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Master's Thesis Sustainable Business & Innovation

*Dynamic capabilities conducive to scaling product-service-systems:
How product companies can deal with internal barriers to scaling.*

The case of Fairphone Easy.

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“To change this industry, we also need to rethink its business models.”

Eva Gouwens, CEO of Fairphone.

Abstract

Unsustainable business practices have led to dramatic sustainability pressures for modern society in the form of climate change and resource scarcity. A potential solution to meet the challenges of the climate crisis are product-service-systems (PSSs), which are combined product and service offerings that together can fulfil customer needs. Through alternative scenarios of product use can PSSs decrease the consumption of products and therefore hold the promise of delivering economic and environmental benefits. However, to accelerate the sustainability transition, PSSs must reach an increasing number of beneficiaries. While prior literature largely focused on the design and implementation of PSSs, scaling them has only been researched to a minor extent. However, there are only a few examples of upscaled PSSs, which suggests that scaling PSSs is challenging. Therefore, the aim of this study was to investigate how product companies can scale PSSs. It has widely been accepted that scaling PSSs is hindered by internal and external barriers. While external barriers have received large attention in the literature, internal barriers have been less researched. To broaden the understanding of the internal barriers firms face and how they can be addressed, this thesis took a qualitative approach. It studied the case of Fairphone, a Dutch smartphone manufacturer that had recently introduced a sustainable PSS. Adopting the dynamic capabilities (DC) lens, using an inductive coding strategy, the research analyzed 17 semi-structured interviews to identify the DCs conducive to early-stage scaling. By matching the DCs with the barriers they help to address, the study found that some DCs enable product companies to reduce or remove barriers, while other DCs prevent barriers from occurring in the first place. The study identified the combinations of DCs that enable product companies to adopt a service-centered mindset, design fully integrated PSSs, plan and execute the service rollout, reduce operational costs, as well as identify and pursue cost-effective ways for scaling. An interesting finding from the case study is that product companies need to foster sensing, seizing, and reconfiguring capabilities simultaneously, as only in combination can they effectively address the identified barriers. Future research could focus on identifying the DCs that are conducive to scaling more mature PSSs that have already moved from initial experimentation to upscaling.

Executive summary

Scaling Fairphone Easy requires Fairphone to deal with the internal barriers. Although the internal barriers to scaling were more severe shortly after the launch, Fairphone did well in dealing with the different barriers. While some barriers have been addressed, other barriers require further efforts. Fairphone has succeeded designing and executing the service rollout plan to bring Fairphone Easy to market. By pursuing, fostering, and implementing the *activities, skills, and processes* identified, Fairphone can also address the remaining barriers to scaling.

While the team members involved in the pilot project have already developed a service mindset and knowledge, it is critical that this type of thinking is spread throughout the organization to fully overcome the inherent product-centered mindset. This can be done through regular updates on the status and progress of Fairphone Easy, as well as lessons learned from the pilot. In addition, organizing workshops to foster service thinking could be beneficial. These could be used to highlight the benefits of a service logic to the overall customer experience. As a service model like Fairphone Easy intensifies the relationship between Fairphone and its customers, the knowledge and skills acquired can be applied in many other areas of the company, such as customer support or marketing. As the pilot was Fairphone's first venture into services, these learnings can also form the basis for developing and scaling other paid services in the future.

Although the general support for Fairphone Easy was given, due to its potential to drive and monetize customer longevity, an internal conflict of interest between sales and service was identified at the operational level regarding limited company resources. This conflict of interest appeared to be rooted in the fear that Fairphone Easy would divert the company's focus and cannibalize product sales. It is important for Fairphone to resolve this conflict, for example, by conducting research with customers to determine whether Fairphone Easy actually cannibalizes sales or whether the service appeals to a different audience. Moreover, the company could be given an overall presentation on the progress of Fairphone Easy and the financial impact of the pilot project to calm the fears of some employees.

The business case of Fairphone Easy already looks promising, with successful financial incentives for customers to choose long-term subscriptions and taking care of their devices. To further validate the business case, Fairphone could start monitoring the number of repair services required. This could be done in a similar way to how Fairphone monitors what percentage of customers opt for the different subscription periods. Monitoring the components that require repairs can also provide valuable feedback for the product team to see which components break most often and need to be improved or repaired and replaced more easily. Although the pilot's overhead costs are still outweighing its revenue due to the limited subscription volume growth, Fairphone Easy shows great

potential with high profit margins and a high customer lifetime value. Fairphone Easy can become an important revenue stream in the future if the subscription volume increases.

To manage the investment and tasks required to scale, Fairphone can build on existing, cost-effective practices. Collaborating with other sustainable companies or public institutions seems to be a good way to raise awareness among potential customers and address data privacy concerns without incurring high costs. In addition, it is advisable for Fairphone to quantify the multi-dimensional stop-and-go criteria set by the management team. This is especially true for the number of subscriptions criterion. To provide the project team with the necessary focus and not waste limited company resources, it is important to have clearly defined minimum targets for when a certain number of subscriptions must be reached. This would then be the trigger for either discontinuing Fairphone Easy altogether for the time being or investing heavily in scaling and rolling out to other key markets such as Germany and France.

Overall, the study found that internal barriers do not appear to drastically affect the scalability of Fairphone Easy. The lack of broader scaling can therefore be largely attributed to external, demand-side barriers. For successful scaling, Fairphone must not only address the remaining internal barriers, but also develop a strategy to identify and address external barriers to scaling. The knowledge gained by the team on service design could help with this. Additional services such as privacy-sensitive cloud storage could make the service more attractive to customers and alleviate their concerns about data privacy when renting a personal device such as a smartphone.

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X. List of abbreviations

BM = Business model

DCs = Dynamic capabilities

PSS = Product-service-system

RBV = Resource-based view

SBM = Sustainable business model

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1 Introduction

In 1987, the United Nations Brundtland Commission raised awareness for the threats posed by unsustainable human activity and defined sustainable development as *“meeting the needs of the present without compromising the ability of future generations to meet their own needs”* (WCED, 1987, p.16). Since then, these unsustainable business practices have led to dramatic sustainability pressures for modern society in the form of climate change and resource scarcity (IPCC, 2014). Improvements in technology, production efficiency, and product design have not been able to offset the negative environmental impacts of linear business models (BMs) considering a rapidly growing global population. To meet the challenges of the climate crisis, it is therefore necessary to achieve a system-level change in the global industrial system, i.e., a fundamental change in the way business is done (Bocken et al., 2014). A potential solution present product-service-systems (PSSs) which are an innovative type of sustainable business models (SBMs) that hold the promise of delivering social and economic benefits while respecting planetary boundaries (Vezzoli et al., 2015).

PSSs are combined product and service offerings that together can fulfil customer needs (Goedkoop, 1999; Tukker, 2004). PSSs are the result of a rising trend called *“servitization”*, which refers to the ambition of product companies to innovate their offering by providing additional services that enhance product functionality throughout their lifecycle (Visnjic & van Looy, 2013). Servitization focuses on delivering value in use rather than selling ownership of physical products which implies a profound shift in the BM of product companies (Baines et al., 2007; Beuren et al., 2013). PSSs alter the value these companies provide to their customers, the way they create and deliver that value, and how they capture that value for themselves (Richardson, 2008). Through alternative scenarios of product use, such as renting or leasing, PSSs can decrease the consumption of products and resources (Beuren et al., 2013). Although critics have pointed out that these BMs do not guarantee sustainability benefits and may lead to an overall increase in consumption due to rebound effects (Tukker, 2004; Vezzoli et al., 2015), it is widely recognized that PSSs have great potential to reduce the environmental impact of economic activity by decoupling economic success from material consumption (Baines et al., 2007). They can, therefore, enable the transition towards a more sustainable society (UNEP, 2002).

Although their great potential to serve customer needs while delivering environmental benefits, most product companies struggle to benefit financially from PSSs (Eggert et al., 2014; Gebauer et al., 2005). They are faced with a *“profitability hurdle”* when following a servitization strategy. The strategy’s initial profitability is high, because companies can serve a few high-paying customers without high investments. However, the profitability declines considerably when firms are trying to scale the service business due to significant investment need in increased service capabilities (Visnjic & van Looy, 2013). To achieve profitable growth, the service business must reach a certain scale of operations where economies of scale compensate for investment costs (Eggert et al., 2014;

Visnjic & van Looy, 2013). If product companies fail to balance the increasing investments in service capacities with economies of scale, their efforts will ultimately prove unsuccessful (Kowalkowsky et al., 2015). Several studies illustrate the enormous challenge the transition to PSSs poses for product companies, as they incur high costs due to servitization (see Baveja et al., 2004; Neely, 2008; Stanley & Wojcik, 2005). The fact that there are only a few prominent examples of companies that successfully scaled PSSs, such as IBM, Rolls Royce Aerospace, Siemens, and Xerox (Cavaliere et al., 2018) suggests that upscaling PSSs is challenging (Coreynen et al., 2018).

While the notion of scaling BMs has traditionally been restricted to an economic perspective, there is a large body of academic work on the different dimensions in which SBMs can scale (Hultberg & Pal, 2021). This notion goes beyond purely economic terms and often considers the scaling of sustainability impact, such as achieving a higher social impact or influencing people's norms and values (see Jolly et al., 2012; Moore et al., 2015). Following the idea of PSSs for sustainability, this thesis uses a dual definition of scaling, i.e., scaling in terms of economic growth and environmental impact. Both types of scaling are equally important. First, to enable PSS to overcome the identified profitability hurdle, and second, to achieve the desired sustainability benefits (Hahn & Pinkse, 2022; Visnjic & van Looy, 2013). However, pursuing profitability and sustainability simultaneously can be challenging for product companies, as there are important trade-offs between marketability and sustainability (Hahn & Pinkse, 2022). Companies often need to weigh whether to increase the attractiveness of their offering to customers or its environmental impact. Addressing these trade-offs must be a high priority for companies seeking to scale their PSS along economic and environmental dimensions (Hahn & Pinkse, 2022). However, not only balancing but scaling along these dimensions overall proves difficult (Coreynen et al., 2018).

While prior literature has focused on the design (Matschewsky et al., 2018; Ulaga & Reinartz, 2011; Vezzoli et al., 2015) and implementation (Fargnoli et al., 2018; Reim et al., 2015; Reim et al., 2017) of PSSs, scaling of PSSs has only been researched to a minor extent (Coreynen et al., 2018). Understanding how they can scale is important, because PSSs can only accelerate the sustainability transition if they will reach a sufficient number of beneficiaries (Ciulli et al., 2022). The failure to scale PSSs is due to several internal and external barriers (Coreynen et al., 2018). External barriers to scaling mostly relate to customer preference for physical products and prevailing cultural values that underrate services and consequently result in customers' unwillingness to pay for services (see Beuren et al., 2013; Piscicelli et al., 2015; REXfelt & Ornäs, 2009; Wittel & Löfgren, 2013). However, internal barriers have not received the same attention (Coreynen et al., 2018). This is not surprising given that several papers have found that upscaling of PSSs is hindered by existing BM logics and unfavorable organizational structures (see Coreynen et al., 2018; Gebauer, 2005). However, whilst academic

research found that scaling of PSSs proves to be difficult, there is a lack of papers addressing how these barriers can be dealt with and authors have stressed the need for more empirical research (Beuren et al., 2013; Coreynen et al., 2018). This study addresses the identified gap in the literature by answering the following research question and related sub-questions:

How can product companies scale product-service-systems?

- 1) *What internal barriers to scaling product-service-systems arise out of the differences between sales- and service-based business models?*
- 2) *How do product companies deal with internal barriers to scaling?*
- 3) *Which dynamic capabilities are conducive to scaling product-service-systems?*

To answer these questions, this thesis draws on the dynamic capabilities view and argues that scaling of PSSs requires dynamic capabilities (DCs). DCs refer to an organization's capacity of purposefully creating, expanding, and modifying its resource base to respond to rapidly changing environments (Helfat et al., 2007; Teece, 2007). The DC view can thus help to explain what enables product companies to cope with the identified barriers to scaling that arise out of the differences between sales- and service-based BMs. While prior studies have linked DCs to SBM innovation (Bocken & Geradts, 2020; Bocken & Konietzko, 2022; Bocken et al., 2021; Inigo & Albareda, 2019; Pieroni et al., 2019; Santa-Maria et al., 2021) and SBM implementation (Khan et al., 2020; Reim et al., 2021), only a few have taken the DC perspective in the context of scaling SBMs (Sandberg & Hultberg, 2021). This study argues that *sensing capabilities* can enable product companies to understand and adapt to the new service logic and identify opportunities for scaling, while *seizing capabilities* enable them to address barriers by seizing the right opportunities as they arise. Similarly, *reconfiguring capabilities* allow product companies to deal with internal barriers by implementing required changes in the different BM components (Teece, 2007; Teece, 2014).

The thesis studied the case of Fairphone, a prominent Dutch consumer electronics manufacturer on a mission towards fairer and more sustainable electronics (Fairphone, n.d.a). In June 2022, the company had launched Fairphone Easy, a smartphone subscription service that was amongst the first of its kind in an industry increasingly pressured by resource scarcity, toxic waste, and high carbon emissions (Fairphone, n.d.b; Lotzof, n.d.; UNEP, 2019). The thesis followed the company's pilot project early on, during the initial ten months of its launch. Fairphone Easy was therefore in its early phase of scaling. In this early phase, product companies aim to reduce uncertainties surrounding their new SBMs by validating the desirability, feasibility, viability, and sustainability. It is crucial to

investigate these stages in the broader context of PSS upscaling, as these experiments can only be scaled when each of the key properties have been validated (Bocken & Konietzko, 2022). Fairphone Easy therefore made a suitable case to observe how product companies can come from initial experimentation to upscaling. By identifying the internal barriers to scaling Fairphone Easy and exploring how the company successfully dealt with them, the thesis was able to draw conclusions on the DCs that could support further scaling.

The contributions of this research to the literature on scaling PSSs are as follows. First, it provides additional insights into the internal barriers to scaling faced by product companies that had only recently introduced a PSS and are in the early stages of scaling. Besides detailing how internal barriers to scaling manifested themselves at the case company, the thesis found that start-ups and scale-ups can also face a resource barrier that limits their ability to pursue the investments and tasks required for scaling. Second, the thesis identified the DCs conducive to scaling and was able to portray the relationship between DCs and internal barriers in more detail than previous research. It identified the *activities, skills, and processes* that can enable product companies to weaken, overcome, and prevent the different barriers to scaling. Moreover, the study identified the importance for product companies to foster *sensing, seizing, and reconfiguring capabilities* as they only in combination allow to effectively address the identified barriers.

Consequently, the study has important implications for practitioners unfamiliar with PSSs in the early stages of scaling. The thesis managed to match the DCs with the internal barriers to scaling and therefore reached the necessary level of detail to provide product companies with concrete recommendations on the skills to foster, processes to implement, and activities to carry out to deal with the respective internal barriers they are facing. The study further found that certain DCs are more important than others as they enable product companies to deal with multiple barriers simultaneously. It can therefore provide an ideal starting point for product companies that are unsure where to begin their scaling efforts. The insights generated can therefore help PSSs to transition from initial experimentation to upscaling.

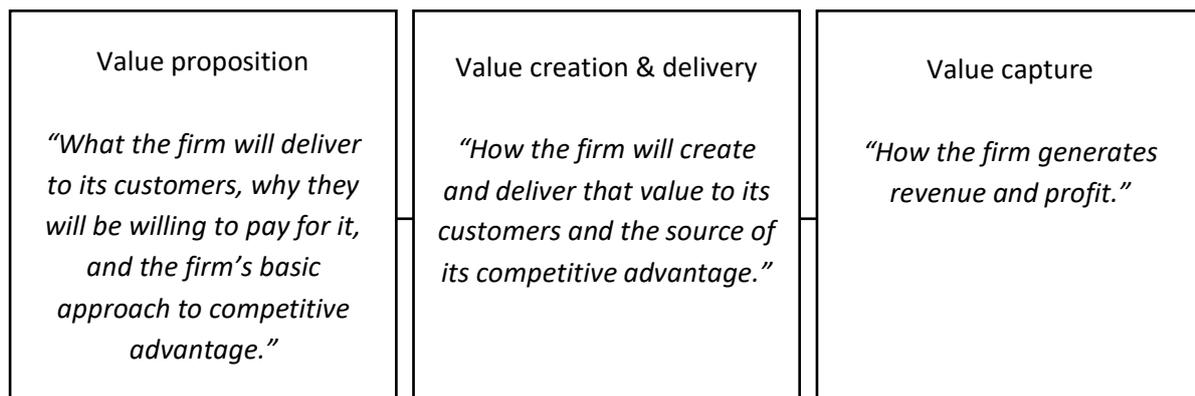
2 Theory

This section will first describe the main concepts used in this research, namely the BM and SBMs, PSSs and their different types, before discussing the literature on upscaling of BMs as well as the internal and external barriers to scaling PSSs faced by firms. Lastly, the used theory of this study, the DC view, is described.

2.1 The business model and sustainable business models

The concept of the BM is relatively young and first surfaced in academic literature at the beginning of the century (Zott et al., 2011). However, due to its application across many academic fields with different perspectives, literature lacks an encompassing definition (Ebrahimigharehbaghi et al., 2022). Whilst some authors propose a holistic view and simply state that the BM describes how a firm does business (Beattie & Smith, 2013; Zott & Amit, 2010), others describe in more detail the elements that together make up a BM (Osterwalder et al., 2005) or what it is fundamentally concerned with (Rasmussen, 2007). Richardson (2008) consolidates the many different views of BM components into **value proposition**, **value creation and delivery**, and **value capture** as shown in Figure 1. This is in line with Teece (2010) who states that the essence of a BM is to define the way in which a company delivers value to customers, gets customers to pay for the value, and converts these payments into profit.

Figure 1.
Business model components.



Note: Taken from Richardson (2008, p.138)

SBMs are an essential part of the current sustainability transition away from linear BMs (Ebrahimigharehbaghi et al., 2022). They are important for fostering and implementing corporate innovation for sustainability as they allow sustainability to be embedded in business purpose and processes (Bocken et al., 2014). SBMs can be described as those BMs that create competitive advantages through superior customer value while contributing to the sustainable development of companies and society (Lüdeke-Freund, 2010). The different forms of SBMs can be divided into nine overarching archetypes.¹ One of them is *deliver functionality rather than ownership*, to which PSSs can be assigned (Bocken et al., 2014).

¹ The nine archetypes of SBMs are *maximize material and energy efficiency, create value from waste, substitute with renewables and natural processes, deliver functionality rather than ownership, adopt a stewardship role, encourage sufficiency, repurpose for society/environment, and develop scale up solutions* (Bocken et al., 2014, p.48).

2.1.1 Product-service-systems as a specific type of sustainable business models

PSSs can be described as integrated product-service offerings that together are able to fulfill customer needs (Goedkoop, 1999; Tukker, 2004). Intriguingly, other authors frequently discuss the concept of dematerialization in relation to PSSs and describe them as “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 BMs” (Mont, 2002, p.239).

Through PSSs, product companies increasingly focus on delivering functionality to customers rather than selling ownership of physical products (Baines et al., 2007). By extending product functionality with additional services, PSSs allow product companies to differentiate their offering from competitors (Visnjic & van Looy, 2013). They can therefore present the source of a sustainable competitive advantage in an increasingly commoditized and competitive global environment (Baines et al., 2007; Matthysens & Vandenbempt, 2008). Additionally, retaining ownership of assets can improve resource use, reliability, design, and protection (Baines et al., 2007). Table 1 juxtaposes the differences between product, service, and product-service BM logics.

Table 1.
Differences between business model logics.

	Product logic	Service logic	Product-service logic
Value proposition	Ownership of a physical product that fulfills customer needs	Provision of a function that fulfills customer needs	Combined product-service offer that fulfills customer needs
Value creation & delivery	<ul style="list-style-type: none"> ▪ Tangible resources, embedded value, transactions ▪ Value in exchange ▪ Key competences: brand, product & process 	<ul style="list-style-type: none"> ▪ Intangible resources, co-creation of value, customer relationships ▪ Value in solution; problem-solving competences & capabilities ▪ Key competences: specialized knowledge & skills 	<ul style="list-style-type: none"> ▪ Tangible & intangible resources, embedded value & co-creation of value, customer relationships ▪ Value in use; functionality-enhancing services ▪ Key competences: specialized knowledge & skills
Value capture	<ul style="list-style-type: none"> ▪ Pay for product ▪ Key resources: patents, trademarks, copyrights 	<ul style="list-style-type: none"> ▪ Pay for service ▪ Key resources: customer relationships & feedback 	<ul style="list-style-type: none"> ▪ Subscription fee ▪ Key resources: superior customer relationships & feedback

Note: Own table based on Amoroso & Link (2021), Baines et al. (2007), Grönroos & Voima (2013), and Vargo & Lusch (2004).

PSSs carry great potential to cater to the sustainable development of society by delivering environmental benefits beyond economic ones (Vezzoli et al., 2015). By decoupling economic success from material consumption through alternative scenarios of product use such as renting or leasing, they have the potential to reduce the environmental impact of economic activity (Baines et al., 2007; Beuren et al., 2013) and can therefore, enable the move towards a more sustainable society (UNEP, 2002). However, the mere implementation of PSSs does not guarantee environmental benefits and their potential to deliver these benefits varies depending on the type of PSS (Tukker, 2004). Unforeseen circumstances related to human behavior may cause rebound effects which lead to an increase in total consumption of environmental resources (Vezzoli et al., 2015). Careless use on the customer side could drastically shorten the product's useful life span and eradicate the perceived environmental benefits of PSSs (Tukker, 2004). Therefore, for PSS to realize their theoretical potential, it is important to mitigate the likelihood of a rebound effect by considering their individual type and designing them to promote favorable consumer behavior (Vezzoli et al., 2015).

2.1.2 Types of product-service-systems

PSSs span a continuum from mainly tangible product offerings to mainly intangible service offerings. Although different authors use different terms and subdivisions to describe these types, their views converge on the existence of three overall categories: product-oriented, use-oriented, and result-oriented PSSs (Baines et al., 2007; Mont, 2003; Tukker, 2004).

For **product-oriented** PSSs, the BM is still primarily oriented towards product sales with additional services offered to enhance the product's value proposition such as after-sales services that aim to guarantee product functionality and durability. In the case of **use-oriented** PSSs, the BM is not geared towards selling products. Whilst the product plays a central role, ownership does not change from the provider to the consumer of a service but access to the product is given in form of leasing, renting, or pooling. In this case the company is motivated to extend product life and materials to create a PSS that maximizes product use. Lastly, **result-oriented** PSSs do not involve a pre-determined product. Rather do providers and consumer agree on a result they want to have achieved with a customized mix of services. Even though the individual PSS types have different theoretic potential to deliver environmental benefits, their company-specific design and implementation determine their actual impact (Baines et al., 2007; Mont, 2003; Tukker, 2004).

2.2 Business model scalability

2.2.1 The concept and dimensions of scaling

Although there are several conceptualizations of the term "scaling up" in different streams of academic literature, scaling of BMs typically refers to increasing the number of customers and

beneficiaries (Bocken et al., 2016). In line with this understanding, the notion of scaling BMs has traditionally been dominated by an economic perspective (Hultberg & Pal, 2012) which views scaling primarily in terms of diffusion and economic growth (see Nielsen & Lund, 2018; Stampfl et al., 2013). More recently, some scholars have criticized this view of neglecting environmental and social values beyond economic ones (Hultberg & Pal, 2021). In response, they developed a multi-dimensional approach to upscaling BMs that additionally considers the scaling of sustainability impact (see Bloom & Chatterji, 2009; Jolly et al., 2012; Moore et al., 2015).

The literature streams on BMs and transitions have given increasing importance to the growth of SBMs and their diffusion to mass market. SBMs, such as PSSs, can only accelerate sustainability transitions if they reach an increasing number of customers and beneficiaries. Starting initially as experiments in niche markets, SBMs scale up to reach the mass market (Ciulli et al., 2022). It is therefore important for PSSs to survive the initial experimentation phase before broad upscaling can follow (Bocken & Konietzko, 2022).

Following the idea of PSSs for sustainability this paper uses a dual definition of upscaling, i.e., scaling in terms of economic growth and environmental impact. While scaling in economic terms refers to scaling the service business to an extent that enables profitable growth, scaling environmental impact refers to delivering more environmental benefits. One way to measure environmental impact for circular BMs such as PSSs, is generating less waste through a higher degree of circularity (Das et al., 2022).

Both types of scaling are equally important. First, for PSSs to be financially sustainable due to economies of scale (Visnjic & van Looy, 2013) and second, to deliver the desired sustainability benefits (Hahn & Pinkse, 2022). However, pursuing profitability and sustainability can be challenging due to important trade-offs between marketability and sustainability of PSSs. Product companies seeking to scale PSSs along both dimensions often need to weigh whether to increase the attractiveness of the PSS to customers or its environmental impact (Hahn & Pinkse, 2022). Indeed, weighing customer attractiveness may not only present a barrier to scaling their sustainability impact, but also to scaling PSSs in economic terms, as many authors have found that a lack of customer demand can be a strong external barrier to scaling these BMs.

2.2.2 Barriers to scaling product-service-systems

Product companies face internal and external barriers that hinder upscaling of PSSs. Internal barriers refer to obstacles within the boundaries of an organization, while external barriers arise from outside of the organization (Coreynen et al., 2018). External barriers to scaling PSSs arise primarily out of many demand-sided barriers on the customer side. The delivery of a product function is a relatively new concept to which customers are unaccustomed to. Due to existing cultural habits, many customers

prefer to purchase physical products and not pay for using them, which may make it difficult for them to adopt a PSS (Rexfelt & Ornäs, 2009). Similarly, existing cultural values may cause customers to hold services in low esteem, leading them to be unwilling to pay for services (Beuren et al., 2013; Wittel & Löfgren, 2013). In a pre-servitization era that focused on technological progress, products, and the value of exchange, the practice of including free services in product sales emerged (Oliva & Kallenberg, 2003). Product companies attempting to monetize services therefore face the challenge that customers are unwilling to pay for something they previously received for free (Wittel & Löfgren, 2013).

Internal barriers to scaling PSSs, on the other hand, are less researched (Coreynen et al., 2018). The current literature suggests that product companies pursuing a servitization strategy face four internal barriers to scaling PSSs. The **logic barrier** refers to the company's product-centric mindset, which hinders the successful integration of product and services (Coreynen et al., 2018; Matschewsky et al., 2018). Products and services are inherently different in the aspects of value creation and value capture (Ryan, 2013). While in the sale of products, value to the provider is typically created during production and captured at the point of exchange, for product-service providers, value creation and capture occurs throughout the lifecycle of the product (Grönroos & Voima, 2013; Matschewsky et al., 2020). This cultural barrier hinders the transition from a goods-dominated to an integrated culture (Ryan, 2013).

The **design barrier** refers to the inability of product companies to successfully develop fully integrated PSSs that go beyond the "service as an add-on" stage due to an existing product logic that overemphasizes product over service innovation (Coreynen et al., 2018; Matschewsky et al., 2018). In most organizations, services are typically undersized and inefficiently developed compared to products (Cavaliere & Pezzotta, 2012), and a lack of service knowledge and capabilities limits their development (Ryan, 2013).

The **rollout barrier** refers to the inability of product companies to capture the value of the PSS in a successful BM, due to the lack of a clear go-to-market strategy. Instead, additional services are often offered in an uncoordinated manner to a handful of selected customers upon demand (Coreynen et al., 2018). A go-to-market strategy ensures that the service reaches and serves the right customers in the right markets through the appropriate channels, along with the right products and value propositions (Friedman, 2002).

The lack of a clear go-to-market strategy can also give rise to a **financial barrier**. Product companies often struggle to benefit financially from an extended service business and are therefore unable to achieve profitable growth with the PSS. The differences in value creation and value capture between products and services are clearly reflected in the revenue streams and cost structures of the

two BM logics. While product sales provide companies with immediate and full revenues, subscription models generate recurring revenue over the subscription period. Therefore, it is critical for product-service providers to be able to manage recurring payments and a subscription business (Grönroos & Voima, 2013; Ryan, 2013). In addition, PSSs incur high costs due to strong investment need in increased service capabilities (Visnjic & van Looy, 2013).

Finally, product companies face an **organizational barrier** to scaling PSSs related to their inability to implement the necessary changes in their organizational structure to effectively support the PSS. While scaling requires many changes in the company’s organizational structure, their implementation proves difficult due to several side effects: a credibility gap as a result of overly ambitious goals set by the management team, an erosion of service quality when the focus shifts to organizational transformation, and the cognitive tendency of employees to treat symptoms rather than causes of service problems (Gebauer et al., 2005). All identified barriers have been consolidated in Table 2. It is worth noting that they are often interconnected and influence each other, such as the logic barrier, which usually leads to a design and financial barrier (Coreynen et al., 2018).

Table 2.
Internal barriers to scaling product-service-systems.

Internal barrier	Description
Logic barrier	The inability to overcome the company’s product-centered mindset that hinders the successful integration of product and services.
Design barrier	The inability to successfully develop fully integrated PSSs that go beyond the “service as add-on” stage due to an overemphasis on product rather than service innovation. Additionally, the lack of service knowledge and skills limits PSS design and development.
Rollout barrier	The lack of a clear go-to-market strategy for rolling out the PSS results in the inability to capture its value in a successful BM.
Financial barrier	The inability to achieve profitable growth due to the failure to benefit financially from the PSS. This is due to differences in revenue model and cost structure.
Organizational barrier	The inability to implement the required changes in the organizational structure for it to effectively support the PSS.

Note: Own table based on the information provided above.

2.3 Dynamic capabilities

2.3.1 Dynamic capabilities view

The DC view is an evolution of the resource-based view (RBV) in a stream of strategic management literature that focuses on the source of sustainable competitive advantage for firms (Teece et al., 1997). While the RBV sees the source of competitive advantage in organizational resources, i.e., firm-specific assets, capabilities, and knowledge, and in the existence of isolating mechanisms that impede the flow of resources between organizations, the DC view argues that in fast-moving business environments characterized by global competition and dispersion of geographical and organizational sources of innovation and production, firms need not only hard-to-replicate resources but also hard-to-replicate DCs for sustained competitive advantage (Barney, 1991; Teece et al., 1997).

In contrast to organizational capabilities which refer to an organization's ability to deploy tangible and intangible resources to accomplish a task, DCs refer to specific *skills, processes, and activities* that enable organizations to adapt their resource base to changing environments (Amit & Schoemaker, 1993; Grant, 1991; Helfat et al., 2007; Teece et al., 1997).

This includes sensing and shaping of business opportunities and threats, seizing of business opportunities, and the ability to reconfigure organizational resources to address long-term threats. **Sensing** refers to business processes that enable the identification, evaluation, and exploitation of new opportunities (Teece, 2014). Sensing capabilities include a range of activities that revolve around scanning, learning, creating, and interpreting (Teece, 2007). **Seizing** refers to mobilizing resources to take advantage of identified technological or market opportunities through new products, processes, and services, and capturing value from them (Teece, 2007; Teece, 2014). **Reconfiguring** or transforming refers to continuous organizational renewal to maintain the evolutionary fitness of the organization (Teece, 2014). As Teece (2007) states "*a key to sustained profitable growth is the ability to recombine and to reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change*" (p.1334).

2.3.2 Dynamic capabilities conducive to scaling product-service-systems

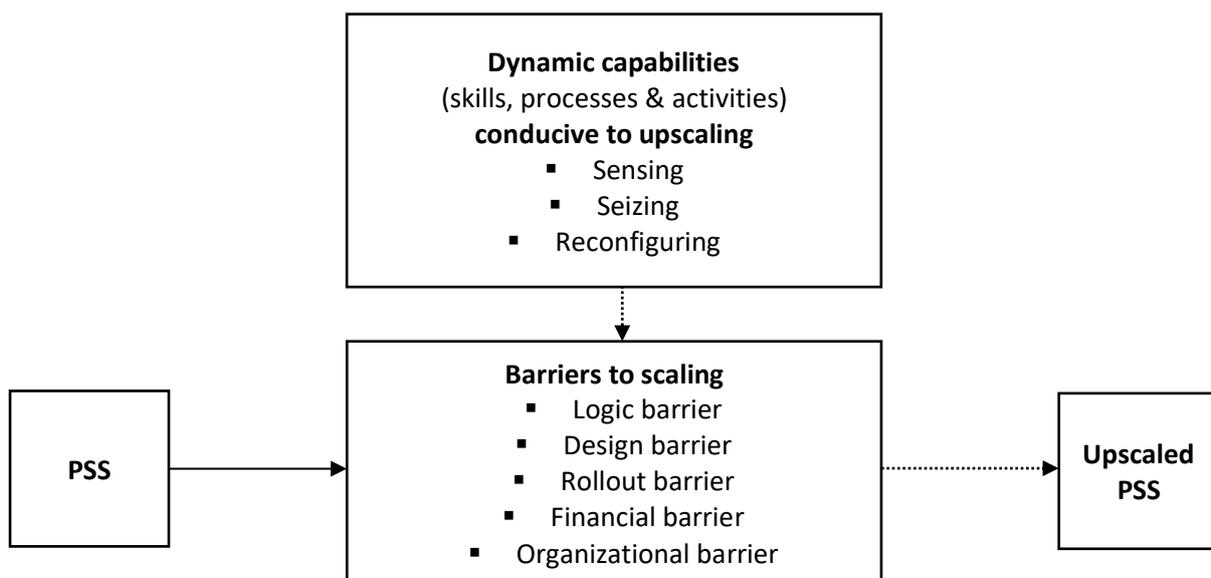
The switch from products to services has profound implications for all BM components of product companies, as they need to change their organizational structure and mindset, their operational processes, and their relationships with all stakeholders. Therefore, dealing with barriers to scaling resulting from differences in BM logics requires product companies to adapt (Cavaleri et al., 2018; Ryan, 2013). Consequently, it can be suggested that the possession of DCs can be conducive to scaling PSSs, as they allow to effectively address barriers to scaling by enabling product companies to adapt to changes in the components of the BM.

Based on the above provided definitions, it can be assumed that sensing capabilities enable product companies to generate knowledge, understand the service logic, and identify opportunities

for scaling. Sensing capabilities can therefore prepare product companies to adapt to the unfamiliar BM logic. Once product companies have identified opportunities for scaling, seizing capabilities enable them to deal with barriers to scaling by seizing the right opportunities as they arise. Finally, reconfiguring capabilities can enable product companies to address barriers by transforming relevant aspects of the business.

Based on the DC perspective, the study seeks to identify which specific skills, processes, and activities enable scaling of PSSs. This can help practitioners make relevant strategic decisions and set the necessary priorities to improve business performance and escape the zero-profit associated with operating in markets open to global competition (Teece, 2007). It is therefore an appropriate framework to help product companies overcome the profitability hurdle associated with PSSs. The conceptual framework in Figure 2 illustrates how the study’s core concepts relate to each other.

Figure 2.
Conceptual framework.



3 Methodology

3.1 Research strategy and design

To develop a deeper understanding of how product companies can scale PSSs, a qualitative research approach was chosen for several reasons. First, it allows to gain new insights and theories about which skills, processes, and activities are conducive to scaling, as not enough prior research has examined DCs in the context of scaling PSSs. Second, it allows addressing the complexity of PSSs as innovative types of SBMs in the context of broader sustainability transitions (Eriksson & Kovalainen, 2008). Qualitative research is appropriate when in-depth investigation is required (Feagin et al., 1991) and

new relationships and abstract concepts need to be identified (Bettis, 1991). It was therefore a good fit with the objectives of the study. The methodological orientation of the research was abductive and exploratory.

This thesis studied Fairphone's PSS pilot project, Fairphone Easy. A case study approach allows for the development of theory even for problem contexts that are less well understood (Eisenhardt, 1989), which seemed appropriate given the lack of work examining how product companies can scale PSSs (Cavalieri et al., 2018). Case study research can be both exploratory and explanatory, which matched well with the objectives of the study: first, to explore what barriers to scaling the company encountered and it dealt with them, and second, to explain which DCs are helpful for scaling based on approaches that were effective in addressing the barriers. The single case study approach provided the necessary focus to investigate how the barriers to scaling manifested themselves at Fairphone and how they have been dealt with. Furthermore, because it allowed to conclude which skills, processes, and activities are conducive to scaling, it seemed appropriate to extend the literature's understanding of PSSs scalability (Yin, 1994).

For this longitudinal study, various employees at Fairphone were interviewed between November 2022 and March 2023. As data collection took place in the first 10 months after the launch of Fairphone Easy, the study followed the development of the pilot in real time rather than looking back at a fully scaled PSS. This allowed to observe the dynamics in the early stages of scaling. It is important to examine these early stages in the context of the broader literature on scaling PSSs, as these experiments need to survive the initial experimentation phase before larger upscaling can occur (Bocken & Konietzko, 2022; Sarancic et al., 2021). Fairphone Easy therefore made an appropriate case to observe how product companies unfamiliar with PSSs can move from initial experimentation to upscaling.

3.2 Data collection

Data collection relied on secondary research, field research, and observations by the researcher. Secondary data sources included websites, articles, and public documents such as corporate sustainability reports, as well as internal documentation provided by the case company. An overview can be found in Appendix 1. These have been used to gain a better understanding of the company and its pilot project before the interviews were conducted. Some documents already indicated the existence of internal barriers to scaling that were then further probed with primary data. Finally, the secondary data sources, together with personal observations by the researcher, were also used to triangulate the data obtained in the interviews.

The field research was conducted through several in-depth interviews with employees of the case company. The objective of the study required the researcher to understand the skills, processes,

and activities that were effective in addressing internal barriers to scaling. The interview was therefore chosen as the preferred method of primary data collection as this information is found through personal interaction and discussions (Bell et al., 2022). The primary data obtained from the interviews was used to answer all (sub-)research questions.

The interviewees at the case company were selected based on their position in the company and their involvement and function in the pilot project. The focus was on employees with decision-making power in higher positions in the company hierarchy and those that were deeply involved in the pilot project or have been involved at an early stage. These interview partners were most likely to be able to provide the necessary insights into all aspects related to internal barriers to scaling and upscaling efforts. As a pilot project can provide a dynamic and fast-paced environment, some employees were interviewed more than once to ensure all developments were captured accordingly in the data. An overview of the conducted interviews can be found in Table 3.

Table 3.
Overview of conducted interviews.

Interview partner	No. of interviews
CEO (T)	1
CFO (T)	1
Fairphone Easy Project Lead (S)	2
Head of Product (S)	2
Commercial Lead (S)	1
Director of Impact Innovation (S)	2
Fairphone Easy Consultant (C)	1
Fairphone Easy Marketing Specialist (E)	2
Fairphone Easy Customer Success Specialist (E)	2
Fairphone Easy Operations Specialists (E)	3
TOTAL	17

T = top manager **S = senior manager * C = consultant ***** E = employee*

Semi-structured interviews were used in this study as they were considered the most appropriate technique to achieve the research objectives. This approach provided the interviewer with a certain structure by prescribing the main topics to be addressed, but at the same time allowed for some flexibility in adapting the questions to the course of each interview. The semi-structured interview guide was developed based on scientific literature to increase the reliability of the study and can be found in Appendix 2. The themes in the interview guide relate to the three sub-research question: internal barriers to scaling, approaches to overcoming them, and DCs becoming apparent in these

approaches that are effective, i.e., conducive to scaling. It was ensured that all interview questions were open-ended to gain as much insight as possible (Bell et al., 2022; Eisenhardt, 1989).

Questions no. 1-7 of the interview guide aimed to identify what internal barriers to scaling existed at Fairphone and how they expressed themselves. Corresponding follow-up questions ensured that deep insights were gained into each barrier experienced: when they occurred, what caused them, and how each barrier affected Fairphone Easy's scalability. Questions no. 8 - 12 then aimed to identify how Fairphone dealt with the identified barriers. Again, follow-up questions sought to develop a deep understanding of the different approaches taken to cope with each barrier and evaluate their effectiveness. The researcher ensured to ask the interviewees for concrete examples in all interview questions to get specific insights into their experiences. This allowed the study to identify the specific skills, processes and activities that were conducive to upscaling.

Before the interview began, participants were briefly informed about the purpose of the interview, confidentiality of the data guaranteed, and consent to audio recording obtained using Utrecht University's consent form as shown in Appendix 3. All interviews were transcribed and coded using the qualitative data analysis software NVivo. To ensure a correct interpretation of the data and to clarify open questions, the research did conduct two follow-up interviews Fairphone Easy's Marketing and Operations Specialist.

3.3 Data analysis

The data analysis software NVivo was used to summarize the data in a database, facilitate coding, and provide additional rigor (Yin, 2009). The analysis was based on all interview transcripts which were further triangulated with different sources of primary and secondary data to ensure a higher reliability of the results (Patton, 1999).

The analysis was conducted in three steps. First, using a thematic coding approach, the research identified internal barriers to scaling at Fairphone and in what form they manifested themselves. The results for each internal barrier are reported in the findings section (Tables 5-10).

Second, the study identified DCs conducive to dealing with the identified barriers. An inductive coding strategy along the approach suggested by Gioia et al. (2013) was used which allows the development of concepts while ensuring qualitative rigor in the conduct of inductive research. The methodology involved structuring the data into first- and second-order categories before combining them into aggregated dimensions (Gioia et al., 2013). For the **first-order concepts**, all skills, processes, and activities that were found to be effective in addressing the barriers to scaling were coded individually at sentence level and analytical notes were taken down by the researcher. The resulting initial structure of coded data was further analyzed and compared to establish comprehensive second-order themes. **Second-order themes** are patterns found in the first-order concepts that represent DCs

conducive to upscaling. The emerging codes were iteratively improved throughout the analysis (Eisenhardt, 1989). Finally, the second-order themes were coded and summarized into the **aggregated dimensions** of sensing, seizing, and reconfiguring, representing the three categories of DCs (Teece, 2007). The resulting data structure is presented in Figure 3. Appendix 4 provides an overview of how the quotes obtained in the interviews were used to develop the first-order concepts and second-order themes.

Third, the research matched the identified DCs with the corresponding barriers they help to address. A cross-case comparison was used to establish their relationship with each other. The corresponding table illustrating which DCs allow to address which barrier can be found in Appendix 5. After comparing the extent to which the DCs could help address the identified barriers, the research found that different combinations of DCs can reduce, remove, or prevent internal barriers to scaling.

3.4 Research quality

As common in qualitative interview research, interpretive validity of the results was a concern. The study attempted to counter this issue, and increase the transferability of results, by creating “thick descriptions”, i.e., detailed explanations of how and why certain skills, processes, and activities enable product companies to reduce, remove, or prevent internal barriers to scaling (Geertz, 1973). Before explaining in detail why some approaches worked in Fairphone's specific environment while others failed, the study attempted to describe the internal barriers, how they influenced each other, and how the company addressed them. This allowed for conclusions to be drawn about what skills, processes, and activities are conducive to scaling PSS also in other settings or situations beyond the study's context (Geertz, 1973).

To reduce the inherent subjectivity involved in qualitative research, the study used multiple data sources. The research strived to reduce personal bias of the interviewees by using multiple data sources to collect primary data (Bryman, 2016). Additionally, secondary data sources were used to triangulate the data obtained in field research (Flick, 2004). Therefore, multiple semi-structured interviews were conducted with employees at the case company which allowed for cross-checking of responses and a richer data set. This provided the researcher with a better understanding of the complex phenomenon of scaling PSS and increases the reliability of the findings (Patton, 1999). The interview transcripts were further cross-checked with secondary data sources such as websites, public documents, meeting transcripts, and company internal documents to further increase the study's reliability. To also reduce personal bias in the coding and interpretation of the data, both aspects were regularly discussed with the supervisor of this thesis.

4 Fairphone and the sustainable product-service-system Fairphone Easy

4.1 Fairphone as a leader in sustainable electronics

Fairphone was founded as an independent company in 2013, having originated out of an awareness campaign about conflict materials three years prior.² Today, the Amsterdam-based smartphone manufacturer is on a mission towards fairer and more sustainable electronics and employs more than 70 employees in three different locations worldwide (Fairphone, n.d.c).

Fairphone aims to challenge existing unsustainable practices in the industry by setting a positive example. The goal is to inspire other players in the industry that ethical electronics that are good for people and the planet can also be good for business (Fairphone, 2022c). With a modular phone designed for durability and repairability, the company aims to reduce carbon emissions and minimize e-waste throughout its lifecycle. Additional take-back systems for old phones ensure that the company can refurbish and reuse components and materials and recycle them responsibly at their end of life (Fairphone, 2022c).

The company's ambitions go beyond pure environmental sustainability and focus on the social pillar of sustainability along the entire supply chain. Fairphone strives for fair mining and sourcing practices, as well as fair working conditions and wages. It was the first company in the electronics industry to introduce a living wage bonus and to work systematically to strengthen worker voices in direct and indirect supplier factories (Fairphone, 2022c).

In 2021, Fairphone sold close to 90,000 phones and achieved a revenue of more than €36 million while managing to avoid 668 tons of carbon emissions and another 8 tons of e-waste. Additionally, the company directly improved the lives of over 7,500 people in its supply chain through living wage programs and other related initiatives (Fairphone, 2022c).

4.2 Fairphone Easy's potential to deliver economic and environmental benefits

Although Fairphone can successfully demonstrate that fair and sustainable business practices can be economically viable, its linear BM did not fully meet the company's focus on product longevity and circularity. A major issue was that the company lost control of the devices after the initial sale. Even with a modular phone designed for repairability, Fairphone could only refurbish, reuse, and recycle the parts it got back (Fairphone, 2022b). With a recycling rate of 17% across the electronics industry in 2019, retaining ownership of resources is an important step in the fight against the growing problem of e-waste (Chatterji, 2021).

The company's move into PSSs was therefore highly motivated from a sustainability point-of-view. Already several years ago, the company published a detailed report outlining its ambition to

² Conflict materials refer to raw materials that come from parts of the world where conflict is occurring. The mining and trading of those materials present a major stream of income for militant groups (EcoVadis, n.d.).

create a circular phone through a PSS (see Fischer et al., 2017). The good remanufacturing characteristics of the phone, i.e., its modular design and ease of (dis)assembly, made it very suitable for such a service proposition (Catulli et al., 2021).

With Fairphone Easy, the company was able to actively promote and monetize the longevity of its products. By offering customers monetary incentives to opt for longer contract terms and maintain the products, Fairphone could positively influence customer behavior. Moreover, the company's financial return and its sustainability impact through product longevity and circularity were reinforcing each other. Fairphone Easy's business case would be most successful if customers stayed subscribed for a longer period of time and only required few repair services.

Fairphone's Director of Impact Innovation was instrumental in developing the current concept, contributing various aspects of the business case, and supporting the pilot to the management team. She emphasized that *"it makes perfect sense to align the business case with the value proposition of extending the life of the phone and [...] leave ownership [of resources] with whoever designs the model to ensure optimization of material use"*. Similarly, Fairphone's Head of Product expressed high hopes for the technical insights created by Fairphone Easy's feedback loops. For example, by analyzing the phones Fairphone receives back, and knowing which components break more easily, they could optimize the phone's design to make those components easier to remove and replace. He concluded by saying that *"the ultimate goal is to further improve and simplify our design"*.

However, the pilot project was also driven by economic incentives, with Fairphone's Commercial Director stating that Fairphone Easy also made sense from a business perspective. A sustainable PSS was very beneficial for the brand itself and strengthening Fairphone's position as a leader in sustainable electronics. Moreover, Fairphone Easy could create new revenue streams and reducing the risk of being financially dependent on product sales alone. Only in the years prior, Fairphone had experienced severe chip shortages due to the Covid-19 pandemic causing the closures of Asian manufacturing facilities which drastically affected the company's sales (Hoecker et al., 2022). A subscription model alongside the linear model that would generate recurring monthly revenue would make Fairphone more resilient to such external events disrupting its supply chain.

4.3 Piloting a sustainable product-service-system

Because of Fairphone Easy's potential to deliver economic and environmental benefits, the company decided to pilot a sustainable PSS in the Netherlands, which went live in June 2022. With a free repair service included in the subscription fee, Fairphone Easy was designed to appeal to a group of customers who preferred not to repair their phone themselves, but to pay for the convenience of having it professionally handled by the company. If the company could not repair the screen or battery, a replacement device was provided within 48 hours (Fairphone, 2022b). Appendix 6 provides

a comprehensive overview of how Fairphone Easy works for customers. They could choose between four different contract periods with different monthly fees. The longer the customer commits to the service, the lower the monthly fee. This fee also decreases by a certain amount for each year that customers keep their phone in good condition and repair-free. Appendices 6 and 7 illustrate the company's ambition of creating a sustainable PSS (Fairphone, n.d.b).

Because a variety of factors played a role in the management team's assessment of the pilot, the company deliberately did not set clearly defined targets or stop-and-go criteria for when Fairphone Easy should reach a certain number of subscribers. However, as Fairphone was confident that the service would attract much interest once it was launched, the company decided to set a cap of 1,000 subscribers during the pilot's first year. However, with about 70 active subscribers at the start of data collection in November 2022, the pilot was far from meeting initial expectations.

The lack of subscriptions significantly affected the pilot's chances of survival, as Fairphone Easy's Project Lead explained, *"it is very difficult to build a case for upscaling when we do not have enough subscribers and data to assess how our system would work for higher volumes of customers and what the business and sustainability impact would be if we scaled"*. He went on to say that if Fairphone Easy was not initially scalable and the pilot project could not demonstrate market demand for the service, the company would likely abandon its efforts to expand the service. Fairphone's failure to scale Fairphone Easy during the first six months of the pilot thus indicated the presence of significant barriers to scaling.

5 Results

5.1 Internal barriers to scaling Fairphone Easy

This subsection addresses each of the barriers found at Fairphone. While some barriers have already been partially or fully addressed by the company, others were addressed at a later stage of the study. Because the concept of a PSS was considered uncharted territory not only within the company, but in the consumer electronics industry in general, there was some uncertainty surrounding the pilot that impacted some of the identified barriers to scaling Fairphone Easy.

The research has identified the existence of a logic, resource, design, and financial barrier that affected the scalability of Fairphone Easy. In contrast, a rollout and organizational barrier seemed to be less present. Table 4 provides an overview of which barriers to scaling Fairphone Easy were present after the first six months of the pilot. The order of the barriers also indicates how severely each impacted the scalability of Fairphone Easy. This was determined based on the researcher's personal observations at the case company over the course of several months, as well as through conversations during the semi-structured interviews, in which several employees in key positions attributed the

greatest importance to the logic and resource barrier. The design and financial barrier, on the other hand, seemed to present a smaller obstacle to scaling Fairphone Easy.

Table 4.
Internal barriers to scaling Fairphone Easy.

Internal barriers to scaling	
Present	Absent
Logic barrier	Rollout barrier
Resource barrier	Organizational barrier
Design barrier	
Financial barrier	

In the following, each barrier is presented in more detail and discussed how much it affected the scalability of Fairphone Easy. For each barrier, a definition is provided along with a summary of the positive and negative conditions that led to its presence or absence. While a (+) indicates positive conditions that helped to reduce a barrier, a (-) indicates negative conditions that reinforced it. The study purposefully included both, negative and positive conditions, as the DCs helpful for scaling were synthesized out of the latter. It should be noted, however, that a clear classification was difficult because often both positive and negative aspects played a role at the same time. Given the dominance of positive conditions (+), the negative conditions (-) had a proportionally higher impact, i.e., a barrier was recorded when there was at least one negative condition.

5.1.1 Logic barrier

The study found evidence that a logic barrier to scaling Fairphone Easy existed. While several conditions indicated that a logic barrier was less present, the internal conflict of interest resulting from Fairphone's inability to overcome a product-oriented mindset had a significant negative impact on Fairphone Easy's subscription volume, a key metric for deciding whether to make large investments to scale the service business.

Table 5.

Aspects that influenced a logic barrier to scaling Fairphone Easy.

The inability to overcome the company's product-centered mindset that hinders the successful integration of product and services.

- + Fairphone's company culture was overall very supportive of the service business due to its potential to deliver economic and environmental benefits.
- + Active information exchange between project team members and rest of the company led to an integrated rather than separated culture.
- + Dedicated operational systems able to handle recurring commerce have been set up and employees received special training to support the subscription business.
- Conflict of interest and internal competition between sales and services about limited company resources.

Supportive company culture (+) Given the company's strong focus on ethical and sustainable business practices, the new service business was strongly supported by the existing company culture due to its potential to promote product longevity and circularity. This support for the pilot project was evident at all levels of the company's hierarchy. For example, Fairphone's Co-Founder and Head of Product, who co-authored the first whitepaper released in 2017, stated that Fairphone Easy was a project very close to his heart as it was "*simply a better model for the circular economy and for our environmental goals.*" Similar sentiments were expressed by the various team members behind the pilot, who emphasized how well the service business aligned with the company's values and mission. More importantly, the pilot received the necessary support from the management team. Despite the low uptake in subscriptions and a challenging economic environment in the second half of 2022, the CEO stated that they were not ready to give up so quickly, as they were willing to let the pilot run longer than the 12 months originally planned. Such a supportive corporate culture would form the basis for successful integration of products and services.

Information exchange amongst employees (+) The cross-functional team behind the pilot consisted of one or two employees from each of the relevant departments in customer support, marketing, customer service, finance, and IT. Depending on the phase of the pilot, their tasks and workload varied, which meant that they spent more or less time on Fairphone Easy than on their tasks in the company's product sales business. The necessity of employees to switch between tasks already indicated to the existence of a resource barrier for scaling Fairphone Easy. However, because there

was no separate business unit set up for the pilot, and team members worked closely with colleagues who were not involved in Fairphone Easy, there was always active communication and information sharing, resulting in an integrated rather than separate culture at Fairphone.

Dedicated operational system and training (+) Before launching the pilot, Fairphone ensured that the right systems were in place to support a subscription business. To this end, the company implemented a platform specifically designed to handle recurring business and trained its operations specialists to use the platform. A customer support agent was also specially trained to handle Fairphone Easy customer inquiries and resolve issues should they arise. This meant that not only the organizational logic, but also the skills and expertise of employees were more closely aligned with the subscription business and its service logic.

Conflict of interest between sales and service (-) While the overall organizational logic supported the service business, some tensions between the company's linear model and its circular counterpart became apparent when looking at the deeper levels. Fairphone Easy was in direct competition for corporate resources with cash sales. Although the service targeted a different set of customers, some employees, including Fairphone's Commercial Director, expressed concern that the service could cannibalize some of the company's sales.

For the pilot's Project Lead, this internal competition between product and service was the biggest hurdle, as *"Fairphone Easy was a couple of deprioritized because other projects were more important."* While he acknowledged that this was not surprising since Fairphone's linear model generated almost all of the revenue and profits, it still had a significant impact on the scalability of the service. A prime example was not only the amount of people, time, and money spent on the pilot project, but also the visibility of the service on the company's website. In fact, the visibility of the service and consequently the awareness among customers was very low, as Fairphone Easy was only advertised on the company's homepage to a very limited extent during the first six months of the pilot project. This internal conflict of interest between Fairphone's linear and circular models not only had serious implications for the scalability of the service, but also created other barriers.

5.1.2 Resource barrier

Given their experimental nature, it is not uncommon for limited company resources to be devoted to pilot projects (Cooil et al., 2008). As scaling the service business would have required considerable investments due to its initial difficulties, the lack of financial and human resources to pursue these investments was a clear barrier to scaling Fairphone Easy.

Table 6.

Aspects that influenced a resource barrier to scaling Fairphone Easy.

The inability to pursue the investments and tasks required for scaling due to a lack of financial and human resources.

- Lack of resources for large-scale marketing campaigns prevented Fairphone from addressing the issue of low awareness of the service among customers.
 - Due to time and cost constraints, the team was unable to develop a fully automated system from scratch that did not require time-consuming manual workarounds.
 - The team members had to switch back and forth between their tasks in the pilot project and Fairphone's product sales business.
 - Manual workarounds could become bottlenecks as Fairphone Easy scales, required either more employees for the pilot or investment in process automation.
-

Lack of resources for large-scale marketing campaigns (-) A major challenge for Fairphone Easy was the lack of awareness of the service on the customer side. While Fairphone Easy's Marketing Manager acknowledged that the brand itself could already be considered a niche product, a far cry from the brand awareness of industry leaders such as Apple or Samsung (Statista, n.d.), even fewer people knew of the service's existence, which likely played an important role in the service's slow uptake. Complicating matters further was the fact that awareness of Fairphone Easy was extremely low even among the target audience. According to the company's Director of Impact Innovation, "*most of the existing customers are people we already knew and people we have brought in directly because we shared the service directly with them.*" For her, the lack of resources for large-scale marketing campaigns and other promotional efforts was the biggest barrier to scaling Fairphone Easy.

Lack of time and money to set up a fully automated system (-) The setup of the pilot's operational system was also constrained by available resources prior to its launch. Due to lack of time and money, a fully automated system could not be developed from scratch. Instead, the team was tasked with developing a system and associated processes that were as close as possible to the existing system of the company's linear model. "*The biggest challenge was to keep the effort as low as possible and use our existing system and setup as much as possible,*" recalls Fairphone Easy's After-Sales Operations Specialist. However, because the circular model had different process flows than the linear one, manual workarounds had to be found for certain processes which was, according to the expert, at times more difficult than designing a completely new setup.

Switching between tasks (-) As described earlier, the pilot project was backed by a cross-functional team consisting of employees from all the departments involved. Since the product sales business was the company's main revenue driver, the workload required to support Fairphone's main business dictated to some extent the time team members could devote to Fairphone Easy. For example, because the IT department had to prioritize other tasks, automating the remaining processes in a timely manner proved difficult, which hindered the scaling process of Fairphone Easy.

Manual workarounds could become bottlenecks (-) Certain manual steps could become real bottlenecks as the service scales, explained the pilot's lead, also referring to the general ability of customer support to handle requests in a timely manner. For example, while filling out customer information for device returns was an automated process that could be done with a single click for cash purchases, in the case of Fairphone Easy, the information had to be filled out manually by customer service representatives. In addition, tracking subscription end dates, notifying customers about the impending end of their subscription, and inquiring if they wanted it to continue, had to be done manually, involving both an operations specialist and a customer support representative. There simply were not enough resources in the IT department, and other projects had to take priority because the volume of Fairphone Easy was not large enough to deem automation necessary. While the relatively small scale of the pilot project allowed certain processes to be performed manually, upscaling of the PSS would require either more employees to handle the various tasks or full automation of all these processes, which in turn would entail significant investment (see Catulli et al., 2021).

5.1.3 Design barrier

Although Fairphone attempted to develop a fully integrated PSS, it was only partially successful because the company faced a design barrier to scaling. Although the company took many important steps to develop a fully integrated PSS, the repair services included focused solely on maintaining product functionality and therefore did not go beyond a "service as an add-on" level.

Table 7.

Aspects that influenced a design barrier to scaling Fairphone Easy.

The inability to successfully develop fully integrated PSSs that go beyond the “service as add-on” stage due to an overemphasis on product rather than service innovation. Additionally, the lack of service knowledge and skills limits PSS design and development.

- + Fairphone hired an external consultant who specialized in subscription BMs to provide strategic and operational insights on designing and executing the pilot.
 - + Even though customer needs were not the driving force behind the pilot, market and user research identified a customer need for convenience that the service could respond to.
 - + The identification of benchmark cases made it possible to learn (in part) from the experiences of others.
 - The repair services included in Fairphone Easy focused exclusively on maintaining the functionality of the physical product.
-

Service design skills (+) Recognizing the fundamental differences between products and services and the lack of expertise in the latter, Fairphone brought in an external consultant who specialized in setting up service and subscription BMs. He was able to provide key strategic and operational insights into the design of the service and the development of the pilot, building on his experience of setting up successful PSSs in other companies. Bringing the necessary (service) design skills to complement Fairphone's existing product knowledge completed the company's expertise needed to develop a fully integrated PSS.

Learning from the experiences of others (+) Although the team brought in an outside consultant with experience in service design, the design process was still fraught with many uncertainties and required working with assumptions. As the consultant explained, *“product-service and subscription models are based on assumptions towards the future which cannot be tested. For example, you cannot test how long customers will stay subscribed, but you can make assumptions on how they can be motivated to subscribe for a long time based on which you design your service”*, the consultant explained. These assumptions could then only be validated by looking back at them in the future. For example, it would have to be seen after a few years whether Fairphone Easy's longevity discount, as shown in Appendix 7, really resulted in customers taking good care of their devices and delivered the desired sustainability benefits. To reduce the inherent uncertainty in the design of Fairphone Easy, the team identified

benchmark cases outside the smartphone industry since no other smartphone manufacturer had implemented a sustainable PSS before. This facilitated the design process by reducing some of the uncertainty surrounding it and allowed conclusions to be drawn about how these companies designed and implemented their PSS.

Market and user research (+) With Fairphone's reasons for setting up Fairphone being its potential to deliver and economic and environmental benefits through taking up additional revenue streams, promote longevity, and increase circularity (Fairphone, 2022b), the decision to move into PSSs was not driven by customer needs. However, the company ensured the service would respond to a customer need after deciding to pilot. *"Our approach was to fit the model with an existing customer need"*, stated the Project Lead. Similarly, the consultant elaborated that the whole design process started from the questions of who the users were and what problems Fairphone Easy could solve for them.

To better understand what customer needs a smartphone subscription service could answer to, Fairphone did extensive market research in its four key markets Germany, France, the UK, and the Netherlands. Understanding the users and their need for convenience enabled the company to cater to that need through a combined offering of Fairphone's products and services.

Focus on tangible features (-) One way of meeting this need was the repair services included in the Fairphone Easy subscription. However, the additional services focused primarily on maintaining the functionality of the physical product. Since Fairphone is a modular phone that can be repaired by anyone, the question was whether these repair services were sufficient to provide customers with enough value for the higher price they had to pay compared to cash purchases.

The slow uptake of the service could therefore point to some fundamental problems in the design of the service. It could have been that the customer need for convenience was not met exclusively by the included repair services, or that customers simply did not value their need for convenience as highly in monetary terms. The service's sole focus on tangible features that maintained product functionality suggested an overemphasis on product rather than service innovation, as Fairphone Easy failed to move beyond mere services as an add-on to the physical phone (Coreynen et al., 2018). The inability to develop a fully integrated PSS that provides sufficient value to customers could seriously impact the future scalability of the pilot by limiting subscription volumes and thus impacting the financial barrier to scaling Fairphone Easy.

5.1.4 Financial barrier

Since the pilot project started only a few months before the data collection, it was difficult to assess with certainty whether Fairphone Easy had a financial barrier to scaling. For this assessment, the pilot would have had to run for a longer period of time to see how customers behaved and how often they would use repair services, for example. However, the research evaluated all available data on Fairphone Easy's revenue and cost side to determine if there was a financial barrier to scaling. In the consultant's view, Fairphone Easy's business case was driven by price (and therefore profitability), the volume of the service business, customer longevity, and product lifetime which will be assessed below.

Table 8.

Aspects that influenced a financial barrier to scaling Fairphone Easy.

The inability to achieve profitable growth due to the failure to benefit financially from the PSS. This is due to differences in revenue model and cost structure.

+	Financial incentives to positively stimulate customer longevity seemed effective as majority of customers chose long-term subscriptions.
+	The service had a high customer lifetime value compared to the linear model, but profitability was largely dependent on customer behavior.
-	Since Fairphone failed to acquire a large customer base, the pilot's costs were outweighing its revenues.

Financial incentives to influence drivers of the business case (+) To positively influence the four factors of the business case, Fairphone designed the service with financial incentives in mind. Customers were rewarded with lower monthly subscription fees if they opted for long-term contracts. In addition, the longevity discount model was designed to encourage customer care by lowering the monthly subscription fee for each year the customer did not use repair services. If customers cared about the devices, the longevity of the products could also be positively impacted. Since the profitability of the service depended largely on customer behavior, i.e., how long customers subscribed and how many repairs they needed, both financial incentives also had a positive effect on the overall profitability of the service.

Indeed, the financial incentives appeared to be effective, as a large majority of customers opted for long-term contracts (36 and 60 months). It would remain to be seen whether they also positively influence the other factors of the business case that determine whether Fairphone is able to profitably grow the service business.

High customer lifetime value but profitability dependent on customer behavior (+) In contrast to generating revenue at the time of exchange in the linear model, product-service models generate recurring revenue over the subscription period (Ryan, 2013). Revenue for Fairphone Easy was therefore calculated using the customer lifetime value (CLV), an estimate of the total amount of future cash flows a customer is expected to spend over the lifetime of the relationship (Groeger & Buttle, 2015). Therefore, the longer a subscription ran, the longer the period of monthly recurring revenue for the company and the higher the CLV. In fact, the CLV for long-term subscriptions of at least 24 months was significantly higher than Fairphone's traditional sales revenue (Fairphone, 2022a) and such an estimate seemed justified given an average smartphone lifetime of around 30 months (Everphone, n.d). This was in line with Fairphone's data as most customers chose long-term subscriptions that promised a high CLV.

Not only the service's revenue but also its profitability would depend largely on customer behavior. Customers who do not treat their devices with care and make use of many repairs would mean higher costs for the company and consequently a lower revenue margin. To illustrate, Fairphone Easy's profit margin would vary between 6% and 10%, depending on the subscription period and corresponding price, if customers needed two repairs or no repairs over a five-year period. However, Fairphone has limited the risk of such reckless behavior by offering one free repair service (screen or battery replacement) per year (Fairphone, n.d.b). Moreover, since the company's longevity discount model aimed to encourage customer care, Fairphone Easy's long-term profitability outlook was quite positive.

Costs outweighing revenue (-) The cost structure of the pilot consisted of production costs for the phones, operating costs for reverse logistics, repairs and refurbishments, team member salaries, marketing costs, project start-up costs, and third-party operating costs (Fairphone, 2022a).³ As the company struggled to grow its customer base significantly, the costs associated with Fairphone Easy were still higher than its revenues, despite the CLV per customer being quite high compared to cash sales. This not only highlighted the need to scale, but also revealed a financial barrier to scaling.

5.1.5 Rollout barrier

Fairphone Easy did not face a rollout barrier because a clear plan for launching and implementing the service was defined and executed accordingly. *"We created the whole strategic plan [for launching the service] from scratch, involving all the stakeholders in the project,"* said the Fairphone Easy Project Lead. He went on to explain that the implementation plan was designed right after which involved all

³ Assuming one screen replacement during a subscription period of 30 months, about 75% of the costs laid in the production of the device itself (Fairphone, 2022a).

the different functions of Fairphone Easy, i.e., customer service, customer support, direct sales, marketing, and brand team. In doing so, the team ensured that Fairphone Easy reached and served the right customers in the right markets through the appropriate channels, with the right product and value proposition (Friedman, 2002).

Table 9.

Aspects that influenced a rollout barrier to scaling Fairphone Easy.

The lack of a clear go-to-market strategy for rolling out the PSS results in the inability to capture its value in a successful BM.

- + The project team set a clear timeline and steps for launching the service in its domestic market.
- + A clear value proposition was defined for Fairphone Easy which targeted a younger, environmentally conscious demographic that had a need for convenience.
- + Although resources were limited, the company ran small online marketing campaigns and promotion events at universities to reach the target audience.
- + The service blueprint clearly defined the necessary partners, such as logistics companies or repair centers, that would enable Fairphone to offer its service to customers directly through the web store.

Dutch domestic market (+) Together with the external consultant, the project team defined a clear rollout plan to launch Fairphone Easy in the Netherlands. The Dutch market was chosen because of its relatively small size compared to the Fairphone’s other major markets, the associated logistics costs, and the company's familiarity with its home market, which promised a safe environment for such product-service experiments. The team also envisioned clear timeline for the launch and upscaling of Fairphone Easy: after designing the subscription service and building the corresponding digital infrastructure and operating system within a few months, the pilot was to prove the market viability of the service, improve the value proposition and customer experience, test whether existing processes would work without disruption, and scale up to 1,000 customers. After the one-year pilot, the plan was then to scale up extensively (Fairphone, 2022b).

Environmental conscious demographic with a need for convenience (+) The company had taken an in-depth look at the customer problem it was trying to solve. After the company's extensive user research uncovered a customer need for convenience, which Fairphone could respond to by including

quick and easy repair services, a clear value proposition was defined for the new service business. Because of its openness to new forms of ownership, the service was aimed primarily at a relatively young audience of environmentally conscious consumers (Fairphone, 2022b). According to the consultant, Fairphone's existing customer base could be described as *"very or fairly green"*, i.e., people intrinsically motivated to buy a Fairphone for its sustainability. Fairphone Easy, on the other hand, had the potential to attract a *"much lighter green audience"* that was closer to the mass market. Fairphone Easy was *"designed for the people who care but are also afraid to invest in a phone they do not know."* However, Fairphone Easy' Project Lead admitted that it had not yet been possible to find the sweet spot in terms of which customers to attract.

Small marketing initiatives (+) Fairphone initially launched the pilot in June 2022 without any special marketing campaigns, relying solely on press releases and organic posts on social media. In the following weeks, the company started to support the launch of the pilot with some online marketing activities and promotional events at universities to reach the target audience. Fairphone marketed its new service to customers by offering them peace of mind, with the quick and free repair services ensuring that customers never had to worry about their phone not working (Fairphone, 2022b). The Marketing Manager therefore prepared *"a strategy on how best to reach the target audience from a paid media perspective"* which defined what content should be published, when, and through which marketing channels.

Service blueprint (+) In the so-called service blueprint, the team also identified the necessary partners that would enable the company to offer its customers a smartphone subscription service via the web store. These included a shipping and logistics company that would handle all necessary transportation and repair centers that would provide the necessary repair services. With all the steps of a go-to-market strategy identified and underway, there seemed to be no barrier to scaling Fairphone Easy.

5.1.6 Organizational barrier

Although the pilot did not reach the stage of upscaling that would have required a change in Fairphone's organizational structure, all indications were that an organizational barrier would be less present in future.

Table 10.

Aspects that influenced an organizational barrier to scaling Fairphone Easy.

The inability to implement the required changes in the organizational structure for it to effectively support the PSS.

- + The pilot was supported by both employees and management, as it offered tremendous potential to increase revenue whilst catering to the company's longevity objectives.
- + The management team was willing to invest more time and resources in the pilot, even though subscriptions remained below expectations.

Support throughout company hierarchies (+) The potential of Fairphone Easy to deliver economic and environmental benefits was acknowledged by both employees and management, resulting in strong support for the pilot throughout the company. Fairphone's CEO exemplified the open and supportive company culture described in earlier subsections (see 5.1.1 Logic barrier) and expressed the company's ongoing commitment to the pilot by stating *"I am a strong ambassador for Fairphone Easy because I believe in order to change this industry, we also need to rethink its business models."*

Willingness to invest time and resources (+) Despite the tight budget, the management team approved the hiring of an additional employee to support the company's scaling efforts and signaled its willingness to test Fairphone Easy for longer than the originally planned one year. The financial commitment to spend more time and resources scaling Fairphone Easy indicated the management team's commitment to hiring additional staff and driving the company's organizational transformation in the future.

5.2 Dynamic capabilities conducive to scaling Fairphone Easy

This section reflects on the DCs, i.e., *activities, skills, and processes*, that have proven helpful in dealing with internal scaling barriers. DCs conducive to scaling have been grouped into the dimensions of *sensing, seizing, and reconfiguring capabilities*. An overview can be found in Figure 3. Whilst this a comprehensive overview free of any time perspective, it is important to note that some DCs had already been applied, and barriers addressed, whilst others might still be in use or are constantly applied to deal with barriers to scaling. For example, whilst *service design* was helpful in addressing barriers prior to the service's launch, *creating and integrating knowledge* was a continuous practice. Moreover, some DCs proved helpful in addressing multiple barriers, while others were only able to address one. Later subsections will expand more on this topic.

Figure 3.
Dynamic capabilities conducive to scaling product-service-systems.

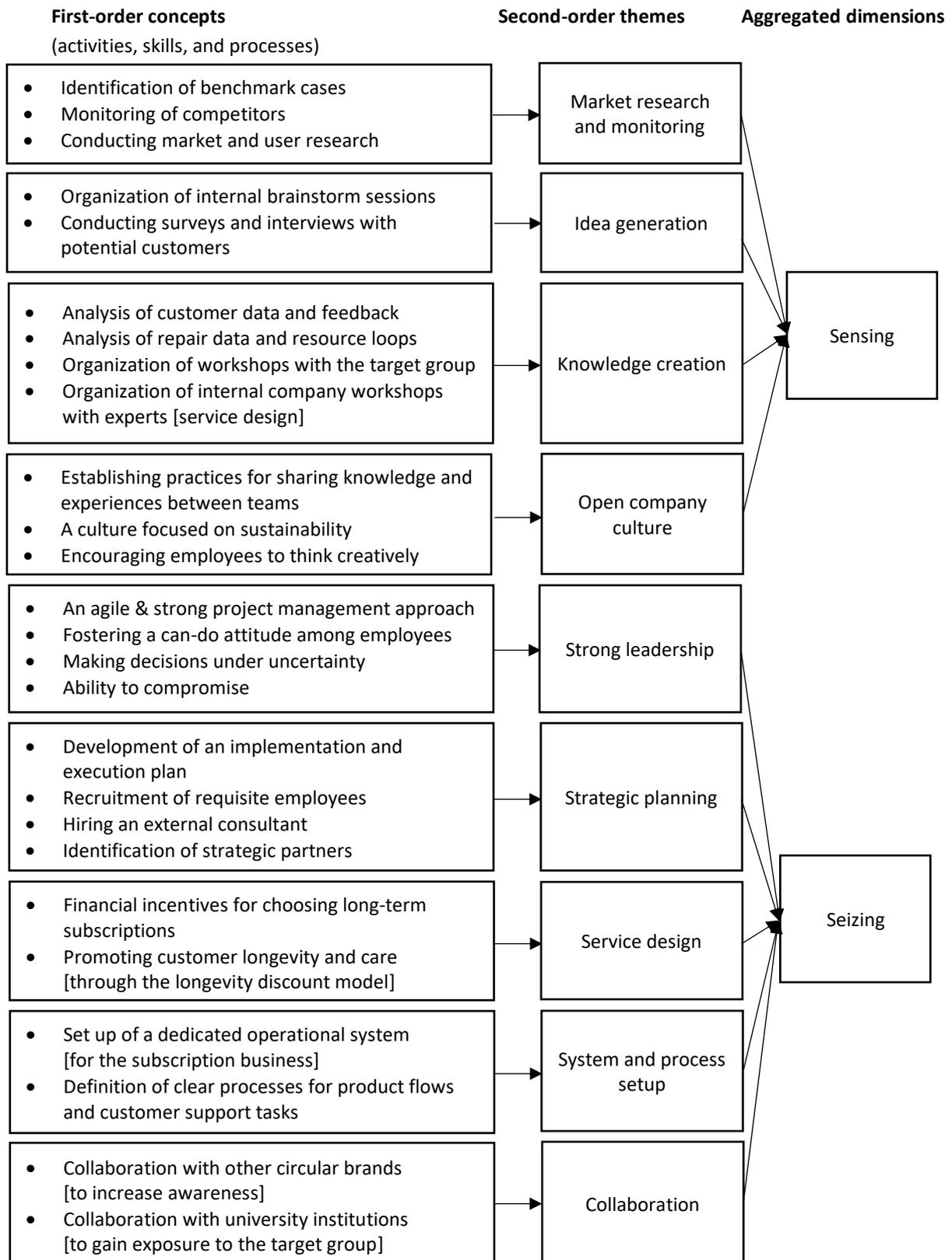
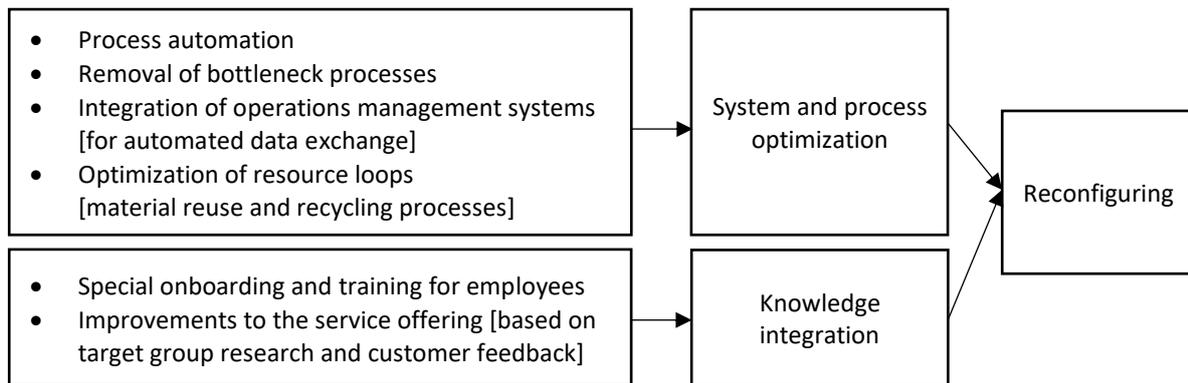


Figure 3.

Dynamic capabilities conducive to scaling product-service-systems (continued).



5.2.1 Sensing capabilities

Sensing capabilities enabled Fairphone to understand the new service logic, identify the challenges it faced in its service business, and identify opportunities to scale. While **market research and monitoring** were especially relevant prior to the launch of the pilot as the team designed Fairphone Easy together with its digital infrastructure, monitoring competitors and general market trends will be equally important to identify opportunities for scaling in the future. To learn from the experiences of others, the team identified benchmark cases from other industries, as there were no cases from the smartphone industry. The companies under consideration were all product companies that had begun offering their products as services, and the team analyzed how they built their services business. "We asked ourselves what we can we learn from them, what we liked [about their setup], and what aspects would fit best with our model?", explained Fairphone Easy's Project Lead, who pointed out that not all benchmarks pursued the goal of sustainability. The company also conducted extensive market and user research to identify a customer need to which it could respond and to determine the right target audience for Fairphone Easy within their main markets. The insights from this research enabled the company to better understand its customers and their issues, which was essential for developing an appropriate value proposition along with a concrete marketing plan on how best to reach the target audience.

In line with market research and monitoring, Fairphone used various methods for **idea generation**. After identifying the customer problem, the project team organized internal brainstorming sessions to find a solution to the problem at hand. To address the customer need for convenience, these sessions led to the included repair service and the promise of a 48-hour phone exchange that never leaves customers without a working phone. These brainstorming sessions were also useful for defining a clear value proposition along with the unique selling points that should be highlighted when marketing Fairphone Easy to customers. Another way to generate new ideas was to

conduct surveys and in-depth interviews with the target audience to establish how well the current service offering met their needs and how it could be improved. Based on the insights that especially a young people seemed to highly value the flexibility to cancel their subscription at any time, provided the team with the idea of possibly removing minimum contract periods in the future.

Since the pilot itself was about learning and testing, **knowledge creation** was essential for Fairphone Easy. This included the creation of knowledge on how internal and external barriers to scaling could be addressed. For example, as the analysis of customer data showed that the service did not appeal to a younger demographic, in contrast to initial expectations and research by the company, new consumer research was initiated to find out why the service was not as attractive to young people as originally expected. The team therefore organized workshops with students from various universities. These were particularly informative in establishing what aspects of the service were not attractive to them and how it could be improved. It emerged, for example, that young people in particular did not want to be tied to long-term contracts and that the most flexible subscription option was simply too expensive compared to buying the device. The analysis of repair data also gave the company a deeper understanding of how the various modules of the phone function during use. The technical insights gained from the resource loop analysis would allow Fairphone to understand not only how resources and materials could be better reused, but also how the phone's design could be improved by ensuring that the components that break most often are also the easiest to repair. Since Fairphone had limited knowledge about services and service design, the company organized a two-day workshop for its employees. The "Designing good services" workshop, led by an outside expert, enabled the participants to gain skills in service design and develop a deeper understanding of what constitutes a "good service."

Finally, an **open company culture** was also beneficial for scaling Fairphone Easy. Not only the establishment of the pilot project itself, but also the identification of opportunities for scaling favored a culture that embraced new ideas and was willing to learn by doing things differently. Such a culture of curiosity and openness was fostered by the management team through regular company meetings where the different teams shared latest developments and insights. As Fairphone had sustainability deeply embedded in its mission, Fairphone Easy received the necessary support from the management team and its employees due to its great potential of PSS to deliver major environmental benefits. To identify opportunities to scale and develop ideas on how to take advantage of them, it was equally beneficial that the company leadership provided employees with the freedom to experiment and explore new possibilities.

5.2.2 Seizing capabilities

After Fairphone identified opportunities to scale and explored effective ways how the barriers could be addressed, seizing capabilities enabled the company to take advantage of opportunities as they arose. The **strong leadership skills** of the people heading the pilot were critical not only for the launch, but also for scaling the new service offering. In the months prior to the launch, designing, planning, and implementing the pilot in a short period meant that the team had to compromise and accept that not everything could work perfectly. The project lead's ability to strike compromises in the right areas was especially relevant for a scale-up with limited resources. Moreover, their ability to foster a "can-do" attitude among employees was helpful to overcome major challenges when setting up and scaling the pilot that required a collective team effort. An example would be the development of a functional operational system together with accompanying processes within a few months prior to the launch. As the pilot was surrounded by a dynamic and fast-paced environment, the right attitude and mindset fostered by the leadership further enabled the team to deal with unexpected developments. Responding to these unexpected developments in a timely manner and navigating the team through the uncertainty surrounding the pilot required an agile project management approach as well as strong project management skills. Lastly, since subscription models are based on assumptions towards the future and Fairphone had no prior experience with services, taking advantage of opportunities to scaling required making decisions under uncertainty.

Seizing the right opportunities when they arose did not happen by chance, but often required **strategic planning** that prepared the team to act when needed. Because Fairphone lacked the necessary knowledge and skills related to designing services and building subscription businesses, the company acquired this knowledge and skill by hiring an outside consultant who specialized in this area. Together with the consultant, the team formulated a detailed plan for the launch of the pilot and executed it accordingly, laying the groundwork for the future scalability of Fairphone Easy. This plan included not only hiring a customer service specialist to handle all operational processes and tasks related to Fairphone Easy, but also identifying strategic partners to handle logistics and repair services. Similarly, will strategic planning prepare Fairphone to take advantage of future opportunities to scale.

With the right **service design**, Fairphone was able to influence customer behavior in ways that positively impacted the business and the environment. The company used financial incentives to positively influence customer longevity and customer care. As Fairphone benefited from customers opting for long-term subscriptions, the company rewarded those who did so with lower monthly subscription fees. And the company's pricing strategy was successful, with over 60% of Fairphone Easy subscribers opting for a contract term of more than 36 months. Since the profitability of the service depended on the number of repairs customers needed, the company tried to positively influence customer care through the longevity discount model. For each year customers remained repair-free,

the monthly fee would decrease by €2. While it remains to be seen after a few years whether this strategy will incentivize customers to take better care of their devices, customer response to the aforementioned financial incentive gives the team hope to achieve similar results.

Setting up the necessary systems and processes was also important for the launch and scaling of the pilot project. First, the company set up its own operational system capable of handling the subscription business. In this context, the team defined clear processes for product flows and customer support tasks that employees could follow, which formed the basis for efficient onboarding and functioning of Fairphone Easy. Even though not all processes could be automated due to time and cost constraints, the team attempted to automate as many as possible to reduce the workload for day-to-day operations.

Collaborating with different actors and institutions was also helpful for a scale-up like Fairphone to drive scaling efforts. Since the lack of awareness of Fairphone Easy among potential customers was likely one reason why the number of subscriptions fell far short of initial expectations, and resources were missing for large-scale marketing campaigns, the company decided to collaborate with other circular brands as well as with universities to gain exposure to the target audience at relatively low cost. Joint marketing campaigns on social media with other sustainable Dutch brands allowed Fairphone to reach a common audience of sustainability-minded customers, and holding guest lectures, inspirational events, and promotions at various universities in the Netherlands allowed to reach a young and highly educated audience.

5.2.3 Reconfiguring capabilities

Reconfiguring capabilities enabled Fairphone to further address internal barriers by continuously improving the service proposition along with the pilot's operational processes to achieve the desired economic and environmental impact. **System and process optimization** played a key role in implementing the necessary changes that made Fairphone Easy operations more efficient. Both process automation and the elimination of bottlenecks reduced the workload of employees in managing day-to-day operations. Because Fairphone set up a separate system for the service business in addition to the linear model, the company had two operations management systems. The integration of the two systems, which allowed for automated data exchange and integration, meant that Fairphone could leverage synergies between the two systems. Due to quicker responses to customer issues and faster handling of reverse logistic processes, this ultimately benefited the customer experience. Furthermore, by working on optimizing resource cycles, i.e., material reuse and recycling processes, Fairphone would be able to reduce its negative environmental impact.

To improve the service offering and the quality of the work performed by the employees, it was crucial that Fairphone continuously **integrated the knowledge** acquired during the pilot project.

Based on research with the target audience through surveys, interviews, and workshops, as well as customer feedback, the team refined several aspects of the service offering, including pricing, subscription options, and upgradeability to new devices, to better meet customer needs. Dedicated onboarding and training for customer service specialists and account managers also ensured more efficient operations and a better customer experience.

5.3 Dynamic capabilities conducive for dealing with internal barriers to scaling

By matching the identified DCs with the barriers they helped to address and comparing the instances when they were applied at Fairphone, the research was able to conclude that DCs can enable product companies to deal with internal barriers in three different ways. Some combinations of DCs **reduce** barriers to scaling, while others **remove** barriers entirely. Through other DCs, product companies can **prevent** barriers from occurring in the first place.

The study found that *sensing, seizing, and reconfiguring capabilities* are equally important for scaling PSSs as they only in combination enable product companies to effectively address internal barriers. Depending on the type of barrier they encounter, it is essential for product companies to master DCs in various categories. Sensing capabilities in the form of *market research and monitoring, idea generation, knowledge creation*, and an *open company culture* enable product companies to develop the necessary understanding of the new service business that allows them to identify opportunities for scaling. Sensing capabilities combined with seizing capabilities, such as *strong leadership, strategic planning, service design, system and process setup, and collaboration*, can enable product companies to reduce the logic barrier, remove the design barriers, and prevent the rollout barrier by identifying and exploiting the right opportunities as they arise. Finally, seizing capabilities together with reconfiguring capabilities in the form of *system and process optimization* and *knowledge integration*, can enable product companies to reduce the financial and resource barrier by transforming relevant aspects of the service business.

For example, *market research and monitoring, idea generation, knowledge creation, strategic planning, and knowledge integration* (sensing, seizing, and reconfiguring capabilities) equipped Fairphone with the knowledge and skills to remove the design barrier. On the other hand, *service design, collaboration, and system and process optimization* (seizing and reconfiguring capabilities) enabled Fairphone to reduce the resource barrier. A cross-case comparison of which combinations of DCs allow product companies to address which barrier to scaling can be found in Appendix 5.

Moreover, the study found evidence that some DCs are more helpful than others. While some enable product companies to address multiple barriers, others are only helpful for addressing one barrier. It would therefore make sense for product companies to start with fostering the DCs that have an influence on multiple barriers at once. For example, *strategic planning* stood out especially as it

can have a direct or indirect influence on all identified barriers. In the case of Fairphone, it directly contributed to reducing the logic barrier by hiring requisite employees, removing the design barrier by bringing in an outside consultant with relevant knowledge and skills, and, with the consultant's help, developing an implementation and execution plan that enabled Fairphone to prevent the rollout barrier. Acknowledging the lack of in-house service knowledge and ensuring that this expertise was brought in can be seen as the most fundamental step for product companies unfamiliar with PSSs. Building upon this knowledge brought in by the consultant, it enabled the company to design the service in a way that promoted customer longevity and care, thus reducing the financial and resource barrier to scaling. Table 11 provides an overview of which DC enabled the company to address which barrier in what way.

It should be noted, however, that the research could not observe how Fairphone prevented the rollout barrier when it occurred because data collection began only after the company had already successfully dealt with the barrier. Therefore, the research relied on respondents' reflections and recollections to identify the DCs that can prevent a rollout barrier.

Table 11.
Dynamic capabilities conducive for dealing with internal barriers to scaling.

Internal barrier	Dynamic capabilities	Effect
Logic barrier	Open company culture, leadership, strategic planning, system and process setup, knowledge integration	Reduce
Resource barrier	Service design, system and process optimization, collaboration	Reduce
Design barrier	Market research and monitoring, idea generation, strategic planning, knowledge creation, knowledge integration	Remove
Financial barrier	Service design, system and process optimization	Reduce
Rollout barrier	Market research and monitoring, idea generation, strategic planning	Prevent

5.3.1 Dynamic capabilities to reduce the logic barrier

An ***open company culture*** fostered by the company's ***leadership*** forms the foundation for product companies to reduce the barrier that hinders overcoming a product-oriented and adopting a service-oriented mindset. This culture of openness to new ideas and new BMs that cater towards a circular

economy enables firms to move from pure product companies to service providers. In Fairphone's case, the role of the management team and project leadership was to foster this culture, convince employees of the pilot and related investment costs, and guide them through this uncertain environment.

Because the transition to a service provider transforms all components of a company's BM, **strategic planning** is essential to prepare and take the necessary steps. For Fairphone Easy, this included hiring requisite employees and **establishing a dedicated operational system** along with accompanying processes to support the subscription business. Planning these steps help to bridge the gap to an unfamiliar service logic that involves recurring revenue, different accounting systems, a greater emphasis on reverse logistics processes, and entirely new forms of customer relationships (Bocken & Konietzki, 2022).

Finally, **knowledge integration** enables employees to move beyond a purely product-oriented mindset. At Fairphone, employees involved in the pilot received specialized training to support the service business. Although this enabled team members to establish a service logic among themselves, this mindset was not shared by the entire organization, as some employees still saw Fairphone Easy as competing with the company's product sales model for limited resources and customers. Therefore, it is important for product companies to integrate new knowledge in the entire organization to fully remove a log barrier to scaling.

5.3.2 Dynamic capabilities to reduce the resource barrier

A combination of multiple DCs can enable product companies to reduce the resource barrier by freeing up capital through cost reduction or the pursuit of other initiatives for scaling that do not involve high costs. Through the right **service design**, companies can reduce operating costs. For example, through its customer longevity discount model, Fairphone aimed to reduce operating costs by incentivizing customer care and thereby, avoiding costly repair services. Similarly, companies can minimize operating costs through **system and process optimization** by automating or eliminating bottleneck processes that required lots of manual work. Both activities aimed to free up the necessary capital that would enable the company to pursue the investments for scaling Fairphone Easy, such as large-scale marketing campaigns.

In the case of Fairphone Easy, as low awareness among customers remained problematic for scaling the service business, the company successfully collaborated with other brands and universities to increase awareness among the target group without incurring high costs. Similarly, product companies can find creative ways to pursue initiatives that are helpful for further scaling through **collaborative efforts** that do not involve considerable costs.

5.3.3 Dynamic capabilities to remove the design barrier

Similarly, several DCs give product companies the ability to design fully integrated PSSs, therefore removing the design barrier to scaling. As a first step, **market research and monitoring**, along with **idea generation**, provides the organization with the necessary knowledge that will form the basis for designing the PSSs. At Fairphone, this included understanding customer needs and coming up with different ways Fairphone Easy could respond to these needs.

With **strategic planning**, product companies ensure to have the necessary service design skills. As Fairphone brought in an external consultant, the company ensured that the necessary knowledge and skills were in place to design the pilot. Thereby, it is important to design fully integrated PSSs that completely meet customer needs. While the repair services offered by Fairphone Easy largely met the identified customer need for convenience, they did not go beyond the "service as an add-on" stage by focusing only on the physical product. Additional services focusing on intangible aspects could have further increase customer satisfaction and thus the attractiveness of the PSS.

By **creating knowledge** and **integrating knowledge**, product companies can ensure that the design is constantly iterated to better meet customer needs. It can also ensure that employees are constantly improving their skills. For example, as Fairphone was using the insights gained from analyzing customer data and feedback, the team was able to further improve Fairphone Easy's offering for a light-green customer group in by including the option to upgrade to a newer smartphone model in the running subscription.

5.3.4 Dynamic capabilities to reduce the financial barrier

By including monetary incentives in the **design of the service**, product companies can stimulate favorable customer behavior that can lead to a higher profitability and sustainability impact of their PSS. For example, as Fairphone Easy's profitability was largely dependent on customer longevity and care, the company incentivized customers to opt for long-term subscriptions by decreasing the monthly fee, the longer they subscribed. Similarly, through the customer longevity discount model, Fairphone provided customers with an incentive to take care of their devices. By avoiding costly repair costs, Fairphone would further increase its profit margins. Both aspects would also increase the environmental benefits delivered by Fairphone Easy.

In addition, by **system and process optimization**, product companies can reduce costs by making their operations more efficient. Automating processes and streamlining workflows, such as reverse logistics processes, can minimize the amount of manual labor required, therefore allowing the company to run the pilot with a minimal number of employees. In Fairphone's case, as the pilot

generated more and more revenue through a slow increase in the number of subscriptions while operating with a minimum number of employees, Fairphone Easy slowly approached profitability.

While the DCs identified in this subsection can reduce the financial barrier to scaling, the research was unable to determine whether they could completely remove it due to time constraints of the thesis. Because Fairphone Easy's profitability depended on customer longevity and care, it could only be confidently assessed after a few years when enough data about the number and type of repairs, as well as the average subscription length is known. Although the subscription volume remained moderate, and the pilot's overhead costs were still overshadowing its revenues, the signs were positive that Fairphone could achieve profitable growth with the service as it promised high profit margins.

5.3.5 Dynamic capabilities to prevent the rollout barrier

Through several DCs, product companies can develop a clear go-to-market strategy for rolling out the PSS and execute on that plan, therefore preventing a rollout barrier to scaling. **Market research and monitoring** can equip the company with the required knowledge and understanding of the market and its customers. At Fairphone, this enabled the team to identify a customer problem and a target customer group. After identifying a customer need, **idea generation** can enable companies to come up with innovative ways to answer to that need, define a value proposition, and develop a marketing strategy for how and through which channels to reach those customers. This ensures that the service will reach and serve the right customers in the right markets through the appropriate channels, along with the right products and value propositions (Friedman, 2002). **Strategic planning** then ensures that the necessary resources are available for the rollout plan to be executed accordingly.

6 Discussion

6.1 Theoretical contributions

This thesis added several aspects to the scholarly understanding of how product companies can scale PSSs by providing insights into the internal barriers faced and the DCs helpful for dealing with them in the early stages of scaling. First, the study found evidence that supported previous literature on the internal barriers to scaling as the case company was facing a logic, design, and financial barrier after it already had prevented a rollout barrier from arising (Coreynen et al., 2018; Matschewsky et al., 2018; Ryan, 2013; Visnjic & van Looy, 2013). In addition, it established that product companies can also face a resource barrier, which was described as *the inability to pursue the investments and tasks required for scaling due to a lack of financial resources and available manpower*. Given the nature of the barrier, it is likely that this barrier exists primarily for start-ups and scale-ups facing resource constraints, rather than large multinational companies.

Second, by identifying DCs conducive to scaling, this study provided several new insights related to scaling PSSs, which has only been researched to a limited extent. Previous studies have already taken the DC view in the context of SBM innovation (Bocken & Geradts, 2020; Bocken & Konietzko, 2022; Inigo & Albareda, 2019; Pieroni et al., 2019; Santa-Maria et al., 2021; Weisbrod & Bocken, 2017) and SBM implementation (Khan et al., 2020; Reim et al., 2021), but not enough research has been done to identify the *skills, processes, and organizational activities* that are conducive to scaling SBM (Sandberg & Hultberg, 2021).

Similar to the implementation of circular BMs, scaling PSSs through *sensing, seizing, and reconfiguring* is a sequential and continuous process (Khan et al., 2020). Therefore, a holistic approach is required for scaling PSSs, as product companies need to leverage different DCs to successfully deal with internal barriers to scaling. The research found that similar DCs required for SBM implementation can be helpful for its scaling, such as *market research and monitoring, idea generation, strategic planning, as well as knowledge creation and integration*. In the case of SBM implementation, DCs enable companies to successfully identify and exploit circular economy opportunities (Khan et al., 2020). Similarly, DCs enable product companies to identify and address internal barriers in the context of scaling SBMs such as PSSs.

Consistent with previous findings on DCs helpful for scaling circular BMs, this work found that a culture of openness, coordination of internal and external contributions, collaboration with external partners, increasing efficiency, and transferring knowledge are also conducive to scaling PSSs (Sandberg & Hultberg, 2021). In addition, the study made an important contribution to the emerging literature on scaling SBMs, as it was able to identify specific DCs for the early stages of scaling PSSs, such as *strong leadership, service design, and strategic planning*.

While previous literature has only established the DCs that are conducive to scaling, this work was able to match the various DCs with the barriers they help address. By comparing the cases in which they were applied, the study found that DCs can enable product companies to *reduce, remove, or prevent* internal barriers to scaling. Building on this differentiation, the study also has important implications for practitioners who are planning to implement or have recently implemented a PSS and are in the early stages of scaling.

6.2 Practical implications

By portraying the relationship between DCs and internal barriers to scaling, the study was able to identify the *skills, processes, and organizational activities* that can enable product companies to reduce the logic, financial, and resource barrier, remove the design barrier, and prevent the rollout barrier in the early stages of scaling. It can thus provide practitioners with specific recommendations

on the skills to foster, processes to implement, and activities to carry out to address the respective internal barriers they are facing and scale newly introduced PSSs.

One important implication is that product companies need to foster *sensing, seizing, and reconfiguring capabilities* simultaneously. The different internal barriers to scaling can only be effectively addressed when combining different sets of capabilities. Product companies have to build all three types of capabilities to reduce the logic and remove the design barrier. To prevent the rollout barrier, a combination of sensing and seizing capabilities is sufficient. Reducing the financial and resource barrier requires a combination of seizing and reconfiguring capabilities.

A second important finding is that certain DCs are more helpful than others as they can enable product companies to deal with multiple barriers simultaneously. For example, *strategic planning* was found to be especially helpful as it can ensure that product companies have service design knowledge and skills required for scaling in-house. Acknowledging the lack of service knowledge is essential for product companies unfamiliar with PSSs. Acquiring this knowledge will prove to be very useful as it can have a direct or indirect influence on all identified internal barriers to scaling. Companies should therefore pay special attention to building up these DCs, as they can serve as an ideal starting point for the scaling efforts of product companies and enable the transition from initial experimentation to upscaling.

Lastly, this research focused solely on internal barriers, but the case showed that external barriers are also important. After Fairphone had successfully reduced, removed, or prevented internal barriers, the research found little evidence that suggested that internal barriers were still considerably impacting the scalability of Fairphone Easy. However, as broader upscaling was lacking, it seemed that external barriers were severely hindering the company's scaling ambitions. To scale PSSs, companies must therefore consider internal and external barriers together.

6.3 Limitations of the study

While the study was able to provide valuable insights into how product companies can scale newly introduced PSS, it is important to note that the case of Fairphone Easy had some particularities that might prevent a broad generalization of its findings.

First, as Fairphone is a sustainability-oriented company, Fairphone Easy was incepted as a sustainable PSS. Because of the inherent trade-offs between marketability and sustainability of PSSs, scaling in terms of economic growth and environmental impact may pose additional challenges that might not exist for PSSs that neglect the environmental domain. Sustainability-oriented companies must therefore balance these two dimensions and cannot fully focus their efforts on one (Hahn & Pinkse, 2022). However, although the study used a dual definition of scaling, the focus was overly placed on economic rather than on environmental scaling. It would be worth considering whether

some changes in service provision aimed at increasing its attractiveness towards customers have a negative impact on its sustainability impacts. Furthermore, as sustainability has always been deeply embedded in Fairphone's mission and business practices, the company's openness to new BMs that can deliver economic and environmental benefits was exceptionally high. From the beginning, this culture, which embraced Fairphone Easy, resulted in a less intense logic barrier that might be a greater barrier to scaling for other companies which are less focused on sustainability.

Second, it is important to note that Fairphone Easy was in the early stages of scaling. While it is necessary to understand how product companies can come from initial experimentation to upscaling, some of the barriers encountered could be more or less prominent for product companies in later stages of scaling. Similarly, different DCs may play a more important role in dealing with internal barriers in other stages of scaling. Since the company, prior to the pilot, only had a linear BM focused on product sales and Fairphone Easy having been the first venture into PSSs, the company's limited experience with services needs to be considered when analyzing how it dealt with barriers to scaling. More experienced companies, for example, might be able to prevent a design barrier by designing a fully integrated PSS from the beginning.

Third, Fairphone Easy was a pilot project running parallel to the company's linear BM and the company's economic survival did not depend on the successful scaling of it. Moreover, the company did not define clear stop-and-go criteria from the beginning that said when a certain volume in subscriptions should be reached. Both aspects raise the question of whether the company would have been more willing to allocate additional resources to scale if it had a higher pressure to succeed in doing so. This could have led to different approaches and priority setting than for other product-service providers where a more risk-taking approach, and therefore a less prominent resource barrier, could be expected.

Moreover, the financial barrier to scaling Fairphone Easy was weak due to the company's size. Since a large majority of the pilot's costs were in the production of the devices themselves, scaling the pilot would have required significant investments due to the need to pre-finance many devices upfront. This barrier might be greater for companies with lower revenues, facing similar cost breakdowns when scaling requires pre-funding many products.

Fourth, smartphones are a special case in the consumer electronics industry, being highly personal devices that contain large amounts of personal data. This resulted in a strong external barrier to scaling as it seemed that customers were more opposed to renting a device as personal as a smartphone compared to mere use objects such as bicycles or jeans. Moreover, as the consultant mentioned, smartphones are even more peculiar because Fairphone Easy is in direct competition with mobile telecommunication operators. He concluded, that in the case for most other electronic

products, customers cannot as easily get a subscription to a device which presented another external barrier to scaling Fairphone Easy. Countering the low uptake of subscriptions would have required a large investment in marketing campaigns to promote Fairphone Easy and address customer concerns. The lack of resources for such campaigns largely contributed to the resource barrier to scaling Fairphone Easy. It is likely that this barrier is less pronounced for companies in other industries with less personal products.

On the other hand, the case displayed important similarities with many product companies unfamiliar with PSSs that make its findings relevant beyond the context of the study. Fairphone belongs to a group of sustainability-focused companies that seek to achieve more environmental benefits by adopting circular BM and practices (Briguglio et al., 2021). Since these companies are usually very open to different types of SBMs, literature would benefit from having an adapted definition of a logic barrier to identify whether such a barrier impacts the scaling of their PSSs. As the case of Fairphone showed, although the management team, employees, and company culture were generally very supportive of the pilot, typical barriers to innovation were evident at the operational level, where a clear conflict of interest over limited resources was identified between the linear model and its circular counterpart.

Lastly, many of the barriers, such as the design or financial barrier, are not specific to the case company but are broadly relevant to product companies unfamiliar with PSSs and services. The logic barrier, which could be interpreted as a company-internal resistance to change might even be applicable to any new form of BM. Therefore, considering the particularities of the case mentioned above, it can be assumed that other product companies face similar barriers to scaling, albeit with varying degrees of severity. Similarly, the DCs identified might also be relevant to many product companies whose industries are rapidly evolving towards sustainability due to regulatory pressure as well as consumer and investor demand (Rafi, 2022).

6.4 Avenues for future research

Although this study has filled some gaps in the academic understanding of scaling of PSSs, further research is needed. Since this study focused exclusively on the early ones, an interesting avenue for future research would be to analyze how more mature PSSs, which have already survived the initial experimentation phase, have scaled. It would be critical to understand whether they face similar barriers to scaling and whether different types of barriers are more salient than others. Similarly, it would be interesting for practitioners and researchers to understand whether similar DCs are conducive to scaling more mature projects and whether different combinations of sensing, seizing, and reconfiguring capabilities become important. It would also help practitioners to understand

whether they must foster a different set of *skills, processes, and activities* in each phase or whether they can rely on the same set of DCs throughout the upscaling process.

While it can be said that the activities, skills, and processes identified in the study are conducive to scaling PSSs, it should be noted that they might not contribute to reducing, removing, or preventing barriers in other cases. While in the case of Fairphone Easy a combination of DCs was sufficient to remove a particular barrier, in the case of other product companies, the same DCs might only reduce that barrier or vice versa. For example, it is likely, that *market research and monitoring, idea generation, knowledge creation, strategic planning, and knowledge integration* may be sufficient to prevent or remove the design barrier when product companies are more experienced with services. It is therefore important for future researchers to consider the prior experience of companies when studying how they addressed barriers to scaling. Moreover, it would be interesting to study upscaling of PSSs in other sectors and industries to see whether addressing internal barriers to scaling with the DCs identified in this research can lead to successful scaling.

Since it is widely accepted that PSSs have great potential to deliver environmental benefits, other studies could benefit from having a dual definition of scaling as proposed in this study. Future research may focus more on environmental scaling and explore how companies can manage the trade-offs between marketability and sustainability of PSSs.

7 Conclusion

To accelerate the sustainability transition, PSSs must reach an increasing number of beneficiaries (Ciulli et al., 2022). Despite the known fact that scaling of PSSs is difficult (Coreynen et al., 2018), there is little research on how to scale PSSs. This thesis therefore investigated how product companies can scale PSSs, using a single case study. The findings contribute to the understanding of how product companies can scale by providing insights into the internal barriers faced by product companies and the DCs, i.e., the *organizational activities, skills, and processes*, helpful for early-stage scaling.

The thesis extended prior knowledge of the internal barriers faced by product companies as it found that they can also face a resource barrier to scaling. In line with previous findings on the DCs conducive to scaling circular BMs, this thesis identified that an open company culture, coordinating internal and external contributions, collaborating with partners, increasing efficiency, and creating and integrating knowledge are also helpful for addressing internal barriers to scaling PSSs (Sandberg & Hultberg, 2021). Furthermore, it specifically identified DCs helpful for scaling PSSs in the early stages, such as strong leadership, service design, and strategic planning.

By matching the DCs with internal barriers, and comparing the cases in which they were applied, the study portrayed their relationship in more detail. It found that DCs can enable product

companies to reduce, remove, or prevent internal barriers to scaling. The study identified the combinations of DCs that enable product companies to reduce the logic, resource, and financial barrier, remove the design barrier, and prevent the rollout barrier from occurring in the first place. It is important for product companies to build up sensing, seizing, and reconfiguring capabilities, because only in combination they allow to effectively address the different barriers. For example, *market research and monitoring, idea generation, knowledge creation (sensing), strategic planning (seizing), and knowledge integration (reconfiguring)* enables product companies to remove the design barrier. Moreover, the study was able to identify that some DCs are more important than others as they can address multiple barriers simultaneously. Product companies unfamiliar with PSSs in the early stages of scaling must ensure to have the required service knowledge and skills in-house.

Due to global sustainability pressures, many product companies need to adopt and scale more sustainable business practices. By identifying how product companies can scale newly introduced PSS in the early stages of scaling, the study made an important contribution to the growing literature on scaling of SBMs. The study hopes to provide initial guidance to practitioners and contribute to further advancing research on scaling PSSs in this important field.

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References

Amit, R., & Schoemaker, P. J. H. (1993). Strategic assets and organizational rent: Strategic Assets. *Strategic Management Journal*, 14(1), 33–46. <https://doi.org/10.1002/smj.4250140105>.

Amoroso, S., & Link, A. N. (2021). Intellectual property protection mechanisms and the characteristics of founding teams. *Scientometrics*, 126(9), 7329–7350. <https://doi.org/10.1007/s11192-021-04098-4>.

Baines, T. S., Lightfoot, H. W., Evans, S., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J. R., Angus, J. P., Bastl, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V., ... Wilson, H. (2007). State-of-the-art in product-service systems. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 221(10), 1543–1552. <https://doi.org/10.1243/09544054JEM858>.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.

Baveja, S. S., Gilbert, J., & Ledingham D. (2004). From Products to Services: Why It's Not So Simple. *Harvard Management Update*, 9 (4), 3-5.

Beattie, V., & Smith, S. J. (2013). Value creation and business models: Refocusing the intellectual capital debate. *The British Accounting Review*, 45(4), 243–254. <https://doi.org/10.1016/j.bar.2013.06.001>.

Bell, E., Bryman, A., & Harley, B. (2022). *Business research methods*. Oxford University Press.

Bettis, R. A. (1991). Strategic Management and the Straightjacket: An Editorial Essay. *Organization Science*, 2(3), 315–319. <https://doi.org/10.1287/orsc.2.3.315>.

Beuren, F. H., Gomes Ferreira, M. G., & Cauchick Miguel, P. A. (2013). Product-service systems: A literature review on integrated products and services. *Journal of Cleaner Production*, 47, 222–231. <https://doi.org/10.1016/j.jclepro.2012.12.028>.

Bloom, P. N., & Chatterji, A. K. (2009). Scaling Social Entrepreneurial Impact. *California Management Review*, 51(3), 114–133. <https://doi.org/10.2307/41166496>.

Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, *65*, 42–56. <https://doi.org/10.1016/j.jclepro.2013.11.039>.

Bocken, N. M. P., & Geradts, T. H. J. (2020). Barriers and drivers to sustainable business model innovation: Organization design and dynamic capabilities. *Long Range Planning*, *53*(4), 101950. <https://doi.org/10.1016/j.lrp.2019.101950>.

Bocken, N. M. P., Weissbrod, I., & Antikainen, M. (2021). Business experimentation for sustainability: Emerging perspectives. *Journal of Cleaner Production*, *281*, 124904. <https://doi.org/10.1016/j.jclepro.2020.124904>.

Bocken, N. M. P., & Konietzko, J. (2022). Circular business model innovation in consumer-facing corporations. *Technological Forecasting and Social Change*, *185*, 122076. <https://doi.org/10.1016/j.techfore.2022.122076>.

Briguglio, M., Llorente-González, L. J., Meilak, C., Pereira, N., Spiteri, J., & Vence, X. (2021). Born or Grown: Enablers and Barriers to Circular Business in Europe. *Sustainability*, *13*(24), 13670. <https://doi.org/10.3390/su132413670>.

Bryman, A. (2016). *Social research methods*. Oxford University Press.

Catulli, M., Sopjani, L., Reed, N., Tzilivakis, J., & Green, A. (2021). A socio-technical experiment with a resource efficient product service system. *Resources, Conservation and Recycling*, *166*, 105364. <https://doi.org/10.1016/j.resconrec.2020.105364>.

Cavaliere, S., Ouertani, Z. M., Zhibin, J., & Rondini, A. (2018). Service transformation in industrial companies. *International Journal of Production Research*, *56*(6), 2099–2102. <https://doi.org/10.1080/00207543.2017.1378830>.

Cavaliere, S., & Pezzotta, G. (2012). Product–Service Systems Engineering: State of the art and research challenges. *Computers in Industry*, *63*(4), 278–288. <https://doi.org/10.1016/j.compind.2012.02.006>.

Chatterji, M. (2021). *Repairing – not recycling – is the first step to tackling e-waste from smartphones. Here's why.* World Economic Forum. Retrieved January 4, 2023, from <https://www.weforum.org/agenda/2021/07/repair-not-recycle-tackle-ewaste-circular-economy-smartphones/>.

Chesbrough, H. (2010). Business Model Innovation: Opportunities and Barriers. *Long Range Planning*, 43(2–3), 354–363. <https://doi.org/10.1016/j.lrp.2009.07.010>.

Ciulli, F., Kolk, A., Bidmon, C. M., Sprong, N., & Hekkert, M. P. (2022). Sustainable business model innovation and scaling through collaboration. *Environmental Innovation and Societal Transitions*, 45, 289–301. <https://doi.org/10.1016/j.eist.2022.11.003>.

Cooil, B., Aksoy, L., & Keiningham, T. L. (2008). Approaches to Customer Segmentation. *Journal of Relationship Marketing*, 6(3–4), 9–39. https://doi.org/10.1300/J366v06n03_02.

Coreynen, W., Matthyssens, P., De Rijck, R., & Dewit, I. (2018). Internal levers for servitization: How product-oriented manufacturers can upscale product-service systems. *International Journal of Production Research*, 56(6), 2184–2198. <https://doi.org/10.1080/00207543.2017.1343504>.

Das, A., Konietzko, J., & Bocken, N. (2022). How do companies measure and forecast environmental impacts when experimenting with circular business models? *Sustainable Production and Consumption*, 29, 273–285. <https://doi.org/10.1016/j.spc.2021.10.009>.

Ebrahimigharehbaghi, S., van der Heijden, H., & Elsinga, M. (2022). Sustainable business model of affordable zero energy houses: Upscaling potentials. *Journal of Cleaner Production*, 344, 130956. <https://doi.org/10.1016/j.jclepro.2022.130956>.

EcoVadis (n.d.). *Conflict Mineral Definition*. Retrieved December 6, 2022, from <https://ecovadis.com//glossary/conflict-minerals/>.

Eggert, A., Hogueve, J., Ulaga, W., & Muenkhoff, E. (2014). Revenue and Profit Implications of Industrial Service Strategies. *Journal of Service Research*, 17(1), 23–39. <https://doi.org/10.1177/1094670513485823>.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), 532–550. <https://doi.org/10.2307/258557>.

Eriksson, P., & Kovalainen, A. (2008). Qualitative methods in business research. *Sage Publications*. <https://dx.doi.org/10.4135/9780857028044>.

Everphone (n.d.a). *What is the average smartphone lifespan?* Retrieved November 30, 2022, from <https://everphone.com/en/blog/smartphone-lifespan/>.

Fairphone (2022a). *Fairphone FaaS Business Case*. Unpublished internal company document.

Fairphone (2022b). *Fairphone FaaS Strategy*. Unpublished internal company document.

Fairphone (2022c). *Fairphone's Impact 2021*. Retrieved November 11, 2022, from <https://www.fairphone.com/wp-content/uploads/2022/06/Fairphone-Impact-Report-2021.pdf>.

Fairphone (n.d.a). *Our Mission*. Retrieved October 20, 2022, from <https://www.fairphone.com/en/story/>.

Fairphone (n.d.b). *The sustainable smartphone subscription*. Retrieved October 20, 2022, from <https://shop.fairphone.com/en/fairphone-easy>.

Fairphone (n.d.c). *About us – together we're creating demand for fair products*. Retrieved November 11, 2022, from <https://www.fairphone.com/en/about/about-us>.

Fargnoli, M., Costantino, F., Di Gravio, G., & Tronci, M. (2018). Product service-systems implementation: A customized framework to enhance sustainability and customer satisfaction. *Journal of Cleaner Production*, 188, 387-401.

Feagin, J. R., Orum, A. M., & Sjoberg, G. (Eds.). (1991). A case for the case study. *UNC Press Books*.

Fischer, A., Achterberg, E., & Ballester, M. (2017). *The Circular Phone: Legal, operational and financial solutions to unlock the potential of the 'Fairphone-as-a-Service' model*. Sustainable Finance Lab & Circle Economy. Retrieved November 7, 2022, from <https://www.circle-economy.com/resources/the-circular-phone#.Wk9R31z81TY>.

Friedman, L. G. (2002). *Go To Market Strategy: Advanced Techniques And Tools For Selling More Products, To More Customers, More Profitably*. Butterworth-Heinemann.

Gebauer, H., Fleisch, E., & Friedli, T. (2005). Overcoming the Service Paradox in Manufacturing Companies. *European Management Journal*, 23(1), 14–26. <https://doi.org/10.1016/j.emj.2004.12.006>.

Geertz, C. (1973). *Thick Description: Toward an interpretive theory of culture*. The Interpretation of Cultures: Selected Essays, *Basic Books*.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology. *Organizational Research Methods*, 16(1), 15–31. <https://doi.org/10.1177/1094428112452151>.

Global Footprint Network (n.d.). *How many Earths? How many countries?* Retrieved March 2, 2023, from <https://www.overshootday.org/about-earth-overshoot-day/>.

Goedkoop, M., van Haler, C., te Riele, H., & Rommers, P. (1999). Product Service-Systems, ecological and economic basics. *Report for Dutch Ministries of Environment (VROM) and Economic Affairs (EZ)*.

Grant, R. M. (1991). The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation. *California Management Review*, 22.

Groeger, L., & Buttle, F. (2015). Customer Lifetime Value. *Wiley Encyclopedia of Management*, 1–3. doi.org/10.1002/9781118785317.weom090070.

Grönroos, C., & Voima, P. (2013). Critical service logic: Making sense of value creation and co-creation. *Journal of the Academy of Marketing Science*, 41(2), 133–150. <https://doi.org/10.1007/s11747-012-0308-3>.

Hahn, T., & Pinkse, J. (2022). A paradox approach to sustainable product-service systems. *Industrial Marketing Management*, *105*, 182–189. <https://doi.org/10.1016/j.indmarman.2022.06.004>.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Malden, MA: *Blackwell Publishing*.

Hoecker, A., Hanbury, P., Heider, H. J., & Zou, S. (2022). When Will the Chip Shortage End? Bain & Company. Retrieved December 14, 2022, from <https://www.bain.com/insights/chip-shortage-end-tech-report-2022/>.

Hultberg, E., & Pal, R. (2021). Lessons on business model scalability for circular economy in the fashion retail value chain: Towards a conceptual model. *Sustainable Production and Consumption*, *28*, 686–698. <https://doi.org/10.1016/j.spc.2021.06.033>.

Inigo, E. A., & Albareda, L. (2019). Sustainability oriented innovation dynamics: Levels of dynamic capabilities and their path-dependent and self-reinforcing logics. *Technological Forecasting and Social Change*, *139*, 334–351. <https://doi.org/10.1016/j.techfore.2018.11.023>.

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC, Geneva, Switzerland, 1-151.

Jolly, S., Raven, R., & Romijn, H. (2012). Upscaling of business model experiments in off-grid PV solar energy in India. *Sustainability Science*, *7*(2), 199–212. <https://doi.org/10.1007/s11625-012-0163-7>.

Khan, O., Daddi, T., & Iraldo, F. (2020). Microfoundations of dynamic capabilities: Insights from circular economy business cases. *Business Strategy and the Environment*, *29*(3), 1479–1493. <https://doi.org/10.1002/bse.2447>.

Kowalkowski, C., Windahl, C., Kindström, D., & Gebauer, H. (2015). What service transition? Rethinking established assumptions about manufacturers' service-led growth strategies. *Industrial Marketing Management*, *45*, 59–69. <https://doi.org/10.1016/j.indmarman.2015.02.016>.

Langley, A. (1999). Strategies for theorizing from process data. *The Academy of Management Review*, 24(4), 691–710. <https://doi.org/10.2307/25934>.

Lotzof, K. (n.d.). *What is e-waste and what can we do about it?* The Natural History Museum London. Retrieved October 16, 2022, from <https://www.nhm.ac.uk/discover/what-is-ewaste-and-what-can-we-do-about-it.html>.

Lüdeke-Freund, F. (2010). Towards a conceptual framework of business models for sustainability. In: *ERSCP-EMU Conference*, Delft, The Netherlands, 1-28.

Matschewsky, J., Kambanou, M. L., & Sakao, T. (2018). Designing and providing integrated product-service systems – challenges, opportunities and solutions resulting from prescriptive approaches in two industrial companies, *International Journal of Production Research*, 56(6), 2150-2168, 10.1080/00207543.2017.1332792

Matschewsky, J., Lindahl, M., & Sakao, T. (2020). Capturing and enhancing provider value in product-service systems throughout the lifecycle: A systematic approach. *CIRP Journal of Manufacturing Science and Technology*, 29, 191–204. <https://doi.org/10.1016/j.cirpj.2018.08.006>.

Matthyssens, P., & Vandenbempt, K. (2008). Moving from basic offerings to value-added solutions: Strategies, barriers and alignment. *Industrial Marketing Management*, 37(3), 316–328. <https://doi.org/10.1016/j.indmarman.2007.07.008>.

Mont, O. K. (2002). Clarifying the concept of product–service system. *Journal of Cleaner Production*, 10(3), 237–245. [https://doi.org/10.1016/S0959-6526\(01\)00039-7](https://doi.org/10.1016/S0959-6526(01)00039-7).

Mont, O. (2003). Editorial for the special issue of the Journal of Cleaner Production on Product Service Systems. *Journal of Cleaner Production*, 11(8), 815–817. [https://doi.org/10.1016/S0959-6526\(02\)00163-4](https://doi.org/10.1016/S0959-6526(02)00163-4).

Moore, M.-L., Riddell, D., & Vocisano, D. (2015). Scaling Out, Scaling Up, Scaling Deep: Strategies of Non-profits in Advancing Systemic Social Innovation. *Journal of Corporate Citizenship*, 2015(58), 67–84. <https://doi.org/10.9774/GLEAF.4700.2015.ju.00009>.

Neely, A. (2008). Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, 1(2), 103–118. <https://doi.org/10.1007/s12063-009-0015-5>.

Nielsen, C., & Lund, M. (2018). Building scalable business models. *MIT Sloan Management Review*, 59(2), 65–69.

Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. *International Journal of Service Industry Management*, 14(2), 160–172. <https://doi.org/10.1108/09564230310474138>.

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying Business Models: Origins, Present, and Future of the Concept. *Communications of the Association for Information Systems*, 16(1), 1-25. <https://doi.org/10.17705/1CAIS.01601>.

Patton M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health services research*, 34(5-2), 1189–1208.

Pieroni, M. P., McAloone, T., & Pigosso, D. A. C. (2019). Business model innovation for circular economy and sustainability: A review of approaches. *Journal of Cleaner Production*, 215, 198-216. <https://doi.org/10.1016/j.jclepro.2019.01.036>.

Piscicelli, L., Cooper, T., & Fisher, T. (2015). The role of values in collaborative consumption: Insights from a product-service system for lending and borrowing in the UK. *Journal of Cleaner Production*, 97, 21–29. <https://doi.org/10.1016/j.jclepro.2014.07.032>.

Rafi, T. (2022). *Why sustainability is crucial for corporate strategy*. World Economic Forum. Retrieved March 9, 2023, from <https://www.weforum.org/agenda/2022/06/why-sustainability-is-crucial-for-corporate-strategy/>.

Rasmussen, B. (2007). Business Models and the Theory of the Firm. *Pharmaceutical Industry Project Working Paper*, Centre for Strategic Economic Studies, Victoria University, Melbourne, 32, 1-11.

Reim, W., Parida, V., & Örtqvist, D. (2015). Product–Service Systems (PSS) business models and tactics— a systematic literature review. *Journal of Cleaner Production*, 97, 61-75.

Reim, W., Lenka, S., Frishammar, J., & Parida, V. (2017). Implementing sustainable product–service systems utilizing business model activities. *Procedia Cirp*, *64*, 61-66.

Reim, W., Sjödin, D., & Parida, V. (2021). Circular business model implementation: A capability development case study from the manufacturing industry. *Business Strategy and the Environment*, *30*(6), 2745–2757. <https://doi.org/10.1002/bse.2891>.

Rexfelt, O., & Hiort af Ornäs, V. (2009). Consumer acceptance of product-service systems: Designing for relative advantages and uncertainty reductions. *Journal of Manufacturing Technology Management*, *20*(5), 674–699. <https://doi.org/10.1108/17410380910961055>.

Richardson, J. (2008). The business model: An integrative framework for strategy execution: An integrative framework for strategy execution. *Strategic Change*, *17*(5–6), 133–144. <https://doi.org/10.1002/jsc.821>.

Ryan, L. (2013). Facilitating the Transition from Product to Product-Service-System. *Conference paper presented at the 2nd Cambridge Academic Design Management Conference*, September 4–5.

Santa-Maria, T., Vermeulen, W. J. V., & Baumgartner, R. J. (2021). How do incumbent firms innovate their business models for the circular economy? Identifying micro-foundations of dynamic capabilities. *Business Strategy and the Environment*, *31*(4), 1308–1333. <https://doi.org/10.1002/bse.2956>.

Sarancic, D., Pigosso, D. C. A., & McAlloone, T. C. (2022). Designing Industrial Product-Service System (PSS) Pilot Projects in Manufacturing Companies: A Proposed Process for Product and Customer Selection. *Proceedings of the Design Society*, *2*, 1119–1128. <https://doi.org/10.1017/pds.2022.114>.

Stampfl, G., Prügl, R., & Osterloh, V. (2013). An explorative model of business model scalability. *International Journal of Product Development*, *18*(3-4), 226-248.

Stanley, J. E., & Wojcik, P. J. (2005). Better B2B Selling. *McKinsey Quarterly*, *38* (3), 15.

Statista (n.d.). *Global smartphone market share from 4th quarter 2009 to 4th quarter 2022*. Retrieved March 2, 2023, from <https://www.statista.com/statistics/271496/global-market-share-held-by-smartphone-vendors-since-4th-quarter-2009/>.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>.

Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Long Range Planning*, 43(2–3), 172–194. <https://doi.org/10.1016/j.lrp.2009.07.003>.

Teece, D. J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies*, 45(1), 8–37. <https://doi.org/10.1057/jibs.2013.54>.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z).

Tukker, A. (2004). Eight types of product–service system: Eight ways to sustainability? Experiences from SusProNet. *Business Strategy and the Environment*, 13(4), 246–260. <https://doi.org/10.1002/bse.414>.

Ulaga, W., & Reinartz, W. J. (2011). Hybrid offerings: How manufacturing firms combine goods and services successfully. *Journal of marketing*, 75(6), 5-23.

UNEP. (2002). *Product-service Systems and Sustainability: Opportunities for Sustainable Solutions*. INDACO Department, Politecnico di Milano, Milan.

UNEP. (2019, January 24). UN report: Time to seize opportunity, tackle challenge of e-waste. <https://www.unep.org/news-and-stories/press-release/un-report-time-seize-opportunity-tackle-challenge-e-waste>.

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

Vezzoli, C., Ceschin, F., Diehl, J. C., & Kohtala, C. (2015). New design challenges to widely implement 'Sustainable Product–Service Systems.' *Journal of Cleaner Production*, 97, 1–12. <https://doi.org/10.1016/j.jclepro.2015.02.061>.

Visnjic, K. I., & Van Looy, B. (2013). Servitization: Disentangling the impact of service business model innovation on manufacturing firm performance. *Journal of Operations Management*, 31(4), 169–180. <https://doi.org/10.1016/j.jom.2013.02.001>.

WCED (1987). *Our Common Future*. Oxford, UK. Oxford University Press.

Witell, L., & Löfgren, M. (2013). From service for free to service for fee: Business model innovation in manufacturing firms. *Journal of Service Management*, 24(5), 520–533. <https://doi.org/10.1108/JOSM-04-2013-0103>.

Yin, R. K. (1994). Discovering the Future of the Case Study. Method in Evaluation Research. *American Journal of Evaluation*, 15(3), 283–290. <https://doi.org/10.1177/109821409401500309>.

Yin, R. K. (2009). *Case study research: Design and methods (Vol. 5)*. Sage Publications.

Zott, C., & Amit, R. (2010). Business Model Design: An Activity System Perspective. *Long Range Planning*, 43(2–3), 216–226. <https://doi.org/10.1016/j.lrp.2009.07.004>.

Zott, C., Amit, R., & Massa, L. (2011). The Business Model: Recent Developments and Future Research. *Journal of Management*, 37(4), 1019–1042. <https://doi.org/10.1177/0149206311406265>.

Appendix

Appendix 1. Secondary data sources.

Name	Type of data source
Fairphone: About us	Company website
Fairphone: Our mission	Company website
Fairphone: The sustainable smartphone subscription	Company website
Fairphone's Impact 2020	Corporate sustainability report
Fairphone's Impact 2021	Corporate sustainability report
The Circular Phone Whitepaper	Research paper
Fairphone Easy Analytics Dashboard	Internal company document
Fairphone Easy Customer Data & Information	Internal company document
Fairphone Easy Customer Interviews	Internal company document
Fairphone Easy Growth Ideas & Opportunities	Internal company document
Fairphone Easy Monthly Update	Internal company document
Fairphone Easy MT Presentation	Internal company document
Fairphone Easy Roadmap	Internal company document
Fairphone Easy Student Workshop	Internal company document
Fairphone Easy Total Cost of Ownership	Internal company document
Fairphone Easy x MUDJeans Collaboration	Internal company document
Fairphone Easy x VU StartHub	Internal company document
Fairphone FaaS Business Case	Internal company document
Fairphone FaaS Strategy	Internal company document
Fairphone Services Assessment	Internal company document
Impact of Fairphone Easy	Internal company document
Who are our customers?	Internal company document

Appendix 2. Semi-structured interview guide.

At the beginning, interviewees are informed about the purpose of the interview, assured of confidentiality in the handling of personal data and sensitive information, and consent to audio recording is obtained using the university's informed consent form.

Introduction

Please introduce yourself and explain what your role was in launching Fairphone Easy and how you are currently involved in this pilot.

Internal barriers to scaling

1. Can you please give some insights into the different topics you were working on before and at the start of the pilot project.
 - a. Why were you working on these topics?
 - b. What were the issues?
2. What are you currently working on in the pilot?
 - a. Why are you working on this topic?
 - b. What were the issues?
3. What topics will be important in the future and why?
4. Are there or were there any challenges to establishing Fairphone Easy? I am interested in both past (e.g., in the very first weeks of operation) and current challenges.
5. For each internal barrier named:
 - a. You named ... How does it affect the scalability of Fairphone Easy?
 - b. Can you give an example?
 - c. What is causing this barrier?
6. For each internal barrier identified in the literature that has **not** been named:
 - a. Logic barrier
 - i. How much attention is given to the service business within the organization?
 - ii. How open is the corporate culture towards the service business?
 - iii. How well does the service business and cash sales coexist within Fairphone and why?
 - b. Design barrier
 - i. What was the motivation behind Fairphone Easy?
 - ii. Can you please provide some insights into the design process of Fairphone Easy.
 1. Why was it designed the way it is now?
 2. What considerations were taken when designing the service?
 - iii. How much attention was given to environmental sustainability in the design of the service?
 - iv. To what extent were customer needs considered in the design process?
 - c. Rollout barrier
 - i. Can you please provide some insights into the thought processes behind the pilot's go-to-market strategy.
 - ii. How did you determine in what way and to whom you will market the service?

- d. Financial barrier
 - i. Can you provide some insights into the cost and revenue structures of Fairphone Easy?
 - ii. What are financial challenges of the pilot? What challenges have already been addressed and how?
 - iii. When is the pilot economically viable?
 - iv. How does its profitability compare to product sales?
 - v. What were significant investments that have led to the pilot up until now?
 - e. Organizational barrier
 - i. What major obstacles would be needed to overcome for the service business to outgrow the product sales model in the future?
 - ii. Scaling the service business will require significant investments and changes in the company's organizational structure. How committed is the company leadership in pushing this transformation?
7. For each internal barrier named:
- a. How does ... affect the scalability of Fairphone Easy?
 - b. Can you give an example?
 - c. What is causing this barrier?

Overcoming barriers to scaling

8. Which barriers were already dealt with and how have they been overcome?
- a. How effective were these approaches?
 - b. What did you learn?
9. For each barrier not overcome: You also named ... as internal barrier to scaling. How are you dealing with overcoming this barrier?
- a. Can you give an example?
10. To probe more for DCs:
- a. What were specific activities taken by the management team that helped to adapt to the new service logic?
 - b. Which internal processes have been adapted to fit the needs of the service model?
 - c. What training or workshops have employees received to be equipped for the new service business?
11. Can you think of instances where you tried overcoming an internal barrier to scaling and the approach was not effective at all?
- a. Why was it a failure?
12. Were there situations in which approaches to overcome the barriers worked extremely well?
- a. What was the reason for that?

At the end, interview partners will be thanked for their participation in the interview.

Appendix 3. Informed consent form and information sheet for interview participants.

Informed consent form (interview)

In this study we want to learn about the challenges you have experienced or are experiencing when scaling Fairphone Easy and how you dealt or currently deal with overcoming them. Participation in this interview is voluntary and you can quit the interview at any time without giving a reason and without penalty. Your answers to the questions will be shared with the research team. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act). Please respond to the questions honestly and feel free to say or write anything you like.

[Only in case of anonymous handling: Everything you say or write will be confidential, and anonymous. This means that we do not ask for your name, and no one will know which respondent said what.]

I confirm that:

- I am satisfied with the received information about the research;
- I have no further questions about the research at this moment;
- I had the opportunity to think carefully about participating in the study;
- I will give an honest answer to the questions asked.

I agree that:

- the data to be collected will be obtained and stored for scientific purposes;
- the collected, completely anonymous, research data can be shared and re-used by scientists to answer other research questions;

I understand that:

- I have the right to see the research report afterwards.

Do you agree to participate? Yes No

Information sheet (interview)

Introduction

You are invited to take part in this study on upscaling of product-service-systems. The purpose of the study is to learn about the challenges you experience when trying to scale Fairphone Easy and effective approaches in overcoming them. The study is conducted by René Kestler who is a student in the Msc programme Sustainable Business & Innovation at the Department of Sustainable Development, Utrecht University. The study is supervised by Dr. Christina Bidmon.

Participation

Your participation in this interview is completely voluntary. You can quit at any time without providing any reason and without any penalty. Your contribution to the study is very valuable to us and we greatly appreciate your time taken to complete this interview. We estimate that it will take approximately 45-60 minutes to complete the interview. The questions will be read out to you by the interviewer. Some of the questions require little time to complete, while other questions might need more careful consideration. Please feel free to skip questions you do not feel comfortable answering. You can also ask the interviewer to clarify or explain questions you find unclear before providing an answer. Your answers will be noted by the interviewer in an answer template. The data you provide will be used for writing a Master thesis report and may be used for other scientific purposes such as a publication in a scientific journal or presentation at academic conferences. Only patterns in the data will be reported through these outlets. Your individual responses will not be presented or published.

Data protection

The interview is also audio taped for transcription purposes. The audio recordings will be available to the Master student and academic supervisors. We will process your data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

[In case audio recordings will be deleted: Audio recordings will be deleted when data collection is finalized and all interviews have been transcribed.]

[In case audio recordings will not be deleted: Audio recordings will only be stored on a secured and encrypted server of Utrecht University.]

[In case of anonymous interview: Everything you say in this interview will be confidential and completely anonymous. This means that we will not ask for your name, date of birth, or other personal information that can be traced to you by us or a third party]. We will process your data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).]

Appendix 4. Quotes supporting the results.

Theme	Concept	Quotes
Market research and monitoring	Identification of benchmark cases	“We created a lengthy deck that includes all research on other subscription models.” (E)
		“We did sufficient research, looking at the work in other cases because those are benchmark cases.” (S)
	Monitoring of competitors	“Because of the limited number of cases, we started looking at other companies outside of the smartphone space, which set up similar models.” (S)
		“What you do is also just a lot of market research, look at existing companies in the smartphone space who did something similar. ‘How did they set it up? What can we learn? What do we like and what not?’” (S)
Conducting market and user research		“I think there is also a bit of change in the markets. If you look at Nokia, for example, they launched a similar subscription.” (S)
		“We did a lot of research around the customer profile, to find out who the user could be and what we think their problems are.” (S)
		“It started with lots of consumer research.” (E)
Idea generation	Organization of internal brainstorm sessions	“They were calling some of the users that already signed to check how the process was, whether they were happy, or whether they encountered any problems.” (E)
		“We did a few projects along the way; in the beginning it was more exploratory and doing a few workshops.” (C)
	Conducting surveys and interviews with potential customers	“We followed this sort of methodology that I developed over the last years, working on these kinds of topics. It really started with us asking ourselves ‘Who’s the user?’ and ‘What problems can we solve for them?’” (C)
		“We did a lot of brainstorms around it, and then we did a lot of research around the customer profile.” (E)
		“We did a lot of external consumer research on the concept, and everything related to it scored really well.” (S)
		“In the end we had to make sure that there is actually a customer need for answering. So we started research in form of surveys with hundreds of customers in Germany, Netherlands, and the UK. With selected ones we continued conducting follow-up interviews.” (S)

Knowledge creation	Analysis of customer data and feedback	<p>“We constantly assessed customer data and listened to their feedback to gain new insights into how the system can be improved.” (S)</p> <p>“You want to optimize your setup and really be able to use the data from the loyal customers on what helps and what does not help in keeping that phone for longer.” (S)</p>
	Analysis of repair data and resource loops	<p>“The more phones you receive back, the more data you have by analyzing the different components.” (S)</p> <p>“It is very valuable when you can extract some insights that have an influence in the product design. Like feedback loops on which components you get back.” (S)</p> <p>“I think it all comes down to data. If we would have enough data on what breaks, for example, we would be able to give these components a certain priority in our product design to make them easier to remove than other parts.” (S)</p>
	Organization of workshops with the target group	Own observation.
	Organization of internal company workshops with experts [service design]	“There was a workshop for the entire company about the design of good services where an expert came in.” (E)
Open company culture	Establishing practices for sharing knowledge and experiences between teams	<p>“The whole process was pretty open. We needed to be really transparent and explain the process and what we saw very well to everyone involved.” (E)</p> <p>“It was a joint effort between many teams, so we had regular alignment meetings.” (E)</p>
	A culture focused on sustainability	<p>“It aligns so well with our longevity purpose and our impact making.” (S)</p> <p>“The business model of Fairphone Easy is the perfect solution for a modular product. This can be the perfect circular example.” (C)</p> <p>“We believe this is part of our brand as it fits our brand perfectly. We have a modular phone and this model bring us to the next level in terms of circularity.” (S)</p> <p>“For me, the ultimate goal is to continue iterating on the design to make it even more repairable.” (S)</p>

		<p>“The main motivation is that it totally makes sense to align the business case with the value proposition of stretching the lifetime of the phone.” (S)</p>
	Encouraging employees to think creatively	Own observation.
Strong leadership	An agile & strong project management approach	<p>“In the few months before launch we had this agile project management approach. Our job was to build the plane in the air.” (E)</p> <p>“Because we did not really know what this new subscription model would bring for us, it was really like it is a pilot setup – let’s make it agile and let’s move quickly.” (E)</p> <p>“He did an exceptional job in leading the team, it was very strong project management.” (C)</p>
	Fostering a can-do attitude among employees	<p>“Our team lead did an amazing job in creating this whole attitude and idea of this project; everyone thought ‘Hey let’s make this work’, as best as we can and as fast as possible.” (E)</p> <p>“He made us feel confident in our abilities to pull this off within a few months’ time.” (E)</p>
	Making decisions under uncertainty	<p>“We had to deal with a certain level of uncertainty because there are not many cases available to compare. In the market, a product-as-a-service is very new, so we could not look at the experiences of others.” (S)</p> <p>“Because we were one of the first smartphone companies to have implemented such a business model, we had to navigate through unknown territory.” (T)</p>
	Ability to compromise	<p>“Getting the ball rolling was all about compromises, making sure we understand each other, what does the launch mean and what is required, and expected from each team within the company.” (S)</p> <p>“Making compromises was important. In a way not pushing fully for the initially planned launch day but agreeing to delay a bit to give every team the time they needed to properly perform their tasks.” (S)</p> <p>“We did have to compromise a lot in designing the operational system because we had a limited resources and time.” (E)</p>

Strategic planning	Development of an implementation and execution plan	<p>“Building on his experience, the consultant could provide a lot of insights both strategically and operationally on how to set up a plan and execute the plan.” (S)</p> <p>“During all the build-up, and executing of the implementation plan, there was a lot of attention within the company and a lot of effort put into it to go live.” (S)</p>
	Recruitment of requisite employees	<p>“We hired another full-time employee to work on setting it up.” (S)</p> <p>“We had to convince other people in the company that these investments, such as hiring an additional employee to support Fairphone Easy, were worth it.” (T)</p>
	Hiring an external consultant	<p>“We started a strategic project with an external consultant, who is an expert on as-a-service business models and subscription business models.” (S)</p> <p>“We are no experts, so we found a consultant who had done this with multiple companies.” (S)</p> <p>“We decided to use the experience that we could get from the consultant who had previously worked on setting up similar models.” (S)</p>
	Identification of strategic partners	<p>“We developed a so-called ‘service blueprint’ for the operational side of the pilot, that defined all systems we had to put in place and major logistics partners as well as the ones performing the repairs.” (S)</p> <p>“We were trying early on to identify the necessary partners.” (S)</p>
Service design	Financial incentives for choosing long-term subscriptions	<p>“The nice thing about this whole idea is that the environmental impact and financial return go hand in hand. They cannot be separated, and it is almost not possible to have a financially successful project without people actually holding on longer to their phones.” (S)</p> <p>“To motivate people to go for this long-term commitment, we tried to incentivize them to go for long-term subscriptions.” (S)</p> <p>“It is actually very uncommon for subscription models to automatically lower the price, the longer you subscribe.” (C)</p> <p>“We are seeing that people are subscribing for longer, which is better for us, because that is guaranteed income for a long period.” (E)</p>

	Promoting customer longevity and care [through the longevity discount model]	<p>“The most unique aspect next to how our product is created, is the longevity discount. It is a really nice way of incentivizing the user to take good care of the product.” (C)</p> <p>“The less people need repair services, the more profitable is Fairphone Easy is.” (S)</p>
System and process setup	Set up of a dedicated operational system [for the subscription business]	<p>“We started to use a new software setup that could handle a subscription business.” (S)</p> <p>“The payment model and swap services are fundamentally different from a linear model, so we had to setup our own system.” (C)</p> <p>“There was clearly a challenge to design a parallel system that was as close as possible to our existing one. For example, for Fairphone Easy there might be a fundamentally different best case solution for the way we use regular reverse logistics processes.” (E)</p> <p>“We had mapped out the whole setup: the backend software setup, the processes, the internal way of working; everything was set up nicely.” (S)</p>
	Definition of clear processes for product flows and customer support tasks	<p>“For the included repair services, we had to design new product flows from the customer to the repair center, and vice versa.” (E)</p>
Collaboration	Collaboration with other circular brands [to increase awareness]	<p>“To have exposure to our overlapping audiences, we decided to have a marketing campaign with another Dutch brand that also has a circular service offering.” (E)</p> <p>“Collaborating was a cost-effective way for us to promote Fairphone Easy.” (S)</p>
	Collaboration with university institutions [to gain exposure to the target group]	Own observation.
System and process optimization	Process automation	<p>“When processes threatened the customer experience as they required lots of time-consuming manual work, the team worked on making this process automated.” (E)</p> <p>“If we want to scale this, we had to rethink whole product flows.” (E)</p>
	Removal of bottleneck processes	<p>“During the signup process, we required customers to perform an identity check, which quickly developed into a blocking point as many banks stopped offering this</p>

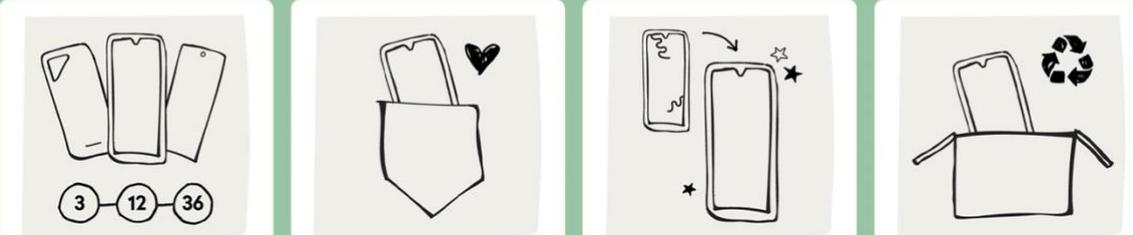
		<p>service and we had to perform these checks manually. Since we saw that a credit check seemed to be sufficient to prevent fraud, we decided to remove that process.” (E)</p> <p>“Some of the steps, we could made simpler, basically by not doing them. The identity check, for example, was not really needed because it did not add any value.” (S)</p>
	<p>Integration of all operations management systems [for automated data exchange]</p>	<p>“Because our existing system could not fully support a subscription business, we had to set up another operational system in parallel. It would be ideal to integrate the two to have them automatically exchange data, which facilitates the whole processes.” (E)</p> <p>“Integrating the two platforms will have a positive impact on the scalability.” (E)</p>
	<p>Optimization of resource loops [material reuse and recycling processes]</p>	<p>“There is a lot to learn and gain in terms of optimizing the whole use of materials and recycling processes.” (S)</p> <p>“When you are financially incentivized to optimize the reuse of materials or the longer use, it will certainly help.” (S)</p> <p>“You want to keep ownership with the one that designs the device in order to ensure optimization of use of materials.” (S)</p> <p>“It is very valuable when you can extract some insights that have an influence in the product design. Like feedback loops and which components you get back.” (S)</p>
Knowledge integration	<p>Special onboarding and training for employees</p>	<p>“Before launching Fairphone Easy I received special training for my role in customer support. Later on, others received the same training.” (E)</p> <p>“Since services are inherently different than selling, our managers did well to organize workshops for us that prepared us for our roles.” (E)</p>
	<p>Improvements to the service offering [based on target group research and customer feedback]</p>	<p>“We constantly strive to listen to customers and improve the offering based on their feedback.” (S)</p> <p>“Customer feedback is really valuable for us. Especially in a pilot setting we can try out different things to make our service more attractive.” (E)</p>

Appendix 5. Cross case comparison of internal barriers to scaling and dynamic capabilities.

	Market research & monitoring	Idea generation	Knowledge creation	Open company culture	Leadership	Strategic planning	Service design	System & process setup	Collaboration	System & process optimization	Knowledge integration
Logic				x	x	x		x			x
Design	x	x	x			x					x
Rollout	x	x				x					
Financial							x			x	
Resource							x		x	x	

Appendix 6. Fairphone Easy: How it works.

How it works



Choose your plan
Choose a 3 month, 12 month or 36 month subscription and your accessories. Once approved, you'll receive your Fairphone and extras within 48 hours.

Enjoy your Fairphone
Get to know and love your Fairphone, as it quickly becomes your best friend. Use with your existing SIM card for a hassle-free transition.

Relax, it's covered
If any accidents happen, we'll send you a replacement phone in 48 hours. We'll also cover the cost of any repairs, so you won't be without your phone for long.

Return your phone
Send your Fairphone back to us to end your subscription. We reuse your phone or recycle its components to minimize e-waste and promote a circular economy.

Note: Picture taken from <https://shop.fairphone.com/en/fairphone-easy>.

Appendix 7. Customer longevity discount.



Note: Picture taken from <https://shop.fairphone.com/en/fairphone-easy>.