Availability and Sustainability as Value Elements in Assessing Customer Value of an Industrial Service

Ville Ojanen¹, Toni Ahonen², Markku Reunanen²
¹Lappeenranta University of Technology, Dept of Industrial Management, Lappeenranta, Finland
²VTT Technical Research Centre of Finland

Abstract—For a customer of industrial maintenance solution providers, purchasing a solution is an asset management option that needs to be justified, preferably in economic terms, e.g. by achieving energy savings or increasing the availability of a production system. Therefore, the value elements of maintenance service solutions should be identified and quantified wherever possible.

When assessing customer value, one needs to focus on the assumed benefits on the basis of which the value proposition is made, on the value elements based on the capabilities and know-how of the service provider, and the features of the services provided.

Even though research on customer value in product, service and solution management has clearly increased in recent years, a common understanding of comprehensive value assessment in industrial maintenance management is as yet incomplete, and new methods to promote value element identification and value assessment need to be studied.

In our paper, we present an integrated methodology for assessing the value of maintenance services. The approach combines a qualitative Service Quality Function Deployment (SQFD) method with a quantitative Service Business Value Assessment (SBVA). The utilization of the multi-method approach is illustrated by means of a real-world case study of an industrial maintenance service portfolio of a provider of industrial solutions.

I. INTRODUCTION

The significance of industrial services as a source of revenue for several companies has increased primarily due to globalization and the changing environment of traditional manufacturing [e.g. 22, 6]. Therefore, it is necessary to identify the elements that add value for customers in order to make profitable business with these services [e.g. 30]. In addition, it is also essential to quantify the elements of value, if possible, to support the selling and marketing decisions of industrial services.

The common importance of assessing the value of industrial services has been widely recognized in practice. In academia, customer value assessment has also been studied for decades [36, 16]. In the context of industrial services, however, there is still a need to clarify the elements of value in a valid and reliable assessment and to note the alternative ways to measure value. In the energy-smart world it is also essential to assess the value from multiple perspectives, monetary and non-monetary. There are also several aspects, e.g. in relation to partnerships, ethical concerns, environmental, safety and sustainability issues and corporate responsibility which are relatively hard to measure. On the other hand, there are causal relationships and other links between different value elements. Comprehensive studies addressing these issues from both suppliers’ and customers’ viewpoints are therefore still needed. In this paper we aim to address some aspects of these issues.

The purpose of the research work described in this paper was to arrive at a new approach to the value assessment of a variety of current and new services related to the industrial maintenance business. The specific purposes of the related case study were to develop a prototype of a tool for the value assessment process, and to demonstrate and present a practical example of value assessment with the help of the process approach developed and the related tool.

The main research question can be stated as follows: “How to identify and quantify the main elements of value and how to promote the value assessment of the industrial service business for the effective and sustainable development of service business?” We propose a process to analyze customer value when new services are created or when the customer specific benefits expected from the existing services are assessed.

We present an integrated methodology for assessing the value of maintenance services. The approach combines a qualitative Service Quality Function Deployment method with a quantitative Service Business Value Assessment method. The approach has two main phases:

- qualitative analysis of the content of the service portfolio, customer needs and value creation mechanisms
- quantitative analysis of value fulfilment, with a focus on the most significant value elements identified in the preceding phase.

The utilization of the multi-method approach is illustrated via a real-world case study of the value-based assessment of a maintenance service portfolio of an industrial solution provider. The case study was conducted in collaboration with the company during a longitudinal study lasting more than a year while the main collaborative work was done in half-day and full-day workshops held on a monthly basis with the company representatives. The researchers were also able to utilize information on customer needs. The information was collected within the company and its clients in a wider survey.

The new comprehensive approach developed with the related methods and tools for customer value assessment is the main outcome of the study. The paper also provides a description of the application of this approach in the light of an explanatory case study of industrial maintenance service business. The results of the study emphasize the identification...
of value elements as a prerequisite for the successful value assessment and management and development of industrial services. With this new approach the paper contributes to the body of knowledge on the value assessment issues of the industrial service business, and managerially, it provides insights into potential elements of value assessment, and methods and tools for the systematic but flexible process of value assessment of industrial service business.

II. INDUSTRIAL MAINTENANCE SERVICES AS VALUE-CREATORS

The most common definitions of services [e.g. 4, 9] generally suggest that services are based on interactions and building relationships and finding solutions to customer problems. Vargo et al. [35] emphasize that service is application of competencies (knowledge and skills). The content of service is typically delivered via processes and driven by people [15]. Definitions of service often emphasize the distinction between services and industrial goods. However, it is widely recognized that there is a variety of services with different characteristics. For example, industrial services differ from consumer services due to their strong link to the management of physical industrial assets. Johansson and Olhager [11] have defined industrial services as follows: “The supply of after-sales services, including tangibles such as spare parts and consumables, related to the maintenance of industrial goods”. This paper takes an even wider perspective on industrial services by including the service packages related to various stages in the life cycles of industrial assets. Thus, in the context of industrial services, the distinction between physical goods and related services is not necessarily relevant. If anything, it is more a question of providing appropriate solutions to customer needs, requirements and problems, and especially adding value to customer’s business.

In addition to the established fact that industrial services and customer solutions typically increase the competitiveness of physical products, they also help in building long-term customer relationships and networks. Understanding the customers’ business and their needs is vital when moving from traditional manufacturing business to providing services. The challenge in transformation changes from knowing the products and manufacturing processes to knowing customers’ value creation and designing how to support this value creation [21].

As a major part of industrial service, industrial maintenance in general includes all the actions undertaken to keep processes, machines, buildings, roads, information networks etc. working reliably. It also includes repairing possible faults and doing all this in an environmentally friendly and safe way [12, 2]. In our research work, the focus is on industrial processes and machinery. According to European Standard EN 13306:2001 [5], maintenance is defined as the combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function(s).

Fig. 1 below shows the business context of maintenance. It also shows the different forces and requirements that maintenance needs to cope with. Maintenance tasks are complex and a blend of management, operations, logistics support and technology is therefore needed. The management part is about the various decisions on maintenance. The operations element refers to the combination of service maintenance interventions with production activities. The logistics element is needed to support the maintenance activities in planning, coordinating and delivering the resources needed. Lastly, technology refers to the physical assets supported by various equipment and tools. Furthermore, there are other factors influencing the current and future maintenance management, e.g. e-maintenance, which helps to overcome communication barriers and makes the coordination opportunities of maintenance service more intense [29].

Fig. 1. Maintenance in business context [adapted from 29].

Maintenance services can be classified in several ways depending on the various aspects of the concept. For example, we can make a distinction between preventive maintenance (on condition or predetermined) and corrective maintenance (immediate or deferred) [2]. A useful way of classifying maintenance services in the context of service design is to consider different customer segments or the various options available to a company requiring maintenance. In addition to the option of having an in-house maintenance department, there are alternatives related to obtaining support from equipment manufacturers, outsourcing maintenance to one or more service providers, outsourcing maintenance to equipment manufacturers or outsourcing maintenance to equipment manufacturers and local service providers. Although equipment manufacturers prefer direct outsourcing to themselves or a dependent service provider, customers often benefit from using a local provider...
familiar with both the equipment and the local culture. Using independent service providers instead may cause problems in relation to product data management if the equipment manufacturer is unaware of the changes that have been made, which in turn may cause problems with spare parts, warranties or equipment modernization [31].

The classification of the service offering by customer segments of industrial B2B service providers is typically presented as in Table 1 [31].

Of these segments, availability or full service customers are currently the largest service customer segment among European equipment manufacturers. There is also a trend to move customers from the basic segment to this group. Equipment manufacturers usually have several performance partners, but only few value partners. It is noteworthy that value partnering is not an optimal solution for all service providers. For example, contractual issues are complicated in such relationships [31]. In becoming a service provider aiming at value partnering, a manufacturing company must understand the customers’ business processes and how to create value for them. This means helping the customers to serve their customers better. Doing this entails not only offering technical solutions for technical processes as before, but also mastering all the customer’s functions and processes that contribute to total value creation [9].

The dependability of a production system – measured as availability performance – is dependent on the following three factors; reliability performance, maintainability performance and maintenance support performance. Reliability performance and maintainability performance are both characteristics of the system or product in question. Both factors are decisively influenced by decisions taken during product development but also by the decisions and actions of the maintenance organization. Maintenance support performance, on the other hand is the ability of a maintenance organization to meet the performance requirements. From the perspective of services, one should take into account the multi-dimensionality of the availability performance and find a balance between the approaches to tackling the problems related to all the three aspects.

The customer value of services offered may frequently consist of elements which are rather difficult to convert into monetary benefits and express in financial terms. However, in capital intensive industries the dependability requirements derived from objectives for production efficiency are often dominant issues regarding the value of outsourced operations and services purchased. Furthermore, the increasing interest in life cycle management issues as well as life cycle cost and profit (LCC) analyses have affected the capabilities to more accurately perceive the meaning of dependability (measured as availability) as a core value element of services. We can say that availability performance is a core value element related to asset management related services; however, the value element is multidimensional in nature and embodies a variety of aspects to be considered. The responsibility of the service provider in creating effective processes should be specifically emphasized when considering the maintenance support performance. Thus it can be stated that the success of the provider in this area is crucial. For instance, the ability to manage the supply network and related contracts, develop and manage the organization, organize the resources and manage the information and knowledge are among the things to be taken into account. The issues in maintenance support performance are related to ‘how’ the maintenance is organized while reliability performance represents the outcomes of decisions made at the design phase of the equipment but also the outcome of maintenance activities and thus ‘what has been done’.

As stated above, the dependability requirements set for production systems result from the need for production efficiency. On the other hand, the fundamental objectives of the company and strategic objectives of the production plant are considered when setting the more specific objectives for production efficiency, dependability and finally for the processes and actions planned for achieving objectives. Considering the potential of the services and expressing the value in financial terms requires that the objectives of the customer are understood and services can be geared to these.

III. ELEMENTS OF VALUE IN CUSTOMER VALUE ASSESSMENT: A BRIEF LITERATURE REVIEW

There are several motives to learn more about the various aspects and elements of customer value [e.g. 30]. It is crucial
when developing new services, and it is also important from the marketing perspective because service marketing essentially includes “making promises about the value that can be expected to be captured from the service” [8]. Grönroos [8] also states that services are processes that support customers’ value creation and that customer value is composed of a variety of elements in the customer interface, which the service marketer should also manage.

Value proposition, customer value creation, value capture and customer advantages are among the key elements of a successful service business model [23, 24, 32]. Value capture in this context is concerned with the means by which a service provider is involved in the customers’ value creation processes, and demonstrates how value is created.

Applying service logic, Grönroos [9] emphasizes the role of the service provider as a facilitator and co-creator of value [7, 24] rather than considering the provider as the creator of value. Value-in-use thinking [18, 35] puts the focus on the customer’s value creation processes and the auxiliary role of services in these, likewise on more direct interactions with the customer’s value.

The typical challenges in creating the value proposition and providing information on the benefits and value of the industrial services result mostly from the fact that there is a shortage of reliable information on customers’ value creation processes. It is therefore also very difficult to assess the value potential influencing customers’ processes. Conventional practices created and developed in product centric businesses may no longer be applicable in service business as services cannot be analyzed solely in the context of value-in-exchange. The analysis should go further into the processes where the customer creates the value.

Reviewing the service-related literature, we can state that customer perceived value has been identified as one of the most important measures for gaining competitive edge [26]. Perceived value has a direct link to customers’ repurchase intentions, as studies on consumer services show [28]. The concept of value practically means the comprehensive ratio between perceived benefits and costs. According to Zeithaml [34], it is a tradeoff of whatever is given and received. For example, in consumer services five dimensions of perceived value have been identified: Behavioral price, Monetary price, Emotional response, Quality and Reputation [28]. These dimensions illustrate the complexity of the concept of value and its formation along both monetary and non-monetary dimensions. The components of quality are important elements of value and monetary price may also influence perceived quality [17]. The mechanism of creating superior value for customers along these dimensions can be seen as investments in assets and unique skills [20].

Purchasing an industrial service is an asset management option for the customer, who must receive added value. Value formation needs to be described accurately and extensively. In addition, the value should be estimated reliably, verified at an early stage, and described in detail to support decision-making. These issues may require changing organizational culture towards service-dominant and value-based thinking. The value derived from a service is transmitted through the service experience as a whole. This total experience is scattered to many organizational units and many interpersonal interactions. The customer needs to ascertain whether the maintenance work was justified and well performed. Defining this value of total service experience is much harder than assessing the value of the actual service performance [e.g. 10].

The value of services provided by manufacturing firms lies in learning more about the customer’s operations. The aim is not merely to make the product work, but to help the customer to maximize all the various processes, actions and strategies associated with a supplier’s product. [6]. Thus, it can be stated that any service is valuable that increases the customer’s profit more than it costs. The problem is how to communicate this irrefutably and convincingly. On the other hand, the supplier needs to appreciate that many services are not automatically profitable, and their capabilities to bring cash flow may spread over time by solving the potential problems related to volume and organizing profitable services [19].

Quality is an important driver of value [17]. Among the main problems in measuring both quality and value is the complexity of both these concepts. They are both difficult to define because they are not well differentiated from each other and subsume similar constructs, such as utility [34]. Another issue is the subjectivity of quality and value. In different situations and businesses the relative importance of different elements of value and quality varies [17]. The elements that customers value in maintenance services may also differ from other customer services.

The maintenance key performance indicators and systems for KPI’s are widely discussed in the literature [e.g. 13, 27]. The systems for plant level asset management indicators [e.g. 14] offer a solid basis for considering the value elements and potential of maintenance services since they address the links between fundamental business goals and lower level objectives and variables. The next section of this paper specifically addresses the challenge to systematically analyze how the industrial services in question correlate with the customers’ needs identified and the assumed value can be articulated with respect to customers’ business goals.

One way to approach quality and value assessment is utilizing known methods like Quality Function Deployment (QFD) [e.g. 1], which is a planning process for products and services in which the input is the voice of the customer. Customer needs are drivers for product or service requirements. The QFD process requires cross-functional teamwork to merge marketing’s knowledge of the customer with product engineering’s need to know the customers’ requirements [3]. The first step in the “House of Quality” (a cornerstone of QFD) is to identify customer needs. These needs are typically categorized into basic, expected and exciting attributes. The importance of these identified needs is further weighted and then converted into product/service
features (engineering characteristics). The next step is to complete the relational matrix, which illustrates the effects of engineering characteristics on customer needs. One engineering characteristic may affect more than one customer need. The customer perceptions part in QFD means the customers’ overall assessment of the company’s current product and service portfolio in comparison to its competitors [25].

There is a lack of reported examples of applying the principles of QFD to the context of industrial services, but at least there are some examples from the service sectors [e.g. 25, 30]. However, we can conclude that a lack of widely established methods for assessing customer value in industrial services persists, which means that the selection of this special area presented in this paper is also well-grounded from the practical point of view. In addition to the qualitative QFD-based part, we will complement the process with the quantitative part of value assessment.

IV. AN EMPIRICAL STUDY ON THE IDENTIFICATION OF VALUE ELEMENTS AND ASSESSING THE VALUE OF INDUSTRIAL MAINTENANCE SERVICES

The case study is a part of a larger applied research project, more specifically a part of a work package entitled “Continuous development of a cost-effective service and showing the added value on the global service market”. This particular work package aimed at providing information on the value creation of services from the viewpoint of customers, providing methods and tools for assessing the customer added value of industrial services, and developing dynamic service development process and creating the basis for value based pricing methods.

The purpose of the case study was 1) to propose a new process approach to assess the value of a variety of existing and new potential services included in the studied service package concept, 2) to develop a tool prototype for the value assessment process, and 3) to demonstrate and present a practical example of value assessment with the help of the process approach developed and the related tool.

Due to the need for profound insights in exploratory research, a longitudinal single case study was selected as the main research approach of this study. The case study was conducted in collaboration with two research institutes and a company which is a provider of industrial equipment and related maintenance and other asset management services. The main methodologies included 11 workshop meetings, complemented with interview data and survey data from the company’s internal customer need survey. Typically, three researchers and four company representatives participated in half-day or full-day workshops, and between the workshops both research and company representatives developed the research approach and related tools further, and gathered data to be utilized in the process. The study as a whole was conducted from late 2008 to early 2010.

The main outcome of the study is the structured process approach developed. The process provides a structured approach to the assessment of customer value with various stages supported by appropriate IT tool prototypes. The approach is presented in detail below. Issues specific to the case study conducted are discussed below in italics. We propose two main process phases for the analysis of customer value (with a focus on functional/instrumental value [33]), both including a structured methodology and related tools presented below:
- qualitative analysis of the content of the service portfolio, customer needs and value creation mechanisms
- quantitative analysis of value fulfilment, with a focus on the most significant value elements identified at the earlier phase.

From the practical and research perspective, in the case study, there was a need for both qualitative and quantitative approaches to service value assessment. The portfolio of services within the broader concept studied included potential services and outlines of services without existing detailed descriptions of their features and customer value, thereby necessitating a qualitative part in the approach. The quantitative approach was needed to indicate how the service features and their links to customer needs emerge in the customers’ processes in relation to the availability and sustainability aspects and in terms of money.

The first step for outlining the value of the service is described in the qualitative part of the proposed process represented here mainly by the Service Quality Function Deployment (SQFD) method (See Fig. 2). In this context the method is applied to yield an analysis of how the elements of the service portfolio fulfil the existing customer needs. The process also aims at combining elements of existing services and developing and describing the potential services. By analyzing how specific features of the services and customer needs meet, the value elements the services and value creation mechanisms are outlined and a basis is created for the quantification of service value.

Compared to how QFD is commonly applied, we emphasize the very detailed documentation of how specific features of the services reflect the needs of the customers and which stakeholders are influenced by the services. The analysis should result in a) a list of factors affected in the customer’s value creation processes, b) information on how the service influences these processes and c) a better understanding of the value elements enabling successful service provision. These elements include, for instance, a proactive stance, cost efficiency, high level of knowledge, technology advantage, fluency and management.

A more detailed quantification of the added value (value analysis) is possible only after the service portfolio is structured and services and their connections to customer needs are qualitatively described. The value analysis includes an assessment of how the services considered affect the customer’s cost elements.
Applying SQFD analysis new potential service concepts can be redirected and existing services adapted to better fulfil the customers’ requirements. When documenting customer needs, the focus is on those matters which are very close to the customer’s practical business processes, related future challenges and the changes that the customer is willing to make. Thus the perspective of future (latent) customer needs can also be taken into account in the course of the SQFD process. It has been found important to identify the links between services and customer needs at a very early phase of service development. In light of the resulting information, service development can be focused on services and features found profitable and significant for the customer, while knowing how to meet the customer’s needs at a very concrete level makes it possible to quantify the customer value.

The process can and often should be performed iteratively so that an analysis of a single service can be completed when more information has been gathered and a better understanding on the whole service portfolio has been achieved. Furthermore, not all the features in the SQFD process may be needed when starting the process. For instance, the links between service concepts may be taken into use when the process has resulted in an adequate amount of information on the individual services and related customer needs.

The SQFD process (which can be performed iteratively) includes the following main phases:

- **Customer needs are described**, also with more detailed information on the background of the specific needs – the voice of the customer
- **Customer needs are prioritized**
- **A portfolio of potential and existing services is composed** for the analysis
  - Preliminary titles for the services are given.
  - Services are given more specific descriptions, the content of the services is outlined and specific features discussed
- The matrix which generates the links between services and customer needs is analyzed
  - An estimate is given on how strong the link is (on a scale weak-medium-strong)
  - The value mechanism is described – how the service correlates with a specific customer need
- **The ‘Roof’ of the QFD house of quality is filled**
  - The correlations between the services are discussed
  - The results are evaluated

The advantage of the SQFD approach is that it helps the participants to commit to collaboration in which the participants are compelled in a constructive way to consider certain aspects in detail. The tools for the application of the method support the collaborative work at the practical level. An example of the interface of the tool developed in our study is presented in Fig. 3.

In the case study, the main customer needs were gathered on the basis of the report of a survey focusing on the identified needs as presented by customers themselves and the internal company representatives working closely with customers. During the case study, three main categories of customer needs were defined from the above-mentioned survey of customer needs and discussion with company representatives. They were 1) better overall asset performance and efficient management of assets, 2) life cycle cost management, and 3) informativeness and proactivity. Each of these categories included two to three main customer needs, which were applied to eight service concepts and their features in the whole service package. In possible future use of SQFD method, it will be essential to recognize that there are various supporting tools to capture the real ‘Voice of the Customer’. Especially when developing new services it is also essential to recognize the Lead Users who are willing and able to co-develop new solutions.

The matching between customer needs and service concepts was done by identifying either strong, medium or weak links between them on the basis of the traditional
principles of QFD. The descriptions of the value mechanisms ("How does the service meet specific customer needs and other related requirements?") were then explicitly written to explain the link.

Comprehensible interpretation of customer needs is also essential and helps to identify the more profound reasons underlying them. These interpretations can then be added to the customer needs table in SQFD. Following this, one can envisage specific characteristics of services that are valuable for customers and which would potentially create competitive advantage for the service provider. The perspective of future (latent) customer needs can also be taken into account in the course of the SQFD process.

The process for service business value assessment (SBVA) at its highest level is outlined in Fig. 4. More specifically, the process includes following phases:
- analysis of the customer’s business scenarios from the perspective of the key cost factors identified
  The objective is to translate the understanding of customers’ business processes into numbers and describe the crucial features of customer’s business in financial terms.
- analysis of the most significant failure modes related to the technical system considered and the challenges related to the business processes
  One of the main targets of the asset management services considered here is to improve the availability of customers’ production processes. In order to evaluate the significance of services in preventing failures causing unavailability, one must identify and analyze the failure modes and gather information on their financial consequences
  - analysis of the impacts of the services on costs
    The preceding phases provide information on the current situation regarding customer’s business operations. The third phase will include the assessment of the effects of the services offered on the current situation, measured in financial terms.
  - analysis of the results
    The results of the preceding phases are compiled according to the cost categories used and from both yearly and life cycle perspectives.

When assessing the value of the services from the customer’s perspective the focus should be on the primary elements that the customer values. On the other hand, the features of the services are similarly developed on the basis of the information on the best value potential.
The determination of customer value can no longer rely solely on product-centric sources of information; it should be based on combinations of various information sources that go deeper into the customers’ processes and business scenarios. Structured methods for collecting information on those value elements of greatest significance to the customer are helpful, likewise the data received, for example, from salesperson call reports, customer visits, competitors’ offerings and customer complaint records. These data enable more detailed analysis based on the value elements. Utilization of these data can be supported by tools based on the process presented in Fig. 4. Fig. 5 presents the user interface for collecting a sufficient amount of data on the current costs related to the customer’s business. While collection of data related to operating costs and preliminary information for calculating the failure costs is presented in this figure, another interface is provided in the actual tool for assessing the failure modes and challenges related to the customer operations. After gathering the aforementioned information, the effects of the services on these costs can be evaluated. Fig. 6 presents the interface for such purposes.

Fig. 5. An interface for gathering information on the customer’s business in financial terms.

Fig. 6. An interface provided for the value analysis of services in the SBVA tool.
An example of the results of an analysis is presented in Fig. 7. The figure addresses the effects of a combination of services on the operating costs. The life cycle failure costs can be addressed likewise. From the perspective of provider-customer collaboration, the key issue is that considering these results together, customers and service providers are able to achieve a common understanding of the need for various services and also identify the subjects which need to be further addressed, for instance by developing additional services.

When assessing customer value, the focus should be on the assumed benefits on the basis of which the value proposition is made but also on the value elements based on the capabilities and know-how of the service provider and the features of the services provided. These value elements are closely connected to the success factors of the provider and determine in practice how the service is provided. The value assessments can be made at customer cluster level and be updated based on customer specific information. The customer needs may greatly vary according to the customer cluster and each customer typically has its own specific needs. It is assumed that the value elements identified are largely shared, however, the weights of each element may vary according to the nature of the customer’s business model and processes. It may also be important to take into account the closeness of the partnership because “loyal buyers are more likely to focus on long-term benefits and engage in cooperative actions beneficial to both partners in a relationship than disloyal partners” [16].

Life cycle profit (LCP) analyses were applied in order to quantify the value of the services considered. When considering overall equipment efficiency (OEE), we can identify the significance of maintenance and other industrial services in each of the subfactors, namely, availability, quality and performance. In the following, we focus on the availability perspective. To address the value of a service from the perspective of availability, we must understand how much it costs for a customer if the considered production equipment cannot fulfil its function. Thus we must quantify the availability of the system considered. Doing this in practice may depend on the business, however, in general the planned production volume (or equivalent) must be evaluated, the actual loss (material, energy, work, profit) determined, and an estimate of the cost related to a stoppage for a chosen time unit (an hour for instance) made.

The services aim to decrease unavailability by reducing the probability and severity of undesired events causing unavailability. In order to address the value of the services, these reasons (failure modes) must then be identified, the unavailability caused by these failure modes must be ascertained and how the services considered may improve the situation must be evaluated. Thus, the value of the services in this context is in their ability to increase availability by reducing the probability and effects of undesired events identified.

V. DISCUSSION AND CONCLUSIONS

We sought answers to the following main research question: “How to identify and quantify the main elements of value and how to promote the value assessment of the industrial service business for the effective and sustainable development of service business?” The answer to this question is to follow a structured process approach which includes the qualitative phase for identifying the value elements and matching the services and their features to identified customer needs, and the quantitative phase, in which this information is then developed further to support the communication of the value elements to the customer and yield concrete information about the benefits of the service in monetary terms. In the background of the assessment is increasing the availability of the customer’s process and taking sustainability aspects (e.g. energy saving) into account. The idea of the whole process is to flexibly utilize it for the...
various needs of separate customer segments in a continuous and iterative manner. It can therefore also be assumed that it helps in communicating the benefits for both parties, supplier and customer, and also in developing sustainable value partnerships as a long-term objective. The generalized process approach contributes to the current research field of customer value assessment in industrial services, especially by taking better account of availability aspects and customer processes by means of a comprehensive methodology package.

One of the most important conditions for success in the process was found to be the commitment of the organization to the process at a very early stage. For example, although the benefits of the QFD-based process are widely recognized, it is a time-consuming exercise when properly done. In this case study, too, the qualitative phase took time, but on the other hand it yielded a systematic approach on which to base decisions related to the further development of certain services and concentrating on certain value elements. It helped especially to reveal the value mechanisms between the services and customer needs, which were explicitly written down with the help of the collaborative workshops. Both SQFD and SBVA parts were also prototyped using an Excel-based tool, which is of use in the automation of some phases and documenting as well as in calculating in the quantitative phase and displaying the results to the customer. Below the main benefits of these separate but connected process phases in general are summarized.

The SQFD method makes it possible to describe the service portfolio at an adequate level and outline the connections between customer needs and the features of the considered services. When addressing the connections between customer needs and services, information is provided on the value of the services in proportion to the identified customer needs and expectations. This information can be utilized when further analyzing and quantifying the added value in the SBVA part of the process.

SQFD provides a practical means for creating a coherent view of the service portfolio provided and a collection of potential services with their titles and features clearly documented, which is very important. An SQFD analysis helps service developers understand what features are included in the existing and potential new services, helps service developers understand how the services correlate with customers’ expectations, and provides the organization with full documentation of the service portfolio considered for use in further developing the services and their practical features or when further analysing the value of the services.

The SBVA tool can be utilized for the following purposes or in the following phases when developing and offering services:

- A target price or cost price is known for a service and the value for the customer of the service needs to be ascertained regarding each significant cost category
  - The profitability of the service is evaluated when estimating whether the service can result in the savings required in order to meet the cost price, thereby indicating the chances of payback.
  - This way ensures the minimum requirements for the services (for each cost category)
- The content of the services has been outlined and the real customer value needs to be estimated based on the improvement achieved in the availability performance of customer’s production process. The result is supporting information for the service pricing activity.
  - The benefits of the service are evaluated according to each cost category; the economic value for the customer as a result
  - Comparing the target price and estimated customer value reveals the real potential of the service (baseline for pricing)
  - The service portfolio can be extended when the assessment clearly indicates lack of customer value related to addressed cost categories

The service offering should always be based on the best understanding of what customers are willing to buy (customer value). Supporting tools are useful in negotiations with the customer to demonstrate the added value. The SBVA tool can be utilized both when developing services at customer cluster level (service development processes) or to assess the customer value for a specific customer (marketing and selling processes).

The assessment of customer value and the development of service content can be performed in parallel and in light of the assessments the further development of the service in question can be determined to reach the required level of added value.

The benefits of the combined SQFD and SBVA approach can be summarized as follows:

- Common practices for the assessment of service value and consideration of the specific features in customers’ businesses as well as argumentation of the practical benefits of services in the selling processes are provided
- The service business value assessment process (SBVA) can be further linked with product development processes and ongoing productizing projects. The SBVA process plays a role at an early phase of the productizing process. Thus value creation should be considered at a very early stage of productizing. However, the nature of the descriptions to be made of the value created depends largely on the study level selected.

The process itself helps in the systematization of the assessment process, but it may not resolve the potential problems related to lack of information, especially, for example, reliable and quantitative cost information. Guarantees can often not be provided on the customer value based on the assessments made with insufficient information. Reference cases can, however, be utilized in service selling processes and on the other hand service provider and customer may come to an understanding on the added value.
by systematically analyzing the value together. Close collaboration with the customer during the process and taking customer specific information into consideration is important because customers emphasize the value elements related to services differently.

The focus of the case study was on the development of an approach to assess customer value and firstly describe the service portfolio from the perspective of customer needs, including sustainability and availability requirements. Thus, no complete analyses were made of the service portfolio, but rather extensive case examples were considered. In light of the experiences of these case examples, the company can implement the approaches developed and integrate them into their other related processes.

The longitudinal single case study was appropriate for the purposes of developing and validating the novel approach as a whole. The methodologies utilized and the tool developed helped the maintenance service provider to increase its own understanding of the main value elements from both the customer’s perspective and its own. It also provided the company with a comprehensive, systematic and collaborative methodology for assessing value when compared to earlier practices where different methods were utilized in different ways by individual company managers. Even though the managerial benefits were significant, and we assume that the major parts of the process could be generalized for use in other environments of other types of industrial services, the need persists to continue gathering more empirical data to validate the parts of the value assessment process and to develop it further.

REFERENCES