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Customer Value Propositions in Product-Service Systems: Are the Existing Value Elements Applicable?

A Quantitative Study Testing Customer Value Elements in Product-oriented Manufacturing Product-Service Systems

by

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Abstract

In the last two decades, emerging business models called Product-Service Systems (PSS), have disrupted the industry. These business models, combining both products and services components in one offering, present new kinds of value propositions to customers. Having a strong Customer Value Proposition (CVP) is strategically essential for firms to create competitive advantage. Both CVP and PSS are research themes of growing interest, which, however, are not combined in research commonly. Therefore, the purpose of this thesis is to investigate whether firms with a PSS business model can build a CVP based on existing CVP assumptions. Hence, to test existing CVP assumptions regarding their applicability in a PSS context, a framework with hypotheses based on existing literature is created. This framework serves as a basis to examine different customer value elements, namely Functional Value, Economic Value, Emotional Value and Social Value. Quantitative data addressing these hypotheses was collected with a survey instrument, including standardized questionnaires. Findings indicate that most of the value elements were applicable in the context of our study, while others function in a different way, depending on the type of customers. This study contributes to research in the distinctive field of CVP in PSS, which yet, remains an overlooked topic and may provide insight for theory and practice.

Keywords: Customer Value Proposition, Product-Service Systems, Manufacturing, e-Business, Customer Value Elements

The raw data set of this study can be requested via the following e-mail: lisa.caje@iubh.de

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1 Introduction

1.1 Background

Customers' demands change over time, and identifying what customers value, is crucial for any business to build and maintain a competitive advantage (Anderson, Narus & van Rossum, 2006; Paltayian, Gotzamani, Georgiou & Andronikidis, 2017). Over the last decade, there has been a drastic change in business environments as a result of an array of innovations in technology, resulting in a (key) inflection point with a high number of new e-businesses emerging and disrupting the industry (Cristofaro, 2020). This change has transformed the manner of operating business, as well as business models in general as we knew them prior to the late twentieth century (Saura, Palos-Sanchez & Correia, 2019) and can be considered as the "second wave of e-businesses (after the dot-com one)" (Cristofaro, 2020, p. 88). Customers have access to products and services across geographical boundaries due to a more globalized world and the internet, which reduces information asymmetry of quality and price for instance and therefore leads to increased competition. Hence, from a firm's perspective, the role of strong CVPs in a strategy context is vital to attract customers (Payne, Frow, Steinhoff & Eggert, 2020).

Besides e-businesses, a further new form of business model has emerged, that combines products with services in one technology and is referred to as Product-Service Systems (short: **PSS**), to offer new types of value propositions to customers (Lim, Kim, Hong & Park, 2012; Mont, 2002). Simply put, PSS refers to the combination or hybrid offering of products and services. Companies adopt this new type of business model from simply selling products, to providing related services to broaden the spectrum of offered products (with these services being able to extend every step of the value chain) (Mont, 2002). Hence, PSS have the capability to enhance their competitive advantage (Mont, 2002). However, there remain research gaps in this field of study due to the novelty of the phenomenon. These include that most theories and frameworks only focus on the PSS provider, while customer's perspectives remain understudied (especially within B2C), although the PSS creates benefits and value mainly for customers (Schmidt, Malaschewski, Fluhr & Mörtl, 2015). The PSS's design and development start with defining customers' demands which typically are ambiguous to the firm (Hu, Xu, Fan, Li & Song, 2013).

Nevertheless, to create a competitive advantage and to benefit from the advantages of a PSS, it is crucial to understand their customers, meaning customers' needs and requirements in order build a strong Customer Value Proposition (henceforth indicated as **CVP**) (Paltayian et al. 2017). There are numerous tools and theories about CVP in general, such as the VP builder created by Barnes, Blake and Pinder (2009) or the Value Proposition Canvas developed by Osterwalder, Pigneur, Bernarda and Smith (2014). These, however, have been researched and built on based mainly on traditional business models, meaning either product or service offerings.

The challenge in PSS compared to conventional business models, however, is that the CVP needs to regard both tangible and intangible components because of the different nature of products and services, which further complicates the definition of the CVP (De Castro Rodrigues, Nappi & Rozenfeld, 2014). This demonstrates the challenge in creating a valuable CVP in PSS, given that there is no widely agreed theory for CVP in PSS. Therefore, to address this gap in the literature, the purpose of the present study is to investigate whether CVP value elements of traditional/non-PSS organizations are also applicable in PSS in an e-business environment. Having investigated the applicability PSS designers can get insights about customer requirements and consequently design their PSS more aligned with customers' needs to enhance their competitive advantage (Ding, Liu & Lang, 2019).

PSS research can be divided into three eras (see Appendix A), where before 2009, the focus of research was more on conceptual development with an emphasis on sustainability, as well as the service paradox (Li et al., 2020). At the moment, since 2009, we are in phase three, where digitalization and value co-creation are subject of PSS research (Li et al., 2020). Responding to PSS according to the current research era, this study is set into an e-business context to address the digitalization research stream. E-businesses, in contrast to e-commerce, do include servicing customers (Shehata & Montash, 2019). Therefore, in this study, it will be only referred to the term e-business, given that the service component is a crucial element of a PSS. E-businesses in this study are defined as executing business transactions via electronic networks such as the internet (Barnes, 2007). Also, only a B2C (Business-to-Consumer) context will be analyzed as it comes with a different set of implications and challenges compared to B2B (Business-to-Business) contexts, where specifically B2C contexts remain understudied in terms of value proposition in the literature (Payne et al. 2020). To sum up,

customers' needs and requirements, as well as what they value, are the basis for building a strong CVP, which provides the basis for firms to build a competitive advantage.

1.2 Research Problem

As mentioned in the previous section, PSS provide new ways of value creation to the customer (De Castro Rodrigues, Nappi & Rozenfeld, 2014). Even though literature agrees that the customer is the central dimension in a PSS (Sakao, Song & Matschewsky, 2017) and PSS enhance benefits for customers, most theories and frameworks only focus on the provider, with customers perspectives regarding their values remaining understudied (Schmidt et al. 2015). Additionally, in contrast to traditional business models, the CVP needs to address both tangible characteristics of products and intangible characteristics of services (De Castro Rodrigues, Nappi & Rozenfeld, 2014) which further demonstrates the challenge in creating an adequate CVP in PSS. Hence, the central research aim of this study can be set as:

To investigate whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context.

1.3 Research Purpose

The purpose of this research is to identify whether firms with a PSS business model can build a CVP based on existing CVP assumptions. Firms can benefit from this study's findings as building a CVP is the first step in the value chain and provides the basis for further steps and its according resource allocation (Adrodegari, Saccani & Kowalkowski, 2016). Knowledge about the customer is fundamental, as he is regarded as the center of any PSS and the according CVP (Adrodegari, Saccani & Kowalkowski, 2016; Pawar, Beltagui & Riedel, 2009, Haber & Fargnoli, 2019; Sakao, Song & Matschewsky, 2017). Both CVP and PSS are research themes of growing interest, which, however, have not been combined in research commonly. Hence, this research is grounded on several authors recommendations of conducting further research in this field (e.g. Da Costa Fernandes, Pigosso, McAloone & Rozenfeld, 2020; Ding, Liu & Lang, 2019; Haber & Fargnoli, 2019).

1.4 Outline of the thesis

The proceeding chapters are as follows: chapter two provides a review of relevant literature, commencing with PSS in general, theoretical underpinnings to CVP and then goes over to CVP in PSS, concluding with a developed framework. In chapter three the chosen methodological approach of this study will be discussed followed by chapter four where empirical findings of the conducted research will be analyzed. These findings are discussed in chapter five and contrasted to secondary findings of the literature review. Lastly, this study will be closed by concluding the research's main findings and practical as well as theoretical implications.

2 Literature review

The following chapter presents the theoretical underpinnings for this study, which is divided into three sections. First, literature on PSS will be discussed, followed by reviewing existing literature to CVP, where in the last section literature on combining the two areas will be revised. Lastly, to address the gap in the literature, hypotheses are presented.

2.1 Product-Service Systems

In recent years, businesses have started to integrate products and services and shift from traditional manufacturing of physical goods to serving customers by merging products with a service component. Merging products with a service component allows to explore new opportunities to create competitive advantage and ensure long-term growth (Barquet, Gouvea de Oliveira, Román Amigo, Pinheiro Cunha & Rozenfeld, 2013; Jacob & Ulaga, 2008; Kandampully, 2002, Meier, Roy & Seliger, 2010; Manzini & Vezzoli, 2003). A competitive advantage can, for example, be achieved by either targeting a broad or narrow customer group adopting a cost leadership or differentiation focus (Porter, 1980). In case of a more service-oriented concept, the competitive advantage is created by involving "key competitive factors such as the capability for continuous innovation, improved design and quality and customized goods, rather than the production of large volumes of standardized products" (Mont, 2002, p. 238). Nowadays, value is added in terms of intangible characteristics such as technological improvements or intellectual property, instead of traditionally transforming raw materials to products which can be sold (Mont, 2002).

Different terms are used to describe the same concept with three research communities being of especial importance: Vandermerwe and Rada (1988) use the term servitization, Vargo and Lusch (2004) refer to service-dominant logic while Goedkoop, van Halen, te Riele and Rommens (1999) use the term PSS in their research (Barquet et al. 2013). This study, however, adopts solely Goedkoop et al.'s (1999) term 'PSS' which is broadly discussed in the literature (e.g. Beuren, Gomes Ferreira, Cauchick Miguel, 2013; Jacob & Ulaga, 2008, Tukker & Tischner, 2006, Meier, Roy & Seligner, 2010; Reim, Parida & Örtqvist, 2015; Tukker, 2004). Reviewing the literature for a definition of the term "Product-Service System", shortly PSS, several authors (e.g. Lim et al. 2012; Mont, 2002) go back to the definition of Goedkoop et al. (1999) who introduced the formal topic of PSS (Mourtzis, Doukas & Fotia, 2016) and first defined each component of the term 'PSS':

> A **product** is a tangible commodity manufactured to be sold. It is capable of falling onto your toes and of fulfilling a user's need.
> A **service** is an activity (work) done for others with an Economic Value and often done on a commercial basis. In this project, we include work done by human beings as well as by automated systems.
> A **system** is a collection of elements including their relations.
> A **product system** is a set of material products needed to jointly fulfil a user's needs.
>
> (Goedkoop et al. 1999, p. 17)

This led to the overall definition of PSS as "a marketable set of products and services capable of jointly fulfilling a user's need. The product/service ratio can vary, either in terms of Function Fulfilment or Economic Value" (Goedkoop et al. 1999, p. 20). This variation in the product/service ratio is graphically illustrated in figure 1, adapted from the original author:

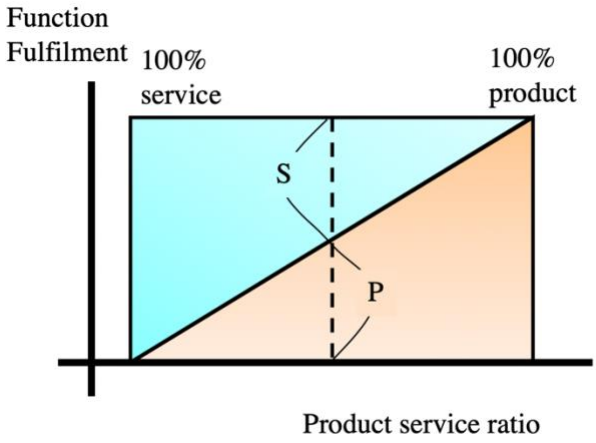

Figure 1: Product-service ratio (adapted from Goedkoop et al. 1999, p. 20)

The difference to traditional product concepts comes with the PSS strength of thinking "that it moves away from existing product concepts, and inherently focuses on the final *need, demand, or function* that needs to be fulfilled" (Tukker & Tischner, 2006, p. 1553). Thus, the focus does not lie on the product itself, but the value it delivers to the customer. A typical example used in literature is car sharing offers, where a customer does not need to buy a car but purchases the service of having a car at disposal for a particular time which is less costly than owning an own car (Lim et al. 2012; Tukker & Tischner, 2006). This shows the benefit of making use of a PSS over a product.

Connecting the Product-service ratio with the above-mentioned focus of PSS on fulfilling a final function (Tukker & Tischner, 2006), it can be noted that the ratio "varies from case to case, but it can also vary over time, due to technological development, economic optimization and changing needs of people" (Goedkoop et al. 1999, p. 20). This implies that there are different types of PSS, which will be referred back to in a later section.

Lahy, Li, Found, Syntetos, Wilson and Ayiomamitou (2018, p. 2233), give a further, more recent definition of PSS stating that a

> Product–Service System (PSS) is created by combing a tangible product and an intangible service into one integrated offering. Thus, a PSS can be achieved by a production company adding intangible services to a product using a servitisation strategy or by a service company adding a tangible product to a service by means of a productisation strategy.

The latter definition differentiates between a servitization and productization strategy, meaning if a firm moves from a firm solely producing products to a PSS by adding a service or vice versa. An example for a productization strategy includes, for instance, Amazon offering services via an online shop and their addition of selling physical products (e.g. Kindle) or Google starting from offering a search engine to selling mobile phones (Lahy et al. 2018, p. 2233). Therefore, PSS can be achieved "for both production and service companies" (Lahy et al. 2018, p. 2233). An example of a servitisation strategy would be Volvo initially selling cars, expanding their offer to Volvo Car Sharing (Volvo Car Mobility, 2020). These two strategies, however, will not be further investigated in this research due to the scope of this study. Given the different nature of products and services, the next section will investigate how the two components combine in a PSS.

2.1.1 The distinction between service and product orientation

Referring back to the different components of the definition, it seems that it is fundamental to distinguish between a service and product economy, which often can represent a blurry line as "any tangible product contains a large amount of service-value embedded. All products have been built up by a series of services added to amounts of raw material" (Goedkoop, 1999, p. 19). This means that also in the manufacturing process of a product, different service elements are involved. There, for instance, a percentage based on how many employees are performing service tasks in the organization can be determined (Mont, 2002). In traditional manufacturing firms, about two-third of the staff perform a service task such as in administration, accounting, research and development, and product design (Mont, 2002). Hence, the fact that service also plays a significant role in product manufacturing makes a distinction between product and service-dominant organizations further complicated. In order to get a better understanding of the different types of PSS, several authors classified the concept PSS into different categories, with Tukker (2004) being one example. He developed a framework dividing PSS into main categories and subcategories based on the degree to which the product can be considered as the core component of the respective PSS:

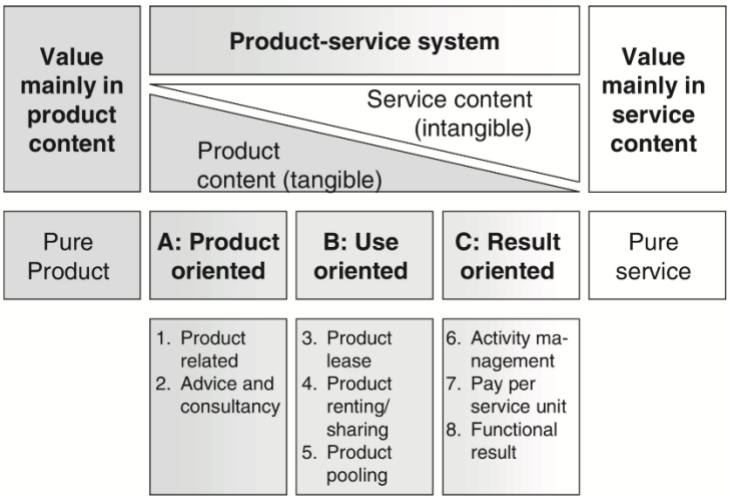

Figure 2: Categories of PSS (Tukker, 2004)

In this model (see figure 2), three main categories include Product-oriented services (short: PO) (A), Use-Oriented services (UO) (B) and Result-Oriented services (RO) (C) with A being the most product oriented with the product being the core component of the PSS and C the most service oriented within the categories. The level of ownership also changes within the different categories, wherein PO PSS the products are owned by the customer, in Use-oriented PSS the product remains owned by the provider and may be shared with other customers. In Result-oriented PSS, the focus lies on the service, where no pre-determined product is included (Tukker, 2004). This study focuses exclusively **on PO PSS (Product-oriented Product-Service Systems)**, where the product is wholly in the ownership of the customer after the purchase. The rationale for this focus is the chosen exemplary PSS provider that can be categorized as Product-oriented PSS and will be referred to in the methodology chapter. Goedkoop et al. (1999) also distinguish between a service within the production of a product and service to end-consumer or business. Therefore, to narrow this research down, similar to Goedkoop et al.'s (1999, p. 18) study, the 'service component' of PSS is confined to the service "provided for benefits of end-users (end-users can be private consumers or businesses". Also, standard distribution, as well as sales activities are not included in the PSS definition, as they would only broaden the research meaning that all products would be considered as a PSS (Goedkoop et al. 1999).

2.1.2 Review of PSS literature

Having defined the business model concept 'PSS', as well as explained the different categories of it, in the following, existing literature to the concept is reviewed. There are different research eras within the concept of PSS. In a recent study, Li et al. (2020, p. 5) (see Appendix A),

visualize the theoretical progress of PSS research and divide its evolution into three phases: In phase one, from 1999-2004, the foundation with conceptual development was built, where the focus lied on environment and sustainability. In phase two, from 2005 to 2008, there was a period of reflection, and adjustment where interest from practitioners arose and the emerging service paradox has been investigated. In the last phase, from 2009 up until today, digitalization and value co-creation have begun to be investigated, where productization starts to become a topic of interest. Only in phase three, theory development started to grow, whereas in the other phases, theory development was scarce (Li et al. 2020). As mentioned in the introduction, this research is set into an e-business context to address the digitalization research stream of the current PSS research phase.

Referring back to the different research eras in PSS, several authors investigated PSS from a sustainability perspective and how the service component can reduce physical consumption to combat resource scarcity by 'dematerializing' the economy (e.g. Mont, 2002, see p. 237; Song & Sakao, 2017). Another area of research includes customization as an element of PSS as a stand-alone or with the purpose to design a sustainable PSS (Song & Sakao, 2017). Barquet et al. (2013) aimed to close a research gap by investigating how to employ the business model concept when adopting a PSS. In line with Barquet et al. (2013), Reim, Parida and Örtqvist (2015) state that recent studies outlined benefits of PSS, but it yet remains to be explored how firms can implement PSS business models. Mourtzis, Doukas and Fotia, (2016) analyzed evaluation methods on how successful the implementation of a PSS is on the market and addressed the research gap of classifying PSS evaluation approaches. According to Lahy et al. (2018), there is much literature addressing the movement of firms to PSS by adding services to their product offerings, i.e. servitisation. However, in line with Li et al.'s (2020) eras as mentioned above of PSS, there is yet not much literature on the opposite, meaning the shift from services to a PSS by adding products, which is why they addressed the research field of productization strategies. From reviewing existing literature, it seems that analyzing PSS from a customer perspective remains understudied with the literature focusing on the organizations providing the PSS itself.

After this review of research areas in PSS, it becomes apparent that the customer side remains understudied (Schmidt et al. 2015). To address this gap in PSS research, in relation to the customer dimension, CVP regarding PSS will be investigated in this research. Taking into account the current PSS research era of digitalization the problem is in an e-business context.

2.2 Customer Value Proposition

Having reviewed relevant literature to PSS, in this section, the concept of CVP will be discussed. Despite its regular use in business, the CVP concept remains unwell defined (Skålen et al. 2015). Generally, Customer Value Proposition (CVP) has been approached as a benefit (Lanning & Michaels, 1988), a statement (Webster, 2002), an expression (Barnes, Blake & Pinder, 2009), set of experiences (Lanning, 1998), a strategic management decision (Rintamäki, Kuusela & Mitronen, 2007), a mechanism (Payne & Frow, 2014), and as promises (Skålén et al. 2015). In literature, both the term *Value Proposition* (VP) and *Customer Value Proposition* (CVP) are utilized in a congruent manner having the same meaning. Henceforth, in this study, the terms CVP and VP are used for same purpose. According to Vargo and Lusch (2004), value is always predefined by the customer.

Ng and Smith (2012) provide an integrative exploration of the value concept combining various theoretical frameworks from management, marketing, philosophy, and economics. According to the same authors, there are firm-centric and customer-centric approaches to customer value, differing on critical approaches, conceptualization, and assumptions. They divide the value understanding based on management literature into six categories: "*utility, economic worth, perceived satisfaction, net benefit, means end and phenomenological experience"* (Ng & Smith, 2012, p. 207). There, conceptualizations in firm-centric approaches discuss value as a utility, economic worth of the customer to a firm (often discussed as Customer Lifetime Value) and as perceived satisfaction (Ng & Smith, 2012). When it comes to customer-centric approaches, value is approached as a net benefit, means-end or phenomenological experience (Ng & Smith, 2012).

2.2.1 The Evolution of the CVP concept

The term value proposition (VP) first was briefly mentioned in a consultancy concept of an internal McKinsey Staff paper (Bower & Garda, 1985). A few years later, it was further discussed in another internal article of McKinsey by Lanning and Michaels (1988) who argued that business success is constrained by an internally focused product-oriented approach. Initially, this concept has been evolved in strategy context as 'the value delivery system' (Lanning & Michaels, 1988, p. 1; Lanning 1998). This early notion of value proposition delineates Value Proposition as something to be offered and delivered, situating the customer

in a rather static and preordained role (Ng & Smith, 2012). This supplier-led approach has since been responded to, namely with the service-dominant logic.

Interestingly, a similar term to 'the value delivery system' with a distinctively different perspective has been utilized by Normann (2001) who referred to 'value-creating systems' in the context of service-dominant (S-D) logic, emphasizing the process of value creation *with* the customer, instead of *for* the customer. S-D logic is a phenomenological view of value creation that describes value providers as facilitators of bundles of resources available for co-creation (Ng & Smith, 2012). This perspective focuses on customers role as not just a receiver of value, but rather as co-creators of it, emphasizing the interactive and experiential nature of customer value. This provides the link to PSS, as SD-logic basically meaning the same as a PSS by utilizing a different term for it in the early areas of research in PSS (Barquet et al. 2013).

Whereas the early definition by Lanning and Michaels (1988) focuses on value based on economic foundations and stand-alone level, Kaplan and Norton (2001) consider the social perspective and holistic competitive business environment with the importance of differentiation. Other studies have also described the evolution of value creation from firm-centric to customer-centric and discussed the co-creation and service-dominant approach (Nenonen & Storbacka, 2010; Prahalad & Ramaswamy, 2000; Prahalad & Ramaswamy, 2004; Storbacka et al. 2012; Vargo, Maglio & Akaka, 2008).

Despite the term value proposition being widely used in business concepts, there does not exist a single widely approved definition for CVP (Anderson, Narus & van Rossum, 2006). Yet, it has been recognized that CVP is "the firms single most important organizing principle" (Webster, 2002, p. 61) and stated as "the essence of strategy" by leading authors in this area: Kaplan & Norton (2001, p. 10) who argued that "strategy is based on a differentiated Customer Value Proposition". In fact, already in 1997, customer value was identified as the source of competitive advantage (Woodruff, 1997). Surprisingly, however, in a study it was found that management-practice research struggled finding examples of value propositions that engage customers in Europe and the United States (Anderson, Narus & van Rossum, 2006). Furthermore, another study surveying more than 200 companies found that yet, numerous companies use the term in casual conversations, less than ten percent of them develop and communicate their CVPs in a formal way (Storbacka et al. 2012).

Despite the lack of consensus about the value proposition definition, already the early economic literature distinguished between two perspectives on customer value: value in exchange (resource exchange) and value in use (resource integration) (Eggert, Ulaga, Frow & Payne, 2018). This distinction has later changed in perspective, as the literature has evolved from value in exchange towards value in use, demonstrating customers idiosyncratic role in today's business (Eggert et al. 2018). There is also a consensus in the literature about two general matters: the strategic role of CVP in the pursuit of competitive advantage, and a customer-driven aspect of CVP (Anderson, Narus & van Rossum, 2006; Webster, 2002).

Today, CVP is mostly used in marketing and strategy contexts and can be as a form of marketing departments positioning (Payne & Frow, 2014). However, Lanning (1988) recognized early that typically the term is used in a rather causal and trivial manner instead of from a strategic standpoint. According to Kowalkowski, Kindström and Carlborg (2016), current research on value propositions focuses on the buyer-supplier dyad, even though recent conceptualizations highlight interdependence and reciprocity as its critical elements (Kowalkowski 2011; Payne and Frow 2014). As a broader alternative to dyadic perspective, authors suggest a triadic value proposition, referring to value creation concept including a third actor, forming a value alignment mechanism of manufacturer-dealer-user triad. (Kowalkowski, Kindström & Carlborg, 2016). This notion aligns with the co-creation trend, where again it can be referred to PSS. Also, as a remarkable statement, in any case, the customer is the one defines what is regarded valuable and also what is not, thus companies can only make value propositions that aim to support the value-creating activities (Vargo & Lusch, 2004).

To conclude, a quest for more exploration within the CVP concept arises as it has received growing interest in recent years and the concept remains poorly understood (Payne, Frow & Eggert, 2017). The topic has been featured as one of the key research priorities by the Marketing Science Institute, making it as one of its most critical missions (MSI, 2018). Payne et al. (2020) point out three main gaps in existing research: managers' use of the VP concept, context of networked relationships, and limitation to B2B firms. This thesis addresses the last-mentioned gap by contributing to the scholarly research on CVP in B2C markets. The call for future research is justified with the fact that most frameworks have been applied for B2B concepts, albeit the similar research to assist B2C firms is essential (Payne et al. 2020).

In general, there is a lack of scholarly literature concerning the CVP concept, despite the term being widely used in business. The reason lies in history: up until the late 1990s, the concept of the value proposition was primarily used in internal staff papers of consulting firms., as well as managerial publications, simultaneously being largely neglected within academic literature (Payne & Frow, 2014). More in detail, research gaps have been identified especially on the lack of research on reciprocal value propositions (Kowalkowski, Kindström & Carlborg, 2016), value propositions at the customer segment level (Payne & Frow, 2014) and lack on research on B2C contexts (Payne et al. 2020). In essence, CVP communicates the reasons why a customer should buy a company's products and services rather than these of a firm's competitors and plays, therefore, a critical part on a robust strategy (Verweire, 2014). For this research, the definition of a CVP as "an encapsulation of a strategic management decision on what the company believes its customers value the most and what it is able to deliver that gives it competitive advantage" (Rintamäki, Kuusela & Mitronen, 2007, p. 624).

2.2.2 Frameworks and dimensions – A review on the components of the Customer Value Proposition

There are frameworks that have been developed within academics as well as in consultancy concepts. Looking at academic frameworks of CVP, there are three that appear to be most commonly used: B2B VP framework by Anderson Narus, Van Rossum (2006), value dimensions framework by Rintamäki, Kuusela, Mitronen (2007), and VP strategy framework by Payne, Frow and Eggert (2017). Considering frameworks created in a consultancy context, the value delivery system by Lanning (1988; 1998), value proposition builder by Barnes, Blake and Pinder (2009), and value proposition canvas by Osterwalder et al. (2014) seem to be the most focal ones. In the following, these will be discussed in further detail.

Anderson, Narus and van Rossum (2006) published a value proposition model that sorts value elements based on three different ways supplier use the term "value proposition", thus, sorting the value proposition elements to three constructs: all benefits (from a market offering to a customer), conducive points of difference (between market offering and the next best alternative) and resonating focus (points of difference with the greatest potential). Elements are the building blocks of a successful CVP, but authors note that there are technical, economic, service or product attributes to customer value. However, since these attributes are usually familiar to competitors, the sorting based on those becomes irrelevant, thus the central issue is

set as: “How do these value elements compare with those of the next best alternative?” (Anderson, Narus & van Rossum, 2006, p. 5).

Payne, Frow and Eggert (2017) argued that frameworks are mostly static in nature, and self-responded to the research need and emphasized understanding the VP's strategic importance (Payne, Frow & Eggert, 2017). A conceptual model of the CVP is proposed, including antecedents of CVP (knowledge and innovation), moderators (customer relationships and brands) and consequences (customers’ perceptions, attitudes, and behaviors). This characterization of CVPs divides firm- and market-based resources required to design CVPs, making two dimensions of market knowledge critical for designing CVPs: customer knowledge and competitor knowledge. (Payne, Frow & Eggert, 2017). Drawing on resource-based theory (RBT), authors believe RBT offers a promising lens for understanding the strategic role of the CVP. Payne et al. (2017) suggest that all VPs have design characteristics on three dimensions: the perspective adopted, granularity, and focus. Distinctive difference to other frameworks providing a rather general overview of value propositions, Payne, Frow and Eggert (2017) focus on how CVPs affect both the supplier firm and its customers.

As a third academic-based framework, tailored for retailing context, Rintamäki, Kuusela and Mitronen (2007) suggest a framework is for identifying competitive CVPs. First, four hierarchical key dimensions of customer value are identified. These categories of VPs focus on customer experience: “economic (determined by price); functional (associated with specific functional needs); emotional (reflecting experiential needs), and symbolic (reflecting self-expression needs)” (Rintamäki, Kuusela and Mitronen, 2007, p. 621). CVP work includes three stages: “(1) identify the key dimensions of customer value; (2) develop the value proposition; and (3) evaluate the value proposition for its ability to create competitive advantage” (Rintamäki, Kuusela and Mitronen, 2007, p. 624). In this framework, the value dimensions form a customer value matrix based on hierarchically organized dimensions. Rintamäki, Kuusela and Mitronen (2007) establish a link between customer value and competitive advantage: evaluation stage (3) determines on the competitiveness. According to Rintamäki, Kuusela and Mitronen (2007), the competitiveness of CVP is defined by the suitability of the company resources and competencies required for delivering on the proposition to gain competitive advantage.

The first popular framework was developed by a consultancy firm. At McKinsey, Lanning (1988) introduced a value delivery system concept as an alternative to traditional product-

oriented systems (see figure 3). The model centers around the phases of choosing, providing, and communicating the value proposition. Common to consultancy frameworks, it has a managerial focus. Also, the importance of various value segments is emphasized; a subject often overlooked in other writings. On the updated version in 1998, the importance of establishing value propositions aimed at key market segments is also emphasized (Lanning 1988; Lanning 1998). Also, in this model, in the first stage of choosing the value, customer value needs to be identified as a first step to develop the value positioning which provides the basis for further steps in the value chain (see figure 3).

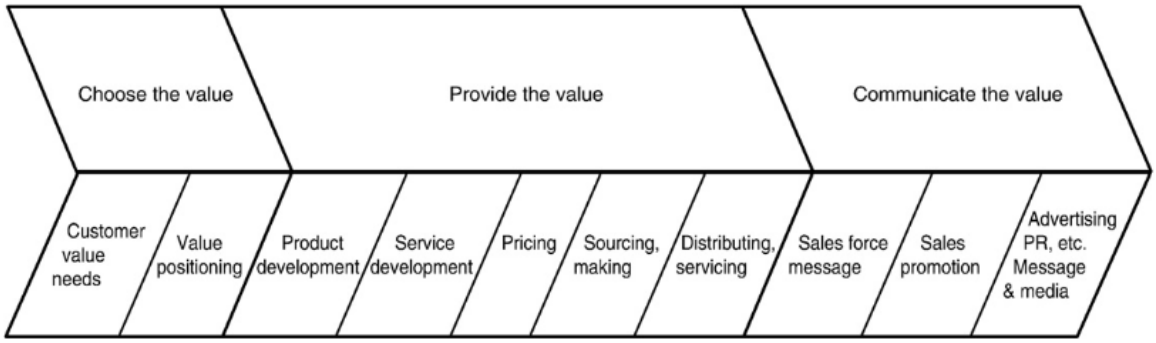

Figure 3: McKinsey & Co's Value delivery system based on Lanning and Michaels (1988) adopted from Ballantyne, Frow, Varey & Payne (2011, p. 203)

A second commonly used framework from the consultancy is a "*Value Proposition Canvas*" by Osterwalder, Pigneur and Bernarda (2014). The framework has a design approach to the VP. It consists of two main elements aimed at assisting VP design: a customer profile and a value map. The goal of the Canvas is to achieve the product-market fit or the problem-solution fit by matching the needs of the customer segment and the value proposition of the firm. The tool requires the definition of a customer segment and the identification of the "customer jobs", pains and gains in order to create products and services and define its "pain relievers" and "gain creators. (Osterwalder, Pigneur & Bernarda, 2014).

The third framework by consultants, Barnes, Blake and Pinder (2009), is a "*VP builder"*, which consists of six stages: (1) identify target customer segments, (2) define customers' value in terms of benefits minus costs, (3) formulate the offer, (4) determine how the offer provides benefits and prioritizing these benefits, (5) consider competitive offerings, and (6) provide support for substantiated credibility of the offering. As baseline assumptions, Barnes, Blake and Pinder (2009) believe VP is *about* customers but *for* the firm; it does not address customers but rather is a driver for these communications, articulating the essence of a business.

The aforementioned frameworks needed to be revised to provide the basis for an understanding of the nature of CVP frameworks. Payne et al. (2020) based on the aforementioned frameworks, reviewed the research on value dimensions and their frameworks, which led to the conclusion that the most agreed four core customer value dimensions are "*Functional Value, Economic Value, Emotional Value, and Social Value"* (Payne et al. 2020, p. 3). As the aforementioned frameworks all have several limitations, in this study, a conceptual framework that is based on literature synthesis on how to explain a CVP phenomenon by Payne et al. (2020), will be adopted. The same authors general notion agrees that value is a multi-dimensional construct but allows the exact nature of these dimensions be open for interpretation, making it suitable for innovative value creation. Additionally, there is also lack of consensus about the number of value constructs, eliminating the need to address all or prevent others from arising (Payne et al. 2020). In addition to common dimensions, the above reviewed frameworks are similar in a sense that they aim to reap competitive advantage. Differences arise from the use or purpose, the context, the focus, and the range of factors. Most models are constrained by assuming generic value propositions in a single company, as these do not consider value propositions at the customer segment level, falling into a research gap noted by Payne and Frow (2014). Also, these frameworks can be considered static, as they do not emphasize the reciprocal nature of value propositions, a limitation mentioned by Kowalkowski, Kindström and Carlborg (2016).

2.3 Customer Value Proposition in PSS business models

In the preceding sections, the literature on PSS and CVP has been reviewed discussed. In literature, there exist theories and studies to each one of the research streams. PSS research and theory development primarily has been conducted based on qualitative case studies, which demonstrates the need for quantitative and mixed-method research in this area (Li et al. 2020). Nevertheless, to create a competitive advantage and to benefit from the advantages of a PSS, it is crucial for firms to understand their customers, meaning their needs and requirements in order build a strong CVP (Paltayian et al. 2017). Although it is widely agreed that PSS enable firms "new ways of offering value to the customer" (De Castro Rodrigues, Nappi & Rozenfeld, 2014, p. 211) compared to only selling either products or services, literature regarding CVP in PSS remains scarce, especially in an e-business context.

A CVP in a PSS implies the offered value of the firm to its customers and stakeholders with their products and services (Resta, Gaiardelli, Cavalieri & Dotti, 2017 cited in Da Costa

Fernandes et al. 2020). Despite the fact that literature agrees that the customer is the central dimension in a PSS (Sakao, Song & Matschewsky, 2017) and PSS create benefits and value for customers, most theories and frameworks only focus on the provider, with the customer's perspectives remaining understudied (Schmidt et al. 2015). This is criticized by the same author, further stating that "the customer is the key success factor of any product" (Schmidt et al. 2015, p. 287). Hence, it is demonstrated that customer's requirements should be accurately defined at the beginning of the PSS design and development stages as they provide a basis for a later satisfaction among these (Haber & Fargnoli, 2017).

Furthermore, defining the CVP in the beginning, guides the other elements in the business model as these are oriented towards the CVP in a business model (Adrodegari, Saccani & Kowalkowski, 2016; Barquet et al. 2013; Da Costa et al. 2020). De Castro Rodrigues, Nappi and Rozenfeld (2014, p. 211) highlight that in PSS "the value proposition needs to take into account uncertainties and tangible and intangible assets in an integrated way leading to more complex decisions". This evokes ambiguity for PSS providers, however, is the intangibility of services as customers perceptions vary from one individual to another, which is a difference compared to conventional products (Haber & Fargnoli, 2019) and further demonstrates the challenge in creating a valuable CVP in PSS. Considering that a PSS is a business model itself, the first step in designing a PSS should be to comprehend the kind of value that can be created and conveyed to the customer (Adrodegari, Saccani & Kowalkowski, 2016; Pawar, Beltagui & Riedel, 2009) (see figure 4). In figure 4, the main elements of a PSS Business Model framework are demonstrated:

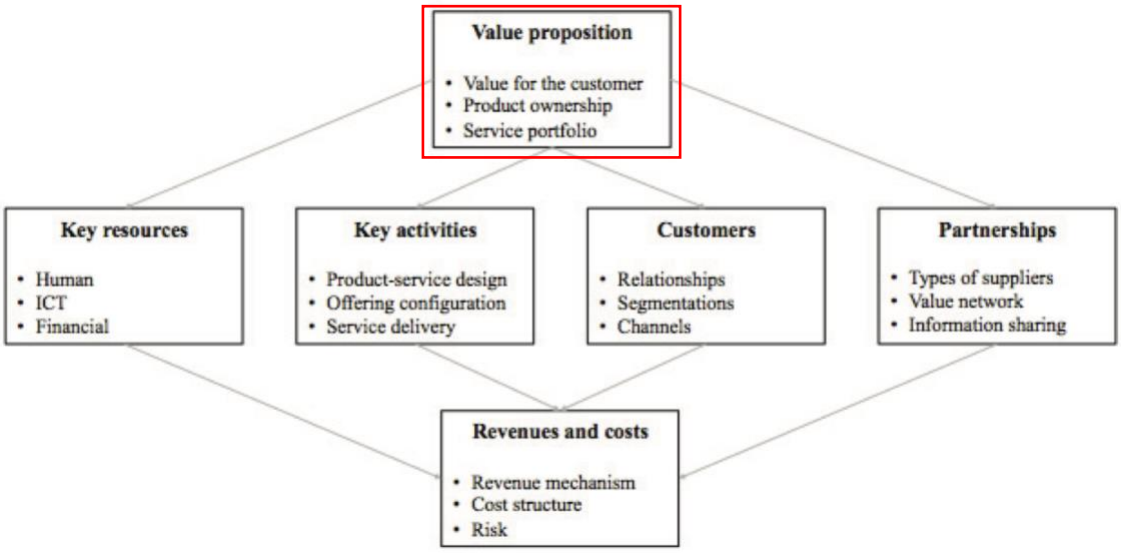

Figure 4: PSS Business Model framework (Adrodegari, Saccani & Kowalkowski, 2016)

When forming a CVP, an elementary piece should hence be the "definition of the source of value extracted from the provider's solution by the customer" where "customers may perceive as a direct source of value the ownership of the product or, vice versa, using the product without having the ownership of it can generate value" (Sheth & Uslay, 2007 cited in Adrodegari, Saccani & Kowalkowski, 2016, p. 519). Contrarily, Barquet et al. (2013, p. 694) state that in PSS "value is provided to customers through services rather than products". Relating this to Tukker (2004), perceiving the ownership of the product as valuable or perceiving it valuable without possessing the ownership, might vary within the different types of PSS such as PO (Product-oriented), UO (Use-oriented) and RO (Result-oriented). PSS as the level of ownership varies within these. Given that this research studies Product-oriented (PO) PSS only, the following hypothesis arises:

Hypothesis 1 (H_1): *In a product-oriented PSS, customers perceive the ownership of the product as more valuable than the service.*

Considering that VP is one main element of PSS business models, this research will try to investigate the VP element in the context of the above-mentioned PO PSS (Product-oriented Product-Service System) by Tukker (2004) (see figure 2). In Adrodegari, Saccani and Kowalkowski's (2016, p. 519) model, it is stated that the following three components should be addressed: "value for the customer, product ownership and service portfolio". Related to the component 'value for the customer', it raises the question, what exactly customers value in a PSS and if value elements from conventional CVP's are applicable in a PSS context. Defining this, according to the same authors, is essential as it provides the basis for the other components,

such as the type of customers to be targeted or key resources required as demonstrated in their proposed business model (see figure 4).

Fernandes et al. (2018), recognized that when firms design a PSS, they need to reformulate their business model, where CVP plays a central role in business models in general. They add that the Value Proposition Canvas (VPC) by Osterwalder, Pigneur and Bernarda (2014) is a commonly used tool to create a CVP in a business model and that there arise different kinds of challenges when applying the VPC in a PSS context. Therefore, they created and tested a prototype aiming to solve this issue, which is called the 'Value Ring', a value proposition tool for PSS (Fernandes et al. 2018) (see figure 5). This tool consists of the stakeholder with his needs, insights, opportunities and desires, a value pyramid consisting of different types of values, other stakeholders than the customer and the PSS. It demonstrates the challenge in aligning all parties' interests in a PSS and has been created under the assumption that in most PSS, only customers are considered, while other stakeholders are neglected.

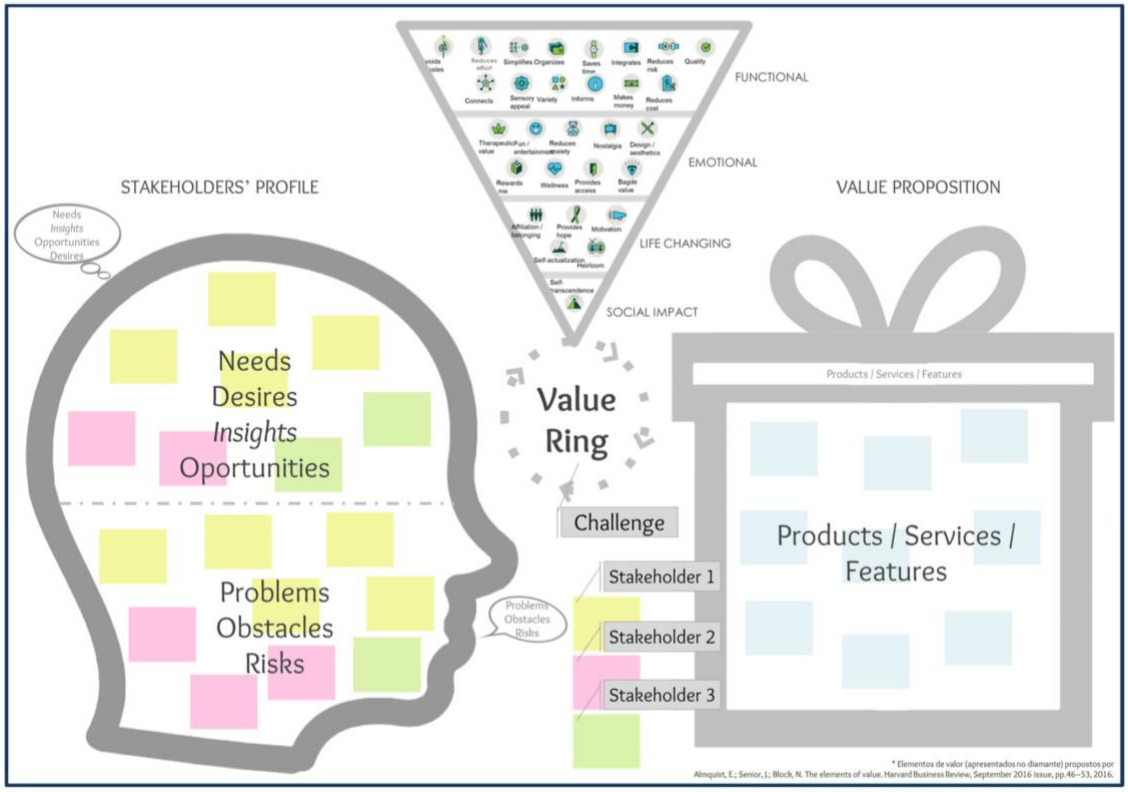

Figure 5: Value Ring (Fernandes et al. 2018)

Thereby, the study's focus lies on product-oriented manufacturers transforming into a PSS by a servitization strategy. In the following, this delineation is referred to as with PO PSS (Product-oriented Product-Service Systems). However, in an experiment, it turned out that this

developed tool comes with several limitations such as not being conclusive, which requires further adaptations for it to become mature. Nevertheless, Fernandes et al.'s (2018) study provides a basis for further research.

Haber and Fargnoli (2019) investigated customer's needs and expectations in PSS in health care, and propose an approach that integrates the "quality function deployment for PSS (QFDforPSS) method", which they test at the case of a "manufacturer in the medical sector seeking to improve his market stance through a PSS model" (Haber & Fargnoli, 2019, p. 257). One of their research questions in the conducted case study is "How to elicit Customer Requirements in an effective manner when adopting a PSS with limited information?" (Haber & Fargnoli, 2019, p. 258), which is investigated utilizing an extensive five-step model. This model comprises a market analysis, filtering of customer requirements with the Kano model, defining customer requirements and PSS characteristics based on conducted interviews, prioritizing these and prioritizing PSS characteristics in the last step (Haber & Fargnoli, 2019, p. 262). Their case study's results include the "importance of the response time for the customers as well as the role of the flow of information between the PSS provider and the receivers" (Haber & Fargnoli 2019, p. 267). This according to the same author highlights the importance of adopting Industry 4.0 technologies in PSS (Haber & Fargnoli, 2019) which has the capabilities of enhancing value for the customer with integrated solutions as a consequence of new opportunities for manufacturers (Xu, Xu & Li, 2018).

The high importance of information flow might be a result of customer co-creation in PSS, where value is jointly created with the customer rather than for the customer as a reciprocal, interactive process where communication is key (Vargo & Lusch, 2004; Zine, Kulkarni, Chawla, & Ray, 2014). Referring back to Haber and Fargnoli (2019), digitalization in a PSS comes with a set of challenges for the provider, who needs to determine which parts of the value chain can be digitalized and consequently, how the business model needs to be reconfigured (Vendrell-Herrero et al. 2017). According to Cenamor, Rönnberg Sjödin and Parida (2017, p. 62) "servitization is increasing in complexity with progressively higher requirements for customization and operational efficiency. These new requirements hinder manufacturing firms' ability to offer advanced services successfully". Some customers, however, might prefer offline service. Hence, higher customer satisfaction might be achieved, offering online services or vice versa. For companies, this is important to know in order to decide what to digitalize and what not (Moon & Armstrong, 2020). Relating this to PO PSS (Product-oriented Product-Service Systems), where the customer physically owns the PSS,

offline services such as information flow might be more valuable than online services which could be the case in Use-oriented or Result-oriented PSS, where the customer does not physically own the PSS, and shares it with others. Based on Haber and Fargnoli's (2019) findings of information flow considering it as a service, set into an Industry 4.0 context, the following hypothesis is stated:

Hypothesis 2 (H_2): *In a product-oriented PSS, customers prefer offline information flow with the provider over online information flow*.

In an empirical study, Ding, Liu, and Lang (2019) aimed to determine the importance levels of different customer's value elements in a PSS at the example of a shearer[1]. There, they used a qualitative method of different steps, where a cloud model to "process expert evaluation information", as well as the Kano model to "modify the basic importance of the value elements", and a Carnot model were applied to evaluate the importance of different value elements that have been established before based on expert interviews. Thereafter they used different methods to transfer the customer value into a PSS. Finally, they compared the different models. They concluded that "the value domain model based on the hierarchical theory of the customer value, which was constructed from the result and target layers of customer expectation, can more deeply capture the customer demand" (Ding, Liu & Lang, 2019, p. 14). In their model, however, experts are interrogated to determine the different value criteria rather than surveying customers, and the author regards the model as a basis for resource optimization rather than the construction of a VP.

The aforementioned studies similar to this study tried to investigate customer's requirements and needs. However, they used complex qualitative methods consisting of different step models, including expert interviews, to categorize the different value characteristics. Having reviewed existing literature, it appears that there exists no mature theoretical framework or model suggesting what exactly customers value in a PSS context and all of the studies have been based on expert interviews rather than customer opinions. As mentioned earlier in section 2.2.2, Payne et al. (2020) synthesized the literature on how to explain a CVP phenomenon. Based on this, they developed a conceptual framework suggesting that the following four customer value dimensions are the most agreed on in literature, which are: *Functional Value,*

[1] a machine that breaks "down the coal from the coal body by the working mechanism and load it into the conveyor (Ding, Liu & Lang, 2019, p. 9).

Economic Value, Emotional Value, and Social Value (Payne et al. 2020, p. 3). Therefore, this study tests as to whether or not these most agreed on value dimensions are also applicable in a PSS context. Therefore, the following hypotheses arise:

Hypothesis 3 (H_3): *The customer value dimension 'Functional Value' applies in a product-oriented PSS.*

Hypothesis 4 (H_4): *The customer value dimension 'Economic Value' applies in a product-oriented PSS.*

Hypothesis 5 (H_5): *The customer value dimension 'Emotional Value' applies in a product-oriented PSS.*

Hypothesis 6 (H_6): *The customer value dimension 'Social Value' applies in a product-oriented PSS.*

Hypothesis 7 (H_7): *The customer value dimensions, 'Functional Value', 'Economic Value', 'Emotional Value', and 'Social Value' apply in a PSS.*

2.4 Summary of Theoretical Review

The review of relevant literature investigated various aspects of PSS and CVP. In the beginning, PSS has been defined, explaining different categories of it, reviewing existing literature in the field. Then, the concept of CVP was discussed, comparing, and contrasting existing frameworks concluding that there is no framework that is exclusively used, suggesting that there are four most agreed on value dimensions in literature. The next section covered CVP through the lens of PSS, where it was found that it has not been addressed in literature before, whether existing CVP models also apply for the business model PSS.

Therefore, this study will investigate as to whether or not these most agreed on value dimensions are also applicable in a PSS context. In order to visualize the stated hypotheses that will be tested in chapter four, a conceptual framework is proposed (see figure 6). The next chapter pertains and discusses the methodological choices of this study.

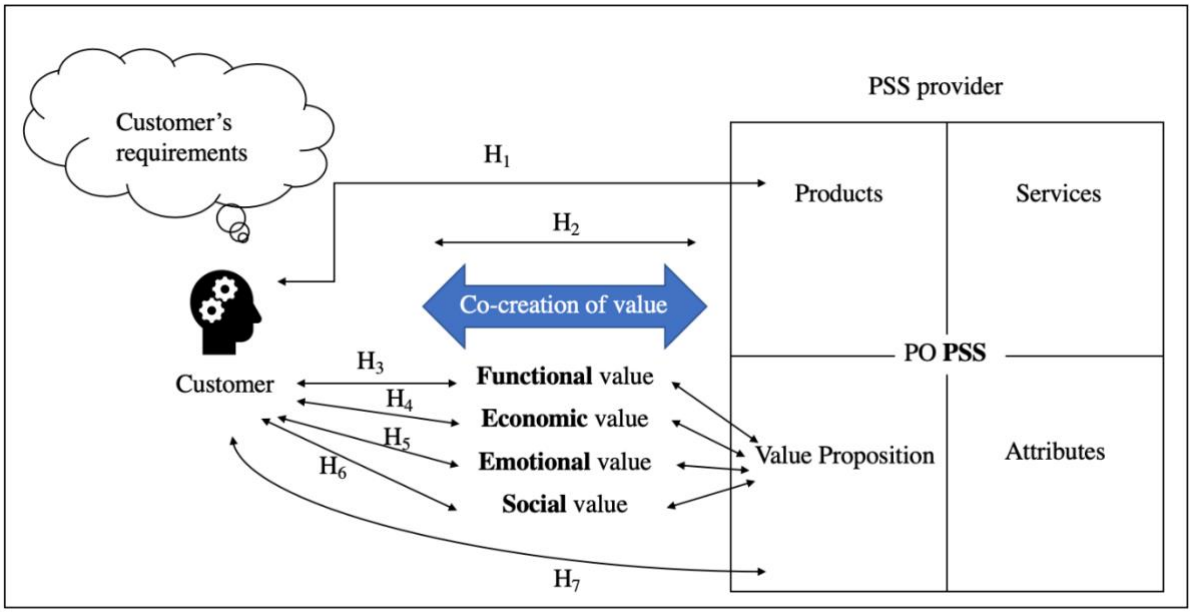

Figure 6: Developed Conceptual Framework

3 Methodology

In the preceding chapter, relevant academic literature, consultancy reports and scholarly publications have been reviewed and searched by using online library databases such as EbscoHost, Science Direct, Emerald Insight, Springer Link and Google Scholar to find journal articles and books using keywords such as (Product-oriented) PSS and CVP. Based on these findings, the research gap of a lack of literature regarding CVPs and customers value elements in PSS has been identified. In order to close this gap, primary data was collected. In this chapter, the chosen methodology for this study's empirical research will be discussed. The overall aim of this research is to investigate whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context. To close this research gap as specified in the introduction, a survey was conducted. Therefore, the chosen methodological path, including applied sampling method, research strategy and other methodological choices, will be examined in the following sections.

3.1 Research Philosophy

There are different types of research philosophies, where a positivistic philosophy highlights the significance of what is 'posited', meaning what is given (Saunders, Lewis & Thornhill, 2015). In regard to research, positivism is a "strictly scientific empiricist method designed to yield pure data and facts uninfluenced by human interpretation or bias" (Saunders, Lewis & Thornhill, 2015, p. 136). Interpretivists, on the other hand, state that findings cannot be generalized like laws to the populace (Brotherton, 2008; Collis & Hussey, 2014; Neuman, 2014). Nonetheless, in an interpretivist philosophy, subjectivism is adopted, which may cause bias as a consequence (Bryman, 2016). Thus, given that this research aims to investigate whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context, a positivistic philosophy has been chosen in order to avoid bias and be able to draw conclusions and give recommendations.

3.2 Methodological Choice and Research Approach

As mentioned in the literature review, PSS research and theory developed primarily has been conducted based on qualitative case studies, which demonstrates the need for quantitative and mixed-method research in this area (Li et al. 2020). Furthermore, in positivistic research, analyses usually are of quantitative nature (Brotherton, 2008; Saunders, Lewis & Thornhill,

2015), where quantification enables researchers to transform relatively complex information into concise and straightforward forms of demonstration (Veal, 2018). Consequently, a mono-method of quantitative research has been applied in this study, given that the primary's data collection output is numerical (Saunders, Lewis & Thornhill, 2015; Smith, Todd & Waldman, 2009). Furthermore, there are different research approaches, where an inductive approach is utilized in qualitative studies, where new concepts are discovered and theories built after having analyzed data (Brunsveld, Hair & Page, 2019; Collis & Hussey, 2014). A deductive approach in contrast, an existing theory is tested by confirming or rejecting hypotheses, where "a hypothesis is a formal statement of some unproven supposition that tentatively explains certain facts or phenomena" and "can be tested using data" (Brunsveld, Hair & Page, 2019, p. 42). Given that this study first analyzed secondary data to PSS and CVP in literature and based on existing literature developed hypotheses, which will be tested in the next chapter, this research adopts a deductive approach. To conclude, this study is positivistic and quantitative, subsequently adopting a deductive approach testing hypotheses with statistical tests based on existing literature. Furthermore, this research can be described as both explanatory and descriptive as it serves the purpose of identifying and "obtain information on the characteristics of a particular problem or issue" but also tries to explain relationships between the phenomena (Collis & Hussey, 2014, p. 4; Saunders, Lewis & Thornhill, 2015).

In terms of time horizon, this research can be considered as cross-sectional rather than longitudinal as it captures a phenomenon at a specific point of time instead of studying it over a larger timeframe as normally time constraints are present (Collis & Hussey, 2014; Saunders, Lewis & Thornhill, 2015). In cross-sectional studies based on results of a sample, patterns and characteristics of a group can be established, while these types of studies demonstrate *what* observed patterns exist, rather than *why* they exist, which can be seen as a limitation (Easterby-Smith, Thorpe & Jackson, 2015, p. 100). Furthermore, they allow researchers to form assumptions and confirm or reject hypotheses. Although processes cannot be described over time with this short timespan (Easterby-Smith, Thorpe & Jackson, 2015), a cross-sectional timeframe was found the most suitable for this research as it is limited by time and aims to explain *what* value elements of a CVP are applicable in a PSS context and not *why* they are applicable.

3.3 Data collection technique

3.3.1 An Exemplary Product-oriented PSS Provider chosen for this study

Conducive to test customer value elements in the context of PSS and as to whether they are applicable or not, an example firm was found appropriate to test the respective elements. Furthermore, participants needed to fully understand what a PSS exactly means in order to be able to give valid answers. Therefore, to give them a better understanding of the whole concept, in the survey of this study a specific company/PSS provider was referred without naming the firm as it was the firm's will to be anonymous. The exemplary e-business company produces customized made-to-measure blinds and curtains for windows. Customers can only order on their website, where they enter the required measurements and may choose between different colors, fabrics, and brands.

Furthermore, they can book consultancy visits to receive assistance in measuring and choosing the most suitable product. This consultancy can be either online (via a chat) or with a personal consultant visiting the customers' home, depending on the operating country. After the customer has chosen the desired product, the PSS provider manufactures it and delivers it to the customer's place, where the customer again can choose between self-installment or a consultant installing it. These additional product-related services contribute as the service-component for the PSS.

The company is successful and plans to expand to another country, where Finland represents an option. Alike in other organizations, resources are limited, so this research aims to help them allocate resources more efficiently. It is worth to mention that the blind manufacturer has no physical stores and offers its product assortment online only. The exemplary firm can be classified as a Product-oriented PSS, according to Tukker (2004) and Goedkoop et al. (1999).

Lastly, regarding the relationship to the company, based on a monetary agreement, they receive consultancy outside the scope of this thesis. Given this, they agreed on letting us use their firm as an exemplary firm for our research, where the company might benefit from this study's outcome regarding what customers value within their business model in general, but also with reference to Finland. Although we were in contact with the company, no information other than public information on their webpage was received. The company can be categorized as a

middle-sized e-business, operating in the manufacturing industry, and in a B2C (Business-to-Consumer) context.

3.3.2 Research Design and data collection instrument

With a positivistic research philosophy, and deductive research approach, a mono-method research strategy in the form of a survey was chosen as surveys ordinarily are used in cross-sectional studies with the goal to identify specific patterns meaning what patterns exist (Easterby-Smith, Thorpe & Jackson, 2015). Questionnaires in surveys are regularly applied in research due to the advantage of standardization, ease of comparability given the numerical output, being low-cost and time-efficient without the necessity of abundant resources (Collis & Hussey, 2014; Easterby-Smith, Thorpe & Jackson, 2015; Schwab, 2011; Smith et al. 2009).

Graziano and Raulin (2013, p. 157) recommend excellent researchers to frequently "collect data on demographic variables, which are characteristics of individuals, such as age, education and social class" and after that, compare them as different demographic groups exhibit different behavioral patterns. Therefore, in the questionnaire of this study (see Appendix B), demographical data such as age and social class have been included to analyze these in the context of CVPs in PSS. The self-report questionnaire (see Appendix B) comprised eleven questions in total, where four interrogated the respondent about demographic and social class variables, such as age, gender, yearly gross income and present occupation, one question about the nationality of the respondent and one on online shopping frequency. These demographic variables and the online shopping frequency variable simultaneously represent the control variables of this study. The other questions were of multiple and binary choice, five-point Likert scale and rank-order questions in respect of value elements in PSS. All questions were closed-ended questions are classified according to their type in the following table (table 1) based on Marshall (1997). Additionally, the survey can be categorized as inferential as it "aimed at establishing relationships between variables and concepts, whether there are prior assumptions and hypotheses regarding the nature of these relationships" (Easterby-Smith, Thorpe & Jackson, 2015, p. 75).

Table 1: Types of questions

Question	Characteristics	Scale
Data protection declaration		
1. Age	Multiple choice, Control variables	Ordinal
2. Yearly gross income		Ordinal
3. Present occupation		Nominal
4. Gender		Nominal
5. Nationality		Nominal
6. Frequency of shopping online		Ordinal
Case description		
7. Rating importance of 12 factors when purchasing a PSS	5-point Likert scale	Ordinal
8. Ranking of 5 most important factors when purchasing a PSS	Rank-order question	Ordinal
9. Choice between online vs. Offline consultancy in PSS	Binary choice	Nominal
10. Importance of PSS provider offering product-related services	5-point Likert scale	Ordinal
11. Purchase of PSS because of product vs. service	Binary choice	Nominal

3.3.3 Measures collected

In this section, the selection of the investigated variables and their theoretical underpinning based on chapter two are discussed. In order to find an existing standardized item list of customer value elements, several researchers have been contacted asking for recommendations on operationalizing customer value elements and how they approached their investigations. One answer was received from Prof. Dr. Andreas Eggert, who responded that he and his co-authors Penny Frow and Adrian Payne have tried to measure CVPs in general but failed in doing so. After numerous unsuccessful attempts to develop a multi-item scale probing different approaches for value propositions, they discontinued their trials. Nevertheless, as their research was conducted a while ago, and in CVP's not specified to PSS, an attempt in this research to identify suitable items was made by identifying multiple customer value elements of Functional, Social, Emotional and Economic Value. As mentioned earlier, these are the four most common agreed ones in literature, according to Payne et al. (2020).

Therefore, several studies have been reviewed for items (Adrodegari, Saccani & Kowalkowski, 2016; Almquist et al. 2019; Barquet et al. 2013; Ding, Liu & Yang, 2019; Ericson, Müller, Larsson & Stark, 2009; Haber & Fargnoli, 2019; Hasan & Abuelrub, 2011; Mont, 2002; Payne et al. 2020; Rintamäki, Kuusela & Mitronen, 2007; Yang & Peterson, 2004). Based on these, twelve items were chosen based on relevance, frequency, and applicability and hence, adjusted to the chosen example of the questionnaire as there is no commonly consented item list for each value dimension. An overview on each item's validation is given in Appendix C. Within

these items, most of them have been validated through expert interviews and confirmed by own empirical studies (e.g. Almquist et al. 2019; Ding, Liu & Yang, 2019; Haber & Fargnoli, 2019). There, several value elements of Almquist, Senior and Bloch (2016), have been applied in a similar study to this by Fernandes et al. (2018) which was discussed in chapter two.

However, it needs to be acknowledged that the validity of these measures may be constrained due to the fact, that there is no pre-tested standard item list and that the choice of the items might be biased by us. To somehow tackle this, pilot-testing was conducted, and it was relied on most up-to-date and credible sources (see Appendix C). Another possibility regarding generating items would have been to apply the commonly used GLOVAL scale suggested by Sánchez, Callarisa, Rodríguez and Moliner (2006) focusing on evaluating customer perceived value. However, it was decided against utilizing this scale, as its focus is on the post-purchase stage. This research, however, takes the approach of CVPs which are taken into consideration before making a purchase. Regarding the questionnaire, having a both Finnish and German population, the questionnaire was designed in English, where for both Finnish and German a translation was given as subtitles to elude comprehension problems. A pilot test was conducted from 28th April to 1st May 2020 before distributing the final questionnaire, with the goal to increase validity and reduce equivocal meanings (Bell & Waters, 2014; Cohen et al. 2018). There, nine responses were received, and minor wording issues could be detected and amended for better comprehension. Having based the questions on relevant literature of chapter two, this resulted in the final questionnaire (see Appendix B), with its literary grounding for each question demonstrated in Appendix C.

3.3.4 Sampling Technique

Regarding the sampling technique, an online questionnaire has been published where a hyperlink was distributed on several Social Media platforms, such as a private Facebook page, WhatsApp messenger and private Instagram account, as well as LinkedIn. Participants were allowed to share the link again, which corresponds to snowball sampling (Saunders, Lewis & Thornhill, 2015). Concerning the sampling strategy, "with probability samples the chance or probability, of each case being selected from the target population is known and is usually equal for all cases" (Saunders, Lewis & Thornhill, 2015, p. 275), which was not the case in this study's empirical research as a result of limited time and resources being of cross-sectional nature. Therefore, applied sampling technique can be described as purposive sampling, which

is a category of non-probability sampling (Fisher, 2010), where participants were elected based on their access to the survey and 'predefined characteristics' such as nationality, for instance. The survey was distributed by sending the hyperlink to people who could also send it to others who were older than eighteen years old and of a Finnish or German nationality which corresponds to volunteer snowball sampling (Saunders, Lewis & Thornhill, 2015). Concludingly, the sampling technique of this research can be classified as purposive, snowball non-probability sampling (Fisher, 2010; Saunders, Lewis & Thornhill, 2015).

Having applied the above-mentioned technique, the survey has been created with software named 'Kwiksurvey' and was online from 2nd May to 10th May 2020. Finally, the survey has been duly completed by 267 participants, of which 17 were neither Finnish nor German which reduced the number of valid responses to 134 Finns and 116 Germans and accounts for a total of 250 valid responses.

3.3.5 Statistical tests

Non-parametric tests are typically used when there are outliers in data, in non-probability sampling, or when data consists of ordinal values or ranks (Analytics Vidhya, 2017). This study uses non-parametric testing, given that this research pursued a purposive snowball sampling, which is a form of non-probability sampling and the fact that Likert-Scales have been utilized in the questionnaire, which constitutes to ordinal variables. As ranks have not been calculated but rather allocated, parametric tests can be regarded as invalid in these cases (Analytics Vidhya, 2017), which is why non-parametric tests have been chosen. Also, "non-parametric tests can be applied to situations when the data does not follow any probability distribution" or has a limit of detection, making it suitable for this study, as the normality remains somewhat uncertain (Analytics Vidhya, 2017, n.p.). However, non-parametric statistics take this into account, and it is also applicable for small sample sizes (Analytics Vidhya, 2017).

Basic measures for tendency are assessed with measures such as mean, median, mode, standard deviation, variance, skewness and kurtosis. Association between the independent control variables (e.g. age) and dependent variables (e.g. value elements) are tested with Mann-Whitney *U* test and Pearson's Chi-square test (when there are two variables) and Kruskal-Wallis Test (when there are more than two variables). Additionally, Correlation with Spearman's Rho demonstrates the correlations between the value elements. Both experimental

and non-experimental (one or two groups of investigation) analyses have been exercised. Each test is with respective explanations is presented with more details in the specific sections. To sum up, there are seven hypotheses, and all tests have been conducted to address these with non-parametric which were chosen based on the particular variable type. Table 2 shows the connections between the hypotheses and questions as well as topic concerned connecting to literature.

Table 2: Reasoning between questions, topics, and hypotheses

Question	Topic	Hypothesis
7. When purchasing a PSS, how important are the following	Value for the customer	Hypothesis 7
ECV1: Low Price	Economic value	Hypothesis 4
ECV2: Delivery price		
FV1: Quality of the product	Functional value	Hypothesis 3
FV2: Websites' user-friendliness		
FV3: Quality of technical support (post purchase, e.g. if something is broken)		
FV4: Online consultancy		
FV5: Offline consultancy		
SV1: Customization possibilities	Social value	Hypothesis 6
SV2: Brand		
EMV1: Trustworthiness of the PSS provider (e.g. through postive reviews, certificates)	Emotional value	Hypothesis 5
EMV2: Product range (variety in options)		
EMV3: Design/aesthetics		
8. Please rank the the five most important attributes out of the list above according to your importance when purchasing a PSS.	Value for the customer	
9. If you had to choose between online (e.g. consultancy on website via a chat) and offline consultancy (e.g. a person coming to your place to assist you measuring or choosing a suitable product). Which one would you prefer?	Value for the customer in e-business context	Hypothesis 2
10. How important is it for you that the company/PSS provider offers product-related services (e.g. measurement, maintenance and installation)?	Value for the customer (product vs service)	Independent variable for question 10
11. Generally, in a PSS would you purchase a manufactured good primarily because the service or because of the product?		Hypothesis 1
1. **Age**	Demographics/control variables	Independent variables
2. **Yearly Gross Income**		
3. **Present Occupation**		
4. **Gender**		
5. **Nationality**		
6. **Online Shopping Frequency**	E-business	

3.3.6 Research ethics

Regarding ethical considerations, there are two main responsibilities the researcher needs to comply with, which are "protection of those who serve as subjects in research and assurance of honesty in conducting and reporting research" (Graziano & Raulin, 2013, p. 112). Participants were fully informed, asked for their consent to participate and were not embarrassed, harmed, or subject to elsewhere material disadvantage (Saunders, Lewis & Thornhill, 2015). No pressure has been exercised, and the survey was completely anonymous, results treated confidentially and not able to be traced back to the respondent (Marshall, 1997). Anonymity is essential in this context as questions have been asked about "age, income, educational background, qualifications and opinions" which "can be regarded as private and/or sensitive matters" (Cohen et al. 2018, p. 471). Moreover, data was fully reported without manipulation for more desired results, nor has the participation in the survey been incentivized for a larger participation rate (Creswell & Creswell, 2014; Greenfield & Greener, 2016).

Regarding the relationship with the exemplary firm of this study, this research has not been manipulated for the company's benefit, nor did the firm have any influence on the research design. Nevertheless, this study's results have the potential to benefit the company as the results may be applicable to them and influence their future decision-making. The firm will have access to this thesis, given that it will be accessible to the general public. However, we will not report further/other information that is not included in the thesis to the exemplary firm. Regarding the exemplary company, anonymity has been granted as requested. Lastly, given that replication of research, it is essential to increase reliability in science, researchers must fully disclose their utilized methodology (Marshall, 1997), which was done in this chapter.

3.4 Research Quality

In order to ensure that research findings are of high credibility, researchers need to secure that results are scientifically objective without subject bias of the researcher, meaning that the possibility of wrong interpretation needs to be reduced (Saunders, Lewis & Thornhill, 2015). According to the same authors, this, to a certain extent, can be achieved by emphasizing two particular elements in research design, which are validity and reliability that also assess the quality of a study's research. Therefore, in the following sections, internal validity, external validity, and reliability will be critically contemplated.

3.4.1 Reliability

Reliability can be defined as "the degree to which we could expect the same results if we or other researchers carried out the study again, using the same methods on a similar sample" where different research methods imply different degrees of reliability (Marshall, 1997, p. 79). There, according to the same author, questionnaires typically are more reliable than other methods as participants take part in the study without directly interacting with the researcher (who's subjectivity could influence the participants and therefore, generation of data). Setting reliability into the context of the epistemological continuum, which refers to positivism in this research, positivists question reliability by asking: "Do the measures used provide a good approximation to the underlying concepts of interest?" (Easterby-Smith, 2015, p. 103). Although questionnaires generally are characterized by relatively high reliability, there are still threats to it which include; *participant error*, where responses can differ depending on the day time, the participants filled out the survey, *participant bias*, where participants respond what they think they are expected to respond, *observer error*, meaning the researcher eliciting responses differently than another researcher would and lastly, related to observer error, *observer bias* where data is interpreted incorrectly (Robson & McCartan, 2016; Saunders, Lewis & Thornhill, 2015).

There, participant error was tackled by publishing the survey hyperlink for several days so that respondents could choose a suitable time to respond, whereas participant bias was aimed to be avoided by wording the questions as neutral as possible and considering the feedback of the conducted pilot-test. However, it cannot be completely ascertained that the survey was free of participant bias. Regarding observer error and observer bias, given that this research facilitates numerical output, it was aimed to choose the most appropriate statistical testing methods. Also, reference values for the different statistical outputs during the interpretation of data served as guidance. Lastly, the chosen non-probability sampling technique limits the level of reliability and overrepresented younger participants. Other demographic variables further reduce the level of reliability, as not all age groups are equally represented. To assess and increase the reliability of a questionnaire the most frequently utilized method is the *test-retest method*, "in which a group of participants, or subjects, are tested and then retested at a later date" (Greenfield & Greener, 2016, p. 279) to measure if the chosen instrument is reliable (Sreejesh, Anusree & Mohapatra, 2014). This, however, due to time constraints of this research could not be implemented, which reduces the reliability of the questionnaire.

In relation to reliability, internal consistency has been tested with Cronbach's Alpha. This test enables to determine the reliability of a scale (Lund Research Ltd., 2018). Generally, a value of Cronbach's Alpha above .60 is considered adequate (Lund Research Ltd., 2018).

Table 3: Reliability Statistics with Cronbach's Alpha

	Cronbach's Alpha	N of Items
Economic Value	.459	2
Functional Value	.580	5
Social Value	.299	2
Emotional Value	.452	3
All CVP Elements	.601	12

Table 3 shows Cronbach's alpha reliability values for this study, and it is evident that the highest reliability value is obtained for the total value proposition as it holds the highest number of items. Low reliability values might appear due to the small number of items, and Cronbach's Alpha is condemned for scale reliability of fewer than ten items because the value tends to underestimate the reliability value of such scales with few items (Taber, 2017). Social Value shows the lowest reliability value, i.e. .299, Emotional Value .452 (two items), Economic Value .459 (two items), whereas Functional Value (five items) shows the highest reliably among all dimensions with .580. Due to only having few variables for each item, there is a risk in this study of having a lower opportunity of getting a high Cronbach's Alpha. Thus, especially for the value dimension Social Value, but also for the other elements, Cronbach's Alpha might not be a good representation of these measurements' reliability. The construct of Social Value (.299) here is especially low, and Economic Value (.459), as well as Emotional Value (.452) are quite low, too.

These shortcomings shall be considered for our outcome, as results are potentially arbitrary. In order to overcome this issue, more questions and value element items would have been necessary in order to be more certain to draw conclusions about CVP. However, the built value element construct has been kept in the analysis, due to the limitation of a generally accepted value element scale and the limited literature on suitable value elements. Another option would have been further pilot-testing to increase reliability. This, however, could not be implemented due to the restricted time of this study. Hence, the limitations connected to the Cronbach's Alpha scores need to be considered during the analysis, discussions and conclusion chapters. Lastly, only the value elements could be tested with Cronbach's Alpha as this reliability test

cannot assess single item measures as it was the case for all other questions in the questionnaire of this study. Unfortunately, there exists no sufficient test alternative for this purpose either.

3.4.2 Internal validity

Internal validity corresponds to "the degree to which methods have been measuring what the researcher set out to measure" (Marshall, 1997, p. 106) and how variables were treated (Bryman & Bell, 2015; Robson & McCartan, 2002). In these regards, referring back to the measures collected, items from multiple sources in literature were reviewed and identified. Nevertheless, internal validity of these may be constrained as they have been adapted to the context of this study and that there is no pre-tested standard item list and that the choice of the items might be biased. In order for the participants to get a better understanding of the questions, an example has been given before the actual questions were asked to increase the comprehensiveness of the questions. Connected to this, it is important to mention, that two Economic Value, two Social Value, three Emotional and five Functional Value elements have been tested. It is noteworthy, that the number of value elements is not equal for each category. This is a result of them having been selected based on existing literature and adapted to the exemplary firm. The high number of Functional Value elements that have been applicable to the exemplary firm might is a result of the firm operating in the manufacturing industry. Also, studies show that there generally exist more Functional Value elements than Emotional Value elements, for instance (e.g. Almquist, Senior & Bloch, 2016). Hence, if an equal number of items for each value category would have been chosen, value categories with a generally low number of items would have been proportionally overrepresented compared to value categories with a high number of items, such as Functional Value.

The actual value elements (see Appendix C), have been rated by the participants on a five-point Likert scale as "reliability and validity are good in scales that have at least five response categories" (Greenfield & Greener, 2016, p. 236). Regarding the questionnaire, having both Finnish and German population, the questionnaire was designed in English, where for both Finnish and German a translation was given as subtitles to elude comprehension problems. In positivist studies, "there is a major concern about whether the instruments and questionnaire items used to measure variables are sufficiently accurate and stable" (Easterby-Smith, Thorpe & Jackson, 2015, p. 83), which is why measures should be pre-tested before the final execution. Therefore, the measures were validated by the above-mentioned pilot test. Lastly, the internal

validity of this research is constrained by the cross-sectional time frame and the fact that cause-and-effect relationships could not be tested based on the selected tests. These are limitations that could not be overcome, given the scope of this research.

3.4.3 Generalizability/External validity

Generalizability or external validity corresponds to "the degree to which findings from a sample can be generalized to the general population" (Marshall, 1997, p. 106) and whether or not findings would be identically applicable to alternative research settings (Saunders, Lewis & Thornhill, 2015). This, according to Saunders, Lewis and Thornhill (2015), is particularly tricky when executing a case study research in an organization. This study did not research within an organization but utilized an exemplary company with questions related to this example. Also, the chosen non-probability sampling method and the relatively small sample size may constrain external validity of this research, as not all cases in the population had equal chances to be selected, meaning that this study's sample might be rather homogenous than heterogeneous. Connected to the sampling method, in this study customer value elements of Finnish and German participants have been investigated. Therefore, the results may not be generalizable to other countries and it is not claimed that results are generally applicable. Additionally, the cross-sectional timeframe limited data collection to a specific point of time, whereas customer's perceptions might change especially considering online and offline environments in this research's context, therefore a longitudinal study would have yielded more generalizable results (Collis & Hussey, 2014). Thus, generalizability to the population might be constrained, and conclusions drawn throughout the next chapters may not be generalized meaning externally valid.

3.5 Summary

In the preceding sections, several methodological choices of this research have been discussed. In short, this study is quantitative, deductive with the conduction a cross-sectional survey to investigate customer's value elements in a PO PSS (Product-oriented Product-Service Systems). With a Finnish and German sample, the questionnaire yielded 250 valid responses, which will be analyzed in the succeeding chapter based on several statistical tests. Ethical considerations have been discussed, as well as reliability and validity to assess the quality of this research. Concludingly, without neglecting the limitations, the next chapters may still deliver some new insights and therefore, provide a basis for further research.

4 Results

In the previous chapter, methodological choices of this research have been discussed, adopting a positivistic philosophy and deductive approach, and testing hypotheses developed in chapter two. The overall research aim of this study is to investigate whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context. Based on this aim, hypotheses have been stated based on existing literature. To test these hypotheses, data was collected with a survey instrument, including standardized questionnaires. In the following sections, first, descriptive information of the data will be provided, then, control variables will be tested for their potential influence on dependent variables, after which the respondents' profile is reviewed. Lastly, the final hypotheses will be tested. Data is mainly analyzed with non-parametric tests due to the nature of our research, as most variables are ordinal, considering that our data is not normally distributed. A significance level (p-value) of 0.05 is adopted in all statistical tests. The p-value is a probability (range 0–1) which is interpreted as follows: the lower p, the more significant the measurement. By consensus, a measure is considered to be significant when $p < 0.05$, which is equivalent to 95 % confidence level (Canela, Alegre & Alberto, 2020).

4.1 Descriptive Analysis of Results

Before analyzing the by executing statistical tests, general descriptive data of the overall sample will be indicated. Again, non-parametric tests have been chosen for the analysis as in this study; the average is not a suitable indicator of the center of the data (Analytics Vidhya, 2017) given that it might substantially be influenced by outliers considering a non-normal distribution, which is taken into account by non-parametric tests. Therefore, with ordinal questions, examining the median is a more suitable choice as it better indicates the center of the data, given that “half of the data lies below the median and the other half lies above it” (Analytics Vidhya, 2017, n.p.). The analysis chapter follows the thematical order of the hypotheses stated in the literature review. Therefore, related to Hypothesis 1, first, question eleven will be analyzed, followed by question seven related to Hypothesis 2 and lastly, the value elements will be investigated referring to Hypthesis 3 to Hypothesis 7.

4.1.1 Descriptive Analysis of Question nine, ten and eleven

In question eleven the aim was to find out if customers purchased a PO PSS in manufacturing primarily because of the service component or the product component. This question intended to investigate which of the two components of a PSS value is extracted from. There, more than three quarters indicated that they purchased a PSS primarily because of the product rather than the service (see table 4). Although this result suggests a high percentage of participants preferring the product dimension of a PSS, in question ten, participants were asked to rate the level of importance of the PSS provider offering product-related services. The majority with 55.6 % rated the offering of product-related services as either important or very important, with an overall median of four. Question nine asked the respondents about whether they preferred online or offline consultancy in a PSS context. There, the majority with 62.4 % preferred offline consultancy over offline consultancy (37.6 %) (see table 4).

Table 4: Frequencies of Question 9, 10 and 11

Question 11:	**Frequency**	**Percent (%)**
Service	57	22.8
Product	193	77.2
Total (N=250)	250	100
Question 10:		
very unimportant	4	1.6
unimportant	23	9.2
neutral	84	33.6
important	107	42.8
very important	32	12.8
Total (N=250)	250	100
Question 9:		
Online consultancy	156	62.4
Offline consultancy	94	37.6

4.1.2 Economic Value, Functional Value, Social Value and Emotional Value

As mentioned earlier, non-parametric tests have been chosen for this study. However, to indicate the descriptive statistics for question seven, meaning the different value elements, measures of central tendency and distribution are shown for a better overview, as well as an assessment of dispersion of the data and reasons of completeness. Nevertheless, in the further sections, reporting the median will serve as the main measurement (tendency measure). Again, first, the different variables are analyzed without considering the control variables. Testing which control variable has an effect on which variable's outcome, will be done in later steps.

In question seven respondents needed to indicate on a five-point Likert how important each value element was to them in a PSS context with a minimum value of 1 (very unimportant) and maximum value of 5 (very important) (see table 5). In this scale, equidistant intervals between the variables are accepted (Cleff, 2019).

Table 5: Standard measures of central tendency and normality

Value dimension	Value attribute	Mean	Median	Mode	Std. Deviation	Variance	Skewness	Kurtosis
Economic Value (ECV)	ECV1: Low Price	3.27	3	3	0.848	0.719	-0.145	-0.189
	ECV2: Delivery price	3.38	4	4	0.984	0.967	-0.337	-0.489
Functional Value (FV)	FV1: Quality of the product	4.59	5	5	0.696	0.484	-2.337	7.711
	FV2: Websites' user-friendliness	4.22	4	5	0.872	0.761	-1.074	0.901
	FV3: Quality of technical support	4.28	4	5	0.791	0.626	-1.024	0.998
	FV4: Online consultancy	3.23	3	3	1.069	1.143	-0.117	-0.699
	FV5: Offline consultancy	3.11	3	3[a]	1.148	1.318	-0.213	-0.746
Social Value (SV)	SV1: Customization possibilities	3.78	4	4	0.988	0.976	-0.605	-0.092
	SV2: Brand (to express yourself)	2.55	2	2	1.041	1.084	0.237	-0.631
Emotional Value (EMV)	EMV1: Trustworthiness of the PSS provider	4.11	4	4	0.807	0.651	-1.032	1.580
	EMV2: Product range	3.91	4	4	0.797	0,635	-0.753	1.247
	EMV3: Design/aesthetics	4.1	4	4	0.829	0.688	-0.835	0.787
a. Multiple modes exist. The smallest value is shown. N=250. Minimum=1 (very unimportant), Maximum=5 (very important). N = 250								

As shown in table 5, the descriptive statistics for each one of the twelve value elements of question seven are indicated including mean, median, mode, standard deviation, variance, and skewness with N = 250. Again, however, having chosen non-parametric analysis, the median is the most "representative" value of this univariate analysis. Here, the Likert scale median scores show that the highest median score is obtained for 'FV1: Quality of the product' being the only value element with a score of five, meaning that it has been rated as very important. 'SV2: Brand' on the other hand, represents the least important with a median of two. Generally,

it can be seen that most of the value dimensions (eight out of twelve) have been agreed on, meaning that they have been rated four or higher. The exact frequencies for each value element's rating can be found in Appendix D. There, in each importance category of the Likert-scale values from respondents are represented.

Another measure of dispersion/spread is variance, which is the average of the squared distances from each point to the mean. A small variance implies that the data points are situated close to the mean, and also close to each other (Cleff, 2019). In contrast, a high variance indicates data points being dispersed out from the mean, as well as from one another (Cleff, 2019). Table 5 represents how variability is spread on each question and whether data is more heterogeneous or homogeneous.

Skewness is a measure of distribution asymmetry, where values larger than zero indicate a right-skewed (positive) distribution, and values less than zero indicate a left-skewed (negative) distribution. Values that are zero indicate perfectly symmetrical distribution, which would be ideal but unlikely for real-world data. Based on table 5, all values are smaller than zero except from 'SV2 Brand', which suggests for left-skewed distribution meaning that distribution is leaning towards negative values, and there is some asymmetry in the sample. Skewness is relevant for normality: many statistics inferences require a distribution to be normal or nearly normal. When skewness varies from -2.337 to 0.237, the overall distribution can be considered moderately right-skewed or highly left-skewed. Skewness values ± 1.0 are considered normal. The standard error for our skewness measures is 0.154, which suggests that there is lot of negative skewness in our sample (to maximum negative value -2.337), and some positive skewness (0.237).

In relation to skewness, table 5 presents kurtosis measures. Kurtosis describes the so-called 'tailedness' (pointy or flat) of a distribution. The standard error of kurtosis of our sample was 0.307, the formula being normalized to a value of zero. With distributions varying from -1.749 (Preference online vs offline consultancy) to 7.711 (FV1: Quality of the product), the test suggests that data is not normal and indeed entails many outliers in the distribution. High kurtosis in a data set indicates that data has heavy tails or outliers distribution (Cleff, 2019). With values larger than three, the peak of the distribution becomes steeper, which is called a leptokurtic distribution (Cleff, 2019). As mentioned for skewness, normality and kurtosis are a typical assumption for statistical tests, when the results are aimed to be generalized to a larger

population. The non-normal distribution of our sample needs hence, to be considered when discussing generalizability in conclusion.

4.1.3 Ranking of value elements: Question 8

Question eight was about ranking these values as mentioned earlier according to their importance, where only the top five could be selected. These results are stated in the following.

Table 6: Question 8: Ranking of the five most important value attributes

Rank	Value Element
1	*FV1: Quality of the product*
2	*EMV1: Trustworthiness of the PSS provider (e.g. through positive reviews, certificates)*
3	*EMV2: Product range (variety in options)*
4	*FV2:Website's user-friendliness*
5	*EMV3: Design/aesthetics*

There, it is noticeable that two Functional Value elements and three Emotional Value elements are in the list. In contrast, Social and Economic Value have not been ranked as the top five important values. This goes in line with the results of question seven, where Functional Value and Emotional Value elements generally, reached higher medians than Economic and Social Value items.

Overall, this section, demonstrated the descriptive statistics of each questions, given an overall impression on skewness, where a central tendency shows that most value elements have a median above three, meaning that a central tendency is towards participants agreeing to the value elements in our sample. Nevertheless, there are some deviations, (e.g. median of two in 'SV2: Brand'), which is why in the next part it will be analyzed where these variations come from. Therefore, in the next section, each aforementioned dependent variable will be set into the context of independent/control variables to detect potentially influencing factors.

4.2 Identification of influencing control variables

After having analyzed descriptive statistics of the data set without taking control variables into account, in the following only the three questions on which the hypotheses are based will be tested including control variables to find potential associations and patterns. Therefore, report continues by following the thematical order of the developed hypotheses in literature review. First, question eleven, then question nine and lastly, question seven will be set into the context

of the control variables, to investigate whether there is an association between the categorial variables (the value elements) and the control variables.

4.2.1 Question 11: Product vs Service and Question 9: Online vs Offline consultancy

In question eleven, it has been asked whether the survey participants in a PSS would purchase a manufactured good mainly because of the service or the product. Participants could choose between two options buying it primarily because of the service or primarily because of the product (where only one answer was allowed). In the following, it will be tested if the different control variables (*age, yearly gross income, present occupation, gender, nationality,* and *online shopping frequency*) influence the outcome of the *product vs service* variable. Testing is done with Pearson's Chi-Square test (X_2), which tests the association between categorical variables, meaning nominal or ordinal variables. In this context, this means it examines the association or relationship between the control variables and product vs service preference. There are typically four steps in a Chi-Square test which include to first state the hypotheses, then to formulate an analysis plan meaning the choice of a significance level (StatTrek, 2020). The chosen significance level in this research is $p < .05$. Lastly, the results are interpreted.

The general underlying hypotheses for a Chi-Square test are as follows:

H_0: *Variable A and Variable B are independent*
H_A: *Variable A and Variable B are not independent.*

This means that the alternative hypothesis proposes "that the level of variable A can help you predict the level of variable B". However, it is important to mention that it suggests "that they are related but relationship" (StatTrek, 2020, n.p.), meaning that it tests the significance of the association between the variables but "does not determine causality of the "association" (LiveInnovation, 2020, n.p.). With the example of testing for an association between the independent variable *Age* and the dependent variable *product vs service preference*, the hypotheses would be as follows:

H_0: *Variable **Product vs service** and Variable **Age** are independent.*
H_A: *Variable **Product vs service** and Variable **Age** are not independent.*

There, the results showed that $p = 0.614$, which means that it is not significant, as $p = 0.614 > 0.05$, meaning that it was not significant. Hence, H_0 could be confirmed, rejecting H_A, showing

that there is no relationship between age and product vs service preference: X_2 (5, N = 250) = 3.561, p = .614.

Regarding the variable gender, in the questionnaire participants could choose between female, male and diverse. The response diverse was chosen by one participant and is filtered out in this test, as one answer is not representative enough to determine a potential association between gender and preference.

Table 7: Chi-Square Test results from Question 9 and 11

Q11: Product vs. Service	Age	Income	Present Occupation	Gender	Nationality	Online Shopping Frequency
Asymptotic Significance	.614	.461	.150	.870	.297	.705
Pearson's Chi Square	3.561	3.615	8.106	0.027	1.806	2.170
Degree of Freedom	5	4	5	1	1	4
N of valid cases	250	250	250	249	250	250
Q9: Online vs. Offline consultancy						
Asymptotic Significance	.011	.208	.480	.389	.000	.120
Pearson's Chi Square	14.754	5.881	4.499	0.743	18.401	7.325
Degree of Freedom	5	4	5	1	1	4
N of valid cases	250	250	250	249	250	250

Analyzing the results of Table 7, it becomes apparent that regarding product vs service, none of the p-values is significant, meaning that for product vs service, no control variable was dependent. Hence, no pattern or relationship between the variables could be identified. Question nine interrogated the participants about whether they preferred consultancy of the PSS provider online (meaning via a chat or similar channels) or offline (with a consultant coming to the customers home). In this question, participants could choose between preferring online and offline preferences (where only one answer was allowed). The results show that there is an association between consultancy preference and *age* and *nationality.* After having analyzed question eleven and nine by testing for potential associations between control variables and categorical variables, the same procedure will be done for question seven that assessed the importance of twelve attributes divided into four value dimension categories (Economic, Emotional, Functional and Social Value).

4.2.2 Bivariate analysis: Mann-Whitney *U* test

It is valuable to see whether there are significant differences between the distinct groups, as it enables the discovery of differentiating characteristics. From our groupings, only gender and nationality can be categorized into two, making them suitable for Mann-Whitney *U* testing.

This analysis having two variables, is called bivariate analysis (Cleff, 2019). Later, multivariate analyses are applied with the Kruskal-Wallis Test, which is typically utilized for groupings of more than two groups (income, age, occupation, shopping frequency). Here, The Mann-Whitney *U* test is used to compare differences between two independent control variable-based groups, to understand whether value dimensions importance differ based on gender or nationality.

Mann-Whitney *U* test (also known as Wilcoxon Rank Sum Test) tests whether two samples are likely to derive from the same population by comparing the equality of medians of two independent samples. In contrast to independent samples t-test, Mann-Whitney *U* test does not require normal distribution, and therefore, is a better option for comparing two samples when assumptions of normality have been violated. Another reason for using the Mann-Whitney *U* test is justified when the dependent variable is ordinally scaled, as it is in Likert scales. Mann-Whitney *U* test is based on a median rather than mean, making it more suitable for this study (Cleff, 2020; Lund Research Ltd., 2018).

Mann-Whitney *U* test provides the U statistic for statistical significance, as well as the asymptotic significance (2-tailed) which refers to the p-value. With a significance level of 0.05, p-values above 0.05 can be considered insignificant, and conclude that a significant difference does not exist. Contrarily, p-values smaller than 0.05 suggest that a significant difference might exist. For example, p-value 0.006 of 'ECV1: Low price', entails a meaning that if the study were to be replicated 1000 times, the result would be wrong six times. In other words, we opt to an error in p=0.006% (<0.05) of cases when we assume that men and women are reacting differently on delivery prices. Asymp. Sig. (2-tailed), known p-value, states whether the two groups were statistically significantly different from each other, and significant values (<0.05) are marked in yellow. Results of this study's Mann-Whitney *U* test are demonstrated in table 8.

Table 8: Bivariate value elements with the Mann-Whitney U test

	ECV1: Low Price	ECV2: Delivery price	FV1: Quality of the product	FV2: Websites' user-friendliness	FV3: Quality of technical support	FV4: Online consultancy	FV5: Offline consultancy	SV1: Customization possibilities	SV2: Brand (to express yourself)	EMV1: Trustworthiness of the PSS provider	EMV2: Product range	EMV3: Design/ aesthetics
Grouping Variable: Nationality * Value elements												
Mann-Whitney U	7470.000	6275.500	7605.500	7366.000	7259.500	6356.000	6845.500	4980.500	7194.500	7728.000	6394.500	7057.500
Asymp. Sig. (2-tailed)	0.572	0.006	0.723	0.441	0.327	0.010	0.093	0.000	0.292	0.932	0.008	0.177
Grouping Variable: Gender * Value elements												
Mann-Whitney U	5933.500	5179.000	5297.000	5927.500	5956.500	5662.000	5994.500	5591.500	5565.500	5845.500	5658.000	5423.000
Asymp. Sig. (2-tailed)	0.562	0.033	0.030	0.548	0.587	0.264	0.661	0.201	0.188	0.429	0.232	0.096

First, the comparisons between the nationalities were conducted. Based on our sample, Mann-Whitney *U* test indicated evidence to support a difference of the ratings between the nationalities of Finnish and Germans ($p < 0.05$) on four value attributes. These are marked in yellow to the table 8: 'ECV2: Delivery price' ($U = 6275$, $p = .0006$), 'FV4: Online consultancy' ($U = 6356$, $p = .0010$), 'SV1: Customization possibilities' ($U = 4980$, $p = .0000$), and 'EMV2: Product range'. There is no evidence to support differences between the nationalities when it comes to the other value attributes. With four out of twelve value attributes having significance, this demonstrates there to be differences between some of the ratings of Finnish and Germans. Therefore, the result guides us to investigate the results with this distinction in mind.

Second, the comparisons between the genders was performed. Regarding potential gender differences within the variables mentioned before, it is evident that there is a non-significant difference between male and female participants for most of the variables, except from 'ECV2: Delivery price' ($U = 5179$, $p = .033$), and 'FV1: Quality of the product' ($U = 5297$, $p = .030$). Here, for statistical reasons, gender option with a single value of 'Other' had to be excluded. The assumption for allowing comparisons are trivial to be done with a grouping with a single item. Therefore, in this case, a distinction is only made between two common groups of genders: males, and females. Here, independent variable 'gender', originally had three groups: 'male', 'female' and 'other'. This exception to exclude the 'other' option was required to do for enabling comparisons between these variables, and only done for this specific test only.

4.2.3 Construct Inter-Correlations with Spearman‘s Rho

As a part of testing the associations between variables, correlations are analyzed (which is also a type of bivariate analysis). This is done with Spearman‘s Rho, also known as non-parametric correlations test. When data is ordinal (like Likert scales), it is recommended to use Spearman’s correlation test. However, aligned with the earlier mentioned limitation of cross-sectional research, measures do not explain why a correlation exists; only that it does or does not exist. Also, it is noteworthy to take up the difference between correlations and causalities: evidence for correlation does not automatically imply causation and provide evidence for cause-and-effect relationships. Values vary from +1 to -1, and the closer the value is to zero, the weaker is the relationship between the variables. Spearman's Rho measures the strength and direction of the association between two ranked variables (Lund Research Ltd., 2018).

Appendix E shows the Spearman's Rho correlation analysis with yellow marked significances ($p < .01$). For example, ‘ECV1: Low price’ is significantly positively related with ‘ECV2: Delivery Price’ whereas ‘ECV1: Low price’ is significantly negatively related with ‘FV1: Quality of the product’, ‘FV2 Websites' user-friendliness’, ‘FV3: Quality of technical support’ and ‘FV5: Offline consultancy’. These relationships may not provide meaningful insights *per se*, but rather support the interactive nature of the value notion as a whole. Overall, it is evident that most value attributes within the same value category (e.g. Functional Value) correlate strongly with each other, whereas also the entire value scheme seems to be strongly correlated. This notion supports CVPs nature as a cohesive multi-dimensional concept, where dimensions are interrelated. Strength and direction of the association between variables can be assessed in more detail in Appendix E, where ** means correlation is significant at 0.01 level and * refers to significance at the 0.05 level.

Spearman’s Rank Correlation Coefficient can also be used for determining the correlations between the control variables. As demonstrated in previous sections, age and nationality seem to have most significant effect as control variables. It comes into consideration to assess, whether age and nationality in our sample mean the same in terms of variations. $P = 0.000$ suggests the strength of the relationship between age and nationality, making it possible that age and nationality, in our sample, indeed correlate (see Appendix F).

4.2.4 Multivariate analysis: Kruskal-Wallis Test

In this part, value elements are compared across the groups with the Kruskal-Wallis test, also known as One-way non-parametric ANOVA. Kruskal-Wallis test, also known as Independent-Samples Kruskal-Wallis Test, is suitable when there is one independent variable (e.g. occupation) with two or more levels (e.g. six levels: student, employee, self-employed, unemployed, part-time unemployed and other). Additionally, it fits with ordinal dependent variable (Likert scales). This test is also known as One-way non-parametric ANOVA, and it is a generalized version of the Mann-Whitney U-test, as it permits a comparison of more than two groups (Lund Research Ltd., 2018). Tables are presented per control variable, where Kruskal-Wallis values, degrees of freedom (df) and Asymptotic significances (p-value), are displayed accordingly (see table 9). The significance level is 0.05.

Table 9: Multivariate value elements with Kruskal-Wallis H-test

	ECV1: Low Price	ECV2: Delivery price	FV1: Quality of the product	FV2: Websites' user-friendliness	FV3: Quality of technical support	FV4: Online consultancy	FV5: Offline consultancy	SV1: Customization possibilities	SV2: Brand (to express yourself)	EMV1: Trustworthiness of the PSS provider	EMV2: Product range	EMV3: Design/ aesthetics
Grouping Variable: Occupation * Value elements												
Kruskal-Wallis H	5.244	3.536	4.350	4.963	3.915	3.132	0.711	6.110	24.480	4.550	1.406	16.849
Asymp. Sig.	0.387	0.618	0.500	0.422	0.562	0.680	0.982	0.296	0.000	0.473	0.924	0.005
Grouping Variable: Yearly gross income * Value elements												
Kruskal-Wallis H	3.099	2.821	4.868	9.905	11.152	3.001	7.536	6.950	6.173	1.143	2.218	8.707
Asymp. Sig.	0.541	0.588	0.301	0.042	0.025	0.558	0.110	0.139	0.187	0.887	0.696	0.069
Grouping Variable: Age * Value elements												
Kruskal-Wallis H	10.224	4.792	0.598	1.378	2.492	1.633	6.353	14.920	6.830	4.595	7.422	8.766
Asymp. Sig.	0.069	0.442	0.988	0.927	0.778	0.897	0.273	0.011	0.234	0.467	0.191	0.119
Grouping Variable: Online shopping frequency * Value elements												
Kruskal-Wallis H	7.784	8.891	4.270	5.407	2.849	3.944	4.547	11.340	6.644	0.815	7.578	7.518
Asymp. Sig.	0.100	0.064	0.371	0.248	0.583	0.414	0.337	0.023	0.156	0.936	0.108	0.111

Regarding age, a Kruskal-Wallis H test showed that there was a statistically significant difference in 'SV1: Customization possibilities' scores between the age groups, Kruskal-Wallis H= 14.920, p = 0.011. Other variables are considered as the same across the age categories (p = > .05). Regarding the different occupation groups, there is significance in 'SV2: Brand' (Kruskal-Wallis H = 24.480, p = 0.000) and design (Kruskal-Wallis H = 16.849, p = 0.005). When it comes to income, significant differences in 'FV2: Websites' user-friendliness' (Kruskal-Wallis H= 9.905, p = 0.042) and 'FV3: Quality of technical support' (Kruskal-Wallis H = 11.152, p = 0.025) can be identified. Lastly, there is a statistically significant difference in

‘SV1: Customization possibilities’ scores between the groups with different shopping frequency (Kruskal-Wallis H= 11.340, p = 0.023).

Concluding the univariate, bivariate and multivariate analyses of question seven, nationality has the most significant overall effect. However, it is still contributing only to some extent with a significant difference. Significance was less supported on comparisons between groups categorized by gender, income, occupation, and age and the least when it comes to shopping frequency. When all questions are set into variable context, table 10 summarizes analysis as mentioned earlier and again shows which associations are the most significant. As some of the control variables showed associations with different value elements and questions, in the following section, the respondent’s profile of this study will be shown.

Table 10: Control variables' significance with dependent variables

	Age	Income	Occupation	Gender	Nationality	Online shopping frequency
ECV1: Low Price	.069	.541	.387	.562	.572	.100
ECV2: Delivery price	.442	.588	.618	.033	.006	.064
FV1: Quality of the product	.988	.301	.500	.030	.723	.371
FV2: Websites' user-friendliness	.927	.042	.422	.548	.441	.248
FV3: Quality of technical support	.778	.025	.562	.587	.327	.583
FV4: Online consultancy	.897	.558	.680	.264	.010	.414
FV5: Offline consultancy	.273	.110	.982	.661	.093	.337
SV1: Customization possibilities	.011	.139	.296	.201	.000	.023
SV2: Brand	.234	.187	.000	.188	.292	.156
EMV1: Trustworthiness	.467	.887	.473	.429	.932	.936
EMV2: Product range	.191	.696	.924	.232	.008	.108
EMV3: Design/aesthetics	.119	.069	.005	.096	.177	.111
Q 9: Online vs. offline consultancy	.011	.208	.480	.389.	.000	.120
Q 11: Product vs. service preference	.614	.461	.150	.870.	.297	.705

4.3 Respondent’s profile

In the previous section, associations between the independent control variables and the dependent variables investigated in this study could be identified. Results, for instance, showed that there was an association between the preference of online vs offline consultancy and age and nationality. Therefore, in the following section, the respondent’s profile of this study will be analyzed.

Starting the analysis with a description of the respondent’s profile, overall, 250 valid responses have been collected. There, regarding nationality, 134 valid responses were from participants of Finnish heritage. At the same time, 116 responses are represented by Germans which means

that Finnish covered for more than half of the respondents (53.4 %), whereas German respondents covered 46.4 %. As mentioned earlier, this compared to the total population shows that Finns are higher represented than Germans. In terms of gender, it appears that females are overrepresented in both nationalities. Females in the Finnish sample account for 96 (71.6 %) with 37 males (27.6 %), and in the German sample with 84 females (72.4 %) and 32 males (27.6 %). Compared to the overall gender ratio in both populations where a sex ratio of 0.97 males per female of people over eighteen is given in Germany (Statistisches Bundesamt, 2019), and 0.95 males per female for Finland (Statistics Finland, 2019, n.p.), female participants in both samples are disproportionally represented. This is possibly a result of the purposive snow-ball non-probability sampling and may be regarded as a further limitation of this research.

Table 11: Control Variable 'Gender'

Valid N=250	**Gender**	Female	Male	Other	Total
Finnish	Count	96	37	1	134
	Percent (%)	38.4	14.8	0.4	53.6
German	Count	84	32	0	116
	Percent (%)	33.6	12.8	0	46.4
Total	% of Total	72.0	27.6	0.4	100

In terms of age, in the German sample, the age group of 18 to 24-year old's is the highest represented age group, while the age group of 25 to 34-year-old in the Finnish sample (see table 12). Generally, a skewness towards younger age groups can be observed, while within 'older' age groups starting from 45 to 54-year old, there can be seen a limited number of participants.

Table 12: Control Variable 'Age'

Valid N=250	**Age**	18-24	25-34	35-44	45-54	55-65	65+	Total
Finnish	Count	8	81	21	12	10	2	134
	Percent (%)	3.2	32.4	8.4	4.8	4	0.8	53.6
German	Count	64	64	17	9	4	2	116
	Percent (%)	25.6	25.6	6.8	3.6	1.6	0.8	46.4
Total	% of Total	28.8	40.4	15.2	8.4	5.6	1.6	100

This skewness is also represented in occupation and yearly gross income, where the highest percentage of participants from Germany are students, followed by employees. Regarding participants from Finland, the majority are employees, followed by a lower number of students compared to the German sample. This also reflects in yearly gross income, where the majority

of Finns (30.8 %) earns between 25 000 € and 56 999€. In contrast, the majority of Germans makes less than 16 999 € (see table 13) which might be a result of the number of students participating in this study.

Table 13: Control Variable 'Yearly Gross Income'

Valid N=250	**Income**	Less than 16 999€	17 000 - 24 999€	25 000 - 56 999 €	57 000 - 99 999 €	More than 100 000 €	Total
Finnish	Count	20	20	77	15	2	134
	Percent (%)	8.0	8.0	30.8	6.0	0.8	53.6
German	Count	60	12	27	15	2	116
	Percent (%)	24.0	4.8	10.8	6.0	0.8	46.4
Total	% of Total	32.0	12.8	41.6	12.0	1.6	100

Table 14: Control Variable 'Present Occupation'

Valid N=250	**Present Occupation**	Student	Employee	Self-employed	Unemployed	Part-time unemployed	Other	Total
Finnish	Count	17	86	5	6	13	7	134
	Percent (%)	6.8	34.4	2.0	2.4	5.2	2.8	53.4
German	Count	55	43	5	2	6	5	116
	Percent (%)	22.0	17.2	2.0	0.8	2.4	2.0	46.4
Total	% of Total	28.8	51.6	4.0	3.2	7.6	4.8	100

Regarding the last control variable of the questionnaire, namely 'online shopping frequency', the data seems to be skewed towards a higher online shopping frequency for Germans compared to Finns. There, for instance, the number of German respondents shopping once or less than once a year is lower than for Finns (see table 15). Thus, the German participants of this sample seem to buy online more frequently than Finns. To conclude, skewness could be detected in the different control variables, which could influence the outcome of this study. Therefore, in later sections, the impact of these on dependent variables will be tested.

Table 15: Control Variable 'Online Shopping Frequency'

Valid N=250	**Frequency**	Once a week or more	Every 2 weeks	Once a month	A few times a year	One or less than once a year	Total
Finnish	Count	5	20	50	50	9	134
	Percent (%)	2.0	8.0	20.0	20.0	3.6	53.6
German	Count	16	32	40	27	1	116
	Percent (%)	6.4	12.8	16.0	10.8	0.4	46.4
Total	% of Total	8.4	20.8	36.0	30.8	4.0	100

4.4 Hypothesis Testing Results

Having conducted different analyses in previous section, ultimately, it needs to be determined if the in chapter two developed hypotheses can be rejected or not. After having analyzed descriptive data of the sample and analyzed correlations, as well as determining factors for the

different value elements, the respondent's profile has been described. Referring back to the research aim, which was to investigate whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context, the different hypotheses will be discussed based on the foregoing analysis.

4.4.1 Hypothesis 1

Hypothesis 1 (H_1): *In a product-oriented PSS, customers perceive the ownership of the product as more valuable than the service.*

Question eleven addressed Hypothesis 1 (H_1) where participants were asked if they would purchase a PO PSS primarily because of the service or the product. As having stated frequencies and percentages of the responses in the descriptive statistics in section 4.1, 77.2 % of all participants (N=250) would purchase a PO PSS primarily because of the product rather than because of the service component. On the other hand, in our sample, 22.8 % stated they would mainly purchase a PSS because of the service component. Given that a bit less than one quarter prefers the service component, it would have been interesting to know which type of customers prefers services over products.

However, having analyzed potential associations between the six control variables and service vs product preferences, results of all Chi-Square tests showed that there was no significant relationship, meaning that none of the control variables had an impact on the results. Thus, to explain this pattern, more control variables would have been needed to explain these variations. Concludingly, H_1, stating that *in a product-oriented PSS, customers perceive the ownership of the product as more valuable than the service,* cannot be rejected as more than three-quarters of our sample extracts more value from the product dimension than the value dimension.

4.4.2 Hypothesis 2

Coming to Hypothesis 2 (H_2), as stated below, question nine served as a basis of analysis.

Hypothesis 2 (H_2): *In a product-oriented PSS, customers prefer offline information flow with the provider over online information flow.*

Question nine interrogated the participants that if they had to choose between online consultancy (consultancy on a website via a chat) and offline consultancy (e.g. a person coming to their place to assist them measuring or choosing a suitable product), which one they would prefer. There, they only were allowed to choose one option. Having tested for potential associations between the six control variables and preference utilizing a Pearson's Chi-Square Test method, results showed that *online vs offline consultancy* preference was dependent on the variables *age* ($p = 0.01$) and *nationality* ($p = 0.000$). Within nationalities, the majority with 64.1 % of Finns preferred online consultancy over offline consultancy, while of Germans, the majority with 63.8 % preferred offline consultancy. Therefore, setting Hypothesis 2 into the context of nationality, it cannot be rejected for the German sample and but rejected for the Finnish sample considering more than 50 % of the participants preferred online consultancy (see table 16). Regarding age, also patterns could be identified, where the main difference was in the age group of 25-34, where 29.6 % of this study's participants preferred online consultancy and 10.8 % offline consultancy in this age group (see table 17). Having analyzed age and gender with a Spearman's Rho correlation test, it turned out that these two variables correlate. This notion might show that age and nationality mean the same thing in our study, as there was a higher proportion of German participants in the age group of 18 to 24-year olds and a higher proportion of Finns in the age group of 25 to 34-year olds.

Table 16: Online vs Offline consultancy with control variable 'Nationality'

Valid N=250		Finnish	German	Total
Online Consultancy	Count	100	56	156
	Percent (%)	64.1	35.9	100
	Percent (%) of Total	40.0	22.4	62.2
Offline Consultancy	Count	34	60	94
	Percent (%)	36.2	63.8	100
	Percent (%) of Total	13.6	24.0	37.6

Table 17: Online vs Offline consultancy with control variable 'Age'

Valid N=250	**Age**	18-24	25-34	35-44	45-54	55-65	65+	Total
Online Consultancy	Count	37	74	20	11	12	2	156
	Percent (%)	23.7	47.4	12.8	7.1	7.7	1.3	100
	Percent (%) of Total	14.8	29.6	8.0	4.4	4.8	0.8	62.4
Offline Consultancy	Count	35	27	18	10	2	2	94
	Percent (%)	37.2	28.7	19.1	10.6	2.1	2.1	100
	Percent (%) of Total	14.0	10.8	7.2	4.0	0.8	0.8	37.6

4.4.3 Hypothesis 3

Hypothesis 3 (H_3): *The customer value dimension 'Functional Value' applies in a product-oriented PSS.*

Regarding Hypothesis 3, 'FV1: Quality of the product' was rated as very important with the highest possible score of five, while both 'FV2: Websites' user-friendliness' and 'FV3: Quality of technical support' were rated as important. 'FV4: Online consultancy' and 'FV5: Offline consultancy' have both been rated as 'neutral' with a median of three. Moreover, question eight, where customers ranked the top five value elements, showed 'FV1: Quality of the product' was placed as number one and FV2: Website's user-friendliness as number four, showing that two FV elements are within the top five most important value elements of the customers of this study's sample. As three out of five Functional Value elements have been rated as four or higher, meaning as important or very important, Hypothesis 3 cannot be rejected. In this context, gender seemed to have an influence on 'FV1: Quality of the product' and Income on 'FV2: Websites' user-friendliness' and 'FV3: Quality of technical support'. As mentioned earlier, nationality showed an association with 'FV4: Online consultancy'.

Table 18: Medians of 'Functional Value'

N=250	Value attribute	Median
Functional value (FV)	FV1: Quality of the product	5
	FV2: Websites' user-friendliness	4
	FV3: Quality of technical support	4
	FV4: Online consultancy	3
	FV5: Offline consultancy	3

4.4.4 Hypothesis 4

Hypothesis 4 (H_4): *The customer value dimension 'Economic Value' applies in a product-oriented PSS.*

Here, regarding the median of 'ECV1: Low Price' was rated as three, meaning that the opinion was neutral, whereas for 'ECV2: Delivery Price', the median was four, showing that it is important to customers. As one out of the two Economic Value elements was rated as important with the other one being perceived as neutral, Hypothesis 4 cannot be rejected. Here, an association between 'ECV2: Delivery price' and gender and nationality could be detected.

Table 19: Medians of 'Economic Value'

N=250	Value attribute	Median
Economic Value (ECV)	ECV1: Low Price	3
	ECV2: Delivery price	4

4.4.5 Hypothesis 5

Hypothesis 5 (H_5): *The customer value dimension 'Emotional Value' applies in a product-oriented PSS.*

In the value dimension of Emotional Value, all three value elements have been rated as important with an equal median of four. In line with these results, in question eight the ranking of the value elements indicated that all three Emotional Value elements are listed in the top five of most important value elements in the context of purchasing a PSS. This consistency within question seven and eight further support for not rejecting Hypothesis 5, in which nationality seemed to have an impact on the rating of 'EMV2: Product range' and Present occupation on 'EMV3: Design/aesthetics'.

Table 20: Medians of 'Emotional Value'

N=250	Value attribute	Median
Emotional value (EMV)	EMV1: Trustworthiness of the PSS provider	4
	EMV2: Product range	4
	EMV3: Design/aesthetics	4

4.4.6 Hypothesis 6

Hypothesis 6 (H_6): *The customer value dimension 'Social Value' applies in a product-oriented PSS.*

Table 21: Medians of 'Social Value'

N=250	Value attribute	Median
Social value (SV)	SV1: Customization possibilities	4
	SV2: Brand (to express yourself)	2

'SV1: Customization possibilities' have been rated as important, whereas 'SV2: Brand' was rated as unimportant, with these value elements having the lowest overall median of all value elements tested in this research. As one of the two value elements in this category has been

rated four, with the other one having been rated as two, it is difficult to either reject or not reject Hypothesis 6. However, one value element within Social Value was rated important, which is why we decided not to reject H_6. For 'SV2: Brand', there could Present Occupation was significant, meaning that there is an association between them. For 'SV1: Customization possibilities', the variables age, nationality, and online shopping frequency were significant.

4.4.7 Hypothesis 7

Hypothesis 7 (H_7): *The customer value dimensions, 'Functional Value', 'Economic Value', 'Emotional Value', and 'Social Value' apply in a PSS.*

The analysis above showed that some value elements showed higher medians than others. Overall, eight out of twelve value elements had a median of four or higher, meaning that they were rated as important or very important by the customers of our sample. Generally, in each importance category (very unimportant, unimportant, neutral, important, very important), values were represented. Within the different value categories, Emotional Value and Functional Value reached higher median values than Economic Value and Social Value. Also, this was reflected in the ranking question of the value elements, where only Functional Value and Emotional Value elements have been rated as the top five value elements. Given, however, that in all four value element categories minimum one value element was rated as important or higher, H_7 cannot be rejected.

5 Discussion and Conclusion

This research has been based on previous research in the area of PSS and CVP, where a lack of existing literature regarding CVP's in PSS was found. Numerous qualitative studies have been undertaken in the field of PSS, where the number of quantitative studies yet, remains scarce (Li et al. 2020). Attempts have been made to close the research gap of identifying what customers value in PSS, where also a tool to build CVP in PSS has been developed (Fernandes et al. 2018). Basing this research on an exemplary PO PSS provider, a survey has been operationalized. Constituting of several questions to identify customer value in PSS, a survey was to determine whether already generally established value elements of products offerings are also applicable in a hybrid offering context of PO PSS. Hence, several hypotheses were developed based on existing literature where none of them was rejected.

5.1 Discussion

Having analyzed the data in several steps, in the following, the results will be further discussed in the order of the hypotheses. Here, we would like to remind the reader of the low Cronbach's Alpha value and the general validity and methodology limitations which means that conclusions need to be treated with caution. Moreover, considering that the Cronbach's Alpha value was the highest for all value elements together, conclusions should be based on the value element construct as a whole, rather than for each value item.

5.1.1 Discussion of Hypothesis 1

In the following, each hypothesis' result is discussed. Hypothesis one could not be rejected, stating that in PO PSS, customers perceive the ownership of the product as more valuable than the service. However, 22.8 % of all participants preferred the service component of the PSS package over the product. This high percentage of customers preferring the product dimension might be explained with the type of PSS that is studied in this research. Referring back to the literature review, and PO PSS as classified by Tukker (2004), in PO PSS the value lies mainly in the product content contrarily to result oriented PSS, where the focus lies on the service component as no pre-determined product is included (Tukker, 2004). Regarding these 22.8 % of customers preferring the service dimension in this study, no pattern or customer profile could be identified, as no specific control variable showed significance. Therefore, more control variables would have been needed to be collected in to identify the specific customer type of

preference. Although question eleven delivered a clear result to confirm Hypothesis one, it maybe cannot be seen as a standalone. In question ten, as shown in chapter 4.1, the majority of participants (55.6 %) rated the level of importance of the PSS provider offering product-related services as important or very important with an overall median of four. According to Tukker and Tischner (2006, p. 1553), in contrast to traditional product concepts, PSS focus "on the final need, demand, or function that needs to be fulfilled". Hence, these two elements may not be separated but, in consonance with the concept of PSS, be only observed as a package. However, this phenomenon could neither be explained by the variations nor by the control variables with the data collected.

5.1.2 Discussion of Hypothesis 2

Regarding the second hypothesis, stating that in a PO PSS, customers valued offline information flow with the provider over online information flow, two influencing control variables could be identified: age and nationality. There, the majority of German participants preferred offline consultancy, whereas the majority of Finns preferred online consultancy. This result might be explained with studies showing that regarding digital readiness in multiple areas, Germany lags behind compared to other EU (Euromonitor, 2019), and scepticism towards online payment and data sharing prevails (Carrel, 2018; Handelsblatt, 2019). Finland on the other hand, for example, is a European leader in regard to digital governments (Finland Toolbox, 2019) and "according to the European Commission, Finland is the third most advanced European country in the digitalization of businesses" (Microsoft & PwC, 2017, p. 6). Given that the business model of the chosen case company example of this study is an e-business, offering online consultancy, and Germans' rather low digital readiness might explain these discrepancies between the nationalities. Also, age showed significance in this hypothesis, which might be explained by different aged people having distinct preferences when it comes to perceived convenience of online shopping, where younger generations consider online shopping more convenient (Sorce, Perotti & Stanley, 2005). There have been different viewpoints regarding product and service preference in literature. Barquet et al. (2013) stated that in PSS business models, the firm would rather provide customer value by the service instead of the product. This has been different for the customers of our study. Shet and Uslay (2007) had a more different viewpoint of this, who asserted that customers might extract value from owning the product, but alternatively, also not owning the product but just utilizing it might create value to them. Interestingly, our Spearman's Rho correlation test revealed that age

and nationality correlated. This might explain that different age groups relate with different nationalities (where German participants were younger than Finns in our sample).

5.1.3 Discussion of Hypothesis 3

The third hypothesis stated that the customer value dimension Functional Value would apply in a PO PSS. This hypothesis could not be rejected as three out of five Functional Value elements had an overall median of four or more, showing that it was important or very important to the customers of this study. The Functional Value elements 'FV4: Online consultancy' and 'FV5: Offline consultancy' both were rated as neutral when it comes to the importance of these. This might be explained with the variations in question nine and the different preferences where variations within nationality and age could be identified as stated in the results of Hypothesis 2. 'FV1: Quality of the product' was the highest rated value element overall. This result is consistent with a previous study, that was mentioned in the literature review of this study. Almquist, Senior and Bloch (2016, n.p.), found that "across all the industries we studied, perceived quality affects customer advocacy more than any other element". They further add that "Products and services must attain a certain minimum level, and no other elements can make up for a significant shortfall on this one" (Almquist, Senior & Bloch, 2016, n.p.).

Our results also showed that 'FV3: Quality of technical support' was rated as important. In Appendix E, it is shown that with a p-value of 0.000, also these two elements had a significant correlation (see Appendix F). This correlation may be explained with several studies, which demonstrate that quality of product and customer service closely related as high quality reduces customer service demands as fewer product errors occur (Takeuchi & Quelch, 1983). This commitment of firm's management towards high quality is called Total Quality Management (TQM) and is seen as an important cost driver as it requires high investments in low defect rates, but on the other hand, reduces costs connected to product failure (Shank & Govindarajan, 1993). Generally, the overall tendency of Functional Value elements showing higher medians compared to the other value element (social and Economic Value) categories was confirmed in question eight. There, out of the top five most important rated value elements, three were Functional Value elements. This demonstrates consistency within the results. Lastly, regarding Hypothesis 3, an association between gender and 'FV1: Quality of the Product' as well as, income and 'FV2: Websites' user-friendliness' and 'FV3: Quality of technical support' could

be noted. These patterns, however, cannot be explained with the available information of this study. More control variables would have been necessary, as well as a larger sample and more extended timeframe.

5.1.4 Discussion of Hypothesis 4

In hypothesis four, the applicability of the value dimension Economic Value in a PO PSS was tested, where this study's participants rated 'ECV1: Low Price' as neutral. 'ECV2: Delivery Price' contrarily, was important to the participants. This result led to not rejecting Hypothesis 4. This result was surprising as "when customers evaluate a product or service, they weigh its perceived value against the asking price" (Almquist, Senior & Bloch, 2016, n.p.). This, as discussed earlier in the literature review, also applies to CPV, where firms need to define customer's value regarding offered benefits minus customer's perceived costs (Barnes, Blake & Pinder, 2009). Therefore, it may be questioned if 'ECV1: Low Price' was really measuring perceived costs in our study. Another possible explanation would be that the perception of price as a value element might differ in PSS compared to traditional business models. Also, it was surprising that 'ECV1: Low Price' was rated neutral, while 'ECV2: Delivery Price' was rated as important. Several studied found that free shipping represents a high priority in online purchases (Amware Fulfillment, 2018; Holmes, 2016; Kukar-Kinney & Close Scheinbaum, 2009). In this hypothesis, an association between 'ECV2: Delivery price' and gender and nationality could be detected.

5.1.5 Discussion of Hypothesis 5

In the fifth hypothesis, it has been stated that the customer value dimension Emotional Value applies in a PO PSS. The findings of our study showed that all three Emotional Value elements, which include 'EMV1: Trustworthiness of the PSS provider', 'EMV2: Product range', and 'EMV3: Design/aesthetics' have been rated as equally important. Therefore, H_5 could not be rejected. This was further supported by the rank order question where all these three Emotional Value elements appeared in the top five rankings. Hence, further evidence for not rejecting H_5 was provided. In the category of Emotional Value, nationality seemed to have an impact on the rating of 'EMV2: Product range' and Present occupation on 'EMV3: Design/aesthetics'. Here again, more control variables would have needed to be collected to gain more insights about this pattern.

5.1.6 Discussion of Hypothesis 6

The sixth hypothesis uttered that the customer value dimension Social Value would apply in a PO PSS. There, 'SV1: Customization possibilities' was ranked as important, whereas customers of this study perceived 'SV2: Brand' as unimportant. This result made it difficult to either reject or not reject Hypothesis 6. The 'SV2: Brand' received the lowest importance of all value elements in this study. An association could be determined between Present occupation and 'SV2: Brand', which might explain for example, students perceive brand as differently important than employees, for instance. However, it cannot be convincingly argued for a cause-and-effect relationship due to the nature of this study. Another reason for the 'SV2: Brand' being rated very low in our study might be the nature of the offering of the exemplary firm used in this thesis. Regarding 'SV1: Customization possibilities', the variables age, nationality and online shopping frequency showed significance. As mentioned earlier, the significance could be identified between age and nationality, which is why significance in age and nationality variables might actually have meant the same in our sample. Also, in the context of H_6, it is noteworthy that regarding reliability, the Cronbach's Alpha value for Social Value was .299, meaning the lowest Cronbach's Alpha value of all value element categories. This might be explained by the low number of variables for this item, which is connected to the risk of getting a low Cronbach's Alpha value. Thus, these results for Social Value ultimately, might not be reliable.

5.1.7 Discussion of Hypothesis 7

The seventh and simultaneously last hypothesis stated that all four value element categories are applicable in a PO PSS context. Based on the above analysis, it can be stated that some value elements showed higher medians than others. Overall, eight out of twelve value elements had a median of four or higher, meaning that they have been rated as important or very important according to our study. There, two categories, meaning Emotional and Functional Value overall, were rated more important than Economic and Social Value. This tendency was supported by the rank order question that indicated further consistency, where only functional and Emotional Value elements appeared in the top five value elements ranking. As in all four value element categories, at least one value element was important to this study's participants, the seventh hypothesis was not rejected. Hence, it can be concluded that traditional value

elements in regard to CVP might function in a slightly different way compared to conventional CVP's according to our study's findings.

Eight value elements seem to persevere in our study and seem relevant in this context of the exemplary firm (PO PSS manufacturing e-business). These include 'FV1: Quality of the product', 'FV2: Websites' user-friendliness', 'FV3: Quality of technical support', 'EMV1: Trustworthiness of the PSS provider', 'EMV2: Product range', 'EMV3: Design/aesthetics', 'SV1: Customization possibilities', and 'ECV2: Delivery price'. 'FV4: Online consultancy', 'FV5: Offline consultancy', 'ECV1: Low Price' and 'SV2: Brand', seem to only survive for some of the customers (e.g. 'SV1: Customization possibilities' scored differed only between the age groups). Therefore, like in general marketing settings, when forming a CVP in a PSS, decisions need to be based on which customers/market segment the firm aims to target. There, it may not work to offer the same dimensions to all customer segments. Hence, firms in general, and PO PSS providers in this case, need to identify of which customers their main revenue streams come from to target thesis in the most cost-efficient way strategically. The Value element 'FV1: Quality of the product' in our study was particularly important, with a median of five.

Also, the Spearman's Rho correlation test showed that there were correlations within the different value elements showing that they are related. Hence, in our study, the different value elements should be seen as a conglomerate construct rather than individually. This was further supported by a Cronbach's Alpha test, where the highest reliability score was for the construct as a whole.

This is why the results for the individual value element categories must be approached with caution since the reliability assessment with Cronbach's alpha showed that instrument validity was poor for some value elements, which may diminish the generalizability. Lastly, this study's results should be framed in the context of the respondent's profile, where there was skewness in certain variables. This includes for example that the participants of this study mostly were females (72 %), aged between 18 and 34 (69.2 %), where half of them were employees (51.6 %) and almost one third (28.8 %) students. Also, skewness within income might have influenced results, where one third (32.0 %) of the sample's participants earned less than 16 999€, with 12.8 % earning between 10 000 and 24 999€, while the largest group of this sample (with 41.6 %) earned between 25 000 and 56 999 €. The residual 13.6 % earned more than 57

000 €. Regarding nationality, 53.6 % were of Finnish heritage, while a bit fewer people (46.4 %) were Germans. Shopping Frequency was mainly centered in the middle, with more than a third (36 %) shopping online once a month, 30.8 % a few times a year and 20.8 % every two weeks. A few participants shop online once a week or more or once or less than once a year. Therefore, framing the population of this study according to the respondent's profile, it can only be said, considering reliability and other methodological limitations of this study, that this type of customers is likely to act as the results of our study showed in our findings.

5.2 Limitations connected to this study

There were several limitations connected to the chosen research methodology and the scope of this study, meaning that this research project was constrained by time since it was carried as a two month-degree project. Among others, these limitations included the cross-sectional nature of the data collection, where a data collection period of nine days was short. This resulted in a total number of 134 survey participants for Finland and 116 for Germany, which could be regarded as a relatively small sample associated with high skewness in certain control variables, whereas a larger sample would have increased accuracy (Marshall, 1997). Thus, a longer period of data collection could have yielded a larger sample size. Furthermore, about the total population, participants of Finnish heritage were overrepresented compared to German participants in proportion to their population.

Also, a limitation of this research connected to the timeframe is that in cross-sectional studies a challenge is "how to isolate the phenomena under study from all other factors that could influence the correlation", where additionally "cross-sectional studies do not explain why a correlation exists; only that it does or does not exist" (Collis & Hussey, 2014, p. 63). Therefore, "no firm conclusion can be reached about cause-and-effect relationships unless groups being compared differ only on those variables" (Easterby-Smith, Thorpe & Jackson, 2015, p. 71). Hence, it could only be demonstrated what observed patterns exist but not why (Easterby-Smith, Thorpe & Jackson, 2015). As groups were not compared based on these isolated variables, this threatened our study and its validity as well as reliability. As a consequence of lacking time and resources, non-probability sampling has been applied, whereas probability sampling generally is more reliable (Saunders, Lewis & Thornhill, 2015). Due to non-probability sampling, utilizing an online survey tool, not every one of the population had access to the survey. Related to the purposive snow-balling sampling technology, limitations can be

identified regarding national heritage as also other nationals had access to the survey, although question five aimed to restrict participation to the chosen sample.

Furthermore, the question about the participants yearly gross income may be regarded as sensitive despite the survey's anonymity, which can result in under or overreporting (potential bias) and cannot be circumvented (Cohen et al. 2018). As mentioned in the methodology chapter, the number of value elements was not equal for each value element category. This was a result of them having been selected based on existing literature and adapted to the exemplary firm. The high number of Functional Value elements was a result of the applicability to the exemplary firm. This might be regarded as a threat to validity and reliability (where especially in the 'Social Value' category, reliability was low). However, the value construct was kept as studies showed that there generally exist more Functional Value elements than Emotional Value elements (Almquist, Senior & Bloch, 2016). Hence, if an equal number of items for each value category would have been chosen, value categories with a general low number of items would have been proportionally overrepresented compared to value categories with a high number of items, such as Functional Value.

5.3 Conclusion

This research has been based on previous research in the field of PSS and CVP, where a lack of existing literature regarding CVPs in PSS was found. Therefore, relevant literature to the concepts of PSS, CVP and the combination of both was reviewed. Based on the secondary findings in the literature, a framework with hypotheses was developed. In chapter three, methodological choices of this study to test these hypotheses were discussed. Chapter four provided the analysis of the collected quantitative data, which led to the discussion of findings at the beginning of chapter five. To sum up the study, in the following drawn conclusions will be discussed.

5.3.1 Research Purpose and aim

The research purpose of this study was to investigate whether or not firms with PO PSS business models can build their CVP based on existing CVP assumptions. Therefore, this study's findings were supposed to aid firms in their decision-making when building a CVP, which normally is the first step in the value chain, providing the basis for further steps and their

connected resource allocation (Adrodegari, Saccani & Kowalkowski, 2016). There, the relevance of this research and the research problem was the fact that the themes of CVP in the relatively new business model 'PSS' have hardly been combined in research. Based on the literature, theories and frameworks developed on the field are scarce and ineffective to function as a comprehensive concept base. Literature, however, agrees on the fact that the customer is the central dimension in a PSS (Sakao, Song & Matschewsky, 2017) as a PSS creates value for the customer, regarding him as the central dimension in the business model. Nevertheless, customer's perspectives remained understudied as existing theories and frameworks predominately focus on the PSS provider (Schmidt et al. 2015) which is why research in this area was demanded based on several studies (e.g. Haber & Fargnoli, 2019; Da Costa Fernandes, Pigosso, McAloone & Rozenfeld, 2020; Ding, Liu & Lang, 2019). A challenge regarding CVP in PSS was that PSS providers need to address both tangible characteristics of products and intangible characteristics of services (De Castro Rodrigues, Nappi & Rozenfeld, 2014). Given that there are tools to build CVP and academic frameworks in this area, the stated research aim was:

To investigate whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context.

Having developed a theoretical framework with underlying hypotheses in the literature review, these hypotheses were tested in the analysis. Here, all hypotheses were not rejected as minimum value element in each value category was rated as important. There, our descriptive data initially demonstrated at the beginning of the analysis, that online consultancy was preferred over offline consultancy. After conducting different bivariate and multivariate analyses, it could be shown that for this example, and some value elements, patterns within the control variables could be detected. Findings further showed that in our study the product component was perceived as more valuable than the service component by most of the customers. After further analysis, it was, however, also shown that the PSS provider offering product-related services also were important to customers. Hence, it was concluded that the PSS offering should be rather seen as a package where the product and service component should not be regarded as separate.

Regarding the value elements, eight elements seemed to be applicable to the context of this study, whereas four were only relevant for a few customers. Quality of the product, with the

highest overall ranked importance, Websites' user-friendliness, Quality of technical support, the Trustworthiness of the PSS provider, Product range, Design/aesthetics, Customization possibilities, and the Delivery price seemed to be applicable. Online consultancy, Offline consultancy, low price and brand, however, were regarded as neutrally important or not important at all. Therefore, it was recommended to consider the type of customers that want to be targeted when forming a CVP in a PSS. Responding to the stated research aim, no clear statement can be made as to *whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context.* Based on our findings, it can only be concluded that the four value element categories (functional, emotional, economic and social value) all included at least one item that was considered as important. Hence, it can only be stated that not all the same value dimensions might be applicable to all customers in an e-business PSS context. Further research would be needed for a more distinct conclusion.

5.3.2 Practical Implications

Having based this research on an exemplary firm to better respond to the research aim, some practical insights could be gained. Therefore, as a practical recommendation, PO PSS providers, based on our study, need to consider which type of customers they are targeting when building a CVP, as different customer types have different preferences. As stated in the literature, a firm's strategy grounds on a differentiated CVP (Kaplan & Norton, 2001). As we do not have the relevant information to understand main customer groups of this thesis' exemplary firm and other PSS providers in general, firms need to identify their main customer segment based on revenue streams and adapt their CVP to this segment, where it might not be possible to target the different segments with the same CVP accordingly. Our study may only give them insight about this study's respondents profile for whom the certain value elements were more relevant than others.

5.3.3 Theoretical Implications and Further Research

Despite compelling literature in strategy contexts and widespread use in business language, the concepts of CVP and PPS remain obscure, especially in academic contexts. Explicitly, we aimed to address the limitations of previous studies that mainly have focused on B2B contexts, qualitative methods, and firms' point of views. Hence, the academic relevance of this research stemmed from theoretical contribution to the aforementioned research gaps. In this research, challenges have been faced due to the limited literature in the field. Given that there is no

established value element item list in literature, we faced similar challenges as previous researchers with the operationalization of these. Hence, further research is essential and should focus on establishing a more valid value items list, given that they provide the foundation of any research in this area. Therefore, our theoretical recommendation is that research should focus on investigating value elements to also increase the reliability of further studies. Also, more control variables should be collected to explain patterns and associations more specifically between value elements and consumer behavior. In our study, no firm conclusions about cause-and-effect relationships could be drawn as a result of the limitations connected to this research. Hence, we recommend further research to overcome this by conducting longitudinal studies on different groups applying large probability sampling. This would enable researchers to collect more precise and representative results. Then, generalizability would be higher and not constrained by the underrepresentation of certain age groups, genders or nationalities.

Responding to the stated research aim, no clear statement can be made as to *whether or not customer value elements based on existing theories and assumptions are applicable in an e-business PSS context.* Based on our findings, it can only be concluded that the four value element categories (functional, emotional, economic and social value) all included at least one item that was considered as important. Hence, it can only be stated that not all the same value dimensions might be applicable to all customers in an e-business PSS context. Further research would be needed for a more distinct conclusion. Although based on our study it could not be stated whether or not customer value elements based on existing theories and assumptions are applicable in an e-business context, it still provided some tendency and gave some insights. We hope that this strategically important but neglected research area will attract further attention by researchers in the future.

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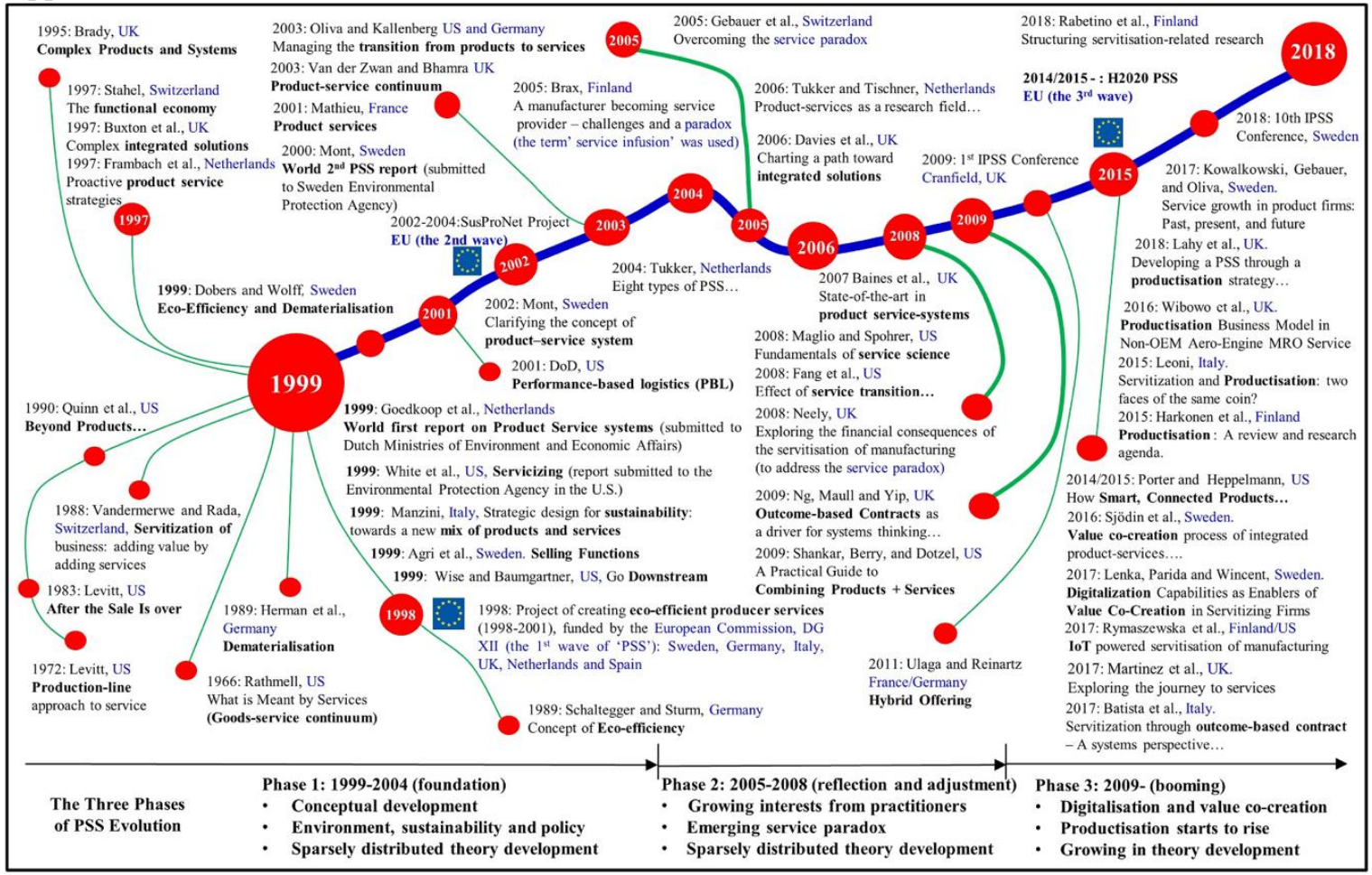
Appendices

Appendix A: The Evolution of PSS Research



Source: Li et al. (2020, p. 5)

Appendix B: Questionnaire

I am over 18 years old and would like to participate in the survey

A: Yes
B: No

1. How old are you?
    - 18-24
    - 25-34
    - 35-44
    - 45-54
    - 55-64
    - 65+

2. What is your yearly gross income/money you get (including everything)?
    - Less than 16 999€
    - 17 000 – 24 999€
    - 25 000 – 56 999€
    - 57 000 – 99 999€
    - More than 100 000€

3. What is your present occupation?
    - Student/Apprentice
    - Employee
    - Self-employed
    - Unemployed
    - Part-time unemployed
    - Other

4. What is your gender?
    - Female
    - Male
    - Other

5. What is your nationality?
    - Finnish
    - German
    - Other

6. How often do you shop online?
    - Once a week or more
    - Every 2 weeks
    - Once a month
    - A few times a year
    - One or less than once a year

Please read the following scenario for a better understanding of the questionnaire:

Imagine you would like to order a made-to-measure blinds or curtains for your windows, and you find a website that allows you to enter chosen measurements and choose between different colors, fabrics, and brands. Additionally, you can book a consultancy visit from the company, that assists you in measuring and choosing the most suitable product. After you have chosen specific product, the company will manufacture your order and eventually, delivers it to you. Upon request, consultant installs the blinds for you. Please keep this

example in mind during filling out the questionnaire. The case we just described is an example for a Product-Service System (short PSS) and will be referred to as a „PSS" in the following.

7. When purchasing a PSS as described above, how important are the following factors for you? (Likert-Scale → very unimportant – unimportant – neutral – important – very important)

    - Low price
    - Delivery Price
    - Quality of the product
    - Website's user-friendliness
    - Quality of technical support (post purchase, e.g. something is broken)
    - Online consultancy (e.g. consultancy on the website via a chat or similar channels)
    - Offline consultancy (e.g. a person coming to your place to assist you measuring or choosing a suitable product)
    - Customization possibilities
    - Brand (to express yourself)
    - Trustworthiness of the PSS provider (e.g. through positive reviews, certificates)
    - Product range (variety in options)
    - Design/aesthetics

8. Please rank at least 5 key attributes from the list below according to how important they are for you when you purchase a PSS. (1 = most important)

- Low price
- Delivery price
- Quality of the product
- Websites' user-friendliness
- Quality of technical support (post purchase, e.g. if something is broken)
- Online consultancy (e.g. consultancy on website via a chat
- Offline consultancy (e.g. a consultant coming to your place to assist you measuring or choosing a suitable product)
- Customization possibilities
- Brand (to express yourself)
- Trustworthiness of the provider (e.g. through positive reviews or certificates)
- Product range (variety in options)
- Design/aesthetics

9. If you had to choose between online (e.g. consultancy on website via a chat) and offline consultancy (e.g. a person coming to your place to assist you measuring or choosing a suitable product). Which one would you prefer?
    - Online consultancy
    - Offline consultancy

10. How important is it for you that the company/PSS provider offers product-related services (e.g. measurement, maintenance, and installation)?

- very unimportant
- unimportant
- neutral
- important
- very important

11. Generally, in a PSS would you purchase a manufactured good primarily because the service or because of the product?

- The product
- The service

Appendix C: Survey item reasoning

Question	Topic	Relation to literature
7. When purchasing a PSS, how important are the following factors for you?	Value for the customer	"Value for the customer" as an element in CVP in PSS (Adrodegari, Saccani & Kowalkowski, 2016, p. 519)
ECV1: Low Price	Economic value	In economic value, "price is the decision factor" (Rintamäki, Kuusela & Mitronen, 2007); "low cost" as variable in Ding, Liu & Yang, 2019, p. 10)
ECV2: Delivery price		"Price" as economic value (Payne et al., 2020)
FV1: Quality of the product	Functional value	"Quality" as functional value (Almquist, Senior & Bloch, 2016, n.p.)
FV2: Websites' user-friendliness		"User-friendly quality" in websites (Hasan & Abuelrub, 2011, p. 16)
FV3: Quality of technical support (post purchase, e.g. if something is broken)		SCh 5 "quality of technical support" (Haber & Fargnoli, 2019, p. 266)
FV4: Online consultancy (e.g. consultancy on website via a chat or similar channels)		Value in e-business, personalized professional pre-sale guidance (Ding, Liu & Yang, 2019, p. 10)
FV5: Offline consultancy (e.g. a person coming to your place to assist you measuring or chosing a suitable product)		
SV1: Customization possibilities	Social value	More customized supply as a core value in PSSs (Barquet et al., 2013; Mont, 2002)
SV2: Brand (to express yourself)		"Brand" as social value (Payne et al. 2020)
EMV1: Trustworthiness of the PSS provider (e.g. through postive reviews, certificates)	Emotional value	Emotional value (Payne et al, 2020; Rintamäki et al 2007); "Trustworthy" as key word in PSS value proposition (Ericson, Müller, Larsson & Stark, 2009, p. 6)
EMV2: Product range (variety in options)		"Variety" as functional value (Almquist, Senior & Bloch, 2016, n.p.)
EMV3: Design/aesthetics		"design/aesthetics" as emotional value (Almquist, Senior & Bloch, 2016, n.p.)
8. Please rank the the five most important attributes out of the list above according to your importance when purchasing a PSS.	Value for the customer	Determination of which kind of value is most important to customers in a PSS
9. If you had to choose between online (e.g. consultancy on website via a chat) and offline consultancy (e.g. a person coming to your place to assist you measuring or choosing a suitable product). Which one would you prefer?	Value for the customer in e-business context	Value for the customer in e-business context, value towards digitalization or traditional services
10. How important is it for you that the company/PSS provider offers product-related services (e.g. measurement, maintenance and installation)?	Value for the customer (product vs service)	
11. Generally, in a PSS would you purchase a manufactured good primarily because the service or because of the product?		Conflict in literature: Value through product or service (Barquet et al. 2013; Adrodegari, Saccani & Kowalkowski, 2016)
1. **Age:** How old are you?	Demographics/control variables	
2. **Yearly Gross Income:** What is your yearly gross income/money you get		
3. **Present Occupation:** What is your present occupation?		
4. **Gender:** What is your gender?		
5. **Nationality:** What is your nationality?		
6. **Online Shopping Frequency:** How often do you shop online?	E-business context/control variable	Frequency for consumer behaviour analysis in e-business context, variable based on Yang & Peterson (2004)

Appendix D: Frequencies of Likert Scale Questions (Question 7 & Question 10)

N=250	Very unimportant (1)		Unimportant (2)		Neutral (3)		Important (4)		Very important (5)	
	Count	Percentage %	Count	Percentage %	Count	Percentage %	Count	Percentage %	Count	Percentage %
ECV1: Low Price	4	1.60	39	15.60	107	42.80	86	34.40	14	5.60
ECV2: Delivery price	7	2.80	44	17.60	72	28.80	101	40.40	26	10.40
FV1: Quality of the product	3	1.20	1	0.40	9	3.60	70	28.00	167	66.80
FV2: Websites' user-friendliness	2	0.80	9	3.60	34	13.60	91	36.40	114	45.60
FV3: Quality of technical support	1	0.40	6	2.40	29	11.60	101	40.40	113	45.20
FV4: Online consultancy	12	4.80	54	21.60	78	31.20	76	30.40	30	12.00
FV5: Offline consultancy	26	10.40	48	19.20	75	30.00	75	30.00	26	10.40
SV1: Customization possibilities	5	2.00	22	8.80	59	23.60	101	40.40	63	25.20
SV2: Brand (to express yourself)	42	16.80	84	33.60	76	30.40	41	16.40	7	2.80
EMV1: Trustworthiness of the PSS Provider	2	0.80	10	4.00	27	10.80	131	52.40	80	32.00
EMV2: Product range	3	1.20	7	2.80	52	20.80	135	54.00	53	21.20
EMV3: Design/aesthetics	2	0.80	7	2.80	41	16.40	113	45.20	87	34.80
Importance of PSS provider to offer product-related services	4	1.60	23	9.20	84	33.60	107	42.80	32	12.80

Appendix E: Value Element Construct's Inter-Correlations

Correlations (N = 250)

Spearman's Rho		ECV1	ECV2	FV1	FV2	FV3	FV4	FV5	SV1	SV2	EMV1	EMV2	EMV3
ECV1: Low Price	Corr. Coeff.	1.000	.289**	-.166**	-.172**	-.173**	-.061	-.285**	-.097	.004	.052	-.058	-.081
	Sig.		.000	.008	.006	.006	.334	.000	.126	.944	.417	.357	.202
ECV2: Delivery price	Corr. Coeff.		1.000	-.022	.076	.035	-.081	-.108	.026	.014	.072	.007	-.030
	Sig.			.730	.234	.581	.200	.090	.681	.820	.259	.911	.641
FV1: Quality of the product	Corr. Coeff.			1.000	.249**	.458**	.097	.287**	.205**	.043	.236**	.148*	.299**
	Sig.			.	.000	.000	.127	.000	.001	.499	.000	.019	.000
FV2: Websites' user-friendliness	Corr. Coeff.				1.000	.241**	.235**	.156*	.190**	.052	.130*	.229**	.199**
	Sig.					.000	.000	.014	.003	.410	.041	.000	.002
FV3: Quality of technical support	Corr. Coeff.					1.000	.276**	.283**	.187**	.124	.190**	.206**	.151*
	Sig.						.000	.000	.003	.051	.003	.001	.017
FV4: Online consultancy	Corr. Coeff.						1.000	.105	.169**	.097	.129*	.101	.201**
	Sig.						.	.099	.007	.126	.042	.113	.001
FV5: Offline consultancy	Corr. Coeff.							1.000	.298**	.067	.036	.087	.143*
	Sig.							.	.000	.293	.571	.170	.023
SV1: Customiza-tion possibilities	Corr. Coeff.								1.000	.127*	.230**	.205**	.264**
	Sig.								.	.044	.000	.001	.000
SV2: Brand (to express yourself)	Corr. Coeff.									1.000	.176**	.174**	.111
	Sig.									.	.005	.006	.079
EMV1: Trustworthiness	Corr. Coeff.										1.000	.174**	.073
	Sig.											.006	.251
EMV2: Product range	Corr. Coeff.											1.000	.278**
	Sig.												.000
EMV3: Design/aesthetics	Corr. Coeff.												1.000
	Sig.												.

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Appendix F: Correlations between Control Variable ‘Age’ and ‘Nationality’

Spearman's Rho Correlations				
Control variable			Age	Nationality
Spearman's Rho	Age	Correlation Coefficient	1.000	-.355**
		Sig. (2-tailed)		0.000
		N	250	250
	Nationality	Correlation Coefficient	-.355**	1
		Sig. (2-tailed)	0.000	
		N	250	250

**. Correlation is significant at the 0.01 level (2-tailed).