User Perspectives on Circular Value Propositions for Kitchen Furniture and Appliances

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ORIGINAL PAPER

User Perspectives on Circular Value Propositions for Kitchen Furniture and Appliances

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Abstract
The urgent need to transition to a circular economy is widely acknowledged, but little attention has been given to how circular consumption affects and is shaped by people's needs, aspirations, and everyday practices. This study explores user perspectives on circular value propositions for kitchen furniture and appliances through scenario workshops with 39 Swedish participants. The findings reveal that scenarios focusing on consumption of pre-used products were associated with economic and environmental motivations. The main barriers were contamination, quality and performance-related issues, and desire for new products. Scenarios focusing on access-based consumption were associated with motivations concerning flexibility, convenience, quality, and environmental reasons. The main barriers to these scenarios were financial concern, unfamiliarity with the concept and uncertainty about terms, desire to own, and practical feasibility. Furthermore, the findings highlight the importance of considering the additional efforts that are associated with circular consumption, the ability to meet users' needs and expectations, and the actual potential for lowering environmental impacts. The relevance of the different scenarios seemed to depend strongly on life situation, financial conditions, and housing situation, with access-based consumption generally seen as a short-term solution. To achieve a circular economy for kitchens, taking a holistic approach to the development of kitchen designs and business models as part of future housing will be needed.

Keywords Circular business models · Consumer preferences · Product-service systems · Access-based consumption · Second-hand consumption · Take-back management · Circular product design

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Introduction

It is widely recognised that it is necessary to break the trend of increasing resource use to reduce the societal burden on the environment and mitigate climate change. In contrast to the linear take-make-waste model that is dominating our economy today, a circular economy is one that is *"restorative and regenerative by design"* [1], p. 5, with the goal of minimising resource input, waste, emissions, and energy leakage [2].

In the commonly used "butterfly diagram" [1], users and consumers are positioned in the centre of the technical and biological cycles of resource use, depicted as playing a crucial role in enabling the cyclical flows of resources by integrating circular solutions into their everyday lives. However, people are at the same time often viewed as passive recipients rather than enablers of the circular economy [3, 4]. Although the term "consumers" is often used in the circular economy debate, in this paper, we will use the terms "users" or "people" to highlight people's active engagement in circular transformation beyond being consumers.

Circular economy involves design strategies combined with business model strategies for slowing, closing, and narrowing resource loops [5]. The concept of product-service systems (PSS) has emerged as a group of business models with the goals of minimising environmental impacts and contributing to circularity [6, 7]. Tukker [8] distinguishes between three categories of PSS: *product-oriented* (offering services alongside selling products to prolong their lifetime and close resource loops), *use-oriented* (providing access to products through leasing, renting, sharing, or pooling), and *result-oriented* (offering a functional result or specific output, including pay-per-use models). In this paper, we use the term access-based consumption (ABC) when referring to the two latter PSS categories. Although ABC could potentially meet the same needs with fewer resources, it has been highlighted that less careful use of non-owned products might lead to shorter product lifespans [7]. Thus, the environmental benefits of ABC are not indisputable, and many barriers have so far limited its diffusion [7]. Although barriers to the acceptance and adoption of ABC have been researched extensively eg. [9–12], there is still a lack of understanding regarding the impact of various barriers on people [13].

Circular consumption also involves the reuse of existing products that are sold from business to consumer (B2C) or transferred from one user to another, either through selling, lending, or giving away products. This paper focuses on the B2C context, including consumption of second-hand products eg. [14–17] and products that have been either refurbished or remanufactured eg. [18–20]. Findings by Hunka et al. [21] suggest that products partly made of reused or refurbished parts can compete with new products at the same price level if the appearance, quality, and functionality correspond to that of a new product. Applying circular economy labels or eco-certification has been suggested to increase willingness to pay for products with recirculated content [22, 23]. However, Van Weelden et al. [24] found that although attitudes towards refurbished products were generally positive initially, refurbished products were often not chosen in the end because of various perceived risks and barriers.

As part of business models centred around sales of pre-used products, companies may offer take-back management (TBM), which is an example of product-oriented PSS. In this circular consumption model, ownership is transferred to the user at the product purchase and then transferred back to the company that sold the product at the end of use. Through a questionnaire focusing on the Dutch B2C printer imaging market, Elzinga et al. [25] found a

considerably higher willingness to adopt TBM than other circular business models (product leasing and pay-per-use). However, research regarding user perceptions of TBM is scarce.

Much of the existing literature regarding user preferences for circular value propositions focuses on one type of business model or product category. Studies that compare preferences for different circular offerings are mainly quantitative, often based on online surveys eg. [13, 21, 26, 27]. What is lacking is insights into how people perceive circular consumption in relation to their daily lives and practices [28, 29]. Recognising how everyday life contexts and social practices shape possibilities for circular consumption is vital to realise the transition to a circular economy [30]. Furthermore, the actual work consumers need to undertake to participate in circular modes of provision needs to be better understood [31]. Some research takes a qualitative approach towards understanding user perceptions of ABC eg. [11, 32, 33] and the consumption of pre-used products eg. [17, 24]. However, to gain deeper understanding of the different aspects influencing people's perception of circular offerings, there is a need for further qualitative research that investigates different consumption models.

This study explores people's perspectives on circular value propositions in relation to the product categories of kitchen furniture and appliances. Domestic kitchens are subject to frequent renewal and are often exchanged before the end of their functional life. Both kitchen appliances and cabinets have been found to represent important contributions to the overall environmental impact of domestic buildings [34]. In a Swedish study, it was estimated that replacements of kitchen appliances and furniture together represented 57% of the overall climate impact from interior renovations of owner-occupied apartments, calculated over a time span of 15 years [35]. In the European Union, about five million tonnes of home appliances are discarded annually [36]. Furthermore, 10 million tonnes of furniture are discarded in EU member states each year, of which kitchen furniture represents a quarter [37]. Between 80 and 90% of the discarded furniture is either incinerated or goes to landfill and only about 10% is recycled [37].

Furniture is a product category for which the highest environmental impact takes place in the raw materials extraction and production phases, which makes this category suitable for reuse and relevant for circular business models to extend product lifetimes [38]. A recent report states that buying used kitchen furniture can reduce the climate impact by 92% compared to buying new [39]. Furthermore, furniture is a prioritised category in recent European ecodesign regulation [40]. In a survey study, Gullstrand Edbring et al. [16] found attitudes towards buying second-hand home furnishings to be generally positive for products made of hard materials. Yet, the same study found generally negative attitudes towards ABC of home furnishings, with kitchens being seen as one of the least favourable categories to rent or lease. Apart from this study, we have not found examples of literature exploring user perspectives on circular consumption models for domestic kitchen furniture.

Home appliances represent an even higher contribution to a building's environmental impact than furniture [34, 35] and have also been proposed as a promising product category for circular business models [41, 42] to deal with problems of resource depletion, waste, and pollution. Research on user perspectives on circular consumption models for kitchen appliances is scarce but there are some studies focusing on other categories of home appliances, such as washing machines. Through choice-based conjoint analysis, Lieder et al. [26] explored user preferences for different circular value propositions for washing machines in Stockholm, Sweden. Their results indicate a general interest in access-based offers such as

pay-per-use and monthly renting. Offering higher service levels and associating remanufacturing cycles with CO_2 savings seemed to positively impact consumer preferences. In another online experiment concerning washing machines, Gülserliler et al. [27] found strong preferences for buying new products and some participants could not imagine leasing at any price that would be profitable for the manufacturer. Of those who could imagine leasing, a significantly higher share preferred to lease used rather than new products. In a different study, Bocken et al. [43] found that a pay-per-wash business model for the washing machine could contribute to more sustainable consumption through changes such as less frequent washes and a lowering of the washing temperature (due to a higher price for higher wash temperatures) [16]

This study is based on workshops with group discussions and evaluations of different scenarios for circular consumption in the kitchen context, including ABC, consumption of pre-used products, and TBM. This research method was selected because of its ability to capture diverse opinions and stimulate discussion to generate rich qualitative insights. The research question that was explored is: *What motivations and barriers do people perceive regarding different circular value propositions for kitchen furniture and appliances?*

Background

This section starts with a comparison of circular consumption models, referring to their implementation of circular strategies. It then presents previous literature findings about user perspectives on circular consumption models and summarises identified motivations for and barriers towards circular consumption.

Circular Consumption

Circular consumption is a wide term that includes different strategies for circularity. In this paper, we have focused on ABC, consumption of pre-used products (including both products reused in their current state, or which have been refurbished or remanufactured), and TBM. We use the 9R framework developed by Potting et al. [44] to explain the potential level of circularity of the three consumption models (see Fig. 1). According to the 9R framework, the highest level of circularity is reached by using the strategies highest up in the framework, such as Refuse, Rethink, and Reduce, focusing on smarter product use and manufacture. These strategies are partly addressed by ABC. The following group of strategies focuses on lifetime extension of products and their parts, which is addressed by ABC, consumption of pre-used products, and TBM. The final group, "useful application of materials" is also relevant in all three consumption models. In theory, ABC thereby has the potential to reach higher levels of circularity than the models based on individual ownership. However, many factors contribute to determining the actual circularity of different consumption models.

Because of the lack of research regarding user preferences for TBM, the following sections focus on ABC and consumption of pre-used products. Most of these studies have been carried out in Europe and the United States, but there are also studies from Asia [45, 46] and Brazil [47].

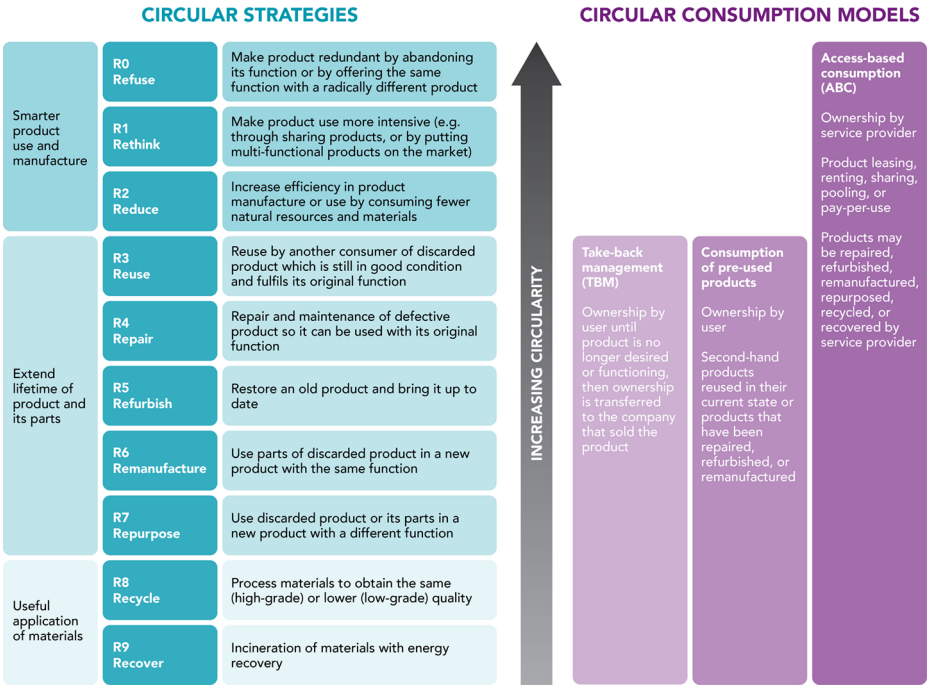


Fig. 1 Circular strategies in the 9R framework [44] in relation to circular consumption models (added by authors). ABC addresses circular strategies higher up in the hierarchy than TBM and consumption of pre-used products

Motivations for Participating in Circular Consumption

The motivations identified in previous literature for participating in circular consumption are summarised in Table 1. For the consumption of pre-used products, economic reasons have been identified as one of the strongest motivators in categories such as home furnishings [16], clothes [14, 15], and electronics [18, 20, 24, 48]. Consumption of pre-used products has been suggested to give access to products with a higher resale value and material value [17]. Furthermore, the fear of breaking products may be lower compared to buying new ones [17]. Economic reasons have also been raised as one of the most important motivations to participate in ABC [46], especially in the case of short-term renting of products [16, 49]. In a study by Rexfelt & Hiort Af Ornäs [12], some participants appreciated having fixed costs to avoid unexpected expenses, while others perceived fixed costs as a negative financial obligation. Gülserliler et al. [27] concluded that pricing alone will probably not be enough to achieve an extensive shift in consumer demand from buying to leasing products.

Both participating in ABC and buying pre-used products may give consumers access to higher quality products or brands they would otherwise not be able to afford [14, 16, 45, 50]. The consumption of pre-used products also seems to be driven by a desire to be unique [14, 16], getting access to products no longer available in stores, with specific product features not available in new products, or without undesirable innovative features [24].

Table 1 Motivations identified in previous literature for participating in circular consumption. The two rightmost columns indicate the consumption model(s) relevant for each of the motivations

Motivation	Description	References	Consumption of pre-used products[a]	ABC[b]
Economic reasons	Saving money or getting good value for money, avoiding unexpected expenses, access to products with higher resale value or material value, lower fear of breaking products	[12, 14–17, 20, 24, 46–51]	X	X
Environmental and social reasons	Avoiding overconsumption, lower environmental impact, reduced feelings of guilt, symbolic values, supporting charity	[14–17, 20, 46, 47, 49, 50]	X	X
Quality	Access to brands and products with better quality and durability	[14, 16, 50]	X	X
Uniqueness	Desire to be unique, access to products no longer available in stores	[14, 16, 24, 52]	X	
Product features	Access to products with specific features not available in new products or without innovative features included in new products	[24]	X	
Flexibility	Changing needs, opportunity to change products, freedom of only having access to products when they are needed, opportunity to test products	[10, 12, 16, 32, 49, 51]		X
Convenience	Making life easier, freedom from responsibilities, not having to deal with maintenance, repair, and the product after its end of use, reduced need of storage	[27, 32, 49, 51]		X
Emotional values	Feeling of fun, thrill of treasure hunting, recreational activity, feeling proud of bargains, opportunity to experiment with style	[14–17, 33, 49, 52]	X	X

[a]Including consumption of second-hand products reused in their current state, and refurbished or remanufactured products

[b]Including product renting, leasing, sharing, pooling, and pay-per-use

Previous literature has identified flexibility as one of the main advantages of participating in ABC [16, 49, 51]. Changing needs [12], the opportunity to change products, and the freedom to access products when needed [16] are some of the highlighted benefits. ABC also offers the opportunity to test products without having to buy them [16, 51]. Convenience is another central motivation for participating in ABC as it may simplify daily life, offer freedom from responsibilities [51], and relieve the user from having to take care of maintenance, repairs, and the product after its end of use [27, 49].

Environmental concerns have been identified as a motivation both for buying pre-used products [16, 20] and participating in ABC [33, 46, 49, 50], though not generally regarded as a primary motivation. However, D'Agostin et al. [47] identified environmental concerns as one of the main drivers for participating in ABC. Additionally, in the case of buying pre-used products, supporting charity can serve as a motivation [17].

Finally, emotional values can be a motivation to buy pre-used products or participate in ABC simply because it is perceived as fun [16, 49]. Buying pre-used products may give the thrill of treasure hunting [14] and be used as a recreational activity [17]. Participating in ABC may give an opportunity to experiment with new styles [33, 52].

Barriers to Participating in Circular Consumption

The barriers identified in previous literature to participating in circular consumption are summarised in Table 2. One of the most important barriers to both buying pre-used products and participating in ABC seems to be fear of contamination, either connected to hygiene or signs of wear. A few examples of product categories where this barrier has been identified are electronics [18, 53], clothing [10, 49], home furnishings [16], footwear [45], baby products [54], and cars [51]. Wallner et al. [60] found that eliminating signs of wear was

Table 2 Barriers identified in previous literature to participating in circular consumption. The two right-most columns indicate the consumption model(s) relevant for each of the barriers

Barrier	Description	References	Consumption of pre-used products[a]	ABC[b]
Contamination	Fear of contamination by previous users (signs of wear and hygienic contamination)	[10, 16, 17, 32, 45, 49, 51, 53–55]	X	X
Uncertainty	Novelty and unfamiliarity with the concept, lack of awareness, lack of trust in service provider, unclear responsibilities in case a product is damaged, broken, or lost, lack of warranty for pre-used products	[9, 11–13, 16, 24, 46, 49, 55–58]	X	X
Financial concern	Lack of financial benefits, anxiety for being financially locked into contracts, long-term contracts perceived as financially risky and more expensive compared to buying, risk of making a bad investment	[9, 11, 16, 18, 24, 32, 49, 53, 56]	X	X
Desire for new products	Pre-used products "lack the thrill of newness", negative social image associated with using pre-used products	[16, 24, 45]	X	
Quality and performance	Fear of inferior performance and quality, and the product becoming obsolete soon	[18, 24, 46, 53]	X	
Lack of accessibility	Not being able to access a product when needed, needing to plan use, not aware of the existence of the consumption model or where to find it	[10, 24, 32]	X	X
Desire to own	Practical consequences associated with non-ownership, impact on everyday life, attachment and emotional values, dislike for subscriptions	[9–13, 16, 46, 56]		X
Consumption work	New demands in terms of skills, knowledge, time, and other resources. Extra effort demanded compared to familiar ways of consuming	[17, 24, 31, 32, 55, 59]	X	X
Not meeting needs and expectations	Not feeling like a target customer, negative prior experiences	[9, 10, 17, 46]	X	X
Environmental concern	Risk of speeding up consumption rates (rebound effect), environmental benefit perceived as small	[16, 56]		X
Practical feasibility	Logistical problems related to storing and transporting large products of bulky nature, differences in consumers' morphology (clothing)	[32, 58]	X	X

[a]Including consumption of second-hand products reused in their current state, and refurbished or remanufactured products

[b]Including product renting, leasing, sharing, pooling, and pay-per-use

considered more important than price reductions and extended warranty to increase preferences for buying refurbished headphones.

Another barrier that has been identified as central to participation in ABC is uncertainty and lack of trust [9, 12, 13, 46]. Partly, this concerns the novelty and unfamiliarity with ABC as a concept [16, 49, 56]. Furthermore, there is uncertainty connected to the responsibility in case a product is damaged, broken, or lost [11, 16, 49, 55]. In a study about ABC models for solar panels, a lack of trust in governments, suppliers, and technology was identified as negatively impacting customer acceptance [57]. Uncertainty can also be a barrier to the consumption of pre-used products, due to the lack of warranty and services [16, 24].

Financial concerns and economic obstacles have also been mentioned as a central factor in the acceptance of ABC [9, 56]. In a study by Cherry and Pidgeon [11], participants raised concerns about the risks of entering contractual agreements and anxiety about being financially locked into contracts that they may not be able to afford later. Especially long-term contracts have been perceived as financially risky and more expensive than buying [16, 49]. When buying pre-used products, users may perceive the price difference as too small compared to buying new ones or fear that it will not be worth the money [24, 53]. Furthermore, users may expect pre-used products to have inferior performance or quality compared to new products and to become obsolete quickly [24, 53].

A central barrier to the consumption of pre-used products is the desire for new products [16, 24]. This barrier may either be of an emotional character or connected to other barriers. Furthermore, the consumption of pre-used products may be impeded by a lack of availability or unawareness of the possibility of buying pre-used instead of new [16, 24].

Several studies have identified a preference for ownership as one of the main barriers to ABC [13, 56]. In the study by Gullstrand Edbring et al. [16], "desire to own" was the most dominant category reported as an obstacle to ABC for home furnishings. Muylaert et al. [10] describe this barrier as a meta-barrier that results from a combination of other barriers. Arekrans et al. [9] explain it as a result of socio-economic and structural factors such as family upbringing, age, and lack of awareness. Cherry and Pidgeon [11] discuss that it is not the loss of property rights per se that causes concern, *"but the loss of the wider sense of flexibility, autonomy and control that comes with ownership"* (p. 11). Rexfelt & Hiort Af Ornäs [12] also suggest that it is not ownership in itself that is important to consumers but rather the practical consequences associated with ownership. They instead highlight the "impact on everyday life" as one of the most central factors to the acceptance of ABC.

An area that has started to gain attention in the literature is the "consumption work" associated with circular consumption. Consumption work refers to the labour *"necessary for the purchase, use, re-use and disposal of consumption goods and services"* [59], p. 37. Consumption work in a circular economy could, for instance, include developing the knowledge needed to choose more circular products or learning how to repair them [31]. Circular consumption thereby places new demands on the user in terms of skills, knowledge, personal attributes, and other resources. Buying pre-used products might be more time consuming than buying new ones because it is often difficult to access detailed and correct product information, examine the product condition, and find exactly what you are looking for [17]. In the case of ABC, users may perceive that it adds a mental burden and demands additional effort connected to logistics [32]. Hazée et al. [55] highlight complexity as a barrier to ABC, referring to difficulties in understanding, accessing, using, and making transactions in connection to the offer.

The participation in ABC furthermore depends on the capability of the offer to meet users' expectations and fulfil their needs [9]. Muylaert et al. [10] identified "not feeling like a target customer" as an important barrier, specifically in the mobility and tools/object sectors. Furthermore, negative experiences from previous participation in ABC offerings or consumption of pre-used products naturally make people reluctant to further engage in these consumption models [9, 17].

Another barrier that has been less discussed in the literature concerns the environmental soundness of ABC [56]. In the study by Gullstrand Edbring et al. [16], a few participants did not imagine renting to bring environmental benefits but rather that it might speed up consumption rates.

Finally, the category of home furnishings faces some specific barriers to ABC. Apart from a general unfamiliarity with the concept of ABC in the context of home furnishings, products within this category are of a bulky nature, which complicates storage, transport, and take-back [58].

Research Approach and Methods

This study reports on data collected during four workshops with group discussions around six scenarios, describing hypothetical circular value propositions for kitchen furniture and appliances. This method was chosen because it enables collecting a wide range of inputs and stimulates discussion, as the participants can build upon each other's statements [61]. Due to its dynamic nature, this method has the potential to generate insights that would be difficult to achieve with other methods, but the unpredictability of group dynamics demands careful consideration regarding how to facilitate discussions between participants and how to assess the relative contribution of different participants in the analysis [62]. In line with previous research [63], p. 145, the workshop scenarios were *"not intended to be definitive statements of the issue under discussion, but provide the basis for discussing and determining how things might be"*.

Research Context

The workshops were performed as part of the research project the Circular Kitchen (CIK), which is a collaboration between academia and industry. The first part of the project (2018–2021) involved two universities, Chalmers University of Technology in Sweden and Delft University of Technology in the Netherlands, actors within the kitchen and appliance industry, and housing associations. The second part of the project (2022–2024) has continued with only the Swedish university and some industry actors.

The CIK project aims to pave the way for more sustainable kitchens from an environmental as well as social and economic perspective. In this project, different versions of kitchen prototypes have been developed based on circular design strategies. The prototypes use a modular design with flexible connectors and durable materials such as plywood with bio-based lignin as a binding agent. The first prototype, CIK 1.0, was placed in a living lab apartment at the end of 2021 and has been used daily by a researcher living there. To date, the furniture of the prototype does not show visible signs of wear, and it is expected to have a lifetime of at least 50 years. The CIK 2.0 prototype (see Fig. 2) has been updated slightly

Fig. 2 CIK 2.0 prototype kitchen used in the workshops. The picture was taken before a dishwasher was installed

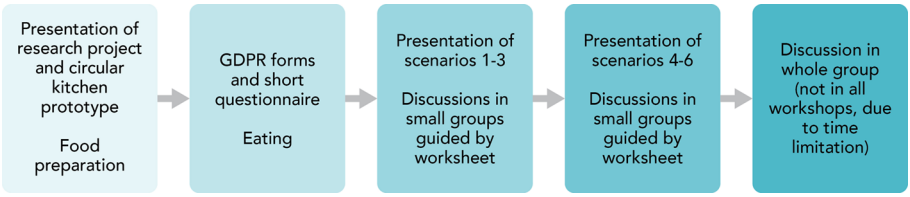


Fig. 3 Overview of the workshop procedure

in terms of measurements, construction, and surface coatings. These changes were motivated by learnings from the installation and use of CIK 1.0, and the adaptation to a different setting. CIK 2.0 uses slightly cheaper materials and is one step closer to industrial production than CIK 1.0, which was handcrafted. In CIK 2.0, the depth of the bottom cabinets was increased from 60 to 70 cm, and socket drawers were added to improve storage possibilities. To simplify logistics, the width of the cabinets was limited to only two variants: 60 cm and 90 cm. The benchtop was divided to enable greater flexibility in moving and replacing modules. Furthermore, the handles were improved from an ergonomic perspective to fit a wider group of users. However, these changes are not likely to have impacted the study findings because both CIK 1.0 and CIK 2.0 are based on the same principles of combining durability and flexibility in the design and using a similar form expression. CIK 2.0 is placed in a building located outside of Gothenburg, Sweden, that is used as a venue focused on sustainable and local food production. This is also the venue where the workshops took place.

In Sweden, building regulations require a kitchen, including a stove, refrigerator, and freezer, to be installed in a dwelling, regardless of whether it is an owner-occupied dwelling or a rental apartment. However, kitchens are generally renovated and replaced more frequently in owner-occupied dwellings (owner-occupied apartments), as indicated in a recent study by Femenías et al. (2018).

Workshop Procedure

Four workshops were conducted with different user groups during the autumn of 2022. An overview of the workshop procedure is provided in Fig. 3. All workshops started in the pro-

totype kitchen with some food preparations and a presentation of the prototype kitchen. The participants then filled out a questionnaire and GDPR form. The participants had not been introduced to the topic of circularity before the workshop. One of the researchers presented three scenarios with different circular value propositions for modular kitchen furniture made from durable and sustainable materials, referring to the prototype kitchen. These scenarios are presented in Fig. 4.

When creating the scenarios, the aim was to provide variation in payment models, product conditions, included services, and terms and conditions. Naturally, it was not possible to test all possible combinations of these factors within the workshop format, but the aim was rather to gain a nuanced understanding of the participants' perspectives regarding different aspects of circular value propositions in the kitchen context. All scenarios were designed to contribute to circularity and sustainability, including different circularity strategies and consumption models.

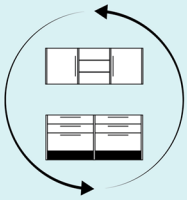
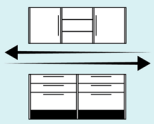
Scenario	S1 PRE-USED KITCHEN 	S2 NEW KITCHEN 	S3 KITCHEN LEASING 
Product	Modular kitchen furniture in high quality materials with long technical lifetime	Modular kitchen furniture in high quality materials with long technical lifetime	Modular kitchen furniture in high quality materials with long technical lifetime
Payment	Buy from kitchen manufacturer	Buy from kitchen manufacturer	Lease monthly from kitchen manufacturer
Condition	Pre-used, in good condition	New	New or pre-used, in good condition
Service	Installation and 5-year warranty included	Installation and 20-year warranty included	Installation, repairs, and replacement of broken products included
After use	The manufacturer can buy the kitchen back for a minor amount, depending on condition	The manufacturer can buy the kitchen back for a minor amount, depending on condition	Upon cancellation of the subscription, the kitchen is returned to the manufacturer
Upgrades			For an extra fee, the kitchen design and functionality can be upgraded
Consumption models	Consumption of pre-used products and TBM	TBM	ABC
R strategies	R2 Reduce, R3 Reuse	R2 Reduce	R1 Rethink, R2 Reduce, R3 Reuse, R4 Repair, R5 Refurbish

Fig. 4 Workshop scenarios 1 – 3 for kitchen furniture

The participants were asked to discuss in groups of two to four persons and together fill out a worksheet focusing on the positive and negative aspects of each of the three scenarios. They were also asked to discuss what they could consider to be a reasonable price for each of the scenarios, given a reference price for a similar kitchen made of chipboard and MDF. However, given that the scenarios were explorative without too detailed specifications, the aim was not to investigate willingness to pay but rather to understand which factors were considered. Finally, the participants were asked to discuss which of the three scenarios they would personally prefer and why.

Following the same procedure, three additional scenarios were presented to the participants, now instead focusing on kitchen appliances and mainly the dishwasher. These are presented in Fig. 5. When discussing price, the participants were given a reference price for a new dishwasher of the same model. The discussions were held in Swedish and audio-recorded with permission from the participants. Figures 6 and 7 show examples of completed worksheets.

Participants

In the recruitment of participants, the aim was to gather people of different ages, genders, household sizes, and dwelling types. Participants were recruited via a Facebook event, posters, and email invitations from the housing development partner to members in their housing queue. Six of the participants currently worked or had previously worked with designing, selling, or building kitchens. An overview of the participants is shown in Table 3.

Analysis

The audio files were transcribed verbatim by the first author. The transcriptions were then coded in NVivo, following a similar procedure to that suggested by Gioia et al. [64], also by the first author. Thus, the categories for motivations and barriers identified in previous literature were not used as predetermined categories in the coding process. Instead, the coding followed an inductive approach in which themes emerged and were established during the process. The resulting coding structure was then revisited, searching for discussions relating to the different categories presented in Tables 1 and 2. Based on this, the authors graded the scenarios in relation to the identified motivations and barriers. This grading should be viewed as a subjective interpretation of the findings to enable a simplified comparison of the scenarios. Some illustrative quotes were selected and translated into English during the coding process.

Results

This section presents the results from the group discussions and evaluations of the workshop scenarios. The quotes in the text are marked with a participant number, indicating which workshop the participant was part of (1 – 4) combined with an individual number (1 – 39).

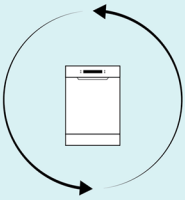
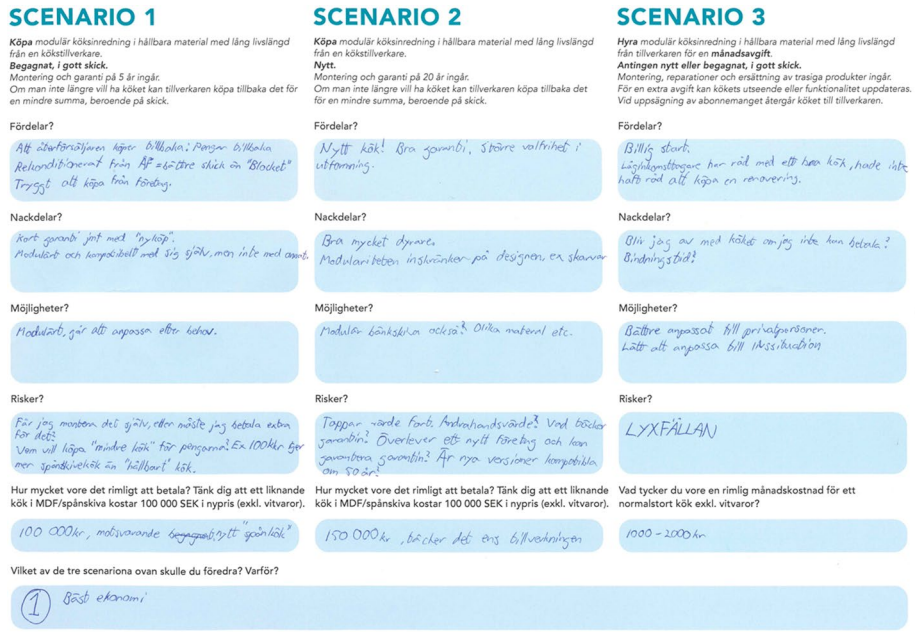
Scenario	S4 PRE-USED APPLIANCE	S5 APPLIANCE LEASING	S6 PAY-PER-USE
			
Product	Kitchen appliances (focus on dishwasher)	Kitchen appliances (focus on dishwasher)	Kitchen appliances (focus on dishwasher)
Payment	Buy from appliance manufacturer	Lease monthly from appliance manufacturer	Pay-per-use
Condition	Pre-used, in good condition and fully functioning	New or pre-used, in good condition and fully functioning	New or pre-used, in good condition and fully functioning
Service	Installation and 3-year warranty included	Installation, repairs, and replacement of broken products included	Installation, repairs, and replacement of broken products included
After use	The manufacturer can buy the appliance back for a minor amount, depending on condition	Upon cancellation of the subscription, the appliance is returned to the manufacturer	Upon cancellation of the subscription, the appliance is returned to the manufacturer
Upgrades		For an extra fee, the appliance can be replaced with another model	For an extra fee, the appliance can be replaced with another model
Consumption models	Consumption of pre-used products and TBM	ABC	ABC
R strategies	R3 Reuse	R1 Rethink, R3 Reuse, R4 Repair	R1 Rethink, R2 Reduce, R3 Reuse, R4 Repair

Fig. 5 Workshop scenarios 4 – 6 for kitchen appliances

Scenario 1: Pre-used Kitchen

The main benefit perceived for *S1 Pre-used kitchen* was the possibility of obtaining a high-quality kitchen at a lower price and environmental impact compared to a new one. Due to the possibility of buying the kitchen directly from the manufacturer with installation, warranty, and a sell-back option, some of the participants found it a safe and convenient option: *"[…] here in S1 I get hooked on that someone comes and builds it for you. Because if you are not that technical or crafty…"* (4–35). However, some asked for a longer warranty.

One participant explained that he would prefer not to pay for the assembly and installation and questioned if the warranty would still be valid if you did this work yourself. Furthermore, some participants discussed what they would be allowed to do, for instance, repaint the kitchen, to be still able to use the sell-back option. Another question was how



SCENARIO 1

Köpa modulär köksinredning i hållbara material med lång livslängd från en kökstillverkare.
Begagnat, i gott skick.
Montering och garanti på 5 år ingår.
Om man inte längre vill ha köket kan tillverkaren köpa tillbaka det för en mindre summa, beroende på skick.

Fördelar?
Att återförsäljaren köper tillbaka. Reconditionerat från AF = bättre skick än "Blocket". Tryggt att köpa från företag.

Nackdelar?
Kort garanti just med "nyköp". Modulärt och kompatibelt med sig själv, men inte med annat.

Möjligheter?
Modulärt, går att anpassa efter behov.

Risker?
För jag monterar det själv, eller måste jag betala extra för det? Vem vill köpa "mindre kök" för pengarna? Ex 100 kr. Tjänar mer spånskivekök än "hållbart" kök.

Hur mycket vore det rimligt att betala? Tänk dig att ett liknande kök i MDF/spånskiva kostar 100 000 SEK i nypris (exkl. vitvaror).
100 000 kr, motsvarande begagnat nytt "spånkök"

Vilket av de tre scenariona ovan skulle du föredra? Varför?
1 Bäst ekonomi

SCENARIO 2

Köpa modulär köksinredning i hållbara material med lång livslängd från en kökstillverkare.
Nytt.
Montering och garanti på 20 år ingår.
Om man inte längre vill ha köket kan tillverkaren köpa tillbaka det för en mindre summa, beroende på skick.

Fördelar?
Nytt kök! Bra garanti, större valfrihet i utformning.

Nackdelar?
Bra mycket dyrare. Modulariteten inskränker på designen, ex skåpvar

Möjligheter?
Modular bänkskiva också? Olika material etc.

Risker?
Tappar värde fort. Återförsäljningsvärde? Vad bäcker garantin? Överlever ett nytt företag och kan garantera garantin? Är nya versioner kompatibla om 50 år?

Hur mycket vore det rimligt att betala? Tänk dig att ett liknande kök i MDF/spånskiva kostar 100 000 SEK i nypris (exkl. vitvaror).
150 000 kr, täcker det enl. tillverkningen

SCENARIO 3

Hyra modulär köksinredning i hållbara material med lång livslängd från tillverkaren för en **månadsavgift.**
Antingen nytt eller begagnat, i gott skick.
Montering, reparationer och ersättning av trasiga produkter ingår.
För en extra avgift kan kökets utseende eller funktionalitet uppdateras.
Vid uppsägning av abonnemanget återgår köket till tillverkaren.

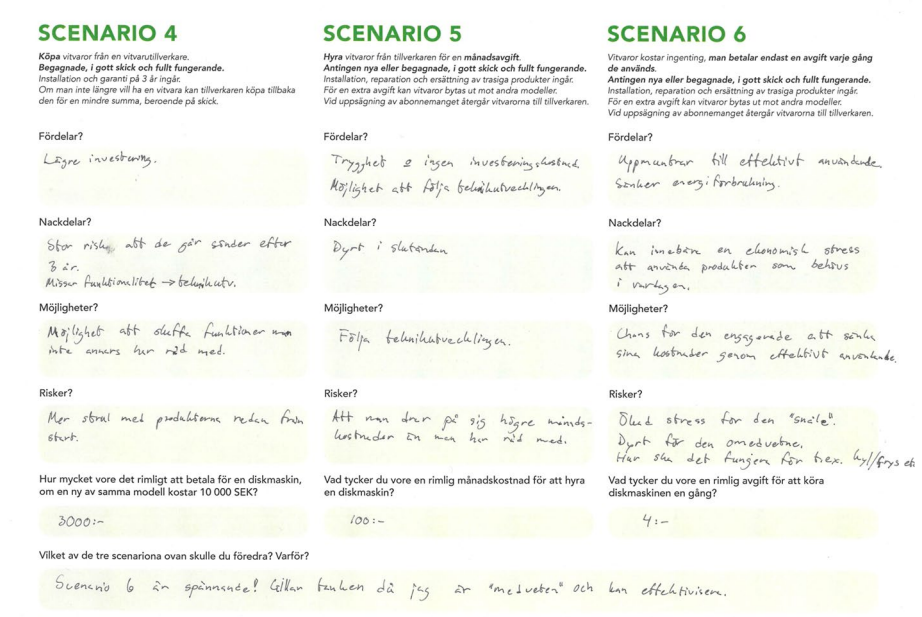
Fördelar?
Billig start. Låginkomsttagare har råd med att hyra kök, hade inte haft råd att köpa en renovering.

Nackdelar?
Blir jag av med köket om jag inte kan betala? Bindningstid?

Möjligheter?
Bättre anpassat till privatpersoner. Lätt att anpassa till installation

Risker?
LYXFÄLLAN

Vad tycker du vore en rimlig månadskostnad för ett normalstort kök exkl. vitvaror?
1000 – 2000 kr



SCENARIO 4

Köpa vitvaror från en vitvarutillverkare.
Begagnade, i gott skick och fullt fungerande.
Installation och garanti på 3 år ingår.
Om man inte längre vill ha en vitvara kan tillverkaren köpa tillbaka den för en mindre summa, beroende på skick.

Fördelar?
Lägre investering.

Nackdelar?
Stor risk att de går sönder efter 3 år. Missar funktionalitet → teknikutv.

Möjligheter?
Möjlighet att skaffa funktioner man inte annars har råd med.

Risker?
Mer stöld med produkterna redan från start.

Hur mycket vore det rimligt att betala för en diskmaskin, om en ny av samma modell kostar 10 000 SEK?
3000:-

Vilket av de tre scenariona ovan skulle du föredra? Varför?
Scenario 6 är spännande! Gillar tanken då jag är "medveten" och kan effektivisera.

SCENARIO 5

Hyra vitvaror från tillverkaren för en **månadsavgift.**
Antingen nya eller begagnade, i gott skick och fullt fungerande.
Installation, reparation och ersättning av trasiga produkter ingår.
För en extra avgift kan vitvaror bytas ut mot andra modeller.
Vid uppsägning av abonnemanget återgår vitvarorna till tillverkaren.

Fördelar?
Trygghet + ingen investeringskostnad. Möjlighet att följa teknikutvecklingen.

Nackdelar?
Dyrt i slutändan

Möjligheter?
Följa teknikutvecklingen.

Risker?
Att man drar på sig högre månadskostnader än man har råd med.

Vad tycker du vore en rimlig månadskostnad för att hyra en diskmaskin?
100:-

SCENARIO 6

Vitvaror kostar ingenting, ***man betalar endast en avgift varje gång de används.***
Antingen nya eller begagnade, i gott skick och fullt fungerande.
Installation, reparation och ersättning av trasiga produkter ingår.
För en extra avgift kan vitvaror bytas ut mot andra modeller.
Vid uppsägning av abonnemanget återgår vitvarorna till tillverkaren.

Fördelar?
Uppmuntrar till effektivt användande. Sänker energiförbrukning.

Nackdelar?
Kan innebära en ekonomisk stress att använda produkten som behövs i vardagen.

Möjligheter?
Chans för den engagerade att sänka sina kostnader genom effektivt användande.

Risker?
Ökad stress för den "snåle". Dyrt för den omedvetne. Har sku det fungera för t.ex. tyg/frys etc

Vad tycker du vore en rimlig avgift för att köra diskmaskinen en gång?
4:-

Fig. 6 Worksheet for scenario 1–3, completed by one of the groups

Fig. 7 Worksheet for scenario 4–6, completed by one of the groups

Table 3 Workshop participants

Number of participants	W1	W2	W3	W4	Total
	14	8	10	7	39
Gender					
Female	11	5	7	4	69%
Male	3	3	3	3	31%
Age					
0 – 19	0	0	0	1	3%
20 – 29	0	2	0	4	15%
30 – 39	2	3	0	2	18%
40 – 49	5	1	0	0	15%
50 – 59	5	1	0	0	15%
60 – 69	0	1	1	0	5%
70+	2	0	9	0	28%
Household size					
1	1	3	4	3	28%
2	1	2	6	3	31%
3	3	2	0	0	13%
4	6	1	0	1	21%
5	3	0	0	0	8%
Type of dwelling					
Rental apartment	1	4	1	3	23%
Condominium	2	0	3	3	21%
Single-family house	11	4	6	1	56%
Occupation					
Working full time	11	4	0	2	44%
Working part time	1	2	0	1	10%
Student	1	0	0	5	15%
Retired	2	0	9	0	28%
Job seeker	0	0	0	0	0%
Other	0	2	1	0	8%
Educational level					
Pre-secondary	0	2	4	0	15%
Upper secondary	1	2	0	0	8%
Post-secondary	13	4	6	7	77%
Not specified	0	0	0	0	0%
Monthly income (before taxes)					
< 25 000 SEK	1	2	5	5	33%
25 000 – 34 999 SEK	2	1	0	1	10%
35 000 – 44 999 SEK	4	0	1	0	13%
> 45 000 SEK	6	2	1	0	23%
Not specified	0	3	3	1	18%

the sell-back price would be determined. Some reasoned that you would probably get more money by selling the kitchen yourself on the second-hand market. However, one participant reflected that:

> *"But convenience often means that you choose things like – okay, I can just make a call, the kitchen will be gone in a week. No showings, no keeping track of messages*

and making appointments, having to be at home, someone not coming, someone coming there and bargaining afterwards, so the uncertainty…" (4–33)

Some of the participants expressed a strong reluctance towards buying a pre-used kitchen. The reasons behind this were doubts regarding the condition of the kitchen and an anxiety that it would be in worse shape than expected. Hygienic aspects and the fear of bringing mould or pests home with it were also discussed.

[…] it feels good to buy something that no one else has, there is no trace of anyone… a certain feeling that it is new. Many people may find it a bit disgusting [to buy a pre-used kitchen]. (4–39)

Another factor that made some participants reluctant to buy a pre-used kitchen was the amount of work they expected in connection to such a purchase. A group of older participants discussed: *"[…] all the work to remove the old and buy a pre-used one […] you need to sell, you have to go look at it… I think mostly about the work"* (3–28), and *"Work costs money. If I get a new one, it will last for the rest of my life"* (3–29).

Other participants were more open to buying a pre-used kitchen, explaining that *"[…] it's not so important that it's brand new, as long as it's functional […] that it's clean"* (3–25). One participant discussed that it feels good to buy second-hand because *"it feels like you're less of a burden on the climate"* (4–37). Another positive aspect discussed regarding buying a pre-used kitchen was the possibility of evaluating its quality: *"[…] if you say that this kitchen has lived for 10 years, then you can actually get a receipt of how well it has lasted over time"* (2–15).

Regarding flexibility, many expected to get greater freedom of choice when buying a new kitchen compared to a pre-used one because *"you can buy exactly the modules you need"* (2–15). Also, when buying a pre-used kitchen, *"the risk is that you can't upgrade it"* (3–23) because of discontinued models. However, *S1 Pre-used kitchen* was still considered to have some flexibility because of the possibility of selling back parts or the whole kitchen to the manufacturer. One of the participants who worked with place-built kitchens mentioned that some people buy a cheap kitchen first and then replace it as soon as they have enough money for a higher quality kitchen. He reasoned that for them, *S1 Pre-used kitchen* would be a better alternative due to the sell-back option.

Willingness to pay for a pre-used kitchen seemed to depend mainly on its condition and age, and if it had been refurbished or not. One group suggested the possibility for the company to offer a condition-dependent price ladder, similar to what some companies currently offer for used mobile phones: *"[…] then you can choose 'as new condition', 'medium condition', 'wear is visible'…"* (4–33). The higher quality and durable materials were described as positive factors although some reasoned that only a few people who are highly interested in sustainability would be willing to pay extra for this. Also, when buying second-hand, *"[…] people would still like to feel that they are making a good deal"* (2–15). For some, buying a pre-used kitchen would not be an option, no matter the terms and conditions connected to the purchase.

Scenario 2: New Kitchen

From the discussions about the *S2 New kitchen*, it seemed that most participants valued the "feeling of new" and liked the thought of investing in a high-quality modular kitchen that would last for many years. It was perceived as a sustainable option compared to a conventional kitchen in chipboard and MDF, although not as sustainable as buying a pre-used kitchen. As mentioned above, it was also expected to get higher freedom of choice and flexibility when buying a new kitchen. However, although it is designed for longevity, one participant expressed that *"[…] I don't trust that people can stick to one and the same kitchen"* (4–39). One of the participants working with kitchens explained:

> *Even if we build kitchens that should theoretically be able to stand for 50 years or a little more if you want, you don't know what the kitchen needs will look like in 50 years. Will we cook in the same way as we do today? Will the appliances look the same? Probably not, they didn't look the same 50 years ago either. So, it's very hard to know […] Then of course modular – it's a good idea but difficult, super difficult to implement in practice.* (2–15)

When considering the prototype kitchen specifically, many found its design limiting: *"I can get so many other variants in an MDF kitchen that I can't get here, then I think it is less worth it even though it is better and sustainable because the aesthetics are so important to me"* (2–16). Another group discussed the importance of uniqueness and customisation: *"[…] how modular is it? It is modular with itself, but […] if I find a very nice marble worktop, can I buy it and use it with this modular kitchen?"* (4–37).

Some participants discussed that the sell-back option would make you more careful with the kitchen and that you might even be afraid to use it:

> *[…] who will be allowed to be in the kitchen? Who will be allowed to use it? Will you be afraid of using the kitchen? If this is in very good condition, then I know I have this money and as soon as there is a scratch, you see those 20,000 [SEK] go […] (4–34)*

Furthermore, several participants discussed how long you plan to live in the dwelling as a decisive factor for investing in a high-quality kitchen or not because *"If I move, then I haven't got the investment"* (3–24). One group reasoned that *S2 New kitchen* would be worth at least twice the price of a conventional MDF kitchen. At the same time, they imagined most people to prefer either buying a more luxurious kitchen or choosing a cheaper kitchen that they can replace again in a few years. One concern was that if you buy a kitchen from a relatively new company, there is a risk that the company goes bankrupt and that you cannot use the warranty anyway. Two of the participants who worked with kitchens discussed:

> *[…] I can say that it's 50-year warranty, but it won't mean anything to the customer in the end because many of the faults that can occur, they are either discovered […] usually during assembly […] or if it's handled correctly, it can stand for as long as you like and if it's handled incorrectly, it won't be covered by the warranty anyway* (2–15)

They also discussed that most people who decide to renew their kitchen have bought a dwelling with an existing kitchen they do not like, while those who have chosen their kitchen themselves often let it stay for *"[…] at least 15 years and often more […]"* (2–15). Therefore, the sell-back option might be more relevant to the buyer of a dwelling than to those who buy a kitchen.

Scenario 3: Kitchen Leasing

One central advantage discussed regarding *S3 Kitchen leasing* was that it allows access to a high-quality kitchen without the need to make a big investment. This scenario was discussed to enable *"[…] more people can get the opportunity to have a good kitchen. There is a huge opportunity with this that would not have worked with a chipboard kitchen"* (4–37). For some people, kitchen leasing might be the only option that is economically possible for renewing the kitchen. Still, it was mainly seen as a temporary solution:

> *It won't get cheaper. But if you say that you're a student maybe, living together with friends in an apartment that you know you will only live in for a couple of years or so, then it's a possibility to still make a climate-smart choice if there is a need to replace the kitchen, then this is a good alternative"* (1–8)

Furthermore, *S3 Kitchen leasing* was described as the most flexible option due to the possibility of upgrading the kitchen and adjusting it to changing needs and preferences. The services included were discussed to make it a carefree option compared to owning a kitchen. However, the risk that people would use the flexibility to change their kitchen even more often was also discussed: *"[…] isn't it that you take advantage then that you can change and renew… it might not be so sustainable then"* (1–6) and *"[…] it is wear and tear to change – every time you change it wears so much that the durability will be lost"* (1–2). Furthermore, some found it complicated to change or renew the kitchen, considering the need for inspection of products to be replaced: *"[…] it's not just like picking up the phone and saying, 'now we want something new'"* (3–26).

One concern that appeared was how to make people feel responsible for a kitchen they do not own themselves: *"Many times, you need to invest a little money in something because then you feel ownership and you feel belonging […]"* (4–33). However, it was also discussed that in some rental agreements, you get a penalty charge if you have damaged the product(s), which might lead to greater care for them. Some participants suggested adding the possibility of buying out the kitchen after a certain time to encourage more careful use.

Because there are currently no such offers on the Swedish market, it was clear that *S3 Kitchen leasing* was the scenario that felt most distant to the participants. The unfamiliarity with the concept contributed to some reluctance: *"Leasing felt very strange, to lease a kitchen. Sure, leasing a car or something but a kitchen… no."* (1–6). Another participant thought: *"[…] what a funny cost to think for yourself that you would pay [for instance] 1500 [SEK] a month to have a kitchen…"* (2–15).

One of the older participants explained: *"It's a bit too modern for us, we are so used to that what we buy, we buy, we in the older generation, it's ours, and when it is worn out, we replace it"* (3–29). One participant reasoned that:

> *[…] the feeling of renting, in particular, is perhaps a bit of a generational issue, that the younger population may be a bit more open to it because it has existed in their world in a different way than for older people. It feels strange to lease* a kitchen. But now you can really rent or lease everything – tools, clothes… (1–7)

However, the younger participants were also not enthusiastic towards subscribing to a leasing contract for the kitchen, reasoning that it could turn into a debt trap. They saw the risk that the monthly fee could increase over time and asked what would happen if you, at some point, would not be able to pay.

> *Then it feels like those who have the most money wouldn't choose this because they had money from the beginning so why not buy a new kitchen? While those who are more financially vulnerable choose this because it is cheaper now because you don't have more money now, but they are also more prone to being [economically] exposed…* (4–38)

Although seeing the advantage that *" […] it will be a very cheap start"* (4–37), some reflected that *" […] the disadvantage of that arrangement is that the longer the kitchen lasts, the less value you have received for your money"* (2–15), compared to buying the kitchen. A suggestion was to vary the price depending on if the kitchen is new or pre-used. Furthermore, questions about termination conditions and the commitment period of the contract were frequently raised. Finally, *S3 Kitchen leasing* was discussed as a more relevant scenario in other countries where the kitchen is something that households bring with them to their next dwelling if they move.

Scenario 4: Pre-used Appliance

The main advantages perceived for *S4 Pre-used appliance* were a lower price and lower environmental burden compared to buying a new appliance. The possibility to buy it from and sell it back to the manufacturer was considered to add flexibility and a feeling of security. One participant reasoned:

> *I can certainly think of disadvantages compared to buying new, but otherwise, I see no disadvantages to there being a functioning second-hand market with services and stuff for white goods. Because appliances feel like an even heavier burden on the climate [than furniture].* (4–37)

However, one of the major concerns was that home appliances generally do not last very long and are often expensive to repair. Many participants were, therefore, reluctant to buy pre-used appliances, worrying that they might break soon or be in worse condition than expected. Another concern was that you would not stay up to date with recent technical developments and improved energy performance. On the other hand, some thought that by buying second-hand, you can afford more advanced appliances.

Willingness to pay for a pre-used appliance seemed to depend on the age of the appliance, how long it is expected to last, the warranty and service included, and whether it has been refurbished or not. The three-year warranty was by some participants considered as

good as for new appliances, while others thought it was too short. Again, what the warranty covers and the terms connected to the sell-back option were also discussed.

Scenario 5: Appliance Leasing

S5 Appliance leasing was described as a carefree and convenient option that eliminates the need to make a big investment. Some considered it convenient always to have functioning appliances while emphasising the importance of having quick access to service. It was also described as a flexible option, allowing the possibility to change to a different model and testing different products. The possibility of getting access to recent technology developments and new functionalities was also discussed as a benefit. One participant reasoned that he would be more open towards leasing an appliance than kitchen furniture because *"[…] then it's a bit more like leasing a car, that you get service if it breaks and stuff like that"* (4–37).

Others were reluctant to the concept of leasing in general, considering costs: *"it won't be cheaper in the long run"* (1–3), and additional work: *"[…] all the trouble around it […] imagine how many phone calls you will have to make before they come here and change, if it breaks or something"* (3–29). Again, older participants in the workshop considered leasing to be more relevant for younger people. However, the younger participants did not show great interest either and described many negative aspects of paying a monthly fee. Similar to *S3 Kitchen leasing*, some participants discussed the risk that this scenario could turn into a debt trap and that you would lose appliances if you, at some point, could not pay the monthly fee. Others discussed the risk that you would feel bound to the contract and limited by the supply of the service provider. The requirement for certain appliances to be part of a dwelling may complicate the practical implementation of this scenario. Furthermore, one group discussed that with a general shift to ABC, the risk is that you lose autonomy.

Similar to *S3 Kitchen leasing*, some groups discussed that not owning your appliances might lead to less careful use. However, one group discussed that the knowledge that someone else will use the product after you encourages you to be more careful with it. Again, the possibility of buying out the appliance after a while was suggested to contribute to more careful use and make the scenario a more attractive option. Furthermore, one group discussed the possibility of combining both kitchen furniture and appliances in the same leasing contract.

Scenario 6: Pay-per-use

The main advantages discussed regarding *S6 Pay-per-use* were that it may raise awareness about consumption, encourage more efficient use of appliances, and allow users to influence their costs. Focusing on the dishwasher, the participants could, however, imagine several negative consequences of the pay-per-use arrangement. First, it could lead to a higher extent of handwashing dishes, which often consumes more energy and water than the dishwasher. Second, if the dishwasher is run more seldom, there is a risk of smell from dirty dishes. Third, it might lead to more people choosing a larger dishwasher than they need to be able to run as many dishes as possible per wash. Fourth, some participants expressed concern regarding having their use of the dishwasher monitored by a company: *"[…] why should anyone keep track of how many times I run a dishwasher?"* (4–34). One participant

expressed: *"It's just that it enters the home. Renting an [pay-per-use] electric scooter in the city – fine, but that it enters the home […], it feels weird"* (4–37). Fifth, pay-per-use was described as stressful and a potential source of conflict at home.

Again, life situation and financial conditions seemed decisive for how relevant this scenario would be to different people. The pay-per-use arrangement was generally not considered relevant for families: *"I have four children […] then it will be a lot of money if you have to pay every time if you have to run your dishwasher twice a day"* (2–18). It was, however, considered relevant for those who use their dishwasher seldom or live in collective housing, to provide a fairer division of costs.

One group discussed the risk that you would not have enough money at the end of the month to use your appliances, describing the scenario as dystopian. They discussed that pay-per-use is more relevant for non-essential products than home appliances: *"It feels like appliances become a dangerous thing not to be able to afford"* (4–34). Furthermore, some thought that pay-per-use feels more expensive than having a fixed monthly fee:

> *[…] 30 times a month, if we think 1 SEK per wash, then it will be 30 SEK a month, but if we rent it, then we were prepared to pay 100 SEK. But it also feels like… should I pay 3 SEK to wash the dishes? That feels expensive.* (4–37)

Evaluation of Scenarios

Figures 8 and 9 summarise an evaluation of the motivations and barriers previously identified in the literature in relation to each of the workshop scenarios. The grading has been performed by the authors based on the group discussions and should be viewed as subjective measures to guide discussion.

The strongest motivations for *S2 New kitchen* were quality, flexibility, and convenience, and the strongest barrier was financial concern. Both *S1 Pre-used kitchen* and *S4 Pre-used appliance* were associated mainly with economic and environmental motivations. At the same time, they were associated with barriers concerning contamination, quality, and performance (with a short expected lifetime for appliances), and desire for new products. Motivations for the leasing scenarios were mainly flexibility and convenience, but also quality in the case of *S3 Kitchen leasing.* The main barriers to these scenarios were financial concern, uncertainty (referring to both unfamiliarity with the concept and doubts about the terms and conditions), desire to own, and practical feasibility (referring to both logistics and building regulations for the kitchen). The main motivations for *S6 Pay-per-use* were flexibility and environmental reasons. Apart from the barriers connected to the leasing scenarios, *S6 Pay-per-use* was associated with consumption work (due to the need to think about consumption in a different way), not meeting needs and expectations (particularly for large households who use their dishwasher frequently), and uncertainty (referring to the concern about being monitored). One group discussed that the alternative you would choose depends on:

> *What are your intentions? If you build your own designed house, then it's also a bit of a different matter […] a lot depends on the budget and scenario, where it will end up. Do you expect to live there for the rest of your life, or do you expect to live there for five years?* (4–34)

Scenarios/ motivations	S1 PRE-USED KITCHEN	S2 NEW KITCHEN	S3 KITCHEN LEASING	S4 PRE-USED APPLIANCE	S5 APPLIANCE LEASING	S6 PAY-PER-USE
Economic reasons	High	Low	Medium	High	Medium	Medium
Environmental reasons	High	Medium	Medium	High	Low	High
Quality	Medium	High	High	Low	Medium	Medium
Uniqueness						
Product features	Medium	Medium	Medium	Medium	Medium	Medium
Flexibility	Medium	High	High	Medium	High	High
Convenience	Medium	High	High	Medium	High	Medium
Emotional values	Low	Medium	Medium	Low	Medium	Low

Fig. 8 Motivations for circular consumption identified in previous literature, graded for each scenario by the authors based on workshop group discussions. Uniqueness was not mentioned as a motivation in the workshops and is left blank. Because social reasons were not discussed, the category "environmental and social reasons" is here reduced to "environmental reasons"

Furthermore, scenarios 1 – 3 were all described as relevant options for landlords and property owners because of the assumed longer lifespan and reduced maintenance of the CIK 2.0 prototype compared to a conventional kitchen in chipboard and MDF.

Discussion

This study has contributed qualitative insights regarding how people perceive and reason about different circular value propositions for kitchen furniture and appliances, an area that to date has been under-explored. We used hypothetical scenarios, deliberately limiting the number of details to leave room for open discussions about positive as well as negative aspects. The research question explored was: *What motivations and barriers do people perceive regarding different circular value propositions for kitchen furniture and appliances?*

Contributions to Research

This study has demonstrated that people have varying preferences and perceive different motivations and barriers in connection to circular value propositions depending on their life situation. Overall, for kitchens, both ABC and the consumption of pre-used products were associated with many barriers. Most participants preferred purchasing a new kitchen with a circular design and a sell-back option, although it was strongly associated with financial concerns.

Scenarios/ barriers	S1 PRE-USED KITCHEN	S2 NEW KITCHEN	S3 KITCHEN LEASING	S4 PRE-USED APPLIANCE	S5 APPLIANCE LEASING	S6 PAY-PER-USE
Contamination	High	Low	Low	High	Low	Low
Uncertainty	Medium	Medium	High	Medium	High	High
Financial concern	Medium	High	High	Medium	High	High
Desire for new products	High			High		
Quality and performance	High	Low	Low	High	Low	Low
Lack of availability	Medium	Low	Low	Low	Low	Low
Desire to own			High		High	High
Consumption work	Medium	Low	Medium	Medium	Medium	High
Not meeting needs and expectations	Medium	Medium	Medium	Medium	Medium	High
Environmental concern	Low	Low	Medium	Low	Medium	Medium
Practical feasibility	Medium	Low	High	Medium	High	High

Fig. 9 Barriers to circular consumption identified in previous literature, graded for each scenario by the authors based on workshop group discussions. Some barriers were not discussed or relevant and are left blank

In line with previous research, one of the most prominent perceived barriers to both pre-used kitchen furniture and appliances was fear of contamination [16, 53]. This barrier could potentially be overcome through refurbishment processes, as discussed by Wallner et al. [60], but the level of refurbishment needed and how to communicate it to consumers to improve the perception of pre-used products is an area that demands further research. In contrast to previous research, contamination was not considered to the same extent for the ABC scenarios [51, 54], even though the descriptions indicated that products within these scenarios could be either new or pre-used.

Some participants seemed to find it difficult to explain why they could not imagine buying pre-used products, and "the feeling of new" was frequently listed as one of the strengths of the *S2 New kitchen*. This suggests that some participants simply desired new products, supporting previous research findings [16, 24]. This is rather paradoxical as a major part of the Swedish population either owns a dwelling that was not new when they bought it or lives in a rental apartment (29% of the Swedish population are tenants living in multi-residential buildings [65]). Consequently, a large proportion of them already use a kitchen that has previously been used. In scenarios *S1 Pre-used kitchen* and *S4 Pre-used appliance*, the negative association towards buying pre-used products became very distinct and prominent in comparison to the general acceptance of moving to a pre-used dwelling. The desire for

new products is perhaps one of the most important and, at the same time, difficult barriers to address. It requires a complete conversion to more circular thinking in society overall and a revaluation of how we use resources.

Similar to previous research, economic reasons seemed to be the strongest motivation to buy pre-used kitchen furniture or appliances [16, 48]. However, the consumption of pre-used appliances was at the same time perceived as financially risky, given the short lifetimes experienced for appliances in general. For the ABC scenarios, there was a reluctance to commit to subscription-based contracts and a concern about financial uncertainties, also identified by Cherry & Pidgeon [11]. However, in contrast to findings by Muylaert et al. [10], the *S6 Pay-per-use* scenario was sometimes perceived as more expensive than paying a fixed monthly fee as in *S5 Appliance leasing*.

In line with previous research [16, 49], unfamiliarity with the ABC concept, particularly in the case of kitchen furniture, contributed to the reluctance towards the ABC scenarios. Through these scenarios, the participants were confronted with new perspectives that they were not familiar with and did not know how to relate to. Indeed, it seemed that the idea of leasing or paying-per-use in the context of the kitchen was almost shocking to them. Therefore, it is not surprising that they were hesitant and focused mainly on perceived barriers in the discussions.

Another central barrier identified for the ABC scenarios was their inability to meet needs and expectations. Despite a diversity of demographic characteristics among the workshop participants, no one seemed to identify themselves as part of the target group, similar to findings by Muylaert et al. [10]. One possible way of overcoming this could be to connect ABC models for the kitchen and its appliances to the home itself, as will be discussed further in the next section.

A barrier to ABC that has been widely recognised in previous research is the "desire to own" [13, 16]. In our study, the preference for ownership was raised but seemed to be related to other factors, such as financial and practical concerns. Our findings, therefore, resemble previous research, which suggests that the preference for ownership is a "meta-barrier" [10], resulting from several other barriers [12] and a lack of flexibility and autonomy [11].

Another important barrier raised in the discussions was the perceived work associated with both buying pre-used products and participating in ABC. The idea of "consumption work" connected to circular consumption has been lifted in recent research [30, 31, 59, 66] but has otherwise received little attention. Even though several services were included in the kitchen furniture and appliance scenarios, it seemed that this would generally not be enough to consider buying pre-used or leasing products instead of buying new ones. Especially *S6 Pay-per-use* was considered to lead to additional consumption work for the household in the form of new practical knowledge and skills needed, new meanings around responsibilities and internal housekeeping, as well as emotional work. How to reduce or address the perceived and actual consumption work connected to circular consumption is an area that deserves more attention. Further experiments in real home environments of applying circular business models to kitchen furniture and appliances are needed to get a deeper understanding of the consequences this may bring to everyday life and practices.

Finally, in accordance with findings by Gullstrand Edbring et al. [16], some participants questioned the environmental soundness of the ABC scenarios, reasoning that they might lead to an increased rate of replacements and renewal. Theoretically, ABC models should, as they are positioned higher up in the 9R hierarchy [44], have a greater potential to con-

tribute to a circular economy and sustainability than ownership-based consumption models. However, contrary to their intention they might lead to higher environmental impact. Previous research has discussed that circular business models might lead to rebound effects and that their environmental advantages might be overestimated [67, 68]. As concluded by Bączyk and colleagues, *"Rebound effects seem likely when the value proposition entails convenience or enables new forms of consumption, while conservation effects seem likely when business models promote sufficiency"* [67], p. 283. Thus, further research on the actual environmental impact of real-world cases of circular consumption is needed.

Contributions to Practice

For kitchen and appliance producers, understanding users' needs and challenges in everyday life will be key to developing attractive circular offers, as also suggested in previous research [69–71]. This study confirms that user preferences for circular value propositions vary, as illustrated by different consumer segments identified in previous research [19, 60, 72]. Therefore, it will not be possible to develop one business model for circular kitchens and appliances that appeals to everyone, but a variety of options will be needed. These options can include different services, such as repair, installation, take-back, or upgrades, combined with products of different levels of reuse, from new to pre-used in different conditions. Offering a diversity of options may reduce financial concerns and the risk of not meeting needs and expectations. For ABC models to become more financially attractive, the possibility of buying out kitchen furniture and appliances may be added to the contract. Refurbishment seems to be an important strategy in order to lower barriers concerning users' fear of contamination, quality and performance issues, and to satisfy their desire for new products. Providing warranties and clarity regarding the terms and conditions connected to the circular offers may contribute to lowering barriers of uncertainty and financial concerns. To lower barriers regarding practical feasibility and consumption work, kitchen and appliance producers need to focus on simplicity in the development of circular offers. Overall, involving users in business model development, design, and experimentation will be central to ensuring that the most crucial barriers are lowered and that the most important motivations for future adoption are strengthened. We also advise careful consideration of rebound effects and contextual factors to avoid unnecessary environmental impact connected to new business models. On an EU level, policies like the Circular Economy Action Plan [73] and the Ecodesign for Sustainable Products Regulation [40] are relevant measures for providing companies with stronger incentives to develop circular products and business models and address these issues.

Regarding the practical feasibility of the workshop scenarios, a frequently raised concern was the Swedish building regulations requiring a kitchen to be installed in the dwelling. These regulations are specific for kitchen furniture and appliances in contrast to other categories of home furnishings and appliances. Still, kitchens are not part of a building's climate declaration, which is required to be handed in for building permits since 2022 [74]. Our findings suggest that further consideration regarding how a kitchen should be seen, either as a fixed part of the dwelling or as a more flexible type of furnishing, is needed. As discussed by some participants, even though the kitchen could be designed to last a lifespan of 50 years or more, this gives no guarantee that it will be kept for that long. This is illustrated by current practices of frequently renewing the kitchen in owner-occupied apart-

ments, of which many renovations are lifestyle related or "cosmetic" [35]. Potentially, the business models of future "circular kitchens" need to connect to the home rather than only the product itself. The government needs to review current building regulations to support reduced environmental impact of both the building itself and the interior. These regulations may need to differentiate between housing categories, possibly allowing owner-occupied apartments to be sold without fixed interiors.

In the case of rental apartments, landlords could for instance be further involved in offering different ABC models and price levels for the kitchen and its appliances to tenants, to include the cost in the rent. To some extent, such models already exist today. For instance, when a kitchen is renovated in a rental apartment this usually leads to an increase in rent. Similarly, the tenant may choose to have an appliance installed that was not included from the beginning, such as a dishwasher, and pay an extra fee per month together with the rent. Overall, it should be relevant for landlords to invest in kitchens that last long to avoid maintenance and renovation costs over time. Furthermore, the possibility to adapt the kitchen according to specific needs and financial conditions adds value to the tenant. In a recent study, Delli Baskaran [75] found an interest among landlords in installing pre-used dishwashers in rental apartments to offer tenants the functionality at a lower cost.

In the case of owner-occupied dwellings, ABC models for the kitchen and its appliances seemed to be of less interest. However, as several participants discussed, willingness to invest in the kitchen depends on how long the household expects to live in the same dwelling. ABC models could be a solution for those who only expect to stay a few years, but this would require a change in current building regulations. Otherwise, the ABC contract would need to be passed on to the next owner, unless the household buys out the kitchen furniture and appliances first.

Interestingly, the sell-back option was by some participants not viewed as a benefit for the buyer of a kitchen but rather for the buyer of a dwelling. This might pose a challenge for marketing sell-back as an added value for the kitchen customer and for incentivising the return of pre-used kitchens to the manufacturer. Although not discussed in the workshop scenarios of this study, the actor to which used kitchen furniture and appliances are returned, resold, and possibly refurbished does not necessarily have to be the manufacturer itself but could be a third-party actor. Collaboration between several actors will probably be key to moving towards more circular kitchen designs and business models in the future [76].

With time, norms and the social acceptance of using pre-used products and participating in ABC will likely change. Previous research has shown that social influence, for instance, from neighbours, may result in peer effects such as installing solar panels or buying electric vehicles [77]. Similarly, participating in circular consumption models for the kitchen may be positively affected by social influence from friends, colleagues, neighbours, and others adopting such consumption models. This could be particularly important to overcome the barrier concerning resistance to shared ownership and desire to own. Furthermore, NGOs could take the role of informing households about the benefits connected to circular consumption models.

Limitations

This study was qualitative, aiming to develop deeper insights into people's perspectives on circular value propositions rather than generating proof for the most preferred kind of con-

sumption model or investigating willingness to pay. The scenarios were, therefore, deliberately created to be of an explorative character. However, the open descriptions of the scenarios left room for different interpretations and evoked many questions, which may have complicated their evaluation. Since the scenarios about kitchen furniture were presented first during the workshops and connected to the prototype kitchen, these scenarios gave rise to deeper discussions than the following scenarios about kitchen appliances. Furthermore, the scenarios were hypothetical and not representations of existing circular business models that the participants had tried out and engaged in. Experiments with circular business models in real home environments would contribute to deeper insights into the motivations and barriers connected to the different models and is an important direction for future research. Research that evaluates both the environmental and financial viability of different consumption models for kitchen furniture and appliances is also needed. This would create a better understanding of the long-term impacts on the environment and economy for both users and companies.

Another limitation of the study is connected to the sampling of participants. Although aiming to reach a demographically diverse group, this study does not, with its 39 participants, achieve a representative sample for the Swedish population. As a second step, the study could be scaled up with more detailed scenarios evaluated by a larger sample of users.

Finally, because there was no preparation for the workshop from the participants' side, their reactions were spontaneous. This was a conscious choice by the research team but a different strategy could be to introduce participants to the topic as a first step, before the workshop discussions.

Conclusions

This study has identified factors that people may consider in connection to circular value propositions for kitchen furniture and appliances, some of which seem specific to the domestic kitchen context. Although ABC models have gained popularity for a variety of product segments in recent years, the concept received strong scepticism in the context of kitchens. Financial concern, unfamiliarity with the concept and uncertainty regarding terms and conditions, desire to own, and practical feasibility were perceived as strong barriers to all the ABC scenarios. For the scenarios that include consumption of pre-used products, the strongest barriers seemed to be fear of contamination, concerns about quality and performance, and desire for new products. Overall, financial concern was the barrier that was discussed the most in relation to the scenarios. Focusing on motivations, ABC scenarios were mainly associated with flexibility, but also quality, convenience, and environmental reasons, and scenarios including consumption of pre-used products mainly with economic and environmental reasons.

Our research indicates that consumption work, both associated with consumption of pre-used products and ABC, poses an important barrier to the wider diffusion of these models. This barrier needs to be further addressed both in future research, for instance, focusing on the consequences of different models for everyday life, including issues of equity, access, and distribution of work, and by companies aiming to develop circular business models and offerings that are attractive to users.

Because kitchens represent a middle ground between furniture/appliances and housing, with bulky products that are complicated to replace, practical feasibility and consumption work become important barriers in this specific context. To achieve circularity, a revaluation of the kitchen's relation to the dwelling may be needed, kitchen business models may need to be more strongly connected to the dwelling, and different models might be needed for rental respectively owner-occupied housing. Incentives for valuing quality, durability, and sustainable materials need to be explored from the perspectives of both households and property owners. Life situation, type of housing, and financial conditions seem decisive in determining the relevance of different consumption models, with ABC generally seen as a more short-term solution than individual ownership. Thus, a variety of circular business models will need to be offered for future kitchen furniture and appliances. Finally, and more broadly, there is a need for societal change regarding taken-for-granted norms that affect how we view products and services, including the value of individual ownership and how novelty is understood, in order to overcome many of the barriers identified in this study.

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Declarations

Competing interests The authors have no competing interests to declare that are relevant to the content of this article.

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