A Reference Model for Analysing Automotive Service Formats

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Abstract

In recent years, the automotive service sector has been affected by various trends. In order to stay successful companies that offer automotive services have to consider these developments by adapting their existing service formats. Therefore, a situation analysis and the derivation of future requirements resulting from trends are necessary.

This paper introduces a reference model for the description and analysis of automotive service formats. The reference model is divided into five dimensions: organisation, product, process, resource and market. On that basis possible strategic fields of action are derived. Finally, the application of the reference model is demonstrated for the automotive service format of a so called Fast Fitter.

Keywords

Automotive Service Formats, Service Analysis, Automotive Service, Service Reference Model

1 INTRODUCTION

Services in the automotive industry include all activities that create benefits for customers over the life cycle of cars [1]. Within the automobile value chain, automobile services can be situated between the car manufacturer and the consumer [2]. Thus, automotive service companies act as important intermediaries between them.

With a view on the life cycle stages automotive services can be divided into “pre-sales”-, “sales”-, and “after-sales”-services [3]. The two former categories are focusing on sales-promotional and sales-supporting activities, e.g. financing, advice for the product choice or configuration. The latter category (“after-sales”) includes all activities ranging from the usage phase to the end-of-life-stage, such as maintenance, spare part (management) or recycling.

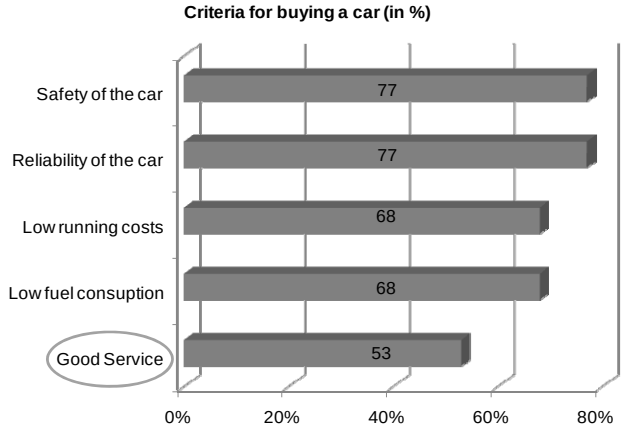

Figure 1: Criteria for buying a car [4]

With an average of twelve years, the usage phase of cars is the longest stage within an automotive life cycle [5]. Thus, services have a high relevance for the customer satisfaction and loyalty. For instance, for more than half of the people owning a driving license, a good service offer is an important reason for buying a brand-name car (Figure 1). Furthermore, services are important for the differentiation from competitors [4, 6].

The economic success of the automotive industry is crucially determined by after sales services due to decreasing turnovers and margins for the sale of new cars in consequence of high competition as well as substitutable cars. Even if the major turnover of car dealers is inducted by the selling of new and used cars, after sales services (e.g. maintenance, retail and car accessory sales) contribute the most to the results (Figure 2).

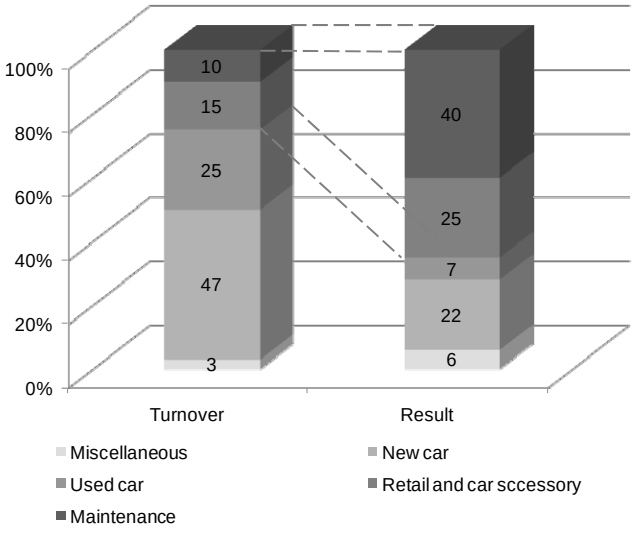

Figure 2: Relevance of after sales service in the automotive industry [7]

The automobile service sector is influenced by a variety of trends, which have to be considered. These trends are shown in Table 1. Thereby, various interdependencies are inherent.

Economic: Increased competition, decreasing service market volumes due to increased car quality and thus extended service intervals, price sensitivity due to increased living and car costs as well as a heightened savings rate, etc.
Political: Liberalisation of the service market by the group exemption regulation (GVO) 2002 and thus changed market conditions for independent car dealers and car workshops as well as component suppliers by changed basic conditions, e.g. concerning the multi-brand service, the location clause, the spare parts supply and the supply with technical car information. All these factors lead to increased competition, etc.
Socio-cultural: Changed purchase and customer behaviour (e.g. online-shopping, heightened demand on quality), shifted priorities (e.g. holiday and health is more important than car ownership, individuality), altered mobility behaviour (e.g. car sharing as a concept for using instead of buying a car), ageing society resulting in the shortage of skilled workers, changed way of life and working, etc.
Technological: New engine technology, increasing electronic components, shorter product life cycles lead to an increasing variety and an increasing car complexity, etc.
Ecological: Increasing environmental impacts caused by world traffic, increasing ecological awareness of car drivers, increasing political and legal measures for the reduction of environmental pollution by car, etc

Table 1: Relevant trends for the automotive service sector

In order to stay successful automotive service companies have to consider the depicted challenges and changes by adapting existing or developing new service strategies and service formats. Thereby, a service format comprises a group of service companies with the same business objectives. These are determined by the needs of their selected target group. A service format covers the structure, dimension and objective of an automotive service company [3].

As automotive services are provided within a socio-technical system and influenced by such manifold trends as shown in Table 1, its analysis requires an interdisciplinary approach. Some of the mentioned trends affect each other; some of them are mutually exclusive. Thus, a partial view on one trend or a local analysis and optimisation focussing only on one trend is not helpful. Equivalent to the planning and development of a physical product, a systematic and holistic situation analysis of existing service strategies and formats is essential. Requirements resulting from trends and future challenges need to be identified in the first step of a systematic planning process. In the second step, these requirements are to be analysed with regard to the structure, dimension and objective of existing automotive service companies. On this basis, strategic fields of action within service formats can be derived (see chapter 4).

Alongside this multi-disciplinary background, the main question is how to process a holistic situation analysis efficiently in order to ensure high-quality service strategies and formats. The planning and development process for the automotive service sector – and therefore also its analysis – are lacking in formalized processes, models and methods. Thus, adequate approaches and models are necessary in order to improve this procedure, resulting in more professional services.

A reference model for the systematic and efficient description and analysis of automotive service formats is required. Such a reference model should provide the input

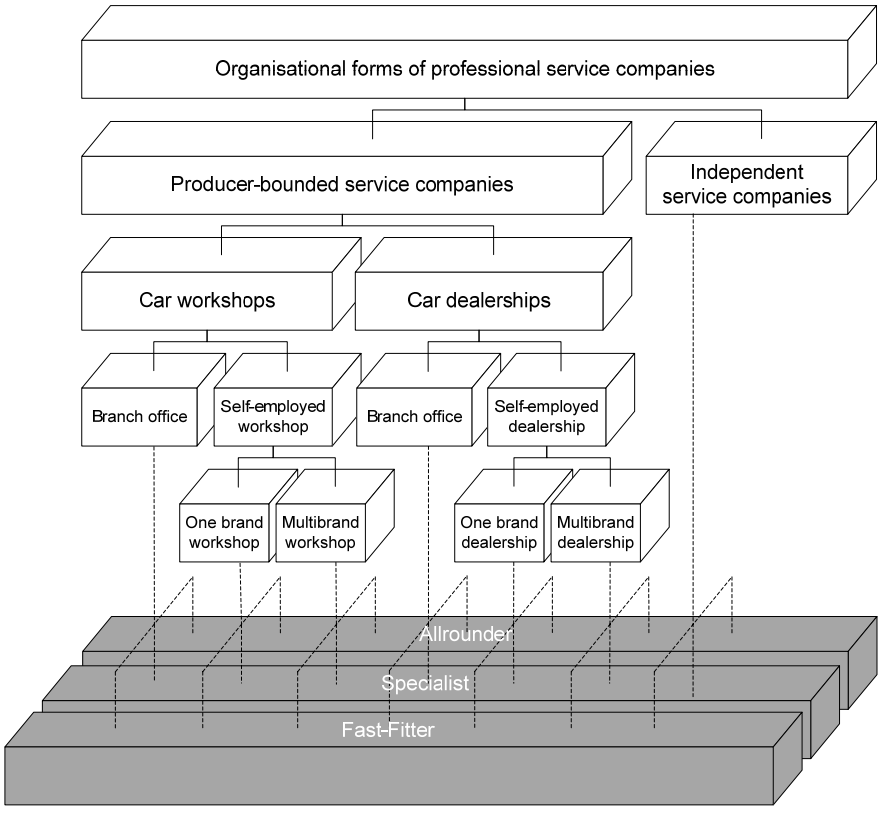

Figure 3: Form of organisation for service formats in the automotive industry

for an effective and goal-oriented adaptation of service formats and serves as a productive method for analysing automotive services.

2 PROVIDERS IN THE AUTOMOTIVE SERVICE SECTOR

Automotive services are provided by service companies which are mostly car dealerships ("pre-sales", "sales" and "after-sales") and car workshops (only "after-sales"). In general, these service providers can be divided into commercial and private providers.

Private providers include those repair- or maintenance operations that are done by oneself or by friends and acquaintances (Do-it-yourself: DIY). Illegal employment is ascribed to this group, too. In summary it makes up a market share of 8% [8].

The focus of this paper is on commercial providers that can be subdivided into producer-bound service companies (authorized dealers and car workshops) and independent workshops. This means that producer-bound companies are integrated into a super-ordinated distribution, marketing and service system of a car, component or retail manufacturer. Currently, the market is still dominated by producer-bound service companies, which have a market share of 55 % [8].

In a further step, producer-bound service companies can be divided into car dealerships and car workshops as shown in Figure 3. Both could be distinguished by their ownership. Either the service company is a branch office of the manufacturer or a self-employed service company. The latter one can also be divided into service companies that serve only one or multiple brands [2]. Finally, service formats can be differentiated in:

- *Allrounder:* This service format must cover full service in order to realise the promised performance and warranty bounds as well as goodwill gestures of the manufacturer. The strengths of the Allrounder can be found in the possibility to handle more complex and car-specific components such as the power train and electronics. Continuously, increasing technical complexity make high demands on the equipment and qualification of workshops. Here, authorized car workshops can draw upon full support and the know-how of the manufacturer.
- *Fast Fitter:* The target groups of Fast Fitters are all car classes and brands with an age of 4 to 15 years as well as price-sensitive customers who own cars of this segment by majority. Fast Fitters focus on selected car brands, as a general rule high-volume brands, and the operation areas are low-tech-workings that are easy to calculate, e.g. brakes, shock absorbers, tires and aluminium wheels or oil change. These need fewer resources, e.g. expensive equipment or specialized staff. Due to better cost structures Fast Fitters can often offer these services at a cheaper rate than *Allrounders*. One disadvantage is that less common cars as well as more complex maintenance workings of the engine, electrics or gear unit can possibly not be handled.
- *Specialists:* Mechanical service operations, such as repair of shock absorbers or exhaust systems, are increasingly conducted by Specialists. In contrary to *Allrounders*, *Specialists* focus on one or several car components for mostly all car classes, brands and segments. Often, the provider is a component manufacturer or a (specialised) dealership group. The advantage of this concept is the concentration on a few individual car components, so that high margins can be reached due to highly-standardised processes. As it is the same with Fast Fitters, overalls works concerning the whole car can oftentimes not be conducted due to their highly specialised knowledge. The different ranges of service offers for the introduced service formats are illustrated in a portfolio (Figure 4).

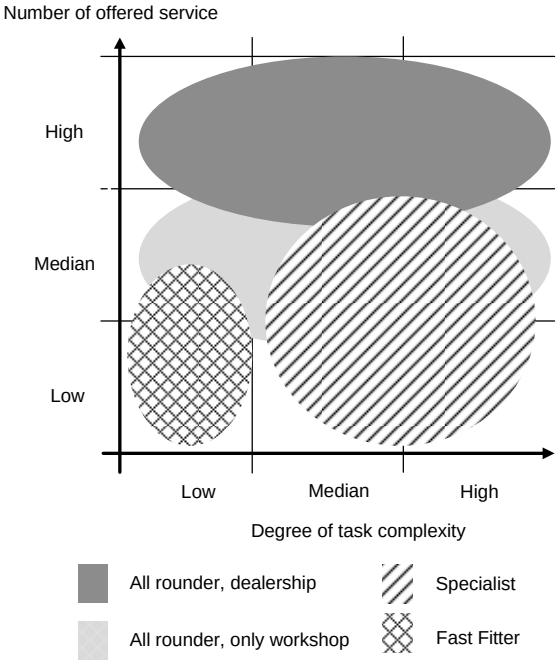

Figure 4: Range of service offers for different service formats

The abscissa indicates the degree of the task complexity, from low to high. Hereby, tasks, such as changing wheels or exhausts, link to low complexity. Tasks with medium complexity are jobs on brake systems, air condition, or simple car body repairs (smart repair), for instance. Works on the engine or electronics are tasks with high complexity. The ordinate indicates the number of offered services, from low (only few, selected services) to high. Examples for low and medium number of services are *Fast Fitters* offering only a few, selected services with low complexity or *Specialists* offering services for selected car components. In contrary, *Allrounders* with their wide range of service offers have a high number of services.

3 REFERENCE MODEL OF SERVICE FORMATS

In order to enable a systematic analysis of different service formats a reference model has been developed aiming at the illustration and description of all possible service formats. The reference model focuses on automotive sales and after-sales services and has the following objectives:

1 *Systematic and comprehensive modelling* of any kind of automotive service formats

2 Provision of a *basis for a situation analysis* of automotive service formats

3 Provision of a *basis for an impact analysis* of future changes (e.g. maintenance of new engine technology)

The reference model is an important input for an effective, goal-oriented adaptation or development of service formats

3.1 Dimensions of a service format

The reference model is based on the concept of model-based service systems engineering [9] as it provides multiple methods and techniques for the modelling as well as institutional background knowledge for the

understanding of service formats. Thereby, the concept refers to the system theory.

According to the purpose of used sub-models in the reference model, it can be differentiated between models focusing on the illustration of the structure or the allocation of objects. Structure models refer to the structure of an examined object type. For instance, an organisation chart illustrates the hierarchical structure of the object type employee. Against this, allocation models focus more on relationships between different object types. For example, the object type employee can be allocated to the object type resource, if an employee is specialised in using e.g. a specific software tool. Furthermore, hybrid models exist, combining structure and allocation models.

The concept of model-based service systems engineering relies on the constitutive, phase-oriented service definition. According to diverse scientific research activities [10] this approach gives the most distinct definition of services as these are defined on the basis of service-specific characteristics. Thereby, it is differentiated between a market, result, process and potentiality dimension.

For the modelling of an automotive service format, the service dimensions have been considered as well as their inter-dimensional connections. Moreover, these are completed by a comprehensive, fifth dimension, the organisational dimension. The organisational dimension of service formats comprises the modelling of the structural organisation. This implies the consideration of organisational connections to adjoining companies, too. Their constitution and structures, however, are neglected as these are not in the focus of the reference model.

In the following, the five dimensions of an automotive service format are described in more detail. Starting point is the depiction of the organisational dimension. In the following step, their market-, result-, process- and potentiality dimensions are presented.

Organisational dimension (What kind of service format is regarded and what is its internal and overall organisational structure?)

The organisational dimension includes the different types of service formats on the service market as depicted in Figure 3. It also implies its embedding in a super-ordinate service company, e.g. Pit Stop [11] or Volkswagen Services [12]. In addition to this, the organisational dimension refers to the structural organisation, i.e. the hierarchical constitution of employees, e.g. within a car workshop.

Market dimension (To whom is the service offered?)

The market dimension of the reference model contains information about the customer and car target groups, suppliers as well as potential competitors. Target groups of a service format can be differentiated in terms of their characteristics and requirements, e.g. demographic or socio-economic characteristics of customers. Thus, the market dimension implies a segmentation of target groups and their allocation to different markets, e.g. national or international markets. This allocation to markets is also part of the competitor view on service formats. Moreover, the connections between services of a competitor can be related to those of the modelled service format in terms of complementary or rival relations.

Product dimension (What kind of service is offered?):

Within the product dimension, the reference model differentiates between an internal and an external view. The internal view comprises the product portfolio of a service format from an internal point of view, whereas the external view combines the market dimension with the product dimension by allocating services to potential customer and car target groups.

Process dimension (*How is this service offered?*)*:*

The process dimension of the reference model considers management-, support- and business processes of a service format. Thereby, the focus is on the illustration of business processes, e.g. the process of arranging appointments or repair processes. Thereby, the implemented process modelling method service blueprinting enables the explicit consideration of the external factor of automotive after sales services within the process dimension. This means that the reference model allows for differentiating between customer processes and internal processes.

Potentiality dimension (Which objects are necessary in order to offer a service?):

The potentiality dimension refers to the necessity of available resources if service formats are able to offer automotive after sales and sales services. The resources contain employees, equipment, materials and the knowledge that is existent within a service format. Regarding the potentiality dimension the strong relationship between resources and suppliers of a service format is emphasised as suppliers are, for example, required to provide spare parts to a service format.

3.2 Frame of the reference model

The reference model of service formats has been developed on the basis of a system perspective and with respect to the introduced service format dimensions in chapter 3.1. In the reference model, the mentioned dimensions are depicted by different sub-models with the help of the corresponding, suitable modelling methods. For the determination of the sub-models, the focus is put on the information required for a market analysis. The reference model is illustrated in Figure 5. Its elements and interrelations will be explained from inside to outside.

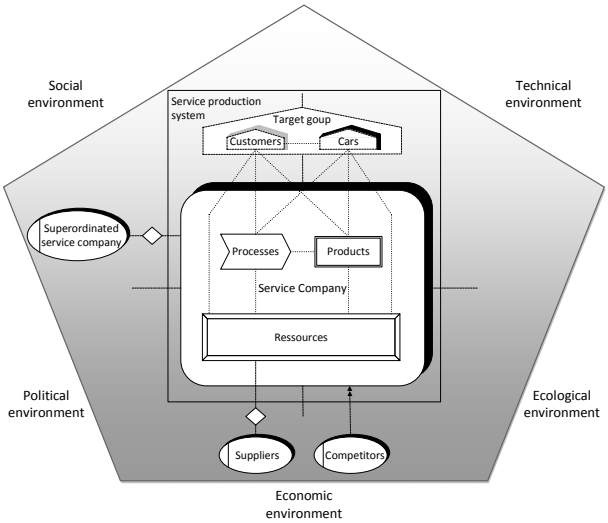

Figure 5: Reference model of service format

In the centre of the reference model is the organisational system of the *service company* with its three sub-systems *products*, *processes* and *resources*. The sub-systems correlate with each other and their configurations determine the complexity of the service format.

The *service production system* is a system that is dependent on the *customers* of a service format on the one hand and their *car* on the other hand. The customers and cars are integrated into the structure *target group.* Thus, the depicted relations refer to the market orientation of a service format on the one hand; on the other hand, it

demonstrates the dependence of its internal processes and resources on the target group. Thus, the integration of the external factor is explicitly respected. Within the context of service formats, the external factor comprises the service customer and his car as well as relevant information about car characteristics.

The outer shell of the reference model illustrates the *environment* of a service format containing the social, technical, political, ecological and economic environment. Therein, *suppliers*, *competitors* as well as *super-ordinate companies* are situated.

As stated above, the reference model aims at the illustration and description of all kinds of possible service formats. The service dimensions described in chapter 3.1 are depicted by sub-models in order to enable a detailed view of a service format. This is done with the help of corresponding, suitable modelling methods of the concept of model-based service systems engineering (Figure 6). Thereby, structure and allocation models as well as hybrid models are applied. When modelling a specific service format, e.g. a fast-fit company (see chapter 4) or an authorised workshop, the individual configuration of the reference model is required.

3.3 Detailing the reference model

A more detailed view on the reference model shall be demonstrated using the example of a sub-model within the product dimension. It contains the general internal product sub-model shown in Figure 7.

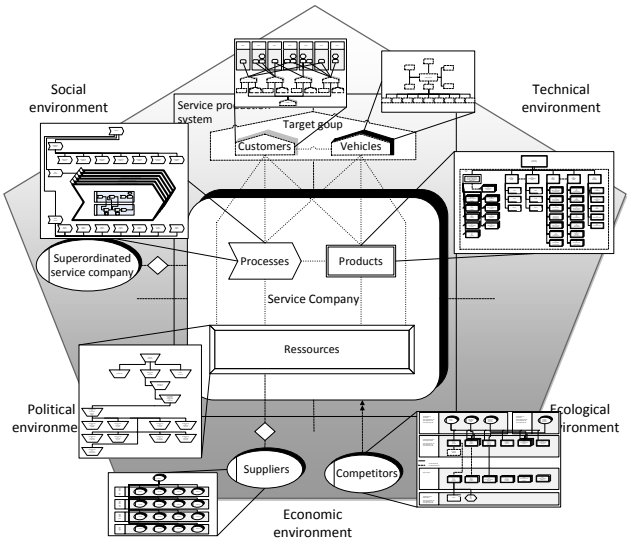

Figure 6: Sub-models of the reference model

The internal product sub-model is a structure model (cf. chapter 3.1) allowing for the illustration of the hierarchical structure of all possible services which can be offered by a service format. Within this sub-model it is differentiated between different categories such as technical services (e.g. repair and maintenance) as well as automotive sales services (e.g. new and used car trading, spare part dealing, accessory dealing) and other services (e.g. financing). Depending on the necessity for further detailing, the hierarchy is divided into further sub-categories, e.g. different degrees of complexity (cf. Figure 4) within technical services (i.e. complexity level).

In order to achieve the allocation of relevant aspects to separate services allocation models (cf. chapter 3.1) are used. This allows for exemplifying inter-dimensional

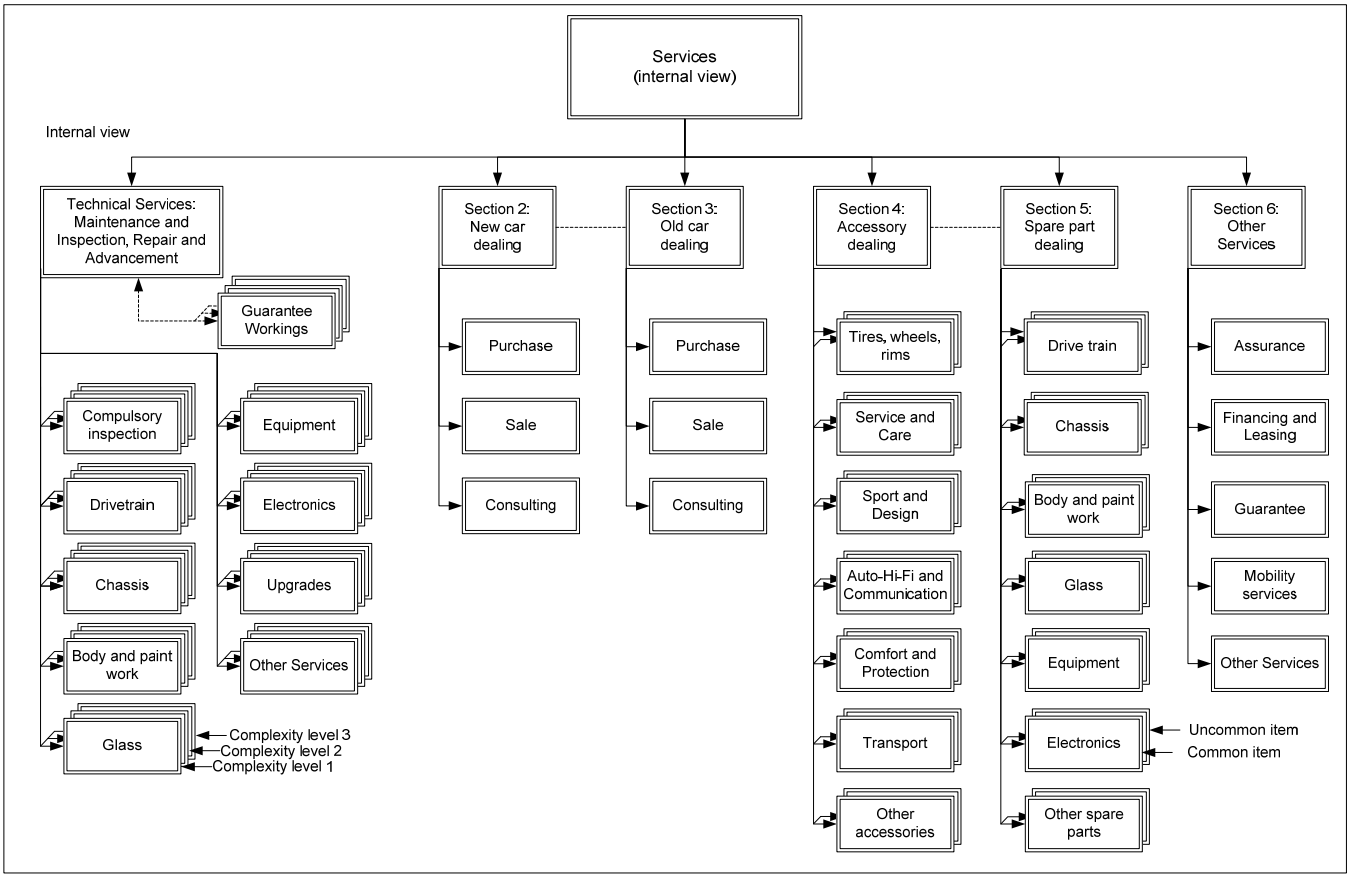

Figure 7: Internal product sub-model

relations as it is done in Figure 8 for the example of an oil-change.

Within the internal product model the oil-change can be located in the category drivetrain, sub-category low complexity level. Exemplarily, the potentiality dimension is represented by the object types *oil pan* and *employee*, the market dimension by the customer *requirement promptness*, as well as *customer* and *car target group*. Further aspects like potential *laws* can also be included.

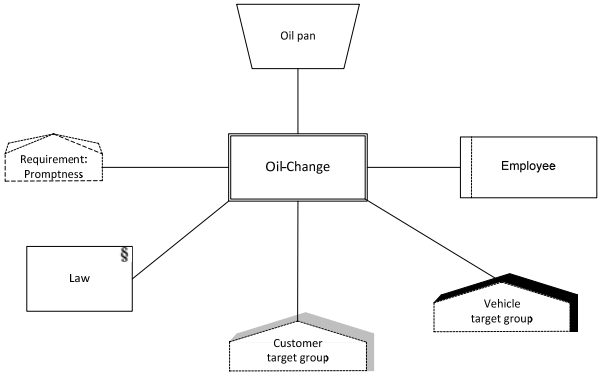

Figure 8: Allocation model for the service oil change

In the course of a project the reference model was applied to the service format Fast Fitter. Every sub-model was specified according to the available data concerning the Fast Fitter. As an example the internal product model of this service format is shown in Figure 9. In analogy to the explanations in chapter 2, the Fast Fitter mostly focuses on technical services with low complexity. Thus, the number of business units is low in the shown sub-model.

4 TRENDS INFLUENCING SERVICE FORMATS

Starting from the specified service format as it was shown for a Fast Fitter in chapter 3.3, further analyses are possible. In order to stay successful in the future, investigations concerning the following aspects are to be conducted:

- Future demands on the workshop caused by a new technologies
- Importance of target groups and their needs in the future
- Required services which have to be offered in future.
- Future process and resource requirements

Therefore, one objective of the reference model is the estimation of impacts and their consequences on a single automotive service format caused by the mentioned trends (cf. Table 1). On this basis possible strategic fields of action can be deducted for the adaptation of service formats. The required procedure steps are as follows:

- Step 1: In the first step *relevant trends* and challenges for the future service business (cf. Table 1) are *identified*. These trends have to be analysed and described in order to achieve transparency and a good understanding of their impact
- Step 2: For every trend, meaningful key factors are elaborated on the basis of step 1. This enables an efficient identification and measurement of the impact of each trend.
- Step 3: Using the key factors, a systematic analysis of the specified service format is conducted. Therefore, every sub-model is checked and evaluated (from high to low) regarding the influence of every single trend. Based on the analysis results, important fields of

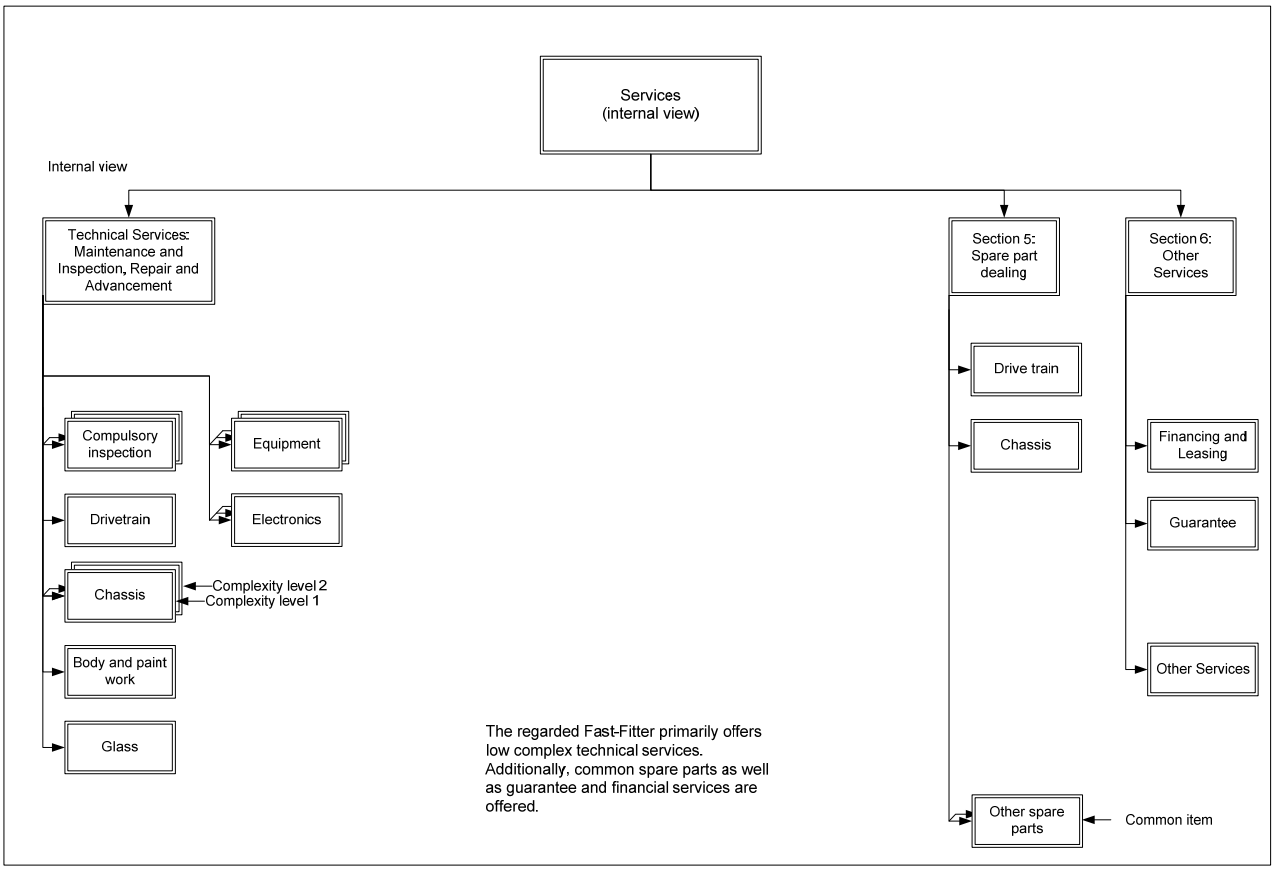

Figure 9: Internal product model for the service format “Fast Fitter”

action are identified and prioritised.

- Step 4: A catalogue of measures is worked out for the high prioritised fields of action

In Figure 10 the impacts of the trend increasing car complexity are depicted for the service format Fast Fitter. Thereby, only the adaptation of the service format Fast Fitter with cost-sensitive customers is considered.

In step 1 the trend increasing complexity has been identified on the basis of a survey representing an important technical trend.

Step 2 then refers to the identification of meaningful key factors pointing at the impact of increasing car complexity. The trend is in large part caused by an increasing share of electronic components [3]. Thus, a key factor for rising complexity is the share of electronics in cars. Furthermore, the increasing individualisation and customisation results in an increasing car variety as well as increasing equipment rates adding to car complexity [3]. Thus, car variety and the number of additional features have also been identified as key factors for the trend increasing complexity.

In step 3 suitable measures have been derived for each of the affected service dimensions on the basis of the reference model. Thus, in order to stay successful the structures of the considered Fast Fitter need to be adapted within the following service dimensions:

- Resources: Within the resource dimension highly complex cars require highly qualified employees and know-how. Additional, suitable technical equipment is necessary. Examples for suitable adaptation measures are shown in Figure 11 such as adaptation of information infrastructure to improve the provision of car or maintenance instruction information, or new diagnostic tools for a safe and quick maintenance. Further on, the employees have to be educated and the know-how needs to be acquired to cope with the new requirements.
- Processes: Increasing car complexity results in more extensive, detailed and heterogeneous processes with increased interfaces. Thus, the objective for the process-model is the aggregation and standardisation for service processes. Accordingly, processes need to be clustered and implemented by a supporting IT-system.
- Super-ordinated companies: In order be able to handle the increasingly complex cars extensive information and maintenance instructions are required. Hence, the access for updated data has to be established in cooperation with the car and spare parts manufactures.

In analogy to the depicted procedure, the service format Fast Fitter has to be analysed for all trends listed in Table 1. Finally, the measurements for all trends, need to be clustered and prioritised in order to get a holistic measurement catalogue for the effective adaption of Fast Fitters.

5 CONCLUSION

In recent years, the automotive service sector has been affected by radical structural changes. Trends in social, political, technological and economic areas force automotive service companies to change their market position. Hence, a systematic analysis of their service format is needed.

Within this paper a reference model for the holistic and systematic analysis of specified automotive service formats was presented. On the basis of the reference model, an approach for an impact analysis of future trends was proposed and detailed, using the example of the service format Fast Fitter. Thereby, essential key factors and affected parts of the service format were identified with respect to future developments. After that, suitable measures for the adaptation of the service format Fast Fitter were compiled for the influence of the trend increasing car complexity.

The advantage of the reference model is the provision of a systematic and comprehensive description and analysis of all kinds of automotive service formats. Thus, it enables a situation and impact analysis concerning all relevant future trends and changes.

Nevertheless, more detailed (quantitative) evaluations are necessary. Thereby, key figures, e.g. cost or environmental parameters, could be integrated in the reference model for a more extensive decision-support.

6 REFERENCES

[1] Torney, M., Kuntzky, K., Herrmann, C., 2009, Service Development and Implementation - A Review of the State of the Art, in: Proceeding of the 1st CIRP IPS2 Conference, Cranfield, 24-30.

[2] Diez, W., Reindl, S., 2005, Das Management der automobilwirtschaftlichen Wertschöpfungskette, in: Diez, W., Reindl, S., Brachat, H. (Ed.), Grundlagen der Automobilwirtschaft. 4 Edition, Auto Business

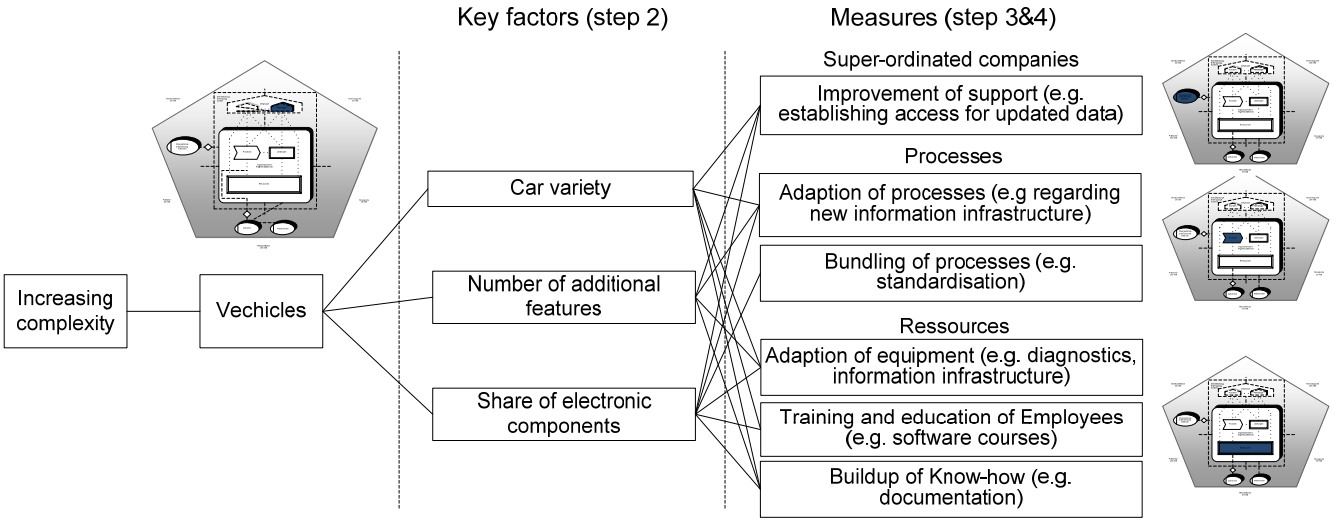

Figure 10: Internal product model for the service format “Fast Fitter”

Verlag, München, 71–104.

[3] Juehling, E., Torney, M., Herrmann, C., Droeder, K., 2009, Framework of the Integration of Service and Technology Strategies, in: Proceeding of the 1st CIRP IPS2 Conference, Cranfield, 132-139.

[4] Communication Networks 12.0, 2008, Studie „Der Markt der Mobilität“, http://www.medialine.de/CN.

[5] C. Herrmann, S. Thiede, T. Luger, A. Zein, J. Stehr, P. Halubek, M. Torney, 2009, Automotive Life Cycle Engineering, in: Proceedings of the 16th CIRP International Conference on Life Cycle Engineering, Kairo, 157-164.

[6] Hesselbach, J.; Dombrowski, U.; Bothe, T.; Graf, R.; Wrehde, J.; Mansour, M., 2004, Planning Process for the Spare Part Management of Automotive Electronics, Production Engineering Vol. XI / Issue 1.

[7] Reindl, S., 2005, Mobilitätsdienstleistungen in der Automobilwirtschaft, in: Diez, W., Reindl, S., Brachat, H. (Ed.), Grundlagen der Automobilwirtschaft, Auto Business Verlag, München, 423–466.

[8] Brachat, H. (Ed.), 2009, AUTOHAUS Extra « DAT Report », Deutsche Automobil Treuhand GmbH (Ed.), 7/2009, Springer Transport Media, München

[9] Klein, R., 2007, Modellgestütztes Service System Engineering – Theorie und Technik einer systematischen Entwicklung von Dienstleistungen, Gabler Verlag, Wiesbaden.

[10] Bullinger, H.-J., Fähnrich, K.-P., Meiren, T., 2003, Service engineering – methodical development of new service products, International Journal of Production Economics, Vol. 85, Number 3, 275-287.

[11] PIT Stop Germany http://www.pit-stop.de/

[12] Volkswagen Service Germany http://www.volkswagen.de/vwcms/master_public/virtualmaster/de3/kunden___service/Volkswagen_Service.html