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## Co-creating circular product-service systems for long-lasting washing machines.

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**Keywords:** co-creation; product-service systems; circular product design; washing machines; circular economy.

**Abstract:** This paper presents the result of a co-creation and context mapping study amongst seventeen washing machines users. The users had widely varying experiences with products offered through alternative ownership models, including three who were active users of a washing machine with pay-per-use or monthly subscription model. Through the co-creation process, user's needs, concerns and desires were identified and translated into potential opportunities and barriers concerning the acceptance of circular product-service-systems for washing machines. The paper details the method used in the co-creation process and consecutively highlights six key benefits of using co-creation in the development of circular product-service systems and exemplify them with citations from users. Examples of these benefits are the added value that the product-service systems can give over classic ownership models, the value propositions that can form an entry point for users to be interested in the service, as well as how pricing and feedback schemes could accommodate different users and their needs and desires. In closing, the paper addresses the implications of these benefits, relate them to past literature, but also raise a number of questions and considerations in the application of co-creation for the development of circular product-service propositions.

### Introduction

Access models are seen as a key factor in successfully closing loops in a circular economy (MacArthur, 2013). However, for the circular economy to become truly successful, it is crucial that people actually start using circular products and services on a sufficiently large scale. As Selvfors et al., (2019) state, "it is essential to increase the understanding of what circular consumption entails for people in everyday life". To achieve this, it is imperative to understand people's aspirations, ideas, fears and dreams, so that these future circular propositions are optimally aligned with user's needs. This is where co-creation comes in. Co-creation methods enable users and other relevant stakeholders to participate in the design process of new service and product offerings (Holmlid et al., 2015; Sanders & Stappers, 2008). By taking this bottom-up approach, the chances of success on the market are increased because the resulting services and products better fit the way they will actually be used in people's own lives, and are therefore more attractive. To date, this approach has received limited attention within the circular economy community (Lofthouse & Prendeville, 2018; Selvfors et al., 2019) while

Cherry and Pidgeon (2018) argue there is an "urgent need for research that explicitly explores the concept of Results-oriented services and how these new business models may be perceived."

This paper details the method used in a co-creation process amongst washing machines users to develop new laundry services. Consecutively, it highlights the benefits of using co-creation in the development of circular product-service systems (PSS) based on the outcomes of the case study. This study is part of a large-scale white goods demonstrator, implementing circular economy in practice within the EU project ReCiPSS (2018). The aim of the demonstrator is to develop and pilot a product-service system that incorporates long-lasting washing machines offered through an access model. As a key first step, co-creation sessions were held with users to identify their needs and to translate these into potential opportunities and barriers concerning the acceptance of circular washing machine business models. This is part of a larger co-creation process where users will be actively involved during strategic stages of the



demonstrator to ensure a meaningful match between users and the PSS being developed.

### Method/approach

Seventeen washing machine users participated in the co-creation study. The users had widely varying experiences with products offered through access models, including three who were active users of a washing machine with pay-per-use (PPU) or monthly subscription model. Others had no experience with access models whatsoever.

The study was conducted in two countries, the Netherlands and Slovenia, to verify if the same needs, concerns and opportunities were valid in different cultural contexts. The Dutch and Slovenian context was chosen as a representation of the North- and South-European context.

The study consisted of filling in a sensitizer booklet about their current washing machine practices beforehand and participating in a co-creation workshop.

The sensitizer was used as a basis for the discussion in the workshop. By using a sensitizer beforehand, users are able to reflect on their laundry experiences (Visser et al., 2005).

The co-creation workshop itself was split into two parts. The first half delved into user's laundry experiences based on what they had written in the sensitizer. In the Dutch session, mixing users who used a PPU washing machine with 'normal washing machine' users provoked a natural dialogue in which users exchanged their laundry experiences and, in the process, surfaced underlying desires and needs. In the second half participants were asked to design their ideal laundry service in pairs of two. A slightly different setup was chosen for the second half of the Slovenian session. There, the ideas from the Dutch session were presented to elicit reactions from the Slovenian participants, who were less familiar with (washing machine) access models, about what Dutch participants said.

### Data analysis

The goal of the co-creation session was to inspire and engage the project team and create empathy for the users. (Sleeswijk Visser et al., 2007). Therefore, a medium needed to be chosen that affords presenting rich and in-depth information about the user in an accessible way

for designers to work with and delve into. An infographic poster can give an extensive graphic summary of the data while retaining the personal identity of the users in the process. Infographics were made of each of the participants to be able to present the data in a manner that was easily accessible by the washing machine design team.

To be able to extract relevant data for the infographics, we first familiarized ourselves with the data by repeatedly listening to the recordings. Through this process we reviewed what each participant had said to gain a better understanding of their key characteristics, needs, and concerns as well as their similarities and differences. During several analysis sessions, open coding was then used to identify key characteristics to include in the infographic. These included key and noteworthy facts about each participant and their washing rituals, how they viewed their washing machine, and their likes and dislikes.

By analyzing this data, four additional themes were identified that gave relevant insights for the development of new circular washing machine services. These were: 1.) user's (innate) needs, frustrations, and desires, 2.) their issues surrounding repairs, 3.) the underlying concerns, and 4.) underlying opportunity spaces that emanated from what participants said during the session.

Additionally, a list of similarities and differences between participants was compiled and then narrowed down. This was done by iteratively identifying and testing key contrasts that were applicable across the sample and were capable of being placed against each other on a scale. These were implemented in the infographics to give a quick overview of key differences between participants and included: their emotions towards different steps of the laundry practice, who in their household did the laundry, whether they were more focused on the function the washing machine delivers or (owning) the washing machine itself, where they based their decision to do laundry on (convenience or capacity), smartness and division of control between themselves and the washing machine, and whether they found the feedback on the costs in pay-per-use models confrontational or helpful.

Consecutively the first author went through the recordings again to select transcribed quotes to include in the infographics. Two examples of the infographics can be found in figure 1.

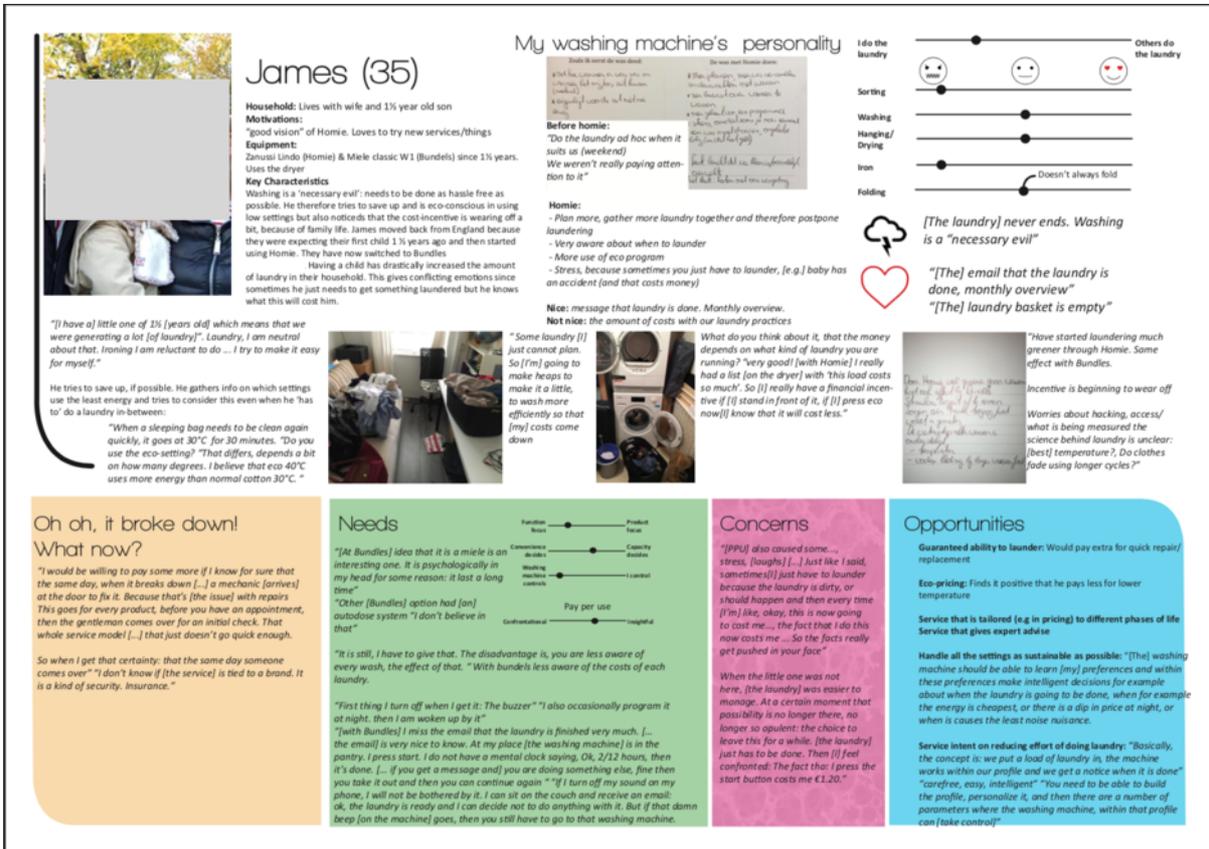
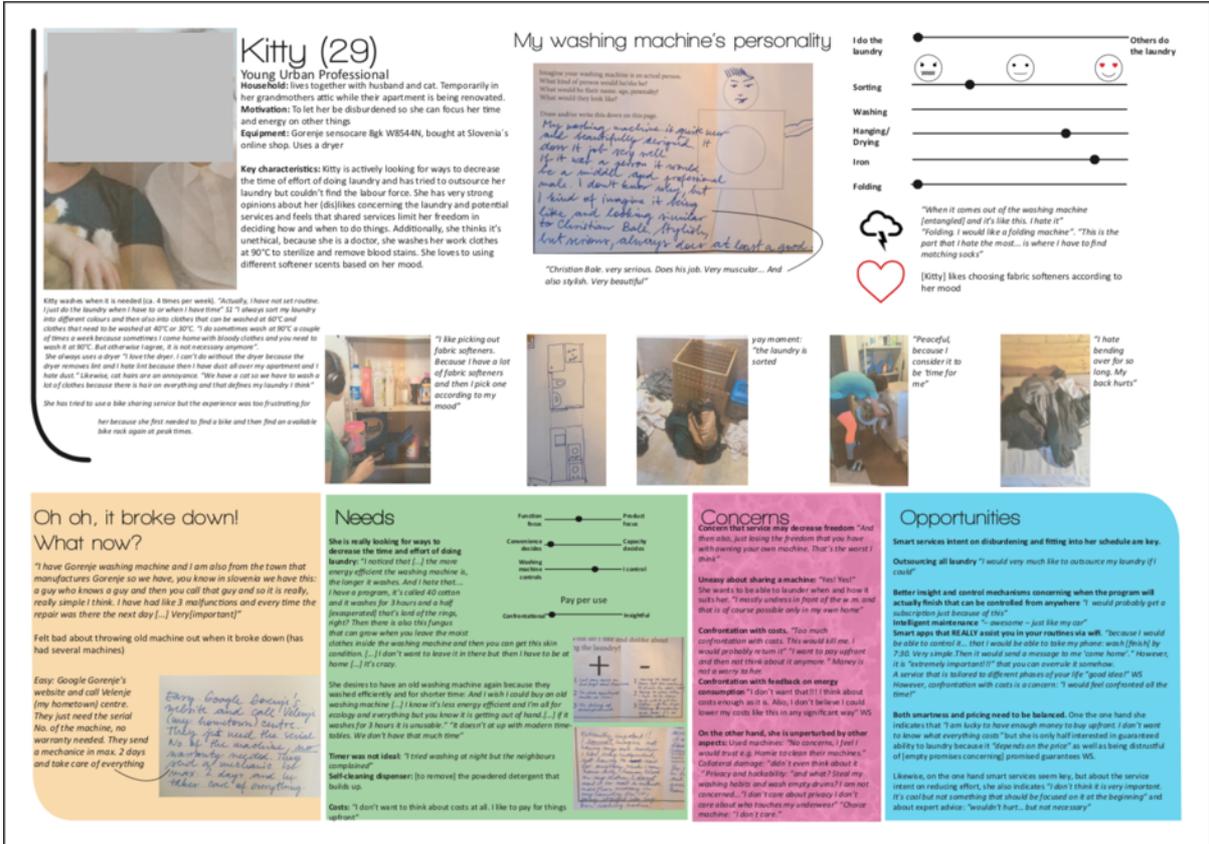


Figure 1 infographics



These infographics were then presented to the design team at the company. To initiate the design process, a first workshop was held together with the design team and all partners of the ReCiPSS project. During the workshop, each team, consisting of 4 people, selected an infographic. During 15 minutes, they brainstormed on new services for the person portrayed in the infographic, after which they rotated. The process of developing new PSS ideas was then continued by the design team in the following months.

### **Results: benefits of using co-creation**

This following section will explain the key benefits of using co-creation for the development of circular PSS's and exemplify them with citations from users. These were extracted from the co-creation process and the subsequent data analysis.

#### *Benefit 1: creating added value for PSS*

Offering products-as-a-service or access models rather than traditional ownership models gives unique opportunities to provide services that would otherwise not be possible. It does require significant changes in the behavior of users and therefore needs have benefits in comparison to the current situation for users to gain interest in it (Selvefors et al., 2019). In this study, the use of co-creation revealed several areas that can make such a service relevant to users.

One example is in the area of service and repairs, where the quickness of repairs or even complete replacements could be part of the service package. As one participant stated: "I would be willing to pay some more if I know for sure that the same day, when it breaks down, a mechanic arrives at the door to fix it. Because that's the issue with repairs... Before you have an appointment, then the gentleman comes over for an initial check. That whole service model that just doesn't go quick enough. So, when I get that certainty: that the same day someone comes over... It is a kind of security. Insurance."

Another example is the opportunity PSS's give to provide relevant and timely information and feedback: "I miss the email that the laundry is finished very much. [the email] is very nice to know. At my place [the washing machine] is in the pantry. I press start. I do not have a mental clock saying, Ok, 2/12 hours, then it's done."

#### *Benefit 2: Ability to develop attractive payment and contract options*

A long-lasting washing machine is a durable good that can (potentially) have a lifespan of 20 or even 30 years. While durability in itself may be attractive, the length of time can give a certain rigidity that may not be attractive to (younger) users who value flexibility. One PPU-user described the appeal of PPU as follows: "Not having to pay upfront costs. You don't need to pay for a washing machine. You are not stuck to it. For example, if you move to another country, you aren't left with a washing machine that you need to get rid of". The lifespan of the washing machine may also mean that a classic ownership model is less suitable than an access-model which can be adapted or tailored to phases of life, e.g. in the size of the machine, payment options and flexibility of contracts: "When the little one was not here, the laundry was easier to manage. At a certain moment that possibility is no longer there, no longer so opulent: the choice to leave the laundry for a while. It just has to be done. Then I feel confronted: The fact that I press the start button costs me €1.20." Or, as a second parent said about the extra laundry loads that are sometimes inherent to having children: "I would feel hindered when having to pay per wash... "I would think every time ka-ching, ka-ching... Possession in itself is not important, but the freedom it offers."

#### *Benefit 3: Finding unique value propositions*

For companies it is essential to find unique value propositions for the proposed circular PSS, particularly when they are not the first on the market to offer access models. Co-creation can identify opportunities to differentiate themselves from competitors. For example, the value proposition could be in providing washing machines with smart technology that is desired by users but would otherwise be financially out of their reach, like providing wi-fi enabled intelligent maintenance or remote access to information and control mechanisms concerning when the program will actually finish. As a user explained: "I would probably get a subscription just because of this"

#### *Benefit 4: Identifying potential user concerns*



The co-creation session intentionally combined users with a pay-per-use washing machine and users with a classic ownership-model washing machine. This approach brought to light certain reservation that users might have including issues surrounding freedom, control, privacy, distrust, and (hygiene) perceptions. An example of this is several users who were very aware of hygiene issues and therefore (very) wary of (re)used and shared washing machines: “because my sister is studying biology, microbiology and she scared the shit out of me... there was a study that the bacteria actually that live in the washing machine can actually be harmful to you” Another example was lack of choice “I would want to choose, what [the washing machine] looks like, what it can do. I find it important that it can open, so that I can add forgotten socks, after the program has started... I would have real problems with ‘oh, you get this concept and this is the machine. Then I would think hmmm...”

*Benefit 5: Assist company with internal shift from product- to service-orientated*

Shifting towards circular economy strategies requires significant changes within companies and co-creation can be beneficial in this process to bring different departments on board. The design team was very positive in hindsight about the co-creation process and saw clear benefits for their company. They stated that it “greatly exceeded their expectations” and that they were now pursuing new ideas and avenues that they would otherwise never have considered.

*Benefit 6: Identify cultural differences*

Holding co-creation sessions in different cultural settings, and particularly using a first session as input for a second session in a different culture, can identify cultural differences. One example of this is that Slovenian participants seemed more prone to question guarantees and be wary of ‘empty promises’: “I would probably go for the cheapest one just because I don’t know how they can guarantee that that one is really going to last so much longer.”

## Discussion

While there are clear benefits to implementing co-creation within circular product development it also raises a number of questions. A key question is whether the suggested

opportunities and barriers also contribute to a prolonged lifetime of the product?

Furthermore, in these two cultural contexts there seemed to be little interest in (long-term) shared-services for washing machines. This begs the question: What would it take to normalize this model in other cultures and what are the underlying cultural values that impede this process? In Scandinavia this model is far more common and Mont (2004) suggests several factors that are at play including regulatory and normative institutional arrangements, the design and application of the PSS and societal socio-cultural background.

Likewise, in how far are perceived barriers going to be actual barriers? Hygiene seems to be a key barrier to several classic business model users. Nonetheless, some of these same users seemed not to be aware that the washing machines that came with their (rental) apartment was likely used by a previous tenant and therefore prone to the same issues.

A further consideration is how to implement the results from the co-creation sessions. A logical approach to hygiene concerns might be to provide a certificate of cleanliness guaranteeing the washing machine is ‘as good as new’. However, previous research suggests that this could be counterproductive saying: “Reassurances that it is as ‘good as new’ just lead to more processing of the fact that it is contaminated.” (Ackerman & Hu, 2017). Positive marketing communications (e.g. ‘as good as new’) on used or remanufactured products tend to make consumers *less* -rather than more- favorable towards these products (Ackerman & Hu, 2017; Mugge et al., 2018). Care should therefore be taken how to apply the results.

## Conclusions

This case study shows that there are clear benefits to co-creating circular PSS’s. It is an advantageous approach that merits more use within the field of circular economy. However, the results should be implemented with careful consideration to avoid having counterproductive effects, e.g. with regards to hygiene. Furthermore, the ideas generated within this process need to be weighed as to their effect on the overall sustainability of the product.

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