.4% of sales) and imitational innovation (564.9 bn EUR; 78.6%).

Another outcome of innovation activities is shown in Figure 8 in terms of patent applications. In Germany there was an increase in numbers from 2010 until 2017 from 59.444 up to 67.707 patent applications (source: DPMA 2018). This shows an increasing innovation activity as well as an increasing technological progress coinciding with technological value added. Companies have to react and accordingly have to protect their know how to face the competition and act successfully on the market. Competitiveness is an important precondition for value creation.

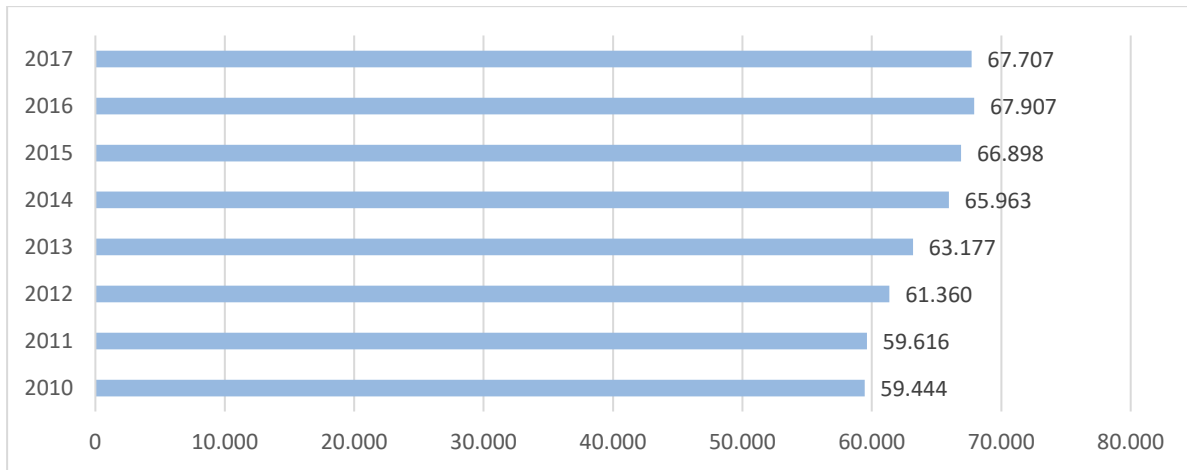


Figure 8: Patent applications in Germany (source: DPMA 2018)

So far there was the analysis of a national economy as a whole. On the next lower level there are industrial sectors to be analyzed and the most innovative sectors may be identified.

Figure 9 shows the comparison indicating the percentage for innovators, the intensity of innovation activity as well as the share of sales with product innovation on total sales for different sectors.

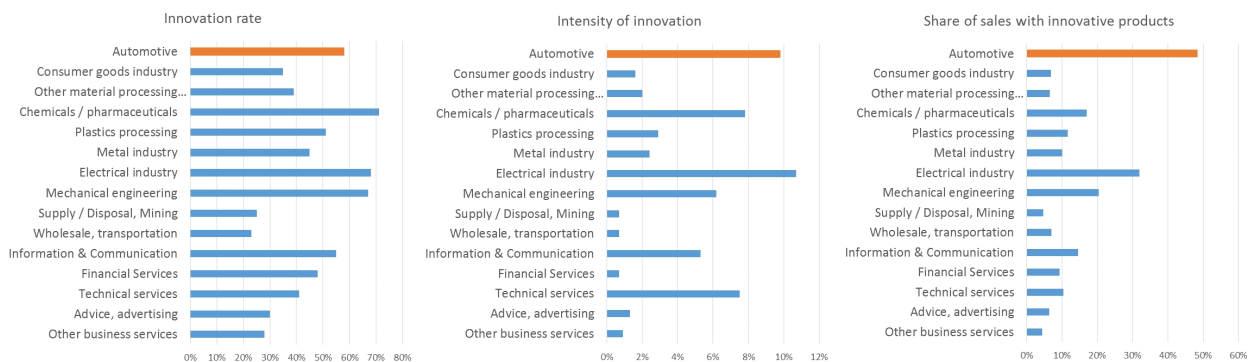


Figure 9: Comparison of innovation measures for industrial sectors in Germany (source: ZEW 2018)

The comparison pinpoints that there is a wide range between the different sectors, but this is quite normal and the innovation intensity represents the degree of competition and even the profitability of the business.

Table 5 illustrates exemplarily the range between the automotive industry and the average of all sectors.

Table 5. Range of innovation measures for automotive sector and average of all sectors in Germany (source: ZEW 2018)

	share of innovative companies	intensity of innovation as expenses in % of sales	share of sales with innovative products
Automotive industry	59.1%	9,39%	49,6%
Average all industries	36.6%	3,14%	15,5%

The empirical data show that innovation activities and corresponding budgets on the input side as well as sales figures of innovation on the output side have a huge impact on companies and economies. Innovations in terms of products and services are essential to create value for the company and for the customer.

Open innovation

Increasing competitive pressure, rising rivalry on the markets and shortened product life cycles face companies with pressure to innovate and force them to push innovation activities with higher budgets. Innovations are drivers for profitable growth, competitiveness and sustainability. New technologies as well as cost and time pressure have changed the practice of innovation activities. Closed innovation has changed into open innovation.

The basic idea of open innovation is to open the internal innovation process to integrate innovative ideas, solutions and technologies generated outside.

This enables companies to use a huge creative potential from outside, exploit more ideas in a shorter period of time, save money and reduce flop rates (Loren 2011, p. 5). Open innovation (Brening and Hofbauer 2017) is a major opportunity to get new ideas, technologies and know how on demand and tasks quickly done. This can be done without limitations in thinking and problems coming up with a slow-acting and sometimes calcified internal organization.

These arguments strongly suggest that there is a high potential for value added.

Figure 10 shows the principle of open innovation, where valuable ideas may come from inside and outside the company and can be marketed from inside and outside as well (Chesbrough 2003).

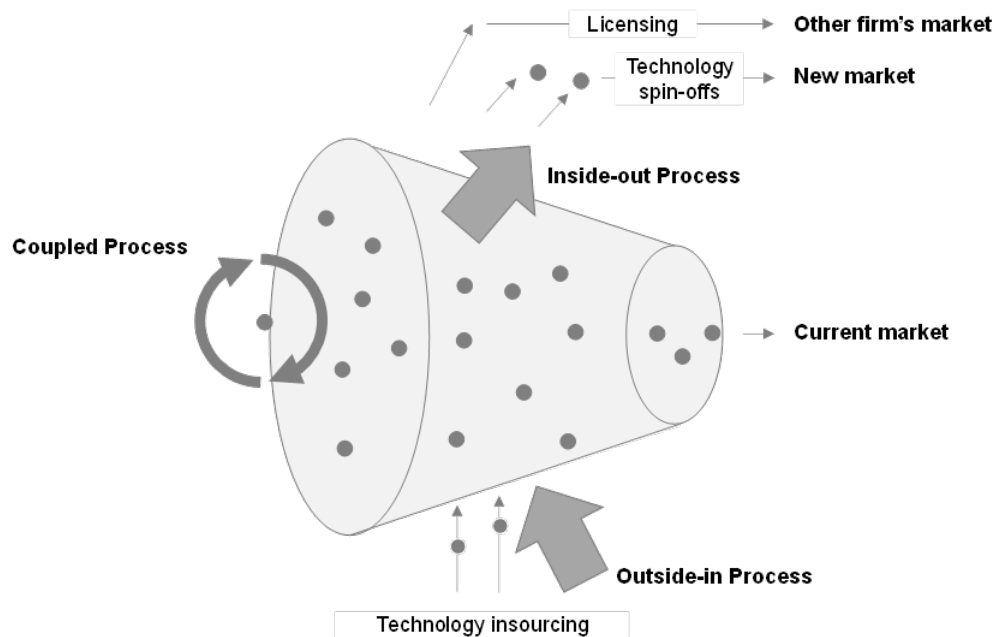


Figure 10: Principle of open innovation (Chesbrough 2003, p. 43)

The principle of open innovation shows that ideas can be integrated from outside (outside-in process). Ideas also can be taken out of the internal innovation process (inside-out process) to be marketed in another way. Even a combination is possible in terms of a coupled process (Chesbrough 2003).

The outside-in process enhances the knowledge base of a company by acquisition and integration of external expertise provided by developers, suppliers, customers or other experts. Subject of this kind of transaction are knowhow, patents and licenses, applications and transfer of technology. *Absorptive capacity* is the most important prerequisite for companies following this process (Reichwald and Piller 2009, p. 99). This means that companies have to be prepared to develop the ability and competence to absorb knowledge from outside for the own innovation activities to turn out well in commercial exploitation (Engelhardt and Hofbauer 2017).

Companies, which choose the inside-out process focus on externalization of their knowhow and innovation. The reason for this approach is to market the innovation faster than through the protracted internal standard process. This dislocation of business activities means creating profits through licensing, spin-offs, start-ups and multiplying technology use. This is why the *multiplicative capability* is a major issue, too (Gassmann and Enkel 2004, p. 13). The establishment of start-ups in new markets is an additional way to commercialize innovations.

In most cases the budgets can be split between the traditional business and the new business and thus get an additional lead in competitive advantage (Enkel and Gassmann 2009, p. 9).

The coupled process is a combination of the outside-in and the inside-out process. Most applications are utilized in strategic networks, alliances, joint ventures and cooperations.

The participating companies are aimed at establishing technical standards and dominant design of their products (Gassmann and Enkel 2006, p. 13). These companies know that the right balance between give and take is the most crucial factor of success. The required *relational capacity* refers to that balancing within a network of a company. It is essential for cooperative innovation processes to have the capability to integrate external knowledge and as well as to share internal know how for the benefit of the partners (Enkel 2009, p. 186). Thus, all partners are able to establish competitive advantages and create value accordingly.

In addition to the advantage for a single company there is a supplementary argument for the importance of open innovation in terms of users and participants.

Figure 11 shows the frequency of application of open innovation among large companies (Chesbrough and Brunswicker 2013). On average 78% of all respondents indicated to use open innovation.

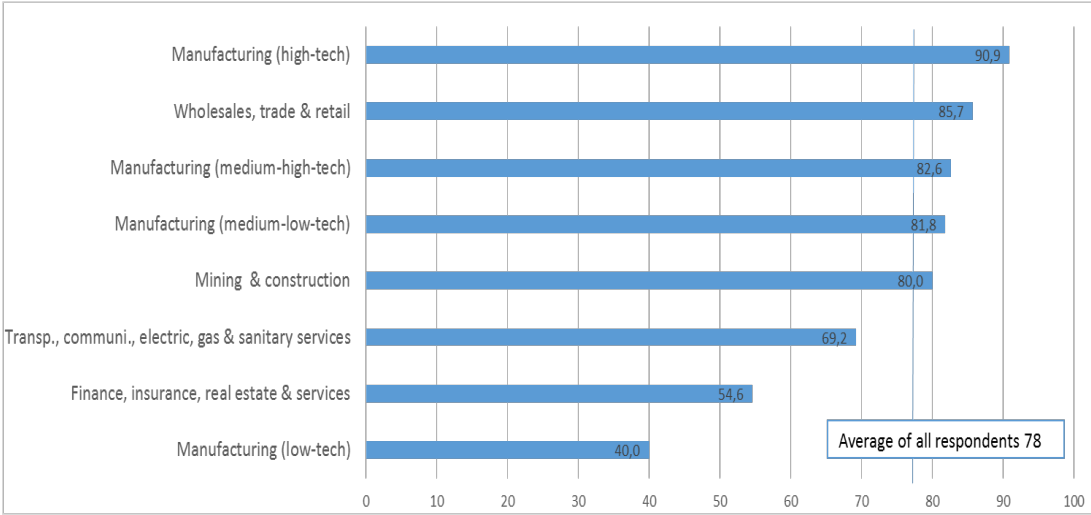


Figure 11: Frequency of open innovation application (source: Chesbrough and Brunswicker 2013)

Summing up the arguments for innovation activities

Innovation activities are vital for successful companies and prerequisites for establishing competitive advantage and value added. The empirical data show that innovation activities and corresponding budgets on the input side as well as the outcome of innovation on the sales side have a huge impact on companies and economies. Innovations in terms of products and services are essential to create value for the company and for the customer (Hofbauer and Gandhi, 2016).

In collaboration with advanced procurement the most important issue is to detect and utilize innovations and innovative potential for the company from outside (Engelhardt and Hofbauer 2017). Therefore, an extensive market research is necessary.

Once suppliers are identified, they should be closely involved into the pre-serial and serial development process of the company (Hofbauer and Wilhelm 2015). Further on products will only be designed best for subsequent manufacturing at supplier's site, if their manufacturing know-how is considered prematurely during the product development process. Far too often products were designed and physically developed before the production feasibility is checked, which is necessarily the next step (Hecht 2014, p. 5).

In order to support value creation in terms of the return of the products, the procurement management has to look for innovations and solutions to reduce complexity and optimize the product for the whole value chain.

The opening of the innovation process represents a supplementary strategic factor (Bischoff, Aleksandrova and Flachskampf 2010, p. 277). The implementation of open innovation processes provides additional knowledge and business potentials. The most important advantages are reduction of time-to-market and cost-to-market and an enhancement of fit-to-market and new-to-market.

The first two issues referring to *time* and *cost* are related to improved access to information about solutions of problems (Reichwald and Piller 2009, p. 172ff). This information is about technical knowledge how to solve specific problems. Further on how to use efficiently existing resources while finding solutions.

Fit and *new* refer to the access of information about needs and wants of customers (Reichwald and Piller 2009, p. 173). The knowledge about the preferences of customers is essential to meet their needs. This helps to improve the effectivity, because the products will meet the needs of the customers and thus the flop rate will be reduced. So, the success of new product entries will increase and value will be created.

All these arguments strongly suggest to propose a collaborative activity in the formation of the revised value chain. This compound activity consists of procurement in collaboration with innovation management. As explained above, both activities have an impact on the succeeding manufacturing and operations activity.

2.5. Considering Logistic Efforts as Secondary Activities

With regard to the logistic activities there are obvious indications to shift these activities from the primary activities to the secondary activities, because there seems to be no noticeable value added to the product through those activities. Inbound logistic activities like receiving, storing and distributing of input factors are quite necessary, but should be reclassified as secondary activity. The same reasoning applies to the outbound activities, storage, collection and distribution is quite necessary as well, but value added in these activities is hardly to find.

The main question is, whether there is a value added. If not, the respective activity should be classified as a secondary activity. The assumption is that logistics nowadays do not create value any more. In order to analyze this assumption, qualitative and quantitative arguments will be given:

Qualitative arguments

Since many decades we know about efficient principles in operations and production technology. Taiichi Ohno, head of production at Toyota introduced the term MUDA, which was interpreted and translated with 'waste' in the English literature (Ohno 1988). But this term means more and has a higher significance than waste. Ohno evaluated activities in terms of the additional value of the activity. In this context 'waste' it is not what he meant, because the opposite of waste is parsimony. The opposite of MUDA however is usefulness, meaningfulness, feasibility or effectiveness and these terms fit exactly to the intention.

Therefore a better expression for MUDA should be used as unnecessary effort or needless operating expense. In consequence the elimination of these unnecessary efforts is one of the most effective ways to increase profitability. In order to do this, it is important to understand what activities are unnecessary and where it comes from. For creating value, it makes no difference where, by whom or how often a part of a product, or even a product has been received, stapled, collected or stored, there is no additional value to be noticed.

In the statements about MUDA, there are seven kinds of unnecessary activities:

transportation, overproduction, inventory, waiting, over-processing, defects and motion.

The first three of them can directly be related to the value chain concept. It can be concluded, that these activities are required as supporting activities, but accordingly are not able to create value. With interrelated, sensor controlled and process optimized Industry 4.0 standards, there will be the opportunity to optimize these issues on a large scale. Industry 4.0 is able to link processes perfectly that one operation after the other can be executed in an optimized way and reduce especially transportation, inventory and overproduction.

Transportation of products between different operation steps, to the storage or to the customer causes cost, but it is a matter of fact, that it does not add value to the product. In addition, excessive transportation and handling increase the likelihood of quality deterioration and damages. Inbound and outbound logistics means also transportation. Of course, it can be difficult to reduce transportation activities, because to some extent transportation is inevitable, but the question is about value added.

Overproduction means that a product is manufactured before it is actually required.

Overproduction is highly expensive for a company, because resources are occupied, storage increases and capital commitment rises.

The Toyota production system overcame this problem by introducing the Just-In-Time (JIT) principle, where each part was delivered and/or manufactured just as it was needed.

Inventory increases when more products are produced than sold to customers, it directly results from overproduction. Unnecessary inventory occupies productive floor space, increases lead times and causes problems in the production process. By achieving a seamless workflow in the production process, it is possible to optimize the lead times, to raise efficiency in using the capacity and to decrease inventory with related cost.

The other 4 remaining kinds of activities, which also should be avoided, are:

Waiting occurs when products or parts are not flowing or being processed. There is a huge amount of lead time wasted for waiting for the next production step. This occurs, because material flow is not optimized, production runs are very long and machines respectively work centers are not interlinked.

Over-Processing means to establish high-performing processes and to use expensive high precision production equipment when simpler working steps and tools would be sufficient.

The crucial thing is, that high precision tools, as soon as they are available, have to be used in order to get a return on that investment. This results in a higher cost per item.

Defects cause a lot of cost for a company. So, this is a very important issue to be solved, because it means capacity loss and raising of manufacturing cost. Quality operations are supportive to solve these problems.

Motion is related to transport and waiting and even solve arising problems when they occur.

Reaching, walking, lifting and stretching are some motions, which could occur. With these motions problems, mistakes and damages may occur. These obvious causes for troubles should be analyzed and redesigned.

Quantitative arguments

It is evident, that the relevance of the logistic activities declines in times of Industry 4.0 with automated supporting processes and sensor controlled internal supply as well as external supply chains across companies and means of transport.

These processes are already highly automated and the management attention on creating value has shifted. The proportion of logistic costs of total costs is declining as can be seen in the graph for industry shown below (Figure 12). This suggests that the potential for cost savings through automation is very low and already largely exploited.

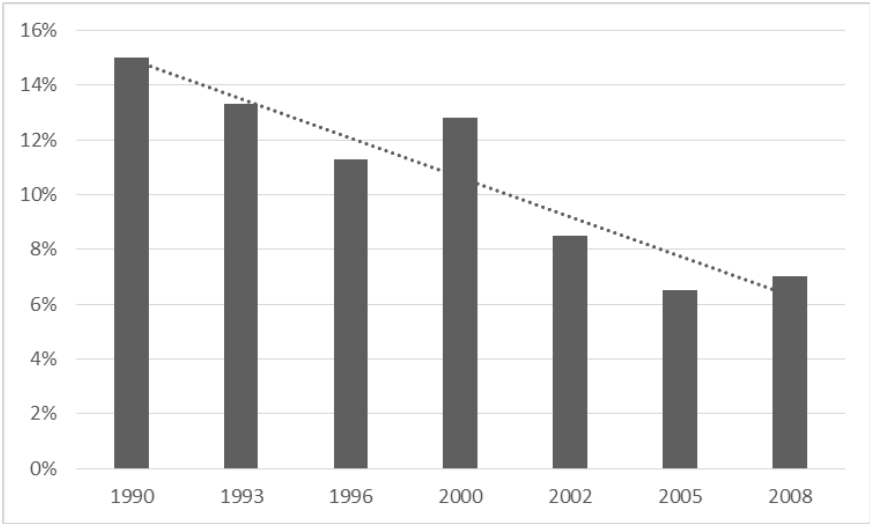


Figure 12: Changes of logistic costs. Source: own graph, based on Handelsblatt 2009

A study shows that 28% of industrial companies surveyed do not know their logistic costs in detail (Straube and Pfohl 2008). Unfortunately, there are no more updated data, which makes more obvious that this cost position is not at all in the focus of management attention.

The share of logistic costs in total for all industries is about 7.0% (as already shown in Fig. 12). These logistic costs are primarily driven by rising energy, fuel and transport prices as well as high personnel expenses. The detailed composition of the logistic costs (7% of total cost) is shown in Figure 13.

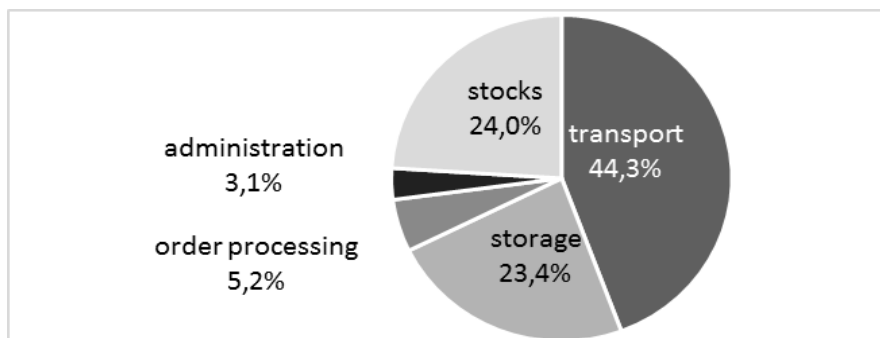


Figure 13: Composition of logistic costs. Source: own graph, based on (Fraunhofer 2015)

The necessity to expand storage due to increasing bottlenecks in the road transportation sector and the increasing environmental protection and safety requirements could lead to an increase of the logistic costs in the future. The decoupling of transports resulting from higher inventories follows the demand for reliability in the logistic systems (Straube and Pfohl 2008), but at the same time represents a needless operating expense as already described above.

This leads to the second basic research question of this paper, which is to identify the value creating potential of logistic activities. If there is no potential, they should be classified as supporting and secondary activities.

In consideration of the outlined statements in this chapter, based on empirical data and analytical remarks, the thesis can be established that logistic activities have no noticeable impact on value creation. It is in the nature of things that supporting activities should be characterized as secondary activities in the value chain.

3. Interim result regarding primary activities in the Value Chain

In this working paper the primary activities are focused and their value creating characteristic is under review. In order to meet this point, different arguments have been discussed in chapter 2. The most important results are to incorporate procurement and innovation management into the primary activities and consider logistic activities as supporting activities. The basic reasoning is the characteristic of creating value, which was confirmed for procurement and innovation in chapters 2.3 and 2.4 and which was rejected for logistics in chapter 2.5.

Taking all stated arguments into account, we propose a compound activity to mark the starting point of the revised value chain. This activity consists of procurement in collaboration with innovation management. The creative and physical outcome of these activities has a noticeable impact on all subsequent activities, immediately on operations.

Figure 14 (own graph) shows the primary activities of the rearranged value chain according to the outlined statements and reasoning. Open innovation is a determining part of those activities.

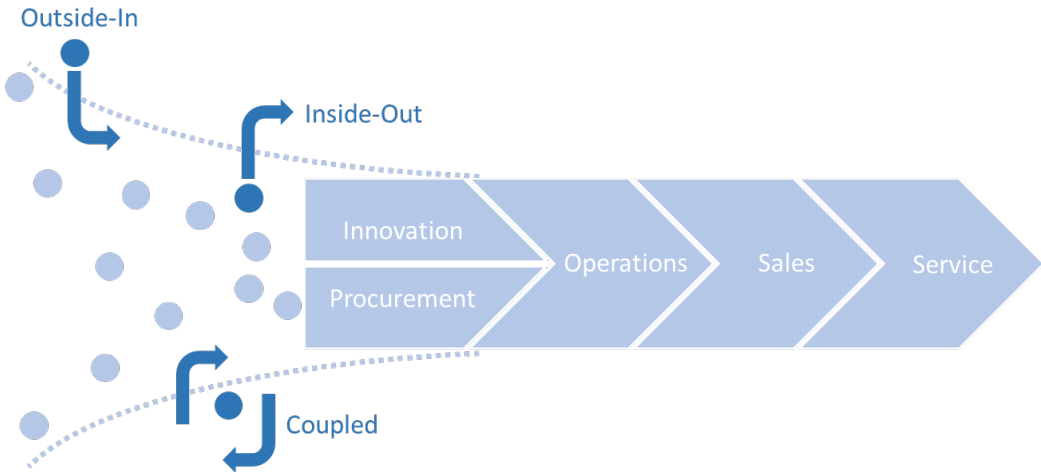


Fig. 14. Primary activities of the rearranged value chain including open innovation

4. Analysis of Secondary Activities

Besides the primary activities there are secondary activities that all businesses must include in some way to support primary activities. The supporting activities are mandatory prerequisites and enablers for the fulfillment of the primary activities and the enforcement and uninterrupted completion of the value chain process. Support activities assist the execution of all primary activities and the realization of each other by providing resources in terms of employees (HR) or money (finance), transport inside and outside the firm (logistics and supply chain management) or providing the basic infrastructure of the company. The support activities facilitate the primary activities and comprise the following: organization, infrastructure, process management, support & IT as the basic enablers, finance and controlling to assure solvency and profitability, human resources for qualification and capacity of the workforce, quality management for the performance of the products as well as logistics and supply chain management to provide the market.

Organization, Infrastructure, Process Management, Support & IT

The overall infrastructure provides a basic platform for all activities and connects its various parts. This is a basic enabler for all activities in the value chain. It consists of process steps, functions or departments and their interrelations in the value stream of the primary activities. In general, this level includes all organizational issues like process management, support functions and IT. The corporate infrastructure includes all activities that are not related to individual activities but to the entire value chain of the company, like public affairs, government relations and general management.

However, depending on whether the organization requires decentralized or centralized decisions, the corporate infrastructure can be a single entity or split into separate organizational areas. Porter points out that the corporate infrastructure could be viewed as a pure overhead in a cost-accounting perspective. He argues that this activity can also be a source of competitive advantages (Oehrich 2010). The integrated product management process (Hofbauer and Sangl 2018) for example shows how important a structured approach to innovation and product management is. Especially a contemporary and stable working IT landscape is an essential precondition for digitalization of processes.

Finance & Controlling

Finance and Controlling is a modern function and inevitable for all companies. It refers to basic questions where the money comes from (finance) and where the money will be allocated (investment). It is essential to keep the company balanced in respect to money inflow (order-to-cash) and money outflow (operational spendings and investment)(Hofbauer and Hellwig 2016, pp. 299-319). Important management ratios are profitability, efficiency and liquidity. Further on the organization's accounting and control mechanisms have to be organized. Proper management of payments, cash flows and investments plays a vital role in all industries. Especially in the capital-intensive industrial businesses these functions are essential (Hofbauer and Bergmann 2013). As in Porter's Value Chain, accounting and finance topics are part of a company's infrastructure.

Human Resource Management

Human resource management includes the activities involved in hiring and retaining the appropriate employees to design, build and market the product. Human resources management includes all employee-related activities such as recruitment, training, education and payroll. Human resources management is not only linked to primary but also to other supporting activities, such as hiring engineers for technology development. The problem is that in many companies the importance of HR management on competitive advantages is not sufficiently realized. However, especially service and high-tech companies benefit from a successful selection of candidates and employee training (Oehrich 2010). Hence human resource management consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.

Quality Management

Porter also classifies quality management as a supporting activity within the company infrastructure. Outstanding quality, however, is an indispensable competitive advantage in many industries, coupled with increased customer price propensity. Quality management means to assure the quality and functionality required by the customers at reasonable prices. Another issue is longevity and traceability. It is proven that higher quality is ever related to higher profitability (Hofbauer and Sangl 2018, p. 155). The responsibility about quality should be extended to all domains within the company.

For this reason, quality management should be seen as an independent, supportive ctivity and should receive appropriate attention. Quality management includes the following tasks

(Hofbauer and Sangl 2018, p. 157): quality planning, quality control, quality assurance and assistance.

Logistics & Supply Chain

In Porter's original value chain, inbound and outbound logistics were classified as primary activities. All those processes associated with collecting, storing and physically distributing the product were included (Porter 2004).

This covers all activities from inbound logistics to production logistics and outbound logistics. The revised value chain of this article includes all the activities necessary to transport both the products and their components, but as support activities. As explained above, these activities do not add value to the product. Therefore, logistics should be seen as a necessary supportive activity. The dotted line in figure 9 reflects the fact, that logistics and supply chain management support the entire chain and also single primary activities.

5. Solution statement and proposal for a new arrangement

Summarizing all outlined arguments and observing all aspects a new proposal can be provided for the revised value chain. The principle of Porter's original value chain has not been changed. Only some activities are newly arranged according to the outcome of chapters 2.3, 2.4 and 2.5.

Figure 15 shows the newly formed composition, whereat the support activities are arranged below to indicate that the support activities are the grounding for the enabling of the primary activities.

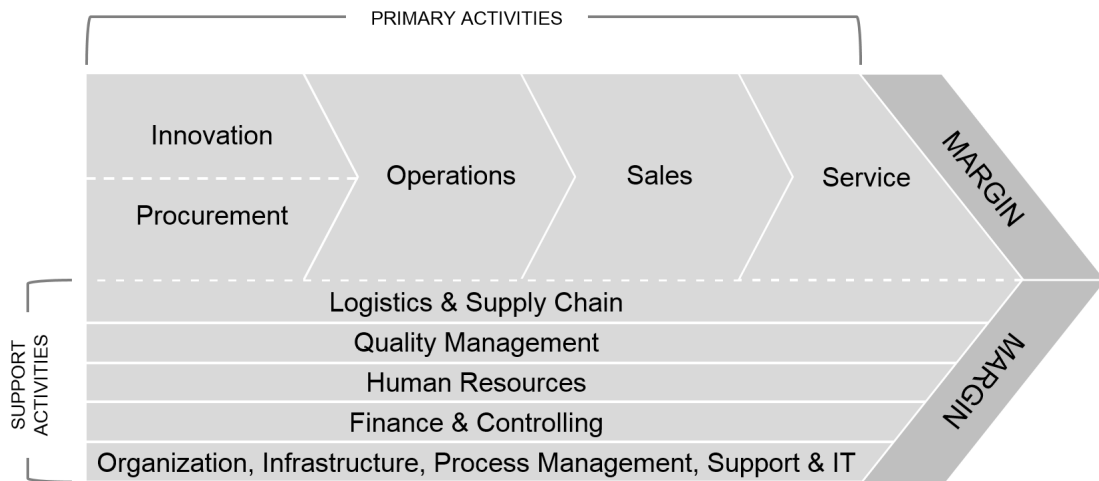


Figure 15: New proposal for modification of the value chain

6. Conclusion

Competitive advantage is a mandatory prerequisite of a valuable company.

For the sake of profitability, it is essential to know about the context in the value chain and the various contributing factors to the value added. It is required to know about value annihilating activities, too. The application of a contemporary value chain is a reasonable concept for managers to analyze valuable activities and to transform these activities into competitive advantage and profitability in the long run. Therefore it has to be revised and updated.

Organizations, processes and business models are changing rapidly over time. Changes in business operations appear on a large scale with high impact. A close look on the concept of the value chain shows that this management tool has not been adapted over decades. Hence it has to be revised and rearranged to provide a contemporary management tool. The outlined arguments and empirical deductions strongly recommend that this change is advisable, well-founded and science-based.

There is no other publication so far dealing with a revision of the value chain. The aim of this research is to provide a revised, contemporary, clear and well-structured guide of the primary activities of value chain concept. The contribution to scientific discussion is a revised version of the value chain, which fulfills all contemporary requirements and complies with all stated working hypothesis.

In order to examine and review the existing concept of the value chain, there were two working hypotheses formulated.

Hypothesis no. 1: All primary activities are listed completely.

This hypothesis had to be refused for two activities: procurement and innovation management. These activities have been neglected so far.

Creating value is the overall scope of a company to achieve competitive advantage. In case that an activity is verified to create value, then this activity has to be considered as a primary activity.

The statements show that procurement activities have changed dramatically. Procurement is not any more just the supporting ordering department. Coming up with the demonstrated fact, that procurement has the highest impact on the cost position of a product, it can be concluded that a company's value and competitive position is strongly correlated with procurement. The research results show that procurement has changed into a value creator, by integrating the various internal activities and combining them directly with the value creating activities of the suppliers. Therefore we postulate to consider procurement not any more as a secondary activity, but as a primary activity within the value chain of a company. Especially in cooperation with the procurement activities there is a huge potential to utilize innovations from outside the company in terms of open innovation. The value creation is more driven by innovations coming from sourcing markets than by price reductions. The empirical data about innovation activities, financial expenses and results show that there is an enormous impact on companies, markets and economies. The orientation of the innovation process towards the potential outside the company is a crucial factor of success.

The implementation of open innovation processes provides additional knowhow and creative potential on the input side and additional business potential on the output side. The most important benefits are reduction of time-to-market and cost-to-market and an enhancement of fit-to-market and new-to-market. Innovations in terms of products and services are essential to create value for the company and for the customer. This is why innovation management should be included into the primary activities, too.

The first proposal to rearrange the value chain is to incorporate the procurement activity into the primary activities. Excellent companies have realized that procurement is more than just buying at the best price. Procurement activities have to be applied as forward sourcing in the very early stage of development.

Only in this early stage innovations can be put into practice and design-to-cost and value-to-cost considerations can be taken into account in order to create and raise value across the whole value chain. So, it is necessary to analyze and use the potential of the sourcing markets as early as possible. Further on it is essential to select and use innovative high-performance suppliers to gain competitive advantage.

The second proposal is to integrate innovation activities into the value chain. The statements in this elaboration show a close relationship to procurement activities and conclude a high impact on value creating potential. A company is able to create new dimensions of customer benefit through exploitation and exploration, which leads to competitive advantage and in the end to higher value added to the company (Hofbauer and Hofbauer 2016). In addition to that, a new window of opportunity is released by the means of open innovation, where innovation management and procurement as well have to assess and evaluate innovations coming from outside the company (Engelhardt and Hofbauer 2017).

Hypothesis no. 2: All included primary activities are relevant.

This hypothesis had to be refused for two activities: inbound and outbound logistics. For these activities evidence has been provided that they do not add value anymore. Creating value and physical creation are essential characteristics of primary activities. If this does not apply, then this activity has to be considered as a secondary activity

Thus, the third proposal is to remove the inbound and outbound logistic activities from the primary activities and include them into the supporting activities, because they do not add noticeable value to the product. Inbound logistic activities like receiving, storing and distributing of input factors are quite necessary, but should be reclassified as secondary activity. The same reasoning applies to the outbound activities, storage, collection and distribution is quite necessary as well, but do not really add value to the product.

Figure 14 displays the rearranged value chain according to the results of research. Further empirical research is intended to do in the application of the value chain in different industries.

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***A critical review of the value
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for a revised version***

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