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Towards Value Webs in the after-sales-service area of the German automotive industry

Research-in-Progress

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Abstract

This paper analyzes the potentials of Value Webs for increasing efficiency and effectiveness in the German automotive industry. Value Webs are networks of collaborating partners within different stages of interlinked value chains. This collaboration is enabled by innovative ICT¹-supported processes. The objective of this research is to pave the way for unleashing some efficiency potentials of a zero latency solution combined with optimized IT-based business processes considering the circumstances and conditions of collaboration in the after-sales-service area of the German Automotive Industry. The issue is shown by an example of a real after-sales-service process affecting several stages of the automotive value chain. After a short description of the trends in the automotive industry, the status quo in the after-sales-service area of a car manufacturer is analyzed. Hereby special focus lies on the repair process of an Original Equipment Manufacturer (OEM). Subsequently, a zero latency concept for this domain is developed and its appropriateness is analyzed. Following that, mayor barriers to the implementation of a zero latency concept are described. The paper closes with an outlook on further research.

1 Introduction: The German automotive industry

The automotive industry is one of the most important industrial sectors in Germany. Almost one quarter of the world's automobiles is produced by German manufacturers. Regarding the production quantities Germany is at the third place with approximately 5.7 million cars produced in 2001. Thereby the automotive industry achieved a total sales revenue of 202.2 billion € while approximately 770,000 people were working for that industry [IG Metall 2002; VDA 2003]. Besides Original Equipment Manufacturers (OEMs) and automotive suppliers, several other players (e.g. insurers) are participating in this part of our economy². At the moment, the entire value chain, consisting of customers, garages, authorized dealers, wholesale dealers, suppliers

¹ ICT: Information and Communication Technology

² The auto insurers' gross premiums in Germany sum up to 20.2 billion € [Kwiecinski/Wodzicki 2003, 1].

and manufacturers is changing dramatically. The actual situation is characterized by excess capacities, decreasing sales numbers and shrinking sales volumes in the service area (e.g. garages) [IG Metall 2002; VDA 2003]. The business environment is changing due to major changes in the underlying market regulations, for example the adaptation of national legislation to EU-laws, especially the modification of the so called “Gruppenfreistellungsverordnung” (GVO³ 1400/02). The new regulations confront car manufacturers with the prospect of sharply reduced control over their distribution networks and a smaller share of the highly profitable after-sales market [Mercer 2003, 133]. Besides that customer expectations regarding price and quality are rising steadily. In order to meet these challenges, manufacturers have to offer innovative services and service-bundles. In Addition to that, they have to optimize their business processes in order to increase efficiency and effectiveness. An often stated possibility for achieving this is supporting more business processes through better ICT. The change of the entire value chain in the automotive industry is an often discussed issue [de Queiroz/Stucky/Hertweck 2002]. In the following, we will focus on one very small part of the value chain in order to analyze the circumstances in that area that might have an influence on integrated ICT-concepts. These integrated ICT-concepts might induce an increase in efficiency and productivity and allow new service products and service bundles around the entire value creation process.

2 The after-sales-service area of German automotive industry

2.1 Global trends and status quo in the after-sales-service area of German automotive industry

According to Ealey/Bermúdez [1996, 64] car manufacturers can only be successful in a world of flat demand by: a) improving the perceived value of a vehicle at the time of sale and b) by increasing the total revenues generated throughout its lifetime. Thus not only the OEMs’ (mass-) production processes, but the processes in the after-sales area of car manufacturers should be a research object because of the growing potential of this area. The importance of the service area for car manufacturers is often articulated in practice. Accenture [2001, 15] claims that a focus on the aftersales/aftermarket for OEMs is not only “nice-to-have” but a necessary condition for future success. Some authors claim that 80 to 90% of the revenues generated throughout a vehicle’s lifetime are service-related [Kaerner 2002]. Yet if such high proportions might not hold true for all manufacturers and market segments, the relevance of the service area is undisputable. Regarding McKinsey’s findings on automakers’ participation on the revenue streams along a vehicle’s lifetime, the typical automakers’ participation equals approximately 43% of the revenue stream. The proportion of maintenance and repair equals 6-10% of the overall revenue stream of a typical mid-sized car [Ealey/Troyano-Bermúdez 1996, 70 and 2000, 74]. Other authors show that the industry’s gross profits mainly result from service (14%) and parts (39%) [Bohmann/Rosenberg/Stenbrink 2003]. Therefore the OEMs are moving into the after-sales-market and seek for downstream revenues in service, parts and ancillary products [Ealey/Troyano-Bermúdez 2000, 72-74].

³ GVO means “Gruppenfreistellungsverordnung” and can be translated as „revised block exemption“.

The after-sales-service area is characterized by services, which are delivered after a vehicle is sold to the end customer. Typical services in that context are repair, maintenance and guarantee-related services provided by the different independent actors in the research field.

While some US automakers estimate, that they control only 20% of the total service business for their cars, the situation in Germany is different [Knupfer/Richmond/Vander Ark 2003, 145]. Looking at the after-sales-service area of German car manufacturers one has to consider its complex structure. On the one hand, car manufacturers “in Europe have a tight grip on the auto repair industry” [Kwiecinski/Wodzicki 2003, 19] on the other hand: most of the OEMs’ car dealers in Germany are independent and therefore the OEMs’ influence will decrease regarding new EU-legislation. Today’s warranty conditions require that cars have to be repaired at certified workshops using solely original parts from the manufacturer. The EU regulations passed in October 2002 (GVO 1400/02) will limit the right of manufacturers to deny authorization to repair shops. Thus, one can expect that more repair shops will obtain certification and they will have a greater choice of manufacturers for spare parts [Kwiecinski/Wodzicki 2003, 19]. Taken together the old legislation and rules (GVO 1475/95) have created an integrated automotive value chain in Germany, which is beginning to break up now [Bohmann/Rosenberg/Stenbrink 2003, 135]. Car manufacturers are now requested to treat all sales agencies, repair shops and sales partners equally, because the European Commission now separates “sale” and “after-sale”. Yet this separation between distribution and service is opposed to the expected trend in the service area of automotive industry.⁴

Early augurs promised changes in the European car distribution system towards multi-branded dealerships as early as 1994 [Mercer 1994, 107]. The worldwide discussion since then showed that multi-branded dealerships are not the only possibility arising from the changes in the legal surrounding [Bohmann/Rosenberg/Stenbrink 2003, 138-142].

Summing up, we deal with a rapidly changing, complex field, generating a huge part of the revenues in the Automotive industry. The heterogeneity of the different partners that are involved in the after-sales-area is normally not noticed by the end customer. He or she feels like interacting with the car manufacturer (Audi, BMW, Mercedes-Benz, Opel, VW, et al.) when entering his or her service station for the 30,000-mile checkup.

2.2 Model of an after-sales-service process today

The following analysis of the current situation in the research field addresses problems and processes in the after-sales-service area of a German car manufacturer. Special emphasis is put on the IT-infrastructures and applications, which are used by the different partners of the value chain⁵. Special weight is laid on the individual actors and their situation within the value creation process. The analysis provides detailed insights into the process-landscapes of the automotive service area. An extensive process-description is developed (see Appendix), which focuses on applications, infrastructure and persons/organizations involved within this exemplary service process.

⁴ The VDA (German Automotive Industry Association) Annual Report gives further information on that issue [VDA 2003, 85-90].

⁵ The study is based on qualitative case studies, conducted together with partners from the German Automotive Industry. The model of the process (see Appendix) shows the current structure in the after-sales-service area of a German OEM, which preferred to remain anonymous.

Figures 4-6 in the appendix show several process models (notation in the form of EPCs (Event-driven Process Chains, for an overview of literature on EPCs see e.g. the publication list of the Special Interest Group on Process Modeling with EPCs at the German Informatics Society, website: <http://www.epk-community.de/>).

Figure 4 shows the general service model / a process map of the repair service, figures 5 and 6 show in detail the arrangement of a vehicle repair appointment and the order preparation for a manufacturer-supported repair process.

The analyses of these processes deliver some interesting results:

- Media-changes/-breaks occur throughout the processes (e.g. paper documents and files are used parallel to ICT-systems like Dealer Management Systems (DMS), appointment-coordination, etc.).
- ICT-systems are not connected with each other (e.g. most garages use their own ICT-system and do not have a connection with the systems of the manufacturer, interfaces between the systems are not yet implemented).
- Redundancies in data storage and maintenance due to the operation of two systems (the manufacturer's after-sales-system and the own (DMS) system).
- Overall: Inefficiencies at many stages and a theoretically high potential for delivering faster and better service at lower costs.

Possible explanations for these results can be found by looking at incentives and motivation structures between the legally independent partners of this value web.

Technology might still cause problems, due to heterogeneous system landscapes, lacking common standards and the high investment costs for acquiring new and compatible systems.

Another approach for explaining the situation is using principal-agency-theory (for an overview see e.g. [Macharzina, 51ff.]), with the manufacturer as principal and the garage as agent. The agent does not want to share his own scarce and valuable resources (e.g. data about his clients) with the principal in order to avoid becoming compensable.

These results are backed by research of Roland Berger and Deutsche Bank [2000], who stated that there is poor cooperation and information exchange between manufacturers and the dealership network. When we look at the real process this does not hold true any more – manufacturers (Summer 2003) have already put some effort on integrating dealers and repair shops into their system landscapes. Currently they are not fully integrated, because of various reasons, we will focus in the discussion at the workshop.

3 Development of a zero latency concept for the Automotive domain

3.1 The zero latency enterprise – a model for a realtime enterprise

“What if the moment a business takes place (...) anywhere along a supply chain – all pertinent systems and people in the enterprise are instantly aware of the occurrence and equipped to act appropriately? This (...) is the promise of a zero latency enterprise.” The idea behind this concept is very simple: whenever a business event occurs, it immediately triggers appropriate responses and actions across the entire enterprise and beyond. [HP 2002a] The term zero latency enterprise (ZLE) was originally coined by the Gartner Group⁶ [2001]. It describes information

⁶ Gartner's Roy Schulte, vice president and research fellow, developed the term „zero-latency strategy“. He defined it as „any strategy that exploits the immediate exchange of information across technical and organizational boundaries to achieve business benefit“ [Gartner Group 2001].

management technologies integrating diverse computer applications and therefore eliminating delays in the propagation of new data throughout the entire value chain. Such an ICT-infrastructure with all its interfaces, standards, connections and most of all applications, that can be adequately integrated, can synchronize information across several value chain stages and make it available on the spot in the desired quality and quantity.⁷

A ZLE architecture combines data and enterprise application integration (EAI), robust messaging, and a data warehouse or operational data store in a real-time-enabled infrastructure. That requires a high-level architecture for real-time, enterprise-wide consolidation of data and integration of applications and processes. [HP 2002a, 2]

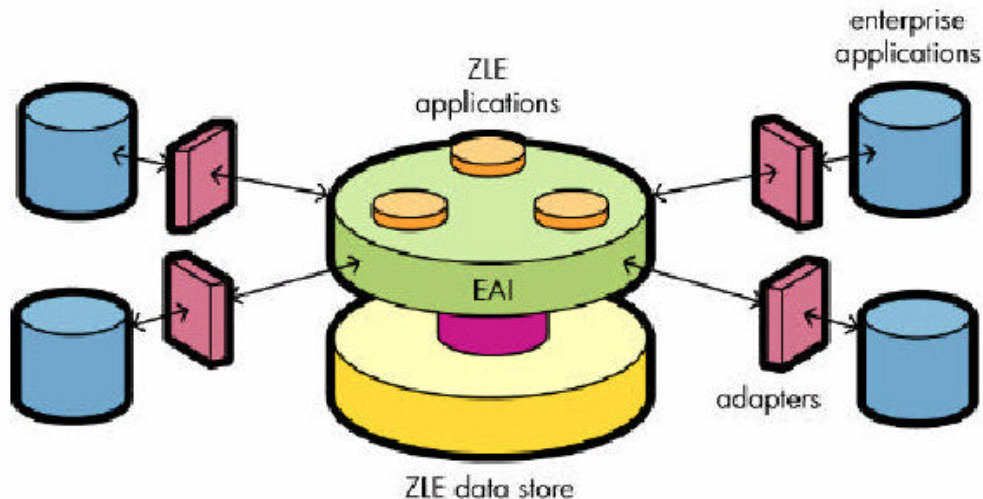


Figure 1: The ZLE framework [HP 2002b, 4]

The ZLE framework⁸ can provide a single, integrated, real-time operational data store which enables event-based procedures in the production process. Data and Applications are integrated, updated and synchronized within this operational architecture in real time.

Furthermore, a ZLE solution offers new possibilities for collaboration. By using this integrated internet-based solution, other members of the value chain (manufacturers, dealers, wholesale dealers) that usually do not have any direct interaction with the customer can now interact with the customer and therefore identify new demand and create new and faster offers.

When trying to integrate ZLE into the debate on Supply Chain Management (SCM) and Business Process Change, we could classify this integrated solution (ZLE) as Business Network Redesign (BNR).

⁷ Following HP [2002a] information in a real time, zero latency enterprise is delivered to the right place at the right time for maximum business value.

⁸ For further information regarding architectural aspects of the ZLE framework see: [HP 2002b].

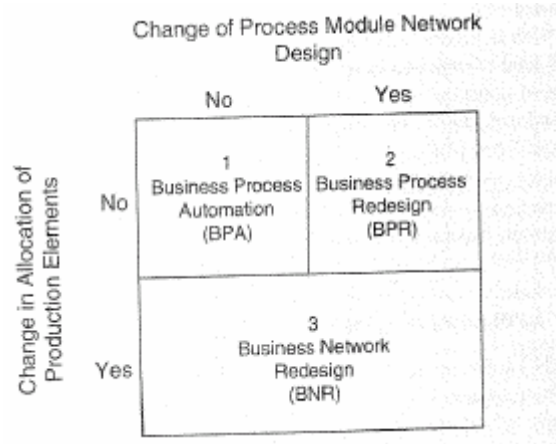


Figure 2: Three MND-based levels of ICT integration [Hoogeweegen et al. 1999, 1081].

The above scheme was proposed in the paper on Modular Network Design (MND) from Hoogeweegen et al. [Hoogeweegen et al., 1077-1082].

Looking at the proposed solution (ZLE) from a distant position two main challenges are catching one's eye: secure connections across the interfaces between the various involved systems and participating partners in the value chain as well as the necessity of standards for the Integration of the Enterprise Applications.

3.2 An adaptation of the zero latency concept for the Automotive industry

Looking at the above described repair process, not only the optimization of the underlying workflow, but especially the conceptual design of an IS-architecture, that supports the optimized processes, is of major importance. Creating a concept, that integrates the heterogeneous infrastructures and applications, the various partners use today, into one zero latency system architecture is one of the most challenging tasks arising from the analysis.

Mercer [Mercer MC 2002] proposed a repositioning of (after-sales) services which should be offered (by the OEMs) *together* with their partners. Thereby the OEMs take a leading position coordinating the services provided by the external partners.

These cooperation networks can be described as value webs [Selz 1999, 99]. Österle [2002a; 2002b, 9] has worked out an example for such a value web in the automotive industry and focuses on the changes on the business model of an OEM. He states that OEMs will become Value Web Brokers, that coordinate the value chains. Accordingly OEMs will concentrate on the most valuable and critical elements of the whole value chain and become the sole interface to the customer. Thus the customer is not aware of the complex structures of independent actors in the value web, a similar situation as often stated for virtual organizations⁹. Figure 3 shows the adaptation of a ZLE-concept to the automotive after-sales-service area with the business bus as the equivalent of the ZLE-Core presented in Figure 1. It connects legally and organizationally independent actors (with their own value chains) to an integrated value web.

⁹ For an overview of literature and findings on Virtual Organizations see e.g. [Krcmar 2003, 280] or [Leimeister 2003].

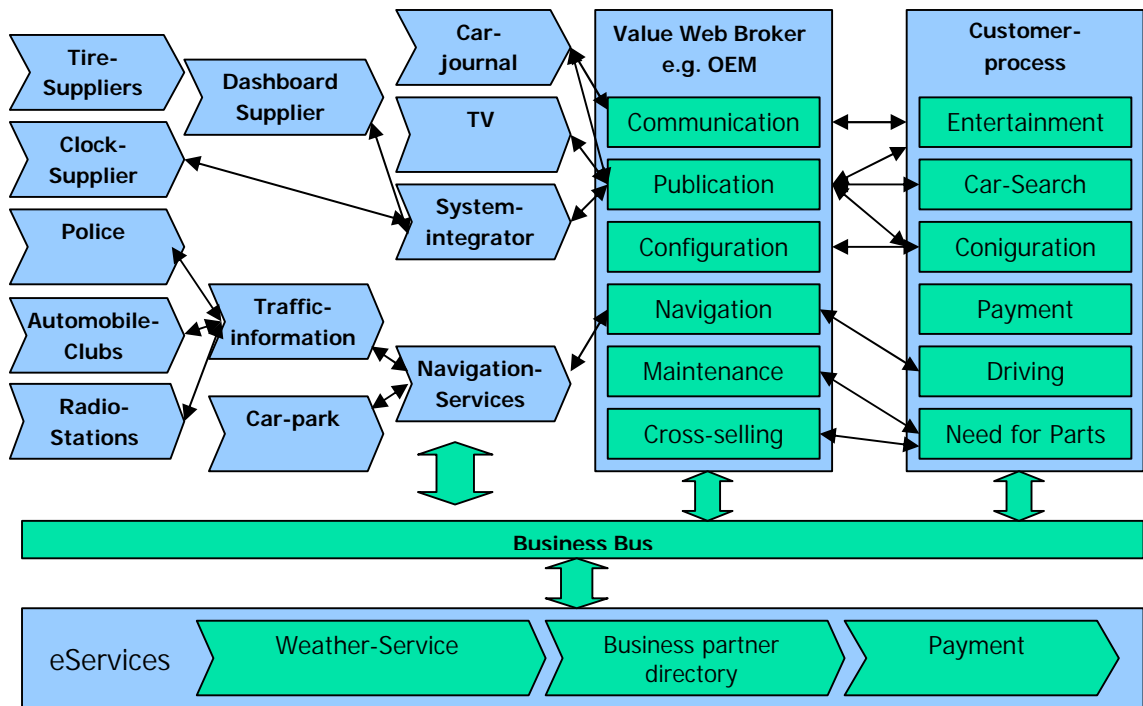


Figure 3: Possible concept for the automotive after-sales-service area
 (based on [Österle 2002b, 9]).

By implementing such a system some of the inefficiencies of the automotive industry's current supply chain model could be solved. Information systems that are not fully compatible today induce insufficient information exchange between manufacturers and suppliers from different tiers. Therefore safety stocks and excess inventories on each stage of the value chain are built, which cause excessive capital commitment [de Queiroz/Stucky/Hertweck 2002, 2].

3.3 New Service Products – conceivable consequences of telematics and Real-time Solutions

When we are looking at the efforts OEMs undertake in their move to the after-sales market, they are experimenting with different forms of downstream participation on the revenues generated throughout a vehicle's lifetime. They try to take equity positions in dealer networks, acquire parts- and service-companies or they offer car buyers new service products (like telematics¹⁰). These products are for example active navigation systems or emergency call services like On-Star (General Motors) and Rescu (Ford). [Ealey/Troyano-Bermúdez 2000, 74-75] This wide range of new services includes vehicle management services like extended service protection or forms of intelligent transportation services (toll collection systems, security alert systems, other two-way communications systems, etc.). [Ealey/Troyano-Bermúdez 1996] One common example for such a new service are customer-individual service cycles for vehicles. General Electric provides such a service for airlines, owning GE turbines. Maintenance and repair appointments are planned and optimized by analyzing the aircrafts' performance data [Kaerner 2002]. Based on data from intelligent telematics solutions together with integrated (realtime) after-sales-

¹⁰ Telematics is a combination of the words Telecommunication and Informatics. It describes new services in the automotive industry that focus on the mobility of cars like navigation services, emergency localization, etc. For an overview on telematics see e.g. [Müller/Eymann/Kreutzer 2003].

service-systems, the adaptation of the GE-example to conventional automobiles seems possible and promising.

For example: a customer enters his service station for the recommended service check after 30,000 miles (the business-relevant event). This triggers the underlying components of the value creation process (e.g. checking the customer's car-history, ordering missing parts from warehouse, manufacturer or wholesale dealer). Consequently the demand for a replacement gearbox could instantly trigger the production of a new component in the factory of the car manufacturer's supplier¹¹. This scenario can be extended by a proactive problem diagnosis in cars that helps to analyze technical problems long before the next service check. Necessary components can be ordered sooner and faster. Due to such a telematics-based pre-check of cars and the connection with the affected partners in the value chain, the (automatic) re-order of maintenance parts and the whole service- and repair-process can be conducted more efficiently and transaction costs can be reduced thereby. By aligning supply- and repair-dates, the customers' waiting time can be optimized. By further improving Quality Assurance procedures and car control based on telematics and other ICT-systems, customer-adequate guarantee times and service cycles (depending on individual car use) as well as new mobility-guarantees for special customer groups can be developed.

There has been a long discussion on these new services and especially telematics-based solutions [HP]. Summing it up, a very important question arises: "Why have only few of these scenarios been implemented today?" Extended service protection for cars surely aligns with the OEMs strategy to increase their revenue share along vehicles' lifecycles. Therefore we have to ask whether there are other barriers hindering the implementation of such services.

4 Barriers to the implementation of a zero latency concept in the after-sales-service area

Fully integrated enterprise resource planning integrating the entire supply chain is often discussed under various labels like Frictionless, Zero Latency or Realtime Enterprise. The promise of connecting the supply chain to front-end-data on customer demand could facilitate significant reductions in inventory and cost savings related to better planning. However "transforming the automotive value chain into a fully connected system is no small task." [Roland Berger/Deutsche Bank, 85] The major challenges for the implementation of such a solution are: a) the development and implementation of new software applications integrating the extremely complex and heterogeneous IT-systems of the different players along the supply chain, b) ensuring safety and confidentiality of information and c) changing the corporate cultures [Roland Berger/Deutsche Bank 2000].

If we look at the above example of customer individual service cycles¹² we can figure out that there are two main incentives for car manufacturer to provide such a solution: a) the customer is willing to pay an sufficiently high amount of money or b) the manufacturer (or dealer) gains from providing such a solution to the customer. Omitting a) (the customers' willingness to pay for such services) we now look at the providers' motives.

¹¹ Though the above described As-Is-process shows the manufacturers' effort on optimization, the re-ordering of materials is not (directly) triggered by the customer's need for spare parts.

¹² We exclude the technical problems to implement such a solution, because of the fact that in the above example (GE Turbines maintenance) the data needed for the solution was available (for the airlines) long before GE provided such a service as an integrated solution. [Kaerner 2002].

As long as the OEM/Dealer system is not ready for an event-based, customer-demand-driven business, there is no incentive for OEMs and dealers to provide such a solution as there are huge inventories of parts and it does not really matter, when they are needed and changed in the customer's vehicle. Therefore there is no incentive for OEMs to provide customer-individual service cycles as long as the underlying processes and applications do not support that kind of event-based resource management.

The close correlation between the two aspects (new services and service bundles on one hand, efficient, ICT-supported business processes on the other hand) is very important. In particular, the analyses of the interfaces between the participants in the value creation process as well as within and between their IT-landscapes and IT-competencies are important, because these are supposed to be fundamental factors influencing a successful implementation of a Zero Latency solution.

We found out, that OEMs try to build integrated solutions like the above proposed model. However there's no such fully integrated system similar to that we described above. There are several reasons that are possibly impeding the implementation of such networks. The heterogeneous systems of the different involved partners in the after-sales-service area, multiple inputs of identical data into different systems as well as media-brakes in relevant processes prevent the patency of data needed in the ZLE-scenario.

Omitting that technology might not be ready for the implementation of such a ZLE-framework, there are various other hindering reasons regarding social, legal and organizational aspects. Most of the relevant actors in the after-sales-service area are legally and organizationally independent. Therefore Principal-Agent- as well as property-Rights-questions play a role in that context. The promises of integrating systems over different stages of a value chain might be very promising – though one should not forget the, to some extent, diametrically opposed objectives of the “partners” in the after-sales-service area.

Furthermore one should not forget on the IT-competencies needed to operate the systems. Not every repair shop owner will have adequate knowledge on the (Information-)management of the IT-systems, that are required for such a solution. Another interesting question is concerning the business model for an integrated ZLE-like solution in that field – which partner will have to pay for the provision of the solution and what are the economic incentives (e.g. for dealers or repair shops) for the utilization of these systems.

Whereas the end customer is not aware of the dynamics and complexity of the situation in the field – he only perceives his car manufacturer – the involved actors have (reasonable) motives for carefulness against such fundamental changes.

For a successful formation of a value-web-like structure in the research field, trust between the involved partners is one of the preconditions. Otherwise nobody will want to use the systems if they induce further dependency or economic disadvantages. A potential system/architecture has to support the development of trust among the partners and provide privacy for crucial data of each member of the value web. Only then, all the full potentials for efficiency and effectiveness can be tapped.

5 Outlook (on further research)

The influence of the above proposed changes on warehouse-, production- and supplier-capacities induce further research on these points, thus the concept of ZLE in the after-sales service area can be considered as a first step towards these new and promising research fields.

The problems we discussed here are, to some extent, similar to the discussion on the Build to Order approach (BTO) – a variant of mass customization in the automotive industry. The discussion on these issues concentrates on the two opposed patterns *produce-to-order* vs. *produce-to-stock* [Hoogeweegen et al. 1999, 1074]. The main promises of a pull model (BTO) vs. the traditional push model are lower supply chain costs. A fully implemented pull system would allow a massive reduction in finished goods [Agrawal/Kumaresh/Mercer 2001]. Focusing on the (very) end of the automotive value chain, inventory levels with finished goods (completed cars) could be reduced. Nevertheless not only the initial production is important for the automotive industry – repairing and maintaining is immanent when we regard (capital) goods with a longer lifetime (e.g. automobiles). Consequently not only the inventories for production but also the OEMs' inventories for repair parts could be further reduced by introducing a “needs driven” pull model in the after-sales-service area.

It is evident that the current ICT systems in the automotive industry, which are mostly designed to support mass production, have to be changed in order to allow real time processing. Therefore the diverse systems (MRP, ERP, etc.), which are sometimes still running in an overnight batch mode, have to be updated and further integrated across all levels of the value chains [Agrawal/Kumaresh/Mercer 2001].

Furthermore the complexity and heterogeneity (regarding ICT-systems) of the research field is what can be taken of the research we conducted so far. When we look at the network-like structure of the after-sales-service area and its stakeholders – especially on the insurers' efforts to reduce their repair-related payouts¹³ – it remains unclear which of the different involved players, will play the predominant role in the field [Kwiecinski/Wodzicki 2003, 19-20]. What can not be denied is the fact, that ICT-based networks will alter today's structure in the automotive service area – yet it has to be analyzed what they will look like and which players (OEMs, large dealer-networks or insurers) will be successful in setting their standards. Further new services in the service area are for example insurer networks incorporating the insurers' preferred providers for repair services or parts supply.

It has to be analyzed, whether telematics-based solutions and new services will induce customers' attention, demand and willingness to pay and then will have their place in the future after-sales-service area of German Automotive industry. For the moment it looks like these solutions, like for example remote problem diagnosis, will only be implemented if they contribute to reduce service costs for the OEMs and allow e.g. optimized supply parts management [Jeltsch 2002].

The proposed research contributes to understanding the possibilities and risks that concern process optimization, IT-support as well as collaboration along the automotive value chain. Recommendations on the composition of process chains, IT-competencies of the involved partners, IT-system- and application-landscapes in the research field will be derived from the analysis. It has to be asked what are the most promising of the research aspects for further research in this field?

The documentation of the current process allows the creation of a concept for optimizing the process across all involved stages in the value chain. Based on the above described results, concepts for innovative IT-based services and new service-bundles can now be developed.

¹³ Auto insurers are the most important (indirect) buyers of repair parts and services.

Appendix

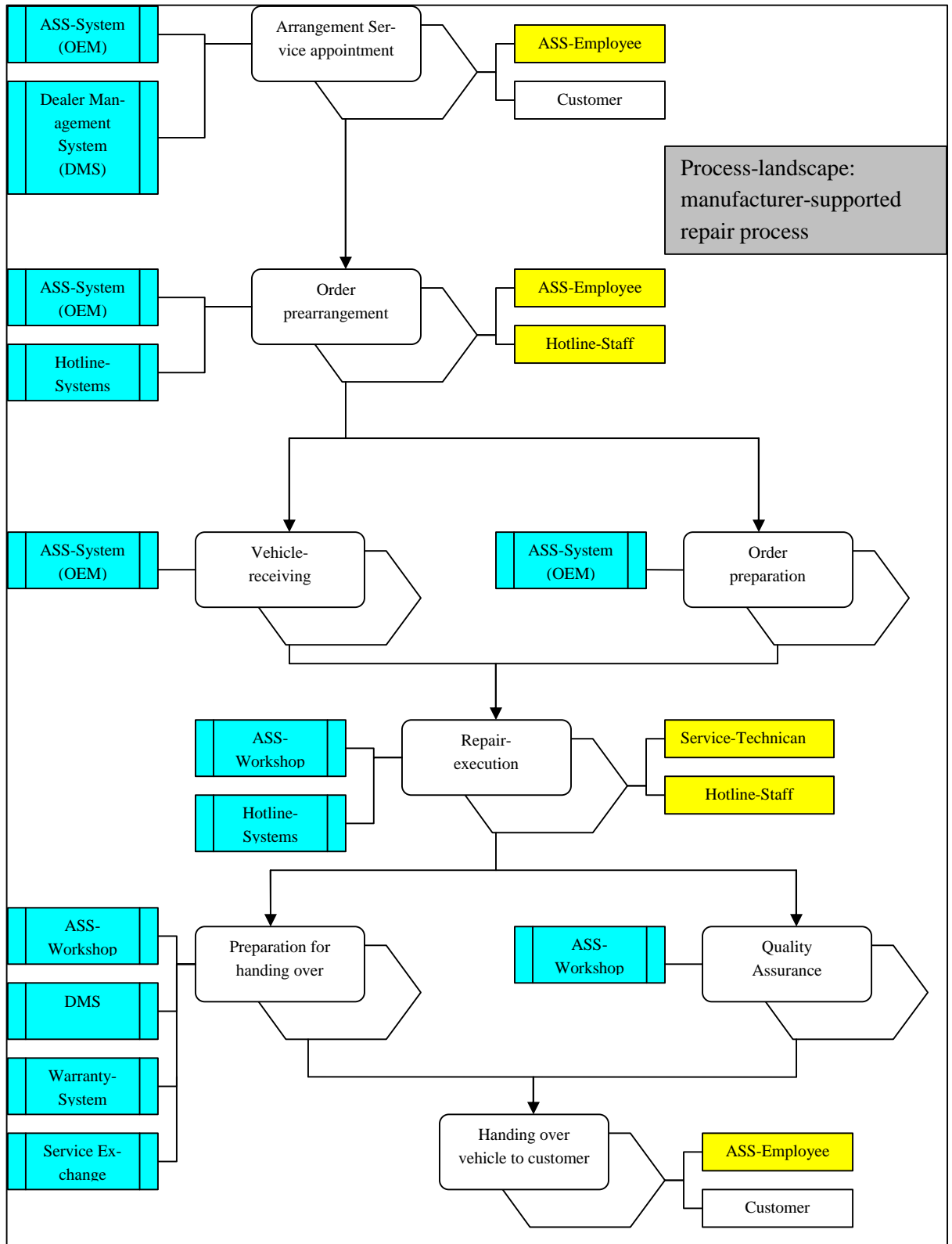


Figure 4: Overview of a manufacturer-supported repair process in German automotive industry

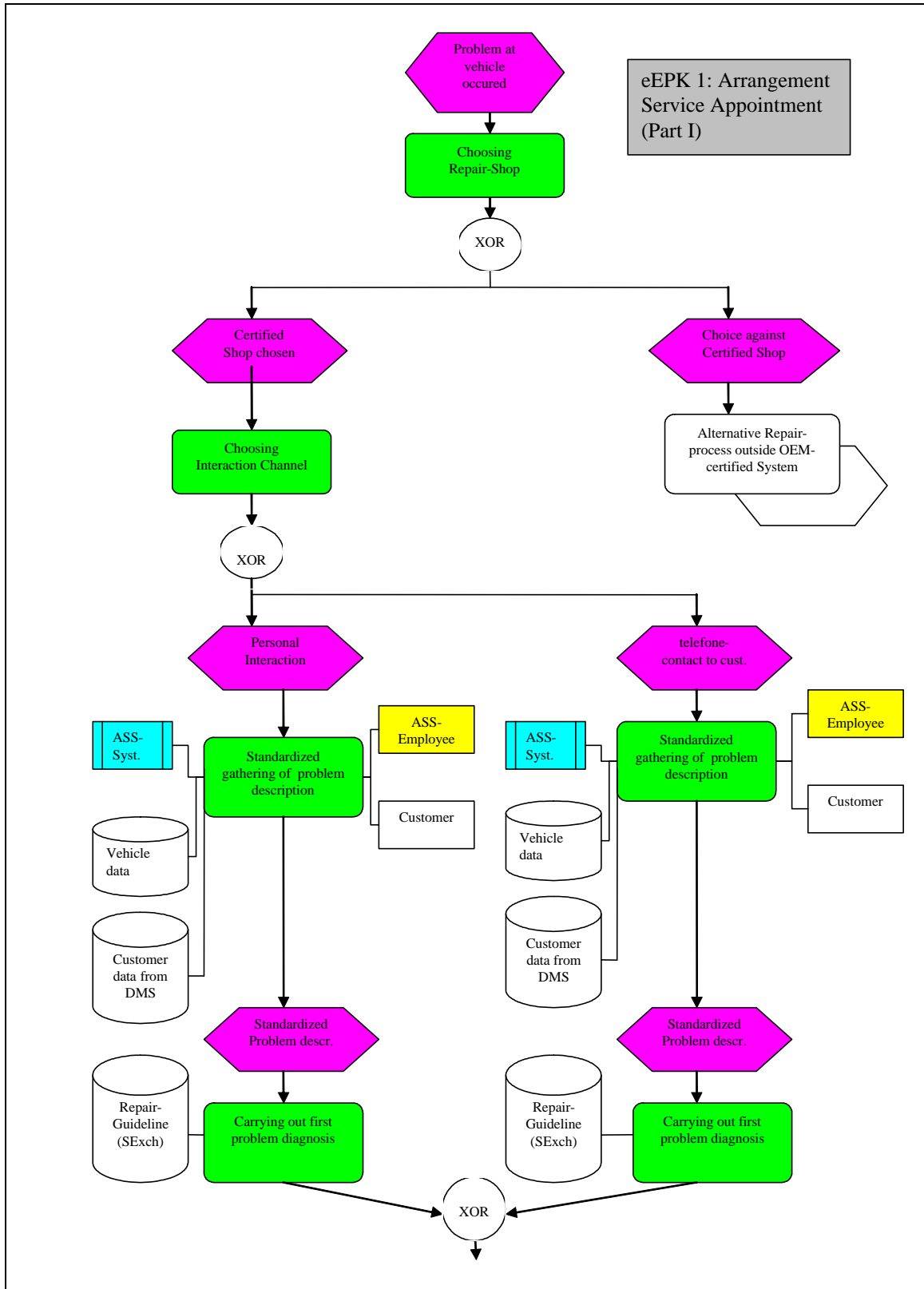


Figure 5: Arrangement of vehicle repair-appointment and order preparation for manufacturer-supported repair process (Part 1)

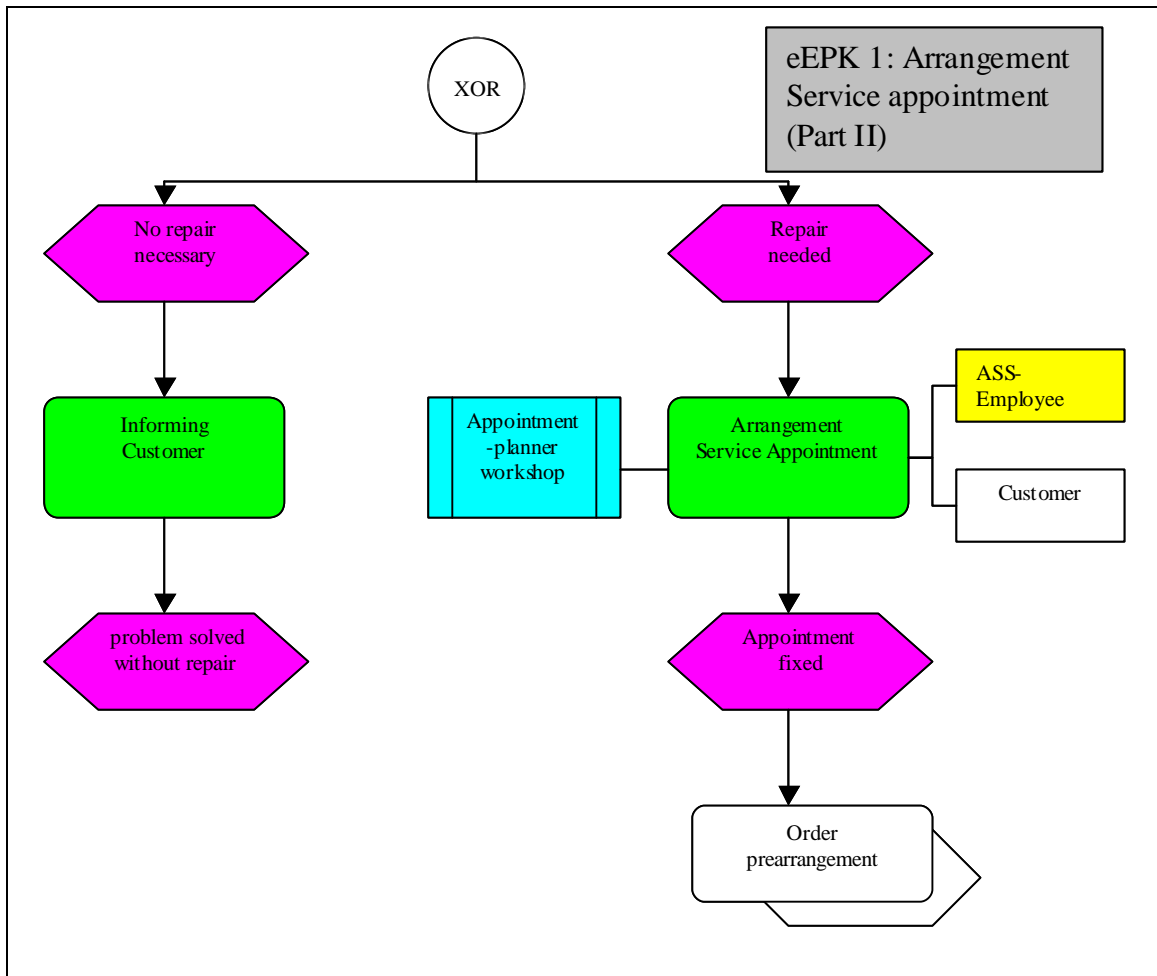


Figure 6: Arrangement of vehicle repair-appointment and order preparation for manufacturer-supported repair process (Part 2)

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