

UNIVERSITY OF JYVÄSKYLÄ
School of Business and Economics

Value co-creation in smart metering business

Master's Thesis, Marketing

Author: Liina Lehtonen

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Supervisor: Outi Uusitalo

ABSTRACT

Author Liina Lehtonen	
Title Value co-creation in smart metering business	
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<p>Abstract</p> <p>Understanding what customers need and being able to create superior customer value is a key question in marketing. Relationship between the parties has raised its importance as a value enabler instead of tangible products. Recently, more and more emphasis has been put to value co-creation i.e. studying how the supplier and a customer may create value together. There is a lot of research available on interactive processes between parties and enablers of value co-creation but there is a need for practical studies from different business areas to get more concreteness into value co-creation process.</p> <p>Main goal of this study is to clarify what capabilities and interactive practices between the technology supplier and its customers enable and support value co-creation in smart metering context. Additional research topics are perceived value of customers and comparison of relationship and value co-creation with two different customer groups: service providers and distribution system operators (DSO). This is a case study where case company is a smart metering technology supplier. Research method is semi-structured interview and for the case study 7 customers of the supplier and 3 supplier representatives were interviewed. The theoretical framework used in this research is based on value co-creation model by Marcos-Cuevas et al. (2016) with additions from model by Grönroos and Voima (2013).</p> <p>Results of this study highlight two things that customers name as key enablers for value co-creation. One is a trusted relationship which has evolved over years and enables open co-operation between partners. Other is the supplier's understanding on customer's business and capability to build innovative solutions to fulfill their needs. These things are related to individuated capabilities of the supplier's individual persons as well as relational and concerted capabilities of the organization. These two key enablers also set basis for linking and institutionalizing practices that promote value co-creation to take place. Results of this study are in-line with findings in earlier research on value co-creation. Via this study we strengthen the value co-creation theory with empirical results from a new business area, smart metering, which has special characteristics due to regulation and monopoly position of distribution system operator.</p>	
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<p>Tiivistelmä</p> <p>Asiakkaiden tarpeiden ymmärtäminen ja arvon tuottaminen asiakkaalle ovat markkinoinnin kulmakiviä. Asiakassuhteen tärkeys arvon tuotannossa on kasvanut samalla kun fyysisen tuotteen merkitys on vähentynyt. Viime vuosina on kiinnitetty entistä enemmän huomiota siihen, miten yritys ja asiakas voivat luoda yhdessä arvoa. Tieteellisissä tutkimuksissa on esitetty useita malleja siitä, mitkä asiat edesauttavat arvon yhteisluomista. Edelleen kaivataan lisää erityisesti empiiristä tutkimusta siitä, miten arvon yhteisluominen tapahtuu käytännössä erilaisissa liiketoimintaympäristöissä.</p> <p>Tämän tutkimuksen tavoitteena on selvittää, mitä on asiakkaan kokema arvo ja miten arvon yhteisluominen tapahtuu älyverkkoliiketoiminnassa teknologiatoimittajan ja sen asiakkaiden välillä. Erityisesti tutkimuksessa keskitytään siihen, mitkä toimittajan kyvykkyydet ja toimintatavat edesauttavat arvon yhteisluomista. Tutkimus on laadullinen tapaustutkimus, jossa tutkitaan yhden teknologiatoimittajan ja sen asiakkaiden, joita ovat sähköverkkoyhtiöt ja palveluntarjoajat, välistä arvon yhteisluomista ja asiakkaiden kokemaan arvoa. Tutkimusmenetelmänä on puolistrukturoitu haastattelu ja tutkimuksessa on haastateltu seitsemää (7) asiakasta sekä kolmea (3) yhtiön omaa henkilöä. Tutkimuksen teoreettinen viitekehys perustuu Marcos-Cuevas ym. (2016) sekä Grönroosin ja Voiman (2013) arvon yhteisluomisen malleihin.</p> <p>Tuloksissa korostuu kaksi asiaa, jotka asiakkaat nimeävät tärkeimmiksi arvon yhteisluomisen mahdollistajiksi. Tärkein on luottamuksellinen suhde osapuolten välillä, joka on kehittynyt vuosien yhteistyön tuloksena. Toinen on toimittajan ymmärrys asiakkaan liiketoiminnasta ja kyky luoda innovatiivisia ratkaisuja asiakkaan tarpeisiin. Näitä edesauttavat sekä toimittajan avainhenkilöiden yksilötaidot että toimittajan organisaation kyky hoitaa asiakassuhteita ja ottaa asiakas mukaan arvon yhteisluomiseen. Edelleen, nämä asiat mahdollistavat asiakkaan ja toimittajan linkittymisen monella eri tasolla sekä organisaatioiden väliset prosessit ja yhteiset toimintatavat. Tutkimuksen tulokset ovat linjassa aiempien arvon yhteisluomisen tutkimusten kanssa ja tällä tutkimuksella vahvistamme arvon yhteisluomisen teoriaa tarjoamalla empiirisen tutkimuksen uudella älyverkkojen toimialalla, jolla on erityisominaisuuksia toiminnan sääntelyn ja toimialan monopoliaseman vuoksi.</p>	
Asiasanat Asiakkaan kokema arvo, arvon yhteisluominen, älyverkkoliiketoiminta	
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ABBREVIATIONS

AMI	Advanced Metering Infrastructure
AMS	Advanced Metering System
DSO	Distribution System Operator
G-D logic	Goods-Dominant Logic
KIBS	Knowledge Intensive Business Services
S-D Logic	Service-Dominant Logic
SP	Service Provider
HES	Head-End System

1 INTRODUCTION

1.1 Background

How to create superior value to customers is a crucial question to firms and its importance has increased over years. Understanding what customer needs and what provides value to the customer is the basis for providing successful customer solutions and can be a key differentiator to the firm on market (Norman & Ramirez 1993; Woodruff 1997; Tuli et al. 2007; Geraerds 2012). In marketing research, customer value creation is one of the key topics and it has been studied widely from different perspectives. Still, definition of value is not trivial as it is subjective what different people find valuable (Eggert & Ulaga 2002; Sanchez-Fernandez & Iniesta-Bonillo 2007).

During the years, viewpoint of customer value creation has evolved from product and supplier-centric to customer-centric. When traditionally, thinking was that the firm defines and creates value for the customer with the delivered products, in 1990's several researchers started to question this and presented views that value is not only created by the firm, but it is actually created by customers (Grönroos 1997; Normann & Ramirez 1993).

In 2004, Vargo and Lusch (2004) introduced a Service-Dominant Logic (S-D logic) emphasizing the interaction between the firm and the customer and value of knowledge, processes and resource given to other party. According to S-D logic, company offers the value proposition to the customer, but the real value is created by the customer when using the product. (Vargo & Lusch 2004).

In recent years, value co-creation has been actively studied in marketing research in both B2B and consumer markets. In this study, the focus is in B2B value co-creation. There is a large amount of fresh research articles available in this area (Hakanen & Jaakkola 2012; Grönroos & Voima 2013; Vargo et al. 2015; Skålen et al. 2015; Kohtamäki & Rajala 2016) but there is still room for further research. There is a wide range of theoretical articles available on value co-creation models and processes, but amount of empirical studies is still limited although they exist (Cova & Salle 2008; Grönroos & Helle 2010; Skålen et al. 2015; Hakanen & Jaakkola 2012; Marcos-Cuevas et al. 2016). More empirical research from different business areas has been requested in several research articles to get more in-depth understanding of interactive processes where value is (co-)created and what kind of value is provided to different actors during the process.

Kohtamäki and Rajala (2016) name specifically smart grids and electronical networks as an interesting area for study as the smart grid business is experiencing big changes. Another research direction suggested for further study has been to extend the value co-creation research from dyadic (supplier-customer) value co-creation into larger community or ecosystem where there might be more than two actors in value co-creation process (Kohtamäki & Rajala 2016).

This study contributes to the requested study topics in several ways. First, it introduces a case study on value co-creation in smart metering business and thus contributes to the request to get more empirical studies on value co-creation in different business areas and especially in rapidly changing business areas like smart metering. Secondly, the study will contribute to value co-creation in ecosystem research as the case study will compare value co-creation in dyadic supplier-customer model and in supplier-service provider-customer model.

1.2 Research problem

This study provides a practical view to perceived value and value co-creation in smart metering business ecosystem between the technology supplier and its customers. The study increases understanding on the value co-creation process between different actors and aims to open what things in interaction between the actors are important to promote value creation.

The main research question in the study is

- What capabilities and interactive practices between the smart metering technology supplier and its customers enable and support value co-creation?

Secondary research questions are

- What kind of value customers perceive from the technology supplier in smart metering context?
- Are there differences in the value co-creation processes in dyadic supplier-customer case and in triadic supplier-service provider-customer case?

This study is qualitative research in nature and uses case study approach as a research method. This approach was selected as aim of the study is to get thorough understanding on what customers of smart metering supplier find valuable and how value is co-created between the supplier and its customers. Different sources of information are used in this study, which is typical for case study research (Eriksson & Kovalainen 2016). The main research method is a semi-structured theme interview. In total, 10 key persons from Distribution System Operators (DSO) and service provider (SP) customers and from the case company are interviewed. As secondary sources of information, various documents of case company like customer satisfaction survey, process documents and meeting minutes are utilized as data sources. As the writer of this study works in the case company and is involved closely with customers,

personal observation with active participation in both internal and customer meetings is one source of information.

Note. The case study of this research studies ecosystem of smart metering business. However, it does not cover the whole ecosystem and all its actors in detail but focuses to technology supplier and its customers: service providers and DSOs. Furthermore, focus is in technology supplier's relationship and value creation with their customers, not relationship between DSO and service provider.

1.3 Main terms

Value

In this study, value is considered in B2B context and from customer point of view. Customer value has many definitions but there seems to be consensus that customer value is a trade-off between benefits that customer receives versus price or sacrifices customer is giving (Zeithaml 1988; Flint et al. 2002; Woodruff 1997). 'Benefits' can include both monetary or other concrete benefits (cost savings, more revenue), but also non-measurable benefits (efficiency, safety, brand value). 'Sacrifices' can include e.g. price, other monetary cost or resources. Perceived customer value is always subjective and therefore interaction between a supplier and a customer is mandatory to understand what customer values. Customer value is also changing over time as new customer requirements emerge and old ones vanish. Therefore, continuous interaction with the customer is necessary for the supplier to understand what customer value (Woodruff 1997).

Geraerds (2012) summarizes customer value in following way which is adopted as definition of customer value for this study: Customer value is the ratio of perceived benefits received by the customer relative to the sacrifices given in terms of price paid, costs taken place and efforts spent to acquire the product.

Value co-creation

Value co-creation is an interactive process where value is created by two or more actors together. Theoretical background of value co-creation is based on service-dominant logic (S-D logic) introduced by Vargo and Lusch (2004). Cornerstone of S-D logic is that the supplier can't provide real value to the customer when delivering the product but that the real value is generated in customer's own business processes when using the product. Supplier may also participate and assist customers in real value creation. Co-creation opportunities that suppliers get are strategic options for them to create customer value (Payne et al. 2008).

Interactive processes between a supplier and a customer which enable and promote creation of customer value fulfillment have been studied in many value co-creation articles (e.g. Grönroos & Voima 2013; Heinonen et al. 2010).

Interaction is focused on customers' value creation and value fulfillment, and moreover, it enables the firm's co-creation of value with its customers (Grönroos 2012).

In this study, co-creation of value is defined as joint collaborative activities by parties involved in direct interactions, aiming to contribute to the value that emerges for one or both parties (Grönroos 2012).

Value ecosystem

Value ecosystem or value network is referring to a group of actors in business environment who are commonly creating valuable solution for the customer. Typically, it consists of suppliers, service providers and a customer. It may also include any other actors of the ecosystem. Value ecosystem as a concept is quite recent and the research related to it has emerged lately. However, as creation in communities have become more and more important in the society, also in business the ecosystem thinking has evolved. Especially in complex societal and scientific challenges, organizations are looking for co-operation opportunities beyond their traditional partners to find new innovative product solutions (Reypens et al. 2016).

In value ecosystems multiple, diverse stakeholders are working together to co-create innovative value. Co-creation in a network creates also new challenges in terms of changed processes and outcomes. Because value co-creation in a network is more ambiguous and value perceptions are likely to differ between partners, new insights are required to determine which outcomes drive effectiveness in multi-stakeholder collaboration (Reypens et al. 2016).

In this study, value ecosystem term is used to denote the set of actors, that are connected to each other for the purpose to integrate their resources to co-create value through solutions (Jaakkola & Hakanen 2013).

1.4 Structure of the study

The structure of the study is seen in Figure 1. After this introductory chapter, theoretical framework of the study is presented. It summarizes findings of value co-creation research and considers value creation themes relevant to this study in more detail. After theoretical part, business environment of smart metering is introduced to give overall understanding on case study business environment. Case study chapter first introduces the case company and its customer environment. Then, the actual empirical study is presented starting from research method and continuing with data collection and analysis of the data. Last chapter concludes the study. It summarizes the results and their contribution to research and business and gives further directions to the value co-creation research.

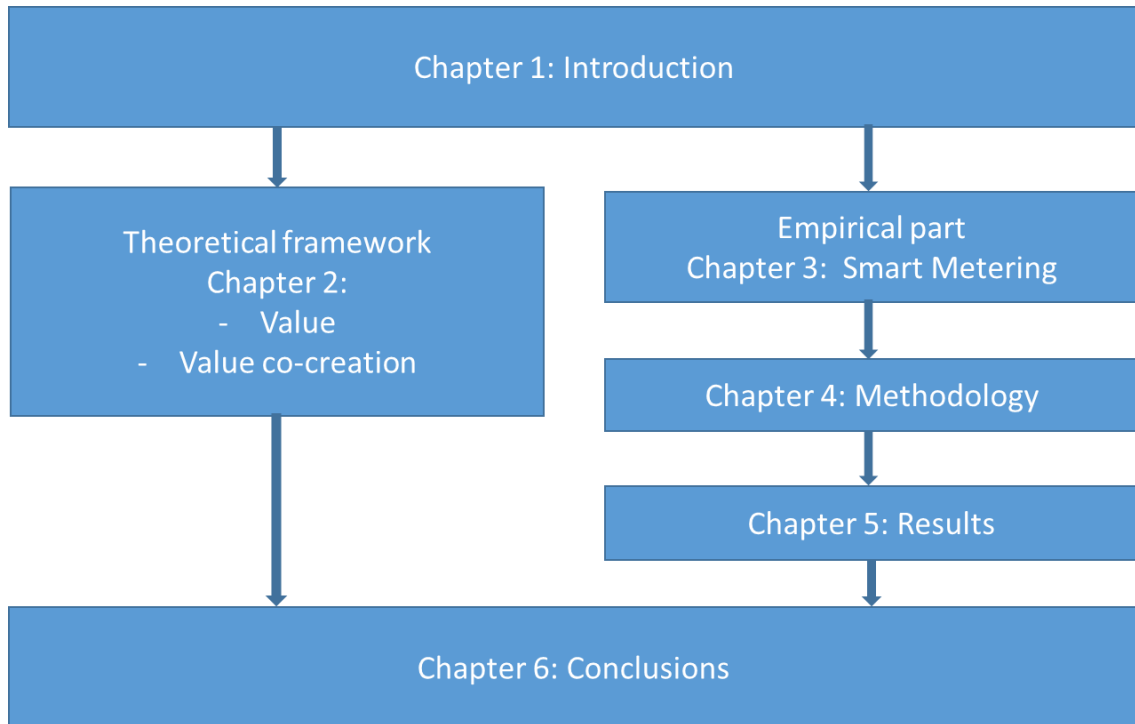


FIGURE 1 Structure of the study.

2 VALUE CREATION

In this chapter, customer value and value co-creation between the supplier and the customer is being analyzed from different points of view. First, concept of customer value and its meaning is discussed. Creating customer value is the key target for firms but to do it, is crucial to understand what customers find valuable. Next, value co-creation research based on service-dominant logic is discussed. S-D logic approach focuses on value-in-use i.e. customer value creation in the phase when customers are using the delivered solution. Then, value creation process between the supplier and its customers is discussed from relationship marketing point of view. In this chapter, interactive process between the supplier and its customers is discussed in more detail. Elements and actions enabling supplier to be involved in the value creation process of the customer is presented.

This chapter also discusses value co-creation in two special contexts. First, value co-creation in service innovation context is considered. Secondly, value co-creation in ecosystem having more than two actors is discussed. Most of value co-creation studies and models handle value co-creation from dyadic, supplier-customer perspective, but research considering multi-actor business ecosystems has started to emerge as in many cases, there are multiple actors present in the business value networks. Finally, theoretical framework for the value co-creation study in this context is presented.

2.1 Customer value

Particularly in B2B markets, customer value is regarded as the cornerstone of the marketing management. Understanding what customers value and being able to create superior customer value is a key to a company's long-term survival and success (Woodruff 1997). Even if the importance of customer value is agreed among marketing professionals, it is not trivial to define what customer value is. Customer value means different things to different people as value is the outcome of an evaluative judgement (Sanchez-Fernandez & Iniesta-Bonillo 2007). The value of an offering is relative to an individual customer's subjective perceptions and experiences (Eggert & Ulaga 2002). So, perceived value is not same for everyone, but each person experiences it in his/her own way. Another thing to be noted is that value creation is a moving target, whereby new expectations are aroused, and old value concepts are commoditized (Geraerdt 2012). Also Flint et al. (2002) point out that perceived customer value is not remaining the same but is dynamic and continuously changing. This means that it is not enough for suppliers to understand their customer expectations and value creation logic only at one point of time, but suppliers need continuous interaction with the customer to really understand what customers find valuable at each time.

In marketing research, there is some deviation in definitions of customer value. For example, Zeithaml (1988) defines value as consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given. According to Flint et al. (2002), customer value involves trading off benefit versus sacrifice experiences within use situations. Anderson and Narus (1998) defines that value is what a customer gets in exchange for the price it pays. Geraerds (2012) defines customer value as a ratio of perceived benefits received by the customer relative to the sacrifices given in terms of price paid, costs taken place and efforts spent to acquire the product. This definition of value is adopted in this study.

Woodruff (1997) lists some characteristics of customer value. First, it is linked through use of some product. Secondly, it is something perceived by customers rather than objectively determined by a seller. In addition, these perceptions typically involve a trade-off between what the customer receives and what the customer gives to acquire and use the product. (Woodruff 1997). Even if different definitions of value exist, there seems to be consensus that customer value is a trade-off between benefits that customer receives versus price or sacrifices customer is giving (Zeithaml 1988; Flint et al. 2002; Woodruff 1997, Geraerds 2012). It is to be noted, that both 'benefits' and 'price and sacrifices' that customer experiences are to be seen broadly. These may be direct like the price compared to competitors, but they can also be intangible and indirect.

Often the first association to value is monetary value. In its most trivial case it is the price of the product compared to other similar products on market. In B2B, however, product price is not often the most important part of value although it is not negligible. Financial value is important in business, but it may include variable elements which are not necessarily directly measurable. Perceived customer value can be more revenue enabled by the product or service, or cost savings aimed by the product. When impact of product or service to costs or revenue is known, the financial value can be measured. Quite often it is not trivial to even measure exact monetary value as many things may have impact to financial result.

In addition to price, the product itself has been traditionally seen as a main source of value. Naturally it is important that functionality and quality of the product fulfills the needs of the customer. In most cases, product or service is an enabler for value creation and the real value is built indirectly through the benefits that customer gets when using the product. Sometimes it is possible to measure benefits, e.g. when a software product provides a new way to fix some network issues remotely which required previously fieldwork and customer can measure the cost savings achieved by the change. In many cases, though, the value created to the customer by the product is not straightforward. For example, if a supplier provides a new product feature that enables customer to take more efficient maintenance process into use and at the same time whole process is reviewed and multiple improvements is made to the process, it is challenging to

measure what part of achieved benefits is due to the new product and what part is due to other improvements made to the process.

Even if concrete things like a product itself and price of the product are value elements to customers, they have become less important differentiator in B2B context (Ulaga & Eggert 2006). At the same time, customer relationship and continuous dialogue with the customer has become more and more important. The supplier's ability to maintain active dialogue and interaction with the customer increases its potential to support the creation of value-in-use (Grönroos 2008).

Measuring customer value is not easy, but it is very important to the technology supplier to be aware of potential sources of customer value. Anderson and Narus (1998) state that value elements can include anything that affects to costs and benefits of customer's business and may include technical, economic, service and social elements. Different categorization models have been proposed over time in various articles (e.g. Ulaga & Eggert 2006; Lindgreen & Wystra 2005; Lapierre 2000). Lindgreen and Wystra (2005) state that there are two levels for modelling value: value of products and services, and value of relationship. Lapierre (2000) has divided customer value into three categories: product, service and relationship for value. Based on that division, example value items are listed in Table 1.

TABLE 1 Value categorization model.

Value category	Examples of value elements
Product	Product features Product quality Product customization
Service	Operational efficiency Responsiveness Reliability Competitiveness
Relationship	Trust Innovativeness capability Commitment Shared values

2.2 Service-Dominant logic

Already during 1990's, several researchers started to question traditional thinking where the supplier defines and creates the customer value and exchanges the value to customers with the products (Woodruff 1997; Normann

& Ramirez 1993). According to the traditional model, tangible goods are the center of the offering even if there were some intangible things offered to the customer as added value services. This thinking was challenged by researchers who highlighted the importance of close interaction between the firm and customers in value creation. They also brought up that value is not only created by the supplier, but that customers create value themselves when using the products. (Woodruff 1997; Grönroos 1997; Normann & Ramirez 1993).

As a continuation to this awareness of customer's prominent role in value creation, Vargo and Lusch (2004) introduced a new marketing model called Service-Dominant logic (S-D logic) which has had a significant impact to value creation and value co-creation research ever since. S-D logic model supports many findings of earlier relationship marketing researchers and contains earlier presented perspectives on the importance of intangible knowledge resources, communicative interaction and interactive processes, but provides a new approach to the value creation research by bringing up strongly service orientation in customer relationships and value creation when using the product i.e. value-in-use (Ballantyne & Varey 2006). Vargo and Lusch (2004) emphasized that the term 'service' in S-D logic model doesn't refer to services or service products provided to the customer, but that the service is an application of competences like skills and knowledge by one entity for the benefit of another.

TABLE 2 Key differences between G-D and S-D logic.

	Goods logic	Service logic
Central focus of logic	Producing something (goods or services)	Assisting customers in their own value-creation processes
Value	Value is produced by supplier	Value as co-created
Role of customer	Customers seen as isolated entity and recipient of goods	Customer is the co-creator of value. Marketing is an interactive process with the customer.
Firm resources	Primarily as operand	Primarily as operant

With S-D model, Vargo and Lusch (2004) wanted to differentiate from the traditional model, which they call Goods-Dominant Logic (G-D Logic). In G-D logic a supplier is considered as the value creator and tangible goods are the center of customer value even if there might be some added-value services provided to customers as part of the product offering. According to S-D logic, however, the purpose of firm's activities is to provide something (goods or

services) to a process of assisting customers in their own value-creation processes. Real value is something co-created with the customer and other value-creation partners, not by the firm alone. (Vargo & Lusch 2008b; Vargo et al. 2008). There is also a difference in resources that firm provides. In G-D model the resources are mainly operant resources i.e. tangible resources that require some action to be performed on them to have value (e.g. products, people). In S-D logic the focus is in operant resources i.e. invisible resources that can be used to benefit the customer (e.g. human skills and knowledge) (Vargo & Lusch 2011). Key differences of G-D logic and S-D logic based on Vargo and Lusch (2004) are collected to Table 2.

S-D logic emphasizes the role of a customer in value creation and states that the supplier can't create real customer value but only value proposition. Perceived (real) value is created only by a customer when using the product (Vargo & Lusch 2008b). Based on S-D logic, customer is always involved in value creation, but value is not created necessarily by the customer alone. Value can also be co-created by the supplier and the customer in an interactive process. Vargo and Lusch (2008b) defines that value co-creation can take place when the service is given to other party in an interactive process. Without interaction between parties, value co-creation is not possible.

2.3 Value co-creation

2.3.1 Roles of actors and value-creation domains

Cornerstone of S-D logic was to replace value provisioning with value co-creation in business strategy (Karpen et al. 2012). Since service-dominant (S-D) logic was published, it has been the basis for main stream of value co-creation research. After the original S-D logic model, the model has been analyzed and enhanced further by both the original authors (Vargo & Lusch 2008a; Vargo & Lusch 2008b; Vargo & Lusch 2011; Vargo & Lusch 2016) as well as other researchers (e.g. Grönroos 2008; Grönroos 2011; Gummesson 2007).

Grönroos (2011) elaborates that the focus of S-D logic is in the concept of value-in-use and thus, it differs from some other relationship marketing studies where the value creation is handled as an all-encompassing interactive process including the whole lifecycle of products/services from development to use phase. Grönroos (2011) points out the difference between these two approaches and emphasizes value creation as customer's creation of value-in-use. The whole process that leads to customer's value-in-use is needed to enable value creation, but all parts of it are not part of value creation for the customer. (Grönroos, 2011).

Grönroos (2008) and further Grönroos (2011) have analyzed the roles of a customer and a supplier in different phases of value creation process and clarifies concepts 'value-in-use' and 'value-in-exchange' from value creation perspective. It also combines the value creation and production view during the process as production process is considered as part of potential value generation process

(Gummesson 2007). The model about the supplier and the customer roles adopted from Grönroos (2011, 283) is presented in Figure 2.

In production phase, including development, design, manufacturing and delivery of the product, the supplier is the main process owner. In this phase, from value perspective, the supplier creates value proposition and value-in-exchange for the customer but can't create real value. Activities in production phase are called value facilitation and accordingly, supplier is a value facilitator (Grönroos 2011). The production phase may be handled by the supplier alone, but the customer may also be involved. When interaction between the supplier and the customer takes place, the customer becomes from the supplier's perspective as a co-producer and contributes to the value proposition creation.

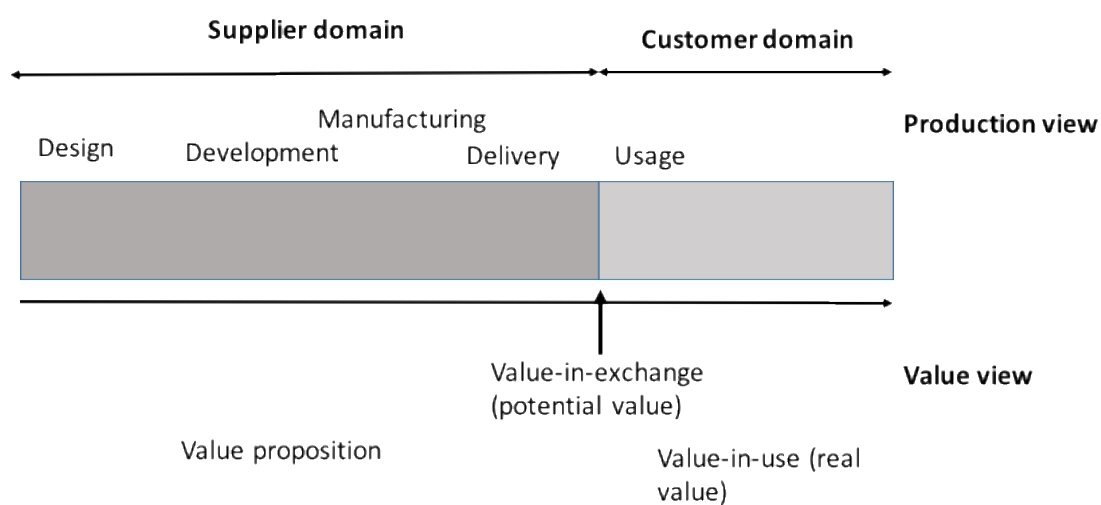


FIGURE 2 Customer and supplier roles in value-creation process.

In use phase, when product or solution has been delivered to the customer, the potential value is handed to the customer who may change it to real value when using the product. However, if the customer is not able to get value from the solution, then value proposition may not realize at all or realizes only partly. It is also to be noted that value realization doesn't happen at once but cumulates over the lifetime of the solution. Customer owns the process in use phase and can decide if they want to share this phase with the supplier. For the supplier, acting as a value facilitator in use phase means possibility to get involved in customer's life and to influence customer's usage processes (Heinonen et al. 2010; Grönroos 2011). Because usage at the same time is value creation for the customer, the firm gets an opportunity to take part in customer's value-creation process as co-creator and the firm becomes value co-creator.

Grönroos and Voima (2013) continues to analyze the roles of a supplier and a customer and presents analysis on value (co-)creation domains and interaction between actors. They divide value creation into three spheres or domains: supplier domain, customer domain and joint domain. This model is presented in Figure 3.

In supplier domain, the supplier is the owner of domain owning activities and processes. The supplier may create potential value to the customer in this domain but not realized customer value as customer is not involved in the process.

In joint domain, the customer and the supplier are in interactive process with each other and may create value together. In this domain, the customer is the main creator of real value, but the supplier can act as a co-creator of customer value when the customer involves the supplier into value creation process and the supplier has resources and knowledge to take that role. According to Grönroos and Ravald (2011), the supplier gets opportunity to influence the value creation process via interaction with the customer, and in the best case enhances the level of value that the customer creates out of a service activity or a good. Interaction can contribute to other direction, from the customer to the supplier, as well. During the interaction between parties, customer can act as a co-producer in supplier's product/service development process. Joint domain is the only domain where value co-creation may occur as value co-creation requires always direct interaction between parties. (Grönroos & Voima 2013). So, tight interaction creates opportunity to benefit both actors in several ways. The supplier gets to understand customer's value creation process better and can improve their offering to fulfill customer's expectations. They may also contribute to customer's value creation and help customer to utilize their service offering in an optimal way. For the customer, interaction provides a way to get better products for their needs in the future and potentially to enhance their perceived value.

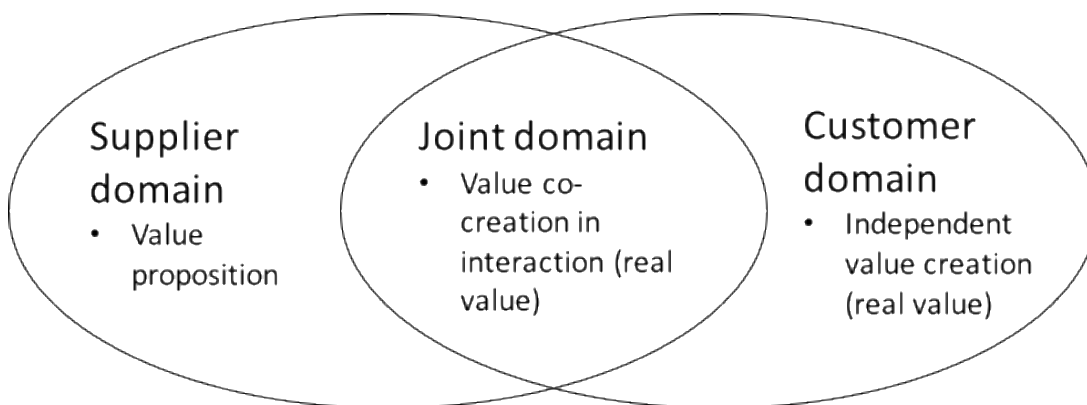


FIGURE 3 Value creation model by Grönroos & Voima (2013).

In customer domain, customer creates the real value by using the product in his/her environment (including processes, people, physical conditions etc.) independently. However, there can be multiple contributors in this domain as well including different actors in customer's ecosystem. (Grönroos & Voima 2013).

Couple of things are important to notice when interpreting the model by Grönroos and Voima (2013). First, one could interpret domains to be chronological starting from supplier's domain and ending to customer's domain,

but that is not necessary. They can, and often do, happen concurrently. So, at the same time when there is joint interaction between actors, customer and supplier have their own processes in progress in their own domains.

Secondly, the size of joint value creation domain compared to other domains may be smaller or larger depending on case. When parties have comprehensive interaction between each other, the joint domain is larger than in the case when parties work more separately. Large joint domain offers opportunities for successful value co-creation, but success depends not only of amount of interaction but on how well interaction works.

2.3.2 Value co-creation models

When a company understands which things creates value to customers, the next thing to analyze is how value is created and delivered to the customer (Lindgreen & Wystra 2005; Flint et al. 2002). Even if value creation has been in the core of marketing research for a long time, our knowledge on value creation process is limited: when it starts, what it includes and when it ends (Grönroos 2011). Understanding the factors and the dynamics of value creation process is of crucial importance in b2b relationships for the supplier both from the theoretical and for practical point of view. Gaining the needed understanding requires in-depth knowledge on how customers think and how their processes work (Gummesson & Mele 2010; Ulaga 2003).

There are two topics highlighted consistently in the value creation process literature: interaction with the customer and the relationship between the supplier and the customer. These two things are tightly related to each other as without interaction between parties the relationship cannot evolve. Ballantyne and Varey (2006) point out that relationships are always present when there is an interaction between two or more parties, but the relationship alone is not valuable. It is the quality of relationship between parties that is meaningful. The quality of relationships is derived from the experience of interacting together over time and the quality of relationship is something that can be managed by parties. How to keep quality of relationship high and develop it further is a consequence of learning together over time. (Ballantyne & Varey 2006).

To implement S-D logic and reach value co-creation in practice, strategic decisions are needed in supplier's side. It requires orientation of supplier organizational behavior towards customers and includes building skills and competences as well as practices which support S-D logic deployment (Karpen et al. 2012).

Beverland (2012) presents value creation in a supplier-customer relationship as a high-level model with three main stages of and practices between them. The process is presented in Figure 4. First pre-requisite for value creation is the value orientation of the supplier meaning focus in truly understanding the logic of customer's business logic and its limitations and benefits and thus, going beyond expressed customer needs (Terho et al. 2012). Value orientation directs suppliers' focus to strategic capabilities that are service-driven and shown in organizational actions (Karpen et al. 2012). Empirical study

by Terho et al. (2012) studying value based selling stresses that understanding the customer's business model in depth enables a salesperson to identify the most important value drivers and to make a value proposition adding substantial value to a customer's business and to differentiate from the competitor's offering.

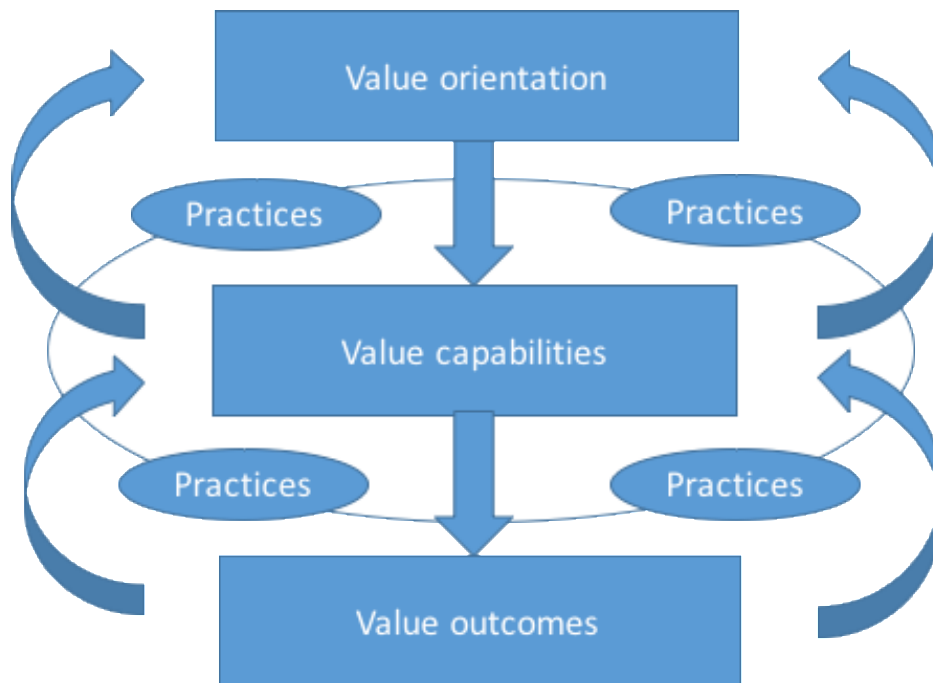


FIGURE 4 Value creation model by Beverland (2012, 9).

Second stage is capabilities of the supplier to support value creation to and with the customer. This requires focus and often investments to core capabilities of the firm like innovation, market sensing, and key account management (Beverland 2012).

O'Cass and Ngo (2012) name two main capabilities required from a market-oriented supplier to refine identified customer needs into deliverable value: product innovation and marketing capabilities. Market-orientation of B2B firms acts as a key market sensing capability, and their marketing and product innovation capabilities act as key market-relating mechanisms. Implication of this is that suppliers need to strategically develop and manage product innovation and marketing capabilities as those are essential for superior value creation. (O'Cass & Ngo 2012).

Ballantyne and Varey (2006) identifies three enablers between a supplier and a customer supporting value co-creation in use phase. They are relating, communicating and knowing. These are very much linked to capabilities of a supplier to keep up and develop relationship with the customer which then enables and facilitates value co-creation between the parties. *Relating* refers to capability to build well working relationship with the customer for creation of knowledge resources that can be used for common value creation. Quality of relationship is built through the cycle of recurrent interaction between parties

and all such interaction is part of the customer relationship development process in which the customer ultimately determines what is of value. *Communicating* refers to quality of marketing communication which is grounded in purposeful social interaction. Ballantyne and Varey (2006) classifies three types of communication: informational for persuasive message making, communicational for informational communication between different stakeholders, and dialogue between parties for learning from each other. Basis for building a successful dialogue, which merges into one integrated process of coordinated actions, is a trusted relationship between parties, otherwise it does not happen. (Ballantyne & Varey 2006). *Knowledge*, and especially operant knowledge is the third key activity named by Ballantyne and Varey (2006). S-D logic emphasizes the importance of human competences and skills and differentiates between operand and operant knowledge (Vargo & Lusch 2004). Ballantyne and Varey (2006) state that many firms have over-invested in building up operand forms of knowledge and ignored operant knowledge development and renewal. Operant knowledge is achieved via learning together both inside company across functional borders to achieve cost efficiencies and working with customers to improve customer value.

Karpen et al. (2012) approach capabilities needed to facilitate value co-creation through S-D logic and ends up with the following six capabilities related to interaction and relationship management: *Individual interaction capability* is referring to supplier organization's ability to understand and adapt to customer's needs and customer's value identification processes. *Relational interaction capability* is about ability to build and strengthen social and emotional ties and interaction towards the customer. *Ethical interaction capability* is about acting fair and non-opportunistically towards the customer and building trusted relationships enabling parties to engage to common value co-creation. *Empowered relationship capability* refers to supplier's capability to enable and welcome customers to influence their processes and to bring customer's voice back into their organization. Further, *developmental interaction capability* means supplier's capability to contribute to customer's competence development and providing knowledge needed for resource integration. Finally, *concerted interaction capability* means supplier's ability to organize and involve the customer in value-creation activities of supplier's organization or wider network. (Karpen et al. 2012).

Message of Karpen et al. (2012) is that firms who aim at value co-creation, need to setup customer orientation in their organization and build these capabilities so that effective and efficient resource integration is enabled.

Third stage in value creation by Beverland (2012) is the value communication and delivery. Terho et al. (2012) point out the importance of communication and credible demonstration of the supplier's offering as its contribution to the customer's business profits is crucial. While any salesperson can claim to save money or enhance customer revenues, value-based seller provides convincing evidence for their value claims (Terho et al. 2012). How to deliver value in practice is a wide research area containing more deep analysis on interactive activities, practices and common processes with the customer.

2.3.3 Interactive practices in value co-creation

There are plenty of studies available on practices and activities used to implement value co-creation in interaction with the customer (e.g. Grönroos & Helle 2010; Aarikka-Stenroos & Jaakkola 2012; Payne et al. 2008; Russo-Spena & Mele 2012; Marcos-Cuevas et al. 2016). Common, interactive process between the supplier and the customer is emphasized in articles discussing value creation. Tuli et al. (2007) have studied relational processes between the supplier and the customer and highlights the importance of well working co-operation in creation of successful customer solution. According to Grönroos (2011) interaction in supplier-customer business context refers to situations where different parties are in contact with each other and where they have opportunity to influence to one another's processes.

Payne et al. (2008) has studied interactive processes between a supplier and a customer in practice. They follow the model by Grönroos and Voima (2013), where processes consist of supplier processes, customer processes and joint process. They model joint process as interaction encounters or touchpoints between actors' own processes. These encounters can be considered as exchange practices in which the parties exchange resources (e.g. products, work, information, time) as well as collaborative practices in which the parties jointly perform activities. Payne et al. (2008) summarize that interactive value co-creation processes challenge traditional marketing approach and require an ability to manage across and within the customer and the supplier value creation processes. Communication between the supplier and the customer needs to be considered in all relevant communication channels to support cognition, emotion and action-based learning within them.

Aarikka-Stenroos and Jaakkola (2012) have examined the collaborative activities, roles and resources of a supplier and a customer interaction within the scope of knowledge intensive business services (KIBS). Their study is based on empirical qualitative interviews of 120 suppliers and buyers of KIBS. Supplier's role and interactive process is emphasized in KIBS as the value to the customer is strongly depending on supplier's expertise and successful interaction with the customer. Aarikka-Stenroos and Jaakkola (2012) propose a framework for value co-creation based on joint problem solving between the supplier and the customer and highlights that, in some cases, suppliers can engage in extensive, personal interaction with the customer. Thereby, they actively influence to customer's value process and to the emergence of value-in-use. In these cases, value is not generated only through use of the exchanged product/service but also through the process of exchange, as affected by the relationship and interaction between the supplier and the customer (Grönroos 2011; Lapierre 2000; Aarikka-Stenroos & Jaakkola 2012). The key in the value creation involvement of the supplier lies in supplier's ability to keep such active dialogue and interaction with the customer that customer sees valuable. In context of knowledge intensive services, customers may have a considerable influence on the formulation of the

value proposition through negotiation and thorough contribution of their own resources.

Aarikka-Stenroos and Jaakkola (2012) name five identified collaborative activities constituting the process of value co-creation of complex offerings: 1) diagnosing needs, 2) designing and producing the solution, 3) organizing the process and resources, 4) managing value conflicts, and 5) implementing the solution. In each of these activities the supplier and the customer have roles, but roles change during the process. The model proposed by Aarikka-Stenroos and Jaakkola (2012) is presented in Figure 5.

In the beginning of the process, it is important to clarify what are the goals that customer wants to achieve and what is the problem they want to solve. *Diagnosing of needs* is necessary, as in many cases, the customer needs are not crystal clear, or customer requirements are not clearly telling what customer really wants to achieve. Dialogue is needed to reach common agreement about the target of the project. In this phase, the supplier has the role of value option advisor by proposing solution options to customer. Supplier has a main role in the dialogue, but customer contributes to the process as a co-diagnoser by providing the information that was not known by the supplier beforehand. (Aarikka-Stenroos & Jaakkola 2012).

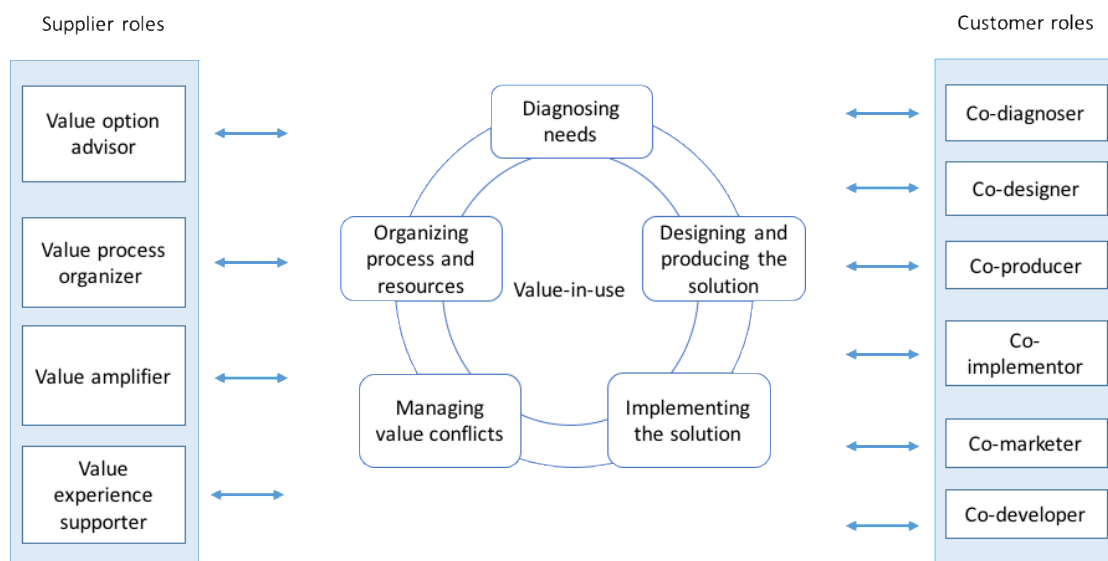


FIGURE 5 Value co-creation process in KIBS services by Aarikka-Stenroos & Jaakkola (2012, 22).

After customer needs have been diagnosed, the parties define the problem to be solved and value proposition to resolve it. This phase can be called as *designing and producing the solution*. The supplier has a main role in creating the proposal alternatives but the customer acts as a co-designer of the solution by evaluating and commenting the alternatives and their potential value-in-use. Success of the final solution depends on customer's skills of industry knowledge and their interests. In this phase, the customer may also act as a co-producer of the solution

by providing in-sight knowledge of the industry like future regulations or company internal materials. Aarikka-Stenroos and Jaakkola (2012) call supplier's role as a value amplifier as they manage and speed up the process and provide their knowledge to the dialogue so that the solution is accomplished.

Next phase is *organizing processes and resources*. In KIBS, project management skills are in central role and this phase includes activities related to project management and resource management to identify, collect and integrate different resources together to make value creation possible. The role of the supplier can be considered as a value process organizer. The customer may be acting as a co-producer by managing their part of resources but often the supplier is also managing the resources of the customer. (Aarikka-Stenroos & Jaakkola 2012).

Aarikka-Stenroos and Jaakkola (2012) raise *managing value conflicts* as one main phase of the process as that was highlighted by both suppliers and customers in empirical study. It tells that the ability to act constructively at both sides is very important. For the supplier, it is crucial to be competent and active but not arrogant or too self-assured. It is important for the supplier not to think that (s)he knows everything but to listen to the customer. On the other hand, if the customer is not openly contributing to the process or is not willing to take any risk in problem solving process, it might be that optimal solution is not possible to find. Managing these kind of value conflicts need effort from both sides but especially from the supplier who has the main role in management of conflict situations during the process. (Aarikka-Stenroos & Jaakkola 2012).

In implementation *phase of the solution*, the solution is deployed into use. Both the supplier and the customer may have an active role in this phase. The supplier may implement the solution or provide the tools and plans to the customer for implementation. If the customer is actively involved, the customer is acting as co-implementor. The supplier can, on the other hand, take a role to support the customer to take the solution into use in a way that optimizes the value-in-use. In this case, the supplier acts as a value experience supporter.

Aarikka-Stenroos and Jaakkola (2012) also studied experiences of value-in-use phase in empirical study. Customers named realized value of the solution via both monetary benefits like cost savings as well as non-monetary benefits like increase of motivation. On the other hand, suppliers felt that they got knowledge on market from customer for their future projects. In that sense customers worked as co-developers. When customers were happy with the solution, they also promoted the solution to others as well and started to act like co-marketers of the solution.

2.4 Value co-creation and service innovation

Relation of value co-creation and innovation is brought up in several studies. Innovation has been considered in two ways. One is innovation capability of the supplier which is a crucial enabler to build winning value-creating solution to

the customer (O’Cass & Sok 2012; Ngo & O’Cass 2013; La Rocca et al. 2016). Another approach is to look at innovation which may take place during the interactive value co-creation process between the supplier and the customer (Vargo et al. 2008; Russo-Spena & Mele 2012; Reypens et al. 2016; La Rocca et al. 2016; Skålen et al. 2015).

Ngo and O’Cass (2013) explore interrelationship between service innovation, customer participation and service quality. They point out that technical capabilities like technology related things and development of new services have received more focus in innovation research than non-technical innovation capabilities like management or marketing but that both are equally important in enhancing the quality of firms' offering and its ability to achieve superior performance. Furthermore, their conclusion is that innovation capabilities are necessary but don't guarantee superior performance. Potential value of innovation capabilities is realized through effective customer participation. Customer participation enables conversion of innovation capabilities into superior service quality. Managers who pay attention to innovation itself only may not achieve their intended objectives in performance if they do not take advantage of customer input as a key resource. (Ngo & O’Cass 2013).

La Rocca et al. (2016) emphasize capabilities of the supplier and especially supplier's customer account team in innovation process. Individual characteristics of the supplier's team have major influence into the success of developing novel solution in co-operation with the customer (La Rocca et al. 2016).

Another approach to innovation is how innovations may be created during the value co-creation process where the supplier and the customer are in interaction with each other (Russo-Spena & Mele 2012). Being able to develop innovative solutions for complex matters, organizations need to engage in collaborative networks and work together to co-create innovative solutions (Reypens et al. 2016). In this approach innovation intertwines into interactive process between the players and opens an opportunity for innovation but doesn't necessarily guarantee it. To succeed in innovation together, the supplier and the customer need to have a common commitment to work in interaction even if the target is open and not defined in advance (La Rocca et al. 2016).

Vargo et al. (2008) define that innovation is not an outcome (like a new product) but a process that involves discovering new ways of co-creating value through more effective participation in resource integration. Same view of innovation as a continuous and interactive process that doesn't have an end is shared by many researchers (Russo-Spena & Mele 2013; Skålen et al. 2015). However, there are differences between researchers in which context relation of value co-creation and innovation are studied.

In S-D logic the emphasis is in value-in-use phase which enables value co-creation between the supplier and the customer (Vargo & Lusch 2008b). Skålen et al. (2015) link service innovation and value proposition process via an empirical study of eight companies. According to them, service innovation can

be equated with the creation of new value propositions by means of developing existing or creating new practices or resources in new ways. Implication of this is that suppliers need to ensure that they do not only have the right resources but also established practices to integrate these resources into attractive value propositions. Secondly, suppliers need to be able to articulate value proposition to the customer and to encourage customers to participate the innovation process. Thirdly, suppliers are advised to move the focus from the product to the customer needs in value proposition process. That brings new opportunities for innovation as the starting point of value proposition is not the product that is being developed but customer's needs and problems they have. (Skålen et al. 2015). This view is similar as the model of KIBS services presented by Aarikka-Stenroos and Jaakkola (2012).

Russo-Spena and Mele (2012) have integrated innovation and value co-creation research by studying innovation process through interaction of actors in the ecosystem from practical point of view. They have defined model of five stages where co-creation may take place: co-ideation, co-valuation, co-design, co-test and co-launch. Co-ideation means generation of ideas together and is a first step of innovation. The practices in this phase may contain free ideation or may be lead and directed by the firm. Co-valuation is a natural next step and tightly connected to generation of ideas. It contains commenting of ideas and selection of most interesting ideas for further elaboration. Co-design includes wide range of practices and is aimed to connect the gap between identified ideas and the possibility of finding a solution. Activities in this phase may contain e.g. sketching, modelling, constructing and documenting. The last two co-operation phases, co-test and co-launch, are both closely related to the launching of the product or services in the market. Co-test phase is used to support the improvement of prototype product/services and is often used to test the marketability of a product or service and the co-launch includes go-to-market activities. Russo-Spena and Mele (2012) remind that managers of firms should consider more clearly the full options of co-creation activities and understand that each co-operational phase provides an opportunity for enhancing the value of the co-creation process.

Marcos-Cuevas et al. (2016) present a holistic value co-creation model called 'sustained purposeful engagement' connecting organizational capabilities, practices and resources across actors. They concretize the value co-creation process with a set of practices and capabilities that may be used in different phases of co-creation process. Their model is based on thinking that capabilities of organizations enable co-creation practices between them. This is in-line with the model by Beverland (2012) introduced in chapter 2.3.2. According to Marcos-Cuevas (2016), practices can be used in different phases of co-operation where value co-creation may emerge.

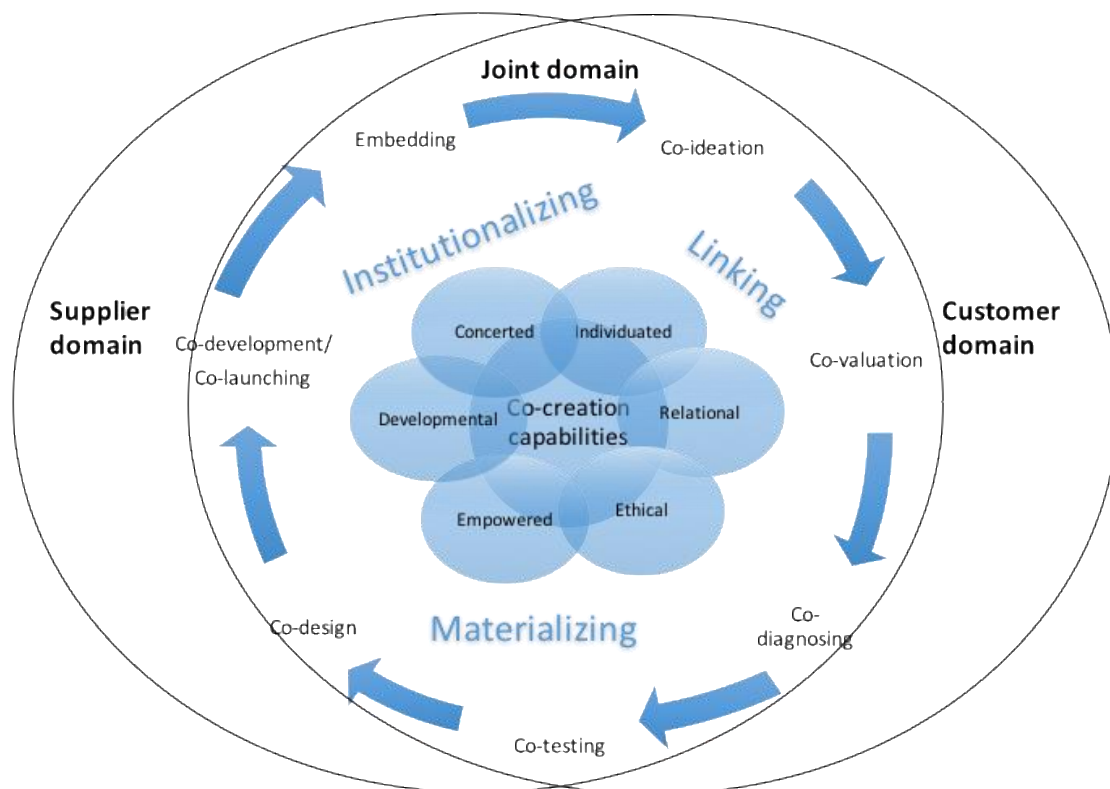


FIGURE 6 Model of value co-creation by Marcos-Cuevas et al. (2016, 99).

The framework of Marcos-Cuevas et al. (2016) is presented in Figure 6. Capabilities that set the basis for integrated practices between players are listed in the inner circle. Model proposes six (6) key capabilities that promote value co-creation process based on Karpen et al. (2011). They were introduced more detailed in chapter 2.3.2. These capabilities can be utilized in different phases or practices where value co-creation may take place.

Phases or practices where value co-creation may take place are presented in outer circle of the model. Marcos-Cuevas et al. (2016) defines seven (7) phases which are combined from models by Russo-Spena and Mele (2012) and Aarikka-Stenroos and Jaakkola (2012). These both models were introduced earlier in this study. Co-creation phases of Russo-Spena and Mele (2012) are taken as a basis with additions of co-diagnosis that is similar with re-design phase meaning possible need to re-design solution if that is found necessary during the process (Aarikka-Stenroos & Jaakkola 2012). In addition, embedding practice is added to present quality assurance and continuous coordination activities to continuous common development activities to retain value and to develop it further.

Marcos-Cuevas et al. (2016) further maps practices into three higher-level main categories: *linking*, *materializing* and *institutionalizing*. *Linking* collects practices that are related to creating and mobilizing networks and keeping up connections and relationship to the other party. These practices are not tied only to some phases of solution development although e.g. co-ideation and co-

valuation can be found as linking practices. Linking practices are, however, containing a lot of continuous activities like knowledge sharing on markets or sharing ideas for future development without any concrete project. *Materialization* is more concrete category of practices including creation of some specific solution or product together. Thus, it includes practices like co-design, co-development and co-testing of the solution. Finally, *institutionalizing* practices contain embedded, continuous coordination activities between organizations like interactive processes to enable continuous value evaluation and co-creation. Examples of these practices are interaction during the lifetime of products or solutions customer has in use or general relationship management activities between organizations. (Marcos-Cuevas et al. 2016).

2.5 Value co-creation in ecosystem

Value co-creation research has been dominated by dyadic approach consisting of one supplier and one customer although need for value creation network studies has been raised already for some time (Gummesson 2007; Hakanen & Jaakkola 2010; Nenonen & Storbacka 2010). In recent years, networks and ecosystems have gained more focus in research. Also value co-creation research has widened from dyadic approach to cases with more than two actors in the network or ecosystem, who are involved in the value co-creation process (Nenonen & Storbacka 2010; Vargo & Lusch 2011; Vargo et al. 2015; Jaakkola & Hakanen 2012; Hakanen & Jaakkola 2010; Reypens et al. 2016; Pera et al. 2016).

Vargo and Lusch (2011) discuss S-D logic in a value network context with multiple actors in the ecosystem. They are considering the naming of different actors in the system as in original S-D logic the parties have been a supplier and a customer. In ecosystem context, they generalize the roles and use the term 'actor', as all actors are fundamentally doing the same thing, co-creating value through resource integration and service provisioning (Vargo & Lusch 2011). This generalization opens S-D logic to include also other actors to the value co-creation process than a supplier and a customer, e.g. other players in the market not having direct supplier-customer relationship with each other. As resources provided by different actors are tools for value co-creation, network approach enables new resources, both operant and operand, to be introduced for the benefit of the network. In value creation, especially operant resources are essential because those are resources that are capable of purposefully acting on other resources (Vargo & Lusch 2008b).

In recent years, value co-creation studies focusing on interaction and resource integration in the network context have started to emerge (Gummesson & Mele 2010; Jaakkola & Hakanen 2013). According to Gummesson and Mele (2010) value co-creation in the network is enabled by actor-to-actor involvement and commitment. Interaction in the network is a key phenomenon and it stimulates resource integration, which takes place via resources, competences and processes. Gummesson and Mele (2010) point out that value co-creation in

network context is a time-based process comprising parallel and sequential phases at the same time. It is iterative and non-linear but there are two core phases that can be identified. One of those is actor-to-actor interaction and other is resource integration of actors. They name three types of interaction contributing to the process: 1) dialog, in which actors build a conversational process to share information and to offer their knowledge and other resources to benefit others, 2) resource transfer, in which tangible and intangible resources like knowledge, products, and solutions are exchanged and shared by actors, and 3) learning to understand how to best interact, and to reduce relationship cost and inefficiency. When actors exchange information and transfer resources, they produce and develop their knowledge throughout a continuous learning process. (Gummesson & Mele 2010).

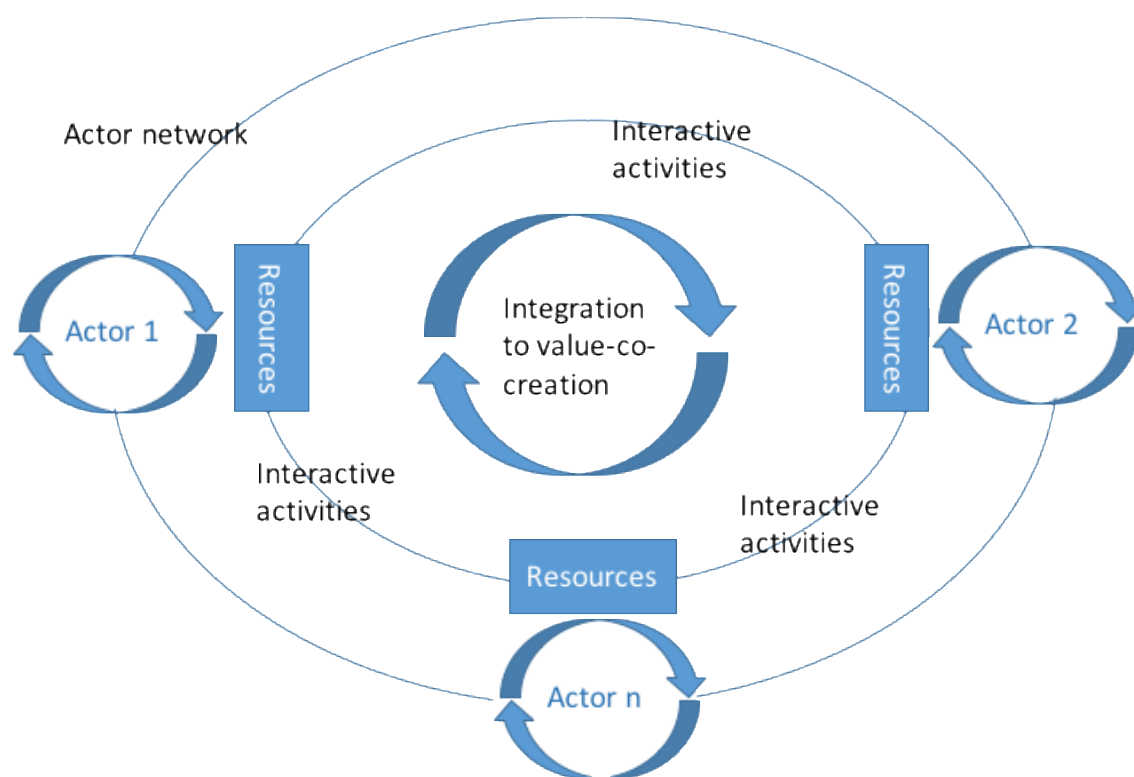


FIGURE 7 Value co-creation model in network based on Jaakkola and Hakanen (2013).

Jaakkola and Hakanen (2013) define value co-creation concept as an iterative, collaborative process happening at three interrelated levels (Grönroos & Helle (2010); Grönroos & Ravald 2010; Vargo & Lusch 2008b; Gummesson & Mele 2010). This is illustrated in Figure 7. According to the model, the first level is actor's internal level where actors execute activities in their own value creation context. Second level is a relationship level, where actors of the network create value together through interaction and resource integration with each other. Third level is a network level where resources are integrated into a larger resource entity through a pattern of activities by a network of actors. The integrated

solution, and the activities through which it is created, represents a new value proposition for the customer, compared to the resources available from individual suppliers. Value co-creation hence involves value processes within organizations, in relationships between actors, and within a network of actors. (Jaakkola & Hakanen 2013).

2.6 Theoretical framework

In previous chapters, different models to illustrate value co-creation have been introduced. Summary of discussed models is presented in Table 3.

TABLE 3 Summary of value co-creation models.

Focus of research	Study	Main findings
S-D concept	Vargo & Lusch (2004) Lusch & Vargo (2006) Vargo & Lusch (2008a) Vargo & Lusch (2008b) Vargo et al. (2008) Vargo & Lusch (2016)	Definition of S-D logic and roles of actors and enhancements to original model
	Grönroos (2008) Grönroos (2011) Grönroos & Ravald (2011) Grönroos & Voima (2013)	Evaluation of S-D logic; value creation domains and actors' role in those
Concept of value co-creation	Beverland (2012)	Process from capabilities to practices and delivery
	Payne et al. (2008)	Conceptual framework for value co-creation based on interaction encounters between parties
	Marcos-Cuevas et al. (2016)	Value co-creation model based on capabilities and practices of value co-creation
Capabilities for value co-creation	O'Cass & Ngo (2012)	Capabilities: product innovation, marketing capability
	Karpen et al. (2012)	6 capabilities: individuated, relational, ethical, empowered, developmental, concerted
	Ballantyne & Varey (2006)	Capabilities: relating, communicating, knowledge

Interactive practices	Aarikka-Stenroos & Jaakkola (2012)	5 activities in KIBS services (diagnosing needs, designing and producing the solution, organizing the process and resources, managing value conflicts, and implementing the solution) empirical
	Skålen et al. (2015)	Model for service innovation: type of innovation and innovation processes
	Russo-Spena & Mele (2012)	Model of interactive practices in innovation: co-ideation, co-valuation, co-design, co-test and co-launch; empirical study.
	Reypens et al. (2016)	Process framework for value co-creation in multi-stakeholder innovation networks
Ecosystem	Jaakkola & Hakanen (2013)	Value co-creation interactions model in ecosystem
	Gummesson & Mele (2010)	Conceptual model of integration and resource integration in ecosystem leading to value co-creation
	Vargo & Lusch (2011)	Extensions of S-D logic to ecosystem

When defining the theoretical framework for the study, it is important that a chosen framework fits into the scope of the study and supports study of set research questions. Main research topic in this study is to understand what capabilities and interactive practices take place in smart metering context between the technology supplier and its customers to co-create value. Another target of the study is to understand what value customers perceive from technology supplier's offering in the context of smart metering. This value may be created either by themselves in their own processes during the use phase or it may be co-created with the supplier or other partners in their ecosystem.

Model of Marcus-Cuevas et al. (2016) is selected as the core of the theoretical framework as it provides a diverse model of capabilities and interactive practices that can be recognized during value co-creation process between the supplier and the customer. It contains the elements that are central in research questions of this study and thus, gives suitable framework for the empirical part. In case study

part, the theoretical framework is used as a basis to structure the data collection and analysis of the data.

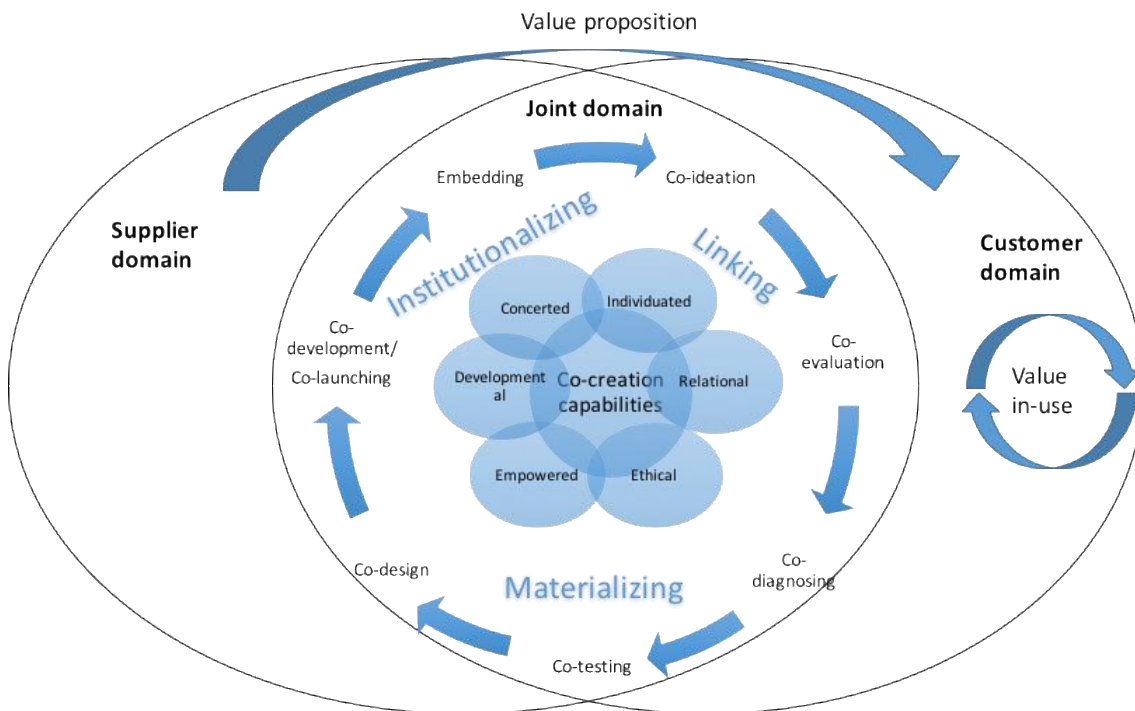


FIGURE 8 Theoretical framework of the study.

Capabilities of the supplier presented in the theoretical framework are supporting the value co-creation process between the supplier and its customers. Recognition of these capabilities is one target of the case study and the capabilities of the theoretical framework are utilized in data analysis of the empirical when relationship and co-operation between the supplier and the customer is evaluated.

Interactive practices between the technology supplier and its customers in smart metering context and how they support value co-creation is another focus area in empirical part. Interactive practices between the case company and its customers are evaluated and analyzed based on theoretical framework and its three main components: linking, materializing and institutionalizing. Seven phases of interaction presented in the theoretical framework are utilized in case study to identify phases where interaction takes place most actively and to clarify which of them promote value co-creation the most.

Theoretical framework model based on Marcos-Cuevas et al. (2016) is enhanced with the domain model of Grönroos and Voima (2013) as it summarizes well different domains where customer real value may be created. Customer perceived value, which is one of the research questions of this study, may be created either in customer's own domain or in joint domain in co-operation with the supplier. From perceived value point of view, both domains are relevant for this research.

Theoretical framework of the study is presented in Figure 8. It contains all the elements set in research questions and thus, it sets a good basis for data collection and analysis of the results.

3 SMART METERING

3.1 Business environment

Smart metering is an interesting business area because of its special characteristics and ongoing big changes of whole business environment. The focus of this study is in Finnish market and in this chapter whole business is looked mainly from Finland and Nordics point of view. However, same kind of changes are ongoing globally, although the schedule and phase of changes may vary from country to country. The characteristics of smart metering business makes it an appealing area to study both generally and from value co-creation point of view.

First, the smart metering industry is going through major changes. This kind of disruption in a business area provides opportunities for new business models, changes potentially roles between actors and provides business opportunities for new players. One major change in smart metering has been moving to automatically readable meters. However, more radical changes will come. For example, production to network is increasing. This causes fast changes in load of electricity networks and puts pressure to monitor network more real-time and to balance the load via automatic control.

Secondly, smart metering environment has some specific characteristics as it is strongly regulated market. Electricity market authority sets a framework to the operating environment of distribution service operators (DSOs), and that impacts both DSOs and their partners. Regulation may sometimes boost the development of the business as happened when regulator gave a strict deadline to install remotely readable meters with certain characteristics. On the other hand, regulation may also slow down innovation and development of new services by its regulation model which does not always reward DSOs for innovation. Another specific characteristic of the market is that DSOs are in monopoly position which has impact to relationships of market players and especially to relationships between DSOs.

Third typical characteristic for electricity business is that business relationships are long. Even if the pace of changes in business is getting faster, the lifecycle of devices and systems are long. Estimated lifetime of devices is 10-15 years. So, devices remain long time in the field although they are remotely upgraded regularly during their lifetime. Service agreements between DSO's and service providers are also long. This means that even if automatically readable infrastructure (AMI) develops over time, co-operation between the supplier, service provider and DSO continue for a long time. This increases the importance of good relationships between players.

In coming chapters, we present in more depth the status of the business area and coming changes in electricity market, introduce key parties in smart

metering ecosystem and discuss characteristics of business relationships between technology suppliers and their customers.

3.2 Changes in operating environment

Traditionally, electricity market has changed quite slowly. Roles of different players in the network have been stable and changes to the network operations have been slow. The biggest change in Finland in decades was the regulation set in 2009, which assessed that at least 80% of electricity meters needed to be remotely readable by end of 2013 (Finlex 2009). This meant that more than 3 million electricity devices were changed in Finland mainly during the 2010-2013. In addition, network systems needed to be updated to be able to handle the measurement data.

Now, after 5-10 years after the mass rollout, the installed base of energy service devices is planned to stay on field a few years or more, depending on case. There are, however, more changes knocking on the door. Discussion and planning of next generation of AMI and its requirements is already going on in Finland although mass deployments are not there yet.

Earlier, forecasting of electricity demand and production has been relatively simple in short term. Consumption level in different hours is predictable on weekdays, and in weekends saunas are heated up at around the same time. When the weather gets colder, consumption of electricity increases when more capacity is used for heating. At any given time, an exact amount of electricity is produced to meet demand. In recent years, stability of electricity production and consumption has disturbed when renewable, weather-dependent electricity generation, including wind and solar power, has increased. Growing number of consumers are purchasing e.g. solar panels and become producers of energy. This has impact to both stability of power grid but also creates new needs to measure and analyze measurement data. Local production is still quite small in Finland but the situation is changing fast and markets need to get prepared for that. In the future, electricity consumption must increasingly adapt to production. (Fingrid 2017).

Currently electricity consumption values are collected on hourly basis, but it is seen that in the future the frequency is shortening at least to 15 minutes or even to shorter periods. This enables e.g. building of more real-time pricing models and fast control of consumption during peak periods. Controls could mean for example load balancing of consumption based on demand of electricity in the network. For consumers this could mean that, in the future, consumers could save in electricity costs by giving a permission to electricity suppliers and other service providers to control their electrical heating automatically. (Fingrid 2017).

At the same time when new measurements and controls provide new opportunities to optimize use of electricity networks, they mean changes and investments to all elements of AMI and not only to devices. As amount of data

grows and at the same time real-time requirements for data transfer speed are tightened, the capacity and end-to-end performance requirements of the whole network increases significantly.

There are also changes foreseen regarding the role of DSOs related to electricity information exchange. Currently companies are storing their customer's electricity information data themselves, but in the future Fingrid will manage a centralized database called datahub, where electricity information is stored and can be utilized by relevant electricity market players. This means that part of DSO's responsibilities and control is removed. According to Fingrid (2017) aim of datahub is to speed up, simplify and improve processes for every market party in electricity information exchange. The centralized datahub was planned to be taken into use in 2019. (Fingrid 2017) but according to current view, deployment will be delayed to 2021.

In addition, Ministry of Economic Affairs and Employment in Finland has started definition of future smart grid requirements which will set framework for roles of smart metering actors and smart metering networks in the future. That may change the roles of DSOs as well and bring opportunities for new players in business. The interim report of smart metering committee was published in October 2017 (TEM 2017). The final report is expected to be published during autumn 2018.

All these changes and new regulation requirements challenge current players in smart metering business to consider, how new regulation can be fulfilled in a cost-effective way and, on the other hand, what new innovative services can be developed to add value to DSO's and other players' business. New services connected to utilization of data is one area that will provide new opportunities and is foreseen to grow (Palmar et al. 2014). Devices will collect more and more data and analysis and utilization of data will expand. For example, remotely readable meters are capable to provide much more data than consumption (or production) values and enable new services and applications through the smart meters and metering data collected. One example is network quality related monitoring. This adds value to DSO's as they get real-time information on faults in the network but enables also building of new consumer services. They can provide consumers more real-time information about their electricity consumption or, for example a notification when their fuse is blown. It is seen, that the value of tangible products is decreasing compared to software and different services built on them (Kowalkowski et al. 2017).

New needs and requirements provide opportunities for current parties of the smart metering ecosystem and opens new opportunities for creating and co-creating value in the business network. However, the changes in the business environment and in regulation may open room also for new players in the field and may change radically the roles of different parties. For example, data analytics and optimization of electricity consumption are areas where newcomers could offer new services. It is already seen, that interest of firms outside the business is emerging to offer services to smart metering business as

well. It is not hard to interpret that the development of new services of smart metering is only in its infancy.

3.3 Smart metering ecosystem

Smart metering ecosystem and its actors are presented in Figure 9. Key actors from this study point of view are seen in the center of the picture. It is to note, that the figure doesn't contain all parties of the ecosystem but tries to show the main links between key players from this study point of view. It is good to remember though, that roles of different actors may vary to some extent from case to case as there are different models to run the network operations.

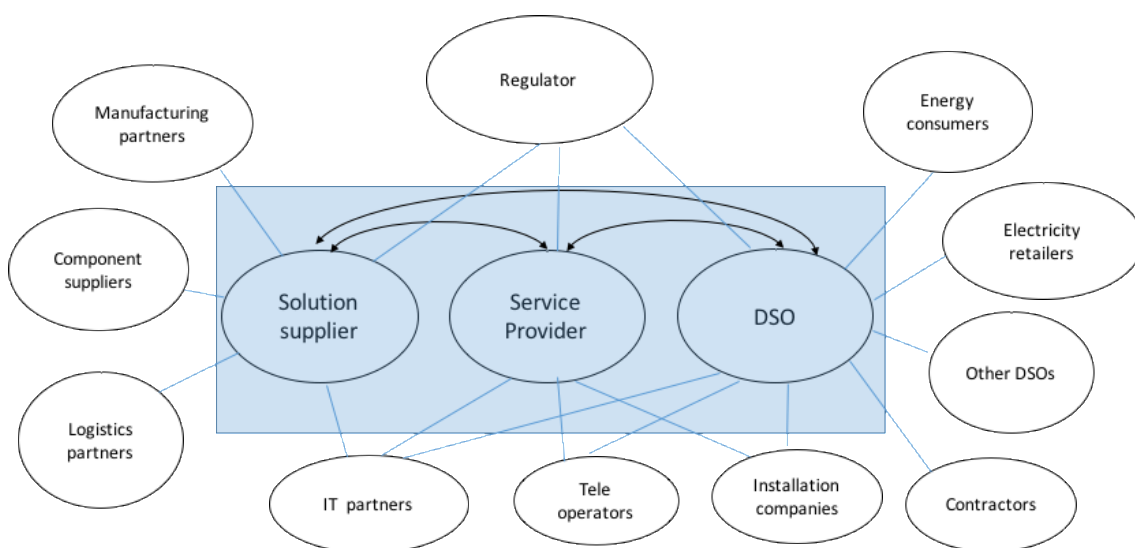


FIGURE 9 Smart metering ecosystem.

The technology supplier is offering products and solutions to DSO's and service providers. The technology supplier is a technology provider providing energy service devices residing on field and measuring electricity consumption and in many cases also head-end system (HES) which stores measurement data read from devices, provides tools for analyzing the data and exports data further to other systems. Figure 10 presents the IT architecture of the smart metering solution and helps to understand how the whole solution is built and what parts are in relation to a technology supplier. The technology supplier may also offer software products extending the capabilities of the system and devices and different services covering customer service, warranty, project management, integration to other systems and customer specific development. Main partners of the technology supplier include component suppliers and hardware manufacturing partners who provide components for devices, accessories and manufacture energy service devices parts or complete products. IT partners

include players who provide software or integration services. Software can be anything from low level device software to system interfaces towards customer systems.

Service Provider (SP) is responsible for operating AMI solution environment for DSO. They offer operation of the system as a service to DSO and are responsible for its performance and service level (SLA). They may have their own reading system, or they may purchase head-end system from some other party, e.g. technology supplier. Service provider acts in many cases as an integrator of end-to-end solutions offered to DSO. They may offer also other tools and services to DSOs like tools for handling field work orders, different reporting tools etc. In mass rollout phase, SP is often the main responsible of the whole project towards DSO also including installation and maintenance. One SP is typically offering service to many DSO customers. Main parties in service provider's ecosystem are DSOs which are their customers, technology suppliers, IT system providers and contractors when SP is responsible for installations or field work. They are also responsible for communications from devices to the system and are in that respect in contact with tele operators.

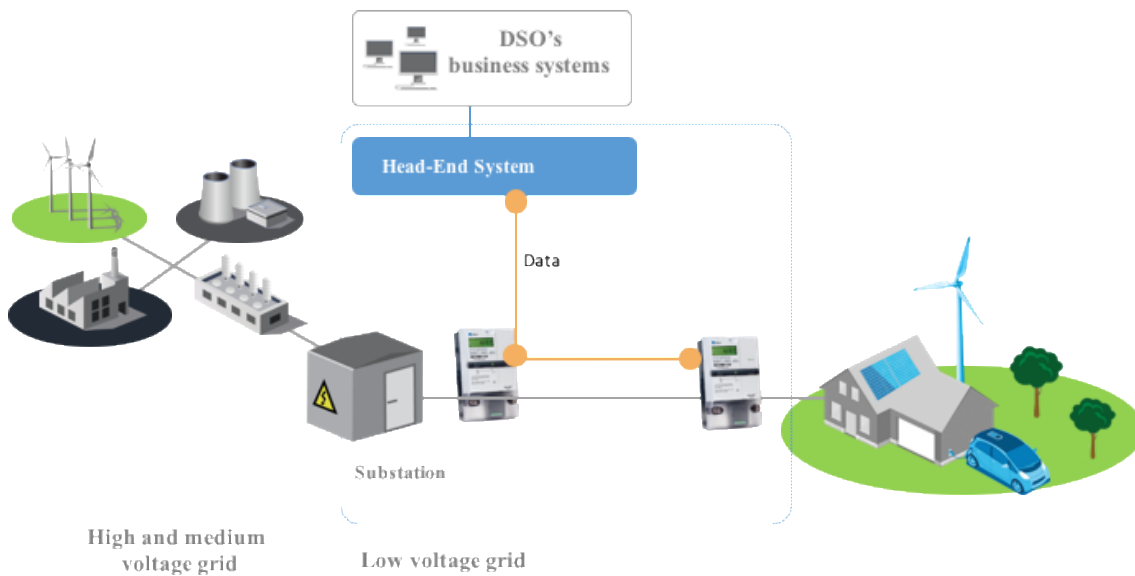


FIGURE 10 Example of smart metering solution architecture.

Distribution System Operators (DSOs) are responsible for providing and operating low, medium and high voltage networks for regional distribution of electricity as well as for supply of lower-level distribution systems and directly connected customers. They have responsibility to ensure system stability, security and quality of transmitted electricity. DSOs are responsible of electricity distribution network of defined physical region and are operating their area as monopoly. So, electricity consumers cannot choose their DSO freely, but DSO is determined by the location where electricity is needed. As DSOs have monopoly in their operating area, their operation and rate of return is monitored by

authorities. Key actors in DSOs ecosystem are technology suppliers, service providers (if they use any), network contractors, installation companies and electricity retailers not to forget their customers i.e. electricity consumers. DSOs have also various IT solutions needed to manage the network, measurement data and invoicing, and they have multiple IT partners.

Regulation authorities are not necessarily key partners in a similar way like other players, but they have major influence into world of DSOs and via that to service providers and technology suppliers as well. They set the requirements for electricity distribution and direct the investments made in the network. One example of these requirements is weather-proof distribution network which has driven DSO's to make lot of investments to cabling of electricity network in recent years. There are multiple institutions which are related to regulation directly or in-directly: Energy authority, Ministry of economic affairs and employment and European Union. There is also Finnish Energy who acts as a branch organization for the energy sector and represents companies that produce, procure, distribute or sell electricity, district heat or district cooling sand related services. All these parties and their relations are not covered separately one by one.

In this study, focus is in the relationships between the technology supplier, service providers and DSOs. Other actors in ecosystem and their role might come up in the case study to clarify the ecosystem dynamics but they are not directly in the scope of the study.

3.4 Customer relationships in smart metering

Relationships between the technology supplier, service provider and DSO are typically long and close. As the lifetime of products is long and the investments to smart metering system have been remarkable, DSO has an interest to fully utilize the value potential enabled by the system. On the other hand, also the supplier has an interest to build new innovative services on top of metering solution to develop its competitive advantage, to keep customers satisfied, and to get new business opportunities. Same interest can be found in service provider side; although reading service is the core business for service provider, building new services gives new business opportunities also for them. Common interest of all parties is to keep the co-operation smooth and keep the service level high as if it drops it means increased work amount and costs to all parties. This fact provides a good basis for interaction and the value co-creation between the parties.

Long lifetime of products and service agreements makes partners dependent on each other for a long time. Therefore, choosing of supplier and other partners for a smart grid deployment is a big and long-lasting decision for DSO. Changing the partners during solution lifetime is not easy and means extra cost. Therefore, bigger changes in environment are implemented at times when there are also other reasons, driven by e.g. regulation, to make anyway larger-scale changes in the system environment.

Customer relationships are quite stable in smart metering. As suppliers, service providers and DSOs interact regularly and even on daily basis, it is everyone's benefit, that relationships are open and trustworthy. That drives different parties to solve possibly raising issues together. Normally relationships in smart metering business area seem to be informal and close. One reason for that might be that number of players on market is limited and people who are working in this area have often a good network within the different actors in the field. There are a few technology suppliers, a few service providers and about 80 DSOs in Finland. That means that people working in the field of smart metering know each other quite well.

The fact that DSOs have monopoly in their area has impact to relationships and ways of doing co-operation in the market. Normally competitors within any business area don't talk openly to each other because they don't want to give any business benefit to other players in the market. In smart metering ecosystem however, DSOs are not real competitors to each other as each DSO has their own geographical region to manage. This means that they can talk, and they do talk, to each other without a fear to lose any business. It is common that DSOs share their opinions quite openly and talk to each other about their experiences on technology, processes and products they are using. This fact impacts also to life of other actors like suppliers and service providers. Both good and bad experiences of suppliers and service providers are spread to other DSOs sooner or later. When there are successful projects, it is easy to get DSOs to tell about them in public as they don't need to be cautious in sharing their innovative solutions to others. It also promotes finding of solution to common DSO problems together in co-operation. This fact drives open communication also between the supplier and DSOs.

One typical thing in customer relationships of smart metering is that there are different stages in the relationship during the lifetime of solutions. As was already discussed earlier, the nature of smart metering business is not flat but there are major changes coming every now and then, perhaps once in a decade and in between the investments and changes to network are smaller. This cyclical nature can be seen in the mode of co-operation between parties and in emphasis of DSOs. In mass rollout phase the importance is in installation of devices and setting up the system to work and updating the operative processes. Related to devices, the focus is in functionality required by the authorities. Co-operation between main actors is run in project mode. After the deployment is done, the focus moves to operational efficiency and added-value functionality. The focus of co-operation moves to regular operative meetings. In addition, strategic and development co-operation takes place every now and then, but intensity of these layers differs from customer to another.

4 METHODOLOGY

Empirical part of this study is a case study where case company is a Nordic supplier of smart metering solutions. This chapter introduces the methodological considerations made during the case study and presents the reasoning for choices made. The chapter proceeds according to methodological process starting from research philosophy followed with research methodological choices and further with data collection and analysis principles.

4.1 Case company

Case company is a leading supplier of smart energy metering technology and smart grid applications in Nordic countries. They are operating mainly in Finland, Sweden and Norway markets. They have own operations in Nordic countries and in addition, have a strong partner network both in areas of manufacturing and solution development. Main products of the case company are smart metering devices, head-end system (HES) and added value products and solutions. Smart metering devices are remotely upgradable and new services and applications can be added to devices during the lifetime of devices. Case company also provides different services to their customers related to e.g. project management, integration, logistics, training and service desk.

Customers of the case company are DSOs and service providers who are operating the smart metering system for DSOs. In all customer cases DSO is somehow involved. Usual split between the roles is that DSOs are owning the smart metering devices, which are measuring energy consumption of DSO's customers. Service Provider is owning the HES system and running the operations of HES which is used to manage the devices, to collect the measurement and other data from the metering devices and to export the data further to DSO's business systems.

Service products and applications offered by the case company may be focused towards DSOs or service providers or both depending the case. One example of applications for DSOs is power grid monitoring, which offers possibility for real-time monitoring of the low voltage network and enables DSOs to find and locate faults in the network in real-time and to monitor quality of energy in the low voltage network. Typical example of services offered to SPs are different reports helping SPs to find exceptions in operations or to monitor service level.

The focus of the case study is in customer perceived value via case company's offering and in value co-creation process between the case company and its customers. In analysis of value co-creation, case study focuses on case company-customer relationship and capabilities of the case company to advance value co-creation. Interactive practices and quality of interaction in different

situations and on different levels of organizations are in the center of the study because successful interaction is a pre-requisite for value co-creation.

4.2 Research philosophy

Main concepts to be considered related to research philosophy are epistemology and ontology. While epistemological and ontological decisions are often linked to certain research strategies, like quantitative research with objectivism and positivism and qualitative research with interpretivist epistemology, it is important to understand that they are not deterministic (Bryman & Bell 2007, 626). Therefore, it is important to consider research philosophical approach and methodological choices independently from each other.

Ontological assumptions concern about nature of the reality (Hirsjärvi & Hurme 2000, 22). Central question from ontology point of view is if the social world is independent of people and their activities or if reality is based on subjective perceptions and may be different to each person and may change over time and context. These views are referred as objectivism and constructivism, respectively. (Eriksson & Kovalainen 2016, 14). In this research ontological approach is constructivism, as assumption of the study is that interaction effects to the reality of social actors and that the reality experienced by people is an outcome of social and cognitive processes.

Epistemology concerns the nature of knowledge and interrelations between the researcher and examinee (Hirsjärvi & Hurme 2000, 22). As in ontology, also in epistemology, there is an objectivist and subjectivist view (Eriksson & Kovalainen 2016, 15). The former is called positivism and it studies social world with the methods of natural sciences where reality is constituted of observable material things (Bryman & Bell 2007, 16). In subjectivist approach, reality is socially constructed via people's subjective observations and interpretations. This is called interpretivism. (Bryman & Bell 2007, 17-18). From epistemological point of view, the position of this research is interpretivism as the aim is on the understanding social world through the examination of the interpretation of that world by its participants.

4.3 Research strategy

Research strategies can be divided into two main groups: quantitative and qualitative research. Both contain several methods that have so much variety that defining qualitative or quantitative research is not trivial. Different methods belonging to one of these groups still have some common characteristics and qualitative and quantitative methods are often defined in comparison with each other. Qualitative research is more concerned with interpretation and understanding the social world whereas quantitative research deals with

explanation, testing of hypotheses and statistical analysis. (Eriksson & Kovalainen 2016). Qualitative research suits as a research method when we want to understand behavioral meaning and its context. Qualitative research examines observations in different situations and gives an opportunity to take into consideration their previous experiences and development. (Hirsjärvi & Hurme 2000, 27).

Qualitative research method was selected as a research approach for this study as the aim of the study is to understand how value is perceived and created in supplier-customer relationship. This requires thorough understanding on what customers are seeing valuable and what things and experiences are impacting their views and could not be achieved deeply enough with quantitative data only.

There are two main approaches how to bring forward research theory with empirical studies. Deductive research takes research knowledge as an assumption and tests made hypothesis with empirical data. This approach is used especially in quantitative research. In inductive research order is other way around i.e. from empirical data to theory or from one case results to generalization of results to theory. (Eriksson & Kovalainen 2016). Induction is often connected to qualitative research approach. Deduction and induction are often considered as alternative solutions. In practice, many researchers use both induction and deduction in their research iteratively so that they move between those two in different phases of the study. This is called as abductive approach. (Eriksson & Kovalainen 2016, 25).

This study has elements of both deductive and inductive approach and thus it presents abductive research approach. Deductive approach has been used when theoretical framework for the empirical study was built from existing research models of value creation and co-creation. Theoretical framework of the study has been basis for collecting data about interactive practices and enablers of value co-creation. Thus, the theoretical framework guided collection of data and to some extent also the structure of interviews and questions asked from interviewees. In data analysis phase, theoretical framework was used to categorize data to find out if the elements of theoretical framework are found in this case. However, analysis was not restricted only to theoretical framework but data was also analyzed openly to find out, if there are any other notable topics outside theoretical framework which have impact to value co-creation. There is also inductive approach in the study. This case study provides findings of value co-creation in new business area, smart metering, giving results of one empirical case. When these findings are compared and combined with other empirical cases results, they contribute to value co-creation theory via induction.

4.4 Case Study research method

Case study was selected as a natural qualitative research approach for this study. Case study is an empirical inquiry that investigates a contemporary phenomenon

in depth and within its real-world context, especially when boundaries between the phenomenon and context may not be evident (Yin 2007, 16). Common characteristic for case studies is that they arise from the desire to understand complex social phenomena. Case study permits a researcher to retail a holistic and contextual in-depth knowledge by using multiple sources of data (Eriksson & Kovalainen 2016, 131). In this study the research setting was to study relationship between the smart metering supplier and its customers and in this setting case study approach fits well.

Although case study is usually listed as a research method, it can be seen rather as a research strategy. Case study does not really limit the type of empirical data in the study and quite often multiple data sources are utilized in the study. According to Eriksson and Kovalainen (2016, 132) the case study is not an alternative research strategy to quantitative research, but it is valuable as such when the aim is to understand the logic of the case rather than generate causal explanations for it. Two types of case studies can be identified: intensive and extensive (Eriksson & Kovalainen 2016, 132-135). This study belongs to intensive case studies as it explores the case from 'inside' and aims to develop an understanding from the perspectives of the people involved in the case.

4.5 Data collection methods

As referred earlier, it is typical to use multiple sources of data and data collection methods in case study research (Gummesson 2000). In business research, different kind of interviews are typical data sources. Besides interviews, other data sources as documents and public information may be used as complementary type of information. Using multiple data sources is not mandatory but enables to cross-check the content from different sources, which is called as data triangulation. Case studies are considered more accurate and diverse if they are based on multiple sources of empirical data. (Eriksson & Kovalainen 2016, 138-139).

Interview is a popular research method as it is a very flexible method and fits into multiple research purposes. During the interview the researcher is in direct communication with interviewee and has possibility to direct the discussion and ask clarifying details during the interview. (Hirsjärvi & Hurme 2000). Of course, like any research method, interview has its pros and cons. According to Hirsjärvi and Hurme (2000), it fits well into situations when research area is not well known as it gives opportunity for researcher to direct discussion to relevant direction during the interview. It also enables interviewees to be subjects of the study. Thus, they have an active role in research and are given an opportunity to describe their opinions freely. For the researcher, interview gives a possibility to deepen and clarifying answers during the interview interactively.

Interview as a research method also includes some concerns that need to be sorted out. First, organizing interviews is costly both time-wise and budget-wise.

This is the case especially when interviews are held face-to-face. Interviews are also demanding from interviewer point of view and requires experience to get all relevant, available data from interviewees. The method also includes potential error sources caused by either interviewer or interviewee. Finally, analysis, interpretation and reporting can be problematic. (Hirsjärvi & Hurme 2000).

There is a wide collection of interviewing sub-methods. They can vary from free everyday discussions to formal structure where same standardized questions are asked from all participants. Semi-structured interview is between these two extremes. In semi-structured interview, the themes handled are same for all interviewees. There are also pre-defined questions to be involved in interview but the wording or the order of questions is not exactly same for all interviewees. (Eriksson & Kovalainen 2016, 138-139).

Semi-structured interview was chosen as a primary research method for this study. The reason for selecting interview as a data collection method was to get direct, face-to-face feedback from customers and not only to hear their answers but also to observe interviewees during the interview. Therefore, all interviews were organized as face-to-face meetings. Semi-structured interviews also provided an opportunity to variate the interview situation to some extent to keep up the conversational mode instead of strict question-answer mode. Themes of discussion were planned beforehand but there were no exact set of questions or their order decided before interviews.

Three main themes were covered in interviews: Operating environment and ecosystem of smart metering, perceived value by the customers, and ways of interaction and value co-creation between the supplier, SP and DSO customers. First theme was included to interviews to provide general information on relationships between different players and their importance in the network. It also provided data on how role of the supplier differs in dyadic and triadic case from value point of view which was one of the research questions. Second theme on customer value was selected to answer to the research question on what value customers perceive. From theoretical framework point of view, it served as source of information to customer domain and what is real value received by customers. Third theme focused on joint domain of theoretical framework and to value co-creation practices.

The structure of interviews is found in Appendix 1. As interviewees were from three different groups: DSO customers, SP customers and the supplier, also the structure of interviews varied a bit although the structure was the same. Especially interviews of case company's customers and case company's employees differed to some extent as the viewpoint to the studied subject was different. The structure of interview presented in Appendix 1 was planned primarily for customer interviews and was modified for case company participants.

First theme of interviews was to clarify how interviewees define their operating environment and actors of value creation ecosystem. Interviewees were asked to name the main actors of their value ecosystem to get understanding on which actors they see as important value creators. In addition,

the role of the technology supplier seen in the ecosystem and importance of the technology supplier as value creator among other players was discussed. In service provider interviews and those DSO interviews where service provider is involved, the roles of all three parties were discussed.

Second theme was the value that customer perceives through supplier's solution offering. In this section, the target was to clarify customer's view on what kind of value they get from the technology supplier and from which elements the value consists of. First, interviewees were asked with open question what they find valuable and what things in supplier's offering to them enables value creation. Then, the value elements provided by the supplier were discussed in more detail using the value categorization model of Lapierre (2000) as a basis.

Third theme of interviews was the value co-creation between the technology supplier and its customers. In this section, the target was to clarify which elements in co-operation between the supplier and its customers enable and assist in value co-creation process. This theme was approached via theoretical framework by going through the procedures and phases of interaction as value co-creation can take place only through interaction of parties. Current procedures and processes of co-operation recognized in different levels of organizations were listed and analyzed. Strengths and gaps in co-operation were discussed together to find out how co-operation should be developed to support even better value (co-)creation between the technology supplier and the customers. Another enabler of value co-creation is supplier's capabilities that can assist in making value co-creation to realize. Capabilities were not handled as a separate topic, but they were covered when interaction between the parties and quality of relationship was discussed.

In addition to interviews, which was the primary data source, the data was supplemented with various documents available from the case company like company strategy, customer satisfaction survey results and meeting minutes of both customer meetings and internal meetings. As the researcher works in the case company, access to all available data was easy to organize.

4.6 Selection of research participants

Like often in qualitative research, also in this study people were used as sources of information. To collect representative data for analysis without enlarging number of interviewees too much, it is important to carefully consider who should participate the study. Eriksson and Kovalainen (2016, 53-54) note that as statistical generalization is not the target of qualitative research, specific sampling methods designed for that purpose are not necessary. Instead, access to appropriate and rich data enabling fine-grained and in-depth analysis and possibility to learn from the phenomena under study is crucial. (Eriksson & Kovalainen 2016, 53-54).

Both number of interviewees and their role was considered before selection of participants. Main interviewee group was customers of case company. As

there are two main customer groups, DSOs and service providers, aim was to get representative group of interviewees who would cover customers diversely. DSO customers were selected to represent different sizes of companies and different operating environments. From SP customers target was to interview representatives of at least two SPs. One research target was to compare value co-creation network in dyadic case where DSO is operating their network themselves and triadic case where service provider operates the network and both service provider and DSO are customers of case company. This target was considered when selecting the participants of the study, so that in triangular cases both SP and DSO representative were interviewed. To get rich data from different angles, also three persons from the case company were interviewed. When interviews were done both inside the case company and among customers, it was possible to compare if the view on value created and quality of co-operation practices differ inside the case company and among customers. The relationships of interviewed companies are illustrated in Figure 11. The figure doesn't necessarily indicate the contractual relationships between different parties but illustrates which actors are present in their business environment from this case study point of view.

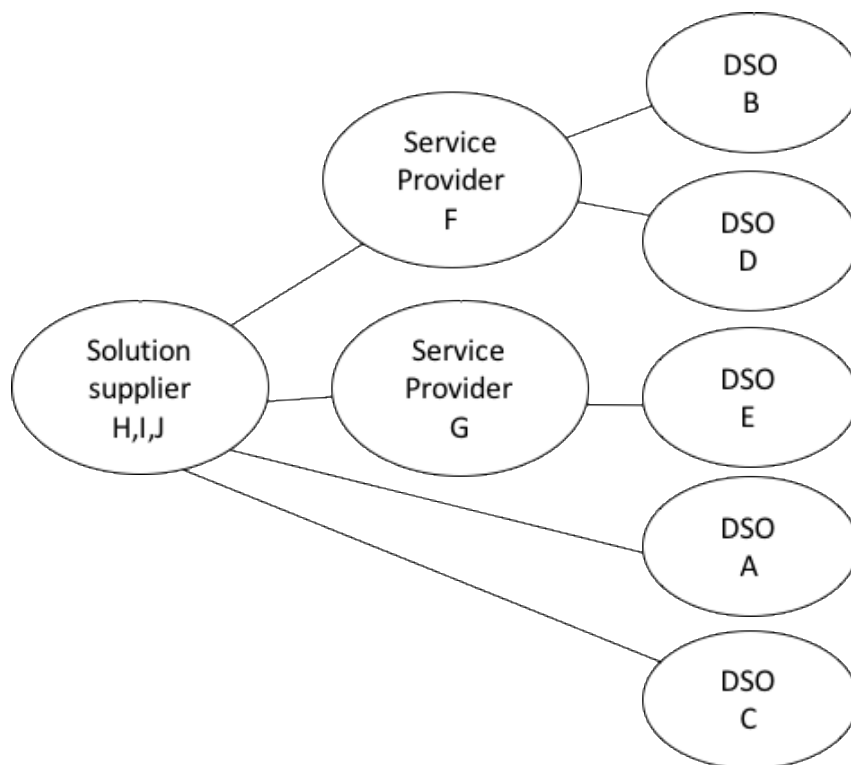


FIGURE 11 Relationship between interviewees.

Number of interviews executed was 10. Seven (7) interviewees were customers of the case company including five (5) DSO representatives and two (2) service providers and three people were from case company. This sample size was seen to be adequate to provide a diverse view to value co-creation between the

technology supplier and their customers. Interviewees and their roles are presented in Table 4.

TABLE 4 Interviewees.

Interview	Type of customer	Title
A	DSO	Account Manager
B	DSO	Account Director
C	DSO	CEO
D	DSO	Manager, Energy Data Management
E	DSO	Service Manager
F	Service Provider	Offering Manager
G	Service Provider	Service Manager
H	Supplier	CEO
I	Supplier	Product Manager
J	Supplier	Sales Director

Interviews were executed during February and March 2017. All interviews were carried out face-to-face. Interviews lasted about one hour each and they were recorded. All interviews were executed in Finland and in Finnish language.

4.7 Data analysis

Although data collection and data analysis are separated in literature, they are not separate, but data analysis strategy needs to be considered already before data collection (Hirsjärvi & Hurme 2000; Eriksson & Kovalainen 2016). Analysis techniques are versatile in qualitative research and they are not strictly standardized (Hirsjärvi & Hurme 2000).

The first phase in analyzing interviews which are recorded, is to get data to written format. This means usually transcribing of data either word-for-word or at least the main parts. When the material is transcribed, it is recommended to read the data several times as whole as already in this phase some ideas and questions arise. (Hirsjärvi & Hurme 2000). After this, the data is split into smaller parts that are analyzed separately. This is often done using different categorization methods where data is coded in a systematic way based on word, sentences, themes or other criteria. Finally, it is important to return into interpretation of whole data and to present theoretical concept of phenomenon under study.

In this study, all interviews were fully transcribed in the beginning of data analysis. Result was about 100 pages of raw text material. Although transcribing of material took time, it also provided a good way to get familiar with the data.

In data analysis phase, the raw data was first read couple of times to get the big picture on the material. After this, data was gone through separately from each research question point of view to mark all comments relevant to that. After that, data related to each research question was analyzed in more detail using theoretical framework. Analysis of perceived customer value was split into smaller categories based on categorization model of Lapierre (2000). Data related to value co-creation process was analyzed in more detail to gather comments related to supplier capabilities and interactive practices promoting co-operation. Next each category of data was split into smaller subcategories. For example, interactive practices were categorized based on different phases of interaction where they take place to find out if the phases of interaction listed in theoretical framework existed and on the other hand, there would be some other phases to be found. When analyzing each category of data, the main messages concerning it were gathered by counting how many interviewees had mentioned same topic during the interview. This method enabled to find the common views of customers regarding co-operation.

One additional analysis dimension was to compare customer cases when SP is involved and where they are not. This was done by comparing answers of each actor chain (see Figure 11) including supplier, DSO and SP (if included) to find out if there were differences found in co-operation, value creation and relationship between actors in situation where SP is running AMS operations and where DSO is operating the AMS system themselves.

5 RESULTS

Results of the case study are presented in this chapter. Results are summarized by themes covered in interviews and by research questions of the study.

As an introduction, we summarize how interviewees see their value network and roles of different actors to get an overall picture of the studied ecosystem.

Then, results concerning customer perceived value are presented. First there is a general analysis on what things are most valuable to the customers followed by more detailed division of value elements provided by products, services and relationship.

Next, main research question on capabilities and practices enabling value co-creation between the supplier and its customers is analyzed in detail following the model of theoretical framework.

After that, differences between dyadic supplier-DSO and triadic supplier-SP-DSO customer cases are compared beginning with consideration of roles of actors in different cases and followed by analysis of relationships between the supplier and customers in different cases. Finally, other findings made during the case study are presented.

5.1 Business ecosystem

5.1.1 Actors

The focus of this study is in triangle of the technology supplier, SP and DSO although, as covered in chapter 3.3, the business environment of smart metering contains other actors as well. Interviewees were asked to name the most important actors in their value ecosystem to build an overall picture of their operational environment and to get a view how the technology supplier is placed in their value ecosystem.

Actors named by DSOs contain their own customers and partners involved in main business processes. Customers of DSOs are understandably in key role as without customers there is no business. Value ecosystem of DSOs contains also different suppliers and partners. They are related to network infrastructure and its construction and maintenance, electricity market, and distribution of electricity to customers. Main partners named by DSOs include technology suppliers, service providers, construction companies, IT system providers and electricity market players. Value provided by partners is tied closely to the DSO's main business processes.

Core process mentioned by many DSOs is the 'from meter to invoice' - process, which enables the chain from measuring the electricity consumption to invoicing the customer. This is also the process where technology supplier and

service provider (if DSO is not running AMS operations themselves) are central. As technology supplier and service provider are heavily involved in this critical business process of DSOs, they are central partners from value creation point of view as well. Technology supplier's value proposition to DSO (and SP) contains devices to measure electricity consumption accurately and communication technology to move measured values timely to the system. These values are moved to real value when DSO utilizes the measurements to invoice the customer or to monitor electricity network usage.

They (most important actors in ecosystem) are mainly system providers, in our case those who are involved in 'meter to cash' -process, because 98% of our money comes via smart meters. Of course, there are meter suppliers, data communication providers i.e. tele operators, providers of measurement data management systems. Of course, then those who are involved in billing. There are many in the chain. That is the most important one, but the other side is security of supply: that we need to build reliable network and there are of course many actors who build network for different voltage levels. (Account Manager, DSO)

Another example of value chain is related to reliable electricity delivery. Currently, big investments are made by DSOs to build weather-proof electricity network e.g. via cabling. Construction companies provide value proposition to DSOs via cabling. Value is realized when there are situations, e.g. storms, when overhead lines would be damaged and would cause extra cost and work to DSOs, but because of cabling electricity delivery continues without outages.

5.1.2 Regulator and authorities

Regulator or electricity authorities were not considered as actors in the ecosystem in a similar way as partners and customers. Regulator's importance to the business environment was seen clear, but the role of regulation authorities was seen more like a framework for the whole business than as one player in the ecosystem. Regulation was seen to have both positive and negative implications. It was seen to restrict business opportunities to some extent but on the other hand, regulation sets clear requirements and targets for the development and operation. No matter, how role of regulation was seen, regulation was seen mandatory in monopoly business.

It (regulation) is mandatory in monopoly. If you want to be in this business, that needs to be accepted, otherwise you are in wrong business. (Account manager, DSO)

It didn't come to my mind and I wonder if regulation authority is an actor in ecosystem. But yes, it sets the framework at high level for our operation. In that respect it is in ecosystem ... (Manager, Energy Data Management, DSO)

5.1.3 Co-operation or competition?

Other DSO's didn't come up when main actors of their ecosystem were asked from DSOs. That is probably because other DSOs are seldom involved in DSO's core business processes. During the interviews, however, co-operation between

DSO's came up several times. As DSOs operate monopoly business, they are not competitors to each other and that enables natural co-operation between them. However, the intensity of co-operation varies between DSOs. There are some groups of DSOs having the similar type of network structure that work regularly together to share and harmonize their processes and to discuss openly about topical things in their business. One example of this kind of co-operation group is the group of DSOs operating city networks in Finland. This is what one member of the DSO co-operation group says about its value:

Yes, it does create co-operational value. ... What we have done a lot in recent years, is to unify how we operate as it is very important thing to DSO's, customers and electricity markets. (Account Manager, DSO)

DSOs also take part in different Finnish Energy workgroups and work there together. In a bigger picture, Finnish DSOs could act as one towards EU to push Finnish targets to Europe. So, there are several possible communities for co-operation. On the other hand, not all DSOs have natural co-operation groups in place and don't have any regular co-operation with any other DSO. Even these DSO's made suggestions on gathering a bigger forum of DSOs to discuss about the future. This idea will be covered in later chapter in more detail.

When DSOs don't see others as competitors and are able to discuss and compare their ideas quite openly, service providers are seeing other SP's clearly as competitors. In principle, they could buy some services from other SP's if they don't offer those services themselves, but otherwise there is practically no co-operation between SP's. Same applies to smart metering technology suppliers. They are competitors to each other and don't have open communication or co-operation with each other.

Question of competition between supplier and SP's was also touched in interviews as the supplier is providing partly similar solutions as SP's do have in their offering. However, the message from SP's was quite clear that at least currently they don't see the supplier as competitor but as a partner. Same opinion is shared in supplier side.

5.2 Perceived customer value

Interviewed customers were asked what things in supplier's offering provides value to customers in their business. Perceived value was discussed first generally and then in more detail based on categorization model presented in Table 1. Each category, i.e. products, services and relationship, is discussed one by one in next chapters and the findings are summarized in chapter 5.2.5.

5.2.1 What provides customer value?

First valuable topic raised by all customers was operational efficiency and all factors contributing into that. This is not surprising as operational efficiency and

quality of operations means savings in costs and resources. It has also non-numerable impact to customer satisfaction and to the brand if operations work well or don't work as expected.

For us quality is valuable. As quality is also efficiency, it is cost-efficiency and it is our reputation towards our customers. (Service Director, DSO)

Even if operational efficiency is always important, it is emphasized in current phase of smart metering business in Finland. Systems are in operational mode and next big rollout is not seen in the next few years even if some development of solution takes place all the time. Operational efficiency was pointed out in interviews by both DSO's and SP's but was highlighted even more by service providers. This is understandable as SP's are responsible for reading operations and in some cases maintenance processes to DSO's. They are typically managing operations for several DSO's and their total amount of devices on field is very large. When there are e.g. million devices to operate, automation of processes and minimizing the amount of metering points requiring specific attention and manual tasks is crucial.

The basic operations need to be working exactly correct and not almost correct. This basic daily work needs to be really efficient. If it is working, then we are able to plan and implement value added services but if the basic operations do not work we can't develop new as too much energy is spent to keep basic machine running. (Service Manager, SP)

When we ensure the operational efficiency, then we can work on new development, but we always need to remember that basic operation is the train that keeps going and makes sure that we have ability to operate. (Service Director, DSO)

For DSOs, smooth operation of business processes like 'meter to invoice' to work smoothly is crucial. The process has several phases and elements that need to work seamlessly to enable efficient and correct measurements and invoicing of customers. In this process technology supplier is seen primarily as an enabler for successful operations.

Technology supplier is the enabler of meter to invoicing process. (CEO, DSO)

Technology supplier creates value by ensuring that customers get electricity and invoicing is correct. (Account Manager, DSO)

Various details have impact to 'from meter to invoice' process and from the supplier point of view it covers different levels of offering: product functionality and product quality, well-working services and smooth processes of co-operation. First, devices need to work reliably, measure electricity consumption correctly and collect needed measurement data. Further, meters need to have communication capabilities to transfer measurements data to the head-end system from where the values are exported further to other business systems like billing system. If there are exceptions found, different services of the supplier

need to work promptly to solve the issues, and overall co-operation needs to support operational processes of the customer.

Other general area bringing operational efficiency is the value provided by monitoring and maintenance related capabilities. This is a wide area including various things like tools supporting device maintenance process or monitoring of faults in the electricity network. These capabilities are providing information on the quality and exceptions of the network, erroneous installations or faulty devices. Maintenance process becomes faster and more proactive with process automation using device capabilities and sophisticated tools. This brings cost savings to DSO's but also increases their customer satisfaction when faults in the network can be fixed and even proactively before customer even notices them.

Information that we get about network quality through low voltage network monitoring is extremely important to us. When we e.g. investigated earlier exceptions in measurement accuracy, we went to the field, sent the meter for further study to somewhere and waited for weeks for results, we now get that information from the system. We have been able to solve now tens of cases remotely from the system and that improves customer invoicing and improves energy efficiency as energy loss decreases. It is very diverse. You could think that it is only a meter, but it has impact to very many issues and I could think that it impacts even to realization of our strategic targets. (Account Manager, DSO)

...network operations and control room services get benefits. That has been probably the biggest single success (from AMR). They got much more than they expected in their skepticism. (Manager, Energy Data Management, DSO)

Another valuable topic mentioned commonly was the ability to plan the future solutions with the supplier. This is enabled by various capabilities that the supplier can offer via products, competences and interactive practices. However, the main contributing factor mentioned was connected to overall relationship between the supplier and a customer. This will be discussed in detail later, but next citation summarizes well value seen from the customer point of view.

But if you think that what are the most important things from value perspective in our business, I see that it is quality, efficiency and then it is the ability to see the future and to find flexible partners who share the same vision to implement it. (Service Director, DSO)

5.2.2 Value of products

When customers were asked on what supplier's products provide value, they brought up both physical elements like circuit breaker and software related things like alarms based on network faults. Good usability of products like easiness of installations was also seen important and brings direct cost savings.

(Supplier) provides significant value in measurements and what can be done with the meter. The added value that the device and products provide is significant in order to get invoicing done and electricity on and that is thing that our customers appreciate and we appreciate. (Account Manager, DSO)

Meter itself is the basic element of energy data management. It has to work reliably and it has to be easy to install. We have unit price from energy authority and

installation can cost certain number of euros. It has to be of high quality but cost-efficient. Functionality needs to support business processes and provide business benefits. One example is circuit breaker. Luckily, it made sense business-wise to take it to all devices and it enables one process which works smoothly. (Manager, Energy Data Management, DSO)

Even if the product itself provides valuable features it is not evident that customers see the value potential when they are buying the product unless the supplier is able to communicate the potential benefits to customer. As the life-cycle of products is long, some decisions on product capabilities are far-reaching. Even if many functionalities can be upgraded remotely, features requiring hardware changes can't.

Circuit breaker was brought up very well by H and J: not based on device technology that how many relays the device has but through business processes. We had some good discussions on that time (Service Manager, DSO)

Although state-of-the-art technology and modern features enabling new services are important, it is good to remember that technology is not valuable as such.

New features need to be good and profitable, if it is just technology hype, it doesn't bring value. (Account Manager, DSO)

Device product features are targeted more directly to DSOs than to service providers. For service providers they are more enablers for providing new services to DSO customers.

If there is new technology on market that produces value to our customers, it is of course an issue that we can offer to our customers as a new feature if they are interested. As a service provider it is important for us to show to our customers that we follow development and are in the top of it and can provide new features to our service. If there are new features that customers also see as beneficial and new, of course it provides value to us. Technology like new radio is an example of feature providing value to the customer. (Offering Manager, SP)

5.2.3 Value of services

In this context, services include e.g. service desk operations, order and delivery services, repair services, training and project management services. Generally, value provided by services didn't come up very strongly in interviews compared to value provided by products and relationship. One reason for that might be that these services are not considered as separate value-added services but rather hygiene factors that are assumed to work fluently. Other reason might be that not all interviewees are directly in touch with these services.

Service desk operation was named most often by customers when asking about supplier services bringing value to them. Service desk providing phone and email support for installers and users of the solution is operating closely with customers. Cases coming to the service desk vary a lot from instant help needed by installers to complex system issues where problem solving requires further analysis and takes time.

Installer calls. It is important that response time is short when installer is usually in bad situation and has a problem which has been ongoing for a while already when he takes a call to ask what he should do. It is very important that someone answers as soon as possible. That is really important for the installer. I would say that it works well. I just know that if it wouldn't, I know that they would complain. Accessibility is number one criteria. (Manager, Energy Data Management, DSO)

For service providers, automation and commonly agreed processes is highlighted related to service desk operation.

We handle big mass of devices and for us it is important that we don't need to handle single cases. For us it provides value if you can provide automation so that we don't need to operate single devices. (Offering Manager, SP)

I think it (service desk) works pretty well but I don't have clear view on that. You have ticketing system and we see all our tickets I would like to see how fast they are solved. That could be better so that we could measure the service level, that could improve our operations. (Service Manager, SP)

Training and common events provided to customers were seen also valuable. Some comments show though that in services side there is value opportunity that has not been fully realized yet. This came up e.g. related to training services.

To some extent, our people are attending (supplier's) trainings and events. It is good to meet people from other companies and to share opinions with them for a day or two. (CEO, DSO)

There is a case that we train the installers in the beginning of the project but they the installers change. Now contractors move the installer's guide to new ones. But they don't get the installer's training and thus they don't ensure their competence. We in practice trust that more experienced installer's train the new ones but we don't know for sure if they have the competence. (Manager, Energy Data Management, DSO)

Technical competence of the supplier personnel was noted valuable generally in all co-operation from service desk to marketing and product management. This can be connected partly to services but also to co-operation generally.

...that you have people who understand about the subject and you can discuss with them and have development discussion on the subject. I see it important. And I do so that when I have some issue concerning you, I send an email or call (Manager, Energy Data Management, DSO)

5.2.4 Value of relationship

Value of relationship between the supplier and its customers was highlighted many times in interviews. As the life-cycle of products and customer relationship is long, it is crucial that the discussion between the supplier and the customer is regular and trustworthy. Mutual trust was pointed out in interviews as a necessity for successful co-operation. Especially, when there are issues to solve like there is in any long customer relationships, it is very important that parties can trust that the other party keeps their promises. In these cases trust acts as a bridge even if there are any issues to solve.

This is about long-term activity. It is not a one-time delivery after which we would not see supplier anymore. The devices need to operate for a long time and it is important that the co-operation is smooth and trustworthy. It has been such with you at all times. (Service Manager, DSO)

The most important thing is the quality and transparency and the fact that there is no such thing that could not be discussed. (Service Director, DSO)

Trust is extremely important. If you don't trust other party, the co-operation weakens. There is no partner, with whom we wouldn't have had problems. But it is about how we solve those. Shall we start to read agreements, or shall we first solve the case together and then agree about the responsibilities. There are many ways to increase or decrease trust. Relationships between people are very important. (Account Manager, DSO)

Service providers pointed out the importance of trust as well and that it helps to solve problems in co-operation if they arise.

Trust. In good co-operation, you don't need to check all the time agreements literally when things work between parties and also difficult things can be solved together. (Service Manager, SP)

Even if trust was raised as number one priority for working relationship it does not mean that personal relationships as such drive the business decisions but that relationships are developing via well-working co-operation.

Relationship is developing through good co-operation over time, not that personal relationships drive purchase decisions. So, relationship is a result of earlier actions. I would like to see it that way that personal relationships may develop strong when reliability and quality of business meet. It starts when we have co-operation and we see that it works, and we want to develop co-operation together. (Account Director, DSO)

5.2.5 Summary on perceived value

Summary of findings related to value that customers perceive is collected to Table 5. Value elements brought up in interviews were categorized according to model presented in chapter 2.1. Results show that customers get value from all value categories: products, services and relationship. In results efficiency and cost-effectiveness of the system are emphasized in value elements of products and services. Quality and cost-effectiveness of products was highlighted as well as operational efficiency and quality of services. Service desk availability and timely orders and delivery are also tightly connected to operational efficiency.

In addition to operational efficiency, importance of future-proof solution offering as well as future orientation was highlighted. For example, state-of-the-art technology of products was brought up. Regarding relationship and co-operation, future orientation of the supplier was seen valuable. Especially innovativeness and vision of the future of case company was seen to provide value.

Customers brought up very strongly value provided by the relationship and capabilities of supplier organization. Importance of trusted relationship was

emphasized by all customers. Also shared values and commitment to partnership were mentioned. It is not a very surprising that trust is valuable in the business where customer makes long-term investment when they choose the supplier and where customer-supplier relationships are long. Still, importance of well working relationships was emphasized by customers even surprisingly strongly.

TABLE 5 Value elements by customers.

Value category	Value elements
Product	Product quality Reliable measurements Easy installation State-of the art technology Cost-effectiveness Network monitoring capability
Service	Operational efficiency Timely orders & delivery Service desk availability and response time Responsiveness Competence of personnel
Relationship	Trust Shared values Vision for the future Innovativeness Commitment Understanding of business

When comparing results between DSO and SP customers, there were some differences in how different value elements were stressed but similar items were still brought up by both customer groups. Both groups raised quality and reliability of products and services. Operational efficiency was seen important by both customer groups, but service providers emphasized that even more. DSOs brought up more value of supplier's business understanding and competence of supplier's personnel. In both groups true, trusted partnership was highlighted equally.

5.3 Value co-creation practices and capabilities

5.3.1 Interactive practices in different organizational levels

Value co-creation may occur only via interaction between different actors. Therefore, ways of co-operation and points of interaction between the supplier and its customers were discussed thoroughly during interviews. Approach taken in interviews was to list interaction points and practices in different organizational levels.

Development is cyclical. It is a big process, what the next device is. But, when the rollout is over, and we move to operational phase, then it is operational kind. We ensure that the operational process works and take care of it every day. Of course, we need innovativeness also during that time, the world doesn't go like in a way that we invest meters for 10 years and then we wait after rollout for 8 years. There are things happening all the time and the cycle of development accelerates. (Service Director, DSO)

There is interaction between the supplier and its customers, both DSO and SP, in all customer cases in different levels of organizations from top management to development but ways of interaction and their frequency varies case by case. There are some common co-operational practices, but common processes are not fully standardized. Levels and ways of co-operation including frequency and the scope is summarized in Figure 12.

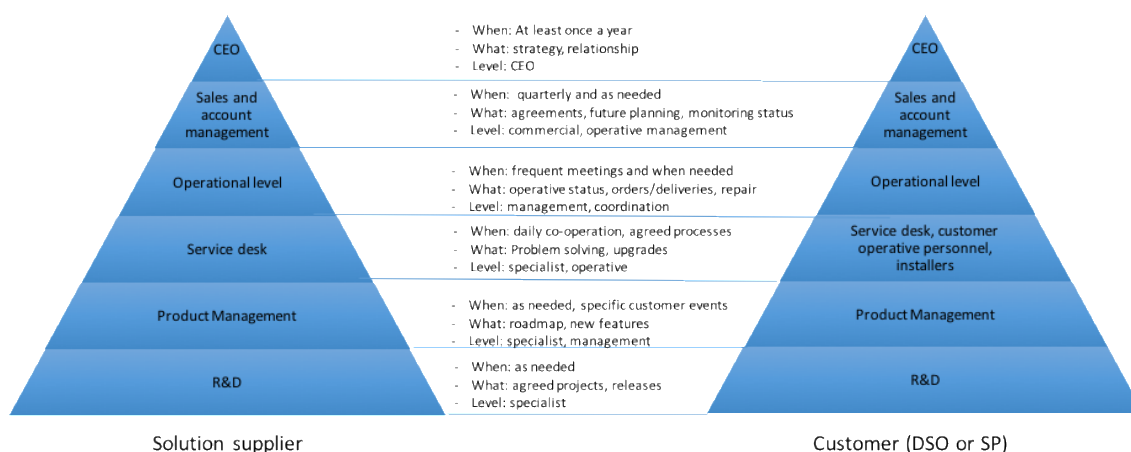


FIGURE 12 Levels of interaction between the supplier and customers.

In top management level, the scope of the meetings is on strategic level. Typical issues handled on that level are common strategic planning, agreements or steering of common projects when there are major decisions to make. In addition to organized meetings, there is interaction between the supplier and customers' top management also in e.g. smart metering events and customer events organized by the supplier. Interaction in this level was seen important by all

parties. No big problems were identified in this level of co-operation. However, agreed process to support strategy focused discussion at CEO level was seen important by both customers and the supplier. There is some variation between customers how organized this co-operation is.

Perhaps what we could develop is common strategic planning, where we are going. Seeing the future is difficult. We see that we are in customer-driven business and a lot of things depend on what they decide to do. (Offering Manager, SP)

Let's say examples that top management would have regularly customer's top management and we would have a process there; that we would have a discussion group to develop this industrial area. We are lacking it. (CEO, supplier)

In sales and account management level co-operation is more regular and contains different areas of co-operation containing both management of commercial issues as well as future planning. Tasks include e.g. sales and marketing activities like solution selling and agreement preparation as well as discussions on future needs on solution offering development. After deployment phase it contains monitoring of service quality and evaluation of future needs together with the customer. In supplier's side sales director and account manager are the key persons in this level, in customer side it may be e.g. service manager/director or offering manager. With most customers, there is a regular meeting between the parties quarterly when with some other customers, meetings don't have agreed schedule but are kept on need basis. There is, however, discussion on management level to both DSO and SP customers at least annually.

Operational level co-operation is partly overlapping with management level activities and can be handled by the same people, but the scope is in daily operations. Tasks include e.g. order and delivery handling, invoicing and repair handling. When customer projects are ongoing to deploy new products or features to the customer, projects are managed on this level. Key persons are project manager, logistics people and account management from supplier's side and operative managers and other people responsible for material orders and warehouse operations in customer side. These issues are handled in common operative meetings with the customer or via email or phone.

We have two different co-operational teams: operational and development group. ... In development group we can't create every time new things. Sometimes they do and sometimes they don't. I still think that is it good that we check together all three of us (supplier, SP and DSO) situation, not that we have only dyadic meetings with SP and with you. (Service Manager, DSO)

We have our common meetings where customers participate and where we look at customer-specific service levels and develop as well. Target of those is to keep up quality, but at the same time those are events where we have chance to hear customer's wishes for the future and what services they want or we need to concentrate or develop. Then we have mutual meetings where we can develop customer-independently our co-operation and systems. And then we have development meetings concentrating on longer-term issues once or twice a year. In a way we look at agreement things but also future a bit further, to see where the world is going. (Service Manager, SP)

Service desk is its own area of co-operation. In supplier side there is a specific team handling technical support for customers. From DSOs the main actors are installers and system key users. In service provider side there might be also their service desk personnel. Supplier service desk operates via phone and email and all the requests are handled via ticket system where tickets are managed systematically.

On technical level, there are two main points of co-operation. One is product management, which is responsible on solution roadmap and lifetime of products. Product managers participate in customer development meetings when needed and act as specialists in co-operation. There is no regular, standardized co-operation on product management level between the supplier and customers, but product managers give support to sales and account management in technical issues when needed. Product management may also have some special projects with the customer to e.g. develop some solution together.

Finally, there is R&D personnel who implement and test products and services. R&D people don't have regular direct customer relations, but they are used as specialists when there is some detailed knowledge needed or if there is a special project with the customer for some specific purpose.

I would say that forum and conditions for co-operation exists so that we can stay close to our customers and partners. (Service Manager, SP)

Naturally there are regular co-operative meetings between operative people to go through tickets etc. Then there are quarterly meetings where we see things on a bit higher level. But just when I started to think future changes like datahub or meter replacement, there would be a clear need to look at things a bit further -what they actually mean. And there will be the report from smart grid committee and that would be a moment to collect more customers together because I think that the vision will be quite different based on same changes, depending on what part of Finland or from which company you come from. It is so different that it would be important to get common vision how we should do this. (Account Manager, DSO)

We have regular development meetings with part of the customers. I think that it supports value creation and doing right things. But where we clearly have a place for improvement, is how consistently we could get new things to our idea-to-product process so that customer co-operation practices would become part of that process that would be processed in a uniform way and we would really get the barrel of the wishes that would be processed regularly in an organized way. Now I think that in the process good ideas might be forgotten. (Sales Director, Supplier)

Development co-operation works pretty well, it works and we've had some larger meetings with whole management and we've made strategic alignment. Then we have open discussion and we discuss even on the things that we disagree. It works well, openness, trustworthiness. (Account Director, DSO)

5.3.2 Interactive practices related to innovation

When analyzing the data, operational processes were emphasized but, at the same time, there is new development and future planning ongoing with customers. Interest of customers for new solutions is evolving and in interviews

mutual interest for common ideation and development was taken up by several people.

According to interviews several supplier's capabilities set basis for mutual value-creation. Trustworthy and open relationship between the supplier and its customers is a key for innovation together. Another key capability for value co-creation is that customers see the supplier to have knowledge and experience that they don't have themselves which provides them value opportunity. This applies especially to DSO customers who brought up repeatedly that they see the supplier as a correct partner for planning the future solutions together.

You (supplier) could help local DSOs to succeed better with their knowledge and experience, it would be possible. ... We should define those things, what we start to improve and agree the effort to be used and then just roll up one's sleeves and start to work, I think I would take some processes to work on. I know that much of your people that I believe that we would be ready for that and I believe that you could help us in that. ... I believe that we would be in and it would develop us and you would achieve more understanding on how we (DSO) think. (CEO, DSO)

I would say that we could have perhaps even more (co-operation). It could be easier to think, what the meter should register, in what kind of events it could send information, kind of processing and analysis of data, there you could have a position. (Manager, Energy Data Management, DSO)

DSOs brought up also supplier's experience with many DSO customers: their network and the solutions they have in place. They found that experience as valuable capability. DSOs talk also to each other openly, but they see the supplier as kind of aggregator of ideas who could process the ideas further to customer solutions.

As you have a large customer base, you get a lot of views from different places. You must receive quite a collection of needs and ideas. We are eager to hear them and expect that you refine them further. It tells about the partner, that those ideas are taken up actively. That we have thought about this, what do you think about this? That is what we like, that we spar each other. (Account Manager, DSO)

The fact that you co-operate with so many companies and our other partners co-operate with many different players and get influence from elsewhere and I hope that it is a sum of different opinions. (Account Director, DSO)

Co-ideation and co-processing of ideas is not seen valuable by DSOs only but also by the supplier. Even if the supplier is talking regularly with different customers, they don't have that kind of insight of customer business as customer have themselves.

But what I have been a bit in service business, the fact is that you can't do it if you don't understand the customer value and without customer being involved in that, there is no hope. We need to be very close to the customer: defining and asking, otherwise it doesn't succeed. When customer doesn't know the value, it should be an opportunity for them when we start working together and both of us will learn hell of a lot during the process. (CEO, supplier).

Would be very interesting to have an opportunity to trial new things. Innovating new things is always the hardest thing as things happen easily in the circle like before

without questioning current ways of doing. How could we get an opportunity to question? We should be inside their (customers) processes to see. (Product Manager, supplier).

Value co-creation through common innovation came up also with service providers although not as strongly as with DSOs. Service providers are willing to create solutions where they build services on top of enablers provided by the supplier's products. In that sense they want to build value to DSOs together with the supplier. However, as data processing and service business is their core business, they don't necessarily want to open their business models to the supplier and therefore common ideation of new services is not as open as with DSOs. In process development side there is however interest to work together with the supplier to make common operative processes more effective.

Operative activity is the basis, on top of we can build other things. It has to work so that we are able to provide our service according to our promises. ... Of course, the other important side is to create new offering, of course it is important for us to bring new things to customers and to show as valuable actors in the chain. That devices enable what customers want and integration of those, it very crucial to our business. (Offering Manager, SP)

We have stayed in the process blocks that we agreed in the beginning. I think we would have more to offer to service providers than what we do now. Another thing is how much service providers want to open it towards us, the opportunity for providing new services. (Supplier, Sales Director)

5.3.3 Summary on value co-creation capabilities and practices

Theoretical framework (Figure 8) names supplier's organizational capabilities that assist in value co-creation. These individual and organizational capabilities are enablers for developing value in customer relationship and further to co-create value together. When analyzing the data of customer interviews, value of certain capabilities of the supplier came up several times even if they were not asked directly. In categorization of theoretical framework, six different categories of useful capabilities were named. Each of these can be found also from empirical data of this case study. On the other hand, supplier capabilities that customers named as affecting positively to co-operation linked quite well into the categories named in theoretical framework. Examples of capabilities belonging to each category are collected to Figure 13.

In addition to capabilities, interactive practices have a key role and are a necessity for value co-creation between the case company and its customers. Points and procedures of interaction were collected in analysis phase to three main categories according to theoretical framework: linking, materializing and institutionalizing. These are high level practices which contain a lot of different concrete activities which may take place during co-operation.

Seven phases of interaction from co-ideation to embedding bring third level to analysis of results. Summary of findings regarding interactive practices between the parties are summarized in Table 6. In summary we also comment the phase where these practices are taking place. Findings are documented

separately for DSO and SP customers for enabling comparison of two customer groups.

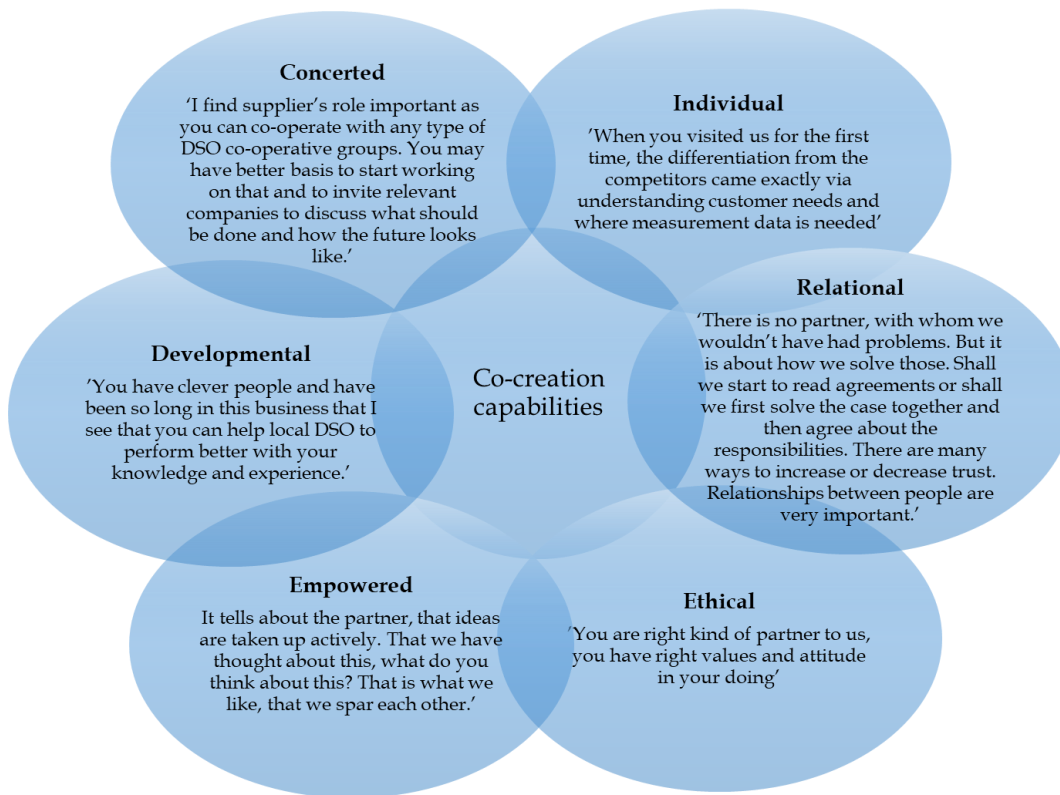


FIGURE 13 Capabilities of the supplier promoting value co-creation.

According to customers, there are many linking practices between the supplier and the customer. There is a trustworthy co-operation atmosphere and communication links in place to share knowledge openly between parties. The supplier was seen to understand especially DSO customers' needs and being able to discuss future business directions. In comments, practices for co-ideation and co-valuation were found. SPs brought up linking practices together via co-ideation to benefit DSOs and to be able to create common offering to them. In addition to ideation of new products or services, especially DSOs saw the supplier as an important link to provide information on smart metering solutions generally and as a connecting link between DSOs.

One finding of the analysis was that there is a linkage between supplier capabilities and certain interactive practices. Some capabilities clearly support linking practices. Understanding of customer needs tells about individual interaction capabilities. Relational interaction capabilities are needed to build social ties to be able to discuss and share knowledge openly and being trusted advisor tells about ethical interaction relationship capability.

TABLE 6 Value co-creation practices found in the study.

Practices	DSO	SP
Linking	<ul style="list-style-type: none"> - Understanding customer needs - Innovative ideas sharing - Ability to see the future - Capability to present benefits from customer's perspective instead of through technology - Co-ideation and co-valuation of new product offering regularly in development group - Strategic long-term planning together - Discussing together the requirements coming from regulation - Open discussion on future strategic directions - Acting as a linking party in smart metering ecosystem - Sharing knowledge on co-operation with other DSOs and utilization of data - Supplier's deep involvement in customer's processes - Sharing knowledge, discussion partner when there are questions - Acting as a trusted advisor to bring knowledge gathered in other customer cases for mutual benefit 	<ul style="list-style-type: none"> - Creating value together to our customers - Innovating together solutions to DSOs - Readiness for continuous development and innovativeness - Common meetings to create valuable solutions to common customers - Strategic planning together to develop future directions
Materializing	<ul style="list-style-type: none"> - Development and deployment of low voltage network management - Co-piloting and co-deployment of new services like reporting - Service desk helping customer in a bad situation - Training service offering provided according to customer needs - Common proof-of-concept project to test new technology capabilities 	<ul style="list-style-type: none"> - Common development to improve SP processes and add automation between parties - Co-development and co-testing of service offering to customers - Common development project for offering new technology to common customers

Institutionalizing	<ul style="list-style-type: none"> - Responsibility for lifetime of products and their quality - Regular status follow-up on operational efficiency - Support and repair processes in place - Sparring each other both ways - Trustworthy relationship - Continuous development meetings to review development opportunities 	<ul style="list-style-type: none"> - Partner for creating value together to our customers - Keeping the operational processes working efficiently - Common monitoring of service level - Common operational meetings to follow-up operational status, both dyadic and triadic with DSO customers - Documented support and warranty processes between organizations
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Materializing practices are related to common product development. Persons responsible for this type of co-operation were not fully represented in interviewees but examples of this kind of co-operation were recognized. These practices may be established through customer requests for some new functionality or by the supplier when they plan to build some new product functions or services and potential pilot customers are searched to participate on deployment of new offerings.

Related to materializing practices, empowered capabilities were shown in cases where customers were invited to design or test some new products or applications under development. Similarly, developmental capabilities are shown when for example in deployment phase of power grid monitoring the outcome of the feature and incidents in the network are analyzed together and the supplier can transfer knowledge to DSO on possible reasons of occasions.

Currently, focus is understandably in regular co-operation processes and therefore institutionalizing practices were emphasized in interviews. Exact practices of co-operation are not standardized but depend on partners involved. In all cases there is some co-operation model in place. In customer cases where SP is involved, the operational co-operation is usually handled together with all three parties and in addition, there are meetings between the supplier and SP. Related to institutionalizing practices concerted capabilities are of importance and for example project management skills are needed from the supplier to organize and to push further common activities.

Interactive practices were investigated also from the supplier point of view. Supplier interviewees raised more development topics regarding interactive practices than customers. Criticism of the supplier was targeted primarily to their own organization. They saw e.g. gaps in having standard co-operation practices with all customers. Regarding linking practices willingness to understand

customer needs was found to be in place, but it was seen that the knowledge of customer processes and agreed processes with customers to get new requirements for common analysis could be improved. In materializing practices there are some examples where common development projects take place with customers and in those co-operation works nicely but those cases are separately agreed, and common materializing practices are not yet built into supplier's internal development processes. In institutionalizing practices, the view of supplier was in-line with the opinion of DSOs and SPs. The regular operational co-operation is in place and works well. Development and strategic co-operation works well with some customers but could be developed into common practice.

5.4 Value co-creation processes in dyadic and triadic customer cases

5.4.1 Roles and relationships between DSO, SP and technology supplier

One aim of the study was to compare from supplier's perspective customer cases where DSO is running themselves their AMS operations and where SP is running the reading operations for DSO. In dyadic case, supplier is providing the devices and HES directly to DSO and they have direct customer relationship.

In triadic case, SP has a central role and operates the AMS solution for DSO. Typically, in this case the supplier is offering device technology to DSOs and optionally HES to SP. In cases where service provider is operating AMS they often have been a prime contractor in system rollout phase and have taken care of service operations for DSO after that. The supplier acts as a technology provider delivering smart meters and possibly also system components. In this case all parties are interacting with each other both all three together and bilaterally. In technical discussions regarding devices and their functionality supplier is interacting primarily with DSO. These discussions may take place between all three players or between DSO and supplier, depending on case. On the other hand, supplier is interacting more regularly with SP in daily operations related to e.g. service level and support issues.

So, both DSO and SP are customers of the supplier, but their roles are different. In next chapter, relationship to SP and DSO customers are opened and compared.

5.4.2 Service provider relationship

From the supplier point of view, service provider can be seen as the partner to provide value to common DSO customer. Thus, the value of supplier-SP relationship can also be measured through the value it creates to DSO.

You (supplier) are seen as a good partner to create value together for our customers
(Offering Manager, SP)

We experience you (supplier) as a good example of partner, not pure subcontractor. We do together and are a lot directly in contact with the customer and try to find together things that would bring added value to our common customer. (Service Manager, SP)

According to interviews, co-operation between SP and supplier works quite well. Emphasis of co-operation is on operational level but there is co-operation in other levels as well. One development topic brought up in interviews was planning and building new solutions more actively together and via that offer more value to the common end customer, DSO. As the supplier and SP may have several common customers, they can also build common solutions not serving only one DSO but all their common cases.

Roles are pretty clear and we see SP's as our customers and want to serve them. Another thing is how much that service provider layer offers data from device environment to DSO's or are utilizing the data even in their own service operations. There we could have place for more enhanced co-operation with SPs. (Sales Director, supplier)

Being able to productize something together so that it is easy to choose, that we haven't reached enough so that we would have product packages made together that would provide more (than individual parts). That productizing could be better. There we could try to create new ways. (Service Manager, SP)

You could easily think that DSO's are best experts of their own business. But perhaps they need help from outside. Perhaps that is something where we could tell about opportunities and how we could solve their burning issues. (Offering Manager, SP)

As noted earlier, the supplier has always relationship to both SP and DSO, no matter if it has contractual relationship with only SP. DSOs see it important to have also direct contacts towards the supplier and see them as a partner. Supplier's value is seen especially from technology and development point of view.

Strategic partners are actors who are very close to us. We have co-operation with them almost daily, they are deep in our processes and take part in our operations' development and you are quite far in there. Even if we don't have direct contractual relationship, but through service provider partner, all development is made triangularly. (Account Director, DSO)

DSOs expect and encourage both dyadic co-operation between all three parties in addition to triangular co-operation. DSOs see that there is an opportunity to create additional value when SP and the supplier are preparing together common solutions for DSOs.

I think that it is good that we look things together all three of us, not only twosome you (supplier) and us (DSO), our SP and us and you (supplier) and SP. Co-operation and providing better tools to SP are visible to us as well because then they can operate more efficiently, which we see. Therefore, it is important that you have direct co-operation with SP. (Service Manager, DSO)

In some discussions a question was raised if DSO and SP are equally important customers for the supplier or if DSO has a special role. That is an understandable

question as the main target of products and services developed by the supplier is DSO, no matter who buys or operates the products. DSOs also have best hands-on knowledge on the needs in the device functionality to manage their 'meter to invoice' -process and to manage their network successfully. Therefore, co-operation and understanding of DSO customers through direct co-operation with them is crucial. That doesn't mean that SPs and the supplier couldn't have successful development together to provide value to common customers or that supplier couldn't provide tools to SP to operate the AMS more efficiently.

I believe that you understand DSO needs very well ... Then the service, I think you have pretty good understanding of our doing, but I have a feeling that you consider DSO more as a customer (than SP), I think there is a bit of that, but you understand both ok. (Service Manager, SP)

DSOs have a special role from innovation perspective. I would say so. After all, the final benefit of solutions needs to be produced to DSOs and the base for that benefit needs to be bigger than sum of two cost points: supplier + service operations. (Sales Director, Supplier)

5.4.3 Supplier-DSO relationship

In cases where DSO is operating their own AMS, the relationship is and is not different from supplier point of view than in service provider case. It is different in that sense that supplier is the first contact point to DSO also in operative issues which would be taken care by SP if they exist. So, that makes co-operation between the supplier and DSO more intensive. Also agreeing on issues might be more straightforward when there are two parties instead of three. However, according to interviews, there is not much impact to supplier-DSO relationship whether there is SP involved or not. In any case there is open and direct interaction between the supplier and DSO.

5.4.4 Summary of results concerning dyadic and triadic customer cases

As a result, for the evaluation of differences, two points can be raised as outcomes of the study. First, the supplier has direct contacts towards DSO no matter if there is SP in place or not. There is some variation in intensity of relationship between customers and the scope of interaction is different depending on who operates the system, but the co-operation is still there. It looks from customer perspective that it is also seen positive both from the supplier and DSO point of view that all actors involved in AMS are in direct contact with each other.

Secondly, there are some differences between the supplier-SP and supplier-DSO relationships. Both SP and the supplier see DSO as the real end customer and the actions to build customer value are mainly targeted towards DSOs by both the supplier and SP. Probably the supplier understands better customer needs of DSO than SP and this is partly caused by the fact that the supplier personnel has more experience of DSO processes but also because DSOs are more willing to involve the supplier into their business processes.

5.5 Community perspective

When discussing about innovation of future solutions, multiple DSOs wished a forum which would collect together a larger group of DSOs and would be organized by the supplier. Of course, there are some events like supplier's customer days where customers meet and have an opportunity to discuss together. However, here the proposal was even more discussions on future directions in business and technology, and further co-ideation of future development. DSOs mentioned that it would provide an opportunity for co-learning from each other and co-evaluating of each participant's ideas.

The proposal that the supplier would be the correct party to create and invite together this kind of forum is interesting. One reason of the proposal may be that the supplier has existing customer relationship with all DSOs and is also player outside DSOs but still has a core player in business. On the other hand, it shows something about the quality of relationship between DSOs and the supplier if DSO's are willing to give the lead of future development forum to the supplier.

I think that in R&D related issues we should do co-operation widely, that would bring benefit. We go through operative issues and agreement stuff, but development scope should be within larger group. You may get wrong impression if you meet different customers and get different requirements from everyone and then R&D may be confused on what is wanted although we head towards a common future. So, I see that current meetings between us are good when we discuss some specific technological issues but common product development, I would like to see a larger forum between customers where those things are taken further. (Account Manager, DSO)

I find supplier's role important as you can co-operate with any type of DSO co-operative groups. You may have better basis to start working on that and to invite relevant companies to discuss what should be done and how the future looks like. If other DSO is asking that, it is seen as extra work and general discussion. But when it is current partner, who asks you to discuss about the future, it touches in another way. I see it so. (Account Manager, DSO)

In a similar way as in dyadic co-operation, also networking within bigger group of DSOs could bring valuable information to supplier as well to have an opportunity to hear different opinions of customers at the same time and to see if it is possible to create a common approach in some development topics.

From supplier view perceiving the value to us, how we should get it from customers. We just discussed about that today that we sometimes have problematic questions that we ask internally from each other and can't answer what benefit it brings to customer. We should have every now and then 'question time' with customers so that we could ask them anything. (Product Manager, supplier)

It is good to meet people from other companies and to share opinions with them for a day or two. It is important that you (supplier) collect similar people together to discuss on common topics. (CEO, DSO)

6 CONCLUSIONS

This final chapter of the study presents the main findings and answers the research questions set in the beginning of the study. Results of this study are mirrored to earlier research of the field and contribution of this study to the research is discussed. Managerial implications to business are presented after that. Finally, quality of the research is evaluated. Limitations of the study are considered and suggestions for the further topics of study are made.

6.1 Contributions to research

Scope of this research was to study value (co)-creation between the technology supplier and its customers in smart metering context. Main topic of the study was to understand what capabilities and practices enable and support value co-creation between parties. In addition, target was to find out what in supplier's offering provides value to the customers. Additional interest was to compare value creation in two different customer cases from the supplier point of view: the one, where service provider is involved and the one where supplier is in direct customer relationship with DSO.

In results of the case study, a few topics were highlighted by the customers as value enablers. One is trusted relationship between the technology supplier and a customer which has evolved over years of co-operation. Trust is a very strong enabler for developing value together. Without trust, common value creation is not even possible. Another main value creation enabler raised in results was technology supplier's understanding on customer's business and capability to build innovative solutions for their needs. Third important topic raised by customers was operational efficiency as whole including many things from quality of products to common agreed processes and ways of co-operation.

Capabilities and interactive practices were analyzed utilizing the theoretical framework presented in Figure 8. Capabilities of the supplier that were found to promote value co-creation mapped well to the ones mentioned in theoretical framework and other earlier literature (Marcos-Cuevas et al. 2016; Ballantyne & Varey 2006; Karpen et al. 2012; La Rocca et al. 2016).

There were a few capabilities highlighted in the results. It became clear that trusted relationship and innovation capabilities to develop solutions to the customers are valued most. These things are related both to capabilities of individual persons as well as to company culture. It is very important for the supplier to have key persons in customer interface who are good in keeping up and actively developing co-operation with the customer, both from relationship and innovative offering point of view. In individual level, knowledge on customer needs and ability to help them to solve their problems sets basis for good relationship. This finding is similar as results by La Rocca et al. (2016) who

emphasize individual capabilities of the supplier in innovation process. When mirroring results to theoretical framework, customer and business understanding tells about individuated capabilities of the supplier.

Good relationship and trust between the parties tells on the other hand about relational capabilities of the supplier. Relational capabilities are tightly in connection to individuated capabilities because it is individual persons who build and develop co-operation with the customer. These findings are in-line with earlier studies where importance of relationship management capabilities has been highlighted (Ballantyne & Varey 2006; Karpen et al. 2012; Beverland 2012; O' Cass & Ngo 2012).

Another capability that was emphasized was supplier's organizational capability to act as a trusted advisor to the customers and to collect together different parties in the business to discuss about future development of market. In theoretical framework context this is linked to concerted capability of the supplier.

In this case study, individuated, relational and concerted capabilities were highlighted the most, but also other capabilities of theoretical framework were recognized as was presented in Figure 13. List of capabilities by Karpen et al. (2012) was seen to cover the capabilities that customers brought up in interviews as important enablers for value creation.

Interactive practices and common activities between parties are other necessity and enabler for value co-creation to happen (Vargo & Lusch 2004; Grönroos & Voima 2013; Marcos-Cuevas et al. 2016). In theoretical framework both phases of interaction and main practices taking place during value co-creation process were included and further summarized into three categories: linking, materializing and institutionalizing according to theoretical framework. These three practices were guiding the evaluation of case study results. Importance of linking practices between the supplier and customers were emphasized in customer interviews. Things that customers named as valuable practices were supplier's understanding and interest of customer needs and acting as a trusted advisor to the customer. Also sharing of market knowledge openly and being able to innovate future development were mentioned as important practices. These topics raised by customers are similar as findings by Aarikka-Stenroos and Jaakkola (2012) about KIBS services development. The linking practices found in case study are well in-line with capabilities that were emphasized in results as building of linking practices requires relational and individual capabilities.

Another set of practices mentioned by several customers were regular and standardized processes and meetings for both monitoring the operational status as well as planning development. These belong to institutionalizing practices and usually their importance increases when solutions have been taken into use and customer's focus is in utilizing supplier's offering to provide maximum value in use. Remembering the phase of Finland smart metering market, it is understandable that common processes and agreed ways of interaction are of great importance. Also materializing practices appeared in results and there were

opinions in both sides, supplier and customer side, that there could be even more common development activities. The reason why materializing practices were discussed more than materializing practices is probably because of state of markets.

Another level to look at common practices is to study them through phase of co-operation and typical activities in those. As current focus is in maintaining the operations of smart metering system rather than active development projects, all phases were not equally visible in case study results. Embedding phase which covers operational mode was dominating in results but common development phases from do-ideation to co-piloting and co-deployment of new offering could be found from results according to models by Russo-Spena and Mele (2012) and Aarikka-Stenroos and Jaakkola (2012).

As a summary, practices of the theoretical framework were found to be valid also in smart metering context and in regulatory, monopoly business environment. As the focus of this study and the roles of interviewees were more in common operations management and relationship management, the simplified 3-phase model of practices of Marcos-Cuevas was better in balance with the studied case study than models highlighting different development phases (e.g. Russo-Spena & Mele 2012). However, overall the model of Aarikka-Stenroos and Jaakkola (2012) which presents the value co-creation model for KIBS services and roles of both actors (the supplier and the customer) would fit very well into modelling of smart metering development case as well. Although the model was not used as a theoretical framework for this study, especially the roles of the supplier presented in the model can be recognized from the results of this study.

Secondary research question was the perceived value by customers. Target was to clarify what in supplier's offering customers find valuable. Earlier studies define that customer value is subjective and constantly changing (Woodruff 1997; Sanchez-Fernandez & Iniesta-Bonillo 2007; Eggert & Ulaga 2002; Geraerdt 2012; Flint et al. 2002). This dependency of value perception on time and situation was noticed also in this study when operational efficiency and quality which are very important in the operational phase of business, were emphasized by customers. These things were further split into smaller pieces according to model of Lapierre (2000) which separates value by products, services and relationship. Results based of categorization are presented in Table 5. According to customers, products, services and relationship all provide value to customers. In products value is related to quality, reliability and usability which provides savings in costs and resources. Services were seen in supportive role by customers to guarantee operational efficiency. This might tell about possibility to develop that side of offering. Relationship was repeatedly seen very important as seen overall in results of this case study. So, as summary we can say that relationship management in both individual level as well as in company culture of the supplier is critical. This has been brought up in research in many articles and was result of this study as well.

6.2 Contributions to business

The results of this study give some guidelines to managers for being successful in their customer relationships and being able to build benefit via value co-creation practices to both customers and to their own company.

First advice is related to orientation of the organization and capabilities of its personnel. Orientation of the company to be customer-focused is the first enabler for value co-creation opportunity. Orientation needs to take place throughout the company. Each person needs to adapt personally into customer-focused view, but company culture and company values has a big impact into it. Therefore, top management and managers working in customer interface need to show example and to bring customer understanding and knowledge on the logic of customer needs to the rest of organization. Capabilities that support value co-creation opportunity can and should be systematically developed inside the company. This is part of competence development and by investing into this, the supplier may take major development steps in relationship management with their customers.

Next remark is also related to relationships with the customer. Especially in the business like smart metering, where customer relationships and product lifetimes are long, trusted relationship and commitment to deliver what has been promised are extremely important. Good customer relationships don't guarantee successful business but if trust is missing between the parties, business cannot succeed. Another learning is that it is important to keep up regular interaction with the customer to be able to share knowledge and to develop co-operation. Co-operation should not be limited to contractual parties, but it is beneficial to have open discussion with the end customer even if the supplier doesn't have direct contract with them.

One remark of results is that basic operations needs to keep going like a train and that quality of the offering is very important. For customers it is very important that there are not sudden surprises in their basic business. On the other hand, customers value future orientation of the supplier and their innovativeness to provide them fresh ideas and solutions. So, these both issues need to be in balance.

Couple of topics related to expanding the co-operation and giving new opportunities to value co-creation did come up during the study as well. First was the value co-creation opportunity in materialization practices related to common new product development or common piloting. There were cases identified where this has taken place, but the process is not in large scale use yet. It would be worth to consider, if this kind of approach should be included systemically into supplier's processes.

Finally, concrete proposal to the supplier to invite a discussion forum or a community which would collect DSOs together to plan the future was raised in interviews. In supplier side interviews same kind of thought was raised for discussing open issues. That is something that is worth to consider.

6.3 Research quality evaluation

Concepts of reliability and validity are the common evaluation criteria of research. Reliability is evaluation criteria measuring reproducibility of results. Validity refers to the extent to which conclusions of research give an accurate and true description or explanation of what happened. These criteria are used commonly also in qualitative research but there are different opinions if reliability and validity suit to evaluation of qualitative research in a best possible way. (Eriksson & Kovalainen 2016; Bryman & Bell 2008).

Eriksson and Kovalainen (2016, 307) suggest that if made research relies on relativist ontology and subjectivist epistemology, like the case is in this study, then it is recommended to replace the traditional notions of validity, reliability and generalizability with alternative evaluation criteria introduced by Lincoln and Guba (1985) which is developed to better accommodate these philosophical starting points in research. This model is widely used in evaluation of qualitative research. Based on methodological decisions made in this study, the evaluation of this study is made using criteria by Lincoln and Guba (1985) which consists of four criteria: credibility, transferability, dependability and confirmability.

Credibility measures truthfulness of findings of the study. The key questions in evaluation are how familiar researcher is with the topic and if data is sufficient to claim the result, and if another researcher would come to same conclusions with the same materials used in this study. (Eriksson & Kovalainen 2016, 308). As the researcher in this study is from inside the business which is studied, it is fair to say that researcher is familiar enough with the research topic and there should not be misinterpretations made because of that. Another aspect to analyze is if the data is truthfully and objectively handled and analyzed. To guarantee this, all interviews made were recorded and transcribed so that during the data analysis, it was possible to go back during the research to original data so that researcher's own opinions or memory wouldn't change the message given by interviewees.

Transferability evaluates the applicability of research findings to other research areas. In the evaluation the research findings of made research are compared to previous research in the field to see connection between those. (Eriksson & Kovalainen 2016, 308). The case study area was about value-co-creation in smart metering where there were no other studies found. However, findings were evaluated against other value co-creation studies, which were based both to theoretical and empirical research methods. Although smart metering has some special characteristics as highly regulated business, the results of perceived value and value co-creation practices were well in-line with other studies in the field. In that sense, the results support findings made in earlier research.

Dependability is concerned with researcher's responsibility for offering information to the reader, that the process of research has been logical, traceable and documented. All these activities establish the trustworthiness of research.

(Eriksson & Kovalainen 2016, 308). During the data analysis, all phases and actions done have been documented and data analysis has been done according to recommendations found in research methodology literature. During the analysis phase, data was recorded and fully transcribed for to not lose any details or nuances of information. Further, data was analyzed several times and categorized in different ways independently to guarantee truthfulness of the research.

Confirmability refers to neutrality of objectivity of interpretations made in the study to evaluate if the results are based on collected data or if researcher has biased the results. There could be concern of this subject as the researcher is working inside the case company and might have own opinions that would bias the results. To prevent this, the data analysis phase has been structured and documented carefully as was explained already in previous sections. It is also possible to track chain from results to original data. Results are also in-line with earlier research made on value and value-co-creation.

As a summary, evaluation of quality is done according to model of Lincoln and Guba (1985). Based on evaluation, credibility, dependability and confirmability are very good. Regarding transformability, the results show that results fit into earlier finding in research. However, it is to be remembered that the research is based on limited number of interviews which are done in specific context: smart metering business area in certain market phase and opinions of interviewees need to be interpreted keeping mind the context. Therefore, results cannot be transferred as such to other businesses or even directly to smart metering business which would be in totally different phase of operation.

6.4 Research limitations

Although this research answered to the questions which were set in the beginning for the study and thus can be said that it targets of the study have been achieved, it has also limitations. Purposefully, the scoping of the study was the supplier and its customers which are SPs or DSOs. Study was about value co-creation within these actors but was limited to value co-creation between supplier and SP and supplier and DSO but not value co-creation in the whole triangle as the value co-creation between DSO and SP was out-scoped. So, in that sense the scope of the study and its contribution to the research of value co-creation in ecosystem was limited.

Another limitation of the study is related to generalization of the results. The empirical part of the study is limited to one supplier and its customers. Even if the interviewees have been selected to represent the customer base diversely, the results are still concerning this case only and cannot be generalized directly to other businesses or even to overall smart metering business. This study is made within Finnish customers and there might be some variation between different countries. As the business of smart metering is also cyclical where focus of business moves periodically from big deployments to operational phases, it is

probable that value elements that customers raise have different priorities at different times although the items are not fully different.

6.5 Further research topics

In this research, the scope was to understand which capabilities of the technology supplier and practices between the supplier and their customers enable and advance value co-creation between them in smart metering business. In addition, it was of interest to clarify what customers perceive valuable in supplier's offering. Scope of the study was the technology supplier, service providers and DSOs. The scope of the study was limited purposefully into these three actors of the ecosystem to keep the scope manageable. However, the whole ecosystem was touched during the interviews. During the study it was found out that the smart metering ecosystem and the relations between different actors is quite unique due to special characteristics of the business. Therefore, studying the whole ecosystem and value co-creation between different actors would provide novel viewpoint to the value co-creation research. Two specific further study items related to smart metering ecosystem would be value co-creation between DSOs as it became evident during the study that they are having co-operation with each other.

Even if this study provides one little piece to value co-creation in actor network, more studies are still needed on value creation in ecosystems in different business areas. Each business has its own special characteristics and it is important for the research to get more empirical studies on value co-creation from ecosystem perspective.

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APPENDIX 1: STRUCTURE OF INTERVIEWS

Operating environment

- Name the main actors in your operating environment
- Which actors are most important from value creation point of view?
- How big role the technology supplier has in your operating network?

Perceived value

- Tell in your own words, what kind of value technology supplier is providing to you?
- How value is seen concretely and how you measure it?
 - o More detailed topics to clarify if needed: direct and in-direct value
 - o Value categorization: monetary value, increased efficiency, quality, image value etc.
- What things in supplier's offering and co-operation brings most value to you
 - o Products: e.g. price, quality, technology
 - o Services: offering, availability, quality, knowledge
 - o Relationship and co-operation
 - Quality of relationship
 - Knowledge: does supplier understand your needs?

Value co-creation

- What kind of co-operation and interactive procedures you have in place with the supplier? How regular they are?
- Is there enough co-operation and interaction in all levels: e.g. strategic level, operational level, common development, future innovation?
- How well the interactive procedures in place support common value co-creation?
 - o Can you name examples where you have created value together in co-operation with the supplier?
- How common processes should be developed to support better value co-creation?
- DSOs: How you see the roles of supplier vs. service provider from value creation point of view?