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CUSTOMER VALUE OF CIRCULAR PRODUCT-SERVICE SYSTEMS

Case Urban Gardening as a Service

Examiners: Professor Jukka Hallikas
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ABSTRACT

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Customer Value of Circular Product-Service Systems - Case Urban Gardening as a Service

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This thesis examines the customer perceived value of circular product-service systems from consumer perspective. Product-service systems are considered as a potential way to move towards the circular economy and to reduce the environmental impact of consumption. In this thesis, the customer value is examined through value drivers and barriers. Additionally, the impact of the environmental benefits of circular product-service systems on consumer value creation is analyzed. The study is conducted as a case study using both qualitative and quantitative research methods. The case company is a Finnish startup company which offers a garden box as a service. Research data consists of customer survey data and semi-structured interviews with the case company representatives and circular economy experts. The results show that highly valued features of product-service systems are the convenience of the service and flexibility of not needing to make permanent acquisitions. Additionally, support provided by the service, especially through the mobile application, was considered important. One of the biggest challenges for product-service systems is the strong culture of ownership. However, the survey results do not support the frequently mentioned barrier regarding the negative image of previously used products and materials. Although the significance of environmental values is growing, sustainability alone is not enough to get consumers to choose a product-service system. Thus, the service must be able to compete with other aspects as well. Essentially, consumers want to make sustainable choices, but in practice, other factors often influence the final purchase decision more. However, the results show that operating in accordance with the circular economy principles increases the company's positive image and the consumers interest towards the company. Communicating the benefits of the circular economy and the significance of consumers' choices in a concrete manner can strengthen their intention to choose a circular service.

TIIVISTELMÄ

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Kiertotalouden mukaisten tuote palveluna -mallien asiakasarvo - Case kaupunkiviljely palveluna

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Tämän tutkielma tarkastelee kiertotalouden mukaisten tuote palveluna -mallien asiakasarvoa kuluttajien näkökulmasta. Tuote palveluna -malleja pidetään potentiaalisena tapana siirtyä kohti kiertotaloutta ja vähentää kulutuksen aiheuttamaa ympäristökuormitusta. Tässä tutkielmassa asiakasarvoa tarkastellaan arvonluontia edistävien tekijöiden ja sen haasteiden kautta. Lisäksi analysoidaan tuote palveluna -mallien ympäristöhyötyjen vaikutusta kuluttajien asiakasarvon luontiin. Tutkimus on toteutettu tapaustutkimuksena, ja siinä on hyödynnetty sekä laadullista että määrällistä tutkimustapaa. Kohdeyrityksenä toimii suomalainen startup-yritys, joka tarjoaa viljelylaatikoita palveluna. Tutkimusdata koostuu asiakaskyselyn vastauksista sekä kohdeyrityksen edustajien ja kiertotalousasiantuntijoiden puolistrukturoiduista teemahaastatteluista. Tutkimustulokset osoittavat, että tuote palveluna -malleissa arvostetaan erityisesti palvelun tuomaa helppoutta sekä joustavuutta olla tekemättä pysyviä hankintoja. Lisäksi palvelun antama tuki varsinkin mobiiliapplikaation kautta koettiin melko tärkeäksi. Tuote palveluna -mallien suurimpia haasteita on vahva omistamista tukeva kulttuuri. Sen sijaan usein mainittu käytettyihin tavaroihin ja materiaaleihin liitetty negatiivinen mielikuva ei saanut tukea tässä kyselytutkimuksessa. Vaikka ympäristöarvojen merkitys on kasvussa, kestävyys itsessään ei ole riittävä syy valita tuote palveluna -mallia, vaan sen on pystyttävä kilpailemaan myös muilla ominaisuuksilla. Lähtökohtaisesti kuluttajat haluavat tehdä kestäviä valintoja, mutta usein käytännössä muut tekijät vaikuttavat lopullisiin kulutuspäätöksiin enemmän. Tutkielman mukaan kiertotalouden mukaisesti toimiminen kuitenkin vahvistaa positiivista mielikuvaa yrityksestä ja lisää kuluttajien kiinnostusta yritystä kohtaan. Viestimällä konkreettisesti kiertotalouden hyödyistä ja kuluttajien valintojen merkityksestä voidaan vahvistaa kuluttajien aikomusta valita kiertotalouden mukainen palvelu.

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1 Introduction

This thesis examines the customer perceived value of circular product-service systems (PSS). In recent years, circular economy (CE) has become a highly promoted concept as it is expected to enable resource efficient and environmentally sustainable economy (Winans, Kendall & Deng 2017). One of the key enablers of more sustainable consumption in the CE is PSS, where the product is offered as a service through for example renting and sharing or by providing agreed performance (Tukker 2004). While the ownership of a product retains with the service provider, they have an economic incentive to invest in material-efficiency and product longevity (Vezzoli, Kohtala, Srinivasan, Diehl, Fusakul, Xin & Sateesh 2014, 38). In terms of environmental benefits, the idea of PSS is that fewer resources are required to fulfill the needs of customers (Kjaer, Pigosso, Niero, Bech & McAloone 2019).

Despite the promising environmental benefits, PSS have not been widely implemented in consumer markets so far (Vezzoli, Ceschin, Diehl & Kohtala 2015; Catulli, Cook & Potter 2017). It has been argued that buying a traditional product offers superior value to the consumers and value related to ownership that PSS cannot provide (Tukker 2015). However, consumers are constantly becoming more conscious about the environmental issues and the interest towards more sustainable consumption solutions is growing (Vehmas, Raudaskoski, Heikkilä, Harlin & Mensonen 2018; D'Agostin, Fleith de Medeiros, Vidor, Zulpo & Moretto 2020; Armstrong, Niinimäki, Kujala, Karell, & Lang 2015). PSS can offer sustainable alternative and value benefits that arise from ownerless consumption (Akbar & Hoffmann 2018). This study examines the consumers' perceived value of using a PSS compared to buying a traditional product. In addition, the impact of environmental benefits of circular PSS in value creation and consumers' intention to choose PSS are examined.

1.1 Background of the study

The extensive use of resources has increasingly raised concerns regarding sustainability of current production and consumption models in the long term (Ellen MacArthur Foundation 2013). The CE offers means for more efficient use of materials, as it seeks to create as much value as possible from the materials used through more intensive resource use, reuse,

maintenance and repair, remanufacturing, and recycling (Korhonen, Honkasalo & Seppälä 2018). PSS are frequently presented as a means to realize CE and as a response to the problem of growing material consumption, as PSS can provide value to customers with less material (Tukker 2015; Kjaer et al. 2019). PSS business models aim to customer satisfaction by providing an integrated mix of products and services, often without shifting the product ownership to the customer (Vezzoli et al. 2014, 31, 36-37). PSS can offer several benefits, such as environmental improvements through product durability and life cycle extension (Tukker 2015), increases competitiveness through cost-savings (Lindahl, Sundin & Sakao 2014), intangible value related to ownerless consumption (Akbar & Hoffmann 2018), and consumer loyalty (Beuren, Gomes Ferreira & Cauchick 2013). PSS are often proposed as a win-win solution, as they can be beneficial to the service provider, customer, environment, and society in several ways (Widmer, Tjahjono & Bourlakis 2018). However, PSS business model is not a guarantee for resource reduction (Kjaer et al. 2019; Corvellec & Stål 2017). For a PSS to be more sustainable option, the environmental aspect and material efficiency must be at the center of the PSS business model and product design (Pigosso & McAloone 2015; Mont 2002; Vezzoli et al. 2015; Pieroni, Nunes Marques, Nunes Moraes, Rozenfeld & Ometto 2017). This study considers the PSS that operate according to CE principles, which are also referred as circular PSS.

Despite the recognized environmental and economic potential of PSS, the practical implications of circular PSS are limited, especially in the B2C context (Tukker 2015; Borg, Mont & Schoonover 2020; Pieroni et al. 2017). A prevalent explanation is that consumers still prefer owning a product over gaining access to one (Mont 2002; Tukker 2015; Halme, Anttonen, Hrauda & Kortman 2006). However, PSS can offer additional value, such as flexibility in consumption, that can be more difficult for a traditional product to provide (Gullstrand Edbring, Lehner & Mont 2016; Akbar & Hoffmann 2018; Borg et al. 2020). Additionally, PSS can offer access to products that would otherwise be expensive to own for many customers (Armstrong, Niinimäki, Lang, & Kujala 2016: Borg et al. 2020). Some studies report growing interest towards ownerless consumption (Akbar et al. 2016; Bardhi & Eckhardt 2012; Lawson, Gleim, Perren & Hwang 2016), but the practical implications remain limited (Borg et al. 2020). A common barrier for CE business model implementation is the lack of consumer awareness of CE, which has been related to low CE involvement (Sijtsema, Snoek, van Haaster-de Winter & Dagevos 2020; Kirchherr et al. 2018). Goyal,

Chauhan and Mishra (2021) identify need for further research for CE awareness, implementation and adoption across different industries and countries. Moving towards CE demands changes in both consumption and production system (Sijtsema et al. 2020), however, most of the CE and PSS research has focused on the production side while less attention is paid on consumers and the changes CE causes in consumption (Camacho-Otero, Boks & Pettersen 2018; Mylan 2015). Therefore, more research is needed of the consumer perceived value of PSS, also in the real-life context (Stål & Jansson 2017).

In addition, it is essential to take into consideration consumers' growing interest in sustainability issues (Vehmas et al. 2018). Although environmental value is not considered to be the main reason for choosing PSS (Tukker 2015; Akbar & Hoffmann 2018), sustainability has been found to have some impact on consumer choices, for example, through reduced perceived risk (Akbar & Hoffmann 2018). Thus far, PSS research has emphasized functional value, while other value aspects should also be considered to obtain comprehensive view of the topic (Catulli et al. 2017; Borg et al. 2020). The environmental value has a complex role in PSS (Akbar & Hoffmann 2018), and more research should be conducted on different value aspects (Catulli et al. 2017). This study aims to fill these gaps by taking a consumer perspective and examining the perceived value of circular PSS while also taking into consideration the role of environmental value.

The empirical study of this thesis is conducted as a case study. The case company is a Finnish startup company that provides garden box as a service mainly to consumers, housing companies, and restaurants. The first operating season of the company was during the summer 2020. From the beginning, the company has strived to operate in accordance with the principles of the CE in order to generate as little waste as possible and to minimize the environmental impact. The PSS model allows the company to ensure the circulation of materials and nutrients and to have better control over environmental impacts. By offering their product as a service, the company can provide consumers effortless and easily approachable way to grow own food and herbs. Growing food in a sustainable manner in urban areas is not only a relaxing activity that supports well-being but may also strengthen the citizens' connection to food production process and can, on a large scale, support building a more sustainable total food system. For the urban food production service to

become more widespread in the future, it is important to understand the value creation of circular PSS.

1.2 Research objectives and questions

This study examines the consumer perceived value of circular PSS. Although PSS is considered as a promising approach to resource efficiency and reduced environmental impacts (Kjaer et al. 2019), the implementation of PSS in B2C area is still limited (Tukker 2015; Sijtsema et al. 2020). The literature requests for more research on consumer perspective of PSS value creation (Stål & Jansson 2017; Camacho-Otero et al. 2018), including the role of environmental value (Akbar & Hoffmann 2018). This study aims to study circular PSS value creation from the consumer point of view and to examine the different factors affecting the value creation process. Additionally, the role of environmental benefits of circular PSS are considered. To shed light on these topics, the following research questions are formed.

The main research question is:

How does circular PSS create value for consumers?

The sub-questions are:

What are the main value factors of PSS in consumer value creation?
What are the main value barriers of PSS in consumer value creation?
What is the role of environmental benefits of circular PSS in consumer's perceived value?

The purpose is to understand which factors of circular PSS create value for consumers and thus promote PSS adoption, and which factors act as barriers for choosing PSS. Since sustainability is characteristic for circular PSS, it is beneficial to include the perceived value of the CE actions in the study and to examine the significance of environmental benefits in choosing a circular PSS option.

1.3 Conceptual framework

The conceptual framework of this study summarizes the main concepts of the research and the relationships between the concepts examined. Value drivers and barriers are examined in detail to understand the consumer value creation elements of circular PSS. The role of environmental benefits of circular PSS and their impact on the consumer's perceived value drivers and barriers is examined as well. The main concepts and their relations are presented in the Figure 1.

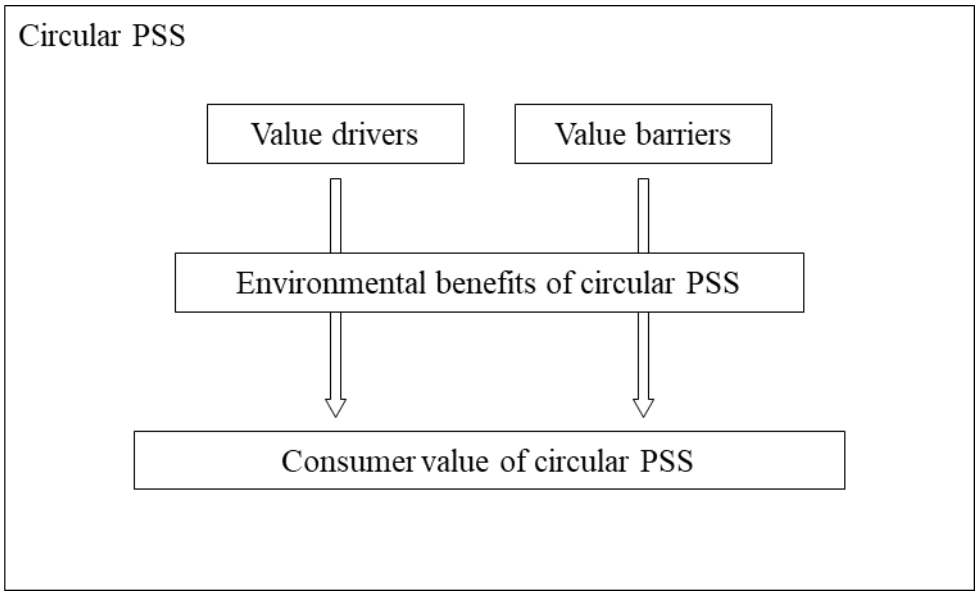

Figure 1. Conceptual framework of the study

Understanding the consumer value creation process helps creating circular PSS that better answer to consumers' needs and thus contributes to wider implementation of circular PSS in B2C context. Therefore, understanding the value creation process is essential for the PSS to be able to compete with conventional products.

1.4 Research methodology and data collection

This study uses mixed method design as it combines both qualitative and quantitative elements in the study. Qualitative research aims to understand complex phenomenon (Hirsjärvi & Hurme 2000, 35) that are difficult to quantify (Hirsjärvi, Remes & Sajavaara

2008) or challenging to study with experiments (Syrjälä 1995, p. 12-13). Quantitative research method allows collecting data in standardized form from a population and enables easy comparison (Saunders, Lewis & Thornhill 2012). Using mixed methods can complement each other and allow findings to be enhanced and clarified, which can increase the validity of the conclusions (Saunders et al. 2012). This study is conducted with case study approach. Case study is an empirical research strategy that aims to examine a phenomenon within its real-life context (Yin 2009, 18). Since this study is limited to a single case organization, the strategy enables thorough examination and gaining detailed information about the phenomenon (Farquhar 2013, 5; Hirsjärvi, et al. 2008).

A quantitative, structured customer survey was conducted to gain information about the customers' perceptions on the case company's circular economy activities. The questionnaire was formed with an online survey tool and a link to the self-administered questionnaire was shared to the customers. Majority of the questions were formed according to 5-point Likert scale, as it is frequently used when measuring perceptions and attitudes (Heikkilä 2014, 51). Additionally, a qualitative, semi-structured interviews were conducted on case company representatives and two experts specialized in themes of circular economy and urban agriculture. Semi-structured interview proceeds roughly according to the planned questions, and it allows focusing on specific themes more thoroughly if necessary (Hirsjärvi & Hurme 2000, 47-48). In this study, a semi-structured interview is used, as it enables flexibility to steer and deepen the information collection according to the interviewee's knowledge and experiences.

1.5 Limitations and structure of the thesis

This thesis has certain limitations. Firstly, the study examines PSS value creation from the consumer perceived value perspective, and B2B aspect is excluded from the study. From different PSS types, this study mainly focuses on use-oriented PSS, where product ownership and most responsibilities remain with the service provider (Tukker 2004), as that is the case company's PSS business model. As mentioned earlier, PSS is not a guarantee of an environmentally beneficial business model (Pigosso & McAloone 2015; Pieroni et al. 2017), however, this study focuses on circular PSS models that operate in accordance with the CE principles. Conducting the empirical research as a case study sets additional

limitations, as the phenomenon is examined in specific conditions. In this case the context is urban agriculture, and the study only considers commercial business models in the field.

The thesis is structured as follows: the introduction is followed by two chapters introducing the theoretical background of the study. The first theory chapter presents the concepts and environmental potential of the CE and PSS. The second theory chapter examines the PSS value creation from the consumer perspective. The current research literature on consumer value factors and value barriers of PSS is reviewed, and the significance and impact of environmental benefits on value creation is examined. The fourth chapter presents the methodological choices of the study and justifications for these selections. At the end of the methodology section, the validity and reliability of the research methods used are evaluated. In fifth chapter, the results of data collection and analysis are presented. The sixth and final chapter concludes the study by reflecting the empirical findings with existing research and by summarizing the main conclusions. Finally, the limitations of the study, implications and future research propositions are presented.

2 Circular economy and product-service systems

The current economic model relies heavily on linear resource use, in which products and materials are simply disposed after extraction, production and use. This causes the consumption to be highly dependent on large quantities of new raw materials and energy. (Ellen MacArthur Foundation 2013) As the population has continued to grow and the standard of living of billions rises in the upcoming decades, the demand for raw materials and energy will increase considerably in the future (Camilleri 2018). Growing demand of limited resources will require more sustainable ways to use materials and products and to maintain their value for longer time (IRP 2020). The concept of circular economy (CE) has been proposed as a promising approach to arrange the economic system in a way that enables economic growth within the limits of planet's resources (Ellen MacArthur Foundation 2013). Product-service systems (PSS) are often proposed as a potential means to move towards CE (Tukker 2015). PSS can reduce the dependence on new raw materials and decrease the environmental impacts of consumption (Kjaer et al. 2019), but it would also mean a change in current consumption patterns and different value creation compared to traditional product sales (Akbar & Hoffmann 2018). This chapter introduces the concept of CE and its environmental and economic potential. Additionally, the concept of PSS is presented as a means to implement CE, and its potential to reduce the environmental impacts of consumption is reviewed. Finally, some challenges and limitations related to reducing resource consumption with CE and PSS are discussed.

2.1 Circular economy

Circular economy is defined as "an industrial system that is restorative or regenerative by intention and design" (Ellen MacArthur Foundation 2013). In CE, the foundation of economic growth is the reuse of material rather than extraction of new resources. Products and materials are kept in use for as long as feasible, while maintaining their value as high as possible. (Ellen MacArthur Foundation 2013) This is enabled by slowing, narrowing, and closing the resource loops which minimizes resource input and waste, energy leakage and emissions (Geissdoerfer, Savaget, Bocken & Hultink 2017; Bocken, de Pauw, Bakker & van der Grinten 2016). A more cyclical model of material flows can offer radical improvements

in sustainability (Korhonen et al. 2018). The value of products and materials is maintained high through long-lasting product design, reuse, repair, maintenance, refurbishing, and remanufacturing, and products and materials that are no longer used are recycled for next purpose (Geissdoerfer et al. 2017). In CE, renewable resources are used in production to the extent feasible, and energy consumption is based on carbon neutral sources (Ellen MacArthur Foundation 2013). Consumption can be based for example on using a service and sharing a product rather than owning one, which intensifies the use of products and materials (Kjaer et al. 2019).

There is no clear indication of a single origin of the CE concept, but the most influential contributing concepts have been the cradle-to-cradle thinking and eco-effectiveness by McDonough and Braungart (2009), and the industrial economy that examines the circulation of material and energy flows (McDonough & Braungart 2009; Erkman 1997; Saavedra, Iritani, Pavan & Ometto 2018; Winans et al. 2017; Korhonen et. al 2018). Additionally, CE somewhat overlaps with the concepts of bioeconomy and green economy (D'Amato et al. 2017). The research specifically in CE field is fairly new, as CE concept publication material has only begun to increase since the early 2000's (D'Amato et al. 2017). Goyal et al. (2021) identify several current key research streams of CE, including for example the CE concept and sustainability, CE adoption, resource life extensions, design of circular products, and CE rebound. Although the idea of material cycles and their potential to reduce environmental impacts has been known for decades, the linear model has dominated the development causing environmental harm (Korhonen et. al 2018).

The CE can create environmental, social and economic benefits. The environmental benefits include reduced need of new raw material and energy input, while the used new inputs are from renewable sources to the extent possible (Korhonen et al. 2018). Moving towards the CE minimizes the amount of waste and emissions in the system, as those are designed out from the products and services from the beginning (Ellen MacArthur Foundation 2013). The social benefits include new employment opportunities and increased participation, involvement and cooperation through sharing economy (Korhonen et al. 2018). Economic benefits include for example reduced raw material, energy, and waste management costs, and reduced costs from environmental taxation and legislation (Korhonen et al. 2018). Reducing new raw material and energy use and utilizing materials' value to the maximum

extent makes production less dependent on new resources (Ellen MacArthur Foundation 2013). Circular economy can support mitigating supply risk, such as supply disruptions, higher resource price, and volatility, bring potential employment improvements, and create long-term resilience of the economy (Ellen MacArthur Foundation 2013). In addition, companies operating according to CE practices may benefit from improved brand image and responsible and green market potential (Korhonen et al. 2018).

Due to its environmental and economic potential, CE has recently become a highly promoted concept by EU and several national governments worldwide (Korhonen et al. 2018). Shifting towards CE and more efficient use of resources has been estimated to represent annual net material cost savings potential of up to USD 630 billion for European industry in addition to potential employment benefits (Ellen MacArthur Foundation 2013). For the economy of Finland alone, Sitra and Mckinsey (2014) have estimated annual gains of 1,5-2,5 billion euros through CE while similarly reducing the environmental impacts. Finland has prepared a strategic programme for promoting circular economy that aims for carbon neutrality and for making CE the foundation of the economy by 2035 (Ympäristöministeriö 2021). These targets reflect the potential of CE to create economic value with lower environmental impacts.

As mentioned, circular material flows can offer great improvements towards a more sustainable economic model. However, although CE may help to face resource scarcity, a circular flow does not equal sustainable outcome (Korhonen et al. 2018). Although CE may decrease the amount of raw materials used, circular processes may lead to higher absolute energy consumption (Kjaer, Pigosso, McAloone & Birkved 2018; Allwood 2014). CE processes such as recycling, will always require energy, and therefore every circular economy process should be carefully evaluated for its net environmental sustainability impact (Korhonen et al. 2018; Allwood 2014). Usually, reuse, refurbishment and remanufacturing require less energy and are therefore promoted as the first desirable option for cyclical material flow in CE (Korhonen et al. 2018). Therefore, recycling should be considered as the final option before landfill (Korhonen et al. 2018).

2.2 Environmental potential of circular product-service systems

Circular economy promotes consumption that is based on using services rather than buying a traditional product (Kjaer et al. 2019). Service offerings that are based on physical products are known as product-service systems (PSS), and they are gaining attention as an effective approach for moving society towards more resource-efficient consumption (Tukker 2015; Van der Laan & Aurisicchio 2020). Frequently referenced PSS definition in the literature is by Mont (2002): "[PSS is] *a system of products, services, supporting networks and infrastructure that is designed to be: competitive, satisfy customer needs and have a lower environmental impact than traditional business models*" (Mont 2002; Haase, Pigosso & McAloone 2017). PSS change the business' focus from selling only a physical product to selling a set of products and services, with additional supporting infrastructures, such as maintenance and repair, updates and upgrades, training and consultancy, and disposal services such as recycling and take-back agreements (Gaiardelli, Resta, Martinez, Pinto & Albores 2014). From CE perspective, PSS enables efficient use of resources as well as better material circulation compared to selling a traditional product (Kjaer et al. 2019). However, PSS business model is not a guarantee for efficient resource use (Kjaer et al. 2019; Corvellec & Stål 2017). For a PSS to enable resource efficiency, the environmental aspect and material efficiency must be at the center of the PSS business model and product design (Peroni et al. 2017; Pigosso & McAloone 2015; Mont 2002; Vezzoli et al. 2015; Manninen, Koskela, Antikainen, Bocken, Dahlbo & Aminoff 2018).

PSS are generally divided into three main categories (Tukker 2004). The first category is product-oriented PSS, where the business model is mainly dependent on sales of products, but some additional services are added, such as maintenance contract, supply of consumables or a take-back agreement when the product reaches its end of life. The second category is use-oriented PSS, where the ownership of the product remains with the provider, and the user pays for the use of the product. The service provider is responsible for maintenance, repair, and control of the product. Use-oriented PSS includes services such as renting, pooling and sharing the product with other users. (Tukker 2004) The third main category is result-oriented PSS, where the firm is selling a result and no pre-determined product is involved (Tukker 2015). The customer and provider may for example agree what is the desired functional result or level of performance, and the provider has the freedom of how

to deliver the result (Tukker 2004). Use-oriented and result-oriented PSS are considered to have the highest potential in terms of improved resource efficiency as those promote ownerless consumption and an incentive for the service provider to operate according to the CE principles (Tukker 2015).

In CE literature, PSS is often proposed as a business model to shift towards more resource-efficient society (Bocken, Mugge, Bom & Lemstra 2018; Tukker 2015). The main logic leading to resource efficiency through circular PSS is that when the service provider retains the ownership of a product and the firms are paid per service unit offered, the products and materials needed for providing the service become cost factors, the provider has an economic interest to reduce the use of new resources (Tukker 2015). As the provider is responsible for the true life cycle costs and the products are designed by taking these cost into account, it creates a strong incentive for optimizing the use of materials and energy (Tukker 2004; Vezzoli et al. 2015; Vezzoli et al. 2014, 38). The longer the product remains in use, the more the costs per service unit decrease (Vezzoli et al. 2015). Thus, the service provider is encouraged to use more durable materials, design products that are material-efficient and easy to maintain, use repair and maintenance services, or otherwise prolong the service life of the products (Tukker 2015; Vezzoli et al. 2015). The PSS business model moves away from the traditional concept of product-selling and focuses on the final need, demand, or function to be fulfilled (Tukker & Tischner, 2006). The PSS providers can create need-fulfilment systems with lower environmental impacts by either replacing a traditional product offer or by influencing users' actions and behavior to become more resource-efficient (Camilleri 2018). Thus, the PSS promotes sustainable production and consumption (Tukker & Tischner, 2006), can support the implementation of CE and lead to minimization of material flows while maximizing user satisfaction and service output (Tukker 2015; Camilleri 2018).

In addition to prolonging the service-life of a product, one mechanism that leads to reduced resource use is the significantly increased use intensity of the products in the system, for example in product sharing or pooling situation (Tukker 2004). More intensive and efficient product use can lead to lower costs in the system (Tukker & Tischner 2006), and using considerably less material and energy in the use phase, the environmental impact can be reduced (Tukker 2004). Another potential benefit of PSS is that due to a higher economy of

scale the provider may use significantly more efficient technology than is used in products sold to the consumers (Tukker 2004).

Compared to traditional product, PSS have an impact beyond the use phase, as the PSS provider is also responsible of further use and disposal of the resources (Camilleri 2018). The provider has an economic interest to re-manufacture or re-use materials and components of discarded products, as it potentially reduces costs compared to manufacturing a new product and landfilling (Vezzoli et al. 2014, 38). Furthermore, the provider has an incentive to find alternative ways to extend material life, such as updating, or recycling and composting materials at the end of the product's life cycle (Vezzoli et al. 2014, 38; Vezzoli et al. 2015; Tukker 2015).

However, it is important to specify that extending product life cycle is not always preferable in terms of environmental impact reduction, as replacing an old product with technologically advanced, environmentally more efficient product can result smaller overall impact (Vezzoli et al. 2014, 56). Therefore, more intensive use of products can also stimulate faster replacement of products by newer and more efficient models (Tukker 2004). Products that consume considerable amounts of resources during the use phase and maintenance, should be regarded to have *optimal* limit for the length of the life cycle, whereas products that consume less energy or material during utilization are often better candidates for extended life cycle (Vezzoli et al. 2014, 56).

Although PSS can create relative resource reductions, enabling absolute resource decoupling is challenging (Kjaer et al. 2019; Vivanco, Kemp & van der Voet 2016). Kjaer et al. (2019) propose three requirements for absolute resource decoupling: ensuring net resource reductions, avoiding burden shifting between life cycle stages when for example extending the product's life cycle, and mitigating the rebound effect. Rebound effect is a phenomenon that occurs when the environmental impact reduction from an improvement is less than anticipated because of systemic or behavioral responses (Kjaer et al 2019; Hertwich 2005). Thus, rebound effect reduces the expected environmental benefits. According to Zink and Geyer (2017), in order to mitigate the rebound effect, it is important that the products and activities produced by CE are truly substitutes for traditional product alternatives. The literature suggest that the highest environmental impact reduction potential can usually be

realized through result-oriented PSS, as those have the most innovation potential and they most likely use radically different technological systems (Tukker 2004). However, radical innovations in result-oriented PSS are also more rare than incremental improvements on existing business models (Tukker 2004).

3 Customer value of circular economy

Circular PSS shifts the focus of consumption from product ownership to service use (Catulli et al. 2017). The interest towards PSS and ownerless consumption is increasing in the academic and business field (Akbar et al. 2016; Bardhi & Eckhardt 2012). However, the implementation of circular PSS in consumer markets is still limited (Tukker 2015). For circular PSS to be successful, it is essential to understand which factors affect the customer's perceived value, as adopting PSS requires changes in current consumer behavior patterns (Akbar & Hoffmann 2018; Borg et al. 2020). In this chapter, the PSS value creation for consumers is examined through value drivers and barriers. Additionally, the impact of the environmental benefits of circular PSS on consumer value creation is examined.

3.1 Customer value of PSS

Literature recognizes several customer perceived value definitions. According to Zeithaml (1988), customer-perceived value is "*the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given*". Another frequently used definition describes customer-perceived value as a ratio between the value benefits and sacrifices (Ravald & Grönroos 1996; Khalifa 2004). The perceived benefits include tangible and intangible attributes of the offering, while the perceived sacrifices include both monetary and non-monetary costs related to the purchase (Zeithaml 1988; Ravald & Grönroos 1996; Khalifa 2004). These cost/benefit approaches thus assume that the perceived value is largely influenced by the perceived costs, which together lead to the final purchase decision (Khalifa 2004). The perceived value is subjective and varies among consumers (Zeithaml 1988), as the perceived value is based on consumers' different needs, preferences and values and financial resources (Ravald & Grönroos 1996). This section examines the consumer perceived value and cost factors related to the PSS offer.

3.1.1 Value drivers of PSS

The benefits and value of using a PSS offer can be divided into tangible and intangible benefits (Tukker 2004; Akbar & Hoffmann 2018). Tangible benefits are usually easily and

objectively measured, such as savings in costs, resources and time input when using PSS compared to a traditional product offering (Tukker 2004). Intangible benefits include for example brand value, ease of access and uniqueness (Tukker 2004). The evidence of the role of intangible benefits in PSS value creation is contradictory. According to Tukker (2015), many PSS, especially in the B2C field, score worse than a competing product solution in respect of intangible added value, particularly in contributing to self-esteem. However, Akbar and Hoffman (2018) propose that it is especially the intangible benefits that drive consumers to choose PSS, as it can offer several intangible benefits that distinguishes it from traditional product. The consumer perceived value is complex and multidimensional in nature (Sánchez-Fernández & Iniesta-Bonillo 2007). Borg et al. (2020) divide consumer perceived value into four dimensions: financial, functional, emotional and social value. While in traditional consumer goods the first two value dimensions would be price and quality (Sweeney & Soutar 2001), the financial and functional dimensions represent better the complex nature of PSS (Borg et al 2020). Although functional value is often emphasized in the literature, it is important to examine other value dimensions as well to get comprehensive understanding of the complex issue of consumer value creation (Borg et al. 2020; Catulli et al. 2017). Figure 2 summarizes the value dimensions and drivers affecting perceived value of PSS presented by the literature.

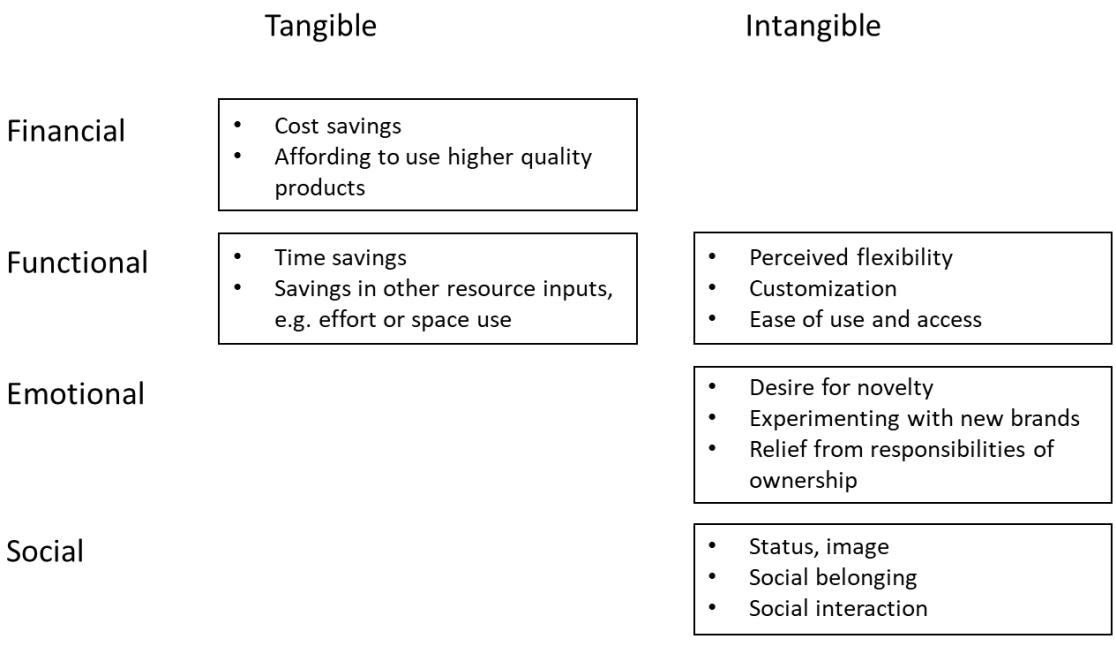

Figure 2. Value dimensions and drivers of PSS

The financial value is one of the main tangible benefits of PSS (Rexfelt & Hiort af Ornäs 2009; Armstrong et al. 2015; Akbar & Hoffmann 2018). Perceived financial value refers to the feeling of making an economically beneficial choice compared to short and long-term costs (Sweeney & Soutar 2001; Armstrong et al. 2015). Using a PSS can cost less than buying a traditional product as the consumer does not need to make initial investment (Mont 2002), and the consumer saves in maintenance and repairing costs which are typically included in the service (Rexfelt & Hiort af Ornäs 2009; Lamberton & Rose 2012). As the consumer only pays for the service used, PSS is often less expensive especially when the product is needed rarely or irregularly (Gullstrand Edbring et al. 2016). However, Moeller and Wittkowski (2010) did not find significant connection between price consciousness and the consumer's preference for non-ownership. The researchers explain this finding with the observation that some consumers in the study believed that renting would become more expensive than purchasing an own product, which may be the case in the long-term (Moeller & Wittkowski 2010). Additional financial benefit is that PSS can give consumers access to products that are technically advanced, higher quality, or highly expensive, and would otherwise not be economically accessible to the consumers (Tukker 2015). These properties make the possible cost savings more apparent to the consumer and thus increase the perceived value of choosing a PSS offer.

The functional value dimension is frequently mentioned in the PSS literature, as it is generally a prominent value element especially in use-oriented PSS (Catulli et al. 2017; Borg et al. 2020). Functional value refers to the benefits related to performance or quality of the service (Sweeney & Soutar 2001) and in PSS context includes elements that highlight the convenience of non-ownership (Moeller & Wittkowski 2010). Functional value includes both tangible and intangible elements. Tangible functional benefits refer to for example time and other resource inputs saved by using the service, such as effort or space use by not unnecessarily accumulating goods (Tukker 2004; D'Agostin et al. 2020; Catulli et al. 2017). PSS can reduce the customer's time and effort expenditures for example on repair and maintenance and on the actions at the end of the product's lifetime (Berry, Seiders & Grewal 2002; Tukker 2004). Perceived flexibility of using a service instead of owning a product is considered as an important intangible benefit that increases the interest towards PSS (Moeller & Wittkowski 2010; Gullstrand Edbring et al. 2016). Flexibility allows the customer to for example change the extent of the service according to temporary changes or

periodic needs (Catulli et al. 2017). PSS also allows high level of customization as the service can be modified according to customer's specific needs (Baines et al. 2007). In addition, perceived ease of access and ease of use are considered as important functional drivers in PSS (Tukker 2004; Borg et al. 2020).

Emotional value refers to affective states and feelings created by a product or service (Sweeney & Soutar 2001). Emotional value includes for example fulfilling the need for novelty and reducing boredom (Armstrong et al. 2015). Consumers that desire new and unique products are more likely to choose PSS if it gives them access to products that they otherwise could not choose or that only few possess (Akbar et al. 2016; Akbar & Hoffman 2018). PSS can thus contribute to personal self-esteem and generate experiences and brand value (Tukker 2015; Mont 2002). According to Moeller and Wittkowski (2010), consumers with higher trend orientation are more likely to adapt non-ownership modes of consumption. The high trend orientation consumers are more interested in the experience of novelty, new and innovative forms of consumption and up-to-date products (Moeller & Wittkowski 2010). Therefore, services that offer unique products or products that are usually difficult to reach are more likely to attract certain consumers (Moeller & Wittkowski 2010). PSS can also give the consumers a possibility to experiment with different styles and brands and thus contribute to emotional value (Armstrong et al. 2015). In addition, relief from responsibilities of ownership related to for example maintenance of a product can act as an emotional driver for choosing a PSS (Rexfelt & Hiort af Ornäs 2009).

Social value of PSS refers to value created through the image or status associated with the service (Sweeney & Soutar 2001). Social value drivers include for example enhanced social interaction when using PSS or sense of belonging to a social group through PSS use (Armstrong et al. 2015). Akbar and Hoffmann (2018) showed that consumers with a higher need for socializing are more likely to choose a PSS sharing offer. PSS that strengthens social status may improve consumer acceptance, as status consumption is a strong motivator (Lawson et al. 2016). Additionally, social pressure has been shown to drive consumers to choose PSS (Shrivastava, Jain, Kamble & Belhadi 2020). However, Borg et al. (2020) found social value to be less prominent than other value dimensions.

3.1.2 Value barriers of PSS

The barriers of PSS reduce the perceived value of the service and may affect consumer acceptance and adoption of PSS (Borg et al. 2020). The costs of choosing PSS do not only include the fee for short-term access to products, but also other sacrifices, and emotional barriers related to perceived uncertainty and stockout risk when using a service (Akbar & Hoffman 2018). Borg et al. (2020) identified three main categories of barriers in consumer acceptance of use-oriented PSS: economic and cost-related barriers, barriers related to the desire to own, and the novelty of the consumption mode resulting uncertainty and issues with trust.

Consumers generally look for alternatives that offer good value for their money (Borg et al. 2020). Choosing a PSS can provide access to products that would otherwise not be affordable, creating financial value for the consumer (Armstrong et al. 2016: Borg et al. 2020). Using a service may be less expensive than owning a product, especially when used infrequently (Gullstrand Edbring et al. 2016). However, with frequent service use or for example in long-term rental, access to a product can become more expensive than buying which can create a financial barrier for adopting a PSS (Gullstrand Edbring et al. 2016). Using a service is often perceived as more expensive than buying a product, regardless of the actual total cost, as the total costs of owning are often difficult to evaluate (Moeller & Wittkowski 2010; Schrader 1999). If the costs of PSS are perceived to be higher than the benefits gained, consumers are reluctant to adopt the service (Akbar & Hoffman 2018; Armstrong et al. 2015). Akbar and Hoffmann (2018) note that in addition to the fee for access, using PSS also includes other transaction costs, such as search cost when searching the available product, technical cost when adjusting the product to personal preferences or when learning to use it, and sunk costs that cannot be recovered. The higher the transaction costs, the lower is the consumer’s intention to choose the PSS offer (Akbar & Hoffmann 2018).

According to several studies, the lack of PSS adoption in the B2C context exists because majority of consumers still prefer owning products over gaining an access to them (Mont 2002; Tukker 2015; Halme et al. 2006; Gullstrand Edbring et al. 2016; Beuren et al. 2013). Owning a product may give the consumer a sense of freedom and control, over the decisions

of use and disposal of the product, which can be perceived valuable (Tukker 2015). To have control over things, products and life itself is a highly valued aspect for consumers (Stø, Throne-Holst, Strandbakken & Vittersø 2008), and product ownership may contribute greatly to self-esteem and thus intangible value (Tukker & Tischner 2006). Consumers' purchase decisions are often influenced by established social standards, and owning material goods signifies security, safety and social acceptance (Halme et al. 2006). Benefits of functionality without ownership is characteristic for PSS, however, products can also be used for other purposes than functional ones, such as for symbolic or emotional purposes (Catulli et al. 2017; Gullstrand Edbring et al. 2016; Bardhi & Eckhardt 2012). In situations where the products are associated with feelings of self-identity and emotional attachment, it can be difficult for PSS to compete (Catulli et al. 2017; Borg et al. 2020). Consumers can fear the loss of economic and technical autonomy when they become dependent on the service provider to use a product (Allais & Gobert 2016). PSS provider will have to overcome the perception that the consumers are put in a relatively dependent position (Tukker 2015). To make customers feel that they are in control in the use of the product, additional reassurances may be needed (Allais & Gobert 2016). Substitutability with traditional product may be beneficial in reducing the barriers of PSS adoption. Studies show a strong effect that if the perceived substitutability with a traditional product is high, the consumer's intention to change one's behavior and choose a PSS is higher as well (Akbar & Hoffman 2018; Lamberton & Rose 2012). Thus, marketers that aim to promote PSS offering should highlight similarities between PSS and ownership (Lamberton & Rose 2012).

As PSS in B2C context is still a relatively new and rare concept, consumers may experience uncertainty and lack of trust towards the concept itself, how it works in practice (Gullstrand Edbring et al. 2016), or about the motives of the service provider (Rexfelt & Hiort af Ornäs 2009). Additionally, confusion about the responsibilities in case the product is damaged can act as a barrier in new consumption modes (Catulli, Lindley, Reed, Green, Hyseni & Kiri 2013; Gullstrand Edbring et al. 2016). Inadequate information about use practices and unclearly defined terms and conditions of the service may cause uncertainty in consumers (Poppelaars, Bakker & van Engelen 2018; Cherry & Pidgeon 2018). As consumers are used to buying a product and owning is considered as a default, using a service requires change in behavior and is therefore associated with risk-taking (Borg et al. 2020). Another barrier and source of uncertainty among consumers are the concerns related to hygiene, cleanliness

and safety of the products that are used multiple times (Armstrong et al. 2015; Armstrong et al. 2016). On the other hand, Catulli et al. (2017) note that commercial PSS can reduce the concerns of hygiene and safety of the product compared to buying secondhand products. When buying secondhand products from another consumer, it is sometimes challenging to ensure that the product is still hygienic and safe. Thus, consumers may find it more trustworthy when a company with a reliable brand takes care of the safety and hygiene of the products between customers and provides assurance for example in a form of documentation or certificate (Catulli et al. 2017).

Additionally, one major barrier related to PSS is the perceived risk of stockout (Armstrong et al. 2015; Akbar & Hoffmann 2018). In retailing, scarcity of the product usually has a positive impact on consumer demand (Van Herpen, Pieters & Zeelenberg 2009; Parker & Lehmann 2011), but in PSS sharing offer context, consumers associate scarcity directly with a possible risk of stockout, which decreases their intention to choose PSS (Akbar & Hoffmann 2018). As the consumer's perceived stockout risk is a major barrier to PSS offers, the service providers should ensure that an adequate number of products is in supply (Akbar & Hoffmann 2018). In addition, access to the PSS product is often more difficult, which may act as a barrier for the consumer (Tukker & Tischner 2006).

Lamberton and Rose (2012) showed different types of consumers perceive risk of using a sharing-based PSS differently. The consumers of high-volume or high-volatility use may feel threat of competition created by other consumers' service use more strongly. However, lower-use consumers were not affected by other users as strongly, and they felt that risk of scarcity is less of a problem in general. To reduce the perceived risk of scarcity, the researchers suggest that the PSS provider should design sharing systems with control mechanism or allow consumers to share a product with those whose behavior they know to be complementary rather than competing. (Lamberton & Rose 2012) In addition, providing information about the product availability or assurances of product availability may reassure consumer's concerns about product scarcity risk (Lamberton & Rose 2012; Allais & Gobert 2016). According to Akbar and Hoffmann (2018), PSS providers should consider the opportunity of integrating customers as value co-creators and risk mitigators to overcome risk of stockouts, for example, by implementing incentive systems for travelling to specific direction with transport PSS.

3.2 The impact of environmental benefits on PSS value

Several studies show that majority of consumers still have a strong preference towards owning a product over gaining an access to one through a service (Halme et al. 2006; Tukker 2015). Although many consumers are interested in acting sustainably, the intentions are not always reflected in the actual purchasing behavior, causing an attitude-behavior gap in sustainable consumption (Park & Lin 2020). Previous studies indicate that the environmental benefits are rarely the main reason to choose PSS, but are rather considered as an additional benefit to other, more important factors, such as cost savings or convenience (Tukker 2015; Akbar & Hoffmann 2018; Moeller & Wittkowski 2010). The group of consumers for whom the environmental impacts appear to be a determining factor in consuming is relatively small, but the significance of sustainability in the purchase decisions has grown in recent years (Gullstrand Edbring et al. 2016; Vehmas et al. 2018). Consumers wish more sustainable choices and more concrete information about the effects of their decisions (Vehmas et al. 2018). Thus, it is important to examine the impact that circular PSS sustainability has on consumer choices. In this section, the impact of environmental benefits of circular PSS on consumers' consumption decisions is examined. In addition, the impact of CE knowledge, environmental consciousness, and attitudes on choosing CE offers are examined.

Although CE is highly discussed topic at business and governmental level, it is not that familiar amongst consumers (Sijtsema et al. 2020). Sijtsema et al. (2020) examined consumer attitudes and perceptions towards CE and found that while the term "circular economy" was associated with a positive image, consumers do not seem to have a clear understanding of the concept of CE. The lack of CE awareness was also related to low interest and low involvement in CE activities (Sijtsema et al. 2020). According to Kirchherr et al. (2018), lack of consumers' CE awareness and interest are the most common barriers to the CE implementation. Similarly, low consumer acceptance due to lack of awareness has been associated with refurbished products (Van Weelden, Mugge & Bakker 2016) and bio-based products (Sijtsema, Onwezen, Reinders, Dagevos, Partanen & Meeusen 2016). However, increased environmental awareness and knowledge increases the likelihood of adopting sustainable PSS (D'Agostin et al. 2020). According to Sijtsema et al. (2020), consumers who are the most familiar with CE practices also experience smaller risks related to them. Therefore, it is crucial to improve consumers' understanding of CE and to

communicate the CE initiatives clearly and effectively, but also to improve companies' understanding of consumers' current perceptions and knowledge of CE (Sijtsema et al. 2020).

Although sustainability of PSS alone might not be enough to lead to PSS participation, studies show that perceived sustainability does have an impact in consumers' intention to choose a PSS offering. Hamari, Sjöklint and Ukkonen (2016) show that perceived sustainability of shared consumption of resources positively influences consumer's attitudes towards it. The study shows that although the perceived sustainability does not have strong influence whether people consider participation in the sharing offer, some of the perceived sustainability was translated into sustainable actions through positive attitudes (Hamari et al. 2016). Akbar and Hoffmann (2018) conclude that environmental benefits do not appear to be a main affecting factor when choosing a mode of consumption, and that perceived stockout risk decreases consumer preference for choosing PSS. However, their study shows that for environmentally conscious consumers, the environmental benefits of PSS reduce the perceived stockout risk and increase the likelihood of choosing a PSS (Akbar & Hoffmann 2018).

As mentioned, low environmental awareness and CE knowledge can act as a barrier for CE implementation (Kirchherr et al. 2018). Increased knowledge alone can have a positive influence on PSS acceptance (Schrader 1999). Similarly, Suárez-Eiroa, Fernández, Méndez-Martínez & Soto-Oñate (2019) emphasize the role of educating for CE in successful CE implementation. Muranko, Andrews, Chaer and Newton (2019) showed that persuasive communication, for example by demonstrating the amount of waste reduced by choosing the CE option, can positively affect consumers behavioral attitudes, product perceptions, and behavioral intentions towards CE consistent products. Main tools in helping consumers to choose environmentally better option have been labels, green marketing and sharing specific environmental information (Stø et al. 2008). Improving product traceability through labels or other means helps consumers to evaluate the products' sustainability and can increase the credibility of company's sustainable image (Galderon-Monge, Pastor-Sanz & Garcia 2020). For CE solutions in textile industry, Vehmas et al. (2018) found that consumers considered the current sustainability information to be too vague and generic and including too much drama and guilt. Consumers wish for neutral and fact-based information with humoristic

approach, more concrete information about the actual impact their choices can have, communicating the CE processes in more detail and overall increasing consumers' trust with more transparency (Vehmas et al. 2018). Similarly, to help consumers to make sustainable choices, Galderon-Monge et al. (2020) suggest companies to increase transparency regarding the product manufacturing and to offer information that is reliable, easy to understand and relevant. According to Buerke, Straatmann, Lin-Hi & Müller (2017), consumers behave more responsibly when they believe they can effectively contribute to environmental issues and when they are aware of their choices' consequences. Thus, communicating CE activities in a more concrete manner could be beneficial for increasing consumer involvement.

Finally, it is important to note that consumers should not be considered as a homogeneous group, as different consumers perceive the value benefits, value barriers, and the significance of sustainability differently. Sijtsema et al. (2020) also highlight the different roles of consumer involvement in CE. According to their study, some customers wish for more convenient circular options that are easily applicable to their daily routines, while others are more open to modify their habits or behavior and be part of planning and value co-creation. (Sijtsema et al. 2020) To attract wider and also less environmentally conscious group of consumers, the service provider should emphasize other benefits besides sustainability, such as flexibility and cost savings (Bocken et al. 2018).

4 Methodology

This chapter presents the research methods used in this research. First, the case company is introduced, followed by description of the research methodology and data collection procedures. Finally, the validity and reliability of the research and methods used are assessed.

4.1 Description of the case company

The case company is a Finnish startup company that offers garden box as a service for growing vegetables and herbs in urban areas. The first operating season of the company was during the summer 2020, and the company currently has six employees. The service includes pre-grown plant seedlings chosen by the customer, weekly instructions for gardening through a mobile application, support from professional gardeners, delivery of the ready-to-farm boxes and collecting the boxes back after the growing season. The aim of the company is to offer an easy and effortless way to grow food in an urban environment, and with the support of the application and the gardening experts, even beginners are likely to succeed. The garden box service is offered for example to consumers, restaurants, companies, housing companies, schools, and retirement homes.

The case company aims to operate according to CE principles in all their processes in order to generate as little waste as possible and to minimize their environmental impact. By offering their product as a service, the company can ensure the circulation of materials and nutrients and has better control over the environmental effects. The garden boxes are reused year after year, and at the end of their life cycle the materials are recycled. The soil and nutrients are recycled to be used during the next growing seasons. The gardening soil that the company uses does not include peat, as it renews extremely slowly, although peat is currently used in most seedbeds. Overall, the company aims to minimize all waste and emissions caused by their operation, and the company has a target of being carbon negative in the future.

Since the company has built their operations according to the CE practices, it is valuable to understand how customers perceive and value their circular activities. Thus, in addition to the service value benefits, this study aims to examine the value of different circular activities and how the sustainability of the company's circular actions affect the overall value creation.

4.2 Research methodology

This study uses mixed methods research design as the study combines both qualitative and quantitative research elements. Mixed methods can complement each other and allow findings to be clarified and enhanced, which can increase the validity of the conclusions. Using mixed methods helps to gain more thorough understand of the research topic and may offer additional contextual background for the study. (Saunders et al. 2012) Using several research methods is also known as triangulation (Kananen 2020, 155). In triangulation, the phenomenon is approached with different methods and aspects in order to verify the results (Kananen 2020, 155). Triangulation helps to avoid possible systematic error of one method (Kananen 2020, 155).

Quantitative research method allows collecting data in a standardized form from a population and enables easy comparison. (Saunders et al. 2012) In this study, quantitative research methods are used in a customer survey which is formed mainly with structured questions. Qualitative research aims to describe, understand, and interpret a phenomenon under research (Kananen 2020, 35). Qualitative research is used to study complex phenomena (Hirsjärvi & Hurme 2000, 35) that are difficult to quantify (Hirsjärvi, et al. 2008) or challenging to study with experiments (Syrjälä 1995, p. 12-13). Qualitative research methods are utilized in data collection phase through semi-structured interviews. Using qualitative interviews with the quantitative, structured data deepens the understanding of the phenomenon under research (Kananen 2020, 171). The data collection methods are described in more detail in the next section.

For this research, a case study method was chosen. Case study is an empirical research strategy that examines a phenomenon within its real-life context, particularly when it is challenging to draw a line between the phenomenon and its context (Yin 2009, 18). Case study enables examining a phenomenon thoroughly and to gain detailed information from a

single case or multiple cases (Farquhar 2013, 5; Hirsjärvi et al. 2008). This study represents a single-case design, as the study focuses on one organization. Yin (2009, 47-53) defines several rationales for conducting a single-case study. A single case study can challenge, confirm, or extend a theory, or it can be informative about an average instance, test a theory in an extreme case, or study a phenomenon previously inaccessible to observation (Yin 2009, 47-53).

Single case studies can be further divided into holistic and embedded case studies, referring to the units of analysis. Holistic case study design is used when the aim is to examine a global nature of an organization whereas an embedded case study includes analyses of subunits within the organization in the study. (Yin 2009, 50-51) This study utilizes the holistic design approach, as no logical subunits could be identified for the purposes of this study. A common challenge in holistic single-case study is that the case study may be conducted at an overly abstract level with insufficiently clear data or measures (Yin 2009, 50-51). This challenge is taken into consideration by carefully defining the aims and measures of the study.

While investigating a phenomenon in a certain environment or context has several advantages, it also creates limitations in terms of extending the results in other situations (Farquhar 2013, 6). Generalizing results from a case study may be only tentatively possible, but the results can be considered as complementary to previous studies (Yin 2009, 71; Farquhar 2013, 6). In addition, as the phenomenon and context may be challenging to distinguish and several perspectives can be identified, the case study research should rely on multiple sources of evidence (Yin 2009, 18). This study utilizes various sources of evidence as it uses two data collection method, questionnaire and interview, and reflects these findings on literature and previous findings to gain comprehensive understanding of the phenomenon.

This study is conducted by using an inductive approach. In inductive approach data collection is used to examine a phenomenon and to identify patterns and themes in order to better understand the nature of the problem. Inductive approach often pays particular attention to the contextual characteristics (Saunders et al. 2012), as does the case study method. Inductive approach often utilizes several data collection methods to establish

various views of the phenomenon. The explorative nature of this study enables flexible and adaptive approach during the research process. (Saunders et al. 2012)

4.3 Data collection and analysis

The data collection consists of two parts including a customer survey and semi-structured interviews with company representatives and circular economy experts. This section describes the data collection procedures in detail and presents the data analysis process.

Customer survey

A customer questionnaire was chosen as a data collection method to discover customers' attitudes and perceptions towards the company's CE activities. The questionnaire was formed with an online survey software Qualtrix and tested before sharing it with the customers. The questionnaire was anonymous, and the respondents could not be identified from the answers. A link to the self-administered questionnaire was distributed to the customers by email and shared on the case company's Facebook page. The survey was open three weeks during spring 2021. A reminder email was sent to the customers after two weeks of opening the survey.

The questionnaire consists of general sociodemographic questions, 27 statement questions and three other questions. The statements in the survey were structured according to 5-point Likert scale inquiring the level of agreement with the statement or perceived importance of the topic presented by the statement. Likert scale was found as the most suitable for the questionnaire, as it is often used when measuring attitudes and perceptions (Heikkilä 2014, 51). In addition, there were two open feedback questions and one question inquiring the familiarity with the company's CE actions.

The aim of the questionnaire is to examine the customers' perceptions, attitudes, and valuation towards the case company's circular activities. In total, 13 responses were collected. The data analysis started by retrieving, cleaning, and organizing the questionnaire data. To calculate the statistical values for each question (Appendix 1), the responses were converted into numeric values in a way that number 1 represents the answers "strongly disagree" or "not at all important", while number 5 represents the answers "strongly agree"

and “very important”. In addition, figures and tables were formed to better illustrate the results. After examining the results of the questionnaire, the results were analyzed together with the data from the interviews.

Semi-structured interviews

In addition to customer survey, semi-structured interviews were used, as they enable deeper understanding of the phenomenon under research (Kananen 2020, 171). Interview is a flexible data collecting method where the interaction between the researcher and the interviewee enables complex answers and clarifications during the interview. The flexibility of the interview also allows to steer and deepen the information collection according to the interviewee’s knowledge and experiences. (Hirsjärvi & Hurme 2000, 33-35, 43) Interview types are categorized based on the level of structure. In semi-structured interview the themes are same to all interviewees and the interview proceeds roughly according to the planned questions or themes, but the answers are free form (Eskola & Suoranta 2005, 86). Semi-structured interview allows focusing on specific themes more thoroughly if necessary (Hirsjärvi & Hurme 2000, 47-48).

From the case company, three persons were interviewed individually. The first company interviewee was a gardener, who works in projects related to urban agriculture development and local nutrient circulation and develops ways to improve the sustainability and efficiency of the soil circulation for the planter boxes. The second company interviewee represents marketing and sales. The third company interviewee represents the case company’s finance and administration. The interviewee also works as an expert in projects related to polluted environment cleanups, environment and energy technology, sustainable development and the CE. Interviewing persons from different positions gives versatile viewpoints to the collected information. To get more thorough understanding of the value of circular PSS, two CE experts were interviewed for the study. The first CE expert interviewed works for the city of Tampere with topics such as achieving the city’s carbon neutrality targets, and in a project regarding sustainable city district development, such as urban food production and CE in cities. The second CE expert interviewed works as a project manager in a project that aims to promote circular food production in urban environment. The project includes for example urban food production experiments in housing companies, campaigns for reducing waste, and utilizing food waste in restaurants. The CE expert also sent notes the interviewee

had prepared for the interview to be used in the analysis. Both CE experts were familiar with the case company's business model through participating in a joint project. Therefore, they had a good understanding of the contextual characteristics that the case company operates within.

All interviewees were interviewed individually, and the interview themes and preliminary questions were sent to the participants beforehand to allow preparation for the interview (Appendix 2 and 3). All interviews were held through Teams, and the interviews were recorded for later transcribing. All interviews were arranged during April 2021. Information about the interviews is presented in Table 1.

Table 1. Interview information

Interviewee	**Position of the interviewee**	**Code**	**Duration (min)**
Company representative	Gardener	A1	49
Company representative	Sales and marketing	A2	30
Company representative	Finance, administration	A3	30
CE expert	Project manager	B1	51
CE expert	Project manager	B2	97

To comply with ethical standards of conducting research, the interviewees were asked for their willingness to participate in the interview, and the participation was voluntary. The interviewees were instructed how the data would be used and permission to record the interviews for later transcribing was asked. The interviewees personal information is not disclosed in this study.

The analysis of the interviews started by transcribing the recordings of the interviews and by grouping the answers according to the interview themes. Next, the analysis proceeded to identifying repetitive topics and patterns as well as unique perspectives from the transcriptions and the interview notes one CE expert had prepared and sent. After roughly organizing the answers, the questionnaire data and the interview answers were analyzed together to find similarities, differences, and complementary aspects.

4.4 Validity and reliability

Validity and reliability indicate the quality of the study. Validity describes how well the measurements correspond to the phenomenon that the research aims to examine (Vehkalahti 2008, 41). Valid research does not have systematic error, and thus validity requires accurately defined concepts and variables (Heikkilä 2014, 27). When the object of the measurement is abstract, such as attitudes or values, creating valid metrics can be challenging (Heikkilä 2014, 28). Validity can be divided into three logical tests, including construct validity, internal validity, external validity (Yin 2009, 40). Construct validity refers to determining accurate operational measures for the concepts being examined. Construct validity can be improved by using multiple sources of evidence, establishing chain of evidence and by defining specific concepts with matching measures for studying the phenomenon. (Yin 2009, 40-42) This study uses multiple data sources, since the data is gathered from the company representatives, CE experts and customers. Establishing a chain of evidence means building a clear chain from the research questions to the conclusions through sufficient citations to relevant data evidence and data collection circumstances (Yin 2009, 114-115). Additionally, the chain should follow specified and defined procedures (Yin 2009, 114-115). The data collection procedures and circumstances were presented in detail in this chapter, and the results of the data collection are introduced in the next chapter. All steps taken and results are explained in detail to ensure adequate chain of evidence in the study. Additionally, the customer survey questionnaire of this study was planned carefully and tested before distributing it to the customers in order to improve validity and ensure the quality of the measurements.

Internal validity refers to establishing a causal relationship where certain conditions are expected to lead to other conditions (Saunders et al. 2012). Internal validity concerns mostly causal or explanatory studies (Yin 2009, 40) and therefore is not considered in this study. External validity defines the extent to which the results of the study can be generalized (Saunders et al. 2012). External validity has typically been challenging for case studies (Yin 2009, 43). However, case study research relies on analytic generalization, where a specific set of results can be generalized to theory or help to identify other cases where the results would be generalizable (Yin 2009, 43-44). External validity can be improved by utilizing a theory in single-case studies (Yin 2009, 41). The limitations of external validity for case

studies are taken into consideration when considering the generalizability of the results in the final chapter.

Reliability indicates whether the data collection and analysis techniques produce consistent results in case the study was replicated (Saunders et al. 2012). Reliability refers to the accuracy of the measurements, meaning that a reliable measurement has minimal error and bias (Vehkalahti 2008, 41). Reliable study is repeatable with same findings, but the findings must not be generalized further than the study is valid (Heikkilä 2014, 28). Reliability of a case study can be improved by documenting the procedures of the case in detail (Saunders et al. 2012). In this study, the reliability is taken into consideration by explaining the used research methods and procedures in detail, and by recording and transcribing the interviews in order to keep all relevant information in safe. Reliability can also be improved by maintaining the chain of evidence, as explained before (Yin 2009, 122-123). Additionally, using self-administered anonymous questionnaires will unlikely cause the respondent to modify their answers to please the researcher according to what is seen as socially desirable response (Saunders et al. 2012).

5 Findings

This chapter presents the findings of the empirical study based on the data collected from the customer survey and the interviews. To get a comprehensive view of the case company's operating context, food production in urban environment is first discussed. After that, the customer value of circular PSS is discussed by starting with the results regarding the value of different PSS service features. Next, the value of the environmental benefits of CE elements is examined, after which the overall perceived value of CE and the issues regarding the communication of the value are viewed.

5.1 Case context: urban agriculture

The context of urban agriculture was first discussed with the interviewees. All interviewees highlight the need for change in the global food system, and they consider urban food production as a way to support more sustainable total food system. According to the interviewees, the current food production system will face several challenges in the future that needs to be tackled, such as increasing demand of food due to population growth, depleted soil quality, and erosion (B2, A2). A company representative notes that the conventional agriculture has leaned strongly on monoculture and chemical fertilizers which are nowadays considered inefficient in the long term (A1). In addition, the climate change affects the conditions of food production, such as the water and nutrition system of the soil (B2). This causes challenges in adapting to rapidly changing environment and increasingly exposes the production to disruptions (B2). It was mentioned that although climate change may make farming some plants easier in Finland, the more frequent extreme weather conditions will cause challenges in food production in Finland as well (A2). One CE expert explains that as the current food system is vulnerable under economic, logistic, and ecological risks, alternative food systems are being developed to overcome these challenges (B2). These systems look for alternative ways of producing and distributing food, and urban food production and technologies related to it are one way to support more sustainable total food system (B2). Alternative food systems typically operate regionally (B2). Urban food production includes several features that are required in sustainable food system, such as

technological innovations, regional cooperation, community farming, direct sales, short supply chains, low intermediate storage, and sustainable energy use (B2).

According to a CE expert, circular economy is an essential part of urban food production, and many of the solutions utilize bio-waste fractions (B2). Urban food solutions are typically highly resource efficient in terms of water, nutrient and space use, and nutrients are kept in closed-loop circulation (B2). However, many current solutions require lots of energy. The CE expert notes that the solutions evolve rapidly, and new, energy-efficient innovations are constantly being developed, besides much of the environmental impact depends on the energy source used (B2). Urban production is not as exposed to environmental instability as conventional agriculture. Additionally, urban farming that is located outdoors can act as a carbon sink and mitigate the issues of urban rainwater runoff. (B2) According to the interviewees, a major challenge of the CE in cities relates to circulating bio-waste fractions more efficiently into food production and to utilizing for example waste heat better (B2, A1).

The present time enables advantageous conditions for the development of urban food production, such as technological innovations, digitalization, and robotization (B2). The interviewees underline that urban food production does not aim to replace production in rural areas but could support the total food system in a sustainable way. Urban agriculture can create new business opportunities and cost savings through new innovations. Developing urban food production can create new technologies and innovations that can be utilized in conventional production as well. As the urban food production solutions are developed outside the agricultural subsidy system, the developed solutions are highly resource efficient and not affected by changes in subsidies. (B2) Urban agriculture can also improve self-sufficiency and food security (B2), however, the other CE expert does not consider urban food production development to have relevant impact on the overall food security in Finland (B1). Currently, commercial urban agriculture solutions are rare in Finland, mainly because land and premises in cities are so expensive and there is a lot of arable, cheaper land in Finland (B1). In addition, new technologies require expensive investments (B2). Thus, a major challenge is to make urban food production cost-efficient enough for it to be profitable and competitive in terms of urban land and space use (B1, B2). However, the CE experts note that globally, there are multiple examples of profitable urban agriculture, for example in the Netherlands, Sweden, Japan, France, and the USA (B1, B2). According to the

interviewees, in Finland, already existing but unutilized premises and structures such as rooftops or walls could be used more, but it is still surprisingly rare (B1, A1, A3). The CE experts add that city planning can have a major impact on supporting the urban agriculture solutions to become more common (B1, B2). In addition, the food industry, food processors, restaurants, the grocery trade, online grocery trade and transportation services have the potential to create demand for urban food production (B2).

One CE expert notes that tracing the origins of a single grocery can nowadays be extremely difficult, and urban agriculture can improve traceability (B2). Food that is locally produced is easier to trace, and shorter supply chains improve transparency which can appear as increased feel of trust to consumers. When it comes to food, safety and traceability are especially important properties, and urban food production can offer transparent, short supply chains as the food is produced locally. Locally produced food can also offer straight connection to the producer and supporting local food production can be perceived as valuable as well. According to the CE expert, it has been shown that most consumers want to support local food producers when possible. The CE expert also sees that having for example labels or certificates to locally produced food could increase the traceability and the sense of safe food, which can increase the food appreciation and interest towards food. (B2) Local urban food production can improve the brand of a city or a district that wants to be profiled as sustainable and circular (A1, B1, B2). Urban food production can create social benefits through increased well-being and improve the sense of community in the area for example through community farming (B2). It could improve the urban landscape value (B2).

All interviewees emphasize the importance of urban food production in increasing consumers' appreciation towards food and food's origins. Several interviewees point out that currently approximately 55% of global population lives in cities and 80% of all produced food is destined for consumption in urban areas, and due to increasing urbanization the numbers will grow in the future (B2, A2, A3). Some urban agriculture solutions focus on participating the consumers of food into the production process. Bringing food production closer to consumers and even participates them in the production strengthens the connection with the food production process and increases consumers' interest and appreciation towards food. Participating consumers in farming of their own food also changes their role from passive consumers to active actors in the process. (B2) Improved connection to food supports

the development of sustainable food system as the resources and effort required in growing food becomes clear, for example, one CE expert notes that increased food appreciation has been connected with reduced food wastage (B1). In Finland, for some consumers, the idea of producing own food is still relatively familiar, which is seen for example in the popularity of community gardens (B1). However, the connection to food has weaken due to urbanization (B2).

"As many citizens do not have connection to countryside, for example through summer cottages, it is clear that the connection to food does not develop by itself. One of the greatest things in urban food production is the possibility to improve citizens food connection and knowledge about how food comes to their table." (B2)

The case company offers garden box as a service to enable easy and effortless way to grow food and practice gardening. The service is meant to facilitate producing own food and to bring the process of growing food closer to people living in an urban environment. According to the interviewees, growing food in cities is an important way to increase appreciation of food and to strengthen the consumer's food connection, but on a larger scale urban agriculture could also be an important part of more sustainable food system. In the future, several different solutions are needed for total food system and urban agriculture, and the interviewees see their service as an initiative towards sustainable urban food production that participates citizens. The company representatives see that their service offers low threshold option and experience that will hopefully make consumers interested in food production and its origins. (A1, A2, A3) One interviewee ads that as their service is based on traditional gardening in soil, it is easier to approach than some unfamiliar new technology innovation (A3).

By offering the product as a service, the company can offer easy gardening experience, but also ensure resource-efficient material and nutrient cycles in their business. In the future, the case company aims to build more efficient material circles and to develop their service so that it could operate regionally (A1, A3). The aim is that the service could be linked to local plant and soil producers, and recycling the soil and the circulation of nutrients could be carried out locally within each city they operate (A1). This would support local producers and minimize logistics needed for the service, but also create positive brand to the cities as they could support producing local food starting from the nutrient cycles (A1, B1). What

makes operating according to CE principles difficult, is that according to the company representatives, there are not many sustainable solutions existing yet (A1, A2). One interviewee mentions that for example fertilizers that are produced sustainably and according to the CE principles do not exist at the moment (A1). Even when the company finds sustainable methods, operating according to CE may cost the company more money, time or effort, at least with the current operating scale (A2, A3). Still, the company wants to operate according to the CE principles, as the interviewees see them as a sustainable foundation for doing business, and operating sustainably does not mean that the business could not be profitable (A2, A3). Additionally, operating in accordance with the CE has raised interest in different stakeholders (A1, A2, A3). As the CE is the foundation of the case company's operations, it is important to understand how their customers perceive the CE operations and whether they are considered valuable by the customers.

5.2 Consumer value of circular PSS

In this section, the data collection results regarding how customers perceive and value the case company's circular economy activities and efforts are presented. In total, 13 responses were collected. In the beginning of the survey, general sociodemographic questions were presented to get an overview of the respondents. The respondents' age, gender, the city of residence or location of business and whether the respondent was a private customer, a company representative, or a housing company representative was inquired. All respondents were private customers located in Tampere and several cities in Southern Finland. As shown in Figure 3, nine of the respondents were female and four male respondents, and the biggest age groups were respondents aged 20-29 and 40-49.

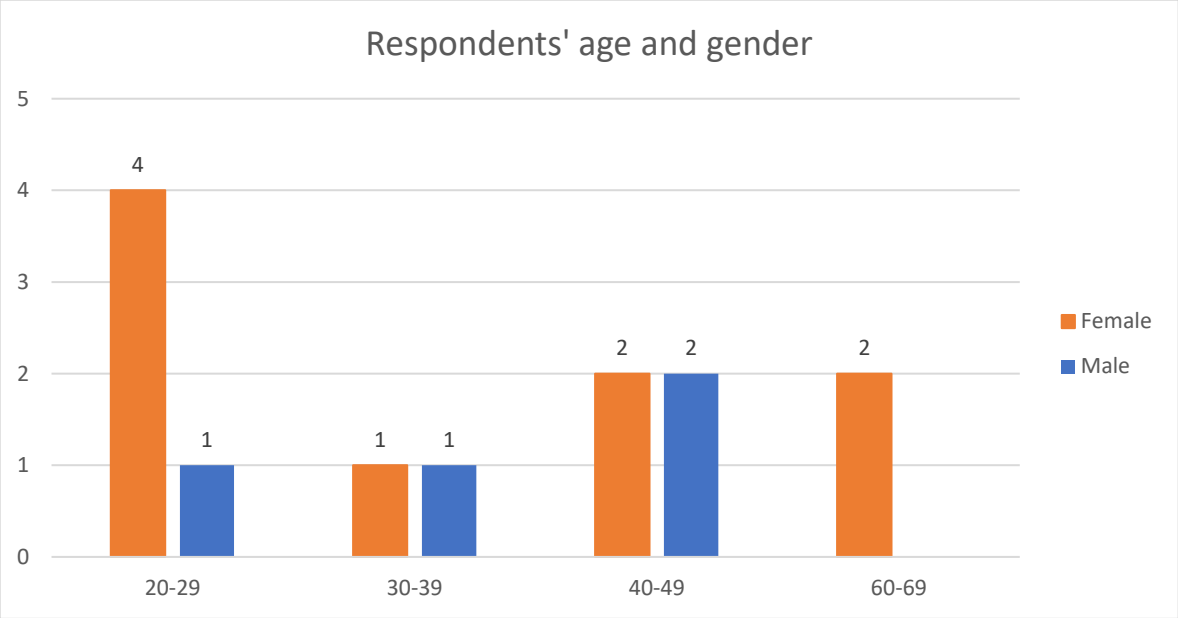

Figure 3. Respondents' age and gender

Next, the customer questionnaire results regarding customer value are presented and complemented with the interview answers. The aim is to understand the perceived benefits of service offering as well as the value of different CE elements. First, the perceived value of offering a product as a service is analyzed based on the collected data. Next, background information about the respondent's interest towards environmental impact of their own behavior and companies' actions are examined, followed by the responses and interview results about the value of the case company's circular activities. Finally, and the overall valuation of circular economy activities is discussed as well as how to communicate CE related actions to consumers.

5.2.1 The value of PSS service features

This section examines which properties of the PSS type of gardening service are valued the most and how the different properties compare to the fact that the company is minimizing the environmental effect on behalf of the customer. One CE expert notes that a product or a service offering is not on a viable basis if the only motivation that guides the customer is sustainability (B2). The product or service should have other competitive advantages as well, such as lower price, quality, or ease of use. The CE expert is optimistic that CE innovations

could offer new possibilities for products and services that are resource efficient and could offer the same or better experience to the customers with lower costs. (B2)

All the case company representatives suppose that the functional benefits of the service model are what primarily interest customers, rather than the environmental benefits. They assume that the ease of using a gardening service is the most important reason to choose their service, but that the flexibility would be considered important as well. (A1, A2, A3) The ease of the service comes from the feature that the garden boxes are delivered to the customer's location, and the boxes are collected after the growing season. The customer does not need to consider the logistics of the materials, which is especially convenient for customers who do not own a car (A1). Secondly, the garden box includes the soil and pre-planted seedlings of the customer's choice. Overall, using a service where several steps are taken care by the company saves time and effort for the customer. Using a gardening service enables certain flexibility to the customer that buying a conventional product cannot offer. The service gives a low threshold opportunity to try urban gardening without permanent acquisitions. Moreover, as the garden boxes are collected after the growing season, the service offers more flexibility in terms of space use. These aspects were inquired in the customer questionnaire.

Two key features that distinguish the service from a traditional product are the support from the application and the gardeners (A1). The application provides frequent information about how and when to take care of the plants. In addition, the gardeners can be contacted to help with issues emerging during gardening. The perceived importance of both were examined in the questionnaire. The support and education that the service provides allows customers to start urban farming without needing to gain an extensive knowledge about the topic first (A2). The support provided in every step makes it easier for an average citizen to try growing one's own food (B1). The company representatives also suppose that the company's environmental efforts, such as recycling the soil, could interest some of the customers, but that for many it is a nice addition rather than a significant component in the decision-making process (A1, A2, A3). This aspect and its relation to other functional service benefits was examined by inquiring the customers how important they consider the fact that the company takes care of the environmental impact of the operations on their behalf.

The distribution of the responses is shown in Figure 4. According to the respondents, the feature perceived as most important was the ease of delivery and collection of the garden boxes. All respondents expressed this to be at least moderately important, and for five respondents this was a very important feature to them. The next important features were the chance to save time and effort, and that the chosen seedlings are pre-grown and planted in advance. Both features were valuated very important by three respondents, while both were also evaluated to have low importance by one respondent. Moderately important features were low threshold for starting gardening without permanent acquisitions and the support for gardening provided by the application and the gardeners. Minimization of environmental impact by the company and saving space outside the growing season were considered the least important from all presented features.

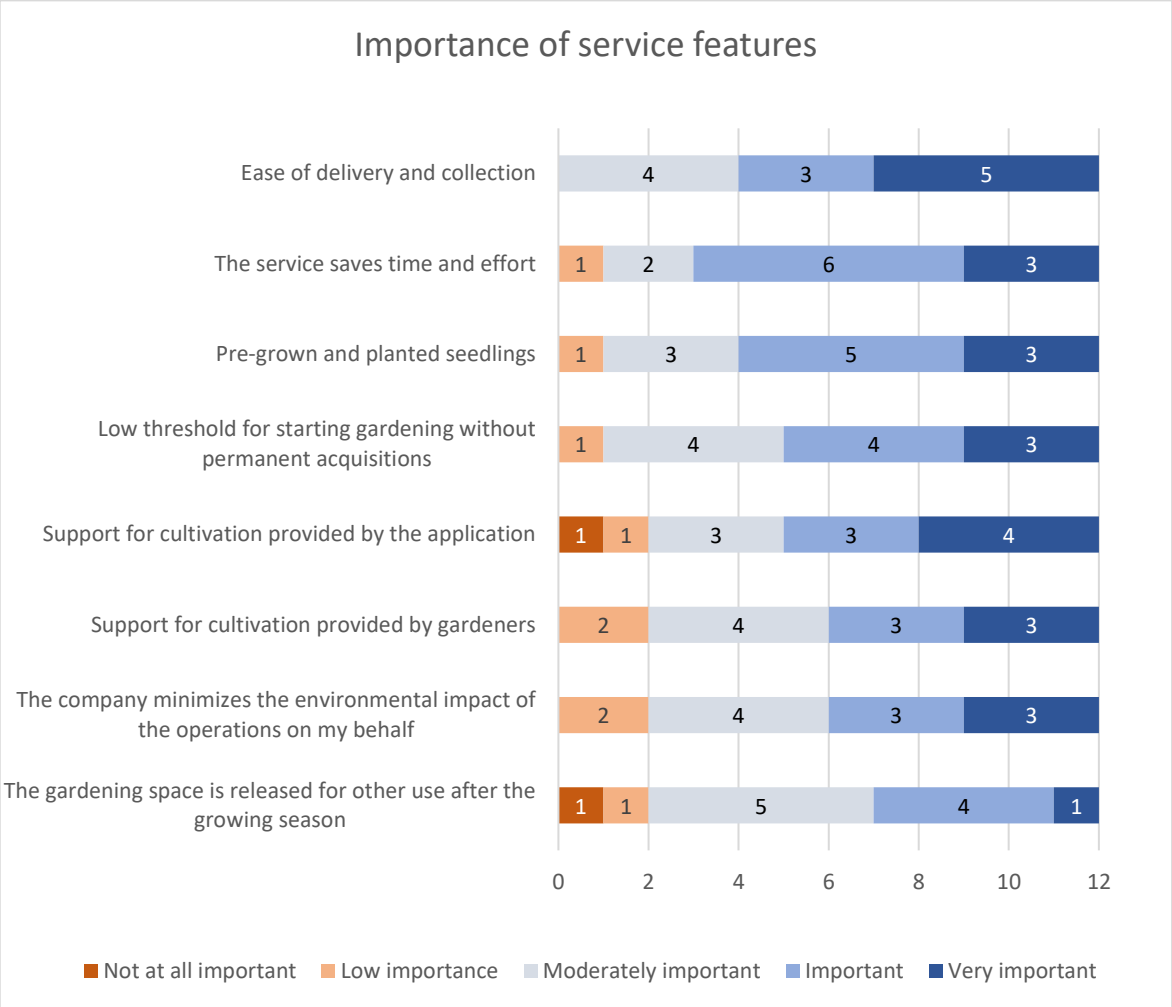

Figure 4. Importance of different service features

To understand more generally what elements customers value in the service offering, the service benefits were distributed into four groups: ease and convenience, flexibility, support, and environmental benefits. The groups are presented in the Table 2. From the four groups, ease and convenience of the service solution was clearly the most important to the respondents. As mentioned before, it was also assumed by the company representatives that the ease of the service solutions is the primary reason why customers choose their service (A1, A2, A3). Additionally, it should be noted that from all individual service benefits, the three most valued features represent ease and effortlessness. The second important group was the support provided by the application and the gardeners, with the application being valued slightly more. The support and guidance were also praised in the open feedback section of the questionnaire. One company representative assumed that the service convenience and the support provided by the application and the gardeners can potentially create value by reducing the perceived uncertainty related to gardening, especially if the customer is trying it for the first time (A1). In addition, value can be created by increased self-confidence as the customer is likely to succeed with the additional support (A1), which a traditional product usually does not offer. Third group was the environmental benefit of a service solution, and fourth the perceived flexibility that the service provides. However, it should be noted that there is a big difference between the two flexibility related service features, the low threshold for starting gardening being the fourth most valued feature while releasing space after use being the least important for the respondents.

Table 2. Importance of different service features and feature groups

Feature groups	Service benefit	Mean	Group mean
Ease and convenience	Ease of delivery and collection	4,08	
	The service saves time and effort	3,92	
	Pre-grown and planted seedlings	3,83	3,94
Support	Support for cultivation provided by the application	3,67	
	Support for cultivation provided by gardeners	3,58	3,63
Environment and sustainability	The company minimizes the environmental impact of the operations on my behalf	3,58	3,58
Flexibility	Low threshold for starting gardening without permanent acquisitions	3,75	
	The gardening space is released for other use after the growing season	3,25	3,50

Compared to other features, the fact that the company minimizes the environmental impacts of the service was considered less important than most features. The CE experts note that although the consumers are getting more aware of sustainability related issues, other features usually have more influence in the final decision making (B1, B2). The company representatives were similarly speculating that the environmental benefits are not the main reason for choosing their service (A1, A2, A3). All interviewees suggest that although there is a growing interest towards sustainable choices, sustainability alone is not enough to get large crowds to choose a sustainable product or service. To get more consumers to choose a service offering, the solution should be cheaper than owning or for example clearly more effortless choice for the user than a conventional product (B1, B2). However, according to the CE experts, there is a small but growing group of consumers who base their consumption decisions heavily on the environmental impact of different choices (B1, B2).

Some of the interviewees indicate slight frustration towards the fact that there still exists a strong culture of owning, especially in Finland (A3, B1). One CE expert states that today, many of the consumers prefer to have the product within reach at any moment, even when they rarely need it, or the product's maintenance would be expensive (B1). One interviewee adds that in addition to owning, Finns are used to do everything by themselves and do not often even consider using a service instead (A3). The perceived inconvenience of not owning the product may lead the consumer to choose a traditional product, which is a significant barrier for circular PSS (B1). However, for the case company of this study, this is not as much of an issue as the garden boxes stay with the customer the whole summer, and they are collected only when the growing season is over. In their service, returning the boxes is positive feature as it saves space for the customer and leaves all the laborious tasks after harvesting the yield to the case company to manage. The CE experts sees the case company's offering as an example where the service model only creates positive value to the consumers (B1). However generally speaking, to get more customers to choose a PSS offering, there needs to be a change in attitudes towards buying products and using a service instead (A3, B1). For many PSS, the group that prefers services over owning a product, is currently quite small, although the CE experts feel that the interest is growing (B1, B2). As mentioned, the service needs to be extremely easy to access or cost significantly less than buying a product in order it to interest larger crowds (B1, B2). For luxury products or for example highly expensive tools it is easier for a service model to attract consumers as it gives access to

products otherwise too expensive to own (B1). However, the CE expert say that shared use of resources is clearly a growing trend and is frequently discussed when developing urban areas (B1). The shared use of resources through a service can also create social value and sense of social belonging (B2). For example, community farms in cities can bring people together and create value that cannot be achieved by buying traditional products (B2).

One CE expert comments that the increase in consumer awareness is related to a phenomenon called *new consumerism*, where the consumers are perceived as active users and actors, rather than passive consumers. As an active user, the consumer becomes part of producing the experience, as often happens in PSS. The CE expert notes that the consumers want both experiences, and easy life, and in best scenario a circular PSS can offer both. (B2)

"Overall, the western consumption is considered to be in a turning point, and consumers' relationship with commodities is going through structural changes. Alongside and instead of buying, immaterial things such as experiences are valued." (B2)

The CE expert notes that in many urban food production solutions the focus has shift from producer-oriented approach towards consumer orientation. In urban food production services, the customer has a big impact to the final result and how big the yield grows. The conventional arrangement where consumer only consumes food thus changes as the consumer can also impact to the result and value of the service. (B2) The CE expert notes that as consumers can be involved in providing the service and its outcome, it is particularly important to include consumers as a stakeholder in the development of the service (B2).

Both CE experts mention that offering product as a service enables the company to include an educational dimension in their service (B1, B2). Service model allows customers to gain information in a different way as an active user of a service than a passive buyer of a product (B2). While the conventional product often leaves learning on customers' own hands, PSS allows constant interaction, education and support when needed. The interviewees note that educational dimension is especially visible in urban food production services (B1, B2). The service can for example include thorough guidance when establishing the farming system or constant education and support with an application throughout the growing season (B2). Applications included in the services can guide the customers' behavior in using the service so that customer gets highest possible value from the service, but also steer the customer

towards sustainable behavior through learning and gamification (B2). Using the application in supporting gardening can also give the customer concrete feedback and experience of learning in a form of a better yield (B2). Thus, the educational and learning dimension of the service can create value through increased self-confidence and experiences of success (A1).

One CE expert notes that in addition to educating in farming, the service can also inform the customers about the origin and value of the food they eat (B2). The educational dimension can therefore also support strengthening the food connection. Besides improving customers' awareness, the urban farming services can make food production accessible to everyone, not only to the natural green thumbs. Hence, urban farming services offer pleasant activity, but can also improve consumers' connection to food and increase the appreciation of food. (B2)

5.2.2 The value of environmental benefits and CE activities

This section aims to examine the value of the case company's CE activities and environmental benefits of their service offering. Before more detailed questions, general information about the respondent's interest towards environmental impact of companies' actions and their own behavior was examined. The first question inquires the respondents' general interest towards sustainability issues, while the second question inquires whether the customer actively looks for sustainability information about companies or products they are interested in. Third question inquires whether the sustainability issues have an impact on the respondent's consumption habits. The results are shown in Figure 5 and Table 3.

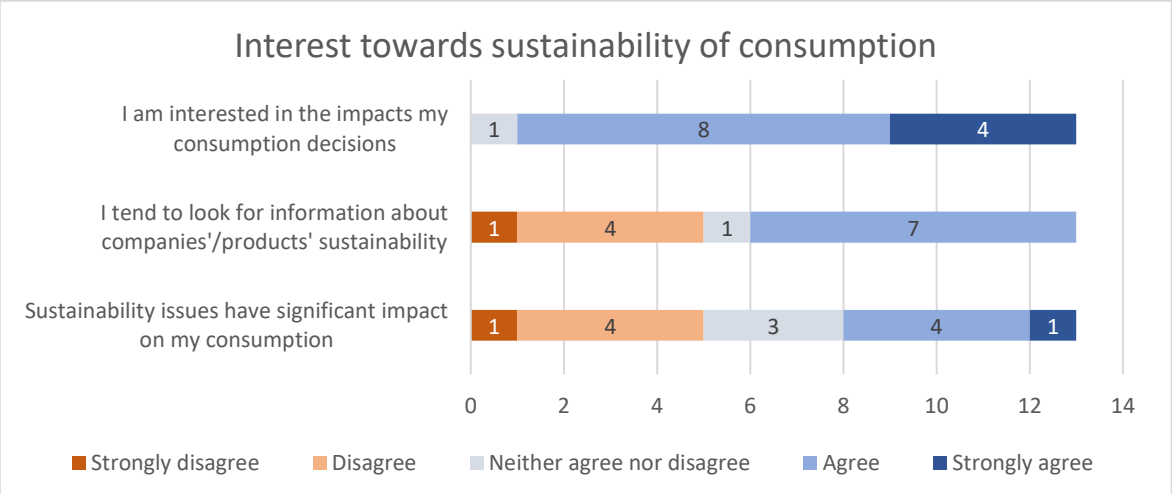

Figure 5. Respondents' interest towards sustainable consumption

Table 3. Respondents' interest towards sustainable consumption

Statement	Mean
I am interested in the impacts of my consumption decisions	4,23
I tend to look for information about companies'/products' sustainability	3,08
Sustainability issues have significant on my consumption	3,00

The results show that majority of the respondents are interested in the impacts of their consumption, but on two other questions that relate to actions and behavior, the responses are more scattered. The discrepancy between interest, intentions and actual behavior was also highlighted by both CE experts (B1, B2). Additionally, considering the answers together with the previous section, consumers show interest towards sustainability issues, but other features such as convenience are perceived more important in consumption decisions. One CE expert adds that when interpreting consumer's answers, it should be noted that generally, consumers often answer that they make sustainable choices in life but in reality, the answers tend to be too optimistic (B1).

The next question inquired how familiar the respondents are with the term "circular economy" and the meaning of the CE concept. The results are shown in Figure 6 and Table 4. All respondents had heard the term before, and it was perceived as positive by all the respondents. Additionally, majority of the respondents answered that they have a fairly good understanding of the CE concept.

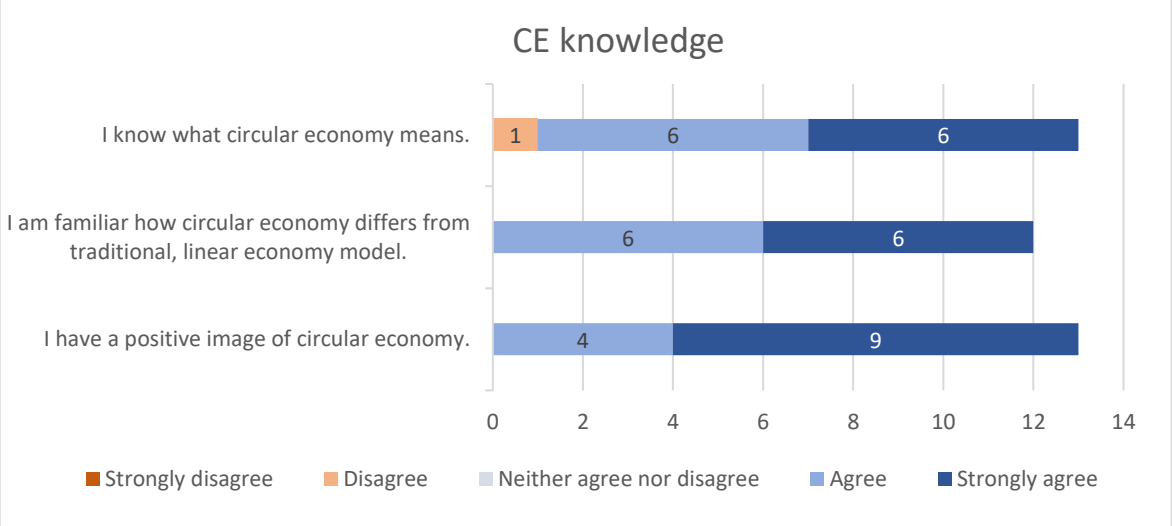

Figure 6. Respondents' CE knowledge

Table 4. Respondents' CE knowledge

Statement	Mean
I know what circular economy means.	4,31
I am familiar how circular economy differs from traditional, linear economy model.	4,50
I have a positive image of circular economy.	4,69

Although majority of the respondents answered to be familiar with the CE term and the meaning of the concept, the interviewed CE experts note that circular economy is extremely wide and complex concept that is difficult to understand thoroughly (B1, B2). In CE knowledge related questions as well, the answers tend to be optimistic, and consumers often overestimate their knowledge (B1). One explanation is that consumers sometimes consider CE to be synonym for recycling or waste management only (B1). In addition, one CE expert comments that the benefits of moving towards CE do not seem to be clear to the consumers yet (B1). It is easier to understand specific targets such as aiming for carbon neutrality or closed loop circulation, but as CE is a whole economy system it cannot be expected that every consumer would understand it thoroughly. Thus, it should be made easy for the consumers to choose the most sustainable option, without requiring extensive knowledge about the topic. (B1) However, having familiarity with the term and a positive overall CE image can be beneficial to the case company.

Similarly, the other CE experts comments that it should not be necessary for consumers to understand CE thoroughly in order to be able to make sustainable choices (B2). Many consumers are mostly interested in financial value and convenience. Sustainable and CE consistent choices should thus be the cheapest or at least marked with reliable certificate labels that tell the consumers clearly the environmental impact of the product or service, making the comparison easy and effortless. Until that kind of steering and nudging methods are available, sustainable choices are strongly dependent on consumers' previous knowledge and interest on sustainability issues, and how well the companies brand their CE product or service. (B2)

The next section examines which of the case company's CE activities the customers are familiar with. The survey respondents were requested to select from different CE activities the ones that they associate with the case company and have heard about before. The aim of this part is to collect information how familiar the customers are with different CE activities

and whether some of them should be communicated more clearly. The Figure 7 below shows the examined CE activities and how many of the respondents were familiar with each of them. Recycling the soil and boxes were the most familiar CE activities to the respondents, while not using peat in the soil was the most unfamiliar. Recycling nutrients and minimizing waste streams were familiar to almost half of the respondents and minimizing emissions and carbon negativity targets were familiar to four respondents only.

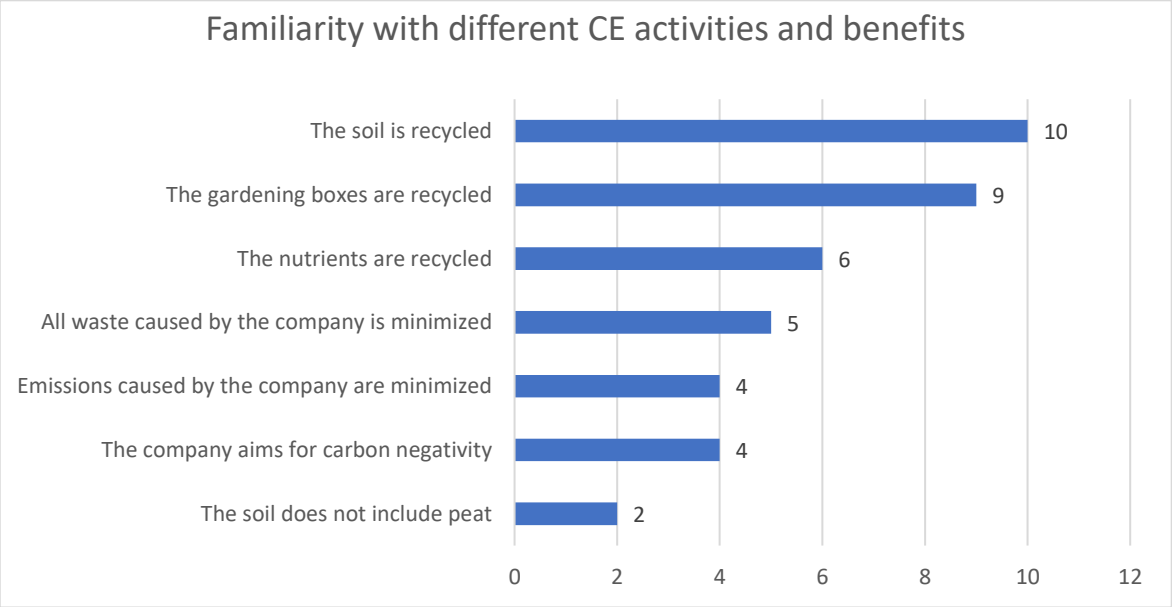

Figure 7. Familiarity with different CE activities and benefits

The company representatives comment that when bringing the garden boxes to the customer's location, they inform the customers about recycling the soil and boxes, but other than that the environmental benefits of their operations are not considerably communicated. Therefore, it is understandable that those two CE actions were the most familiar to the respondents. The interviewees feel that it is difficult to communicate the benefits of circular activities or other sustainable aspects, as those features are not clearly visible to the customers in the service. Additionally, the interviewees are not sure how interested the customers are about the circular processes behind their operations or whether they perceive them as important at all. (A1, A2, A3)

The next section examines the respondents' perceptions and attitudes towards the case company's circular activities and urban gardening in general. The topics are similar to the previous section with few specifying statements about the recycled soil and the plastic

garden boxes, as those are topics that the company is most frequently asked about (A2). The case company has decided to use plastic in their garden boxes, as they can be reused multiple times, the material is hygienic, they are easy to storage, and at the end of the boxes' life cycle the material can be recycled into new boxes (A2). However, the use of plastic material has sometimes raised questions about the sustainability of the boxes, and therefore the customers' perceptions about the use of plastic was examined with two statements. Additionally, the perceived safety and quality of the recycled soil was examined, as consumers' concerns about quality and safety of previously used products and materials has been highlighted by previous literature (Armstrong et al. 2016). The statements and the results of this section are presented in the Figure 8 and in Table 5. Additionally, there was a possibility to leave an open comment or a question regarding these topics.

The most agreed statements considered the importance of minimization of emissions and waste and aiming for carbon negativity. The recycling of the soil was considered important as well, and the recycled soil was considered safe to use and to have good quality, although the answers to these questions had more variation than in the first two. In addition, some respondents had left open comments regarding whether recycling the soil is actually safe, and whether recycling the soil is reasonable. The benefits of urban farming and the importance of not using peat in the soil were somewhat agreed, and none of the respondents strongly disagreed with the statements. The last two statements regard the plastic boxes used in gardening. The first one justifies the use of plastic instead of wood as a material due to the reuse and recycling properties. Eight respondents either agreed or agreed strongly and four responses were neutral, while one of the respondents disagreed strongly with the reasoning of the plastic use. The last statement examined the respondents' attitudes towards the use plastic in the garden boxes by stating that other materials would be more desirable. Compared to the previous statement, the responses here should be reverse due to the layout of the statement. Six respondents disagreed or disagreed strongly and four were neutral while three agreed or agreed strongly.

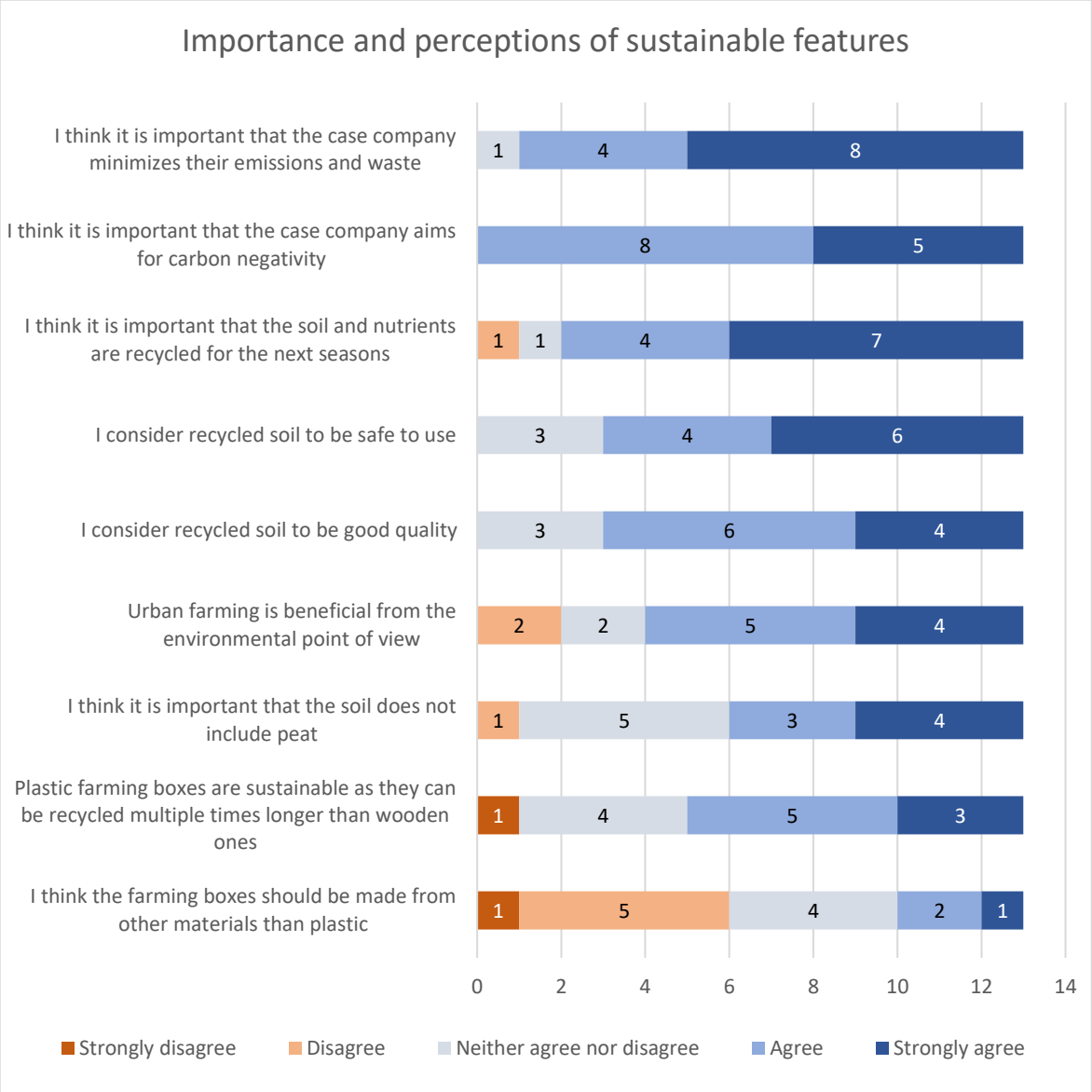

Figure 8. Importance and perceptions of sustainable features

Table 5. Importance and perceptions of sustainable features

Statement	Mean
I think it is important that the case company minimizes their emissions and waste	4,54
I think it is important that the case company aims for carbon neutrality	4,38
I think it is important that the soil and nutrients are recycled for the next seasons	4,31
I consider recycled soil to be safe to use	4,23
I consider recycled soil to be of good quality	4,08
Urban farming is beneficial from the environmental point of view	3,85
I think it is important that the soil does not include peat	3,77
Plastic farming boxes are sustainable as they can be recycled multiple times longer than wooden ones	3,69
I think the farming boxes should be made from other materials than plastic	2,77

The company representatives supposed that the most important environmental benefits for the customers would be recycling the soil and the boxes. In addition, they expected that some environmental value may come from the fact that the company aims for carbon negativity and to minimize the waste streams and emissions caused by their operations. (A1, A2, A3) However, aiming for carbon negativity and the minimization of emissions and waste were perceived as the most important activities, possibly because they are well-known sustainability targets and frequently mentioned in the media. According to a CE expert, these are familiar targets for many, and the environmental benefits of these actions are easy to understand, compared to for example nutrient circulation (B2).

The CE experts note that a strong barrier for circular PSS implementation is the image that used products have. For that reason, some companies might be afraid of using previously used products as those could negatively affect their image (B1). One CE expert states that typical perceived risks of secondhand products are related to safety, hygiene and quality, and these negative assumptions are deep in our culture and attitudes (B1). Additionally, it was mentioned that it is more difficult for consumers to accept a used product when the product remains externally the same. The more the product is changed in the process, so that it looks different or is used for different purpose, the more it seems new, safe and clean, and the easier it is for consumers to accept (B1). However, the CE expert also notes that if the consumer is aware of the benefits of CE and considers it as a meaningful value in life, it is much easier to let go of the negative associations related to previously used products (B1). However, according to the survey, the recycled soil was considered to be of good quality and safe by most respondents, although one open feedback questioned the safety of the recycled soil. Both CE experts note that much of the CE customer value and perceived risks depend on branding (B1, B2). For example, the term wastage is easily associated with something negative, secondary and of bad quality, especially when considering food (B2). It would be beneficial if the company manages to brand the product as something with higher and unique value, as it could lead the association away from waste management (B2).

Finally, the overall perceived value of CE activities was inquired with four statements, regarding the value and impact of knowing that company operates according to the CE principles has on the respondent. The first statement relates to the sense of getting better value for the money spent from service compared to a traditional product offering, while the

other statements refer to improved brand image, increased interest, and increased intention to choose the offering that is produced according to the CE principles. The aim of this section is to examine how the information about the CE efforts of the company affects the consumer, how the efforts are valued and whether the gardening as a service offer creates better value to the customer. The results are presented in the Figure 9 and Table 6.

For the first statement, getting better value for money spent with the service offering, most of the respondents agreed, while four responses were neutral and one disagreed. The next statement considers the impact that a company's CE practices have on the company image. The answers were very positive, as only one respondent was neutral about CE information, but rest of the respondents agreed or agreed strongly with the statement. The next statement inquires whether a company's CE activities increase the respondents' interest towards the company. Similarly to the previous statement, one response was neutral and rest of the respondents agreed or agreed strongly. The last statement examined the respondents' perceptions whether a company's CE activities makes the respondent more likely to choose that company's product or service. Again, the responses were very positive, as none of the respondents disagreed, three were neutral and the rest agreed or agreed strongly.

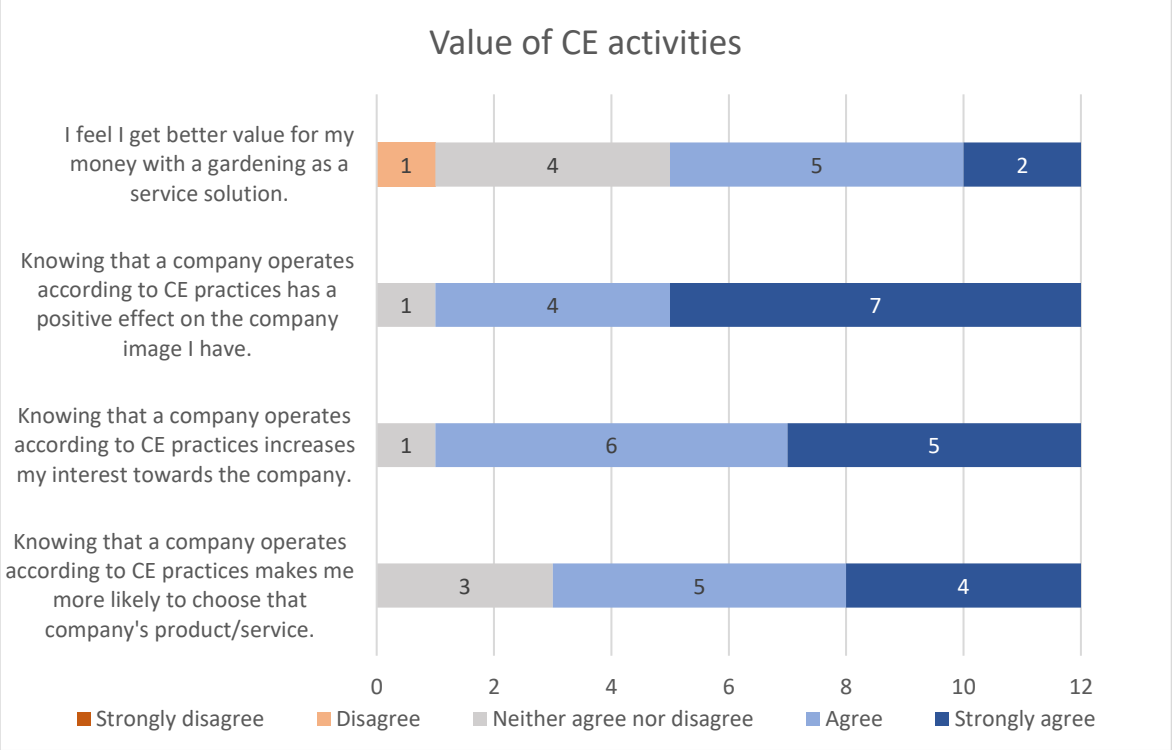

Figure 9. Value of CE activities

Table 6. Value of CE activities

Statement	Mean
I feel I get better value for my money with a gardening as a service solutions	3,67
Knowing that a company operates according to CE practices has a positive effect on the company image I have	4,50
Knowing that a company operates according to CE practices increases my interest towards the company	4,33
Knowing that a company operates according to CE practices makes me more likely to choose that company's product/service	4,08

Thus far, the company has not included much information about the CE activities or sustainability on their website (A2), but the results indicate that there could be interest towards that kind of information. Additionally, in the open feedback section, there was a request for more information regarding the themes of environmental sustainability and the CE in the company's website.

The CE expert notes that again, it is important to remember that there is a discrepancy in consumers' sustainable intentions and how they act in a situation of choice (B2). The importance of environmental values is growing, but the circular solutions should be able to compete with other factors as well. (B2) In general, consumers want to act sustainably and wish for sustainable options, but they generally end up choosing the cheapest or most convenient offer or the one that is considered the most trustworthy (B2). If sustainable circular PSS requires compromises in price, quality, convenience, or safety, it is not likely to interest larger customer groups (B1, B2). In addition, one CE expert states that the consumption decisions are not always rational but affected strongly by familiarity, and thus it may be challenging for alternative circular solutions to access the market if they deviate much from previous practices. (B2)

5.3 Communicating the value of CE and circular PSS

The company representatives highlight that they find it difficult to communicate the CE activities to the consumers (A2, A3). Both CE experts note that much of the CE customer value creation is depended on communication and branding (B1, B2). Many of the CE activities take place in the background of the actual service or product, and these actions are not visible to the customer in any concrete way. Due to the lack of visibility, branding circularity in a product or service in a meaningful way can be difficult. (B1) This challenge

was also mentioned by the company's representatives, as many of their CE activities are not concretely apparent in the final product (A2, A3). The company has mostly communicated the value of service features, for example convenience to the customers, and also recycling the soil and reusing the garden boxes (A2, A3). The communication has mostly focused on concrete benefits that the service offers to the customer, such as convenience, but not much of the value to the environment or society (A3). CE expert comments that if the customer base is already interested in sustainability, the circular economy is clearly an added value, and it is easier to emphasize it in branding (B1).

For consumers who are less interested in sustainability issues, other benefits than CE could be perceived more valuable. Saved money, easier use experience and maintenance, flexibility or support offered by the service could interest customer groups who are less interested in sustainability and CE perspective (B1). Ideally, producing the product or service according to CE principles creates cost savings and makes the offer cheaper to the consumer as well, in which case the environmental value is easier to brand on top of the financial value (B1). The CE experts also note that in urban food production context, growing own food and gardening in general creates abundantly well-being (B1, B2). The PSS offerings have a possibility to remove all the most laborious steps in food production process so that the customer can only focus on the easier and pleasant side of growing own food (B1). This is a great benefit of the company's PSS offer, as conventional gardening can turn out to be more laborious than expected (B2).

The CE experts highlight that as sustainable material use is a built-in property in the circular economy offerings, the companies should be more transparent about their supply chains and CE processes (B1, B2). CE activities are often complex processes and companies should not assume that the benefits are clear and understandable to the customers on their own (B1). In addition to value creation through the service properties, companies should highlight the advantages that CE creates to the customers, the environment, and society and explain why operating according to CE practices is beneficial to all (B1). Educating consumers about the benefits of CE could thus demonstrate the value of CE operations to the consumers, but also improve company's positive image (B1). One CE experts notes that some customers do show interest towards different industrial processes, partly due to growing interest in sustainability, and are looking for detailed information about how the products and services

they use are produced (B2). Information about the CE processes could thus itself be perceived valuable. Sharing information about the CE processes could increase consumers' interest and valuation towards the product or service (B2). The CE expert also mentioned that the consumers are no longer satisfied with vague environmental promises but demand concrete information and sustainability targets instead. More detailed information about the case company's CE actions was also requested by one respondent in the customer survey's open questions. When it comes to food, safety and traceability are especially important properties (B2). Being transparent about the circular supply chains could appear as trust to the consumers and give a sense of safety and traceability (B2).

Consumers interested in sustainability are usually also interested in the carbon footprint and handprint of the products they buy, and as said before, the interest is growing (B1). Being transparent and precise to the extent possible about the possibility to minimize the negative impact and increase positive ones could be perceived as valuable and show the concrete benefits to consumers (B2). The CE expert notes that consumers' do not always understand their possibility to influence and might not act sustainably as they may feel their choices do not matter, which is why the impact of consumers' choices should be made clear (B2). Especially topics related to food may seem complex and the expectations contradictory to the consumers, since food discussion combines different values, attitudes, habits, and realities (B2). In addition, the time perspective in sustainable decisions may be difficult to understand since the decisions are made at this moment, but they may influence in longer term and on multiple issues (B2). Being concrete about the impacts and environmental benefits of choosing the CE option could bring clarity to consumers' decisions and be perceived more encouraging than information that causes feelings of guilt (B2). Using illustrative, concrete examples to clarify the meanings and relations of the facts is also beneficial in sustainability communication (B2). In addition, having labels or certificates for CE consistent options and sustainably produced local food could also steer consumers to more sustainable behavior (B2). Determining the impact of consumer choices can be challenging for companies, but concrete information makes it easier and more trustworthy to the consumers to make environmentally better decisions, which many are interested to make. One CE expert also emphasizes the importance of social peer information in consumer decision-making (B2). The knowledge that others have made sustainable choices makes consumers more likely to make them themselves (B2).

The CE experts conclude that possibly the most valuable deed that the circular services in food production can do, is to educate consumers about the food production process and how much resources and energy it takes to produce food (B1, B2). Enormous quantities of food are currently thrown away and it seems to be difficult for consumers to understand the amounts of money and resources that is wasted because of that (B1). Better food connection can reduce the amount of wasted food and also steer to eat healthier and higher quality food that is better for the environment (B1). Understanding the origin of food supports consumers in making more sustainable choices (B2).

6 Discussion and conclusions

The aim of this study was to examine the consumer perceived value of circular PSS, and to understand the role that the environmental benefits of circular PSS have on the value creation process. This chapter concludes the study by reflecting the results with previous research and by answering the research questions based on the empirical findings. In addition, managerial implications are introduced, the limitations of the study are evaluated and suggestions for future research are presented.

6.1 Results and discussion

In line with the findings of Borg et al. (2020), this study recognizes functional, financial, emotional, and social value dimensions for PSS. The findings of this study are similar with previous literature on the fundamental role of functional value in PSS offerings (Catulli et al. 2017). In the customer survey, when comparing different service value features, the ones related to ease and convenience through savings in time and effort were perceived as the most important by the survey respondents. These statements highlight the convenience of non-ownership, which is also often emphasized by the literature (Tukker 2004, Catulli et al. 2017, Berry et al. 2002; Moeller & Wittkowski 2010). The CE experts also note that the ease of use and the convenience of the service are some of the most important value factors, and something that the consumers usually do not want to compromise (B1, B2). Another important functionality related value factor is the perceived flexibility of the PSS (Moeller & Wittkowski 2010; Gullstrand Edbring et al. 2016; Catulli et al. 2017). Similarly in the questionnaire, a flexibility related statement about having a low threshold for starting gardening without permanent acquisitions was perceived as the next important feature after the ease and convenience related statements. On the other hand, flexibility in terms of savings in space use was considered the least important of all presented statements. While Catulli et al. (2017) found that saving space may be valuable for some consumers, in this case other features were valued more, possibly because the garden boxes are used outside which makes space savings less important benefit.

The statement about having a low threshold for gardening without permanent acquisitions can also be perceived as a feature that provides emotional value. A possibility to experiment with new products and hobbies without the burdens of ownership has been recognized by several studies (Armstrong et al. 2015; Rexfelt & Hiort af Ornäs 2009). Likewise, the desire for new and unique products and experiences is a well-recognized emotional value element for PSS (Armstrong et al. 2015; Akbar et al. 2016; Moeller & Wittkowski 2010). In addition, relief from responsibilities of ownership related to for example maintenance of a product can be regarded as an emotional driver for choosing a PSS (Rexfelt & Hiort af Ornäs 2009). In this case, the customer can enjoy the most rewarding part of gardening, as the case company takes care of the laborious gardening maintenance tasks in the spring and autumn. Thus, possibility to avoid permanent acquisitions can create both functional and emotional value to the consumer.

An important functional benefit of the case company's PSS is the support for gardening provided by the application and the gardeners. From these two the application was perceived as slightly more important by the respondents. This support can help the customers achieve the higher yield and therefore enhance the service experience (B2). In addition, the provided support can potentially create emotional value by reducing the perceived uncertainty related to gardening, especially if the customer is trying it for the first time (A1). The support can also offer emotional value through increased self-confidence as the customer is more likely to succeed (A1). PSS support element can thus create functional and emotional value which can distinguish it from a traditional product.

Additionally, the literature underlines financial benefit as one of the main value factors of using PSS (Armstrong et al. 2015; Rexfelt & Hiort af Ornäs, 2009; Tukker 2015; Borg et al. 2020). The CE experts also consider the financial value of a CE offering as one of the most essential value factors (B1, B2). Both CE expert and literature recognize that CE innovations have great potential to create financial value to the consumers as the service models and more efficient use of resources can enable the same or better experience to the customers with lower costs (B2; Tukker 2015). In accordance with Tukker (2015), one CE expert notes that for highly expensive or luxury products the PSS model can be more appealing, as it gives access to products that would otherwise be financially inaccessible (B1). The CE experts note that although consumers want to make sustainable choices, they rarely want to

compromise other important aspects, especially price or convenience. In the customer survey, most of the respondents agreed with the statement that service offering provides better value for the money spent. However, many respondents had neutral response to the statement and one respondent disagreed, indicating that the perceived financial value of the case company's service offering is not indisputable.

The literature recognizes social value of PSS related to enhanced social interaction when using PSS, sense of social belonging (Armstrong et al. 2015), and strengthened social status (Borg et al. 2020). Similarly, CE expert notes that especially in the context of urban food production, communal PSS can increase the sense of community and social belonging (B2). These solutions can create social value that cannot be bought as a traditional product but is created through doing and experiencing together (B2). The CE expert also highlights the role of social pressure in steering towards sustainable consumption decisions (B2), which is also recognized by the literature (Borg et al. 2020; Shrivastava et al. 2020).

The literature finds PSS value barriers related to costs, new mode of consumption and desire to own (Borg et al. 2020), and similar barriers were recognized in the empirical study. While cost savings can create financial value, cost related barriers can act as a significant obstacle in PSS acceptance (Borg et al. 2020). The CE experts agree that costs can be a major barrier for PSS, as consumers are often reluctant to compromise on price (B1, B2). In line with Moeller and Wittkowski (2010), the CE experts also note that the costs of using a service are often automatically considered higher than buying a product, even when the product is rarely needed (B1, B2). One CE expert notes that even if the service would be less expensive choice, the total costs of each choice may be difficult for consumer to evaluate, and consumers do not always act rationally but rather choose the most familiar offer (B2), relating also to the barrier of novelty of the consumption mode.

According to the literature, the novelty of consumption mode may result in uncertainty and issues with trust (Borg et al. 2020). The CE expert notes that customers' decisions are often affected by the familiarity of the offer, and thus it may be challenging for alternative circular solutions to access the market if they deviate much from previous practices (B2). The literature also highlights the uncertainties related to new consumption modes (Borg et al. 2020; Catulli et al. 2013; Gullstrand Edbring et al. 2016) and suggests that highlighting

similarities and substitutability between PSS and traditional product increases the consumer's intention to choose and use PSS (Akbar & Hoffmann 2018; Lamberton & Rose 2012). Additionally, an important barrier related to this uncertainty is the concern of quality, hygiene, and safety of previously used products and materials (Armstrong et al. 2015; Armstrong et al. 2016). The negative image of used products was also recognized by the CE experts (B1, B2). It was also mentioned that one barrier for PSS to become more common is that companies may fear that using previously used products negatively affects their image (B1). However, it was noted that for environmentally conscious consumers, it is much easier to let go of the negative associations related to previously used products (B1). Additionally, this negative image was not strongly supported by the questionnaire responses, as all respondents either agreed or were neutral towards the statement that recycled soil is safe and of good quality. It could be that consumers are becoming more familiar with reused and recycled materials, and the attitudes towards them are not as much associated with negative images as previously. Additionally, Catulli et al. (2017) noted that compared to buying secondhand from another consumer, customers are more trustful when companies with reliable brand ensures the safety and quality of the product between the customers. Customers confident attitude towards recycled materials is especially important in the case company's context, as safety and hygiene are particularly crucial aspects in food and food production related matters.

The barrier related to desire to own was mentioned by a CE expert and a company representative (A3, B1), as well as several studies (Borg et al. 2020; Mont 2002; Tukker 2015; Halme et al. 2006; Gullstrand Edbring et al. 2016). The literature recognizes multiple reasons for this barrier. Owning a product may give the consumer a sense of control and freedom (Tukker 2015), security, safety and social acceptance (Halme et al. 2006), it can contribute to self-esteem (Tukker & Tischner 2006), and self-identity (Catulli et al. 2017; Borg et al. 2020). By choosing a service instead the consumers may fear a loss of autonomy (Allais & Gobert 2016). The interviewees highlight that much of the desire to own is dependent on the culture, and culture of owning is particularly strong in Finland (A3, B1). Many consumers still prefer owning a product, although it would make more sense in terms of costs and effort to choose a service instead (B1). The perceived inconvenience of not owning the product may lead the consumer to choose a traditional product, which is a significant barrier for circular PSS (B1). According to the interviewees, there would need to

be a great change in attitudes towards using services in order to PSS to become more common in B2C context (A3, B1).

This study also examined the role of the environmental benefits in circular PSS value creation. All interviewees suppose that environmental benefit of choosing a PSS is not the main value factor for consumers, but rather a nice addition to other more important features. The same observation has been made by previous studies (Tukker 2015; Akbar & Hoffmann 2018; Moeller & Wittkowski 2010), although for environmentally conscious consumers the environmental benefits may have stronger impact (Catulli et al. 2017). Similarly, the CE experts note that there is a growing group of highly environmentally conscious consumers, whose consumption decisions are strongly affected by the environmental impact of different choices (B1, B2). The CE experts also note that although consumers are increasingly interested in environmental issues, all this interest does not translate into action, as there is a gap between the sustainable intentions and the actual behavior (B1, B2). Thus, the circular solutions should be able to compete with other factors as well (B2). This was shown in the questionnaire as well, as the fact that the company takes care of minimizing the environmental impact on behalf of the customer was less valued than most other service features. In line with Tukker (2015), the CE experts note that consumers wish for sustainable options, but if circular PSS requires compromises in price, quality, convenience, or safety, it is not likely to interest larger customer groups (B1, B2).

Studies have recognized environmental benefits to have a complex role in CE solutions and PSS value creation (Akbar & Hoffmann 2018). The customer survey shows that the respondents are familiar with the concept of circular economy, and that they have positive image about CE. The respondents also showed interest towards sustainability issues, and the impacts of their consumption decisions. Literature shows that consumers who are environmentally conscious and are familiar with the CE practices, also experience smaller risks related to them and thus are more likely to choose the PSS offer (Sijtsema et al. 2020; Akbar & Hoffmann 2018). The CE expert notes that for environmentally conscious consumer the sustainability of a CE solution may also reduce the negative associations related to previously used products (B1).

The CE experts note that as the CE is a complex concept, it should not be necessary for consumers to understand CE thoroughly in order to be able to make sustainable choices (B1, B2). Consumers should rather have easy and trustworthy comparison methods available, or the most sustainable choices should otherwise be made more attractive (B2). However, studies show that lack of consumer awareness is among most common barriers to the CE implementation (Kirchherr et al. 2018), as the lack of CE awareness has been connected with low interest and low involvement in CE activities (Sijtsema et al. 2020). To increase CE awareness, the CE expert suggests that PSS providers could educate consumers about the CE and sustainable choices through the service, for example by utilizing an application (B2). Similarly, Suárez-Eiroa et al. (2019) emphasize the role of educating for successful CE implementation. By sharing information about the environmental impacts of different choices consumers can be nudged towards more sustainable behavior (B1, B2).

Even though sustainability of PSS alone might not be enough to lead consumers to choose PSS, Hamari et al. (2016) show that some of the perceived sustainability is translated into sustainable actions through positive attitudes. Overall, the customer survey respondents considered that a company's CE activities have a positive impact on company image, respondents' interest towards the company and their intention to choose that company's offer. The questionnaire data indicates that there is interest towards CE solutions among consumers, thus it would be beneficial for the company to provide information about their CE activities and efforts. The CE experts highlight that much of the CE value to the consumers is dependent on branding and communication, as many of the circular actions are not concretely visible in the final product or service (B1, B2). Additionally, since sustainable material use is a built-in property in the CE offerings, the companies should be more transparent about their supply chains and CE processes as it can be perceived valuable by the customers (B1, B2). Similarly to the CE experts, the literature suggests transparent and concrete communication about consumers' possibilities to influence with their choices (Muranko et al. 2019; Stø et al. 2008; Vehmas et al. 2018).

6.2 Conclusions

Circular PSS has been promoted as a promising way to implement CE, thus it is important to gain better understanding of the value characteristics of circular PSS and how consumers

would be more likely to choose the PSS offering. This study contributes to better understanding on how circular PSS creates value for consumers, and what is the role of the environmental benefits in the value creation process. The study was conducted as a case study with an example of a company that offers gardening solution as a service to consumers. The study utilized both qualitative and quantitative research method elements, as the data collection included customer survey and semi-structured interviews of the company representatives and CE experts. This section concludes the study by answering the research questions based on the findings of the study.

The aim of the first sub-research question was to examine *what the main value factors of PSS in consumer value creation are.* This study recognizes several value dimensions for PSS. The features related to functional value, especially convenience in terms of savings in time and effort, are emphasized in the case company's PSS offer and are perceived as the most valuable features by the consumers. Additionally, the perceived flexibility of not needing to make permanent acquisitions is a highly valued functional feature of PSS. In addition to the functional value, the convenience of non-ownership can create emotional value as it can allow to experiment with new or unique products and mitigate the emotional burden created by maintenance, repair, or other laborious tasks. PSS can create financial value to the consumers through cost savings, and it is important to note that the financial value is a feature the consumers rarely want to compromise on. Additionally, in urban food production PSS, social value can be created through shared use of PSS and increased sense of community.

This study also provides findings on the area of value creation through a PSS application. In this study, consumers perceived the support provided by the application as an important part of the service. The support can create functional value through a more successful and enhanced service experience, and emotional value through increased confidence in using the service and reduce the uncertainties associated with it. Additionally, the application can be used to educate the users about the CE and more sustainable choices, which can be perceived valuable by consumers interested in these topics.

The second sub-research question examined *what the main value barriers of PSS in consumer value creation are.* One emphasized barrier in this study was the impact that the

desire to own has in wider implementation of PSS. The culture of owning is still strong, and the attitudes change slowly. Additionally, consumers' decisions are strongly affected by familiarity, and the novelty of consumption mode of PSS can increase the perceived risk and uncertainty as the new service models require consumers to change their usual behavior patterns. In addition, the costs of using a service are often perceived higher, as the total costs of each choice may be difficult for consumers to evaluate. Previously used products are also often associated with negative images, but according to a customer survey, recycled materials were generally perceived to be safe and of good quality. Thus, the attitudes towards previously used products and materials may be changing, which is particularly important for food related CE solutions.

The third sub-research question aimed to examine *the role of the environmental benefits of circular PSS in consumer's perceived value.* While the environmental benefit of the circular PSS is not the main value factor in the service, the consumers do show interest towards sustainability issues and the impacts of their consumption decisions. Although all consumers' environmental interest does not translate into sustainable actions, according to the interviews consumers are increasingly looking for sustainable alternatives and the importance of the sustainability of different consumption options is growing. The survey showed that consumers consider themselves familiar with the CE concept and associate it with positive images. Additionally, this study indicates that a company's CE activities are considered to have a positive impact on company image, increase consumers' interest towards the company and their intention to choose that company's offer. Even though sustainability of the circular PSS and CE knowledge may increase the likelihood of consumers choosing PSS, CE knowledge should not be a requirement for consumers to be able to act sustainably, but the PSS should compete with other features as well.

The aim of the main research question was to examine *how the circular PSS creates value for consumers.* PSS can provide value benefits for consumer that a conventional product cannot, such as flexibility, ease, and relief from burdens of ownership. The importance of environmental impacts in consumers' consumption decisions is growing, and circular PSS can provide more sustainable alternative to consumption. As for the case company, in addition to enabling a sustainable gardening experience and efficient recycling of materials without waste, the service offers consumers an easy and flexible opportunity to try growing

their own food without having to make permanent acquisitions. Additionally, the service allows consumer to start growing food without needing to gain extensive knowledge on the topic first, as the consumer is supported by the service at all stages. In general, the service brings food production process closer to citizens which can strengthen the consumers' food connection and thus support sustainable behavior.

In addition to value benefits, it is essential for a circular PSS company to identify value barriers of the service and aim to minimize those. As many of the CE actions are not visible in the final product or service, it is important for a company to communicate their CE activities openly to the consumers. As for the case company, communicating the rationale behind using the plastic boxes and recycling the soil could further reduce the negative images related to reused materials and inform the customers about the importance of the CE processes. Improved CE knowledge can increase the interest towards circular PSS and lower the threshold for trying a service instead of purchasing a product, thus reducing the barriers related to desire to own and the novelty of consumption mode. As many consumers essentially want to make sustainable choices, concrete information about the environmental benefits of choosing a circular PSS and the positive consequences of consumer's choices may appear as trustworthiness and encourage consumers to choose the sustainable PSS option.

6.3 Managerial implications

This study provides managerial implications for B2C PSS companies. It is important for PSS companies to identify the most essential value benefits of their services and emphasize those in their communication. The main benefits of PSS are often related to convenience of non-ownership in terms of savings in time and effort. As PSS offers a low threshold option for new experiences, the companies should also emphasize the flexible possibility to try different products with PSS without the need of making permanent acquisitions. Additionally, non-ownership through PSS can also create significant emotional value. Thus, companies should consider various value dimensions to interest different customers. The study also highlighted the benefits of the educational dimension in the service. In PSS, the interaction between the customer and the service provider lasts longer than in traditional product, allowing better support and educating the user for example through an application.

The service providers should utilize this opportunity for enhancing the service experience and supporting the customer to get the highest possible value from the service. The support and educational dimension can also steer the customer towards more sustainable behavior through learning and gamification, which can also be perceived valuable. In urban food production context, sharing information can educate the consumers about the origin and value of food and thus increase the food connection and appreciation.

It is essential for the PSS companies to also recognize their most prominent value barriers and aim to mitigate those. In general, many consumers want to make sustainable choices, but without compromises in other aspects, such as price, quality, safety, or convenience. This often leads to contradiction between the sustainability aspirations and actual behavior. Thus, it is essential that the circular PSS can compete with other features than sustainability as well. The companies should reduce the uncertainties related to choosing a PSS, for example by highlighting the flexibility and low threshold to try the service and by ensuring the quality and safety of the used products and materials. One barrier for PSS implementation is the strong culture of owning. Although cultural consumption habits change slowly, companies should aim to tackle this barrier by communicating the benefits of CE and choosing a PSS to consumers.

As shown in the study, consumers are interested in the environmental impacts of their consumption choices. Although all companies' CE actions are not directly visible to consumers in the final product or service, it would be beneficial to communicate them openly. The customer survey results showed that information about the company's CE activities increase the customers' interest, positive image, and intention to choose the company's offering. To be able to make sustainable choices, consumers need easy ways to compare the environmental impacts of different options. It was also brought up in the interviews that the consumers are no longer satisfied with vague environmental promises but demand concrete information and sustainability targets instead. Thus, concrete information about the company's CE actions could be perceived valuable by the customers, teach customers about new aspects and benefits of the CE, reduce the perceived risks related to PSS, and thus increase the likelihood of choosing the PSS. Since CE can be a challenging concept to understand, the companies should communicate clearly and understandably the CE processes they have implemented and why it is important for them to operate in

accordance with the CE. As sustainability is a built-in property in circular PSS, it would also be beneficial for the company to highlight the concrete environmental benefits that are achieved by choosing their service. Being transparent to the extent possible about the opportunity to minimize the negative impact and increase the positive ones could thus be perceived as valuable and show the significance of choosing CE option to consumers. It could also strengthen consumers' experience of being an active actor in the face of the global sustainability crisis. As for the company, detailed information about the CE actions and future targets can improve the company image, increase trustworthiness, and reduce doubts of greenwashing.

For companies operating in the urban food production field, being transparent about the CE supply chains could appear as trust to the consumers and give a sense of safe and traceable food. When it comes to food, these are essential properties, however tracing the origins of a single grocery can nowadays be extremely difficult. Urban food production can offer transparent and short supply chains as the food is produced locally. Communicating the CE operations clearly can reduce the negative image related to circular actions and the utilization of food waste. Local urban food production can improve the brand of a city or a district that wants to be profiled as sustainable and circular. Local food production could also increase the sense of community in the area and improve the urban landscape value. In addition, having for example labels or certificates for locally produced food could increase the sense of traceability, interest towards food, and food appreciation.

6.4 Limitations and future research

The study has certain limitations that must be taken into consideration when assessing the generalizability of the results. One limitation of the study is the low number of responses in the customer survey, which affects the external validity of the results. One explanation for the low response rate could be that the survey was conducted outside the gardening season, possibly making the topic of the survey seem distant and reducing the willingness to respond. Conducting the survey during or right after the season could generate more answers. Furthermore, as the study concerned the customer value of the circular economy, it is possible that consumers who were already interested in these topics were more likely to participate in the survey. With a higher number of respondents, the generalizability of the

results could be improved. Furthermore, as mentioned in the study, there is an inconsistency between sustainable intentions and behavior, meaning that consumers often express they are interested in environmental issues, but all this interest does not translate into action. This was however brought up when analyzing the results. Additionally, a single case study method places certain limits to the generalizability of the results. Since only one company was examined, the results as such may not be directly applicable to other contexts. By using multiple cases and comparing the results the generalizability of the study could be improved.

As ownership is still strongly the default of consumption, more research on consumer value of circular PSS is needed if the PSS solutions are desired to become more common. It was mentioned by the interviewees that the strong culture of owning acts as a major barrier for circular PSS implementation. An interesting area for future research could be examining the utilization of mobile applications as part of the service for nudging consumers towards more sustainable choices. Previous literature highlighted the lack of CE awareness as a common barrier for CE implementation, as it can lead to low CE interest and involvement (Sijtsema et al. 2020; Kirchherr et al. 2018). It would thus be beneficial to examine in more detail how the educational dimension of the PSS application and nudging by providing information about CE and sustainable choices affects consumers' behavior and the perceived value of the service.

Urban agriculture is increasingly gaining attention and interest as it offers new and innovative means for food production. However, the implementation of urban food production solutions in Finland is still limited. It was mentioned in the interviews that urban food production could be supported with city planning and other actors in the food industry. Thus, it would be interesting to examine how for example cities and companies together can contribute to the urban food production solutions to become more common. For future studies, it would also be interesting to examine how different actors of urban food production, such as companies, suppliers, and cities, can co-create value and enable efficient recycling of materials and nutrients regionally.

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Appendix 1. Customer survey questions

Age
Gender
Customer group
City of residence

Statement	**Mean**	**Standard deviation**	**Variance**
Ease of delivery and collection	4,08	0,86	0,74
The service saves time and effort	3,92	0,86	0,74
Pre-grown and planted seedlings	3,83	0,90	0,81
Low threshold for starting gardening without permanent acquisitions	3,75	0,92	0,85
Support for cultivation provided by the application	3,67	1,25	1,56
Support for cultivation provided by gardeners	3,58	1,04	1,08
The company minimizes the environmental impact of the operations on my behalf	3,58	1,04	1,08
The gardening space is released for other use after the growing season	3,25	1,01	1,02

I am interested in the impacts my consumption decisions	4,23	0,58	0,33
I tend to look for information about companies'/products' sustainability	3,08	1,07	1,15
Sustainability issues have significant impact on my consumption	3,00	1,11	1,23

I know what circular economy means.	4,31	0,82	0,67
I am familiar how circular economy differs from traditional, linear economy model.	4,50	0,50	0,25
I have a positive image of circular economy.	4,69	0,46	0,21

I think it is important that the case company minimizes their emissions and waste	4,54	0,63	0,40
I think it is important that the case company aims for carbon negativity	4,38	0,49	0,24
I think it is important that the soil and nutrients are recycled for the next seasons	4,31	0,91	0,83
I consider recycled soil to be safe to use	4,23	0,80	0,64
I consider recycled soil to be good quality	4,08	0,73	0,53
I think it is important that the soil does not include peat	3,77	0,97	0,95
Plastic farming boxes are sustainable as they can be recycled multiple times longer than wooden ones	3,69	1,07	1,14
I think the farming boxes should be made from other materials than plastic	2,77	1,05	1,10
Urban farming is beneficial from the environmental point of view	3,85	1,03	1,05

Open feedback	If the above-mentioned topics raise questions or comments, please share them here:

I feel I get better value for my money with a gardening as a service solution.	3,67	0,85	0,72
Knowing that a company operates according to CE practices has a positive effect on the company image I have.	4,50	0,65	0,42
Knowing that a company operates according to CE practices increases my interest towards the company.	4,33	0,62	0,39
Knowing that a company operated according to CE practices makes me more likely to choose that company's product/service.	4,08	0,76	0,58

Open feedback	Please leave feedback related to the service, this questionnaire, or any topic.

Appendix 2. Interview themes, case company representatives

Company operations and circular economy

1. Briefly describe your company's operations.
2. How is the circular economy shown in your company's operations and the service you provide?
3. What benefits / value has the implementation of the circular economy brought to your company?
4. What challenges has circular economy brought to your company?
5. How do you see the role of urban food production in the future?

Customer value in the circular economy

6. How is the circular economy shown to your customers in the service?
7. What are the value benefits of a service-based farming solution for your customers?
8. What are the value benefits of circular economy actions for your customers?
9. What feature do you consider to be the most important to your customers?
10. How have you communicated circular economy actions to customers?
11. What kind of feedback have you received from your customers regarding the circular economy actions?

The circular economy in the future

12. What are the circular economy related goals for your company in the future?
13. What are the benefits of achieving these goals for you and your customers?
14. How do you think the circular economy will affect companies in general in the future?
15. How do you believe the circular economy will affect customer value creation in the future?

Appendix 3. Interview themes, CE experts

Urban food production and the circular economy

1. How would you describe the current state of urban food production and the circular economy in food production?
2. How will the urban food production be developed in the future?
3. What are the main challenges for the development of urban food production and the circular economy in food production?
4. What is the role of urban food production in future?

Customer value in the circular economy

5. What benefits and value does the development of urban food production create for consumers?
6. How does the development of the circular economy (e.g. in urban food production) create value for consumers?
7. How do the new modes of consumptions (e.g. increase in services and sharing) create value for the consumers?
8. How well do consumers understand the benefits and opportunities of the circular economy?
9. How is the increase in circular economy communication and awareness reflected in consumer behavior?
10. What benefits and negative issues do consumers usually associate with the circular economy?
11. What circular economy related should be communicated better?
12. What about sustainable urban food production related?