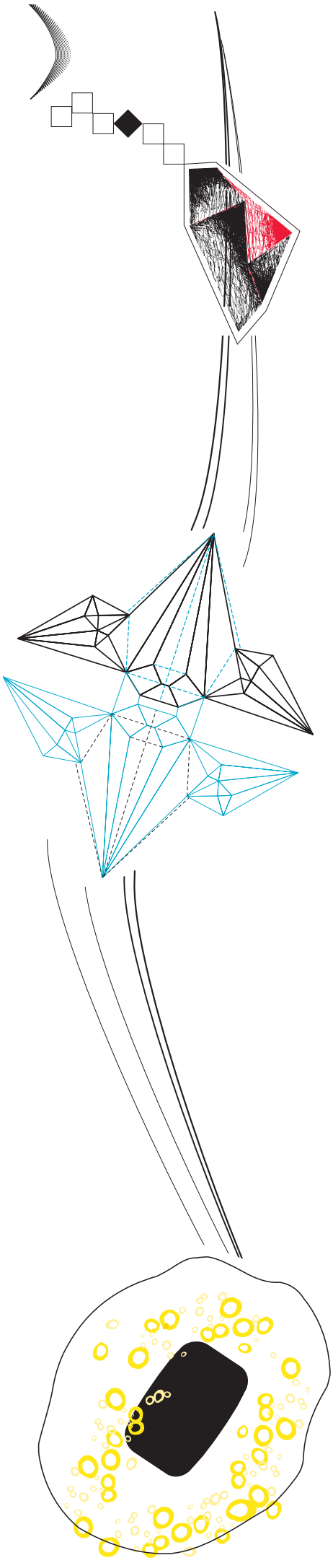

Master Thesis

The creation of value propositions from a customer value-in-use perspective: a conceptual framework

Author	Ruben ten Veen
Permanent email address	Ruben.tenVeen@outlook.com
Education	Business administration M.Sc.
Specialisation track	Entrepreneurship, Innovation & Strategy
Institute	University of Twente Faculty of Behavioural, Management and Social sciences Enschede, the Netherlands
Internal supervisors	
1st supervisor	Dr. K. Zalewska-Kurek
2nd supervisor	Dr. R.P.A Loohuis
External supervisor	Dr. M.J.M Habets

Document status	Final version Enschede, June 2018

UNIVERSITY OF TWENTE.

Acknowledgements

This thesis was written within the M.Sc. program: Business Administration (specialisation track: Entrepreneurship, Innovation & Strategy) of the University of Twente. The case organisation gave me the opportunity to write my thesis in an innovative business environment in a country abroad. I mark my period at this organisation as a time where I developed my skills in a professional and personal way. I started my thesis in December 2017. Now, seven months later, I am pleased to announce that this process comes to an end. This thesis would not have been what it is today without the support of many. Therefore, I wish to thank various persons for their contribution to this thesis.

First of all, I want to thank my first supervisor from the University of Twente, Kasia Zalewska-Kurek. She always gave me supportive feedback and her theoretical insights kept me on the right track. The sparring hours we had helped me to shape the thesis of what it is now. Secondly, I want to thank, my second supervisor, Raymond Loohuis for his visions in the final phase of the thesis.

Furthermore, I want to extend my thanks to my external supervisor: Matheus Habets. He gave me the freedom to make this thesis my own, but provided me advice and useful business insights when I needed it. Next, my colleagues and fellow students within the case organisation. Many thanks for all the contributions, feedback and, most important, the good time we had during our period together.

In addition, I would like to acknowledge my family and friends from whom I received ongoing moral support and encouragements throughout my years of study and through the process I worked on this thesis. Writing a thesis is a process with many ups and downs. However, I found much support from my girlfriend who was in the same stage of her studies. Therefore, a big thank you to her.

Ruben

Enschede, June 2018

Abstract

Literature emphasises the importance to reshape traditional business models and to offer downstream systems and services. This servitization movement is relevant, since it becomes more challenging to offer value and to compete on a core product level. Moreover, a shift in the value-creation within marketing took place. Instead of being the 'target' for suppliers, the customer takes the role of co-creator and develops his own value. Therefore, value propositions are made through cooperation between supplier and customer. In this process, the creation of a value proposition is a continuously process wherein the customers value-in-use is identified, redefined and optimised. However, in the literature, no conceptual framework can be found that includes the field of servitization and customer value-in-use to create customised value propositions. Therefore, the following research question was formulated: "*How can the supplier define customer solutions based on a customer value-in-use perspective and what are the consequences for value propositions?*"

Within this study, a framework is proposed that includes the process of the supplier, the customer and the cooperation. The concepts of the framework are derived from an understanding of studied literature and empirical data from a case study. This data was collected through supplier and customer interviews. The participants were selected on basis of their knowledge, relationships and expertise regarding the research subject. The gathered data is analysed by coding and gave content to the concepts. The conceptual framework is a guide and supportive tool in the creation of customised value propositions.

Table of content

ACKNOWLEDGEMENTS ..... **I**

ABSTRACT ..... **II**

INDEX OF FIGURES ..... **V**

INDEX OF TABLES ..... **V**

1 INTRODUCTION **1**

2 THEORETICAL FRAMEWORK **2**

2.1 SERVITIZATION 2

2.1.1 Competitive advantage in servitization *3*

2.1.2 Challenges in servitization *6*

2.2 CUSTOMER VALUE 6

2.2.1 Service marketing *7*

2.2.2 Value-in-use in customer solutions *8*

2.2.3 Value propositions *11*

2.3 CONCEPTUAL FRAMEWORK 12

3 METHODOLOGY **13**

3.1 RESEARCH DESIGN 13

3.2 CASE 14

3.3 SELECTION 15

3.4 DATA COLLECTION 16

3.5 DATA ANALYSIS 17

4 FINDINGS **20**

4.1 SUPPLIER PROCESS 20

4.1.1 System value *21*

4.1.2 Services value *22*

4.1.3 Solution identification *23*

4.2 CUSTOMER PROCESS 25

4.2.1 Problems that influence KPI's *25*

4.2.2 Solution identification *28*

4.2.3 Key performance indicators *29*

4.3 COMPARISON 29

4.4 CHALLENGES 30
4.4.1 Organisational *30*
4.4.2 Individual *31*
4.5 REDEFINED CONCEPTUAL FRAMEWORK 32
5 CONCLUSION 34
5.1 THEORETICAL IMPLEMENTATIONS & FUTURE RESEARCH 38
5.2 PRACTICAL IMPLEMENTATIONS 39
5.3 LIMITATIONS 39
6 REFERENCES 41
APPENDIX I VII
APPENDIX II VIII

Index of figures

Figure 1, The capital goods value stream (Davies, 2004) 4
Figure 2, Design-operation feedback-loop (Davies, 2004) 6
Figure 3, Product-centric and process-centric approach (Tuli et al., 2007) 10
Figure 4, Customised value proposition framework 13
Figure 5, Codes derived from the interviews categorised in concepts and processes 20
Figure 6, Redefined customised value proposition framework 33

Index of tables

Table 1, Data sample characteristics experts case organisation 17
Table 2, Data sample characteristics customers 17
Table 3, Concepts, description & potential indicators 19

1 Introduction

Since the introduction of the service-dominant logic of Vargo and Lusch (2004), a shift in the way how to think about customer value and customers has occurred. Traditionally, marketing had a role wherein tangible outputs and discrete transactions had a central position. The value was created by the supplier and the customer was herein a 'target'. In a service-dominant view, intangible exchange processes and relationships become central. The role of the customer shifts from 'target' into a cooperative partner that co-creates its own value. So, value propositions are not proposed by the supplier alone anymore, but designed in cooperation with the customer. In this process, the identified solutions are not simply delivered as a roll-out to reach the predefined goals but is rather seen as a continuous process wherein value-in-use is identified, redefined and optimised by the supplier and customer throughout the complete journey (Macdonald, Kleinaltenkamp, & Wilson, 2016). Moreover, when shifting towards co-created solutions, the customers does not only assess the quality of the suppliers' offering, but focus on their own resources and processes and the joint resource integration as well.

Furthermore, literature emphasises the importance of change in how traditional business models deliver value. An organisation should not only focus on the manufacturing of tangible goods anymore, but rather use its capabilities and knowledge to offer downstream systems and services. This development is known as servitization (Baines, Lightfoot, & Benedettini, 2009). The understanding of both fields enables organisations to provide customised value proposition based on solutions to specific customer situations.

In literature, multiple articles can be found that emphasise the importance of servitization and the relevance of organisations to focus more on customer relations. This cooperative relation is necessary to facilitate and co-create in customer value-in-use. However, no case study addresses the perspective of the supplier, his vision on solution development and the customer perception of value-in-use. This is a topic that is highly relevant for most organisations. The theoretical discussion also found its way to practice. Organisations realise more often the importance of change, but how to translate the theory into practice remains a challenge.

This empirical study will be explorative, since value-in-use highly depends on the customer and industry. This research is conducted in the field of maintenance. Moreover, both the supplier and customer are involved, since value is created due to cooperation between parties. The aim of the research is to develop a framework that is the base for a customised value proposition.

The framework assists to give insights in relevant concepts and to simplify the process. Based on the research question "*How can the supplier define customer solutions based on a customer value-in-use perspective and what are the consequences for value propositions?"* the following sub questions will be addressed:

1. What is maintenance related value according to the supplier?
2. To what extent can the supplier deliver customer solutions?
3. What is maintenance related value-in-use for the customer?

2 Theoretical framework

2.1 Servitization

These days, tangible goods and services cannot be seen independent from each other anymore. This process changes the function of traditional manufacturers whereas the business model is not only focused on making goods anymore, but shifts towards a more complete offering. An offering that provides, besides the usage of physical goods, related systems and proactive services which are related to the product. This shift is called servitization and over the years, many studies have been published that apply too different servitization perspectives. However, the topic servitization is not developed recently. The idea can be tracked back as far as the 1960's and it was Vandermerwe and Rada (1988) that introduced the term that became known as "servitization of manufacturing" (Baines et al., 2009).

Vandermerwe and Rada (1988) define servitization as the offering of customer focused combinations of goods, services, support, self-service and knowledge, with the aim to add value to the core product. Since the last decade, servitization is becoming more popular and relevant among scholars and practices. In the report by Festge and Sintern (2016), servitization is seen as a major shifting growth pattern for manufactures. An important driver for this is the reduce of added value that manufacturers can create (Wise & Baumgartner, 1999). A major reason for this is the globalisation of competition and the ability of this competition to copy manufactural activities easier and faster. Therefore, it becomes harder for organisations to maintain their distinctive position. Hence, the importance of price is increasing for competition. However, a "race to the bottom" strategy is something most manufacturers try to avoid (Neely, 2008). Vandermerwe and Rada (1988) argued three reasons why manufacturing organisations should servitize: to lock out competitors, to lock in customers and to increase the level of differentiation. In addition to the strategic rationales, Goedkoop, Van Halen, Te Riele, and

Rommens (1999); Wise and Baumgartner (1999) mention the relativity of economic and environmental motives. Servitization is a way to increase the sales revenues of the supplier. Nevertheless, it is the customer that benefits from the servitization of the supplier as well. Servitization offers the customer an opportunity of risk reduction and a decreasing of maintenance and support costs (Slack, 2005). Gebauer, Krempl, Fleisch, and Friedli (2008) and Spring and Araujo (2009) state that service provision is becoming a distinctive feature for innovative manufacturers to compete strategically. Herein, the most common offerings in servitization according to Neely (2008) are: the design and development of services, systems and solutions, retail and distribution, maintenance and support services and installation and implementation services. However, the acknowledgement and understanding of a different marketing approach for services in comparison to products is needed. The study of Shostack (1977) can be seen as a milestone in the shift of servitization. Like the author stated "it is wrong to imply that services are just like products expect for tangibility" and that marketing requires a framework that accommodates intangibility instead of denying it (Shostack, 1977, p. 73). Fisk, Brown, and Bitner (1993) build on this theory and state that services are intangible, heterogeneous, inseparable and perishable – IHIP. Later, it were the studies by Woodruff (1997) and Vargo and Lusch (2004) that had a significant effect on a new era in product-service differentiation. "Researchers in the field of service marketing have largely evolved from a traditional perspective of the exchange and distribution of commodities, to a focus on a customer relationship management of the provision of services" (Baines et al., 2009, p. 2). Moreover, servitization is an opportunity for manufacturers to come up with value-in-use solutions, a requirement that is gaining importunacy for customers.

2.1.1 Competitive advantage in servitization

Literature suggests that the product quality, internal operations process quality and product innovation no longer provide the basis for a competitive advantage (Butz & Goodstein, 1996). The process of improving those factors continues, but so does the external environment that is the driven force behind them. Therefore, the next major marketing transformation occurs, when organisations turn their attention more externally towards customers and markets (Woodruff, 1997).

Service-led competitive manufacturing strategy is an area of growing interest for businesses because of the combination of stagnant product demand, expanding installed base and increased customer demands that has pushed economic value downstream (Gebauer, 2008). This counts especially for product-centric services, where a produced good is central to the provision of

integrated services (e.g. through maintenance, repair, support, availability and capability contracts) (Baines et al., 2007). Figure 1 (Davies, 2004) presents an overview of how systems and services are built up on the manufacturing process and where value is added including: the manufacture of components; the design and integration of components (systems integration services) into a functioning system; the operation, renovation and maintenance of a system during its life span (operational services); and the provision of services to the final consumer.

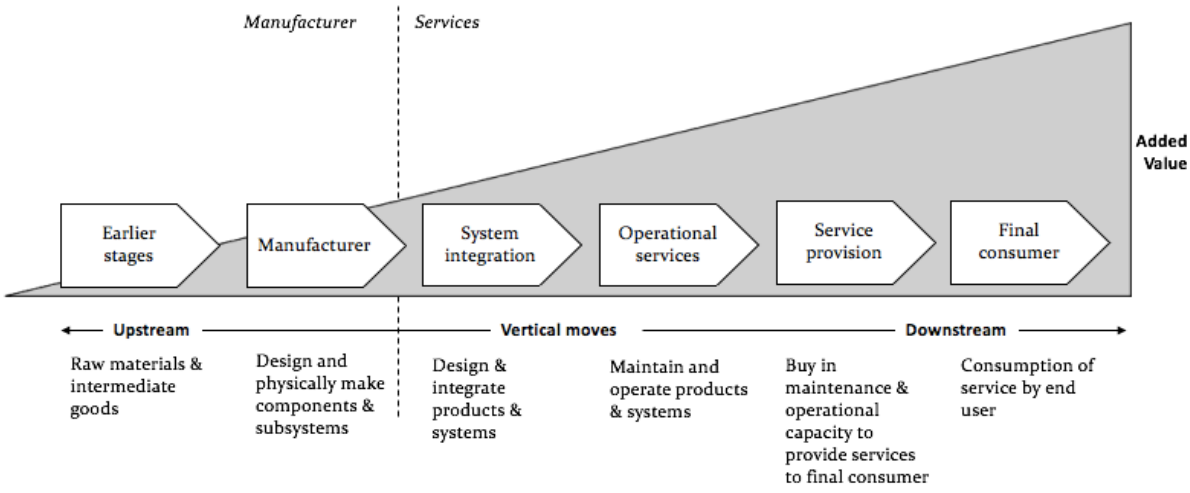

Figure 1, The capital goods value stream (Davies, 2004)

The idea of servitization, combining manufactures with service offerings, leads to a customer allegiance strategy, instead of an operation excellence strategy. Hereby, the aim is not to focus on the largest customer share but to gain the strongest relationship with the most profitable customers. By doing so, it is essential to deliver a combination of services that minimises the overall costs associated with owning and using the product (Wise & Baumgartner, 1999). However, organisations need to exploit innovative combinations of products and services as integrated solutions for the specified customers' needs, rather than just moving downstream into services (Davies, 2004). Moreover, risk adoption (actions taken by the organisations that were formally the customers responsibility) becomes an important factor of service-oriented market propositions (Baines et al., 2009).

Xerox, Rolls-Royce Aerospace, Thales and Alstom Transport, are examples of organisations that have adjusted, with a business consultancy perspective, a customer allegiance strategy. Therefore, these organisations are not just selling a product anymore and taking their hands of the sold good, but is tapping into a more continuous revenue stream by providing services. For

instance, Xerox[1], is strengthening customer relations through emphasising how large print and copier systems and related services will reduce related costs. Therefore, Xerox changed from selling hardware to delivering a document management service (Baines et al., 2007; Howells, 2000; Wise & Baumgartner, 1999). Next, Rolls-Royce Aerospace[2], transformed from selling aerospace engines to the offering of flight hour's solutions where Rolls-Royce became responsible for the uptime of the product. This resulted in a risk adoption strategy with a "no uptime, no payment" model (Baines et al., 2007; Baines. et al., 2009; Howells, 2000; Neely, 2008). Furthermore, the traditional core business of Thales Training & Simulation[3] focused on design and integrated flight simulators for commercial and military aircrafts. Nowadays, the organisation offers integrated solutions like training services, networked training, independent training centres and synthetic training environments (Davies, 2004). Moreover, the company has moved more downstream and is involved in operational services like pilot training programmes, training joint ventures and sharing knowledge to create training facilities. To end, Alstom Transport[4] evolved from a seller of goods to an integrated system and operational service provider. When the British Rail lost its complete monopole position in 1997, Alstom Transport was able to exploit this opportunity. It outsourced 90% of its rolling stock products and instead focused on the design and development of subsystems. Therefore, systems integration and operational services became an important source of added value for the firm (Davies, 2004).

Manufacturers that move downstream have the opportunity to include feedback-loops (figure 2). The creation of feedback-loops can lead to improvements between systems and operational services, to design more reliable and efficient systems (Geyer & Davies, 2000). The feedback-loops can improve the relation between parties since it provide the option to learn and influence each other's perceptions and actions (Ballantyne & Varey, 2006). Furthermore, organisations can the obtained knowledge of feedback-loops use as a benchmark for further applications so that systems from the beginning become more reliable and easier to maintain. Overall, scholars agree that the combination of products and services, that provide functionally and value-in-use to customer, leads to sustainable manufacturing business revenue for many businesses (Cohen, Agruwal, & Agruwal, 2006; Jacob & Ulaga, 2008; Kobler, Fahling, Vattai, Leimeister, & Krcmar, 2009; Maxwell & Vorst, 2003; Sawhney, Balasubramanian, & Krishnan, 2004).

[1] www.consulting.xerox.com
[2] www.rolls-royce.com/civilaerospace
[3] www.thalesgroup.com
[4] www.alstom.com/products-services

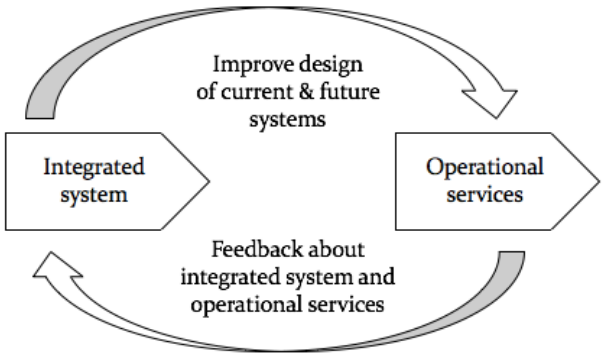

Figure 2, Design-operation feedback-loop (Davies, 2004)

2.1.2 Challenges in servitization

Several studies state the difficulty of realising the expected return from downstream offerings (Gebauer, Fleisch, & Friedli, 2005; Neely, 2008; Reinartz & Ulaga, 2008). Literature describes three broad categories why this might be the matter, namely; [1] the challenges of shifting mind-sets, [2] the challenges of timescale and [3] the business models/customer offerings. The [1] shift in mind-set from a transactional approach towards a relational approach is a struggle especially for marketers, sales representatives and the customer of the organisation. No longer are only single products sold, but long term contracts are entered and affect the role of marketing (Vargo & Lusch, 2004). In addition, Gebauer et al. (2005) noted that sales people rather put effort on selling the tangible good for a high one time investment, than making effort to sell a relatively smaller service contract. [2] The challenge of timescale includes the challenge to manage the role between the customer and supplier. The customer becomes a co-creator of its perceived solution and an intense relationship is required to create one. Both parties need to be able to manage and control long-term risk. In order to do so, the customer needs to open up and the supplier must be willing to understand the total picture of the customers' organisation. Lastly, in order to servitize, organisations need to develop a [3] service culture, fully understand how to redefine, the suppliers and customers, current business model and know how to target the value-in-use of customers (Goedkoop et al., 1999; Neely, 2008). The next chapter will elaborate this topic in more detail.

2.2 Customer value

Marketing literature frequently refers to customer value. However, customer value can be explained and understood in different ways. For example, to create and deliver value to targeted customers, as a focus on marketing strategies or as behavioural aspects of the customer (Flint & Woodruff, 2014). Therefore, multiple definitions of customer value can be found in literature.

Anderson, Narus, and Rossum (2006, p. 6) define customer value in business markets as: "the worth in monetary terms of the technical, economic, service, and social benefits a customer company receives in exchange for the price it pays for a market offering". Grönroos (2006) mentions the monetary value as "the effect on customer's growth and revenue generating capacity" and "the effect on the cost level of customers" as well, but also defines a third type. This value is non-monetary and based on the effect of perceptions like trust, attraction and commitment. Nevertheless, according to Flint and Woodruff (2014), not one definition can cover the complex nature of customer value.

Within this research, the importance of a shift from a value added concept towards a value-in-use concept will be addressed. The value added concept is based on the suppliers' perspective. Hereby, value is embedded in products and services, the supplier is reshaping value through improving the quality which does not depend on the customer interpretation. However, enhancing the value of products and services will not lead to a business problem solution. This concept is also known as the product-dominant logic of Vargo and Lusch (2004). In a product-dominant logic, bundles of products and services take, rather than the customer's requirements and environment, a central position. This strategy of marketing has now been labelled as a more traditional way of customer value offering. In the same paper, Vargo and Lusch (2004) propose the value-in-use concept that is based on the customers experiences, perceptions and specific situations. A more comprehensive, in-depth understanding of the foundation of what customer's value is, is herein required. This theory is consistent with Ramirez (1999), wherein value is not simply added but is a continuous process of co-creating and re-creating with all involved parties.

2.2.1 Service marketing

More and more businesses observe a transition in the vision how offerings need to be provided to customers (Terho, Haas, Eggert, & Ulaga, 2012; Vargo & Lusch, 2004). Traditionally, marketing focused on tangible outputs and to create discrete transactions with customers. Value was determined and embedded by the supplier in the production and distribution stages. Goods were standardised and produced away from the market to reach high control of production and efficiency. The value of an end product was transferred through a transaction to the customer. The customer became responsible and did had to learn how to use, maintain, repair and adapt the application to its specific needs, usage, situation and behaviours (Vargo & Lusch, 2004). Thus, the customer was bounded to the related usage costs and need to bear all risks (Porter & Heppelmann, 2014). This is known as goods-dominant logic (GD-L), where the customer and the product is an operand resource. Since Normann and Ramirez (1993) already emphasised,

value creation should not be designed by a value-added notion, grounded in the outdated assumptions and models of an industry, but rather should be created in collaboration with suppliers, partners and customers. The study conducted by Vargo and Lusch (2004) argues that all economies are service economies and propose a service-dominant logic view (SD-L). With this approach, intangibles (i.e. skills, information and knowledge) and the rise of interactivity and connectivity towards ongoing relationships receive a more central position. This is a view wherein the goal of marketing is to support the customers value creation. Moreover, the role of the customer changes from "target" in a GD-L to "co-creator of value" in a SD-L (Grönroos, 2006). Hereby, the product and customer become an operant resource. In addition, value need to be co-created by multiple users since value can be perceived differently by different people within the customer firm. (Vargo & Lusch, 2015). Therefore, suppliers should not simply focus on value offerings, but invest in customer relations that deliver value-creations (Grönroos, 2006). Vargo and Lusch (2008) and Grönroos (2011) argue that the customer is always the creator of value and that knowledge is the source for competitive advantage. Moreover, organisations that put the customer central of the value facilitation do not produce goods anymore, but only participate and co-create value propositions instead (Vargo & Lusch, 2004). The SD-L is consistent with the value-in-use concept and Macdonald, Wilson, Martinez, and Toossi (2011) argue that this perspective is superior to the value added concept. Macdonald et al. (2011, p. 6) define value-in-use as "a customer's outcome, purpose or objective that is achieved through service". Products and services can only be evaluated properly through its use by customers (Vargo & Lusch, 2004), and cannot be measured at the moment of purchase (Raja, Bourne, Goffin, Çakkol, & Martinez, 2013). In addition, Lemke, Clark, and Wilson (2011) state that the perceived value by customers is then not only arising by product usage, but at any point in the customer journey. Furthermore, Lemke et al. (2011, p. 22) emphasise the importance of value-in-use in business-to-business markets since "value-in-use mediates between customer experience quality and relationship outcomes such as commitment, purchase, retention and word-of-mouth". This is in line with perception, non-monetary, based value proposed by Grönroos (2006).

2.2.2 Value-in-use in customer solutions

Previous research has shown that the understanding of value perception often differs between suppliers and customers (Sharma & Lambert, 1994) and that the understanding of what customer value is, has been a challenge for long (Macdonald et al., 2011). "Such gaps create the potential for mistakes in organisation's effort to deliver value to customers" (Woodruff, 1997, p. 143). Importantly, Anderson et al. (2006); Grönroos (2011); Ramirez (1999); Vargo and Lusch

(2015) state that a powerful solution offering cannot be crafted by the supplier alone but requires participation of the customer for a dialogue, customer specific data and other customer specific inputs. This is an understanding that has been acknowledged in the past, but receives more and more focus in the present. Predefined literature describes a customer solution as a bundle of customised and integrated products and services to address customer business' needs. Like, for instance, defined by Davies, Brady, and Hobday (2006, p. 1), a solution "involves the provision of tailored combinations of products and services as high-value 'integrated solutions' that address the specific needs of large business and government customers". Customisation involves designing, modifying and selecting products that fit in the environment of the customer. Integration stands for designing, modifying and selecting products that are connected and work well among each other (Tuli, Kohli, & Bharadwaj, 2007). However, suppliers that perform likewise, tend to have a product-centric view of customer solutions. In contrast, the study by Tuli et al. (2007) notes that customers experience a solution more extensive, as a set of relational processes between customer and supplier. In addition to customisation & integration, the study proposes three extra stages: [1] requirements definition, [2] deployment and [3] post deployment support. All of the stages are required to meet the customer specific business needs. See figure 3 for a comparison between a product-centric solution approach and the new proposed theory. Tuli et al. (2007) emphasise the importance of the [1] 'customer requirement' stage, while customers are often not aware of their truly required business needs. Therefore, selling often use to remain at the level of predefined requirements without an understanding of the real drivers that supply substantial value to the customers' business (Tuli et al., 2007). Moreover, it is also required that the supplier understands the broader customer business needs, including an understanding of the customers' market and customers' business model concept that is defined into four key dimensions: the customers value proposition, profit formula, key resources and key processes (Johnson, Christensen, & Kagermann, 2008). The supplier should be capable of recognising current business needs requirements, as well as future needs since development is a continuous process and value is changing over time (Macdonald et al., 2011). By doing so, the supplier becomes able to craft offerings that have substantial potential to impact customer profits (Terho et al., 2012). [2] The 'deployment' stage, refers to the delivery and installation of a product into the customers' environment. Like running test rounds, modifying systems to the customer new customer requirements and the cooperation to develop a roadmap. Moreover, deployment processes regard the management of people assets as well. This involves the understanding of capabilities in the customer firm and to customise a training program to enhance the solution quality. [3] 'Post deployment customer support' can be viewed as more than the delivery of spare parts and routine maintenance. It rather can be experienced as the

ongoing relation between supplier and customer. This relation is required to check current value performance and to achieve higher efficiency because business needs as well as the perceived value are changing over time (Macdonald et al., 2011). Moreover, the cooperation provides the opportunity to stay involved in customer performance and to participate in feedback-loops. The focus of customer solution based on relational processes is important since the purpose of a solution is to satisfy the business needs of the customer. Therefore, it is desirable to identify a solution based on the beneficial point of view. The supplier must consider all four stages well to deliver a solution that a customer will consider as beneficial (Tuli et al., 2007). Moreover, focussing on relational processes is consistent with the SD-L theory of Vargo and Lusch (2004), the importance of marketing shift from a product-centric view towards a process-centric view. Having that considered, the general understanding of customer solutions developed to: the integrated products and services that are shaped by the supplier exist to solve a customer's organisational problem and achieve better outcomes than simply the sum of product and service components (Nordin & Kowalkowski, 2010; Storbacka, 2011; Tuli et al., 2007). Macdonald et al. (2016) add to this existing definition, that customers' resources and processes are also part of the solution, that solutions are customised through a joint resource integration, that joint resource integration is a continuously optimised process and that solutions are based on collective and on individual value-in-use. Macdonald et al. (2016) conducted research on how customers judge the quality of solutions and the value-in-use. The authors emphasised the cooperation between the supplier and the customer to create, monitor and optimise value-in-use. Customers do not only assess the quality of the suppliers' offering, but focus on their own resources and processes and the joint resource integration as well. Relevant constructs of the resource integration are the coordination effectiveness and the asset management effectiveness. Besides the shared collective value-in-use, customers of the usage centre judge the business solutions also on an individual value-in-use perspective. This may be perceived differently among the users of the usage group and therefore (Vargo & Lusch, 2015), involving multiple users will give a more representative overview of the individual value-in-use.

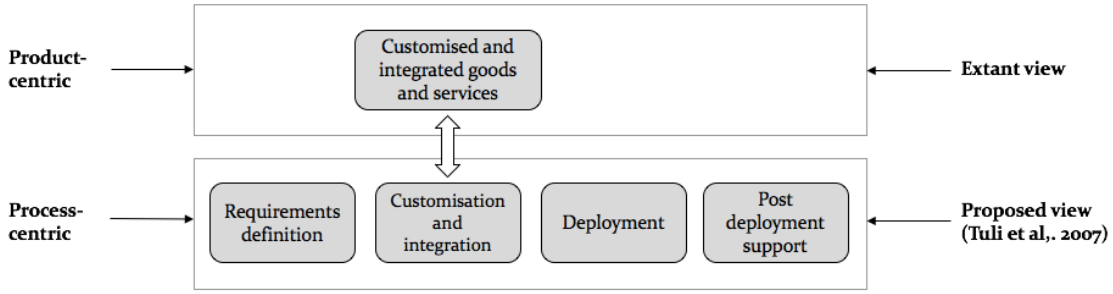

Figure 3, Product-centric and process-centric approach (Tuli et al., 2007)

2.2.3 Value propositions

Value propositions enable organisations to verbalise value offerings into a marketing strategy, or to adjust customer solutions. However, value propositions too often take a value added perspective by mostly stating what value a product or service can facilitate (Flint & Woodruff, 2014). Within the study of Anderson et al. (2006), three types of strategies that help organisations to develop a useful value proposition have been categorised: [1] all benefits, [2] favourable points and [3] resonating focus. [1] 'All benefits' refer to a value proposition that does not require deep knowledge about the customers and competitors but only of its own offerings. For this strategy counts that the more benefits the supplier can name, the better. Nevertheless, this approach includes two major risks, namely: state irrelevant features for the customer and most of the features may be points of parity to the next best alternative. Moreover, if the offered values are the same, the suppliers need to compete at price level, a competition most organisations want to avoid (Festge & Sintern, 2016; Porter & Heppelmann, 2015). Value propositions must give the customer a clear understanding about points of difference and points of parity. The strategy of [2] 'favourable points of difference' consists of favourable points a supplier offers in comparison to the competitor's. Therefore, not only knowledge about own offering is required but about competitors' offerings as well. However, without knowing customers' requirements, organisations might stress the points out that have little influence on the decision making of a customer and presumption occurs. Within the first two mentioned strategies, the value added concept of customer value is the underlying theory. Furthermore, the supplier is not only the facilitator of value anymore, but operates as a creator since the customer is not involved in the co-creation process of value (Grönroos, 2011; Vargo & Lusch, 2015). Therefore, the value proposition strategies serve more as a guide for internal organisation users than for communication with external customers, since customers tend to think more in a value-in-use way that provide a specific solution. By applying the [3] 'resonating focus', suppliers are required to understand the customers' business model concept and environment (Terho et al., 2012). Cooperation between the supplier and beneficial is required to co-create value preferences that result in a customised customer solution. However, customer value-in-use research includes disadvantages like time consuming, requires effort, customer specific result and the supplier might deal with customer persistence. Nevertheless, the resonating focus can be seen as the "golden standard" (Anderson et al., 2006). Even when the value proposition facilitates superior customer value, it is the challenge for the supplier to proof this claim effectively, to gain perception based value, and to avoid that it will be marked as marketing puffery.

2.3 Conceptual framework

The conceptual framework (figure 4) proposes the process towards a customised value proposition. Herein, the supplier (left blue circle) and customer (right blue circle) are involved and cooperate. First, the supplier process. The 'value facilitation' concept refers to the suppliers' contribution to value. This value is divided into 'systems value' and 'services value'. The 'machinery value' will not be addressed within the scope of this research, since this research is about the value of downstream offerings. The reason for that is that the downstream offerings value is more generally applicable and less depending on the core product. For instance, the value of operational services is independent from the machinery or industry. However, the machinery value is more divers and bounded to a specific offering in a specific industry. Next, the 'customer solution identification' and involves the development of a customer solution. Requirements that address needs of the customers' organisation must be identified. This is a continuously process since value facilitation, requirements and customer value can change over time. As illustrated, the supplier and customer are both involved in this concept. This is relevant since the knowledge and expertise of both is needed to identify problems that cause a lower performance on the customers' KPI's. The goal is to effectively address problems and to foster a positively effect on the performance of customers' KPI's. The 'value-in-use' concept is based on perceptions and situations within the environment of the customer, and will arise when the specific customer needs are addressed. However, customer value-in-use is experienced during the usage process and through the whole customer journey. Since this research focuses on a framework to create customised value propositions, the identified solution is not in use yet. Therefore, the real value-in-use cannot be answered within this study but results in potential value-in-use instead. The total procedure, the facilitation of value by the supplier, the solution identification process by both, and the co-creation of value by the customer results in a customised value proposition, the red circle.

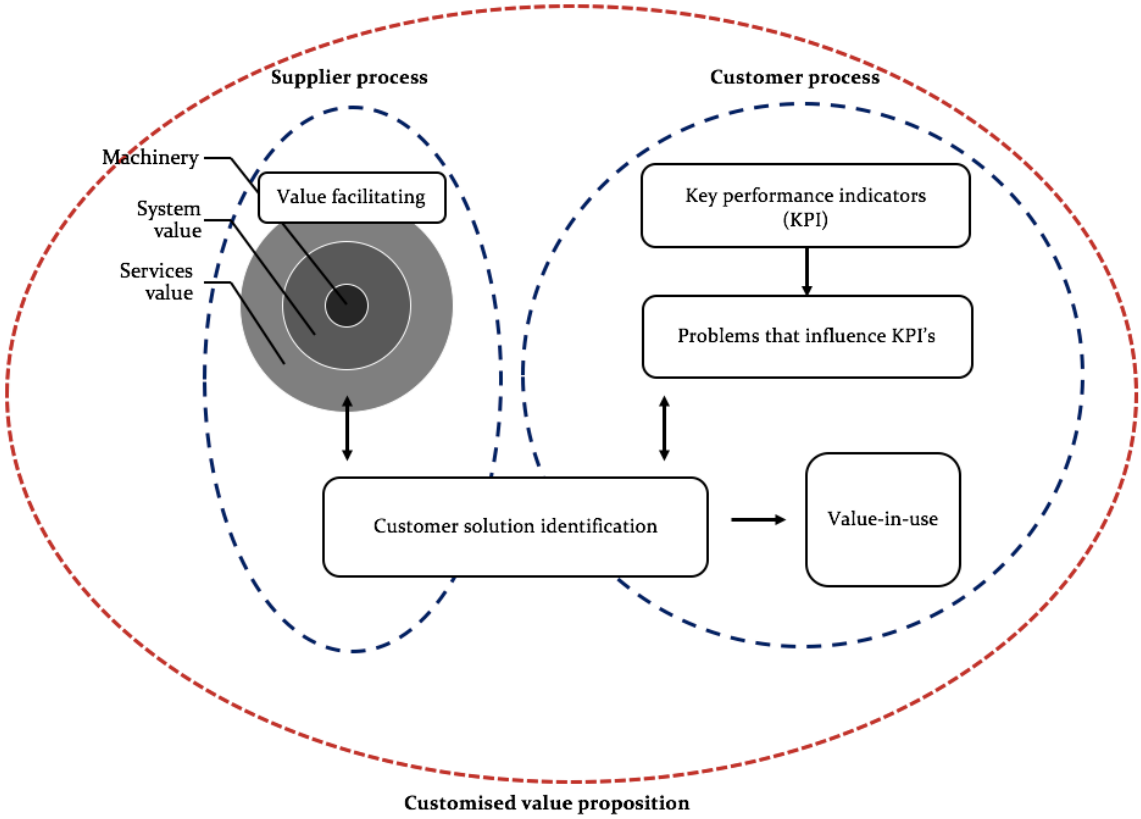

Figure 4, Customised value proposition framework

3 Methodology

3.1 Research design

There will be made use of a qualitative research design for this study (Bryman & Bell, 2015). This design was chosen since qualitative research provides the researcher the opportunity for intense contact with the field and to gather data from the inside that gives a holistic view of the content. It provides the participants the freedom to choose the content to some extent rather than to be limited to a predefined set of items. Moreover, it gives insights in the act of people's behaviour (Miles & Huberman, 1994). However, disadvantages of qualitative research include that it is too subjective, difficult to replicate and that it creates a lack of transparency (Bryman & Bell, 2015). Nevertheless, it is extremely helpful by performing a case study (Miles & Huberman, 1994). The case study will be exploratory, since it involves a specific case without much previous executed research in this field. The overall goal of the case study design is to address the following questions:

1. What is maintenance related value according to the supplier?
2. To what extent can the supplier deliver customer solutions?
3. What is the maintenance related value for the customer?

The 'value facilitation' concept of the conceptual framework is linked to the first sub question. The aim of this sub question is to get insights in what experts consider as relevant maintenance value for downstream systems and services. Due to these insights, the case organisation can make a comparison between its current value offering and the preferred value offering by the understanding of experts.

The second sub question is linked to the 'customer solution identification' concept of the conceptual framework and provides insights in how the case organisation aims to identify and to deliver a customer solution. Within the solution identification concept, the role of the case organisation, the co-operation with the customer and the opinion of the experts about the total process are discussed topics. Therefore, a comparison with the applicable literature will be made to reflect the performance of the case organisation.

The third sub question is linked to the customer process of the conceptual framework. Several topics need to be addressed to get an understanding of the maintenance related value of the customer. For instance, downtime factors, system value, services value, key performance indicators and the preferred cooperation with the supplier or other external organisations will be discussed. Macdonald et al. (2016) state that customer value-in-use can be distinguished between collective and individual perspectives. This research only focusses on the collective value-in-use of the customer.

3.2 Case

This research is executed in cooperation with a global technology organisation that is headquartered in the South of Germany. The case organisation operates in a business-to-business market and offers a broad portfolio of systems, products, services and digital applications, that sets standards in a wide variety of markets. Currently, the case organisation has over 19,000 employees and locations in more than 60 countries around the world. The operations are divided into four divisions. Three of them existed already for a longer time, the fourth division was established in 2015 and will serve as a case for this research.

With this new created division, the case organisation brings together all group's divisions knowledge and expertise in the area of digitisation and automation to develop innovative business solutions. Nowadays, 1400 employees, which are all experts from different fields, work for this division. The focus of this division will be firstly: enhance existing product portfolio to include digital capabilities; secondly, developing new digital solutions for established core markets; and thirdly, the realisation of applications and business models that were not addressed in the past. Moreover, within this division, there is a high focus on customer support with a variety of services in the deployment and post deployment stage.

For this research, the case organisation wants to investigate business opportunities for maintenance systems, based on the customer value-in-use. The researcher was on site of the case organisations for the period of 20 weeks. During this time, a broader understanding of the offerings and markets was developed. Moreover, several meetings with employees were scheduled prior to the actual case study.

3.3 Selection

Within this research, the process understanding of both, the supplier and the customer, is considered. Therefore, two sample groups are used, namely the experts of the case organisation and customers. The customer group includes, besides actual customers, potential customers and external experts like, servitized OEM's and service providers. However, all external experts will be addressed as 'customer' within this study. The method of purposive sampling was used to create the sample for both segments. According to this method, interviewees are selected on basis of their knowledge, relationships and expertise regarding the research subject (Bryman & Bell, 2015; Freedman, Pisani, & Purves, 2007). Furthermore, purposive sampling is an common and effective way in exploratory research and in cases where limited empirical sources are available (Fisher, 2010). However, purposive sampling is a non-probability approach and therefore, the sample cannot be generalised to a population (Bryman & Bell, 2015). Thus, the experts of the case organisation were chosen based on job functions and cross-recommendations. For the customers' representatives, it was required that the organisation operate in business-to-business markets and perform maintenance and/or deliver maintenance systems. Moreover, these customers needed to have a managerial role in the machinery availability and maintenance decisions.

3.4 Data collection

The conduction of interviews is used as a research method. A semi-structured method was chosen since it offers the flexibility to explore relevant subjects, based on what the interviewee states, that were not initially meant to be addressed by the predetermined questions (Gill & Johnson, 2010). The predetermined questions provided a clear guide but were followed-up with additional questions to get a better understanding and clarifications. Appendix I presents an overview of the predetermined questions for both sample groups. The aim of the predefined interview guide was to gather data from the participants in the sample group that addresses the concepts of the conceptual framework (figure 4).

Eleven interviews have been conducted in total, whereas six of them with experts of the case organisation and five with customers. All the interviewees have a managing position within the firm and met the beforehand set requirements. Table 1 presents an overview of characteristics of the experts and table 2 from the customers. The customer's maintenance strategies differ as well as the industries they operate in. All interviewed customers are located in Germany and the researcher visited the organisation for the interview. The average duration per interview was 45 minutes for the expert interviews and 60 minutes for the customer interviews. All the interviews were conducted in February and March 2018. Prior to the actual interviews, the pre-set interview guide was checked by the supervising researcher of the case organisation and a researcher from the University of Twente. To reduce bias, the interview guide has been sent in advance to give the participants the opportunity to make themselves familiar with it. In addition, a non-disclosure agreement and a document that briefly describes the research topic were sent beforehand. Before the official interview started, the researcher controlled, if the questions were understood by the interviewee in the intended way. This was in some cases necessary because all the interviewees, as well as the researcher, are not native English speakers. Most of the interviews have been audio-recorded after agreement by the interviewee. In one case, detailed notes have been made instead. One interview was performed by the use of a Lync-call, all the others in a face-to-face meeting.

Experts	Job title	Industry	Contact
#1	Senior Reliability Expert	Digitalisation & automation	Face-to-face
#2	Product Owner Asset Management	Digitalisation & automation	Face-to-face
#3	Head of Asset Performance Management Services	Digitalisation & automation	Face-to-face
#4	Product Owner	Digitalisation & automation	Face-to-face
#5	Technical Sales Manager	Digitalisation & automation	Face-to-face
#6	Manager MRO-Data Engineering	Digitalisation & automation	Face-to-face

Table 1, Data sample characteristics experts case organisation

Customers	Job title	Industry	Contact
#1	CEO Managing director	Pump & Engine machinery manufacturer	Face-to-face
#2	Maintenance Manager	Automotive components manufacturer	Face-to-face
#3	Head of After Sales & Services	Pump & engine machinery manufacturer	Face-to-face
#4	CTO	Paper	Face-to-face
#5	Senior Manager Maintenance Management	Rail mobility	Lync-call

Table 2, Data sample characteristics customers

To increase the internal reliability, the supervising researcher was present, as an observer, at five interviews to check on the process and to participate in the interviews. Afterwards, the interview was discussed by the researchers to check if the outcome was interpreted in the same way. The external reliability provides the extent to which way a study can be replicated. Since this research involves an exploratory case study, it was more difficult to measure the external reliability as technology, suppliers' offerings and customer value-in-use is changing over time (Bryman & Bell, 2015).

3.5 Data analysis

After the collection stage, the process of analysing the data started. First, the audio-taped interviews were fully transcribed into raw data (Strauss & Corbin, 1990). Next, the process of coding was executed by the use of the coding software, Atlas TI 8.1.3. A deductive and inductive method was applied (Miles & Huberman, 1994). It is deductive in the sense that the code groups are based on concepts of the conceptual framework. Table 3 provides an overview of these

concepts, a description per concept and potential indicators. The potential indicators were defined prior to the actual research and based on a current understanding of the researcher. An inductive coding approach was applied to create the actual codes. They were not defined in advance, but derived from the obtained data and linked to a concept. As example, the code group 'system value' is based on the conceptual framework and defined in a deductive way. Via inductive coding, codes like 'transparency and 'integrated systems' were developed, and could be linked to this concept/code group. However, the 'customer solution identification' concept in the supplier process was an exception. The four stages of a customer solution defined by Tuli et al. (2007) were used as code to define the solution identification process of the supplier.

The coding process involved three stages. First, the open coding process was performed, followed by axial coding and selective coding (Saldaña, 2015). Within the open coding process, in vivo coding and descriptive coding have been used in a mixed way. In vivo coding refers to words or short phrases that can be referred to the interviewee. The descriptive coding process refers to a text segment that can be summarised into a code (Miles & Huberman, 1994). To create codes, it was important that insights, ideas and believes of the interviewees were mentioned by multiple participants from the expert group, customer group, or both (Bendapudi & Leone, 2002). The open coding stage resulted in a total of 110 codes. Next, axial coding has been applied. Within this process, the earlier identified findings in the open coding process are being modified and merged into smaller groups or concepts (Saldaña, 2015). The 110 earlier defined codes could be reduced and categorised to 56 codes. Finally, the selective coding process was performed. Within this process, the axial themes and groups are narrowed down to core concepts discussed in the conceptual framework (Miles & Huberman, 1994). The conceptual framework was a guide during the coding process. However, inductive coding resulted in additional concepts that were not initially attended by the conceptual framework. 29 Codes were left after the last coding stage.

Concept	Description	Potential indicators
Supplier process		
Value facilitating	Downstream offerings of the supplier that contribute to value facilitation.	See 'system value' and 'services value'.
System value	The concept 'system value' stands for the value a system facilitates for the user to organise maintenance in a more effective and efficient way.	• Transparency of components and machinery • Integrated systems • User friendliness
Services value	The 'service value' concept refers to services that help the user to perform maintenance in a more effective and efficient way and therefore, contribute in the facilitation of value.	• Maintenance tasks • Spare parts provision • Advisory role
Customer solution identification	The process involves the development of a customer solution. Requirements that address specific needs of the customers' organisation must be identified.	• Requirements definition • Customisation & integration • Deployment • Post deployment support
Customer process		
Maintenance KPI's	Key Performance Indicators (KPI) are measurable values that indicate how effectively an organisation is achieving its maintenance targets.	• Availability of machinery • Costs structure • Life-cycle of components and machinery
Problems that influence KPI's	Maintenance related problems or failures that cause lower performance KPI's and therefore, have a negative effect on maintenance targets of the customers' organisation.	• Reactive maintenance • Inefficient maintenance planning • Dependent on external organisations
Customer solution identification	The process involves the development of a customer solution. Requirements that address specific needs of the customers' organisation must be identified.	• Beneficial relation with the supplier • Identifying and addressing problems • Development of a maintenance strategy
Value-in-use	The value-in-use concept is based on experiences, perceptions and specific situations of the customer.	Customer value-in-use arises from the usage and the perception at any point in the customer journey. This research only focuses on potential value-in-use by addressing customer problems

Table 3, Concepts, description & potential indicators

4 Findings

The coding process resulted in a total of 29 codes. 23 Codes were defined based on the concepts of the proposed conceptual framework. The other resulted in additional concepts: 'organisational challenges' and 'individual challenges'. The codes were derived from customer and expert interviews and merged, since the results showed overlap. Figure 5 provides an extended overview of all derived codes, concepts, processes and the causal links as proposed in the conceptual framework. Table a in appendix II presents the codes with illustrative quotation for the 'supplier process'. The same counts for table b, 'customer process' and c, 'challenges'.

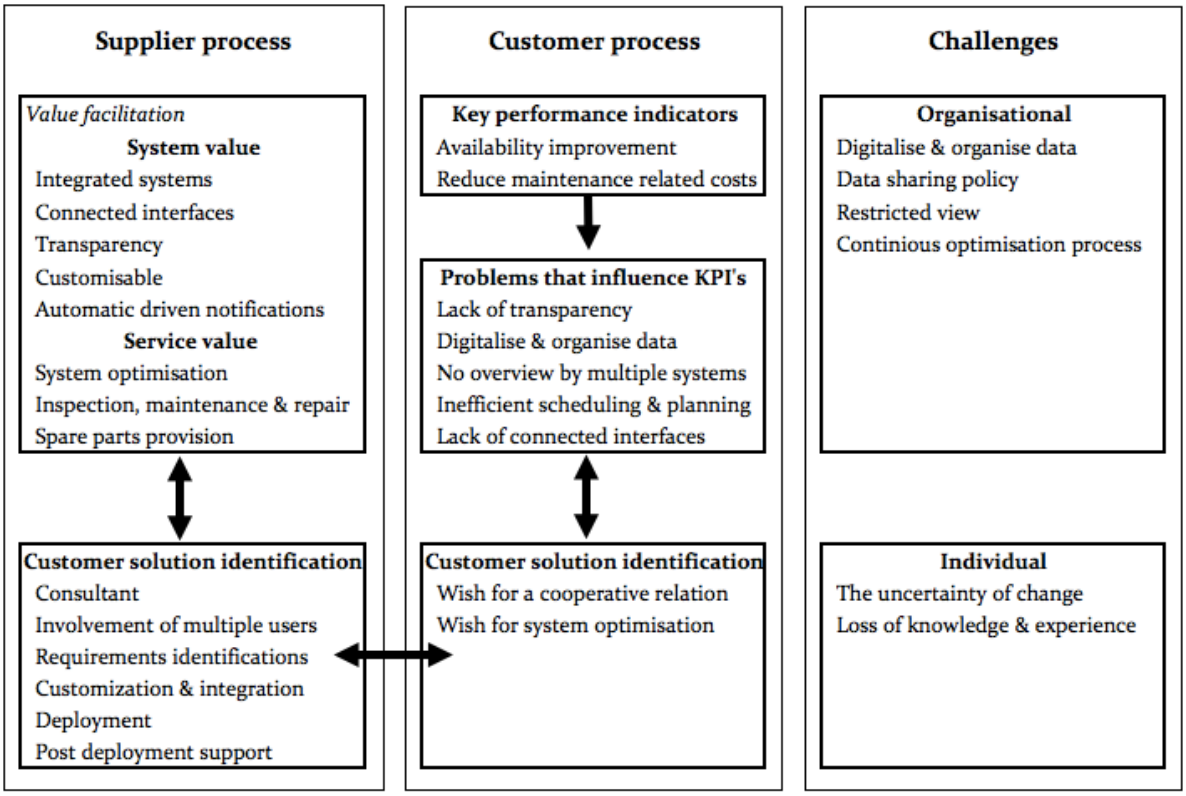

Figure 5, Codes derived from the interviews categorised in concepts and processes

4.1 Supplier process

Two sub questions will be addressed in the supplier process, starting with: 'What is maintenance related value according to the supplier?'. The purpose of the first sub question involves getting a clear understanding of what experts consider as relevant maintenance value for downstream systems and services. The second sub question involves: 'to what extent can the supplier deliver customer solutions?'. Hereby, the analysis needs to give insights in how the case organisation aims to identify and can deliver a customer solution.

4.1.1 System value

The concept 'system value' stands for the value a system facilitates for the user to organise maintenance in a more effective and efficient way. In total, five codes were discovered that are related to the 'system value' concept. All experts emphasised the value of '**transparency'.** Transparency refers to the (real life) insights the user has of components and machinery. The insights can be related to the availability, costs structures and exactly knowing what and when actions to take to prevent downtime. By having this information, transparency can result in a better understanding of processes and a more efficient time, resource and man-power planning. In addition, it simplifies and justifies the decision-making process for the user in the future. Moreover, the experts state the importance of transparency integrated in systems, like the spare part management. Organisations want to have the spare part in stock if a breakdown occurs, but to many leads to unnecessary costs. Real value for the user will arise when the system is able to alert the user in advance when and what specific actions are required. Therefore, the efficiency of maintenance highly depends on the quality of the predefined standards by the supplier. These standards, like temperature, pressure, speed, vibration, life cycle and so on, are determined by combining collected data from the customer with the data, knowledge and experience of the supplier organisation. Next, the interviews described the value of '**customisability**'. The maintenance system can be modified to, so far, all maintenance related business needs of the customer. In addition, the maintenance systems of the case organisations can be applied to original equipment from another manufacturer as well.

"We can customise our system, with user interfaces and integration, in such a way to customer requirements, that we can offer a customised solution at the end. For maintenance, we could always deliver a system that fulfils the customer's needs" (E4)

Most of the experts stress the value of one '**integrated system**'. Having an efficient maintenance process relies on multiple factors that are often tracked in different systems like, for instance, systems that measure the actual components status, machinery spare parts and maintenance work orders. Thus, all these systems generate various kinds of output and therefore have a negative effect on the total overview. The value of integrated systems can be reached through combining the input of multiple sources into one platform. In addition, the experts pointed out that the central platform needs to be easy in use for all maintenance levels since employees of all levels need to work with this system. So, all the output of the different maintenance related systems need to be central and easy in use in one maintenance system. Still, this maintenance

system needs to be available on multiple '**connected interfaces'.** The use of multiple connected devices needs to simplify the procedure of maintenance activities. For instance, a maintenance manager needs to be able to do routine checks and having all needed information present on a tablet. It makes it possible to directly create notifications and work orders in the system. In addition, a smart maintenance system offers the possibility to **automatically send notifications** to the user if maintenance is required. Besides the new, faster and smarter possibilities, some experts noted that the importance of personal contact is valued by customers. Therefore, it is advised to invest in new interface opportunities, but not to abandon the more traditional possibilities.

"It is simple to create notifications, with all the information you need, in the system. Scan the QR code and the system will recognise it selects the correct location and equipment. You can also select the machine structure, add photos, notes and a simple augmented reality part." (E6)

"You have the systems and mobile applications [...], so a maintenance guy can receive five a clock in the evening a message "there is something going wrong and it needs to be checked" so it is automatically driven by the system to work with the system" (E3)

4.1.2 Services value

The 'services value' concept refers to services that help the customer to perform maintenance in a more effective and efficient way and therefore, it contributes to the facilitation of value. Three service offerings were stated during the expert interviews. Starting with '**system optimisation**'. The experts mentioned the in house capabilities and resources to optimise maintenance systems for the customers. The maintenance system continuously sends data to the cloud. Then, the supplier is able to make an analysis, to address problems, to discover patterns and to learn about the taken actions. Afterwards, the supplier sends back the data to the system as improved input. These upgrades support the customer to set a higher standard of performance. To do so, it is relevant that the supplier has access to the maintenance system of the customer and is allowed to use the data. Besides the improvements of a maintenance system, the supplier is able to define reliable benchmarks for components and machinery in different markets. Furthermore, the claims of the case organisation are easier to proof since performance is measured.

"[...] then we have a lot of data, we can start to compare models and signals from 20 different mills at the same time, we can see the patterns, learn from it and improve the input for systems" (E6)

Next, the '**inspection, maintenance & repair**' services are regarded. The case organisation has the resources and capabilities to offer on-site operational services and to develop maintenance programs through the life-cycle of machinery. This results, for instance, in the development of inspections wherein maintenance activities are planned or the actual repair and replacement of components in case of a breakdown. In cooperation with the customer, the supplier develops service packages that fulfil customer needs. The service packages can be customised based on time, considering budget and business needs. The inspection maintenance & repair services enhance the operational performance of machinery and decrease the risk of unplanned downtime. Moreover, the experts emphasised the relevance of its involvement since the customer often does not have a full understanding of the total process and own requirements. **Spare parts** are essential to perform maintenance and repair activities. The case organisation is able to supply a wide range of spare parts and therefore, he is not depending on other suppliers to perform operational services. Due to services, the provider is enabling himself as an expert for spare parts provision and replacement, he has the capabilities and knowledge to perform inspections and maintenance and is able to make an analysis that improves the standard maintenance systems.

4.1.3 Solution identification

Literature emphasises that a customer solution is not created only by the supplier, but is always co-created with the customer through intensive cooperation. During the expert's interviews, it was clarified that the case organisation understands that a customer solution is more than a customised product. Most of the experts stated that the organisation is not a real software company, but that the unique selling proposition of the organisation lies in the information, expertise and knowledge it has of maintenance in multiple industries. Therefore, the experts see the organisation not as supplier of maintenance systems but rather as a '**consultant**'. However, this vision has not always been present but was defined recently, like a participating expert states:

> *"[…] a general understanding we have at [case organisation] is building, supplying and commissioning machines and after this is finished, everybody tries to take off and goes to the next project. We lose the asset out of our sight. This will change now because there is not so much growth anymore […]" (E4)*

The aim of a maintenance system is to organise maintenance more efficiently by increasing the machine availability and to reduce maintenance related costs. However, the vision of the experts goes beyond the idea of only delivering a system and the supplier considers the consequences as well. Like, for instance, when an improved system reduces the required work and workers can be dismissed. For the customer, this might result in a loss of valuable information and expertise. As a consultant, the supplier has knowledge about human resource management and can provide different possibilities to avoid the redundancy of the worker. Another example involves organising the plant towards a lean environment. Furthermore, operating as a consultant provides objectivity and honesty towards the customer. Nevertheless, it is the business case that counts in the end for the customer. The next stated value includes '**requirements identification'.** All the experts mentioned that most customers do not completely know what their pain points and business needs are. Due to this reason, it is already necessary that the supplier is involved as a solution co-creator. The supplier gets a better understanding of the customers' current situation and will be capable to define value measurements through the performance of audits and interviews. A team of maintenance experts, sent by the supplier, executes the audit that takes about a week. Simultaneously, interviews will be conducted. Even when the decision whether to invest or not happens at the managerial level, it is important that all levels are involved to get an in-depth view of current processes. After the audit, the supplier is able to define measures that improve the organisation, the system and the use of recourses. The '**customise and integration**' phase is the next step according to the experts. The system needs to be customised to the predetermined measurements. Again, the experts state that customer support is always required because they can never fully rely on the customers' knowledge and capabilities.

"First to customise the system, the next one is to implement the existing data in the system, just to prepare it, to make it convenient to be automatically transferred to the system this is the way it usually works, plus you also have to train the people" (E1)

Hereafter, the suppliers emphasise the value of staying involved to offer '**deployment**' services. This phase can refer to modifying the system and running test rounds. The value is not only focused on the integrated system but also regards the management of people assets like the training of employees and defining a roadmap for the long-term. The roadmap is defined in cooperation with the customer to improve the customers' KPI's. The last phase of the solution identification theme is the '**post deployment support**'. Hereby, experts mentioned the relevance of an ongoing relationship with the customer. This phase contains the, earlier

discussed, systems related services but it also goes further. Staying involved opens the possibility to establish feedback-loops to optimise process. However, some of the experts noted that at least two years of data is required to redefine specific standards. The customer continuously improves and the supplier extends the revenue stream. In conclusion, the supplier is more than only delivering a system, he provides himself as the co-creator of a solution. Even when the top management makes the purchase decision, a '**higher value is created when multiple team members are involved**'. Thus, by including all levels, a better understanding of key processes and business needs will arise. The same counts for the deployment and post deployment stage. Like, for instance, trainings are defined based on the capabilities of the team members that actually need to use the system.

"That is also the consulting part, we come once every four till six weeks, make an inspection go through everything, we review what happened the last weeks and what were the difficulties, we make a homework program for the next coming weeks and that is why we are training them, to think in a new way and how to work with the systems." (E4)

"Once you sell software, you have updates, you have a lifecycle of the software and this is one of the reason why you should be involved [...] so you have always the feedback how to optimise." (E3)

4.2 Customer process

The question "What is maintenance related value for the customer?" had a central role during the customer interviews. The goal of this process is to identify common maintenance problems that negatively affect maintenance KPI's. In addition, the 'solution identification' will be addressed to understand the importance of this concept for the customer.

4.2.1 Problems that influence KPI's

The customer interviews provided insight in a variety of problems that customers face and that have an undesired influence on maintenance KPI's. An often occurred problem among customers referred to the '**lack of transparency**'. Due to this problem, customers do not have information of components or machinery and therefore, they face difficulties to make efficient decisions. This can result in redundant costs, extra time, money and the replacement of well-functioning components. By having a system with predefined standards and up-to-date information, decisions can be better justified. Furthermore, the lack of transparency is related

to other problems that were named, for instance, unplanned shutdowns and problem solving after the breakdown occurred. So, inefficient maintenance is a situation that organisations tend to avoid. However, having a shutdown because of an unnoticed breakdown occurred is the worst case scenario. The customer is then forced to stop the production to avoid further damage. The unplanned shutdown leads to additional maintenance costs, targets cannot be reached and the workforce is not able to produce, but the payment continues. In addition, the customer interviews showed that the customers cannot independently solve most of the breakdowns because the employees do not have the capabilities, knowledge or tools present. The following illustration stipulates the scenario of a lack of transparency and a participant states, for him, the perfect solution.

"We have a mechanism that has to be activated every thirty seconds so that they know that the guy driving that train is still alive. This mechanism is often defect. Here it would be nice to monitor it, and know when to change or clean it. With that information, we would avoid the complete stopping of the train. […] That is something that costs the customer a lot of money." (C5)

"It is interesting to know how the machines really perform. […] we need to analyse the reasons why machines have a breakdown and to avoid the same situation in the future […] For us it will be perfect if the machine makes a notification or a call to us if the breakdown comes in the future" (C1)

Another problem that was addressed contains the '**organising and digitalisation of documentation**'. The documentation can involve: made notifications by employees, information of components, breakdown action plans and more. The correct documentation of this data is necessary to create a history and to learn from it so it can be applied faster in future situations. In addition, it captures the knowledge and expertise of the maintenance team members and makes it available for others. Nevertheless, even when the organisation operates like this, it is still the question where the required information is stored. Some customers highlighted the problem of '**not having an overview by multiple systems'.** This means that the customer is not prepared when an unplanned breakdown occurs. Therefore, it takes more time to find out where the breakdown was caused before maintenance can be executed. This results in higher unavailability, additional costs and lower productivity. It is relevant that employees of all levels know how to use the systems in a proper way and where to find required information to solve a drawback. The same counts for the registration of spare parts for example.

This can be for own spare parts management systems as well as the systems from an external organisation. Like the next situations explain:

"What kind of situations occur when the spare part is not available?" "Then we hope that the supplier has this part in stock […] we took a taxi for important cases." (C2)

"The most problems are involved with not cleaning the machines, because the information from the operator does not reach the maintenance department. (C2)

Documenting and building a history of data enables the organisation to make knowledge easily accessible, faster problem solving and the organisation can optimise its maintenance procedures. In addition, it enables the customer to address the problem of '**Inefficient scheduling & planning**'. During a customer interview, the importance of an efficient maintenance schedule was emphasised. This organisation plans a scheduled shutdown every four weeks. Within this scheduled shutdown, all the required maintenance activities are performed to ensure that the machine can function until the next planned shutdown. The predefined standards, based on own data and input from the supplier, allow maintenance to be performed more efficiently. Then, the procedure starts to prepare the organisations for the next cycle to order spare parts and to involve external parties for consultancy. Inefficient scheduling and planning will have significant effects on the productivity and maintenance KPI's. So, strict maintenance procedures support organisations to prepare against unpleasant situations and keep its unplanned downtime percentage low. Most of the customers are able to perform maintenance only to a certain extent and therefore rely on the capabilities of external organisations. The next quote illustrates the importance of efficient scheduling and planning.

"If a machine has a breakdown, you call a service team. But are all the service technicians waiting until the customer calls? No. Sometimes we do not have them available because all the projects are planned and if an unplanned service is coming, we do not have the capacity, nor the parts. Then, we have a critical situation. In my opinion, we cannot help the customer with the same quality, if we plan it in advance." (C3)

The last mentioned problem that was derived from the interviews is the '**lack of connected interfaces**'. It is a problem that was mentioned less often than the ones discussed earlier but not less important. Connected interfaces can simplify the maintenance activities for all levels as notifications can be easily made and sent to the central system. The performance of inspections

can be done more straightforwardly since all information is directly available on a tablet, for instance. In addition, some experts state that a miscommunication with the use of traditional devices was easily made.

4.2.2 Solution identification

The 'solution identification' concept elaborates how the customer aims to develop his own solution and to what extent the customers prefers to cooperate with the supplier. It is seen as a process that was well understood by the supplier but in most cases less by the customer. The first discovered value involves the wish for a '**cooperative relation**'. All the customers rely to some extent on the suppliers' expertise and capabilities. Interviewed customers emphasised the most value on capabilities that have a direct effect on the product like inspections, maintenance and repair, spare part provision and system integration. The outsourcing of these kind of services saves the customer resources in time and capital. A more strategic cooperation with the supplier that contains consulting, roadmaps, defined goals and trainings on different levels was barely mentioned.

"We have a contract with some companies, they come every half a year and check the complete machine. We make also checks by ourselves with the help of the supplier" (C2)

"We have service vans that are fully equipped and then we are driving there with a team to the customer and do the maintenance there." (C5)

Secondly the '**system optimisation**' value was identified. All of the interviewed customers do have a system to organise maintenance more efficiently. As mentioned before, maintenance systems have integrated predefined standards. Based on the gathered data from the system, the supplier and customer are able to learn from the data and to improve the standards of the systems. Some of the customers employed IT personal to modify and improve the system but most of the customers rely on the knowledge of the supplier. The supplier is capable of making an analysis and to address problems. Therefore, the optimised systems help the customer to plan the use of resources and workforces more efficiently.

"With a lot of other customers we have agreements and contracts that are full service contracts. With full service contracts it is necessary that we are allowed to use the data to give optimal solutions to the customer." (C5)

"This is also an internal learning process because you know you get data from the machine and perhaps the machine takes more power, so it means that something is not right … and then you need to analyse where the difference comes from. This is also a learning process for every supplier to have a data stock with settings to get to know the critical parts." (C1)

4.2.3 Key performance indicators

The customers stated the importance to address problems they currently face and emphasised the importance of a good relation with the supplier. Nevertheless, the customers dedicate the most value on the financial aspect. All customers mentioned both: improve '**machinery availability**' and '**reduce the maintenance related costs**' as value when the topic concerning maintenance KPI's was addressed. The increase of machinery availability, the organisation is able to produce more and to increase the revenue stream. In the end, it is the business case that counts for the management and decides whether to invest or not. However, it is for the customer often difficult to find the right balance between increasing uptime and reducing maintenance costs. Reasons for this include insufficient capabilities and knowledge of the customer, a lack of transparency in the system and the organisational restricted view (more on this in 'organisational challenges').

4.3 Comparison

Similarities and dissimilarities were identified between the two sample groups, even when the experts focused more on perceived value and the customers on their actual maintenance problems. Regarding system related value, both sample groups emphasised the importance of the transparency of systems, an integrated main system and the use of multiple interfaces to perform maintenance in a more simple and efficient way. All the values support the user friendliness of systems, e.g. automatic driven notifications, which was underlined by both groups. In addition, the supplier stated the importance of customisable offerings. This value cannot be linked to a problem derived from the customer interviews. From a customer perspective, the problems of 'inefficient scheduling & planning' was highlighted to a broader extent than by the experts.

Over the years, the case organisation increased knowledge and experience and is able to create a broad range of maintenance related offerings, tailored to the user requirements. In comparison to the customers, maintenance is important, but cannot be seen as the core business

of the organisation. The customers rely in many ways on the expertise of external organisations. Like, for instance, operational services, spare parts and to some extent the optimisation of the maintenance system. These values have a direct effect on the operational availability of machinery and less on a strategic, long-term level. The case organisations developed a well-defined understanding of how to create a customer solution. It enables itself as a consultant and takes action based on well-defined steps. A long-term, cooperative relation is emphasised as an important value for the experts. Furthermore, all the experts stated that most of the customers have no in-depth understanding of their own business performance and requirements e.g. the availability of machinery and the costs of a breakdown. To end, the solution identification process is influenced by the challenges. The following chapter will elaborate this concept in further detail.

4.4 Challenges

As mentioned before, the coding process developed concepts that were initially not addressed in the conceptual framework. The concept of individual and organisational challenges provides an overview of challenges based on interviews from both sample groups. The theme is divided in organisational and individual challenges.

4.4.1 Organisational

The first organisational challenge is the '**digitalisation and organising of data'.** Often, the supplier deals with customers where documents are not digitalised or even available. However, this is relevant in multiple ways. For instance, customer data, based on own conditions, situations and environment provides a better understanding of key processes. It supports the supplier to get a deeper understanding of the business case and to customise offerings. Moreover, analysis can be made of the obtained data to improve the parameters of the maintenance system of the customer and for his own benchmark. From a customer perspective, documentation is necessary to get an overview of all information and maintenance processes. The information is better available and easier to gain and it supports the customer to schedule and perform maintenance activities more efficient. In addition, it captures the knowledge and expertise of the maintenance team members. The knowledge needs to be transparent, so that the organisation does not rely on specific workers.

"I saw so many power plants where the documentation is not stored in a proper way, where the knowledge about spare part handling was just poor, a breakdown occurs and they need documentation, they do not know where to find it." (E5)

Both, customers and experts, emphasise 'system optimisation' as a value. However, some customers have a strict '**data sharing policy'.** The supplier does not have access to the data and cannot make an analysis. Therefore, the supplier cannot improve the predefined standards, maintenance processes or use them as a benchmark. The customer needs to rely on his own capabilities to make the system more efficient. In some cases, the customer grants access to the supplier if the expertise is required to consult in a situation. Nevertheless, customers that stated this, also mentioned that it can be a solution for the future. A strict data sharing policy can be quantified as a '**restricted view**' since it inhibits the efficiency of a solution. More examples of a restricted view were derived during the interviews and include for example: insufficient knowledge about own assets and services to not realising the benefit of cooperation with the supplier or customer. Moreover, most of the participants mentioned the conservative industry wherein change travels slow.

"Do you know the availability percentage of your machinery?" "No, we don't know". (C2)

"We have about 80 customers with a service contract but actually, I have no data where I can see that the machines run better without maintenance contracts or with a contract. My feeling says that the machine runs better. But it is interesting to investigate this." (C3)

The last challenge that was derived is the '**continuously process optimisation'.** Predefined conditions, downstream offerings and value-in-use are changing over time. It is important to stay innovative to facilitate in the development of customer solutions. Moreover, the cooperation between supplier and customer to improve customers' processes and maintenance systems is essential. The implementation of, for instance, structured feedback-loops can help in this process.

4.4.2 Individual

'**Change uncertainty**' is the first challenge that was derived on an individual level. Experts noted that employees of all levels might be sceptical when the supplier is intern for an audit or interviews. An improved maintenance system will structure the way how to do maintenance and can result in a reduction of the workforce. The employees are afraid of being dismissed by giving too much information. Some employees work with the same procedures and routines for several years and are therefore special because they have that knowledge to solve situations. Therefore, according to the experts, it is important to ask the right questions in the interview and multiple

employees of the levels need to be interviewed to compare results. The other individual challenge involves the '**age, knowledge and expertise**' of maintenance team members. Experts and customers pointed out that in maintenance, many workers retire or fluctuate to other organisations. It becomes a problem when these workers leave the organisation and take the knowledge and expertise with them, because maintenance activities were not properly documented. Therefore, the earlier discussed system values are necessary because they help the organisation to capture and organise this knowledge.

"They are afraid of new tools. Maybe by giving information, he cut his own job or becomes less special as he is right now." (E5)

"They all have different targets, the managers want to improve the availability with the lowest level of costs, the target for technician is to be a hero to be that guy who can fix the problem and being the only one, but what if this guy will retire or leaves the company." (E2)

4.5 Redefined conceptual framework

The conducted interviews provide a clearer understanding of the concepts and therefore, a revised conceptual framework can be proposed. The results of the experts' interview do not influence the concept of the original conceptual framework to a high extent. However, some adjustments have to be made. The concept 'services value' showed some overlap with the 'customer solution identification' process, since it effects both system based services and services wherein the solution has a central position e.g. developing a roadmap and the training of employees. Therefore, 'services value' is changed to 'system services value' and the other services melt into 'customer solution identification', and are therefore not visibly shown in the model. The customer has a different role in the 'solution requirement identification' process than the supplier. An understanding was developed that the supplier is the facilitator and mostly the creator of value. The customer is co-creator as well, but often does not have a clear understanding of own business needs to increase the efficiency of maintenance. Furthermore, new concepts regarding challenges were introduced. These concepts have an impact on the 'customer solution identification', because it influences the way an optimal solution can be proposed. The concept 'value-in-use' remained unchanged, which counts for the customised value proposition as well.

The interviews with customers resulted in two maintenance performance related KPI's, increasing availability and reducing maintenance related costs. Since all customers agreed on these main values, the concept has been changed to 'target-based KPI's'. During the customer interviews, more weight was emphasised on what the customers value about maintenance systems and less on the currently faced problems. This can be a reason of a lack of knowledge, insufficient transparency or that the customer prefers to state what goes well instead of focusing on problems. Therefore, the concept 'problems that influence KPI's' is changed to 'potential efficiency enhancement factors'. The concept of, 'value-in-use' remains unchanged, however, an arrow has been placed directed to the 'target-based KPI's' since customer value-in-use has the aim to improve the target-based KPI's, which is a continuous process. Furthermore, the arrow between 'customer solution identification' and 'value-in-use' points now in two directions (was 'customer solution identification' towards 'value-in-use'). Initially, the identified customer solution leads to value-in-use for the customer. However, this can be perceived differently by the customer during the usage or experiences at any point in the customer journey. The implementation of feedback loops between the two concepts allows both, the supplier and customer, to reshape and improve the customer solution so that it actually leads to value-in-use.

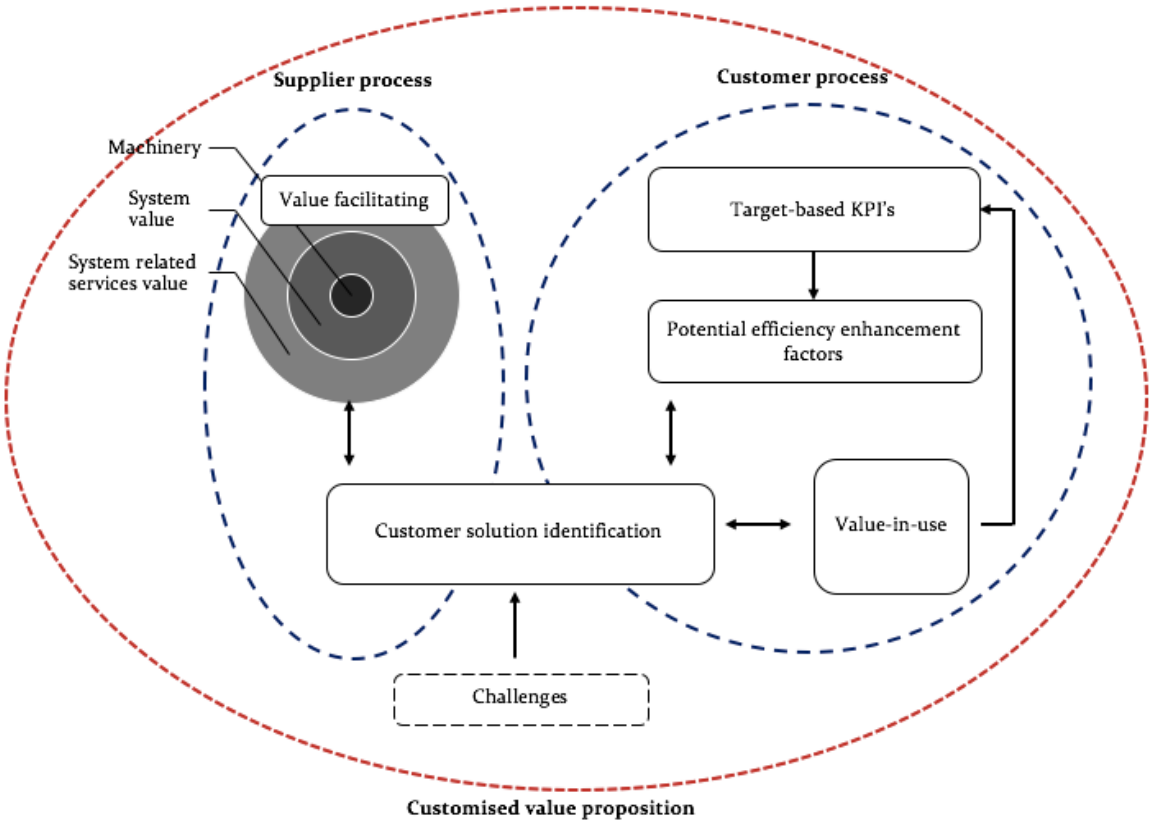

Figure 6, Redefined customised value proposition framework

5 Conclusion

The aim of the research was to design a generalizable framework that simplifies the creation of a customised value propositions. Hereby, the following research question was formulated: "*How can the supplier define customer solutions based on a customer value-in-use perspective and what are the consequences for value propositions?"* The worthiness of a customised value proposition depends on the effect of three influencers: firstly, the value facilitation of the supplier; secondly, the value-in-use of the customer and; thirdly, the clear understanding of the business case and the identification of current and future needs, translated to a customer solution. These influencers will be elaborated in the following sections.

Value facilitation of the supplier

The suppliers' value facilitation addresses values that the interviewed experts of the supplier consider important to provide in maintenance offerings. Herein, a distinguish is made between the value of systems and the value of services related to maintenance. This research identified five system values according to the experts. These values are: [1] **transparency of components and machinery** - the transparency of for instance performance, costs structures and exactly knowing what and when actions to take to prevent downtime; [2] **integrated systems** - combining the output of multiple sources into one integrated platform; [3] **customisable systems** - the possibility to modify offerings to fulfil the maintenance related requirements of the customer; [4] **connected interfaces**- the availability of information on multiple devices to simplify the process and lastly; [5] **automatic driven notifications**- notifications, based on predefined standards, that are sent from the system to guide the customer to perform maintenance in a more efficient way. Regarding services that enrich the maintenance efficiency for the customer, three offerings were categorised. According to the interviewed experts, these services are considered as necessary since all customers rely on external organisations to some extent, because of a lack of knowledge and capabilities. The service offerings are: [1] **inspection, maintenance & repair** - the case organisation needs to be able to provide on-site operational services and to develop maintenance programmes for the entire life-cycle of machinery and [2] **spare parts provision**. These two services are more focused on the operationally of the machinery and the short term, whereas the service of [3] **system optimisation** concentrates on the improvement of current maintenance processes on a strategic and long term level. Here, the in house capabilities, knowledge and quality in offerings of the supplier have a major role.

Value-in-use customer

Customer value-in-use will be perceived, if an offering improves the performance of target-based KPI's in the customer specific situation. According to the interviewed customers, the availability of machinery and the reduction of maintenance related costs are considered as most important. Therefore, target-based KPI's for the customer are extracted. This research identifies five maintenance related problems that currently have an undesirable effect on the target-based KPI's of the interviewed customers. The problems involve: [1] **a lack of transparency** - having no clear insights in own performance, processes and assets; [2] **no overview by multiple systems** - maintenance related systems are not integrated and therefore, it takes more time to find the right information. This is in line with the asset management effectiveness construct of Macdonald et al. (2016); [3] **the digitalising & organising of data** - the retrieved data from systems, like temperature, pressure, speed, vibration, life cycle, and maintenance documentation is poorly organised and not digitally available; [4] **inefficient scheduling & planning** of maintenance, and a [5] **lack of connected interfaces** that simplify maintenance activities. This value is confirm with the coordination effectiveness construct in the research integration process of the research of Macdonald et al. (2016). Value-in-use will arise when a solution is developed that solves the identified problems and that has a progressive effect on the target-based KPI's of the customer. However, the real value-in-use can only be determined during the actual usage and by the way how customers experience the entire customer journey. Therefore, it is important to stay involved and to keep track of the results derived from the customised solution. The implementation of, for instance, feedback-loops enables both parties to stay involved in the process and to monitor and to make adjustments to coordinate the effectiveness of predefined solutions (Macdonald et al., 2016).

Customer solution identification

It can be stated that the case organisation as a supplier is aware of the importance to move downstream. The capabilities and knowledge of the supplier are translated into downstream systems and services that enhance maintenance value for the customer. Through this vision, the supplier is more involved in the customers' organisation, able to lock the customer in and to increase the level of differentiation, as proposed by Vandermerwe and Rada (1988). Due to the lock-in effect, the supplier is capable to extend the revenue stream of the customer and to collect maintenance data for benchmarks. Here, the customer is not a 'target' anymore, but a partner in the co-creation of value wherein knowledge and relationships receive a central position. This vision has initiated the way customer solutions are developed by the supplier, as an ongoing process and with intensive cooperation with the customer. The method of how the case

organisation creates customer solutions in practice agrees with how it is defined in the literature by Tuli et al. (2007). Herein, a customer solution is more than **customising and integrating a system**, it includes as well the stages of: **requirements identification**, where the supplier executes on-site audits and interviews employees to identify business needs. The coordination effectiveness is herein a driver for customer value-in-use (Macdonald et al., 2016); **deployment,** the development of a roadmap to improve maintenance on the longer term and **post deployment support,** the control of the process and the offering of trainings to increase the capabilities of workers of the customer. In addition to the values derived from literature, the supplier positioned himself as a **consultant** and states that the solution identification process is a continuous process. Since customer's business needs and the value facilitation of the supplier is changing over time, so does the customer value-in-use. Moreover, the case organisation emphasised the importance to **involve all levels** for a better understanding of key-processes, identification of requirements and the ability to facilitate value. This vision is in line with the paper of Vargo and Lusch (2015).

In contrast to the perspective of the supplier, the customer sees the supplier more in the role of a seller instead of a cooperative partner wherein improving processes and a good inter-firm relation is central. Therefore, the interviewed customers highlighted the value of operational services like inspection, maintenance & repair and spare part provision to a larger extent than the fostered value of services with a long-term strategic level. Nevertheless, some of the customers pointed out that the relation with the supplier became more cooperative in recent years. Besides the more traditional service offerings like maintenance and spare part provision, the supplier offers more strategic services like consultancy and making analyses to optimise maintenance processes. Hereby, the effective coordination of assets and processes during the cooperation is important and is reached by involvement of the supplier by e.g. audits (Macdonald et al., 2016). Moreover, the involvement of external organisations is required, since the customer is not able to perform all the maintenance activities independently. Reason for this involves the lack of knowledge, capabilities, time or financial resources. Moreover, customers emphasised the challenge of finding the right balance between investments, savings and costs. Therefore, the offering of downstream services provides value for the case organisation. However, both sample groups stated the conservative industry they operate in. Therefore, it remains a challenge to cooperate with a traditionally oriented customer.

This research goes in line with the understanding of scholars like Vargo and Lusch (2004) and Grönroos (2006), wherein the role of the supplier and the customer in the creation of value is

described. The supplier is the facilitator of value, because he has the knowledge and expertise to craft downstream maintenance systems and services. In this process, the customer is a co-creator but was, according to the supplier, often not familiar with his own business needs. Therefore, the supplier receives a double role. Besides the facilitator of value, the case organisation enables itself as a consultant for the customer. In the creation of customer solutions, the supplier needs to be aware of the potential value-in-use of the customer. The way how experts perceive maintenance value is comparable to the maintenance problems of customers. Therefore, it can be stated that the experts have an accurate understanding of relevant value for customers in the market.

Challenges

Furthermore, the research identified the concept of challenges that influence the effectiveness of the customer solution. The challenges have organisational and individual backgrounds and were derived from expert and customer interviews. However, most of them can be directly linked to the customer and present the lack of knowledge and capabilities of the customer to achieve effective and efficient maintenance. These organisational challenges involve: **digitalise & organise data**, whereas the retrieved data from systems and maintenance documentation is poorly organised, not digitalised or even not available. This means that it increases the difficulty to improve processes and discover business needs. Next, the **strict data sharing policy** - external organisations do not have access to the data, cannot make analysis. Therefore, they are not able to improve predefined standards and maintenance processes and lastly; **restricted view** - this challenge involves the vision of the customers' strategy and the lack of overview of own maintenance performance. Moreover, two individual challenges were identified. The **uncertainty of change** - employees of the customer have fear to become unnecessary by the reduction of workforce and **age, knowledge & experience** - that involves the challenge to keep knowledge and expertise of employees that retire or change their workplace. The derived challenges have an undesirable influence on the effectiveness of a solution. However, these organisational and individual challenges open the possibility to a broader range of services (Macdonald et al., 2016).

The conceptual framework

The above mentioned concepts of: value facilitation, customer solution identification and customer value-in-use are the base for the redefined conceptual framework to conduct customised value propositions. The concepts are developed on a theoretical foundation and the empirical data derived from the case study. During the process of the case study, an additional

influencer emerged, namely: challenges. Anderson et al. (2006) emphasise the importance of value propositions that aim to address the value-in-use of the customers. Here, the cooperative relation between supplier and customer is required to identify business requirements and potential value-in-use. This study aims to address these relevant concepts and proposes a framework that operates as a guide and as a supportive tool to create customised value propositions. The framework involves the process of the supplier, the customer and the relation between them. Even though this framework was developed in the field of maintenance, the concepts are generally formulated and therefore should be applicable to various fields.

5.1 Theoretical implementations & future research

This research was executed in the field of maintenance and therefore limited to one specific case. It would be interesting to conduct similar research in fields outside the boundaries of the case organisation to estimate the usefulness and applicability of the concepts and the framework. Moreover, the literature and case organisation emphasise the importance of involving multiple levels to increase the value. For this research, only one participant per organisation was interviewed. All of the participants had a role in the maintenance decision making unit of the organisation. Problems and values were derived from this members' perspective. However, including employees that actually perform maintenance on the factory floor might provide further insights on problems. The same can be said about the interviewed experts.

Furthermore, this research was conducted in only one particular time period. Future research can include how business needs and the way value-in-use is perceived develops over time. In addition, further research could examine the effect of intensive cooperation in the solution identification process and how it influences maintenance key performance indicators of the customer in comparison to cases where this understanding is less developed. Moreover, challenges that influence the customer solution process were additionally derived during the interviews. These challenges contributed to an extra dimension in this study. However, further research that has a main-focus on potential challenges needs to provide a broader understanding of this field. Lastly, the customer solution identification is well defined in literature for the supplier perspective. However, this study shows that the customer faces difficulties to have an active role in the creation of his own solution. Therefore, it is interesting to conduct further research on the solution identification process in the perspective of the customer.

5.2 Practical implementations

The shift in marketing from a goods-dominant logic towards a service-dominant logic, the change of business models to create downstream value and the creation of solutions that are based on value-in-use are popular fields in literature. This research contributes by translating the theory into practice, which still remains a challenge in corporate life. This study aimed to provide a framework that convert the theory in practical concepts that are applicable for organisation that servitize. The concepts of the framework are defined based on literature and a conducted case study in the field of maintenance. The proposed framework is a guide and a supportive tool for managers to create customised value propositions. Especially relevant is that it includes concepts of the value facilitation of the supplier, the customer business needs to create value-in-use and the cooperation between both to create a solution with a beneficial point of view. The concepts within the framework are not meant to be static, but dynamic and interconnected since the customer value-in-use, business needs and the value facilitation of suppliers are changing over time. Therefore, it is important that the cooperative relation between the supplier and customer stays intact. Furthermore, this study elaborates maintenance related problems of customers and deepens the understanding of how experts experience value in future offerings. In addition, this study provides insights in processes and challenges of the customers that are related to maintenance.

5.3 Limitations

Besides theoretical and managerial contributions, this study has some limitations. The research is performed by the support of a case study. The case study provided an in-depth understanding of a specific setting. Therefore, a limitation of this research is that the results cannot directly be applied to different settings and results are not generalizable. The next limitation includes the potential indicators from table 3. The potential indicators are not derived from literature but based on an understanding the researcher had prior to the actual case study. Therefore, the indicators are not reasoned and a comparison between literature and the case study results is not applicable. Further limitations are derived from the diversity in the sample groups. All the participants of the customer sample are involved in the maintenance of the organisation they are employed in. However; they all operate in a different industry. It is possible that business needs and problems differ per industry. In addition, the customer sample group included more than only customers but was a mixture of customers, potential customers and servitized OEM's and maintenance service providers.

The outcomes give a clear overview but could have been more specific if the customers were comparable. In addition, no distinguish was made in the size of the organisations and the size of the maintenance team, while this can have influence on the maintenance strategy and the vision of the organisation. The experts are all working for the Digital Solutions department. This department is established in 2015, but most of these employees have already been employed by the case organisation before this department was founded. Therefore, the experts have a different vision and knowledge and experience is based on different industries. The same counts for here: the outcomes provide a clear overview, but could have been more specific if the experts were comparable. Furthermore, the average duration of interviews with experts and customers was between 45 and 60 minutes. Within this time, several concepts, e.g. maintenance problems, were to be identified. However, the case organisation takes about a week to discover the customers' requirements. Therefore, the duration of the executed interviews may not be long enough to get an in-depth understanding of the real problems of important value according to the supplier. However, it was enough to get a general overview of value and problems.

6 References

Anderson, J. C., Narus, J. A., & Rossum, W. V. (2006). Customer value propositions in business markets. *Harvard Business Review, 84*, 1-4.

Baines, T., Lightfoot, H., & Benedettini, O. (2009). Servitization of manufacturing a systematic literature review of interdependent trends. *Journal of Manufacturing Technology Management, 20*(5), 547-567.

Baines, T. S., Lightfoot, H. W., Evans, S., Neely, A., Greenough, R., Peppard, J., . . . Wilson, H. (2007). State-of-the-art in product-service systems. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 221*(10), 1543-1552. doi:10.1243/09544054jem858

Baines., T., Lightfoot., H., Peppard., J., Johnson., M., Tiwari., A., Shehab., E., & Swink., M. (2009). Towards an operations strategy for product-centric servitization. *International Journal of Operations & Production Management, 29*(5), 494-519.

Ballantyne, D., & Varey, R. J. (2006). Creating value-in-use through marketing interaction: the exchange logic of relating, communicating and knowing. *Marketing Theory, 6*(3), 335-348. doi:10.1177/1470593106066795

Bendapudi, N., & Leone, R. P. (2002). Managing business-to-business customer relationships following key contact employee turnover in a vendor firm. *Journal of Marketing, 66*(2), 83-101.

Bryman, A., & Bell, E. (2015). *Business research methods* (4th ed.). USA: Oxford University Press.

Butz, H. E., & Goodstein, L. D. (1996). Measuring customer value: gaining the strategic advantage. *Organizational dynamics, 24*(3), 63-77.

Cohen, M., Agruwal, N., & Agruwal, V. (2006). Winning in the Aftermarket. *Harvard Business Review*, 131-138.

Davies, A. (2004). Moving base into high-value integrated solutions: a value stream approach. *Industrial and Corporate Change, 13*(5), 727-756. doi:10.1093/icc/dth029

Davies, A., Brady, T., & Hobday, M. (2006). Charting a path toward integrated solutions. *MIT Sloan Management Review, 47*(3), 39.

Festge, R., & Sintern, W. v. (2016). *How to succeed: Strategic options for European machinery* Retrieved from https://www.mckinsey.de/files/vdma_european_machinery_2016.pdf

Fisher, C. (2010). *Researching and writing a dissertation: an essential guide for business students* (3rd ed.): Pearson Education.

Fisk, R., Brown, S., & Bitner, M. (1993). Tracking the Evolution of the Services Marketing Literature. *Journal of Retailing, 69*(1), 61-103.

Flint, D. J., & Woodruff, R. B. (2014). Marketing's service-dominant logic and customer value. (pp. 201-213): Routledge.

Freedman, D., Pisani, R., & Purves, R. (2007). *Statistics* (4th ed.): Norton & Company Ltd.

Gebauer, H. (2008). Identifying service strategies in product manufacturing companies by exploring environment–strategy configurations. *Industrial Marketing Management, 37*(3), 278-291. doi:10.1016/j.indmarman.2007.05.018

Gebauer, H., Fleisch, E., & Friedli, T. (2005). Overcoming the service paradox in manufacturing companies. *European management journal, 23*(1), 14-26.

Gebauer, H., Krempl, R., Fleisch, E., & Friedli, T. (2008). Innovation of product-related services. *Managing Service Quality: An International Journal, 18*(4), 387-404. doi:10.1108/09604520810885626

Geyer, A., & Davies, A. (2000). Managing project–system interfaces: case studies of railway projects in restructured UK and German markets. *Research Policy, 29*(7), 991-1013.

Gill, J., & Johnson, P. (2010). *Research methods for managers.* (4th ed.): SAGE Publications Ltd.

Goedkoop, M. J., Van Halen, C. J., Te Riele, H. R., & Rommens, P. J. (1999). *Product service systems, ecological and economic basics*. Retrieved from

Grönroos, C. (2006). Adopting a service logic for marketing. *Marketing Theory, 6*(3), 317-333. doi:10.1177/1470593106066794

Grönroos, C. (2011). Value co-creation in service logic: A critical analysis. *Marketing Theory, 11*(3), 279-301. doi:10.1177/1470593111408177

Howells, J. (2000). *Innovation & Services: new conceptual frameworks* (Centre for Research on Innovation and Competition, Trans.): Centre for Research on Innovation and Competition, The University of Manchester.

Jacob, F., & Ulaga, W. (2008). The transition from product to service in business markets: An agenda for academic inquiry. *Industrial Marketing Management, 37*(3), 247-253.

Johnson, M. W., Christensen, C. M., & Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review, 86*(12), 57-68.

Kobler, F., Fahling, J., Vattai, A., Leimeister, J., & Krcmar, H. (2009). *Analysis of Value Co-creation through Product-Service Systems in the German Medical Industry*. Paper presented at the Proceedings of the 1st International Symposium on Services Science, Leipzig.

Lemke, F., Clark, M., & Wilson, H. (2011). Customer Experience Quality: an exploration in business and consumer contexts using repertory grid technique. *Journal of the Academy of Marketing Science, 39*(6), 846-869. doi:doi.org/10.1007/s11747-010-0219-0

Macdonald, E. K., Kleinaltenkamp, M., & Wilson, H. N. (2016). How Business Customers Judge Solutions: Solution Quality and Value in Use. *Journal of Marketing, 80*(3), 96-120. doi:10.1509/jm.15.0109

Macdonald, E. K., Wilson, H., Martinez, V., & Toossi, A. (2011). Assessing value-in-use: A conceptual framework and exploratory study. *Industrial Marketing Management, 40*(5), 671-682. doi:10.1016/j.indmarman.2011.05.006

Maxwell, D., & Vorst, R. v. d. (2003). Developing sustainable products and services. *Journal of Cleaner Production, 11*(8), 884-895.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook.* (R. Holland Ed. 2nd ed.): SAGE Publications

Neely, A. (2008). Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research, 1*(2), 103-118.

Nordin, F., & Kowalkowski, C. (2010). Solutions Offerings: A Critical Review and Reconceptualization. *21, 4*(441-459). doi:10.1108/09564231011066105

Normann, R., & Ramirez, R. (1993). From value chain to value constellation: Designing interactive strategy. *Harvard Business Review, 71*(4), 65-77.

Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review, 92*(11), 14.

Porter, M. E., & Heppelmann, J. E. (2015). How smart, connected products are transforming companies. *Harvard Business Review, 93*(10), 96-114.

Raja, J. Z., Bourne, D., Goffin, K., Çakkol, M., & Martinez, V. (2013). Achieving Customer Satisfaction through Integrated Products and Services: An Exploratory Study. *Journal of Product Innovation Management, 30*(6), 1128-1144.

Ramirez, R. (1999). Value Co-Production: intellectual origins and implications for practice and research. *Strategic Management Journal, 20*, 49-65.

Reinartz, W., & Ulaga, W. (2008). How to sell services more profitably. *Harvard Business Review, 86*(5), 90.

Saldaña, J. (2015). *The coding manual for qualitative researchers.* (J. Seaman Ed. 3rd ed.): Sage

Sawhney, M., Balasubramanian, S., & Krishnan, V. (2004). Creating growth with services. *MIT Sloan Management Review, 34*(4), 34-43.

Sharma, A., & Lambert, D. M. (1994). How accurate are salespersons' perceptions of their customers? *Industrial Marketing Management, 23*(4), 357-365.

Shostack, G. (1977). Breaking Free from Product Marketing. *Journal of Marketing, 41*(2), 73-80.

Slack, N. (2005). Patterns of Servitization: Beyond Products and Service. *Institute for Manufacturing: Cambridge University*.

Spring, M., & Araujo, L. (2009). Service and products: rethinking operations strategy. *Journal of Operations and Production Management, 29*(5), 444-467.

Storbacka, K. (2011). A solution business model: Capabilities and management practices for integrated solutions. *Industrial Marketing Management, 40*(5), 699-711. doi:10.1016/j.indmarman.2011.05.003

Strauss, A., & Corbin, J. M. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*: Sage Publications Ltd.

Terho, H., Haas, A., Eggert, A., & Ulaga, W. (2012). 'It's almost like taking the sales out of selling'—Towards a conceptualization of value-based selling in business markets. *Industrial Marketing Management, 41*(1), 174-185. doi:10.1016/j.indmarman.2011.11.011

Tuli, A., Kohli, A. K., & Bharadwaj, S. G. (2007). Rethinking customer solutions- From product bundles to relational. *Journal of Marketing, 71*(3), 1-17.

Vandermerwe, S., & Rada, J. (1988). Servitization of Business: Adding Value by Adding Services. *European Management Journal,, 6*(4), 314-324.

Vargo, S. L., & Lusch, R. F. (2004). Evolving to a New Dominant Logic of Marketing. *Journal of Marketing, 68*(1), 1-17. doi:10.1509/jmkg.68.1.1.24036

Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: continuing the evolution. *Journal of the Academy of Marketing Science, 36*(1), 1-10. doi:10.1007/s11747-007-0069-6

Vargo, S. L., & Lusch, R. F. (2015). Institutions and axioms: an extension and update of service-dominant logic. *Journal of the Academy of Marketing Science, 44*(1), 5-23. doi:10.1007/s11747-015-0456-3

Wise, R., & Baumgartner, P. (1999). Go downstream: The New Profit Imperative in Manufacturing. *Harvard Business Review*, 133-141.

Woodruff, R. B. (1997). Customer value: the next source for competitive advantage. *Journal of the Academy of Marketing Science, 25*(2), 139-153.

Appendix I

Experts - interview questions

1. Imagine an ideal maintenance solution? What would it be?
2. To what extent and how is this solution implemented in your offerings?
3. By considering your offerings, what value can these maintenance systems deliver customers?
4. What is for customers' important value concerning maintenance systems?
5. How do you identify recognised and unrecognised specific customer needs?
6. How do you know what customers think about your maintenance systems?
7. To what extent can you customise your integrated systems to address customer requirements?
8. Can you rely on the customers' knowledge and insights to use your integrated systems efficiently?
9. How can you support customers in the process to work efficiently with the integrated systems and to take action if needed?

Customer - interview questions

1. Imagine an ideal maintenance solution? What would it be?
2. To what extent is this solution implemented in your maintenance strategy?
3. How would you describe the maintenance strategy of your organisation?
4. Why is this the maintenance strategy of your organisation?
5. How would you describe maintenance usage routines to prevent downtime?
6. What are the Key Performance Indicators of your machinery?
7. What influence has the maintenance strategy on the Key Performance Indicators of your machinery?
8. What are repeatedly occurred problems that caused downtime?

(please take in mind an efficient and inefficient way how you solved the downtime situation)

   a. What was the problem?
   b. How long was the machinery out of use?
   c. What actions did you take to solve the problem?
   d. What were the results?
   e. What influence did this have on the Key Performance Indicators of your machinery?
   f. How is the situation now?

9. Do you consider it as beneficial for your organisation to invest in more efficient maintenance systems?
10. What are important problem solving indicators for you to evaluate the maintenance system?
11. What are your expectations of future maintenance solutions?
12. Are you familiar with suppliers of maintenance systems and do you consider these suppliers capable of delivering you problem solving offerings?
13. Would it be helpful if a supplier consulted you on your maintenance strategy, i.e. to analyse data, conduct maintenance reports etc. Can you elaborate your answer?
14. Would you leave the control of the integrated system to the supplier? Can you elaborate your answer?
15. What kind of interaction/interfaces with the supplier is preferable in order to operate the integrated system as meant?
16. Would you subscribe to a maintenance service contract, i.e. for consulting or control, in return for a monthly payment

Appendix II

Table III-a: Supplier process

Concept	Interviewee(s)	Illustrative quotation(s)
System value		
Integrated system	E2	"Most of them they have different systems. They have a system which records the actual plant values, a system for the spare parts, a system only for maintenance orders, and they are not combined. Then we got the feedback; if they only could have one tool […] this would be such a helping hand." (E2)
Connected interfaces	E2, E6	"Everybody should have access to either a desktop version or to a mobile version to create notifications to receive work orders and so on. they should not do it on the paper and give it to the planner or supervisor so therefore it must be user friendly" (E2) "Send a mail, call, or tell it to us when we are on the plant. we need to support our organisation with hotlines, different levels, service levels, we will start now to implement that within Digital Solutions." (E2) "Create notifications, with all the information you need, add this information in the system. Scan things with a QR code and the system will recognise it and will select the correct location and equipment. You can also select the machine structure, add photos, notes and a simple augmented reality part." (E6)
Transparency	E1, E2,	"An ideal maintenance situation is full transparency on the processes, own efficiency and effectiveness" (E1) "The maintenance manager must know about the performance of the maintenance, maintenance organisations and the performance of the assets. what are the weak points and where do we have to improve?" (E2)

Customisable	E4	"We have some processes inside, we can customise our system in a way, with user interfaces and integrated in such a way to customer requirements. We can offer a customised solution at the end. For maintenance, we could always deliver a system that fulfils the customer's needs" (E4)
Automatic driven notifications	E3	"You have the systems and mobile applications […], so a maintenance guy receives five a clock in the evening a message "there is something going wrong and it needs to be checked" so it is automatically driven by the system to work with the system" (E3)
Services value		
System optimisation services	E2, E6	"Another value is that we now offer our solution in the cloud which makes it easier to connect with the real time information. It makes it easier for organisations that have different plants on several locations to have the transparency about all the plants to get an overview about the performance to make benchmarks" (E2) "…Then we have a lot of data, we can start to compare models and signals from 20 different mills the same time, we can see the patterns, learn from it and improve systems" (E6)
Inspection, maintenance & repair	E1	"The customer knows something about its maintenance, but definitely not everything, we have often a deeper understanding of what pain points and critical components are" (E1)
Spare part provision	E1	"Regarding the machinery […] we deliver systems, inspect our own systems and perform maintenance with own spare parts" [E1]
Customer solution identification		
Consultant	E2, E6	"… We are not a real software company, there are other companies that are better in software but our Unique Selling Proposition is that we have the information about the maintenance and about the process in that industry, not only from a software perspective." (E2) "You can eliminate this worker, you lose a lot of information and knowledge or you make it clever and to give him other tasks, higher educated tasks, and use this workload reduction… then you get higher feedback for repaying instead of eliminating a worker." (E6)

Requirements identification	E6, E2, E1	"Normally the customer cannot express to you what they need to have." (E6) "We typically make an audit, 3-5 days and after that we have a good picture about what needs they have where they have to improve what is good what is not good and what is the potential. We have maintenance experts that do that audit." (E2) "You should have an understanding how the plant is working, what are leads and what are the processes and responsibilities. then you have a better understanding… We start with an audit to see find out where they are. After the audit, we define the measures, how can we improve the organisation, the systems, organise, reorganise the manpower" (E1)
Customisation and integration	E1, E5,	"First to customise the system, the next one is to implement the existing data in the system, just to prepare it, to make it convenient to be automatically transferred to the system this is the way it usually works, plus you also have to train the people" (E1) "We have the maintenance knowhow we have the knowhow about how good maintenance software should be look like with the data with the customer, this one value" (E5)
Deployment	E4, E2	"You can never relay that the customer has the knowledge to use it immediately, so you always have to provide service, to keep the system running" (E4) "… We decide with the customer what are they specific goals, targets where do they want to go and then we start working a program for them." (E2) "Once you sell software, you have updates, you have a lifecycle of the software and this is one of the reason why you should be involved you can offer a contract besides the system to stay involved" (E4)
Post deployment support	E1, E2, E6	"We come once every 4 till 6 weeks, make a workshop and go through everything, we review what happened the last for weeks and what were the difficulties. We make a homework program for the next four weeks and that is why we are training them, to think in a new way and how to work with the systems." (E1)

		"We have the maintenance excellence program where we go to the customer we have a contract to the customer and go there every 4-6-8 weeks and then we define what is the current situation and what are the next steps." (E2) "It is a subscription, typically we build up the platform and for both sides it is the most beneficial to have a contract for 2-3 years and then to continue with another 2-3 years or per year. it does not make sense to do this in a short period then…" (E6)
Involvement of multiple users	E6, E2	"That is one of the benefit of doing such a job, you need to collaborate with all of the levels. you need to maintenance management how they typically spend the money for processes. you need to collaborate with management and you have to understand what a shift leader or worker leader." (E6) "The whole team needs to involved in the audit, we make individual interviews with different guys over all levels" (E2)

Table III-b: Customer process

Concept	Interviewee(s)	Illustrative quotation(s)
Key performance indicators		
Availability improvement	C4, C2	"KPI's are availability and costs" (C4) "We put the info in the SAP system and we have a time line we must do this weekly/monthly [...] we can reduce the machine downtime to only 30%" (C2)
Reduce maintenance related costs	C4, C2	"At some machine we implemented Condition Monitoring, so it is really the business case what counted here." (C4) "The young management was more open for preventive systems, after making the calculations. If we clean the machines, if we change the bearings, hydraulic pipes, we can reduce costs and they accepted" (C2)
Problems that influence KPI's		
Lack of Transparency	C2, C4	"...We want to see the problem before the downtime" (C2) "We want to have more information...you need to have specialist for every machine because you don't know all the machine functions. [...] within this maintenance system we can get notifications, pay extra effort on this and that. We cannot educate all our personal to do everything on the machine, it is impossible." (C4)
Scheduling & planning	C3, C4	"If today a machine has a breakdown. you call a service team, and are all the service technicians waiting until the customer calls, no. sometimes we don't have them available because all the projects are planned and if an unplanned service is coming, we do not have the capacity, we do not have the parts. Then, we have a critical situation. In my opinion, we cannot help the customer with the same quality, if we plan it in advance." (C3) "Time efficiency is really important since every fourth week we have planned downtime." (C4)

Digitalise & organise data	C2	"We digitalise our documentation for two years now, we have currently about 60% digital. We can things faster and it is better organised" (C2)
No overview by multiple systems	C2	"It should be one system, which can be monitor on one screen." (C2) "The most problems are involved with not cleaning the machines, in our case, and also one if this problems, the information from the operator does not come to the maintenance department" (C2) "What kind of situations occur when the spare part is not available? Then we hope that the supplier has this part in stock…we took a taxi for important cases." (C2)
Lack of connected interfaces	C5, C1	"Today I can use remote applications to, virtually, set myself on the vehicle, I can call experts with a camera directly to the vehicle and they look at the problem and give suggestions to the customer what to do" (C5) "Customers have different needs of interfaces to communicate with us…In our branch it is often the case that the customer wishes that we talk to him personally, that we call him. With that he feels guided and mentored." (C5) "If you are interested I can show you data glass […] we can define exactly what skills should the technicians have, what parts do we need and now via the phone, a misunderstanding can easily arise due to a different expectation and impressions…" (C1)
Customer solution identification		
Wish for a cooperative relation	C2, C4, C5	"Some components last for 6 years…the supplier is coming every half a year to check the pipes and make notes, in case we need to change it before really brakes. Of course this costs money, but the savings are better." (C2) "We have service vans that are fully equipped and then we are driving there with a team to the customer and do the maintenance there." (C5)

			"Sometimes people from the supplier are doing an inspection on site and consult us were needed […] We can also open the VPN gate in case when we need the suppliers' expertise. This saves us costs and time." (C4)
Wish for optimisation	*System*	C1, C3, C5	"This is also an internal learning process because you know you get data from the machine and perhaps the machine takes more power, so it means that something is not right … and then you need to analyse where does the difference comes from. This is also a learning process for every supplier to have a data stock with settings to get to know the critical parts." (C1) "The condition monitoring system checks itself every 20 days. We gave already some limit parameters, when the conditions exceed these parameters then the customer get a message on the display" (C3) "With many customers we have full service contracts. With full service contracts it is necessary that we are allowed to use the data to give optimal solutions to the customer." (C5)

Table III-c: Challenges, derived from customer and supplier interviews

Concept	Interviewee(s)	Illustrative quotation(s)
Organisational		
Digitalisation & organising data	E3, E5	"I think to introduce all the documentation in the system, this is a general challenge for us [...] you need the documentation of the components, as you maybe are used to this documentation it is not uniform. you get it in different formats, language, set-ups from different suppliers." (E3) "I saw so many power plants where the documentation is not stored in a proper way, where the knowledge about spare part handling was just poor, a breakdown occurs and they need documentation, they do not know where to find it. All of these bad situations happens on the plant." (E5)
Data sharing policy	C4, C3, C5	"Data will not be given to external organisations" (C4) "But the customer needs to open the gate for us. We are not allowed to look on the machine what the data is or the condition, we only send a request/call them and they confirm the access and then we have an VPN" (C3) "That is something which is missing today, where I think we still need that. To classify documents, like internal reports, and to adjust permission rights." (C5)
Restricted view	C1, E6, E1, C2	"We have about 80 customers with a service contract but actually, I have no data where I can see that the machines run better without maintenance contracts or with a contract. but my feeling, the machine runs better. but it is interesting to investigate this." (C1) "Normally the customers say to us what they want to have, but often it is not what they really need. they don't understand it." (E6) "Yes, and sometimes they do not see the benefit, they do not know what is the benefit and what are the losses they have without doing such proactive and preventive maintenance." (E1) "Do you know the availability percentage of your site? No, I don't know, I think 90%." (C2)

		"They don't recognise that the dirt of the machine could cause most of the downtimes" (C2)
Continuously process optimisation	C5, E2	"Today I have the impression that we are really stiffly oriented. I cannot react on new requirements and cannot include new parameters. I would include that because it is a value that I want and that the customer wants. Also to include developments and expertise that I gather on the market." (C5) "The feedback about ourselves, we currently work on that to give the customer the opportunity to give feedback to our software where we have problems where do we need to improve." (E2) "We are in the starting point of the integration of the different systems … so we have to improve that" (E2)
Individual		
Change uncertainty	E5, E3,	"Some employees are afraid for a good maintenance system, it will structure more the way they have to do the maintenance. It means: it is more structured for which working order they need how many hours and how many human resources. This could lead, depends on how the management sees it, that they are able to reduce the workforce. So, some of these are afraid if you say that you want to optimise the operation or maintenance of the plant." (E5) "They are afraid of new tools, maybe by giving information, he cut his own job or becomes less special as he is right now." (E5) "If they did something for a long time in a certain way then they know how it works, and they are safe about the result what they do, and they do not think much about it. any change increases uncertainty, and this is something we all don't like. Our stress level goes up." (E3)
Age, knowledge & experience	E2, E4, E1	"They all have different targets, the managers want to improve the availability with the lowest level of costs, the target for technician is to be a hero to be that guy who can fix the problem and being the only one, but what if this guy will retire or leaves the company." (E2)

	"Many customers today loose knowledge due to retirement or fluctuation. they want of course to keep the knowledge but how to transfer individual knowledge from these people…" (E4) "A big problem in maintenance today is the age" (E1)