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Consumers'expectations of circular business models: perspectives of suppliers

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Consumers'expectations of circular business models: perspectives of suppliers

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Summary

In Flanders its ‘Vision 2050. A long-term strategy for Flanders’, continuing the transition towards the circular economy is one out of seven transition priorities, in which the development of new business models plays a role. Circular business models are situated within the context of the circular economy, which received growing attention over the last decade. A specific type of circular business models is called Product-Service Systems (PSS), which are defined as integrated bundles of products and services that aim at creating customer utility and generating value. However, the widespread implementation of PSS in the business-to-consumer (B2C) context is hampered by consumers who value owning things, going against ‘servitisation’.

Therefore, this report builds on a study by Sandra Rousseau and Raïsa Carmen for Flanders’ Circular Economy Policy Research Center, in which a survey addressed different consumer attitudes towards a diverse set of circular business models. Specifically, Rousseau & Carmen identified a host of drivers for and barriers to circular business models in sectors such as coffee, housing, printers and clothes. Yet they concluded that the support of consumers for circular business models is dependent on contextual factors such as the type of business model, product category and consumer characteristics, which is in line with recent research on the context of PSS.

Following up on these findings, this report takes a first step in exploring how suppliers of PSS manage consumers’ drivers and barriers, particularly concentrating on how suppliers navigate tensions between providing PSS within the B2C context and consumers’ drivers for and barriers to the services? Against this backdrop, we interviewed eight suppliers of PSS within the B2C context in the coffee, housing, electrical appliances and clothes sector.

The study identifies three patterns in the strategies of the suppliers. Specifically, the suppliers navigate tensions between business development within the context of established markets and consumers’ expectations of the service, between the context of existing price preferences for products that require high investments and the service, and between the context of established consumer culture and consuming in more sustainable ways. Overall, this confirms that PSS are context-dependent and it emphasises the dynamic relation between producers and consumers in PSS within the B2C context.

Future research priorities include conducting more in-depth empirical research to uncover practical and cultural aspects of B2C PSS, as well as exploring what it takes for PSS to be transformative and how they may influence fundamental sustainability transitions towards a circular economy.

For policymakers, we caution against the straightforward implementation of traditional policy instruments because PSS are highly context-dependent. As such, we recommend linking isolated PSS projects to broader, contextual dynamics of established, unsustainable markets, cultures, preferences and policies. Additionally, depending on the context of specific PSS, market incentives, environmental levies, regulation and subsidies may help to support the PSS analysed in this report.

Samenvatting

In ‘Visie 2050. Een langetermijnstrategie voor Vlaanderen’ is de transitie naar de circulaire economie een van de zeven transitieprioriteiten. Daarin kan de ontwikkeling van nieuwe businessmodellen een rol spelen. Circulaire businessmodellen zijn gelinkt aan de circulaire economie die de voorbije decennia steeds meer aandacht kreeg. Een specifiek type circulaire businessmodellen heet Product-Service Systems (PSS): geïntegreerde bundels van producten en diensten met als doel het creëren van nut voor de klant en het generen van waarde. Deze ‘verdiensting’ via het uitrollen van PSS in de context van business-to-consumers (B2C) is echter beperkt omdat consumenten waarde hechten aan het bezitten van producten.

Dit rapport bouwt verder op een studie van Sandra Rousseau en Raïsa Carmen voor het Steunpunt Circulaire Economie. Die studie peilde naar de attitudes van consumenten tegenover verschillende circulaire businessmodellen en identificeerde drijfveren en barrières van consumenten in sectoren zoals koffie, huisvestiging, printers en kledij. Toch benadrukt de conclusie van de studie dat de interesse van consumenten in circulaire business modellen afhankelijk is van contextuele factoren zoals het type businessmodel, het product en de kenmerken van de consument. De bevindingen bevestigen voorgaand onderzoek naar de context van PSS.

Daarom zet dit rapport een eerste stap in het onderzoek naar de manier waarop leveranciers van PSS omgaan met de drijfveren en barrières van consumenten: hoe navigeren leveranciers tussen de spanningen van het aanbieden van de PSS in de B2C-context en de drijfveren en barrières van de consumenten voor de dienst? We interviewden acht leveranciers van PSS in de B2C-context in vier sectoren: koffie, huisvestiging, elektrische apparaten en kledij.

Het rapport identificeert drie patronen in de strategieën van de leveranciers. De spanningen waartussen de leveranciers navigeren zijn, meer bepaald, de wrijving tussen het ontwikkelen van businessmodellen in de context van gevestigde markten en de verwachtingen van de consumenten, de wrijving tussen de context van gevestigde prijsvoorkeuren voor producten die hoge investeringen vergen en de dienst, en de wrijving tussen de context van de huidige consumentencultuur en duurzamer consumeren. Dit bevestigt dat PSS contextafhankelijk zijn en het benadrukt de dynamische relatie tussen producenten en consumenten van PSS in de B2C-context.

Verder onderzoek kan via diepgaande, empirische studies de praktische en culturele aspecten van B2C PSS blootleggen. Het kan ook verkennen wat er nodig is om het transformatief potentieel van PSS te ontwikkelen, en hoe PSS diepgaande duurzaamheidstransities naar een circulaire economie kunnen beïnvloeden.

Aangezien PSS zo contextafhankelijk zijn, wijzen we beleidsmakers op de valkuilen van een te rechtlijnige toepassing van traditionele beleidsinstrumenten. We raden daarom aan om kleinschalige PSS projecten te koppelen aan bredere, contextuele dynamieken van gevestigde maar weinig duurzame markten, cultuur, voorkeuren van consumenten en beleid. Toch kunnen – afhankelijk van de context van de specifieke PSS – instrumenten zoals marktstimulansen, milieuheffingen, regelgeving en subsidies PSS ook verder ondersteunen.

1. Introduction

In 2019, the European Commission published the Green Deal and articulated its intention to develop a low-carbon and circular economy for Europe by 2050. Member states are expected to develop elaborate plans to reach intermediate goals by 2030. In Flanders its 'Vision 2050. A long-term strategy for Flanders', continuing the transition towards the circular economy is one out of seven transition priorities, in which the development of new business models plays a role (Government of Flanders, 2016). However, according to the European Environment Agency, 'Europe will not achieve its 2030 goals without urgent action during the next 10 years to address the alarming rate of biodiversity loss, increasing impacts of climate change and the overconsumption of natural resources' (EEA, 2019). Here the widespread adoption of circular business models may accelerate sustainability transitions towards a more circular society (Diaz Lopez, Bastein, & Tukker, 2019; Pieroni, McAloone, & Pigosso, 2019).

Circular business models are situated within the context of the circular economy, which received growing attention over the last decade (Homrich, Galvão, Abadia, & Carvalho, 2018; Korhonen, Honkasalo, & Seppälä, 2018). In general, the circular economy proposes to close the loops of material and energy cycles by reducing waste and reusing and recycling resources and products. It also provides an alternative model to the linear take-make-dispose system of waste management, addressing its negative environmental, economic and social effects (Ghisellini, Cialani, & Ulgiati, 2016). A fundamental sustainability transition towards a circular economy requires a long-term, multi-dimensional shift in established policy, culture, technology, markets and user preferences (Köhler et al., 2019), in which the development of circular business models may play a crucial role (Proka, Beers, & Loorbach, 2018; Santa-Maria, Vermeulen, & Baumgartner, 2021).

A specific type of circular business models is called Product-Service Systems (PSS), which are defined as 'an integrated bundle of products and services which aims at creating customer utility and generating value' (Boehm & Thomas, 2013, p. 252). A distinction between three main categories of PSS can be made, namely product-oriented services, use-oriented services and result-oriented services, and it is suggested that result-oriented PSS offer the greatest prospect of environmental gains (Tukker, 2015). However, Tukker (2015) also finds that the widespread implementation of PSS in the business-to-consumer (B2C) context is hampered by consumers who value owning things (i.e. intangible value), which goes against 'servitisation'.

Accordingly, in a report by Flanders' Circular Economy Policy Research Center, a survey was conducted to address different consumer attitudes towards a diverse set of circular business models. The main finding of this report was that the support of consumers for circular business models is dependent on contextual factors such as the type of business model, product category and consumer characteristics (Rousseau & Carmen, 2021), which is in line with other research on the context of PSS (Van Gaubergen, Paredis, & Block, 2021; Vezzoli, Ceschin, Diehl, & Kohtala, 2015) and the practice approach that acknowledges 'the active and dynamic relation between producers *and* consumers in making new arrangements *and* in developing and sustaining them over time' (Shove, Pantzar, & Watson, 2012, pp. 11–12). Nonetheless, more research is needed on PSS in the B2C context, particularly on the dynamics between the suppliers of PSS and consumers' drivers and barriers. Therefore, this study delves into how suppliers of PSS manage the drivers and barriers of consumers, building on the aforementioned report of Sandra Rousseau and Raïsa Carmen (2021) that focussed on consumers' drivers for and barriers to circular business models.

The following research questions are explored in this report: how suppliers navigate tensions between providing PSS within the B2C context and consumers' drivers for and barriers to the services? To do so, it focusses on whether the supplier has experienced the consumers' drivers and barriers that were identified in the survey, the additional drivers and barriers faced by their consumers and the strategy of the suppliers to manage these expectations within the B2C context. Against this backdrop, we selected eight suppliers of PSS within the B2C context for an expert interview. The suppliers are based in Flanders or the Netherlands and belong to four broadly defined sectors: coffee, housing, electrical appliances and clothing. Although this selection is largely in line with the survey of Rousseau & Carmen (2021), it is not exactly the same because PSS within the B2C context have not been widely implemented in Belgium and the Netherlands. As such, we present eight PSS within the B2C context, focussing on consumers' drivers and barriers according to the suppliers of PSS and the resulting strategy of the supplier.

The paper unfolds as follows: section 2 details the methodological approach. In section 3, the empirical analysis is presented, particularly the supplier and the product-service system, the circular elements of the business model and the drivers and barriers of the consumers of the service. In the discussion in section 4, three patterns are identified that demonstrate how suppliers navigate tensions between providing PSS within the B2C context and consumers' expectations. Section 5 concludes the paper, suggests avenues for future research and provides policy recommendations.

2. Methodology

In this report, we took an abductive approach (Schwartz-Shea & Yanow, 2012), which implies that prior knowledge, theoretical literature and the empirical material influenced the analysis: 'During the process, the empirical area of application is successively developed, and the theory (the proposed over-arching pattern) is also adjusted and refined' (Alvesson & Sköldberg, 2009, p. 4). Specifically, the drivers and barriers identified in the survey were presented to the interviewees, which were then further discussed and refined. Here we were guided by the interviewees' interpretation of the concepts used in the survey study to operationalise 'drivers' and 'barriers' (e.g. 'lifestyle', 'ease of use' and 'environmental concerns', see Rousseau & Carmen, 2021). Additionally, prior knowledge of the circular economy and the research field of sustainability transitions led to a focus on the ways in which suppliers navigate tensions between providing PSS within the B2C context and consumers' drivers for and barriers to the services.

The selection of suppliers for an interview was mainly guided by convenience sampling because the implementation of PSS within the B2C context is not widespread in Belgium and the Netherlands, and because we pursued to investigate the sectors that were analysed in the survey (i.e. coffee, housing, electrical appliances and clothing). Further, the selection of suppliers was also based on purposive sampling in order to obtain a broad range of perspectives and information on PSS, implying that we differentiated between large companies, start-ups and NGO's. Overall, this led to selection of eight providers of PSS, namely: CoffeeBundles (the Netherlands), Quppa (Belgium), BotaniCo (Belgium), Smarthomesystems (Belgium), Papillon (Belgium), Instant Ink HP (Benelux), KrijgdeKleertjes (the Netherlands), Les ReBelles d'Anvers (Belgium).

From every supplier, (one of) the founder(s) or the business developer was interviewed. These interviews took place online, lasted 30-70 minutes and were documented in field notes that were used in the write-up of the analysis. In the interviews, we first focussed on the supplier, the product-service system and the elements of circularity, which usually led the interviewees to address some of the drivers and barriers. Subsequently, we presented the drivers and barriers that were identified in the survey study, which were discussed, adjusted and refined during the interviews. In doing so, how suppliers navigate tensions between providing PSS and the drivers and barriers of consumers gradually emerged.

3. Empirical analysis

In this section, we explore how the eight suppliers navigate tensions between providing PSS in the B2C context and consumers' drivers and barriers to the services. To do so, we focus on whether the suppliers have experienced the consumers' drivers and barriers that were identified in the survey, the additional drivers and barriers faced by their consumers and the strategy of the suppliers to manage these expectations. The eight suppliers are arranged in four sectors: coffee (3.1), housing (3.2), electrical appliances (3.3) and clothes (3.4). In what follows, for every supplier, we first describe the product-service system and the elements of circularity, and then turn to the consumers' drivers for and barriers to the services, which also highlights the strategy of the supplier to manage these expectations.

3.1. Coffee

3.1.1. CoffeeBundles

Introduction

CoffeeBundles is a company that offers coffee-at-home subscriptions since 2017. By means of a pay-per-cup business model, it provides households and small SME's with a Siemens EQ6 coffee machine, full maintenance and, with the help of the internet of things, the automatic delivery of fair trade coffee beans. Specifically, a cup of coffee costs €0,47, €0,37 or €0,26 for the 'Small Enjoyer' (approximately 2.5 cups/day and €35/month), 'Coffee Lover' (approximately 4 cups/day and €45/month) or 'Big User' (approximately 10 cups/day and €80/month), respectively. The consumer pays per cup and if more/fewer cups are consumed, CoffeeBundles recommends another subscription. The delivery of the machine and the coffee is complimentary but a deposit of €50 is due. If the subscription is cancelled within five years, the deposit of €50 is not returned to the customer. Of CoffeeBundles' customers, 80% are households and 20% are small enterprises (up to ten employees). Furthermore, CoffeeBundles purchases the coffee machines from Siemens. To fund this, the company made use of Oneplanetcrowd (crowdfunding) and then used BundlesInvest (bonds issuing platform).

Elements of circularity

The main circular element of CoffeeBundles is the product-as-a-service business model. As the company owns the coffee machines, it is incentivised to keep the machines in use as long as possible, which is being carried out by providing maintenance guidelines to the customers. If a machine breaks down, it is repaired and reused. The interviewee employed by CoffeeBundles says, however, that a more circular business model would comprise of Siemens becoming a shareholder of CoffeeBundles. It would incentivise Siemens to provide long-lasting coffee machines, whereas it is now only encouraged to sell as much coffee machines as possible to CoffeeBundles.

Drivers

The main drivers identified in the survey regarding coffee-at-home subscription are reduced risks (maintenance and repair are included in the service), ease of use and environmental impact.

CoffeeBundles acknowledges these drivers but adds price (1) as the primary driver for this business model. Specifically, in CoffeeBundles' model, a high-end coffee machine, of which the market price is approximately €900, is provided for free. By using CoffeeBundles, the customers circumvent this initial investment and only pay for the consumed cups of coffee. The interviewee further confirms that the low price is a major driver by explicating that CoffeeBundles' most successful marketing campaign centred around the motto 'free coffee machine'. Nonetheless, the interviewee also notes that some of the customers pursuing low prices are not the ideal type of customer because they frequently cancel their subscriptions, implying higher costs and uncertainty for CoffeeBundles. In line with the survey, the secondary drivers are reduced risks and ease of use. Concerning reduced risks (2), it is confirmed that the maintenance services play an important role in customers' choices for CoffeeBundles. Similarly, the ease of use (3) is a driver for customers, particularly the pay-per-cup principle, the automatic and free delivery of coffee and the low entry barriers to the coffee-at-home subscription (i.e. low deposit and the possibility of trial period). Diverging from the survey, only around 20% of the customers purchase a coffee-at-home subscription because of environmental concerns (4), which is therefore identified as a tertiary driver by the company. This limited segment of customers is interested in fair trade coffee and the circular business model. As customers driven by economic concerns are less reliable according to the interviewee, CoffeeBundles is diversifying its marketing strategy in the direction of green customers.

Barriers

The main barriers identified by consumers regarding coffee-at-home subscriptions are cost considerations, the lack of familiarity and concerns about contractual conditions.

For the customers of CoffeeBundles, the two main barriers are cost considerations and contractual conditions, whereas the lack of familiarity is not a barrier because the company has invested in ease of use (i.e. a driver) from the outset. Regarding cost considerations as a barrier for customers (1), CoffeeBundles observes that the low price of the coffee subscription is a driver but, importantly, may also form a barrier. The company knows that potential customers typically also consider Senseo and the subscriptions offered by Nespresso, which are cheaper and more expensive than CoffeeBundles, respectively. Therefore, the prices of CoffeeBundles, along with the market and competitors, are actively monitored to retain or gain new customers.

Similarly, contractual conditions (2) may be a barrier under certain conditions. As mentioned, at the moment, the entry barriers to a CoffeeBundles subscription are kept low: the deposit is €50 and a two-month trial period is available. This implies that contractual conditions are currently not perceived as a barrier by potential customers, although CoffeeBundles considers raising the deposit and dismissing the trial period. Such stricter contractual conditions may lead to a barrier for some customers, particularly for those driven by the current low-cost model.

3.1.2. Quppa

Introduction

Quppa is a start-up company that developed a business model revolving around a reusable coffee cup. The model works in the following way: in a couple of speciality coffee bars in Leuven (Belgium), a consumer may ask the bar to serve a takeaway coffee in a Quppa-cup instead of in a disposable cup, after which the cup is registered in an app. When the consumer finishes the cup of coffee, the cup may be deposited in a drop-off point, usually another speciality coffee bar, which then washes and reuses the cup. The app registers that the cup was returned by the consumer. Financially, the participating coffee bars pay for Quppa's services and Quppa-users can use one cup for free, whereas Quppa is investigating a subscription of €12/year that provides access to the service.

Elements of circularity

Three circular elements characterise the business model of the start-up. First, the reusable Quppa-cup replaces disposable coffee cups and thus leads to a decrease in residual waste. Second, the cups are made from lightweight and durable polypropylene (i.e. plastic), requiring few primary resources and implying a low environmental impact. Additionally, the start-up is exploring how to collect and recycle broken Quppa-cups into new ones. Third, all cups are smart as they are scanned and registered, allowing the start-up to trace their cups, analyse where cups disappear and what bars need new cups.

Drivers

The main drivers identified by consumers regarding a coffee subscription in the city are ease of use, environmental impact and expected quality. Quppa, however, offers a subscription to a coffee cup instead of coffee, leading to different drivers.

Quppa identifies three main drivers for their consumers: environmental impact, price and lifestyle. Regarding environmental impact (1), the start-up knows that the bigger part of the Quppa-users is driven by sustainability considerations. The start-up makes use of this driver by using the app to provide the users with data on the number of disposable cups that have not been used and, moreover, by using, for example, pictures of overflowing litter bins in their marketing strategy. Furthermore, these users are willing to pay a certain price (2) for the circular businesses model, although the price-setting remains highly complex for Quppa (see below: barriers). Finally, lifestyle (3) is considered as a driver for the users of the circular cups, which is observed frequently when users associate themselves with Quppa by means of social media.

Barriers

The consumers of a coffee subscription in the city identified the following barriers in the survey: costs, fit with the consumers' lifestyle and contractual conditions. Here again, Quppa's model slightly differs, leading to different barriers.

The three key barriers Quppa identifies for consumers are lack of familiarity, hygiene and price (including price-setting). Lack of familiarity (1) is considered as the main barrier. Specifically, before using a cup, users are required to register and to install the app; subsequently, after finishing the takeaway coffee, the users can only deposit the cup in a drop-off point; and once such a point is found, the users are frequently asked to join the queue in a coffee bar top drop-off their cup. Here, the start-up is exploring, respectively, to include the payment of coffee in the app; to create more drop-off points; and to collect the used cups in a box at the entrance of the bars. In addition, Quppa reckons that the routine of disposable cups is a barrier for potential users of Quppa-cups. Therefore, the start-up is exploring how to incentivise coffee bars to switch to reusable instead of disposable cups by, for instance, exempting the bars from payment once they decide to stop providing disposable cups to their consumers. Hygiene (2) is a moderate barrier for the users. Now and then, questions are raised about the release of microplastics from the cups and the brim of the cups. The answers to these questions typically are diverse and complex, which may lead to a backlash against the service. Therefore, Quppa deals with them by individually approaching the users. Additionally, Quppa maps and randomly checks the dishwashing practices of the bars. Although price was considered as a driver because the users of Quppa are willing to pay for the circular business model, price (3) and, relatedly, price-setting continue to be a struggle for the start-up. Specifically, the €12/year-subscription would lead to a razor-thin profit margin for the start-up and a price increase may form an obstacle for some users. Yet if Quppa's customer base grows, the margins increase and the price can be kept relatively low. Another challenge for Quppa is the question of what users receive when they subscribe, ranging from a service and an app, over multiple cups and more drop-off points, to information and so forth.

3.2. Housing

3.2.1. BotaniCo

Introduction

BotaniCo is a co-housing project in Leuven (Belgium) that was developed by the residents of the housing units. From 2013 onwards, a group of fifteen citizens started searching for a space to live, particularly to live in an environmentally conscious way, with low space requirements and by sharing cars. Since 2020, BotaniCo is located in an area that used to be a school but was converted into twenty-eight apartments and a large shared area, mainly built with sustainable materials. The apartments have different sizes and always consist of one or more bedrooms, a living room, kitchen, bathroom and washroom. Twenty-three apartments were bought by the residents for prices ranging between €236.000 and €400.000, while five apartments are rented out. The former playground was converted into a shared area, comprising laundry facilities, a storage space, a shared living room, co-working spaces, four guests rooms, a play area and a large communal garden.

Elements of circularity

The circular elements of BotaniCo are low space requirements, sharing (home devices, cars and space), the use of sustainable construction materials and a context of mutual understanding and conviviality.

Drivers

The main drivers identified by consumers concerning co-housing are environmental impact, the possibility of cost-saving and the benefits of social contact.

In line with the survey, BotaniCo identifies two main drivers for the consumers or residents of its circular business model, whereas cost-saving is identified as a barrier because BotaniCo's apartments are rather expensive. Concerning the environmental impact (1), BotaniCo observes that shared environmental beliefs kept the group of residents together over time. This ties in with the benefits of social contact (2), as the residents all like social gatherings and democratic, consensus-driven decisions. In addition to the survey, three other drivers were identified by BotaniCo, namely the financial capacity (3) and technical and regulatory knowledge (4) of some of the founding residents as well as the support of a sustainable project developer called CoHousing projects.

Barriers

The main barriers identified by consumers with regards to co-housing are perceived risks, misalignment with the user's lifestyle and hygienic considerations.

BotaniCo has encountered a range of barriers among its consumers or residents, although hygienic considerations and perceived risks are the only barriers that correspond with the barriers identified in the consumer survey. Hygienic considerations (1) have continuously been a challenge, which became particularly pronounced in the decision whether or not to hire a cleaning company for the shared areas. No risks were perceived (2) at the start of the project. However, over time, uncertainty increased around topics such as contractor contracts, urban development regulations, payment of invoices, the quality of the used materials (e.g. interior doors were used instead of well-insulated entry doors), delays, large time investments and free-riders. Moreover, BotaniCo is a pioneering project: no other best practices were available for advice and public departments and agencies lacked prior experience. Misalignment with the user's lifestyle (3) is a barrier that was not observed in BotaniCo because the involved residents established the project. Nonetheless, it is mentioned that large time investments may clash with potential residents' lifestyles.

Furthermore, BotaniCo encountered two additional barriers that were not identified in the consumer survey. The price (4) of the residential units is high, although it is a competitive price within Leuven's city centre. However, the price may influence potential residents to withdraw from the project, which influenced the founding residents to rent out five out of twenty-eight units. Shared responsibilities and decisions (5) were also a barrier. Specifically, a dedicated but non-binding policy is pursued in which everything is up for discussion during the residents' meetings. Yet those that do not join the meetings lose their voting rights with regards to the topics discussed during a particular meeting.

3.2.2. SmartHomeSystems

Introduction

SmartHomeSystems is one person company web shop in Belgium. It is one of the only companies in Belgium that provides a host of smart home devices and systems to households. For instance, smart lighting and smart heating comprise an on/off function on the users' smartphones and functional plans adapted to the users' preferences; a smart doorbell connects the doorbell’s camera to the user’s smartphone; and a smart garden knows when specific parts of the garden require extra water.

Elements of circularity

The circular elements in SmartHomeSystems’ business model are related to the efficient use of resources such as electricity, heat and water. There is no sharing, renting or leasing, nor reuse or recycling, although the company is considering providing maintenance services to its customers.

Drivers

The main drivers identified by consumers concerning smart home systems are ease of use, environmental impact and expected quality.

In line with the survey, the provider of smart home systems identifies ease of use and environmental impact as drivers for the customers of its circular business model, whereas expected quality is not considered and lifestyle is added as an additional driver. Regarding the ease of use (1), most customers express that they will only temporarily live in their houses. Consequently, they want to avoid huge investments in, for example, demolition works or electricity lines. The interviewee specifies this as follows for smart lightning: ‘For €120, a customer can buy a dimmer light switch and a low power battery, instead of spending €2.000 on demolition works and electricity lines. Concerning lifestyle (2), the customers like to give the impression of being ahead of time, particularly by using smartphones to smartly manage several home devices. Finally, the environmental impact (3) is deemed less important, although it is perceived as an additional benefit by the customers.

Barriers

The main barriers identified by the consumers of smart home systems are cost price, perceived risks and lack of familiarity.

Along the lines of the survey, the provider of smart home systems has encountered the following barriers for customers: perceived high cost and lack of familiarity, whereas the perceived risks related to, for instance, maintenance contracts are not applicable in the case of this company. First, the provider of smart home systems observes that the customers often expect the price (1) to be high. However, the consistent use of smart home systems increases the efficiency of the use of electricity, heat and water, leading to a decrease in costs. ‘Traditional home automation’ is usually offered as a package deal from a particular brand, which implies high upfront costs and less flexibility. By contrast, smart home systems can be purchased step-by-step (e.g. first buying light and then heat components) and different brands of home automation may be combined over time. Generally, companies that provide smart home systems attempt to debunk the high-price myth by providing extra information and by online marketing. Second, the provider of smart home systems confirms that lack of familiarity is a barrier for customers (2). Specifically, a lot of customers are afraid that they will not be capable of installing the devices and will not able to repair the devices when they break down. For now, the strategy of the company is to repeatedly provide extra information to the customers, although providing maintenance services is being considered by the company.

3.3. Electrical appliances

3.3.1. Papillon

Introduction

Papillon is a product-service project established by Samenlevingsopbouw (a big non-profit organisation focussed on social work and empowerment) in the province of West Flanders (Belgium), involving Bosch and energy-poor and water-poor households. The goal of the project is twofold: reduce energy and water poverty and cut emissions as part of a climate strategy. This results in Bosch lending new, efficient large electric appliances (e.g. washing machines and freezers) to Papillon. The households then rent the appliances from Papillon (for a price of around €7/month) for ten consecutive years, replacing their energy-intensive appliances. In turn, Papillon pays Bosch around €9/month on a yearly basis, meaning that Bosch remains the owner of the appliances and takes care of the maintenance for free. At the beginning of 2021, 73 households were renting an appliance. Nonetheless, Papillon observes that 135.000 Flemish citizens are living with energy poverty and thus plans to increase the supply to 500 and, subsequently, 4.000 appliances in the next few years.

Elements of circularity

Papillon's project consists of at least two circular elements. The first circular element is the product-service business model, which influences Bosch to develop high-quality appliances that last long and barely require maintenance. Second, when the contract ends after ten years, Papillon has an agreement with Bosch that stipulates that Bosch will pursue the most sustainable solution for the used appliances, particularly considering whether they may be refurbished and, if that is not possible, dismantled and recycled. As such, Bosch's aim is learning about product-service models, developing high-quality appliances, refurbishing and recycling appliances, whereas the project also bolsters its reputation.

Drivers

Although Papillon not only focusses on washing machines but also on other large domestic appliances, we expect the drivers to largely correspond with the drivers identified in the survey regarding a subscription for washing machines. In this survey, the main drivers were environmental impact, ease of use and expected quality.

In line with the survey, environmental impact, ease of use and expected quality play a role, a nuanced way, for Papillon's participants. However, price is added as the most important driver by the interviewee. Accordingly, the environmental impact (1) of Bosch providing high-quality appliances and of the energy-efficient appliances are an additional driver for the participants of Papillon. Ease of use (2) is a driver for the participants in specific ways. For instance, some of those living in energy poverty also rely on food assistance and a freezer from Papillon allows them to preserve the food for extended periods of time. In the same vein, some do not own washing machines and spend a lot of time in laundromats or on trips to relatives who do own washing machines. The expected quality (3) also plays a role for the participants as most of them have never been able to use appliances from premium brands such as Bosch. Finally, contrasting the survey, price (4) is a major driver for the participants of Papillon, particularly, as the interviewee notes, 'the target group of Papillon has no alternative'. Typically, this group does not own or cannot purchase high-quality electric appliances or they own energy-intensive appliances, implying that renting appliances for €7/month is the only option they have. Additionally, it is added that this group is cautious about unexpected costs related to, for instance, the maintenance of appliances, which Papillon bypasses as Bosch takes care of the maintenance for free.

Barriers
The consumer survey identified the barriers to a subscription to washing machines, namely contractual conditions, the price and the lack of familiarity.

The barriers that the participants of Papillon encounter are contractual conditions and lack of familiarity, whereas the interviewee adds ease of use to this list and, moreover, underscores that these barriers are secondary to the participants because they are outweighed by the driver related to the price of the subscription, which contrasts with the survey. Strict contractual conditions (1) may form a barrier to participate in Papillon for the target group and, therefore, the project provides flexible contracts, lasting for ten years but only requiring notice of three months to terminate the contract. Lack of familiarity (2) with the business model is a barrier because the target group is used to owning instead of renting electric appliances. Ease of use (3) is a barrier for some of the participants of Papillon. For example, the procedure to receive electric appliances from Papillon typically takes about one month as the participants are offered a two-week reflection period and the items are usually shipped from Germany. Additional barriers related to ease of use are that the supply is limited and the operations focus on West Flanders for now; the delivery of the appliances is limited to the second floor, whereas the target group is usually unable to rent a furniture hoist; the assortment is limited to a few types of appliances and built-in appliances are not available.

3.3.2. Instant Ink HP

Introduction
Instant Ink HP is a business segment of HP Inc., the multinational information technology company, providing printer ink as a service to 9 million customers around the world as well as in the Benelux. In 2013, HP outfitted its inkjet printers with wireless sensors that monitor the usage of ink. Once such a printer is purchased for a price between €50-200, the customer may choose to use traditional HP cartridges or decide to subscribe to Instant Ink HP. In such a subscription, the printer monitors the ink level and automatically triggers reorders of new, larger and recyclable cartridges before customers run out of ink. HP owns the cartridges and the customers are required to return them in a pre-paid envelope. When the subscription fee is not paid the cartridges are deactivated. Based on the number of pages the customers print (i.e. pay-per-copy), they pay a monthly subscription fee for the desired result instead of ink usage. The prices range from €0.99 for 15 pages/month, over €4.99 for 100 pages/month, to €49.99 for 1500 pages/month, with additional options in between these three tariffs, implying that the services' target groups are households and small businesses with less than five employees. If more pages are printed, an additional set of pages can be purchased, which, for example, can be done for €1 in the subscription of €0.99 for 10 pages. Generally, HP benefits from economies of scale as, globally, ink is produced when it is needed; from a decreased dependency on retailers selling cartridges; from new data about the usage of ink; from the loyalty generated by the subscription; and from a better reputation with regards to sustainability.

Elements of circularity
The business model of Instant Ink HP consists of two circular elements. First, the product-service system provides a product as a service, namely ink cartridges as pay-per-copy, leading to just-in-time manufacturing and to global environmental gains. Second, once returned to HP, the cartridges are sorted, disassembled, shredded and new cartridges are manufactured (HP, 2020). The circular elements concern ink, whereas the printer needs to be purchased by the customers.

Drivers
The main drivers identified in the survey concerning a printing at home subscription are ease of use, environmental impact and price.

According to the interviewee of HP Instant Ink, the three drivers for the customers of the service are price, ease of use and environmental impact, confirming the results of the survey. First, price (1) plays an important role as a driver. Specifically, ink is generally perceived as an expensive product and, therefore, the low price is crucial in convincing potential customers. As such, Instant Ink HP's marketing revolves around low-cost ink as a service that may lead to savings of up to 70% on ink. However, second, once customers are convinced by the price, ease of use (2) becomes pivotal. Specifically, Instant Ink HP knows that people usually struggle with ink cartridges by, for example, buying the wrong cartridges or running out of cartridges at the wrong moment. Here Instant Ink HP's customers are driven by the automatic delivery of fitting cartridges. Third, although the first two drivers are crucial, the interviewee observes that sustainability (3) is becoming more important for the customers, which is a trend that HP is increasingly using in marketing campaigns. Overall, the interviewee notes that these are the three drivers for the customers of Instant Ink HP, which is regularly confirmed in the feedback received from Instant Ink HP's customers.

Barriers
The main barriers identified in the survey regarding a printing at home subscription are contractual conditions, lack of familiarity and price.

In line with the survey, the interviewee identifies two barriers for potential customers of HP Instant Ink, namely contractual conditions and lack of familiarity, whereas the price is not a barrier (see drivers). First, regarding contractual conditions (1), the interviewee observes that most potential customers are suspicious of signing contracts, inducing HP to use flexible contracts. Specifically, the subscription to Instant Ink HP can be cancelled within one month, and HP regularly organises promotional campaigns that, for instance, offer a free subscription for six months in a row when a HP printer is purchased. Along these lines, lack of familiarity (2) is a barrier to potential customers of the service, particularly they are not used to signing contracts, to returning the ink and to the automatic delivery. Therefore, Instant Ink HP uses the price (see drivers) as a tool to convince these customers and, once enrolled in the service, the ease of use of the service (see drivers). Additionally, using Instant Ink HP requires the potential customers to be familiar with, for instance, wireless networks. Overall, the interviewee observes that these two barriers are not insurmountable and that the main obstacle is increasing the popularity of a low-involvement product such as inkjet cartridges.

3.4. Clothes

3.4.1. KrijgdeKleertjes

Introduction

KrijgdeKleertjes (KDK) is a Dutch non-profit organisation that focusses on exchanging clothes by providing a website and real-world exchange points. It was founded in 2012 by a group of mothers that were friends and wanted to exchange their children's clothes. Accordingly, they launched a crowdfunding campaign to build a website that was user-friendly, fraud-resistant and privacy compliant. The website was launched with a huge success and, today, the organisation is entirely run by volunteers and consists of more than 5.000 members, 30 exchange points and more than 9.000 exchanges have been made. Whereas the exchange points do not require membership, the participants can only exchange clothes online by paying a membership fee of €12 per year, which is used to pay for the website. The subscription initially provides the 'exchangers' with three tokens, which are exchangeable for three packages of clothes offered by another participant. A token can be exchanged for one package of clothes, of which the size is somewhat standardised, and each participant receives one token for delivering a package of clothes to another participant.

Elements of circularity

Circularity is part of KDK's business model in at least five ways. First, the exchange of clothes ties in with reusing discarded products. Here the organisation rallies against fast fashion's linear, take-make-dispose model, also implying that they focus on making the exchangers environmentally conscious, especially in the exchange points. Along these lines, KDK wants to 'normalise' exchanging clothes. Second, as the project gained traction, retail chains inquired about transferring leftover clothes and previous collections to the exchange points of KDK, which now regularly happens and, moreover, convinces potential exchangers to become a member. Third, if worn-out clothes still pass the selection criteria at the exchange points, the clothes are repurposed or recycled by creating new products such as a flag line, whereas some of these clothes are transferred to other civil society organisations that focus on, for example, young mothers or refugees. Fourth, community building is important to KDK, focussing on moms and citizens that are environmentally conscious, interested in charity and volunteering, as well as on building bridges between exchangers that belong to different socio-economic groups. Fifth, two additional sustainability pathways for the organisation are being explored. On the one hand, KDK is trying to establish a platform and an app that allows their participants to exchange tokens for clothes in sustainable retail chains. On the other, KDK is considering opening the exchange points for apprenticeships and workplace learning for people facing challenges to enter the labour market. Overall, the interviewee notes that KDK's key contribution lies in reducing the environmental impact of the clothing sector, whereas poverty alleviation is a secondary effect.

Drivers

In the consumer survey, the drivers to rent clothes online were environmental impact, price and a fit with the consumer's lifestyle. Although KDK focusses on exchanging clothes instead of lending clothes, we expect the barriers in both models to converge to a certain extent.

KDK acknowledges these three drivers but adds the role of community building and particularly of social gatherings and cordial relationships as a fourth driver. The interviewee confirms that the environmental impact (1) is the main driver for most of the exchangers and that KDK typically emphasises this aspect in the exchange points. Furthermore, although KDK focusses on reducing the environmental impact of consuming clothes, some of the participants are also driven by the low price (2) of participating in the project. Specifically, members can access the website for one year for only €12 and receive three tokens in return for registering. Additionally, entering the exchange points does not require a membership but the participants are expected to bring exchangeable clothes to the point. A fit with the participants' lifestyle (3) is also a driver and the interviewee indicates that it is closely related to the driver of environmental impact, particularly as KDK attracts environmentally conscious participants and continues to emphasise how exchanging clothes is more sustainable than buying clothes in retail chains. One additional driver is suggested, namely the role of social gatherings and cordial relationships (4). The driver is not only important in the exchange points but also in the online exchanges and, moreover, is part of the strategy of community building of KDK.

Barriers

In the survey, the barriers for consumers to rent clothes online are lack of familiarity, hygiene, ease of use and contractual conditions.

KDK is familiar with all these barriers but indicates that hygiene and contractual conditions can hardly be called barriers for their participants, whereas a lifestyle barrier is added to this list by KDK. Concerning lack of familiarity (1), the interviewee observes that prejudices against exchanging used clothes restrict some citizens to participate in the initiative. Here KDK focusses on a warm welcome in the exchange points, also tying in with the objective of community building. In the case of KDK, hygiene (2) is not considered as a major barrier for the participants. The warm and friendly atmosphere leads to a reciprocal relationship between the participants, implying that bringing in dirty, unhygienic clothes is considered as impolite. Ease of use (3) is recognised as a barrier in the context of the opening hours of the exchange points. Typically, this requires an appointment or the exchange points are only opened a few times a month, sharply contrasting with regular clothing stores. The contractual conditions (4) of KDK are rather relaxed and, therefore, are not perceived as a barrier, particularly the exchange points can be accessed free of charge, whereas the website requires a yearly subscription of €12. An additional barrier encountered by the participants of KDK is related to lifestyle (5). Specifically, the exchange of clothes for adults is hindered by adults' preferences for brands and trends. The former preference implies that some participants expect KDK to offer packages that only include brand clothing, which opposes KDK's objective to resist the clothing industry's principles. The latter preference holds that some participants only participate to receive fashionable clothing, which is in line with fast fashion but goes against KDK's objectives.

3.4.2. Les ReBelles d'Anvers

Introduction

Les ReBelles d'Anvers (LRBA) was a temporary clothing library-experiment founded in Antwerp in 2016, which lasted three months and resulted from a collaboration between the City of Antwerp, Plan C and Flanders Fashion Institute. The library lent out outfits on a subscription basis: for €35 per month or €100 per 3 months, the subscribers were allowed to use three items for two weeks. LRBA focussed on lending out clothes of Belgian, sustainable designers, whereas clothes from Filippa K (Sweden) were a special case and the mainstay of LRBA's business model. The library only lent out new clothes because, according to one of the founders, Antwerp was not ready for second-hand clothes in 2016 and a certain style could then be maintained in the library. LRBA owned the clothes, which were (a) donated by the designers, (b) bought wholesale and (c) donated by the designers but had to be paid once one of LRBA's consumers bought the item. The library mainly provided women's apparel but tailored suits for men were available as well.

Elements of circularity

Although the communication strategy usually did not refer to a circular economy, LRBA was aware of how the business model tied in with a circular economy. First, induced by companies such as Airbnb and Uber, the sharing economy gained traction from 2010 onwards, which influenced the establishment of the LRBA's clothing library. Here the aim was to lend out and reuse clothes by means of a product-as-a-service business model, which provides an alternative to the linear, fast fashion system. Second, from a sustainability perspective, overstock and clothing from past collections were frequently available for hire in the library, and local designers using short supply chains comprised the biggest part of the library's supply.

Drivers

In the consumer survey, the drivers to rent clothes online were: environmental impact, price and a fit with the consumer's lifestyle. Even though LRBA focusses on lending out clothes in a physical store, we expect that the drivers for renting clothes online or offline largely converge.

The interviewee of LRBA confirms that the survey's drivers are important in circular business models but adds curiosity as a fourth driver. Furthermore, depending on the age of the consumers, environmental impact, price and fit with the consumers' lifestyle played different roles. For consumers aged 25-35 years, the environmental impact (1) and particularly the idea of sharing was imperative. However, this driver was quickly set aside because of the price (2) of the subscription and the consumers' lifestyle (3), both thus functioned as barriers (see below). As such, most consumers were aged over 35 and were, in contrast to the younger consumers, not driven by environmental concerns (1) but by the price and fit with their lifestyle. Concerning the price (2), this group is more wealthy than their younger counterparts and is attracted by the reasonable subscription price that provides access to LRBA's designer clothes. Accordingly, the fit with their lifestyle (3) was larger, implying in particular that attention is given to appealing and qualitative apparel such as the collection of LRBA. Finally, it is observed that curiosity (4) about the library's collection, designers and new items was a driver for some of the consumers.

Barriers

In the survey, the barriers for consumers to rent clothes online are lack of familiarity, hygiene, ease of use and contractual conditions.

These four barriers are considered relevant for the consumers aged over 35 years of LRBA, whereas the price and lifestyle functioned as barriers for the consumers aged under 35 years. Concerning lack of familiarity (1), it is observed that the consumers expected, along the lines of the fast fashion system, continuous updates in the library's collection. For LRBA, this implied purchasing a huge stock that only satisfied few consumers and, as an alternative strategy, using consumer service to guide consumers towards slower fashion habits. Although all clothes were new and maintained and cared for, hygiene (2) was an issue for a couple of consumers, who raised questions about whether the clothes were thoroughly cleaned. For the consumers of LRBA, ease of use (3) was a barrier in two ways. Some of the consumers were afraid of how to take care of the clothes while borrowing them. Here, in hindsight, LRBA would take control over the maintenance of the clothes. Additionally, ease of use was a barrier because the library was not located in Antwerp's shopping district, attracted consumers from all over Belgium and was a so-called destination store, implying that potential consumers did not find their way to the library. For these consumers, in retrospect, the physical store would thus be combined with an online clothing library. Tying in with these ease of use barriers, one contractual condition (4) formed a barrier. Specifically, for the consumers not residing just around the corner of the physical store, borrowing clothes for only two weeks was perceived as a short period of time, which LRBA would extend if they were to resume the project. Finally, for the consumers aged under 35, the price (5) of the subscription and the consumers' lifestyle (6) formed barriers. Specifically, this group was not ready to rent expensive clothes, also implying a mismatch with their lifestyles.

4. Discussion

The previous section presented eight suppliers of PSS within the B2C context, particularly focussing on whether the suppliers have experienced the consumers' drivers and barriers that were identified in the survey, the additional drivers and barriers faced by their consumers and the strategy of the supplier to manage these expectations. By using the specificities of the analysis, we now answer the research question about how suppliers navigate tensions between providing PSS within the B2C context and consumers' drivers for and barriers to the services. We do so by identifying three patterns occurring across the eight suppliers, namely the tensions between business development within the context of established markets and consumers' expectations of the service, between the context of existing price preferences for products that require high investments and the service, and between the context of established consumer culture and consuming in more sustainable ways. In the next section, we conclude the paper, suggest avenues for future research and provide policy recommendations.

The first pattern we observe is that all but one supplier (SmartHomeSystems) of PSS navigates tensions between business development within the context of current prices and contractual conditions, and the consumers' expectations. For example, CoffeeBundles (3.1.1), Quppa (3.1.2), Instant Ink HP (3.3.2) and Les ReBelles d'Anvers (3.4.2) consider(ed) changing the price of the subscription, the services provided for a certain price and/or the contractual conditions. Likewise, although the relaxed contractual conditions and low price of Papillon (3.3.1) and KrijgdeKleertjes (3.4.1) do not impose barriers to their consumers, it is clear that stricter conditions would negatively influence their business model. Concerning BotaniCo (3.2.1), as developing pioneering cohousing projects is expensive, the price of the units is high, which leads to a barrier for less well-off residents. The observations demonstrate that the suppliers navigate tensions between providing viable PSS within the context of established markets and consumers' expectations. Specifically, a price increase could be beneficial for the business model but could also disappoint the service's consumers. This further suggests that the potential of the suppliers' circular business models to transform established markets and user preferences is limited within current socio-technical systems, compromising a fundamental shift to sustainability.

Second, in the larger part of PSS within the B2C context, we observe that a high perceived investment to purchase the product may lead to greater adoption of the services by potential consumers of PSS. For example, the customers of CoffeeBundles (3.1.1) are usually persuaded by the high-quality coffee machine; the Instant Ink model of HP (3.3.2) thrives on the perception of expensive inkjet cartridges; and Les ReBelles d'Anvers (3.4.2) customers are attracted by the reasonable price to wear luxurious designer clothes. Although not recognised as an explicit driver, the cost savings related to SmartHomeSystems' appliances (3.2.2) play a role for the customers, particularly in comparison to the large investments required for traditional home automation. Additionally, the households involved in Papillon's project (3.3.1) usually cannot afford high-quality appliances and, as they have no alternative options to own such appliances, they are convinced by Papillon's service. Hence, we identify a pattern of how the suppliers that replace a product that requires high investments, navigate tensions between the context of consumers' established price preferences concerning an expensive product and providing a service.

Third, we observe that environmental concerns are a driver for the consumers of every PSS, although closer inspection leads to a more fine-grained understanding. For the customers of CoffeeBundles (3.1.1), SmartHomeSystems (3.2.2), Papillon (3.3.1), Instant Ink HP (3.3.2) and Les ReBelles d'Anvers (3.4.2), the environmental impact of the product-service system plays a secondary role in comparison to the other drivers. However, except for Les ReBelles d'Anvers, these suppliers indicate that the role of the customers' environmental concerns are becoming increasingly important. What is more, the customers of Quppa (3.1.2), BotaniCo (3.2.1) and KrijgdeKleertjes (3.4.1) are primarily driven by the environmental impact of PSS. Interestingly, these suppliers make the (negative) environmental impact of the established practices regarding coffee cups, housing and clothing tangible. Quppa uses pictures of overflowing litter bins in their marketing strategy; the residents of BotaniCo share space and tools; and KrijgdeKleertjes provides plenty of information to their customers about the transformative potential of the project. Overall, these observations highlight a third pattern, in which the suppliers of PSS navigate tensions between the context of established, unsustainable culture of consuming and producing and new, more sustainable ways of meeting consumers' expectations.

Summing up, the three patterns underscore the distinct ways in which suppliers navigate tensions between providing PSS within the B2C context and consumers' drivers for and barriers to the services. Specifically, the suppliers navigate tensions between business development within the context of established markets and consumers' expectations, between the context of existing price preferences of expensive products and the service, and between the context of established consumption culture and consuming in more sustainable ways. The dynamics between established configurations of markets, culture and preferences and new configurations have been documented in previous research on green niches (Smith, 2007) and transformative business models (Proka et al., 2018), requiring specific policy advice (Schot & Geels, 2008) to which we will turn in the next section.

5. Conclusions, future research and policy recommendations

In this study, the ways in which suppliers navigate tensions between providing PSS within the B2C context and consumers' drivers for and barriers to the services were investigated. It did so by analysing eight suppliers of PSS in four broad sectors: coffee, housing, electrical appliances and clothing. Accordingly, it focussed on whether these suppliers have experienced the consumers' drivers and barriers that were identified in the survey, the additional drivers and barriers faced by their consumers and the strategy of the suppliers to manage these expectations. The study identified three patterns occurring across the eight selected suppliers. Specifically, the patterns illustrate how the suppliers navigate tensions between business development within the context of established markets and consumers' expectations, between the context of existing price preferences for products that require high investments and the provided service, and between the context of established consumer culture and consuming in more sustainable ways. Overall, the study confirms that PSS are context-dependent and emphasises the dynamic relation between producers and consumers in PSS within the B2C context.

At this point, we identify three promising avenues for future research and address the preliminary nature of the analysis. First, we draw lessons from eight suppliers based in the Netherlands or Belgium, which we did not thoroughly analyse but, rather, interviewed in an exploratory fashion. Future research could therefore further explore our findings through empirical research and in-depth, qualitative analyses of more cases, including in other countries. Theoretically, as the three patterns underscore the dynamic relation between suppliers and consumers of services, the practice approach (Shove et al., 2012) may be useful to go beyond economic and socio-psychological views, particularly focussing on the practical and cultural aspects of PSS (Mylan, 2015; Vezzoli et al., 2015). Second, in identifying the three patterns, we directed attention to the dynamics that occurred across the eight suppliers of PSS, putting aside other relevant dynamics related to drivers and barriers such as hygiene, reduced risks, lifestyle, ease of use and lack of familiarity, which require further research. Additionally, in the case of two suppliers (BotaniCo and KrijgdeKleertjes) social gatherings and cordial relationships played a role for the participants, which were not part of the survey study but play an important role in a circular society (Jaeger-Erben, Jensen, Hofmann, & Zwiers, 2021). Third, we did not explicitly analyse the PSS' transformative potential for sustainability transitions towards a circular economy. Specifically, it is clear that, for instance, Papillon's high transformative potential differs from the product-service system of Instant Ink HP or CoffeeBundles, particularly when considering the social and ecological dimensions and the views on the nature of changes required in society's political-economic institutions (Hopwood, Mellor, & O'Brien, 2005), the social-economic elements of the transformation to circular economic models (Schröder, Lemille, & Desmond, 2020) or the potential of circular business models to close, narrow and slow the loops (Bocken, de Pauw, Bakker, & van der Grinten, 2016). Hence, future research could further explore what it takes for PSS to be transformative and how PSS may lead to fundamental sustainability transitions.

For policymakers and practitioners, finally, a few recommendations may be provided, although we caution against the straightforward implementation of traditional policy instruments and emphasise that PSS are highly context-dependent. First, radical socio-technical experiments such as Quppa, Papillon and KrijgdeKleertjes are, generally, isolated local projects, which should be linked to broader, contextual dynamics of established, unsustainable markets, culture, policies and preferences (Schot & Geels, 2008). Specifically, once learning, networking and visioning processes are being developed, the lessons of these processes have to be translated to broader policy arrangements or socio-technical regimes related to waste disposal and coffee cups, unsustainable electrical appliances and the fast fashion industry. Recent research suggests that this process of translating and linking may be accelerated by transition intermediaries (Kivimaa, Bergek, Matschoss, & van Lente, 2020) such as policy task forces (e.g. Circular Flanders in Belgium) and, under certain conditions, by established firms (e.g. Bosch in the case of Papillon), agencies and organisations (Ampe, Paredis, Asveld, Osseweijer, & Block, 2021; Turnheim & Sovacool, 2020). Second, specific policy instruments may also help in the widespread implementation of PSS, particularly Quppa's model would benefit from a ban on disposable coffee cups and KrijgdeKleertjes would gain in popularity if the participants are allowed to exchange tokens for clothes in sustainable retail chains. More generally, traditional policy instruments such as market incentives (e.g. to incentivise Siemens to become a shareholder of CoffeeBundles or to make shared spaces in housing projects more attractive), environmental levies (e.g. to improve to the business case for reusable coffee cups), regulation (e.g. regarding maintenance services, planned obsolescence or waste disposal) and subsidies (e.g. to replace KrijgdeKleertjes's volunteers with paid staff) may support some of the analysed PSS.

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