



**ENABLING COMPETITIVENESS AND IMPROVING VALUE CREATION
THROUGH MODULARITY OF SERVICE OFFERING**

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ABSTRACT

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Enabling competitiveness and improving value creation through modularity of service offering

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The profitability of manufacturing companies in high-cost industrialised countries has declined year on year in recent decades. Due to this, more and more manufacturing industry companies have started to pay more attention to service business and have started transitioning from goods-dominant to more service-dominant business models.

This study aims to examine how a manufacturing company with a high product mix can, by implementing service-dominant logic and modularising its existing service offering, increase its competitive performance and value creation for customers while at the same time meeting the diverse and changing needs of different customer groups.

This study is a qualitative research conducted by using design sciences methods. At first, a comprehensive literature review was conducted, and after that, data was collected through 16 semi-structured interviews in two iteration rounds.

The study's findings illustrate that by using service modularity and service-dominant logic, a manufacturing company can better manage its complex service offering and gain competitiveness, flexibility and cost-efficiency and increase value creation for customers.

The study proposes a solution for the case company on how modularity could be implemented in their existing service offering and what are the related benefits and challenges of that implementation.

TIIVISTELMÄ

Lappeenrannan–Lahden teknillinen yliopisto LUT

Teknis-luonnontieteellinen

Tuotantotalous

Eetu Hietanen

Kilpailukyvyn mahdollistaminen ja arvonluonnin parantamien palvelutarjonnan modularisoinnin avulla

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58 sivua, 13 kuvaa, 6 taulukkoa ja 1 liite

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Korkean kustannustason teollisuusmaiden valmistavien yritysten kannattavuus on viime vuosikymmeninä heikentynyt vuosi vuodelta. Tästä johtuen yhä useammat valmistavan teollisuuden alan yritykset ovat alkaneet kiinnittää enemmän huomiota palvelu liiketoimintaan ja ovat aloittaneet siirtymisen tuotelähtöisistä liiketoimintamalleista kohti enemmän palveluvaltaisia liiketoimintamalleja.

Tämän tutkimuksen tavoitteena on tutkia, kuinka laajan tuotevalikoiman omaava yritys voi, modularisoimalla olemassa olevaa palvelutarjontaansa, parantaa kilpailukykyään ja arvon luomista asiakkaille ja samalla vastata eri asiakasryhmien vaihteleviin tarpeisiin.

Tämä tutkimus on laadullinen tutkimus, joka on toteutettu käyttäen kehittämistutkimuksen menetelmiä. Alkuun työssä tehtiin kattava kirjallisuuskatsaus, jonka jälkeen suoritettiin aineiston keräys kuudentoista puolistrukturoidun haastattelun avulla kahdella erillisellä iteraatiokierroksella.

Tutkimuksen tulokset osoittavat että, käyttämällä palvelumodulaarisuutta ja palvelukeskeistä arvonluonnin logiikkaa, valmistavan teollisuuden alan yritys pystyy paremmin hallitsemaan monimutkaista palvelutarjontaansa ja saavuttamaan kilpailukykyä, joustavuutta ja kustannustehokkuutta sekä lisäämään arvonluontia asiakkaille.

Tutkimus ehdottaa lopuksi tapausyritykselle ratkaisua, miten palvelumodulaarisuus voitaisiin toteuttaa heidän olemassa olevassa palvelutarjonnassaan ja mitkä ovat siihen liittyvät edut ja haasteet.

ABBREVIATIONS

CAPEX	Capital Expenditure
COP	Customised Operating Procedure
GDL	Goods-Dominant Logic
OaaS	Operations as a Service
OPEX	Operational Expenditure
SDL	Service-Dominant Logic
SLA	Service Level Agreement
SOP	Standard Operating Procedure
VP	Value Proposition
XaaS	Anything as a Service

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1. INTRODUCTION

In the beginning, the first chapter introduces the background of the study, the growing interest of manufacturing companies towards services. Secondly, it defines the research problem and the scope of the study and sets the objectives and research questions. Thirdly, the structure of the study is outlined.

1.1 Background

The majority of manufacturing companies are still generating most of their revenue and profits through goods, and the contribution of services is relatively low (Gebauer, Fleisch and Friedli, 2005). However, it has been shown that the profitability of traditional manufacturing companies in high-cost industrialised countries has declined year on year (Martinez et al., 2010). It has also become more challenging to gain a competitive advantage with traditional goods in global markets. (Grönroos et al., 2007) In order to respond to decreasing product margins, manufacturing companies have started to show a growing interest in extending service business as a source of generating additional revenue, profits and competitive advantage. (Kohtamäki et al., 2018). At the same time, the customers of manufacturing companies have been increasingly concentrating on their core businesses and outsourcing non-core activities (Pekkarinen & Ulkuniemi, 2014). Customers no longer want to own, operate, and maintain physical products or systems but buy services and solutions that support their business processes (Baines et al., 2009). These trends support the view that manufacturing companies' future growth potential and business opportunities lie in services (Ojanen & Ojanen, 2008).

This change from goods-centricity to service-centricity is called service transformation, service transition, or servitisation (Jacob and Ulaga, 2008). Baines et al. (2007) defined the term servitisation as "*the innovation of a manufacturing organisation's capabilities and processes to shift from selling product to selling an integrated product and service offering that delivers value in use*". Servitization can be seen as both a strategy and a process that de-commoditises one's offerings and provides a new value creation model, delivery, and

appropriation (Kohtamäki et al., 2018). Servitisation has changed the way how manufacturing companies see services. Traditionally, manufacturing companies have seen services as add-ons and extensions to their physical products, such as training, installation, spare parts, and warranty period services (Oliva and Kallenberg, 2003). In later stages of servitisation, companies offer complete value-generating solutions that further enhance customer's processes (Grönroos et al., 2007). Companies also start to see their services as a key way to gain competitive advantage, create value for customers and earn profits (Kohtamäki, Einola and Rabetino, 2020).

Services could provide manufacturing companies with a more stable source of revenues with higher margins while being less asset-intensive than products (Matthyssens & Vandenbempt, 2008). Services can also provide protection from market fragmentation and can be used to balance cyclical fluctuations (Ojanen & Ojanen, 2008). By providing quality services and solutions to their customers, companies can also differentiate from competitors and thus gain a robust market defence to competition from other companies (Wise and Baumgartner, 1999). In addition, the services and the comprehensive solutions could significantly increase the competitiveness of traditional physical goods and build long-term customer relationships (Ojanen & Ojanen, 2008). The risk that manufacturing companies are taking by not paying more attention to their services is eventually becoming commoditised and unavoidably entering into a price war with their goods (Martinsuo & Kohtamäki, 2014)

Even though multiple research emphasises the benefits of servitisation, current literature also reveals that servitisation is most often a challenging and painful process where manufacturing companies encounter many significant difficulties and obstacles (Tronvoll et al., 2020). There is no certainty that when manufacturing companies switch from supplying goods to deploying comprehensive service and solutions offering, these promises mentioned above will be realised (Salonen., 2011). Several manufacturing companies are struggling with service business because the service-centric and service-dominant business logic requires different value creation models and service offering management methods than product-centric and goods-dominant ones (Grönroos et al., 2007). In order for manufacturing companies to successfully grow and develop their service business, they must pay increasing attention to how value creation for the customers takes place and how they can efficiently manage their constantly more complex service offerings (Ojanen & Ojanen, 2008).

1.2 Objectives and scope

Recent research in manufacturing companies' services has more focused on service innovation and development. The value creation of services and service modularity have received much less attention (Martinsuo & Kohtamäki, 2014).

This study examines service modularity and value creation in the context of one selected case company. The case company operates in a manufacturing industry characterised by emerging technologies, heterogeneous customer needs and accelerated competition. The case company business is in a small niche and low volume markets. The company primarily provides installation, maintenance, training, and other traditional services for its products in all of its market areas globally, but it has intentions to grow its service business in the near future.

This study examines how a goods-dominant manufacturing company could increase value creation for customers by using service-dominant logic (S-D Logic) and could the company increase its competitiveness by implementing service modularity to its existing service offering. Two research questions are set in this study. Both of these are formulated and are presented in Table 1.

Table 1. Research questions and objectives

Research question	Objective
RQ1: Would the utilisation of S-D logic increase the value creation for customers?	<ul style="list-style-type: none"> • Find out how the S-D logic should be utilised so that it would maximise the value creation for customer • Discover the disadvantages of S-D logic
RQ2: Can companies increase competitiveness by implementing modularity into their service offering?	<ul style="list-style-type: none"> • To what extent can the service modularity frameworks from the literature be applied to the case company's service offering • Discover what are the key challenges of implementing a modular service offering • Detect what will be sacrificed if moved to a modular service offering

The first research question aims to understand how the S-D logic could be utilised to maximise the value that a case company's services create for the customers. Also, the disadvantages of using S-D logic are discovered. The second research question deal with service modularity. It examines how and to what extent the reference service modularisation frameworks from the literature could be applied to the company's service offering to increase competitiveness and efficiency. The study answers the second research question by creating a draft modular service offering model for the case company. The goal of the second research question is also to discover the key challenges of implementing the draft modular service offering and detect what will be sacrificed if the case company adopts it widely.

The study focuses on goods-dominant manufacturing companies in the early phases of the servitisation process. It limits all the other business areas and industries out of the scope. The study is carried out in co-operation with a Finnish stock-listed manufacturing company. Due to time constraints, the study does not observe any actual market/customer response to the suggestion/model, but these are topics for future research.

1.3 Structure of the study

The study is divided into six chapters. The whole structure of the thesis is presented in Figure 1. In this figure, each chapter's inputs and outputs are presented. The study starts with an introductory chapter, where the background of the study is explained, and the scope of the study is presented. This chapter defines the research questions, objectives and limitations of the study. At last, the first chapter outlines the structure of the study.

The second chapter, the literature review, examines the theory of service-dominant logic and service modularity. It identifies how the services create value for customers and identifies a framework for a modular service offering. The third chapter introduces the methodology of the study. The chapter explains the used research design in detail and also discloses how the data used in this study is collected and how data is analysed.

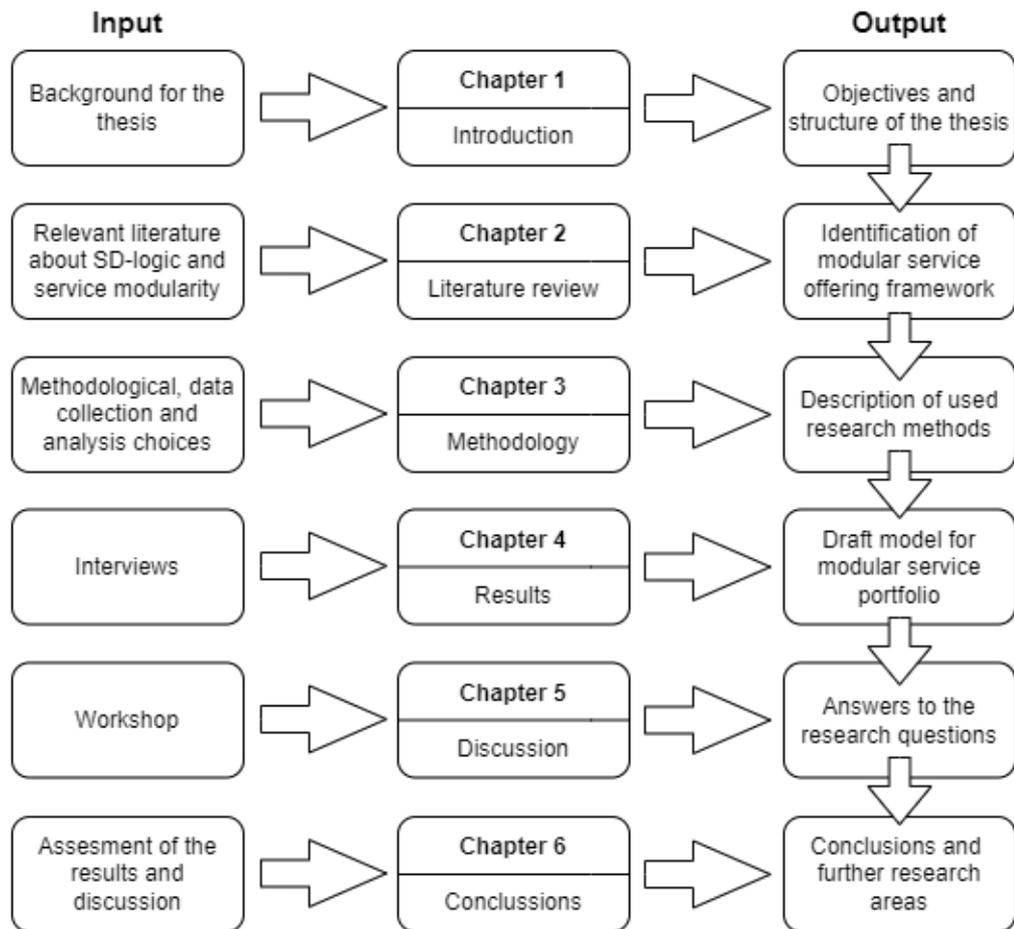


Figure 1. The structure of the thesis

The fourth chapter forms the draft model for the case company's modular service offering based on the literature review and interviews. The fifth chapter, the discussion chapter, answers the research questions and addresses the key challenges of implementing the draft modular service offering model broader inside the company.

In the sixth chapter, the results and discussion are assessed. The last chapter sums up the conclusions made in the study. The last chapter also discusses the possible future research topics and areas.

2. LITERATURE REVIEW

The literature review chapter consists of two separate sections. The first section explores the service-dominant logic literature. From the literature, the study finds answers to questions like what the service-dominant logic is all about, how it differs from goods-dominant logic, and how the value creation process is seen in this logic. Also, in this section, the term *Anything as a service* is being examined.

The second section makes a deep dive into service modularity literature. In this section, the basis of service modularity is introduced, and the different pros and cons it brings are evaluated. In this section, the theoretical framework for service modularity is also built based on the findings from the literature. This theoretical framework for service modularity is the basis for the case company-specific service modularity framework in the later stages.

2.1 Service-dominant logic

This section aims to give a basic understanding of the service-dominant logic, how it differs from the more popular and traditional goods-dominant logic, and how the new logic changes how the value creation process is seen. The section also introduces the concept of *Anything as a service*, which has been capturing much attention lately in the service literature.

Throughout the study, the following definition for the term *service* is used: "A service is a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific risk" (Office of Government Commerce, 2007). As the definition suggests, the goal of services is to take a more significant share and responsibility for the customer's operations (Grönroos et al., 2007). In contrast with goods, services are intangible, simultaneous, and heterogeneous. (Wang, et al., 2014).

2.1.1 What is service-dominant logic

Traditionally, manufacturing firms have been using goods-dominant logic (G-D Logic) as a theoretical framework for understanding the value that they are creating for their customers. G-D logic is an old neoclassical economics view, which frames the world of exchange in terms of units of output (Goods), where the company's purpose is to maximise the single profit outcome. The G-D logic sees the production of goods as the central component of the business, and companies are creating value for their customers mainly through their products. In G-D logic, the value is embedded into goods during production and distribution. G-D logic states that companies are the central actors of economic exchange because they are seen as the innovator, developers, producers, distributor, and promoters of goods. (Grönroos et.al., 2007)

Service-dominant logic (S-D Logic) is a new alternative theoretical framework to understand the role of services and the value creation process. It is an alternative to the product-oriented and goods-dominant worldview. Table two highlights the most fundamental differences between the G-D and S-D logic.

Table 2. The differences between G-D and S-D Logics. (Lusch and Vargo, 2014)

	Goods-dominant logic	Service-dominant logic
The primary unit of exchange	Goods	Services
Role of goods	Goods are end-products	Goods are distribution mechanisms for services
Value	Value is created through products	Value is co-created through services together with the customer
Sales	Selling products and systems	Solving customer's problems and providing solutions
Role of customers	Customers are a recipient of goods	Customers are co-producer of value
Customer relation	Customers are passive	Customers are active; firms can make value propositions
Value producer	Value is determined by the producer and embedded in goods	Value is perceived and determined by the customer

S-D logic claims that the exchange of services is the fundamental basis of all economic exchange, and goods are only a distribution mechanism for service provision. The S-D logic asserts that all companies are service companies, and for example, car manufacturers are not selling cars but transportation services or driving experiences. The S-D logic also states that the value is always co-created together through customer interactions. In the S-D logic perspective, the value does not arise from the company's internal processes but rather through the use of the company's services. (Lusch and Vargo, 2014)

The fundamental axiom is that in the end, all customers are seeking solutions, not products. The company's purpose is to assist its customer to solve their challenges through an interactive, processual relationship. In S-D logic, efficiency is essential, but the paramount importance is effectively meeting the customer's needs. S-D logic points out that the value is always experiential and phenomenological. Each customer perceives the value uniquely, and thus, value is always uniquely experienced and determined by the customer. Due to this, companies cannot deliver pure value but only offer value propositions. (Lusch and Vargo, 2014)

When a manufacturing company extends its business more into services, one risk it confronts is the so-called service paradox. The service paradox is a situation when significant investments in extending the service business result in increased service offerings and higher costs but do not generate expected higher returns. Due to increased cost and a lack of corresponding returns, the growth in service revenue fails to meet its defined objectives and goals. Instead of achieving a transition from products to services and successfully exploiting the financial potential of an extended service business, the manufacturing company fails to follow the transition line but falls into the "service paradox". The service paradox is visualised in figure 2. (Gebauer, Fleisch and Friedli, 2005)

Another potential risk is the risk of being trapped by two businesses. Balancing between being a pure product manufacturer and a service provider simultaneously consumes a lot of resources and creates unclarity within the company. One good strategy for mitigating this risk is separating the old legacy products and the new service solutions into two business units. This way, the other business unit can still serve existing and more conservative customers and provide steady revenue to accelerate and scale the service and solutions focused business unit. (PWC, 2021).

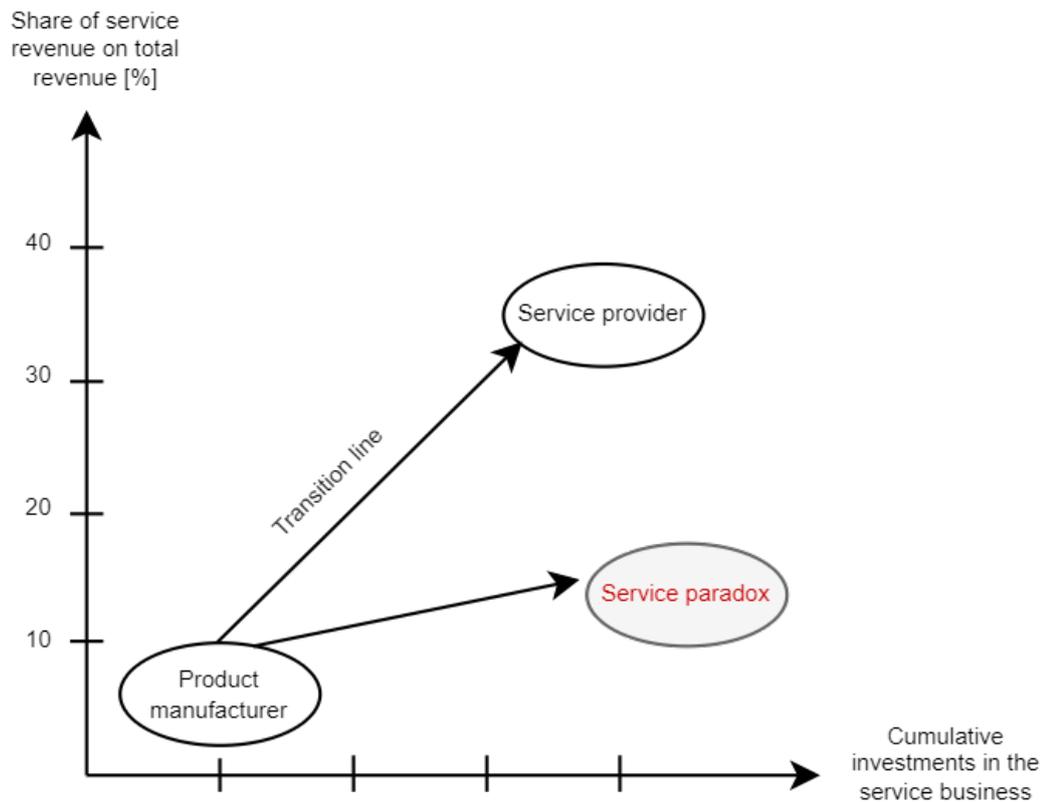


Figure 2. Transition line and service paradox. (Gebauer, Fleisch and Friedli, 2005)

It can be noted that the S-D logic offers an entirely new angle to see the purpose and the importance of the services. Out of all the differences in S-D logic compared to the G-D logic, the most prevalent is the difference in how value creation is seen. Due to the high importance of service value creation in the S-D logic, the next sub-section delves deeper into this topic. The following sub-section examines the entire value creation process starting from the value proposition and ending in value capturing.

2.1.2 Value creation in S-D logic

When companies are moving towards more service-dominant business models, there is a need to rethink and reconsider the whole value creation process. This sub-section aims to examine the concept of value creation in S-D logic discourse. The section goes through all these four value creation process components, value proposition, value creation, value capture, and value network.

There is a continuous argument regarding on how the term value is defined and measured (Werelds et al., 2014). Generally, the term value has been conceptualised as an assessment of the tradeoff between benefits and sacrifices (Dodds et al., 1991). The benefits can be anything from better use of resources, increased quality, life cycle extension, cost reduction (Maintenance, operating, or capital costs) to loss reduction (Planned or unplanned downtime, inefficiency) (Karababa & Kjeldgaard, 2013). It is essential to understand that not all benefits can be measured with economic indicators, but they may also have ethical, social, emotional or brand-related aspects. The sacrifices are usually understood as the price that customers are paying for the service, but it can also be, for example, a loss of power or a loss of control that customers are experiencing when they start to use some specific service (Karababa & Kjeldgaard, 2013).

One typical misconception of manufacturing companies is that the customer makes their purchasing decision based on the state-of-the-art technology associated with the product (Ojanen & Ojanen, 2008). However, the SD-logic does not emphasise product orientation but the benefits of the value promise received by the customer for the customer and their business (Lusch and Vargo, 2014). In most cases, customers are not primarily interested in goods or services per se but in how these can be used for value creation and benefit the company's business (Ojanen & Ojanen, 2008).

Figure 3 summarises the key components of a service value creation process, as seen by Velu (2018). At the core of the model is the company's core business model. Business models can be seen as complex systems with components that answer the questions like what are the company's value propositions, how the value is created and distributed, what are the means of value capture, and who are the partners in the value network (Velu, 2018). Basically, the selected business model is based on the company's core strategy, and it determines and articulates how the whole value chain should be configured (Boudreau, 2021).

As discussed in the previous section, according to the S-D logic, companies are not selling goods but offering value propositions (VPs) to be of service to their customers (Gummesson, 2007). S-D logic also states that companies cannot create value but only create value propositions (Lusch and Vargo, 2014). Companies should see services as objects of exchange, wherein the value is created through an interactive relationship between the company and the customer (Pekkarinen & Ulkuniemi, 2014).

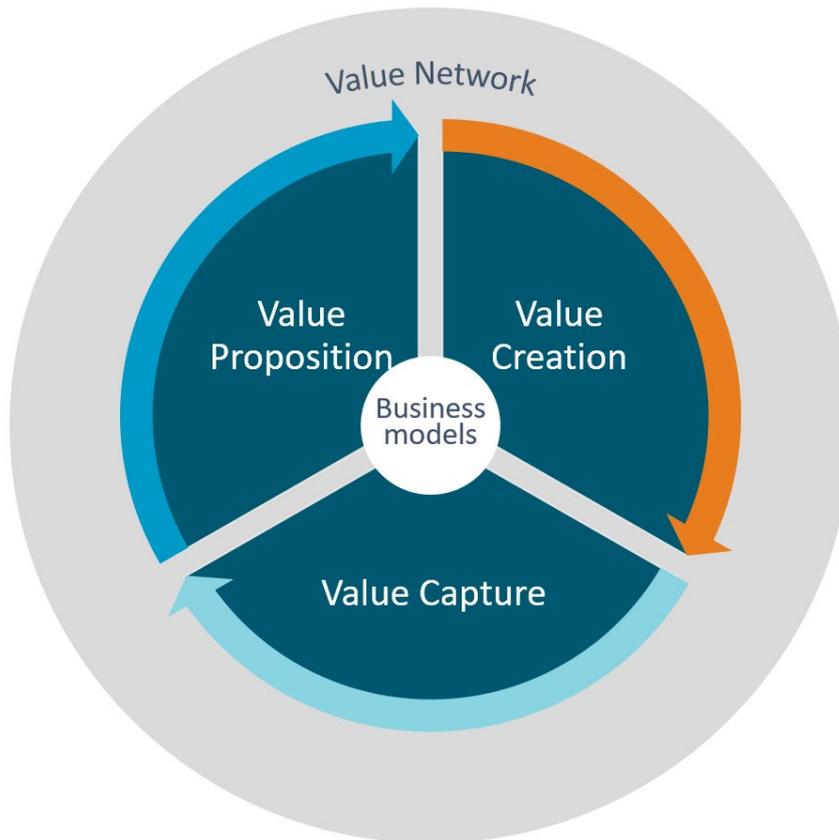


Figure 3. Service value creation process. (Velu, 2018)

Value propositions are claims about how the provider's specific service will provide and empowers customers to create value (Storbacka & Pennanen, 2014). These claims and arguments may relate, for example, to price, quality, benefits, or service staff knowledge and skills. By having convincing VPs, companies can help their customers understand their service offerings' superior value (Heikka, Frandsen and Hsuan, 2018). Persuasive VPs are also a way to demonstrate to the customers what is unique in their service offering compared to competitors (Wang, et al., 2014). If a company fails to demonstrate its VPs clearly, customers will likely distinguish it only as a marketing tactic (Anderson, Narus, & Van Rossum, 2006).

Figure 4 illustrates the role of the VPs in the context of S-D logic and its value co-creation concept. Companies are making promises (VPs) to their customers, and at the same time, they need to ensure that the providers (Company's own or partner company's employees) have enough resources and capabilities to keep all the promises. The joint creation of value

by the company, provider and customer is the combined result of all three activities (making, enabling and keeping the promises). Value co-creation describes the way the different participants interact, behave, evaluate, and experience propositions based on the social circles to which they belong. (Menon, 2012)

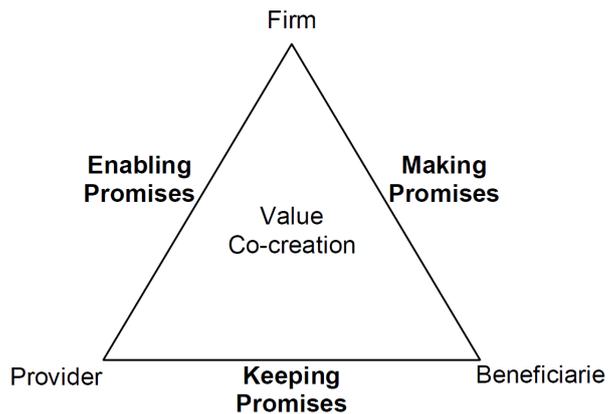


Figure 4. Value propositions and value co-creation concept

There are multiple challenges when building a VPs. One is that despite the services can contain physical elements and materials, the actual value-added often consists of an intangible element. Intangibility creates a significant challenge because it is challenging to communicate and concretise the service in advance to the customer making the purchase decision. This is a challenge, particularly when the customer has no experience purchasing the services (Ojanen & Ojanen, 2008). Another challenge is that if the value drivers are not sufficiently recognised or their dynamic effects are not fully understood, it is difficult to make accurate value promises to customers (Martinsuo & Kohtamäki, 2014). It is not always so easy and straightforward for companies to understand how customers evaluate their services and how different services contribute to their perception of value creation (Ulaga and Eggert, 2006). Especially when the customer base and customers' needs are heterogeneous, it can be challenging to be deeply conscious of all the different customer overall value perceptions formed by comparing overall value and overall cost. (Rahikka, Ulkuniemi and Pekkarinen, 2011) Companies can manage varied customer segments and gain a competitive advantage by formulating various value propositions for varied customers (Heikka, Frandsen and Hsuan, 2018). It can sometimes also be hard for the customers to

understand the value created for them. This is why companies should always provide data and other evidence to demonstrate the logic behind their VPs (Teece, 2010). For that company to make and keep value propositions that could increase their competitiveness, the promises need to be enabled by the operational resources of the company, and for example the training, incentives and management must support these VPs (Lusch and Nambisan, 2015). By making excellent VPs and keeping the promises, the company can outcompete alternative and substitute offers (Boudreau, 2021).

As manifested in the previous section, according to S-D logic, the value is not created exclusively by the company, but it is created in collaboration with the customer and interactions with different actors (Vargo & Lusch, 2014). The company's role is to propose a value proposition, and it is primarily the customer who creates the value through a service creation process. Due to this, close co-operation and action between the service provider and the customer are essential. It should be noted that the service provider is only creating and advertising the value proposition, but it does not redeem the VPs. It is the company's employees or company agent, partner or subcontractor who implement and fulfil the proposed value. This is why the VPs should always be designed so that the company has the competencies, know-how, and resources to profitably deliver the value promises (Grönroos et.al., 2007).

After the value proposition, the next step in the value creation process is value creation. The value creation step answers, for example, with questions like; What is the operating model for delivering the value proposition with lower costs or higher differentiation and what is the signature combination of procedures and practices embedded in the company that will make this possible? (Boudreau, 2021). Every company needs to understand that even though they are making, enabling and keeping the promises, the actual value is always created at the customer's own processes during usage of the services in response to the value proposed by the service provider (Grönroos, 2000). Usage can be a physical, virtual and/or mental process, and it can also be mere possession. (Grönroos et.al., 2007). Any way the company can participate in the value creation process of the service. By engaging in to the customer's value creation process, the company develops possibilities to co-create value with its customers, and by doing this, the company is no longer limited to only VPs but can engage itself in the value fulfilment as well. (Grönroos, 2000).

The last step in the service value creation process model is the value capture step. In the value capture process, intangible value turned into monetary value. Although value capture should not ever be any company's primary focus, it is still essential to already in the early phases to design and plan how the value created is collected from customers. In other words, how the services are priced. Traditional manufacturing companies have often provided services free of charge, or the price has been hidden as part of the product's price (Martinsuo & Kohtamäki, 2014). Since services can generate value in several different ways, the value of services can be challenging to measure purely in money. Thus it is sometimes, especially when the company starts offering completely new services, it can be demanding to calculate all the costs accurately, and thus it can be demanding to price services appropriately. The most critical element of value capture strategy is always to realise a fair return. Correct levels of value capture benefit both the company and the customers and allow continuous investment in value creation. Research shows that focusing on value creation will result in more significant revenue and profit margins in the long term. (Wirtz and Ehret, 2017)

Companies are often forced to change their pricing logic when moving towards more service-centric business models. One strategy that the literature promotes is value-based pricing. In this pricing method, the price is not directly based on the costs but on the amount of created value. Value-based pricing is one of the most effective ways to capture the fair share of the value the company creates for its customers (Grönroos et.al., 2007). The most significant difficulty with value-based pricing is finding the proper pricing metrics. The value-based pricing metric should track the value metric (the unit of consumption by which the buyer gets value) (Wirtz and Ehret, 2017). This metric usually varies between industries, companies, product lines, and even individual services. The value capture has an essential role in the service value creation process because, after all, it is relatively easy to develop services that add value to customers, but the big question is whether customers are willing to pay enough for these new services.

In most cases, the services are not provided, and the value is not created alone but in co-operation with many actors. These actors and all their processes and actions combined form the value network. The value network thinking embodies the S-D logic statement about service value co-creation. It indicates that value is not created by one actor and delivered to the other, but it is co-created through the interactions of all the actors involved in the network (Grönroos et.al., 2007). There are continuous multi-actor interactions during the value

creation process. Therefore, it is essential to identify the capabilities of the network that complement the company's own capabilities. The proficiency and expertise in using partners and subcontractors in the service value creation process play a significant role. With increased interactions with the partners and subcontractors, the company can better identify the individual needs of its end customers and offer quality services with a local presence and enhance the overall value creation process. (Martinsuo & Kohtamäki, 2014)

Usually, the value network is only seen as the usage of partners and subcontractors, but while the world is getting more and more connected, the importance of the customer to customer interactions has increased in the value creation process. One example of how the company can support these customer to customer interactions is through customer engagement platforms where customers can communicate with each other and share best practices, know-how, tips, and other ways to help each other. (Kuzgun and Asugman, 2015) Customer-to-customer interactions do not happen themselves, but companies must invest and build platforms and ecosystems to allow customers to interact and create value for each other. Even competitors in the same field can sometimes cooperate among themselves in order to gain a competitive advantage (Velu, 2018). In some cases, their products or services can complement each other just the right way to create the maximum value for a single customer.

The study has now introduced the S-D logic in general and paid more detailed attention to the service value creation process in the S-D logic context. The following sub-section takes a deeper look at the ultimate stage of the servitisation; Anything as a Service. Anything as a Service is the situation and a business model where companies do not offer products at all but are offering anything as a service.

2.1.3 Anything as a Service - XaaS

The core of a manufacturing company's service offering has traditionally been a physical product around which the service such as installation, maintenance, repair and training are intertwined. However, as S-D logic and servitization claim, companies should widen their perspective and look at services as the key distribution mechanism of value. As figure 5 visualizes, the current trend is powerfully moving towards more service-oriented business models.

XaaS stands for Anything as a Service. "Anything" is a broad category, though, which can sometimes make the concept of XaaS hard to grasp. The term is originally from the cloud-computing industry, but recently many companies across different industries have been shown interest in XaaS to power and grow their business. The whole term is still relatively new and thus still vague and lacks a general definition. The term compounds many sub-terms like Software-as-a-Service (SaaS), Data-as-a-Service (DaaS), Platform-as-a-Service (PaaS), Infrastructure-as-a-Service (IaaS), and Operations-as-a-Service (OaaS). XaaS is kind of the ultimate goal of servitisation. Common for all these different terms is that they no longer sell any goods but services under one subscription. (Duan et al., 2016)

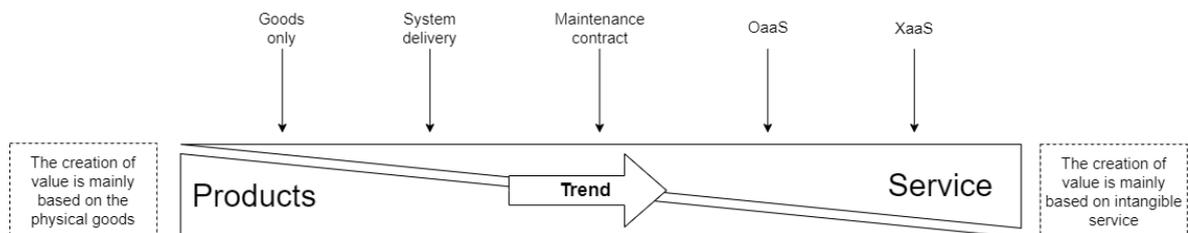


Figure 5. The trend of servitisation.

One example of a manufacturing company's XaaS business is jet engine manufacturer Rolls-Royce's TotalCare program. Through this program, Rolls-Royce offers long-term jet engine rental contracts for its customers on a "power by the hour" basis. Customers are charged on a fixed € per flying hour basis. This kind of XaaS service seeks to remove the effort of engine maintenance from the customer and transfers the management of associated equipment operating risks to Rolls-Royce. From the airline's viewpoint, engine maintenance is not their core business, so by outsourcing this to Rolls-Royce, they can cut their costs, lower the amount of capital tied to the engines and thus boost operational efficiency. This kind of arrangement incentivises the jet engine maker to maximise the reliability of their products. Rolls-Royce can even offer a "lifetime warranty" for its customers because the customer no longer buys a single jet engine but "power by the hour", so theoretically, Rolls-Royce just provides a new engine whenever needed to its customer without any additional costs. Customers pay the same fixed price per flying hour, and Rolls-Royce makes sure that the engine is working, or whenever needed, the company replaces the engine with a new one without any extra costs. The Rolls-Royce TotalCare program allows Rolls-Royce to retain

ownership of the jet engine and, as a result of this, use its valuable materials once it is decommissioned.(Rolls-Royce,2018)

In order to succeed to change the company's business more towards the XaaS business model, the goal must be more than just milking more money from customers. The new XaaS model must also create more value or cost reductions for the customers. One very significant value creator is that in XaaS, customers usually pay for monthly or yearly subscriptions. This reduces the need for CAPEX (Capital expenditure) and shifts the focus to OPEX (Operating expenses), which often reduces the total cost of ownership. Lower CAPEX also lowers the entry barrier to testing or trying new services and solutions because it is usually easy to start with a smaller scale and later expand the usage if found relevant and working. This ability creates a lot of flexibility and agility for the customers. XaaS products also usually help the customer companies to become leaner and focus on their core business. Instead of more unpredictably one-time payments, the service provider companies operating with XaaS models get more predictably recurring revenue. (Bigelow, 2017)

Not even the XaaS model comes without its cons. One key challenge is that customers, and even the company's employees, might be resistant to adopting XaaS. Due to this, special attention must be focused on demonstrating the benefits of XaaS to the company's customers and measuring the company's success in this business model transition. It can be that the company's internal processes do not support the XaaS model, as it is used to serve the customer according to the traditional goods-dominant logic (Martinsuo & Kohtamäki, 2014). Also, if the value proposition does not meet the consumer's demands, maintaining a subscribers base becomes impossible. In summary, it can be stated that if the company is planning to transform its business model into more service-dominant, S-D logic can bring a valuable way of viewing the services, and it can significantly ease the transition phase. S-D logic offers creative tools for understanding the service value creation process, and thus by utilising it, companies can better build their future service offerings.

Usually, services need to be highly customised to meet the customer's specific needs (Pekkarinen & Ulkuniemi, 2014). This quickly leads to a complex service offering. When companies start the servitisation journey, one of the critical questions is how they can manage the ever more complex service offering. One way to move toward more service-oriented business models and keep the service offering manageable and straightforward is to start using service modularity (Bask et al., 2011; Pekkarinen & Ulkuniemi, 2008). The

next section determines how service modularity could be utilised to manage this complexity challenge. The other goal of the following section is to explore how the utilisation of service modularity could increase companies' competitiveness.

2.2 Service modularity

S-D logic is based on the idea that services are disappearing, and each service situation is unique. Therefore, services must always be delivered more or less tailored to each customer. Implementing S-D logic into the company's processes can quickly solve individual customers' unique problems. The ability to tailor service offerings according to individual customer needs and deliver these efficiently is a significant challenge for companies. Service modularity plays an essential role in addressing this challenge and effectively delivering customised services to customers (Storbacka et al., 2013).

This section introduces the basic principles of service modularity. After the basics of service modularity, the study builds a preliminary theoretical framework for service modularity based on the theory and all of the best practices found in the literature.

2.2.1 What is service modularity

Generally, a company has had two main opposing options for providing a service. Standardisation and customisation. High cost-effectiveness can be achieved by standardisation, while customisation leans more towards high quality and meets each customer's unique needs (Ojanen & Ojanen, 2008). Service modularity aims to achieve the benefits of standardisation and customisation simultaneously. At its best, service modularity allows for customisation at a low cost, with the same or nearly the same impact on the customer as traditional "real" customisation. The goal is to offer near-customised solutions at approximately the cost of standard services (Martinsuo & Kohtamäki, 2014).

Modularity has been extensively discussed in the literature from a product design point of view. In product design, modularity means that the final product is assembled from separate and independent modules (Sanchez and Mahoney, 1996). Baldwin and Clark's (1997) have

defined modularity as: "Building a complex product or process from smaller subsystems that can be designed independently yet function together as a whole". In general, modularity can be understood as the ability to separate and recombine system components to create a variety of configurations without losing functionality (Schilling, 2000). In the case of services, the literature about modularity is much scarcer.

In recent years, modularity has been extended to services in different industries, such as manufacturing industry. There is no one universal definition of service modularity. Most often, it refers to the ability to offer a customisable service offering by dividing the services into smaller standardised components that can be easily combined to form multiple service modules and bundles (Pekkarinen and Ulkuniemi, 2008). The concept of service modularity includes avoiding any strong interdependencies between specific service components. When all the low-level service components are loosely coupled, it allows easy "mixing and matching". This way, the company can easily create new and update their old service modules and bundles without redesigning the components (Sanchez and Mahoney, 1996).

Because service modularity can be seen as a means to standardise service offering, by applying it, companies can reduce the complexity of their service offering and make the management of services more straightforward and thus achieve better customer value and profitability. (Rahikka, Ulkuniemi and Pekkarinen, 2011). Companies can also achieve reductions in time and cost of delivering customised services when applying the modularity principles (Ojanen & Ojanen, 2008). Service modularity also increases the visibility of services and thus assists customers, especially in the service buying process (Rahikka, Ulkuniemi and Pekkarinen, 2011). The service modularity is especially suitable when a company has a complex service offering. Service modularity also often improves the service quality simply because it is easier to handle and monitor fewer and standardised services components (Kastalli & Van Looy, 2013).

The theoretical framework for service modularity is being built in the following sub-section. The theoretical framework is based on the findings and best practices from the service modularity literature.

2.2.2 Theoretical framework for service modularity

In this study, a 3-layer model of service modularity is used. The lowest level (Level 1) in this model is the service components. A service component is considered the smallest unit into which services are divided. Service components are the company's internal resources, standard operating procedures or methods that define who and how the specific function of some specific service is carried out. Due to that, the service components are often processed and performed as if they were not services, not too much attention is paid to them. However, poor management of background services, such as complaint handling and billing, places an emotional burden on customers and causes unnecessary waste of time and effort. (Grönroos et.al., 2007) The extent and size of the service components vary concerning the customer's needs. Service components are not provided as such because they do not provide value to the customer individually, but they are to be combined into different service modules that provide the customer with more value than the sum of their parts. Using the same modular service components makes it possible to fulfil varying customer needs, even highly tailored needs. (Pekkarinen & Ulkuniemi, 2014).

The second level (Level 2) is service modules. Service modules are composed of one or several service components designed independently but still function as an integrated whole to perform the intended function that the customer requires. Some service components can be shared with multiple service modules. A service module is an entity that fulfils and meets a customer's single service characteristic, for example, installation, data communication, or warranty. Service module variants are obtained by swapping one or more service components. This is called component swapping modularity. Service modules are only marginally dependent on the characteristics of other modules. A practical service module consists of interdependent service components but is as little as possible dependent on other service modules. The service module is the smallest unit that can be offered to customers. Standardised service modules enable more efficient production of services and the flexibility of the offering, which in turn brings added value to the customer, as the offering can be formed into more customer-specific service offerings. (Martinsuo & Kohtamäki, 2014) The service portfolio is a collection of the company's service modules and components from which the service can be tailored to customers' needs. However, the service portfolio is only internal and not visible to customers.

The highest level (Level 3) is the service bundles. Service bundles are consist of several service modules. The goal is that the offered service bundle is more valuable to the customer than the service modules alone. The interaction between the different modules and their combination to produce a particular solution is constantly changing depending on the needs and wants of each customer. Based on the desired service bundles, a service offering is formed according to the customer's needs. Offering ready productised service bundles for customers is a way of making the services more understandably and visible. This helps the company better communicate the total value that the services could generate to the customer. Even though the customer would not initially choose the most comprehensive service bundle, well-productized bundles offer a tremendous upselling opportunity. It makes it easier for customers to discover the company's complementary service bundles and for sales personnel to offer customers an upgraded or more expensive version of the initially selected bundle. All of this could increase the overall profitability of each customer. (Pekkarinen & Ulkuniemi, 2014)

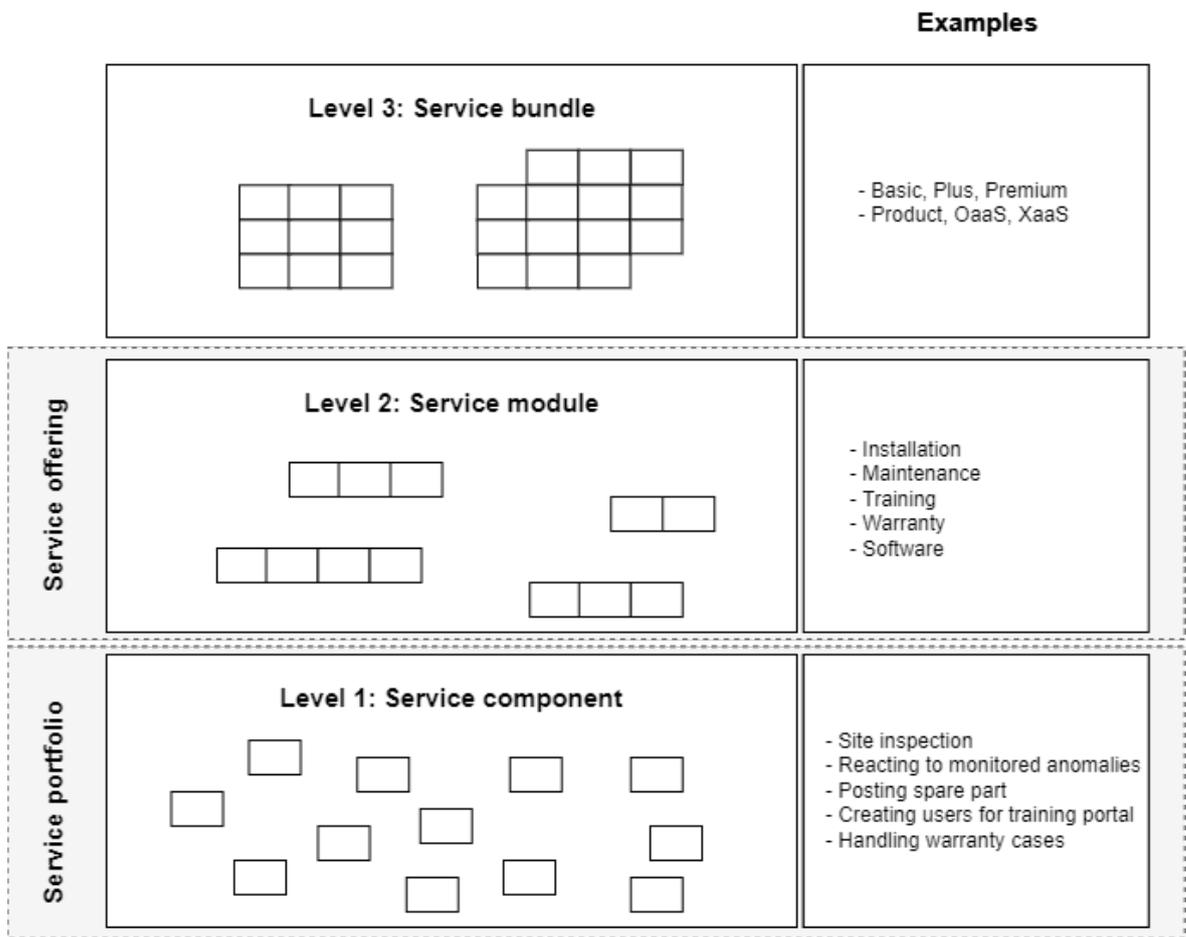


Figure 6. Service modularity framework

Even though the service modularity bounds the degree of customisation of the services, service modularity and customisation capability have a tight connection (Bask et al., 2011). The idea of service modularity is to offer the customer multiple options when the service customisation aims to offer each customer precisely the wanted service. (Fixson, 2006) The connection between modularity and customisation is visualised in figure 7. The figure introduces a framework where service offering is divided into four categories based on modularity and customisation.

When the degree of customisation and modularity are both low, service offering belongs to the “non-modular regular” category. In this category, the service offering is very standard and monolithic, with only a few integrated options for the customers. The customer can only choose between these predetermined service components and cannot influence the

specifications of the services. This type of service philosophy is also called "buy-from-store" to exemplify the predetermined options for customers. (Bask et al., 2011)

If the degree of customisation is high, but the degree of modularity stays low, the category is called "non-modular customised". In this category, services consist of both standard and fully customised service components. The service components can be fully integrated for the customer's specific requirements, and customer involvement extends even to the design stages of the service components. In the non-modular customised category, there are a substantial number of options available for the customer. The other name for this category is "buy-from-tailor", which emphasizes the high degree of customization of services. (Bask et al., 2011)

The category where the degree of modularity is high but the degree of customisation is low, is called "modular regular". In this category, there are predetermined productised service bundles that customers can choose from. All the different service bundles are combinations of standard service modules. (Bask et al., 2011)

The last category is called "modular customised". In this category, both the degree of modularity and the degree of customisation are high. This is achieved by combining standard and customised service components that can be mixed and bundled into service modules to meet more individual customer needs. The modular customised category combines the flexibility of tailoring and the efficiency of modularity through which companies can deal with divergent customer needs.

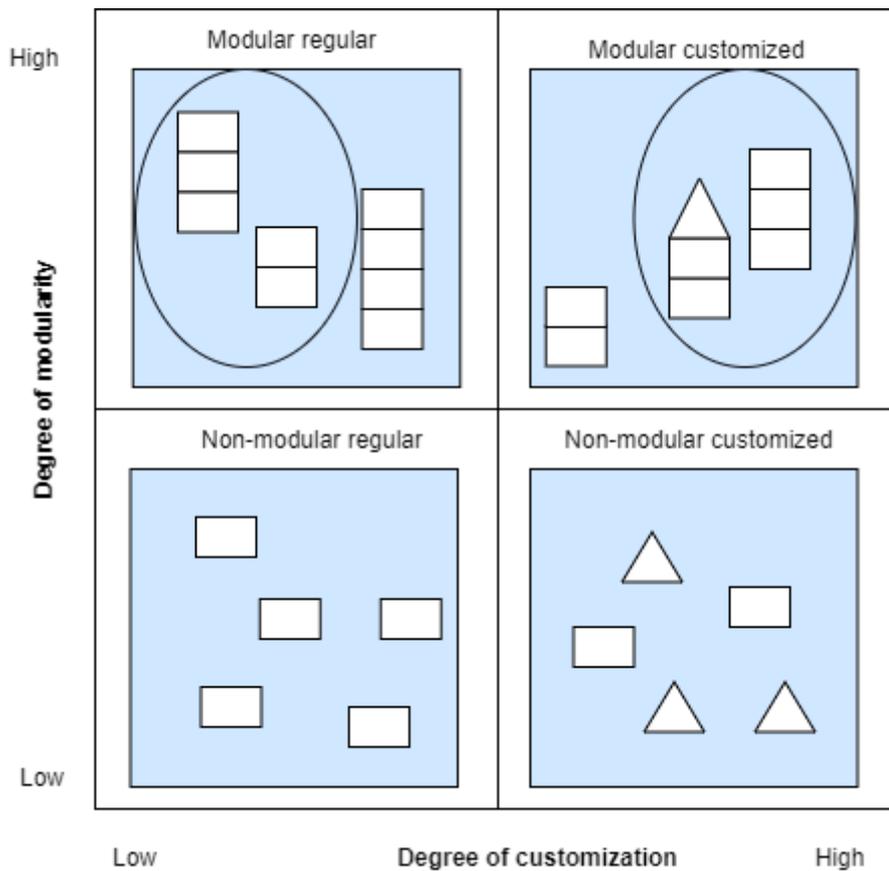


Figure 7. A framework combining service modularity and customisation (Bask et al., 2011)

In the service modularity framework that this study builds and presents, the modular regular category is preferred. In practice also, a modular customised category is allowed in a special cases. This is needed so that the case company can meet the needs and requirements of its most important and demanding customer. Standard service modules are still preferred. Every customisation should be justified and always made available to all customers. Fully tailored customisations should be avoided to the last. (Bask et al., 2011)

One key challenge that the above-presented framework does not consider is service interfaces. Service interfaces define how different service components interact with each other and how they are connected with the service modules (Heikka, Frandsen and Hsuan, 2018). Service modularity cannot be achieved without standardised interfaces so that the recombination of service components is possible. Standardising the interfaces involves specifying in advance how the service components of service modules will interact (Baldwin & Clark, 2000).

In a real-life, different product families can rarely use the same service component interfaces due to their great diversity (Ulrich and Tung, 1991). For example, services within different product lines can use a different kind of technologies, software, or different teams are responsible for producing the service, and thus same service components cannot be utilised, and individual product lines need their own service components because no standard interface cannot be created. This is especially true with the case company's situation when the company's products are so various.

In conclusion, from the service modularity literature, it can be stated that service modularity can offer companies tools to manage their complex service offerings better and, through this achieve better competitiveness. However, in order to gain competitiveness, many factors need to support the success of service modularity. The most profound factor is that there needs to be a high and adequate demand for modular, variable, and customised services and solutions from the customer's side. Also, for the company to be able to benefit from service modularity successfully, personnel, equipment, and information technology have to be trained and designed to support modularity (Pekkarinen & Ulkuniemi, 2014).

3. METHODOLOGY

The third chapter provides an overview of the design and methods used in this study. Firstly, the chapter introduces the used research design and the schedule of the thesis. Secondly, the chapter goes through the data collection methods and, for example, lists all the conducted interviews. The second section also describes the methods used to analyse the collected data. Finally, the chapter discusses the reliability and validity of the study.

3.1 Research design

The design science research method is used in this study. Design science methodology is often used to develop solutions for practical engineering problems. Design research aims to describe and explain the subject matter and solve and overcome the initial problem. This is the main difference compared to pure empirical research, whose goal in most cases is to only describe and explain the subject in the matter but not solve it. In design science, the solution is built by creating artefacts. Artefacts are defined as "An object made by humans with the intention that it will be used to address the practical problem". This study uses and adapts an existing artefact, modularity, and reuses it in a service offering management context. (Johannesson & Perjons, 2016) The proposed modular service offering frameworks, introduced in chapter 4, are the artefacts of this study.

The framework of the study is presented in figure 8. The study framework is an overview of what has been done and in which order. It visualises all the five different activities of the study. The study starts with a problem explication activity, where the initial problem is analysed and precisely formulated, and its importance is justified. This stage answers the question: "What is the problem experienced by the stakeholders of a practice, and why is it important?". Then the study continues with a requirements definition activity, which outlines the requirements for the solution to the explicated problem in the form of an artefact. In this study, the problem explication and the requirements definition activity were done together with the main stakeholders in the case company.

In the design and development activity, the artefact itself is created. All the necessary functionalities and structures of the artefact are determined to address the explicated problem and fulfil the defined requirements. (Johannesson & Perjons, 2016) The design and development activity was conducted in the form of 16 semi-structured interviews.

During the demonstration activity, the newly created artefact is used in proof-of-concept or one real-life case to show that the artefact actually can solve the explicated problem in a feasibly way. A demonstration is already a weak form of evaluation because if the artefact can address the problem in POC or one real-life case, it might be able to do so in other cases as well. During this study, a workshop, where all the case company's relevant internal stakeholders were invited, was conducted to conduct the demonstration activity.

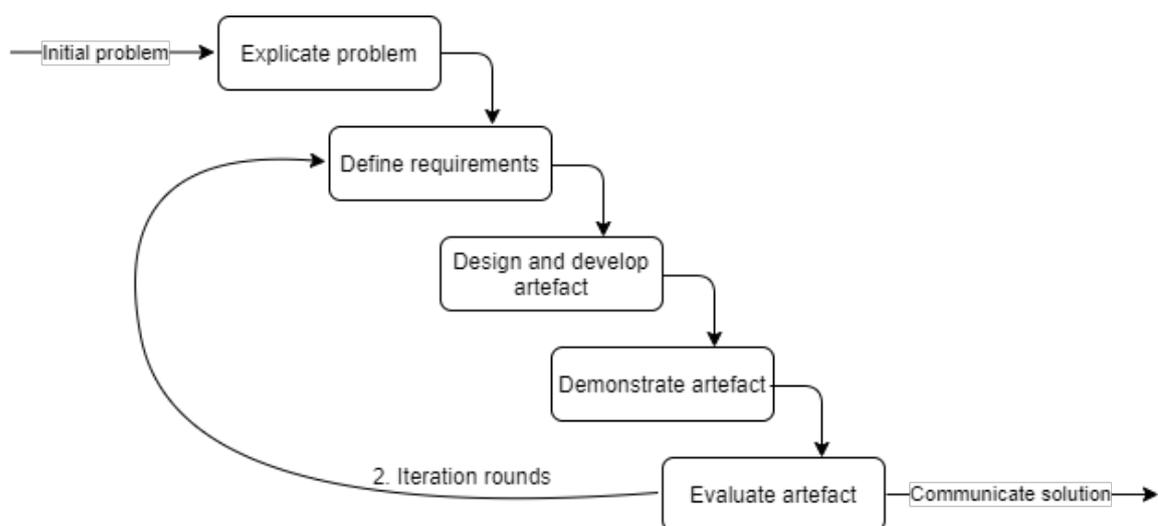


Figure 8. The framework of the study

In the last activity, evaluation, the performance of the artefact is determined. It is measured how well the artefact can fulfil the requirements and to what extent it can solve the practical problem explicated at the beginning. Due to time constraints, this study did not evaluate the artefact in a real-life case. (Johannesson & Perjons, 2016) Design science studies are always carried out iteratively, and this is why from the evaluation artefact activity, the study moves back to the requirements definition activity. In this study, two iteration rounds are conducted. Finally, the solution is communicated to broader audiences, which in this study meant a

presentation to all stakeholders and a shorter summary sent via email to a wider audience inside the case company. (Johannesson & Perjons, 2016)

Thesis timeline	Oct - 21	Nov - 21	Dec - 21	Jan - 22	Feb - 22
Explicate the problem					
Iteration 1					
Define objectives of solution					
Design & develop					
Demonstrate					
Evaluate					
Iteration 2					
Define objectives of solution					
Design & develop					
Demonstrate					
Evaluate					
Communicate the solution					

Figure 9. The timeline of the study.

Figure 9. presents the timeline of the study. The study was conducted between the beginning of October 2021 and the end of February 2022. Some finalisation work and writing were also conducted in March 2022. The first month was used only to explicate the problem and analyse the initial problem. After the problem explication phase, the one and a half month-long iteration round one started. In this iteration round, more time was used to define the objectives of the solution and into the design & development activity

Right after the first round, the second iteration round started. More time was dedicated to demonstration and evaluation activities in the second iteration round. The last month of the study was used to communicate the proposed solution inside the case company.

3.2 Data collection and analysis

The data for this study has been obtained from several different sources. A study of existing literature about service-dominant logic and service modularity, combined with a comprehensive case study in a global manufacturing company, creates the basis of this study. The case study is based on internal documentation and interview data. Sixteen semi-

structured interviews were conducted during the study. Interviews were held in person or via Microsoft Teams. In these semi-structured interviews, the interviewer was not asking strictly formalised questions but instead focused more on a predefined theme, allowing for a discussion with the interviewee. The two predefined research themes for this study are service value creation and modularity. These themes and all ancillary questions are presented in appendix 1. The interviewer could add additional themes not included in the interview template during the interview. The detailed list of interviews conducted for this study is presented in table 3.

Table 3. List of conducted interviews

ID	Title	Phase	Lenght
1	Service Offering Manager	Problem explication	120min
2	Service Product Manager	Problem explication	105min
3	Service Product Manager	Problem explication	60 min
4	Product Manager	1. Iteration	45 min
5	Head of Offering	1. Iteration	60 min
6	Delivery Team Leader	1. Iteration	60 min
7	Business Development Manager	1. Iteration	50 min
8	Business Development Manager	1. Iteration	60 min
9	Sales Manager	2. Iteration	60 min
10	Product Information Manager	2. Iteration	45 min
11	Head of Product Marketing	2. Iteration	60 min
12	Head of Digital Solutions	2. Iteration	60 min
13	Head of Sales Operations and development	2. Iteration	60 min
14	Partner Channel Manager	2. Iteration	75 min
15	Customer Services Manager	2. Iteration	55 min
16	Sales Manager	2. Iteration	35 min
17	Workshop	Evaluation	90 min

At the beginning of the interviews, each interviewee was asked for permission to record the conversation, and all the interviews were analysed afterwards. The primary data analysis method chosen for this study is qualitative content analysis. The two research themes are used as the start point for the content analysis. The qualitative content analysis aims to form a comprehensible description of the phenomenon for further investigation. (Yin, 2009) The

frequency of certain words and phrases in interviews is analysed through qualitative content analysis. The most significant challenges with the current service offering and the possible broader implementation of the proposed modular service offering framework were identified by counting how many times each key phrase was mentioned.

3.3 Reliability and validity

The study includes only the results from one case company operating in a small niche and low volume market. Therefore the results from this study cannot be generalised without further research. It can also be hard to copy and apply the results from this study to other much bigger markets with higher volumes. Due to time constraints, the study does not observe any actual market/customer response to the suggestion/model, so the results cannot be fully confirmed before more extensive real-life tests. In this study, the final evaluation of the proposed frameworks was done in a workshop, where all the case company's relevant stakeholders were invited. In this workshop, the stakeholders had an opportunity to express their opinions about the framework, and why it would work or fail.

Because the study results are firmly based on interviews, both the interviewer and interviewee's biases and skills affect the results. It should also be noted that interviewees may not give all the relevant information or open the whole company strategy and challenges. All these factors may affect the reliability of the results. This issue can be curtailed by putting more emphasis on the literature review.

The modular service offering framework mock-up was built only for two of the case company's products, and the case company have several hundred product families, so the study only scratches the surface and based on this study, it is hard to ascertain how the mock-up framework would work if taken into broader use. Also, the mock-up modular service offering framework contains many assumptions and hypotheses that have not been confirmed with tests or even by finding any supporting literature.

4. RESULTS

The fourth chapter presents the results of this study. At first, two example products are selected, and the current state analysis of these products' existing service offerings is described. The first section also uncovers three key challenges with the current service offering.

After the current state analysis, the chapter introduces a proposal for a modular service offering frameworks for both of these selected products. This proposed framework has been done by combining the theoretical service offering framework with the feedback and comments received in the sixteen interviews conducted during the two iteration rounds.

4.1 The challenges of the current state

The case company has an extensive product portfolio containing over 300 products families. Products range from simple on-site sensors to highly complex countrywide networks. The product portfolio contains physical sensors as well digital-only products and many combinations in-between. For this study, two very different products are selected for closer examination from the case company's extensive product portfolio.

The first selected product (Product X) is one of the most complex and largest by its size out of all case company's products, while the second selected product (Product Y) is small and much more straightforward by its structure. The volumes of product X are relatively low, only 1-10 units per year, when the volumes of product Y are estimated to be 500-1000 per year. Another significant difference between the example products is the price. The unit price of product X is very high (~ 500,000€) when the unit price of product Y is low (~ 1,000€). Also, the product application areas and customer segments are almost entirely different. In addition, product X has many customised parameters that change depending on the customer's needs and desires, while product Y always stays very standard regardless of the customer. One similarity between these products is that both products are only at the beginning of their life cycle, just released or soon to be released.

The current status of the service offering of both products is illustrated in figures 10 and 11. Currently, neither product has any productized service bundles, but all the services are sold separately as an individual service modules. The square at the top right corner of each service module means that the customer or the sales personnel must by themselves choose in the quotation stage which services are needed in each case.

Standard operating procedures have been defined for each service component, but quite a lot of customisation still occurs. Especially in the product X has many customisations to different customers. One huge issue is that these customisations are often not documented or distributed into broader usage but only used with only one customer. So in practice, therefore, the wheel may be reinvented multiple times. Figures 10 and 11 do not cover all of the service components, but only a couple of example service components are introduced.

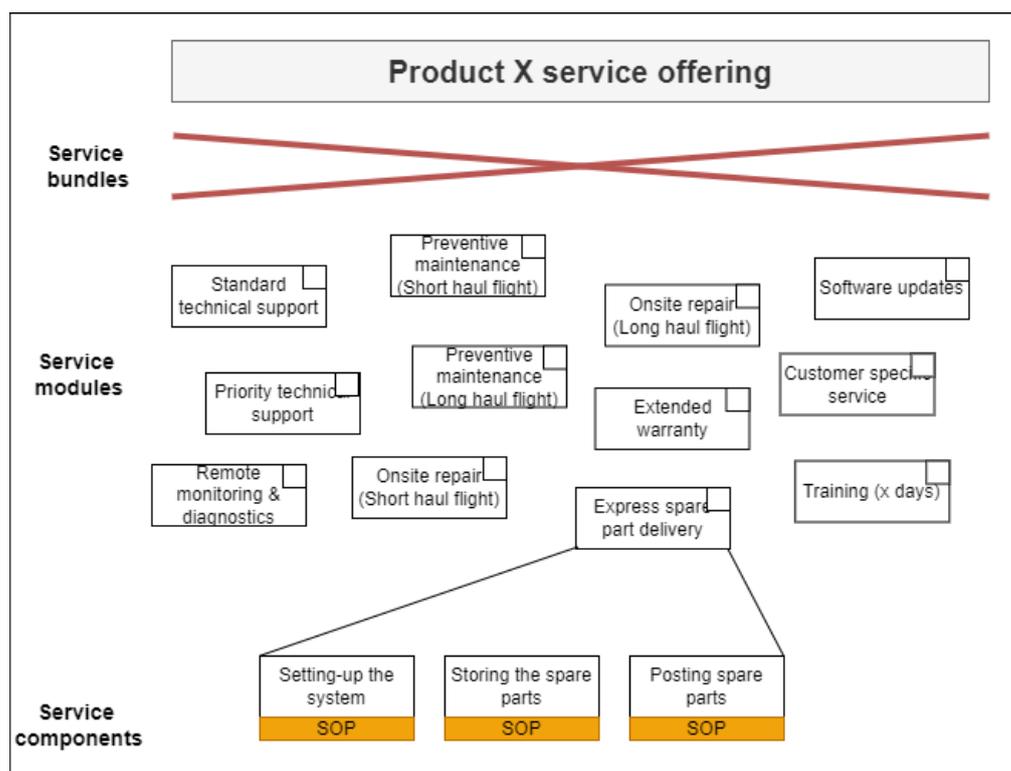


Figure 10. The current service offering of the product X.

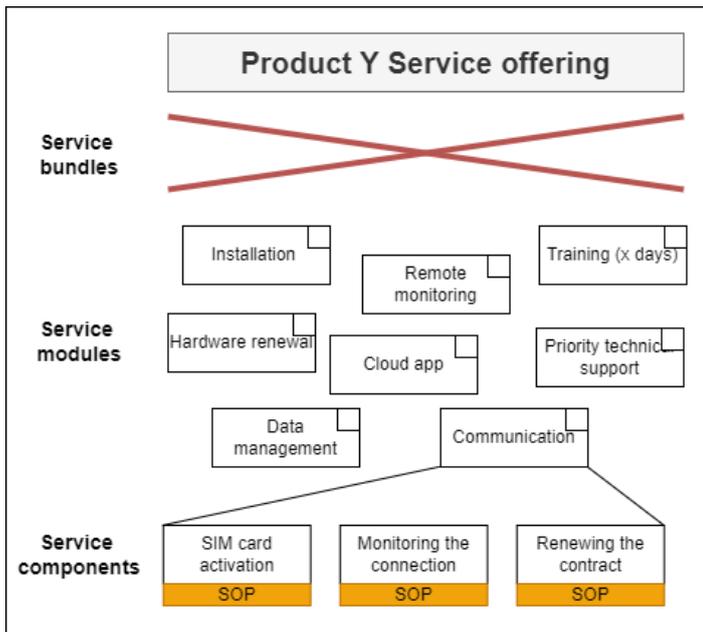


Figure 11. The current service offering of the product Y.

The interviews conducted during the two iteration rounds revealed many challenges and possible improvement areas in the current service offering. This study presents only three of these challenges. In total, more than 27 challenges with the current service offering were mentioned, but 19 of these were only mentioned once or twice. Thus, going through only these three challenges is comprehensive enough to give a good picture of the current situation of the service offering. These three most mentioned challenges with the current service offering and the number of times they were mentioned are presented in Table 4.

Table 4. Key challenges in the current service offering

Challenge	Times mentioned
Not succeeding to show the value of services	15/16
No ability to scale up without increasing costs	11/16
No clear ownership of service modules/components	9/16

The most mentioned challenge with the current state was that the case company is not succeeding in demonstrating the value that the services could offer. All but one of the interviewees recognized this challenge. The communication insufficiency about the service value creation and the general service offering concerns both internal and external stakeholders. The roots of this challenge lie in that the case company is a traditional product-centric company without a strong service culture. Neither the majority of the customers do not have much experience buying and appreciating services. One major factor for not succeeding in showing the value of services to customers is that a considerable amount of the case company's business is a tender business, and still today, most tenders are mainly focusing on price and the products, but not on the services. Inside the company, a change in the attitudes (Both internal and external) has been noticed, but it is anticipated that it will take at least several years or even decades before the services are genuinely appreciated among the employees and customers.

When the true value potential of services is not recognised properly, it leads that the services are seen only as a mandatory add-on to products, and thus not so much attention is given to the services. The lack of attention leads to a lack of communication and continuous improvement. The company with ease just offers the same services year after year and does not critically examine possible areas for development of services and how relevant the services actually are to customers. The poor internal communication about the services also causes sales to need much support when selling services, and sales also have difficulties gathering the most optimal service bundle for each customer. Further, when sales do not see services as value creators, they do not communicate the knowledge on customer pains back to the employees responsible for maintaining and developing the services.

By using S-D logic, the case company could improve the marketing, selling and execution of its service offering. By understanding the S-D logic better, the company could increase its employees' service-centric mentality and culture around the company. When employees better understand the importance and role of the services, they can more easily advertise, sell, and build better future services.

The second most mentioned challenge is the lack of scalability. This means that the case company does not have an excellent ability to scale up its service production without increasing costs with the current service offering. The case company also has difficulties handling all the various customisations created for multiple customers. The service offering

is relatively fragmented and complex, and the services are not developed to be scaled quickly. In order to be able to scale the services without increasing the costs, the services delivery process must be well standardised and automated. The service modularity and the modular service offering framework could offer some creative tools, but it is not indeed the only needed solution for achieving successful scalability. The scalability challenge is especially an issue with the cheaper high volume products because it is much easier to handle customised service solutions in more expensive low volume products. If services do not take advantage of standardisation and modularisation, the benefits of large-scale production cannot ever be achieved. The most demanding services to scale efficiency are where customers expect or require a local presence. In these cases, the partners and sub-contractors and their usage are in a vital role.

In one of the interviews, one service area expert stated, “The productisation of services is quick and easy, delivering the services to a couple of customers is fairly straightforward, but scaling the service production profitable is the hard part. And in scalability, the background processes are the key part.” The utilisation of S-D logic could significantly improve the productisation of the services, while the implementation of service modularity brings tools and enhances the service delivery process and reduces the service offering complexity.

The third most mentioned challenge was that, at the moment, there are unclear responsibilities and no clear ownership of each service module. The services are scattered throughout the company, and the organisation's various functions are fragmented. When no one has the overall responsibility, standardisation is not used as widely as it should, and service production relies too much on tacit knowledge. Product areas focus on products and do not recognise that services would include in their territory.

This all leads to the product areas not sharing information about the services, standard practices, or best practices between the areas constantly. In order to service modularity to work, the whole organisational structure must be apparent and well thought out, and every service modules need a clear owner. The owner does not necessarily need to be a single person, but it can, for example, be a named team. The owner of a service module should be responsible for continuous marketing, management, and the development of the service module.

As it has already become apparent in this section, there are challenges in the current state of the case company’s service offering and not so much if any service modularisation is currently being utilised. In the next section, a modular service offering framework is introduced for the two example products of the case company. The proposed modular service offering frameworks are based on the framework introduced in the literature review chapter, and the frameworks are further developed to take into account the specific characteristics and challenges of the case company.

4.2 Proposal for modular service offering framework

This section presents a proposal for a modular service offering framework for the two selected case products. During the two iteration rounds, it became clear that the products and the requirements for their services were so different that only one proposal framework would not work, and due to this, two separated frameworks were built. Figure 12 and 13 shows the proposed modular service offering frameworks.

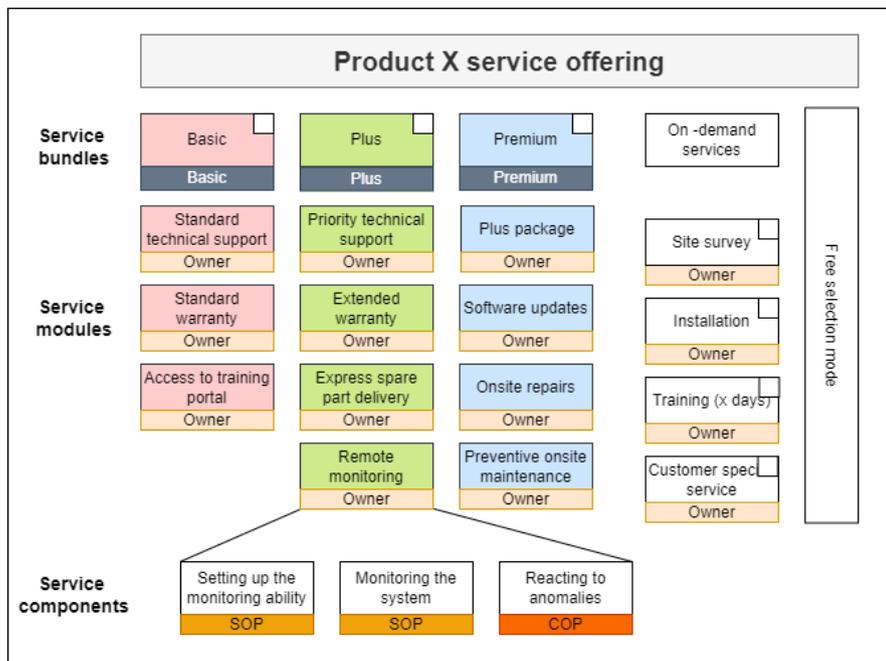


Figure 12. Modular service offering framework for product X.

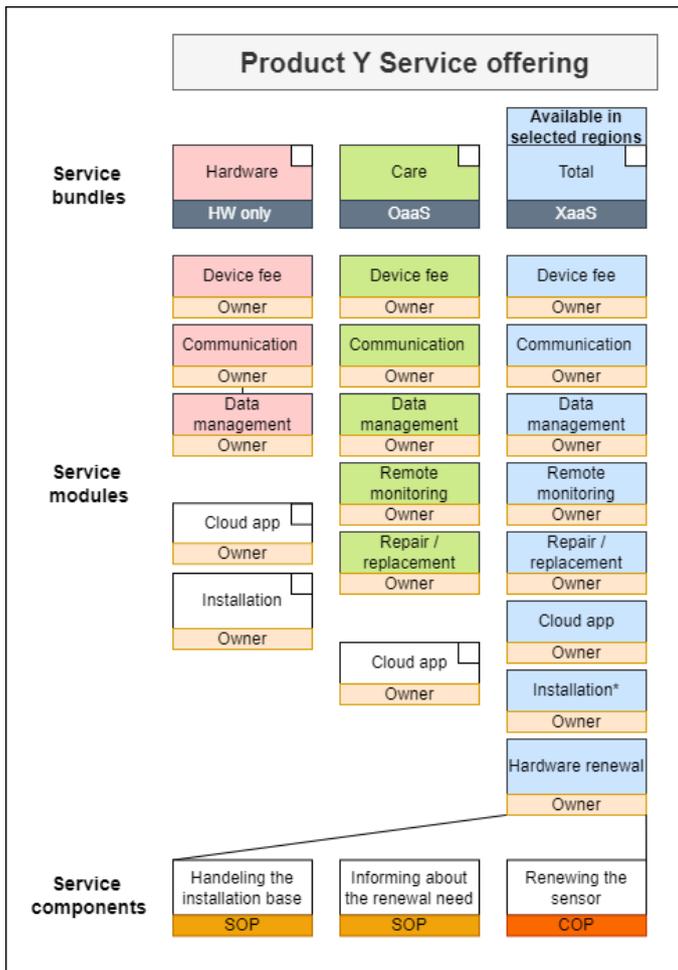


Figure 13. Modular service offering framework for product Y.

Compared to the current state, the proposal contains many changes and modifications. The most remarkable change is that the proposal introduces ready productised service bundles. With productised service bundles, the company can increase sales but not delivery capacity. For product X, basic, plus and premium bundles were created. Product X's modular service offering framework also contains an "On-demand services" bundle. This bundle contains services not included in basic, plus or premium bundles but are only offered on-demand. This solution was reached due to the characteristics of the product are. For some customers, the site survey and installation services would not produce any value because they are well able to handle the commissioning of the product by themselves, but on the other hand, for some customers, these services are essential. Due to this, it does not make sense to force these services into any ready productised bundle but offer them only on-demand.

For the product Y, Hardware, Care and Total bundles were created. The Hardware bundle includes only all the essentials that the customer needs in order to get the hardware to work. In addition, the customer can purchase an installation service or a cloud app (User interface for the data that the hardware produces). The Care bundle represent OaaS, Operations as a Service, model. The idea is that when the customer selects this bundle, the case company takes care of the hardware. The case company monitors the hardware 24/7/365, and if any anomalies or issues occur, the case company automatically detects and fixes them. If needed, the case company would repair or even replace the hardware without any additional fees. The same additional services as in the Hardware bundle also apply to the Care bundle. The Total bundle operates as a XaaS model. This means that, as already presented in the literature review chapter, the case company takes all the responsibility for installing, monitoring, maintaining, renewing the hardware, and the customer only pays monthly or yearly fees, which allows them to log into the Cloud app and see the data without needing to do anything else. In some situations, the customer does not even need to know what kind of hardware is installed and where because they can focus on dealing with the data they are getting. The Total bundle is only available in selected regions since installing and renewing the hardware requires a local presence, and the case company can only offer this bundle in regions where they have their own offices or some partner or sub-contractor who can take care of the hardware installation and renovation.

The second change that the proposed framework does is the owner for each service module. This ownership of service modules would enhance the management and development of the service modules. The named service module owner would also be a straightforward contact person inside the company for anyone who has any questions or uncertainties with the related service. The owner of each service module could also represent the service module and spread the information about the specific service inside the company. This would more comprehensively affect the service culture and how employees see the services and the value that the services create. The owner could better help sales and customers understand the benefits of a new type of services (OaaS, XaaS) by creating sales material, organizing trainings or by participating in customer meetings. Each named service module owner should familiarise themselves with the S-D logic theory and principles because it would give them a great new perspective to see the role of the services that they represent.

The third modification that the proposed modular service offering framework does is the method of handling any customisations. The make it as simply as possible, the proposed model does not allow any customisations, except for the on-demand services, in the service bundles or service modules. The bundles and modules always stay the same. The primary method for handling the customer's customisation needs is to suggest different service bundles for the customer. Because in the case of product X, customisation has a much more significant role, a “free selection mode” has been added to the framework. In practice, this means that in some cases, the sales personnel are able to freely select which individual service modules they include in a specific customer’s quote. With the product Y, this is not allowed.

The second method of better handling any customisation need is adding “Modular customised” modularity into both frameworks. In most cases, the service components are executed using standard operating procedures (SOP). However, if the customisation need can be argued well enough, it is possible to create and use a customised operating procedure (COP) to execute any service component. COP is a practical implication of the modular customised modularity that was introduced in chapter two. These customised operating procedures can be, for example, some unique way to contact customers, different remote monitoring service level agreements (SLA), or some specific installation method. COPs must always be created to be able to use as many different service modules and so many different products as possible. So COPs are not customer-specific customisations, but they must be adequately documented and distributed so that other services and product lines can benefit from any created COPs.

In summary, it can be stated that by using these two proposed frameworks, the case company could tackle some of the challenges that they have with the current service offering and enhance the value creation for the customers. The first change that the new frameworks made was the productised service bundles that will help the case company to communicate their service offering to the customers better. The second change for the current service offering was the deployment of the service module owners, which will help the management and development of the services. The last proposed change for the case company is to handle the customisations as low level as possible (At the service component level in this case) and not to do any customised service modules or bundles. This will improve the scalability of the services.

5. DISCUSSION

The fifth chapter is the discussion chapter, where the study delves into the results' meaning, importance, and relevance. The first two sections of the fifth chapter present the answers to the research questions, and the third section examines the additional question on why the modular service offering framework presented in chapter four would work or fail when implemented for wider organisational use in the case company. Table 5 summarises which chapter answers which questions.

Table 5. The discussion chapter sections and research questions

Section	Research question / Additional question
5.1 Use of S-D logic in manufacturing companies	RQ1: Would the utilisation of S-D logic increase the value creation for customers?
5.2 Service modularity and increased competitiveness	RQ2: Can companies increase competitiveness by implementing modularity into their service offering?
5.3 Broad deployment of the modular service offering framework	Additional question: What are the most significant challenges the case company would face if they take the proposed framework into broader usage.

The answers to the research questions and the additional question are formed based on the findings in the literature and the data collected during the two iterations round. The additional question is outside of the study's original scope and research questions, but it was included in the study because of its importance to the case company. In the interviews conducted during the two iterations round, a lot of data was collected related to this additional question, making it possible to include it in this study.

5.1 Use of S-D logic in manufacturing companies

The study shows that the utilisation of S-D logic would definitely increase the value creation for the customers. S-D logic would offer a new way of thinking and seeing the role and the importance of the services. By teaching and sharing the knowledge about the S-D logic around the company. The case company could improve the service culture among its employees. Employees could slowly start to see the value creation process a little bit differently and realise the service's full potential and not keep them only as add-ons to products. When employees understand and use S-D logic, they can better develop new types of services and figure out new ways to monetise the value that the traditional services are creating for the customers.

One considerable risk here is that it is often difficult to maintain two different logic in an organisation in parallel. Companies in their servitisation process face the risk of being trapped by two businesses. This risk is called the service paradox. Usually, the goods-dominant logic covers a much larger part of the organisation and has a much older and deeper tradition in the company. This creates an obstacle to developing a young and unfamiliar service culture. The risk is that the service culture will eventually fade, and the traditional strong manufacturing culture will leave behind the service business. However, the transition from G-D to S-D logic will not make traditional products obsolete but transform the strategic and operational logic by emphasising customers and services. The critical question is how the case company wants to position itself in value networks and what is its unique competitive advantage.

5.2 Service modularity and increased competitiveness

As stated before, service modularity is not suitable for nearly all companies or products. Its suitability depends on the company, customer segment, product type and many other factors. Implementing a new modular service framework for a new product is a vast process that – if not appropriately managed, may even decrease the company's overall competitiveness. Service transformation and implementing service modularity into the current service is often more prominent and challenging than expected and requires new capabilities, practices,

structures, and organisational culture that are not often the core competencies for a product-oriented company.

The study shows that in the case company's situation, the company could gain a competitive advantage and competitiveness by implementing service modularity into its current service offering. The service modularity is also needed in order to ensure the scalability and efficiency of the service offering, in the case of cheaper high-volume products. Product Y is an excellent example of this kind of product.

Nonetheless, the case company will sacrifice the ability to answer to every tailored need of customers. Even though the proposed modular service offering frameworks can handle and offer some level of customisation, they decrease the customisation capability significantly. For example, in the case of product X, where the volumes are relatively low, and customisations are highly valued, the service modularity would not increase the efficiency so much. However, also with product X, the well-productised service bundles would better promote and make the services visible to their customers. This eases the path for customers to move to use more comprehensive service bundles. The case company's business model and high product mix set rather complex demands for a general modular service offering framework. Due to this, it is not feasible to build and implement only one modular service offering framework for all the products, but rather create separate frameworks for all different product lines.

The most important thing is to understand that service modularity is not a shortcut to happiness, and successful implementation requires resources as well as attention from the company's management side.

5.3 Broad deployment of the modular service offering framework

In the beginning, it is almost always worth starting the transition towards a more modular service offering in the few selected products lines. When a company, the case company or some other traditional manufacturing company, plans to deploy S-D logic and modular service offering framework into multiple product lines, it will most likely face multiple new challenges.

Based on the interview conducted during the study, three key challenges were identified, which the case company should consider when starting the broader implementation of the suggested modular service offering framework. All the key challenges and how many times they were mentioned during the interviews are presented in Table 6. During the interviews, a total of 31 different challenges with the broader modular service offering framework deployment were mentioned. Nine of the mentioned challenges were managed to combine with the challenges introduced in the table below, and the rest were only mentioned 1-3 times, so they are left entirely unprocessed. The goal of this section is not to solve any of the found challenges. This section aims only to discover the key challenges and make them visible to the case company.

Table 6. Key challenges for broader deployment of the framework

Challenge	Times mentioned
Resource limit – Where to implement S-D logic and service modularity first	12/16
Culture change – How to get employees to increase their service-oriented mindset	8/16
New KPIs – How to measure the success and show the value of services	7/16

The challenge that was mentioned the most is resource limits. It is almost self-evident that implementing the modular service offering into broader usage is a significant change for any organisation and takes a lot of resources. For example, human resources, infrastructure support and changes to management systems are needed. When the company resources are always limited, the company must carefully assess where to allocate the resources. Before making any quick decisions, the company should first deeply analyse the markets and try to figure out which products and segments would be most attractive and provide the most promising growth opportunities to start the utilisation of service modularisation. There is no point in implementing service modularisation to product lines or business segments where it would not clearly pay off. Based on this study, it can be stated that the service modularity would pay off particularly well with cheaper high-volume products. This study does not touch this challenge any further, but the case company must assess it by themselves.

The second most noted challenge was that in order to successfully implement S-D logic and service modularity into the case company, a significant culture change must happen. This kind of major cultural change is a slow and demanding process that does not happen by itself overnight but needs extra effort and attention. The prevailing ways of thinking and operating are often a problem for product-based companies when moving into more service and solution-based business models. The service business is often more CAPEX focused and requires a much faster clock speed than ordinary goods dominant business. One method of reinforcing the culture change is by having a solid and clear service strategy that encourages the company and the employees to make the appropriate organisational arrangements and take the time to learn new ways of thinking. The critical question is whether a manufacturing company will be able to embrace value-based service thinking quickly and become service-minded organisations where services are seen as a key differentiator factor. In the end, it is not enough for the companies to have a service-oriented mindset and capabilities as the customers' mindset and capabilities have to be aligned with the companies' ones as well. Changing the customer's mindset is an even more intricate and slow process that can take decades.

One very big and the third most mentioned challenge during the interviews is that when/if leaping to a more service-dominant business and more modular service offering, the old KPIs are not so relevant anymore. In order to measure the success of the modular service offering framework and the service business in general, the case company would need a set of new KPIs. Exploring and implementing the right set of KPIs needs considerable effort and could be a topic for another master's thesis. Good candidates to measure success in a service business are, for example, Customer Acquisition Cost (CAC), Annual Recurring Revenue (ARR), and Net Revenue Retention (NRR). New relevant measures should be introduced to the customer also. To help the customers understand and evaluate the value created by the services, such indicators as Total Cost of Ownership (TCO) and Customer Lifetime Value (CLV) could be used.

6. CONCLUSIONS

The sixth chapter summarises how well the study answers the research questions and achieves its objectives. It also summarises all the main results and the practical contributions of these findings. In addition, the chapter introduces the research topics and areas that should be dealt with in the future.

6.1 Summary of the research findings

This study makes many observations and findings. Some of the findings and conclusions are common for all manufacturing companies that are currently planning or even already starting their transformation from G-D logic towards more S-D logic-based business models, while some conclusions are only valid in the case company's situation. The three most important research findings are listed below. These three conclusions are made from the case company's perspective, and the inference that they would work in every situation cannot be drawn straight away.

- By utilising S-D logic, the company can better understand the role and importance of the services and how they are creating value for the customers and thus, it enables the company to improve its overall value creation process.
- Service modularity could assist the case company to reduce the complexity of the service offering and improve the services' scalability. Through this, the case company can increase its competitiveness.
- In the case company's situation, it is not feasibly to create a one-size-fits-all modular service offering framework for different product lines, but separated frameworks are needed in different product lines.

In final summary, it can be said that S-D logic and service modularity can definitely help companies enable their competitiveness and improve them to grow the value creation for the customers. However, the chances of success and the magnitude of the benefits to be achieved depend strongly on the company and the product in question. For example, in the case company's situation, it was shown that the S-D logic and service modularity would benefit the product Y much more than the product X.

Nevertheless, nothing comes easy, and companies must understand that the journey to well working modular service offering, which would redeem all these promises, is not straightforward but long and laborious. Although some financial investments are certainly needed in the process, it is mostly a matter of having visionary people in the company with an understanding of what it takes to develop the company to operate in a more service-oriented way and the courage and strength to implement these people's visions.

6.2 Next steps and future research

Due to time constraints, the study could not observe any natural market/customer response to the suggested frameworks. This is why a broader and more profound real-life test case is a subject for future research. A test case or a trial usage of a modular service framework in the case company would provide much more valid data and help further develop the modular service offering frameworks. After a real-life test case, based on potential business value, the following product lines and customer segments could be selected to implement the service modularity.

From the academic perspective, the most tempting future research topic could be to examine the usage of S-D logic and service modularity in various fields, and not just in the context of manufacturing companies.

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Appendix 1: Interview template

Theme 1- Current status of case company's service business

- The current status of the case company's service business, in the interviewees' own words
- Most critical challenges and pain points at the moment
- Tracked KPIs and strategic targets
- Company's service culture, service-centric mentality

Theme 2 – Future of service business

- Servitisation
- Future market trends, customers needs and competitors' plans
- Case company's future service business strategy
- The role of eCom in the future service business

Theme 3 – Service value creation

- Service-dominant logic, the benefits and disadvantages
- Value proposition
- Value creation
- Value capturing

Theme 4 – Service modularity

- Service modularity, the benefits and disadvantages
- Service modularity at the sales phase and the delivery phase
- Meaningful service bundles
- The level of requisite customisability
- Scalability
- Service offering & portfolio management

