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Methodological approach for a process-orientated Lean Service implementation

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Abstract

Manufacturing companies are increasingly focusing on the field of the After Sales Service. In the primary product sector, margins are often very low for these companies due to stricter business conditions. This is due to the fact that more and more new competitors are operating on the market and price pressure is dominating. Therefore, new distinguishing features must be identified. The After Sales Service is a possible instrument for this purpose. By providing After Sales Services, primary product manufacturers can differentiate themselves from competitors. In addition, excellent After Sales Services can also increase customer loyalty and customer satisfaction. The importance of After Sales Service can be seen, for example, in the fact that manufacturing companies generate a high percentage of the profit with the After Sales Service. In order to design the After Sales Service efficiently in the future, methodological approaches must be identified and implemented. This paper presents a process-oriented approach based on process characteristics to identify suitable principles of Lean Production Systems based on process characteristics in the After Sales Service. For this purpose, process characteristics are analyzed for the core processes in the After Sales Service and principles are identified on the basis of these process characteristics.

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Keywords: After Sales Service; Customer Service; Lean Production Systems; Service Processes; Process orientation

1. Economic relevance of the After Sales Service

Many companies attach higher importance to customer orientation and, as a result, to the field of the customer service as part of the After Sales Service. In this way, companies try to differentiate themselves from competitors. This is due to the fact that the sole offer of primary products is becoming increasingly exchangeable. [1]

Hence, the focus on the After Sales Service is necessary as the primary products are getting more and more equal in terms of price, quality, technical functionality as well as features. [1, 2]

Therefore, companies offer various as well as new developed services. These efforts are made by the companies due to the fact that offering After Sales Services is highly profitable and can be responsible for 75 - 80 % of the company profit. [3]

Hence, it is mandatory for manufacturing companies to secure the profits that are gained by the business sector After Sales Service. In the following, the three business sectors of the After Sales Service that are presented are (see Fig.1):

- the spare parts service,
- the customer service and
- the accessories business [4]

whereas the focus of this paper is the customer service.

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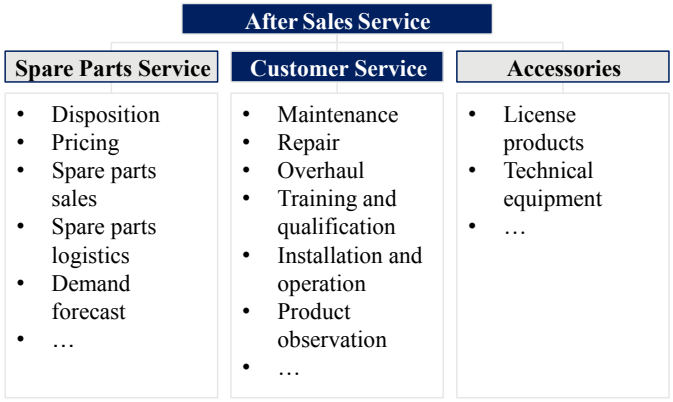

Fig. 1. Trisection of the After Sales Service [4]

The spare parts service as part of the After Sales Service focuses on the areas of demand forecasting, spare part management, spare part production, spare part distribution and spare parts management [7]. The customer service includes the tasks like maintenance, overhaul, repair, trainings, financial services, instructions and installation. [4] The accessories business deals with the areas of merchandise, tequipment and individualization of products. [4, 5] As mentioned, the After Sales Services strives for an increased customer loyalty by offering appropriate customer services. So, the objective of the customer service is the establishment of a high level of customer satisfaction and loyalty during the complete life cycle in which generally no further investments are made by the customers. [6]

Moreover, the offer of After Sales Service to the customer has several economic advantages. These advantages include economic dependency, high margins, growth and innovation potential, long service cycles as well as intensive and long-term customer contact. [7] As a result, the After Sales Service helps manufacturers to overcome cyclical fluctuations by reducing the dependency on the primary product and generating revenue from other business areas [6].

But there are also challenges for manufacturing companies offering After Sales Services. For example a volatile and, therefore, poorly predictable demand concerning the offered services, a high degree of individuality and non-standardized customer orders are among the biggest challenges in the After Sales Service. [8] Besides, the After Sales Service division is insensitive to cyclical fluctuations. [6] This becomes evident due to the fact that maintenance and service contracts are concluded on a long-term basis. Above this, customer services like repairs or the fulfilment of service intervals or contracts are also necessary during economically difficult times. [7]

To fulfill the customer's requirements, it is important that the customers' needs are closely analyzed during the operating phase and that the provision of customer services is aligned with customer requirements and wishes. [1,5] By applying Lean Production Systems to the customer service it is possible to help to qualify employees and to improve key performance indicators like profitability, revenue growth or return on investment [9]. But there is currently no methodological approach to implement Lean Production Systems on process-orientated basis.

2. Importance of Lean Production Systems

Lean Production Systems (LPS) have their origins in Lean Production, Taylorism and innovative working models [10]. In Lean Production Systems, strengths of all three models are combined in order to create value for the customer. Moreover, the objective of Lean Production Systems is to eliminate waste in the processes [11]. By using LPS companies are able to focus on activities that increase the value of the product for the customer. In this way, it is ensured that value is created and waste in the processes can be avoided [12]. One the one hand, by a successful and sustainable implementation of a Lean Production System in an organization, it is possible to act more reliable, faster, closer to the customer's demand and transparently in the market. On the other hand, key performance indicators like quality, time and costs can be improved. [11]

Lean Production Systems usually consists of the elements objectives, enterprise processes, principles as well as methods and tools. Basically, it can be presumed that the basic structure of a LPS is always the same, but there is no general Lean Production System in terms of content. The Lean Production System has to be adopted company-individually. [11, 13]

Consequently, the LPS principles can be interpreted as company-individual combinations of the methods and tools that have to be implemented. Hence, methods and tools of LPS represent the concrete implementable elements which are meant to improve the processes. [13] The LPS principles are:

- Standardization: Standardization is the operation sequence determination of repetitive technical and organizational operations in order to achieve safe and stable enterprise processes [13, 14]. Deviations can be reduced by the principle standardization so that this principle is a prerequisite for securing and increasing process quality [13, 15, 16].

- Avoidance of waste: Objective of this principle is the orientation of all enterprise processes towards the customer demand so that all non-value-added activities have to be eliminated as far as possible. [13, 17, 18]

- Continuous improvement process: Continuous improvement of production or enterprise processes is the core idea of LPS. All employees have to strive for perfection. That means that inefficiencies or waste in the production processes have to be eliminated [19]. This has to be accepted by all employees so that the continuous improvement becomes company culture. [13, 17].

- Zero defects principle: This principle summarizes methods and tools in order to avoid the occurrence of defects and their transport to other or following production steps. [13, 15]

- Flow principle: The flow principles strives for a comprehensive process design that enables quick and low-turbulence flow of materials or information in the complete supply chain. [13, 17]

- Pull principle: Implementation of methods and tools in order to supply the production with needed material. Hence, the material supply is oriented towards the customer demand. [14]

- Employee orientation and management by objectives: There is no distinction between productive and planning work. Therefore, employees have to take part in further training and education. [19] Hence, a change of the view on the employees in the enterprise is necessary because employees are the most important resource in order to actively and proactively identify problems and implement improvements. [17]

- Visual management: Visual management is a visual representation of information concerning the work flows, process details and outputs. The objective is to visualize enterprise objectives. The visualization helps to realize objectives and can also be used for problem identification or solution. [13, 15]

3. Challenges for Use of Lean in After Sales Service

Most commonly, mass series production with standardized production lines and production programs is predominant in the manufacturing industry. Production processes are synchronized and each cycle content has a defined input and output. [13] Therefore, the principles of Lean Production Systems can be implemented. In most cases, serial or even mass production, as is usually the case within primary product production, is not possible in customer service.

The business sector of After Sales Service is characterized by a number of special characteristics that makes it difficult to implement principles, methods and tools of Lean Production Systems. [16, 20] In order to show the differences between Production or respectively Product Sales and After Sales Service, a comparison between the Production or Product Sales and the After Sales Service is given in Fig 2.

Customer requirements in the After Sales Service are generally high and likely to increase. [21] This is mainly due to the urgency of the demand, since the downtime of plants and machines usually has considerable consequences. [22] Therefore, deliveries of spare parts and services must be made within the shortest possible time. However, in contrast to a production program, it is difficult to predict failures or service calls. Furthermore, the place of service performance is not always standardized in After Sales Service. [23] In the case of service performance in a workshop, services are tending to be easier and more standardized. [20] Difficulties occur when carrying out the service on-site customer's installation. Travelling times to the place of performance, qualification of service personnel or spare parts must be taken into account. Depending on the service, the typology and specifics of the service performance can vary. Within the scope of planned

	After Sales Service	Production
Forecastability of demand	Downtime / concrete order contents difficult to predict	Comparably high
Order generation	By customer	By customer or customer-anonymous
Customer requirements	Very high and high urgency of the need for service	Mass-individualization
Place of order performance	Common at customer	Manufacturing company / production line
Differentiation potential	Very high	Frequently saturated
Production typology	Individual provision of service	Often mass production
Order specifics	Rarely standardized, very heterogeneous	High degree of standardization

Fig. 2. Differences between After Sales Service and Production [6, 7].

services (e. g. preventive maintenance or installation), deadlines, resources and order volumes can be planned comparatively well. In the case of unplanned service requests (e. g. urgent repairs), these orders have to be processed by the service organization without knowledge of the specific problem or needed spare parts. In this case, too, the customer expects a satisfactory and fast service performance. [24]

Nevertheless, there are some approaches for the implementation of LPS in After Sales Service. However, most of these approaches are focused on the application of only isolated methods and tool of LPS. Examples for methods and tools that can be used in After Sales Service are standardization, value focus and waste identification [25, 26], flow and pull principle or visual management [26, 27] and waste elimination [28, 29] or visualization via methods like the spaghetti diagrams. [30]

In After Sales Service, only 14 % of manufcaturing companies that offer customer services have already implemented LPS principles whereas 90 % of these companies use LPS principles in production. It is expected that in the next ten years the number of companies using LPS in After Sales Service will rise up to 46 %. [31]

Therefore, it is important that the adoption of Lean Production System principles to the customer service have to be supported by all employees. Many implementation activities of LPS principles, methods and tools in the After Sales Service focus on waste reduction, but not on creating value for the customer or continuous improvement. [32] It has to be mentioned that all principles of LPS can be used in After Sales Service. But they have to be chosen and implemented individually for each respective service organization. [16, 20, 33]

Moreover, a survey conducted within the research project "Systematic adaption of Lean Production System Principles to After Sales Service for Customer focusing and Waste reduction" (DO 750/25-1) shows that only 10 % of the participating companies use principles of LPS consciously. Further 45 % of the participating companies stated that LPS principles are used partly and 45 % stated that LPS principles

are not used. The principles that were evaluated most importantly in the survey are standardization, continuous improvement process, avoidance of waste and zero defects principle. Challenges during the implementation of LPS principles that were identified are employee acceptance and integration, missing or insufficient process standardization as well as high variance in customer service processes or primary product. This is based on the fact that there is no structured and holistic implementation concept for LPS in After Sales Service as it exists for the production.

4. Methodological approach for a process-orientated Lean Service implementation based on process characteristics

As described above, is possible to transfer LPS-principles to other business sector [20, 34]. For example, in the financial or insurance sector the use of these principles and methods is practicable because of a high number of similar processes and activities. Further sectors of Lean Production Systems implementation are food sector [35], hospitals [36] or administration. These sectors are characterized by a high number of static processes with low variety and high repetition rates. [37] Moreover, WINNEFELD developed a Lean Service System for the aviation sector. [38] But this Lean Service System is highly specialized for the aviation maintenance and the spare parts pooling and spare parts logistics. Above this, the Lean Service System does not focus on a generic process model so that it is not adoptable for other industry sectors.

In the sector of customer services, there is a high variance of the process kinds and typologies. Therefore, the customer service processes have to be characterized. Table 1 gives an overview over the different process characteristics according to BECKER ET AL. [39].

Table 1. Overview of process characteristics [38].

Process characteristics	Description	Form of expression
Level of standardization	Degree of detail, flexibility, uniformity, idealized process patterns, measurability, repetitiveness, standardization, control capability, structurability, variability, degree of repetition	High - low
Cognitivity level	Type of execution, data intensity, decision diversity, experience, fault tolerance, information knowledge, creativity, performance knowledge, framework conditions knowledge, knowledge intensity	High - low
Result orientation	Type of added value, trigger, object of observation, customer benefit, output, quality	Material - immaterial
Predictability	Determinability, dynamics, complexity, complexity, variability, risk	High - low
Degree of collaboration	Work sharing, manageability, interaction, communication intensity, coordination and interaction,	High - low
Resource intensity	Capacity requirements, cost intensity, use of resources	High - low

Based on this characterization, it is possible to assign principles to the processes steps (see Fig. 3). Therefore, the processes have to be documented as well as described in detail by using methods like swimlane diagrams or service blueprints. Based on the processes, each process step of the customer service process has to be characterized. In the first step the framework of the assignment of this paper was presented to a group of service experts in a workshop. The experts work in the automotive After Sales Service, commercial vehicle sector and maintenance companies. These experts have knowledge about Lean Production Systems but do not use in the respective After Sales Service. In the second phase, the assignment of the LPS principle to the respective process characteristic was performed by the service experts (see Fig. 3).

Process characteristics	Form of expression	LPS Principles: Standardization	Avoidance of waste	Continuous Improvement Process	Zero defects principle	Flow principle	Pull principle	Employee orientation	Visual management
Standardization level	High	+	+	+	+	+	+	+	+
	Low	-	+	+	o	o	o	o	o
Cognitivity level	High	-	o	o	-	-	-	o	-
	Low	+	+	+	+	o	o	+	+
Result orientation	Material	+	+	+	+	o	o	+	+
	Immaterial	+	+	+	o	o	o	o	+
Predictability	High	+	+	+	+	+	+	+	+
	Low	o	o	o	o	-	-	o	o
Degree of collaboration	High	+	+	+	+	o	o	+	+
	Low	+	+	+	+	o	o	-	+
Resource intensity	High	-	o	o	o	o	o	o	o
	Low	+	+	+	+	o	o	+	+

\+ Principle can support the process characteristics
o Principle is possible applicable
\- Principle do not support the process characteristics

Fig. 3. Assignment of LPS principles to process characteristics

However, it is important to differentiate whether the service is carried out at the provider or at the customer's or respective machine's location. If the process is carried out at the service provider itself, there is a standardized working environment (tools, spare parts, place of performance). If the service is carried out at the customer's location or at the

object, proactive and preventive planning is necessary to plan which tools, machines and spare parts will have to be used. In the event of a problem, contact with the supervisor or the leadership of employees is also more difficult.

In general, it can be stated that processes in customer service with a high level of standardization (e. g. common maintenance order in a workshop) can be supported by all LPS principles. If the level of standardization is low (e. g. repair order at the customer without knowledge of the concrete damage), it is hardly possible to standardize the complete process or use flow or pull principle. Nevertheless, it is possible to use principles like Continuous Improvement Process or Avoidance of waste and the respective methods and tools.

The cognitivity level describes how much knowledge, problem-solving competence and mental ability the employees need in order to fulfill the process step. [39] If the order execution requires a high cognitivity level of the employee, the tasks are for example special repairs or defect identifications. In that case, the principles standardization, zero defects principle, flow or pull principle as well as visual management cannot be used. Principles like avoidance of waste, continuous improvement process or employee orientation can support in order to improve the service efficiency or service quality. In the case of a low cognitivity level, the service processes are repetitive and well described. In that case, all principles can generally be implemented for the improvement of these processes.

Result orientation defines whether an output of a process is material or immaterial. [39] Material process outputs are, for example, repaired or overhauled products. Immaterial processes in customer service are processes that generate information for the employee in order to fulfill the next process steps. In the case of operational processes with a high degree of material process outputs, all principles can generally be used. It depends on the respective process step and the framework conditions (workshop or service at customer / plant) if the flow or pull principle is applicable. In the case of immaterial process outputs, the employee needs the correct and concrete information. Therefore, the processes have to be standardized and over-information, thus a kind of waste, should be reduced. Above this, it is necessary to visualize the needed information transparent and easy to understand.

The process characteristics predictability focuses on the forecast ability of process uncertainties. Routine processes like maintenance have a degree of predictability due to the fact that the operations are always nearly similar. Therefore, all LPS principles are applicable. Processes that exhibit a low degree of predictability (urgent repair order without knowledge of the concrete defect) are not suitable for Flow or Pull principle. In these cases, the customer service employee has to focus on a fast service performance in order to guarantee the operational capability of the serviced product.

The degree of collaboration outlines to what extent the work within a process is influenced by the interaction between process participants. [39] There is only one difference between processes including a high or low degree of collaboration. Low degree collaboration processes are not suitable for the LPS principle employee orientation. This is based on the fact that the service employee has to execute the service order without any connection to the service leadership. Hence, it is hard for the leadership to focus on the respective employees and to help them to fulfill the service orders.

The characteristic resource intensity differentiates whether the process makes use of a high or low degree of staff, execution time and IT-systems. [39] If the process execution requires a high degree of resources, it is hardly possible to standardize the process due its complexity. Moreover, the more employees, tools or spare parts and IT-support is needed the less is the possibility to avoid waste in the process. In case of processes with a low resource intensity, all LPS principles may be used to improve these processes.

In order to use the principles, the processes in customer service must be identified and visualized (e. g. by using swimlane diagrams or service blueprints) and the respective characteristics for each process step have to be derived. Based on this derivation, the methods and tools of the respective LPS principle (see Fig. 3) can be selected depending on the process characteristics of the respective customer service process step. Hence, the presented process characteristics based on BECKER ET AL. [39] as well as the assignment of LPS principles allow a pre-selection for implementation of the LPS methods and tools.

5. Conclusion

Based on an analysis of process characteristics for the core processes of the customer service, this paper identifies suitable and applicable principles of Lean Production Systems. For this purpose, it is necessary to describe and characterize each individual process step customer service specifically. On this basis, it is possible to implement suitable methods and tools of Lean Production Systems in the customer service. In this way, a Lean Service System can be implemented objective-orientated. Nevertheless, the next step is to validate the use of the LPS principles in reference processes. However, the identification, the use and the adjustments of principles, methods and tools has to be made individually for each company or the respective customer service.

Similar to production, a Lean Service System cannot be copied. Subsequently, Lean Service Systems can help reducing rework and service costs and therefore increases customer satisfaction. Moreover, employees, production resources, equipment, etc. can be used more effectively and efficiently. Further research activities include the analysis of methods and tools, so the operationally executable part of Lean Production Systems. This will help companies to find out which methods and tools can be used for each process step in the Customer Service. Lastly, it should be noted that all customer service processes must meet a certain degree of standardization. This means that defined inputs and outputs of the processes has to be defined. In this way, approaches and trends like Industrie 4.0 or Smart Services can also be supported, for example, as they require standardized service processes.

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