

# HOW ARE EMOTIONAL ATTACHMENT STRATEGIES CURRENTLY EMPLOYED IN PRODUCT-SERVICE SYSTEM CASES? A SYSTEMATIC REVIEW UNDERSCORING DRIVERS AND HINDRANCES

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## ABSTRACT

Aiming to decouple value creation from resource consumption, the Circular Economy is considered an alternative to the current linear model of production and consumption. Among the innovative circular business models, Product-Service Systems (PSS) have been recognized as a possible route to achieve enhanced sustainability performance through the extension of product lifespans and the reduction of product substitution. However, PSS may lead to rebound effects due to less careful behavior during the use phase, which compromises product durability. Currently, the effect of non-ownership models on product care is not yet fully understood, nor are the strategies that could enable better product care. This research aims to deeper comprehend the consumer-product relationships in PSS solutions, as well as to shed light on the potential role of emotional durability in PSS development for product attachment. In order to do so, this paper analyses twelve Product-Service System cases derived from a systematic literature review, categorizing the emotional attachment strategies in each case, and identifying how these strategies might hinder or potentialize PSS solutions.

**Keywords:** Circular economy, Product-Service Systems (PSS), Emotional design, Product Care, Consumer behaviour

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# 1 INTRODUCTION

Seen as an umbrella concept, the Circular Economy (CE) has gained increased attention in academia, businesses, and governments. CE is defined as a regenerative and restorative system that stands as an alternative to the linear model of production and consumption (Bech et al., 2019). By slowing, closing, and narrowing resource loops, value creation is decoupled from raw-material extraction (Geissdoerfer et al., 2017). The successful implementation of CE requires that organizations articulate innovative business models based, for instance, on the continuous circulation of products and materials through reuse (Bocken et al., 2016). In circular business models, the transference of the property of the physical product is not a sine-qua-non condition to reach its value proposition (Pieroni et al., 2018), which can be delivered through the provision of Product-Service Systems (PSS) (Kjaer et al., 2019; McAloone and Pigosso, 2018). PSS combines products and services with the ultimate purpose of delivering a solution to the final customer (Tukker and Tischner, 2006), in collaboration with different partners. By incentivizing multiple product's uses and enhanced utilization and, thereby, prolonging its lifespan through reuse, repair, and remanufacturing (Pieroni et al., 2018), the goal is to keep the highest value and functionality for as long as possible (Bech et al., 2019).

Although the notion of a system in the PSS definition encompasses the inseparable link between products and services, the ratio between them in a PSS is not always the same, diverging according to the offering (Demyttenaere et al., 2016). A widely accepted typology for PSS categorization was proposed by Tukker (2004), consisting of three possible classes of the mix of physical products and services: i) Product-oriented, ii) Use-oriented, and iii) Result-oriented. This division clarifies three parameters among the range of PSS: whether it is more oriented to the product or the service, the role of the consumer and its responsibility, and the temporality of ownership (Demyttenaere et al., 2016). Despite the significance of product durability in the context of PSS development (Mesa et al., 2022), several cases demonstrate the less careful behaviour triggered by use-oriented PSS (such as renting and leasing systems), which ends up resulting in a lower than expected durability and a potential rebound effect (Metic and Pigosso, 2022). Although literature has extensively explored the concept of durability as a physical property of a product, it has not looked so carefully to the emotional durability and the nuances of consumer-product relationships (den Hollander et al., 2017) in PSS development for product attachment (i.e., the emotional bond between users and products resulting in a protective behaviour). Tunn and Ackermann (2020) have also shed light on the missing point of research in this area, arguing that the literature has neglected the investigation of how non-ownership proposals might affect product care, as well as considering the strategies that would enable product care in these business models. Thus, there is a need for deepening the comprehension of the possible alterations of the symbolic meanings of products in the context of moving from ownership to PSS (Catulli et al., 2017).

In this context, the research question this paper aims to answer is: *How are emotional attachment strategies currently employed in PSS cases?* A systematic literature review (Section 2) was conducted to systematize the state-of-art PSS cases linked to strategies of emotional attachment and identify how these strategies might hinder or potentialize PSS solutions (Section 3). Lastly, based on the discussion of the findings (Section 4), the research gaps are identified with the aim of improving the current knowledge on integrating emotional attachment strategies into PSS design and operation (Section 5).

## 2 RESEARCH METHODS

This study was conducted using a systematic literature review approach based on the procedures proposed by Biolchini et al. (2005), which includes three phases: data collection, data analysis and data reporting. The first phase, data collection, corresponded to the identification and selection of the PSS cases from academic literature. The articles were selected through searches performed in November 2022 in Scopus. The string gathers two keyword clusters: i) product attachment and synonyms and ii) PSS and synonyms. An iterative process enabled the refinement of the search string, resulting in the use of various synonyms for "product attachment" (to cover a broad range of correlated research fields), the focus on article titles (to enhance relevance) and the inclusion of "ownership" and "non-ownership" aspects in both clusters. The complete search string is: ( TITLE ( "product attachment" OR "emotional attachment" OR "consumer behav\*" OR "consumer-product relationship\*" OR "consumer\* attachment" OR "consumer\* care" OR "consumer\* trust" OR

"consumer\* identi\*" OR "consumer\* perception" OR "care for product\*" OR "product care" OR "emotional bond\*" OR "sense of car\*" OR "caring behav\*" OR "emotional durab\*" OR "product longevity" OR "emotion\*" OR ownership OR "sustainable behav\*" ) AND TITLE-ABS-KEY ( "product?service system\*" OR "product service system\*" OR "product as a service" OR "product-as-a-service" OR "use-oriented PSS" OR paas OR serviti?nation OR "access-based business model\*" OR "non-ownership" ) ). The search returned 50 publications. Studies that were not written in English, book chapters and books were excluded, resulting in 44 articles published in journals and annals of events. Subsequently, the following inclusion criteria guided the selection of relevant studies: i) studies must present an empirical perspective, preferably showing results related to practical implications of emotional attachment in a PSS context; ii) studies must focus on the product emotional attachment rather than other reasons for keeping the product and extend its use; iii) studies must consider at least one effect of emotional attachment to PSS. In total, 12 articles passed the inclusion criteria and were fully read, resulting in the final sample analysed in this study. The second phase of the review (data analysis) went through three steps, concerning the extraction of information and the procedures of categorization. Firstly, a bibliometric approach was adopted to gain an overview of the most used methods, and the geographical distribution of studies. Secondly, the PSS typology was elucidated according to [Tukker \(2004\)](#), indicating the focus of the case. Thirdly, a qualitative analysis supported the identification of the emotional durability strategies addressed by each paper (Table 1), in accordance with the framework proposed by [Haines-Gadd et al. \(2018\)](#), which was generated based on a robust iterative process and is well-aligned with the research question presented in Section 1. Finally, the role of product attachment as a driver or a hindrance to PSS has been analysed.

Table 1. Strategies for more emotionally engaging product experiences

Theme	Definition	Strategies ( <a href="#">Haines-Gadd et al., 2018</a> )
Relationships	Building emotionally rich, engaging relationships between people and products	S.1.1. Ensure participation with creative activities
		S.1.2. User can fix or maintain the product
		S.1.3. Create a ritual or habit
		S.1.4. Create a feeling of control or mastery
Narratives	Capturing shared histories that exist between objects and users	S.2.1. Consider gift giving
		S.2.2. Create a sense of nostalgia
		S.2.3. Use artifacts with existing stories
		S.2.4. Capture a moment
		S.2.5. Create or show multi-layered stories
Identity	Making the identity of the product and the user coexist within their interaction	S.3.1. Think customization or personalization
		S.3.2. Give the product a personality
		S.3.3. Promote connection or community belonging
		S.3.4. Promote self-discovery
Imagination	Understanding the mystery, excitement and captivation objects can provide to users	S.4.1. Create surprise effect
		S.4.2. Leave room for ambiguity
		S.4.3. Create a little magic
		S.4.4. Build anticipation
Conversations	Creating conversations (intentional interactions) between products and users	S.5.1. Create inherent response or feedback
		S.5.2. Consider degrees of response
		S.5.3. Labour leads to love
		S.5.4. Respond to the environment
		S.5.5. Communicate intention
Consciousness	Enabling a sense of consciousness within the product interaction	S.6.1. Design for animacy
		S.6.2. Mimic human behaviour
		S.6.3. Create unexpected interactions or partnerships
Integrity	Considering more than the physical (structural) integrity, embedding enduring values into the product	S.7.1. Be authentic and honest
		S.7.2. Think open and transparent
		S.7.3. Promote reflection of use
		S.7.4. Use durable or eco-appropriate materials
		S.7.5. Ensure quality, durability and reliability

Materiality	Comprehending aspects of the materiality of the product in terms of its changes over time	S.8.1. Ageing gracefully
		S.8.2. Celebrate imperfection
		S.8.3. Engage the different senses
		S.8.4. Make it unique
Evolvability	Assuming the perception that products can have different phases of use over time	S.9.1. Design for variability and modularity
		S.9.2. Design for multiple lifetimes
		S.9.3. Show progression (over time)
		S.9.4. The product transforms into something else

Finally, in the third phase, data reporting encompassed an overview of the selected cases, followed by the identification and discussion of the different strategies mapped in the articles, leading to the identification of potential research avenues to be explored.

### 3 RESULTS: EMOTIONAL ATTACHMENT STRATEGIES IN PSS CASES

In this section, the key findings from each one of the analysed papers are presented in relation to the potential drivers and hindrances of the use of emotional durability strategies for PSS (as described in Table 1). A cross-case analysis is presented in the discussion session (Section 4). The cases derived from the systematic review are presented in Table 2. The publications are described in relation to the author and year and classified according to the PSS solution, the PSS typology according to Tukker (2004), and the methodological aspects, including the research method and the country where it was conducted.

Table 2. Overview of the identified PSS cases in the literature (PO = product-oriented, UO = use-oriented, RO = result-oriented)

Publication	PSS solution	PSS type			Research method	Country
		PO	UO	RO		
Amstel D. et al., 2022	Bicycle sharing				Case study	Netherlands
Moon D. et al., 2021	Washing machine sharing				Survey	Japan and Thailand
Yang X. et al., 2021	Smart beds				Case study	China
Tunn V. and Ackermann L., 2020	Accessed washing machines and bicycles				Survey	Netherlands
Loussaïef L. et al., 2019	Access, borrowing, and sharing luxury clothing				Interviews	France
Cherry C. and Pidgeon N., 2018	Home service provision				Workshops	United Kingdom
Catulli M. et al., 2017	Car sharing				Case studies	N/A
Lawson S. et al., 2016	Access-based business models				Survey	United States
Stacey P. and Tether B., 2015	Cancer care PSS				Case study	United Kingdom
Armstrong C. et al., 2015	Clothing sharing				Focus group and survey	Finland
Zhao M. et al., 2015	Electronics, household appliances and clothing				Experiment	China
Moeller S. and Wittkowski K., 2010	Renting of consumer goods				Survey	Germany

Amstel et al. (2022) highlighted the role of **psychological ownership** as a contributing factor to involving users in closing-the-loop activities. According to this approach, there are three ways – or routes, in the authors' words - to increase the sense of ownership: control, self-investment, and intimate knowledge. After conducting a case study focused on a bicycle-sharing service, these three routes were observed in practice, first by offering bicycles per cluster of users (S.1.4) and then by gathering the users and the PSS provider to share the responsibility for the service. In this regard, they could have the product checked after use (S.1.2 and S.7.5) and make it possible for the users to self-invest in the bicycle service, dedicating time and effort (S.5.3).

Through a consumer survey, Moon et al. (2021) investigated patterns in the use of laundromats in Japan and Thailand, which have different ownership rates of private washers; in Japan, where the ownership rate of private washers is close to 100%, the emotional value of owning the device is linked to attachment to an 'old lifestyle', being seen as a daily necessity and shadowing the perks of pursuing convenience. This indicates that the **strong emotional value** of private washers combined with insufficient experience can be considered hindrances to using laundromats and perceiving it as a means of consumption (Moon et al., 2021). As recommendations to change this scenario, running towards a consumer behavioural transformation process concerning laundromats, Moon et al. (2021) propose removing laundry spaces when designing residences and installing it in shared areas. These actions might foster the reflection of use (S.7.3) of laundromats and provide conditions to create a habit (S.1.3).

Yang et al. (2021) chose to show the particularities of smart PSS, underscoring the relevance of emotional design in such devices usually embedded with a strong sense of technology. The combination of intangible services and smart functions tends to keep the users at a distance; thereby, the authors point that it is significant to consider emotional factors when designing smart PSS to improve the user experience and the so-called stickiness. In their case study on smart beds, it was possible to note that connecting the emotional and smart spheres enabled the creation of a surprise effect (S.4.1), exceeding users' expectations.

Tunn and Ackermann (2020) conducted a survey to investigate factors influencing consumers' product care of washing machines and bicycles since these products present a high functional value and might have their lifetime extended through product care. An interesting result was that **use innovativeness**, "the tendency to use products in a creative way, to find new purposes for existing products and to change products according to one's needs" (Tunn and Ackermann, 2020), can influence product care. In this sense, hands-on activities and craftsmanship are part of the interaction between the user and the product (S.1.1). Having identified lower levels of product care in access-based product-service models, Tunn and Ackermann (2020) recommend three strategies: design for care, introducing customizing options (S.3.1) and facilitating maintenance and repair activities (S.1.2); design to reduce the need for care, considering the product durability (S.7.5) and the communication of the sustainability benefits (S.5.5); and penalising users if they do not take sufficient care of the products, promoting reflection of use (S.7.5).

Looking into the similarities and divergencies of non-ownership (access and borrowing) and joint ownership (sharing and shared purchase) business models in the luxury fashion area, Loussaïef et al. (2019) examined how these practices influence consumer self-identity. A relevant finding was that a new relationship to objects arises from accessing, borrowing, and sharing these luxury items: the **liquid identity transformation**, corresponding to the flexibility to modify an identity position, allowing consumers to express one facet of their personality (S.3.2 and S.3.4).

Cherry and Pidgeon (2018) propose that taking the contractual agreements into consideration, result-oriented services based on pay-per-use models tend to increase product care. To verify this idea, the authors conducted workshops to understand the concerns related to pay-per-use home service provision. One of the key areas they found was care and control, showing that altering the relations towards the objects was seen as an obstacle to enjoying products. In fact, a **high level of anxiety** was reported in the study associated with keeping the PSS in good quality and condition, and the feeling that this inability to relax might influence the family and friends' routine, compromising the sense of flexibility, control and autonomy. As suggestions of efforts to this case, Cherry and Pidgeon (2018) point out the necessity of integrating the values of trust (S.7.1), flexibility and responsibility when designing pay-per-use solutions, along with the communication of these aspects in the firms' discourse (S.5.5).



After conducting mobility-focused case studies, [Catulli et al. \(2017\)](#) found that users of the car-renting service were resistant to the company's attempt to form a brand community. They considered renting a temporary solution until they could buy a car and did not want to be identified as users of the service or be involved with the brand. In this sense, there was **little sense of belonging**, making it hard to generate loyalty and self-identity. The authors also mention that another obstacle is the **temporary nature** of a PSS brand community, which hampers the social affiliation process. Trying to overcome this issue, [Catulli et al. \(2017\)](#) advice that PSS providers should think of schemes to guarantee that consumers identify with the product through a sense of uniqueness (S.3.1) and feel as a member of a community of similar consumers (S.3.3), being able to trust their peers. Taking these directions would positively impact the continued use of the PSS, decreasing the churn rate of temporary users. Moreover, another insight is that PSS designers should also take into account groups of consumers aware of the benefits of PSS and receptive to sustainable values, altering the symbolic meaning of consumption (S.7.3).

[Lawson et al. \(2016\)](#) proposed a categorization of four groups of consumers with distinct dispositions toward access-based consumption, calling attention to the need of firms to make use of communication channels (S.5.5) so that the customer recognizes the environmentally friendly attributes present in the solution provided, understanding the range of benefits. The authors also emphasize the difference between inhibiting factor and barrier, referring to the attachment to goods as the former, meaning that it is transposable when certain conditions are established, such as, for example, appealing to consumers that want to follow fashion trends (S.3.3).

[Stacey and Tether \(2015\)](#) conducted an in-depth case study on a cancer care unit to explore how positive 'emotional chain reactions' can be incorporated into PSS design, resulting in an emotion-centred PSS. The authors state that "people need to be able to wield power, exercise their agency over artifacts, which should be configurable, on-demand, customisable and are sited in an inhibiting context of use". The idea lies in **stimulating user agency**, intervening in a situation and taking action (S.1.4).

Trying to understand the reasons behind the scarcity of implemented PSS in the clothing industry, [Armstrong et al. \(2015\)](#) conducted a mixed-methods study in Finland. Among the factors influencing the perceived value in PSS, the participants of the study cited the overall quality and durability (S.7.5), extending the lifetime and avoiding early disposal, and the wide range of emotions that customized design could address (S.3.1). Moreover, some PSS models could provide emotional experiences, by changing the role of consumers through hands-on activities (S.1.1) and enabling a learning journey to develop a new skill (S.5.3). Another meaningful finding was that some participants described renting as a previous condition before deciding on buying a product, as a chance to test new styles.

[Armstrong et al. \(2015\)](#) argued that a service might not be capable of substituting the emotional meaning that comes with ownership, mainly in the clothing sector, since an outfit can express identity and be associated with important memories. In this sense, the authors cite that the **lack of trust in the service provider** and the **strong emotional satisfaction of the purchase process** are contributors to a negative perception of PSS. As recommendations, the authors propose that PSS providers start considering the offer of re-creation services (S.1.1), increasing the interaction with the product, as well as acknowledging that since history keeping motivates the ownership of garments, incorporating this aspect into PSS (S.2.2 and S.2.4) is also important.

Investigating the emotional valence of services, [Zhao et al. \(2015\)](#) advocate that "customers' emotions toward a PSS are more positively affected by the service provided". Given that the service is intangible, the authors claim that it is more difficult for the consumer to run an evaluation objectively, leaving room for ambiguity (S.4.2). [Moeller and Wittkowski \(2010\)](#) investigated the determinants of preference for non-ownership, finding that "trend orientation" and "convenience orientation" facilitate these new models focused on access. The trend-oriented consumers see the characteristic short rental periods as a means to rapidly fit the innovations (S.3.3), establishing an interaction with the rental provider.

In summary, across all the analysed PSS cases, four drivers and six hindrances were identified for the development of PSS based on emotional attachment strategies (Figure 1). The four drivers identified show that product attachment may motivate a person to feel responsible for a PSS, actively participating as a protagonist during the interaction journey, and looking beyond functionality. However, the six hindrances confirm that resistance to change is still rooted in the mindset of some consumers who are reluctant to see the benefits of business models in which the owner becomes the user.

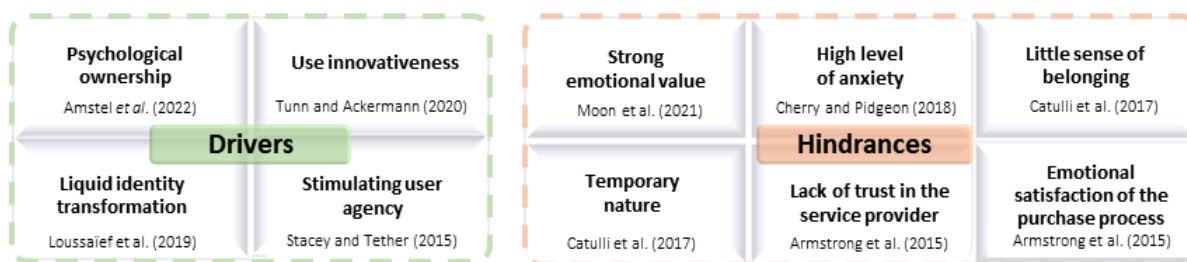


Figure 1. Drivers and hindrances for PSS derived from emotional attachment

Furthermore, out of the 9 themes and 38 emotional durability strategies proposed by the Design Nine framework (Haines-Gadd et al., 2018), six themes and seventeen strategies were identified across the analysed PSS cases (Table 3). It is interesting to note that while some studies focused only on the interactions between the user and the product, others adopted a broader perspective, investigating the relationships that emerge when the user interacts with the service provider and other users, for example.

Table 3. Identified emotional durability strategies

Themes	Haines-Gadd strategies												
		Amstel D. et al., 2022	Moon D. et al., 2021	Yang X. et al., 2021	Tunn V. and Ackermann L., 2020	Loussaief L. et al., 2019	Cherry C. and Pidgeon N., 2018	Catulli M. et al., 2017	Lawson S. et al., 2016	Stacey P. and Tether B., 2015	Armstrong C. et al., 2015	Zhao M. et al., 2015	Moeller S. and Wittkowski K., 2010
Relationships	S.1.1. - Ensure participation with creative activities												
	S.1.2 - User Can Fix or Maintain the Product												
	S.1.3 - Create a ritual or a habit												
	S.1.4 - Create a feeling of control and mastery												
Narratives	S.2.2 – Create a sense of nostalgia												
	S.2.4 – Capture a moment												
Identity	S.3.1 - Think customization and personalization												
	S.3.2 – Give the product a personality												
	S.3.3 – Promote connection and community												
	S.3.4 – Promote self-discovery												
Imagination	S.4.1 – Create surprise effect												
	S.4.2 – Leave room for ambiguity												
Conversation	S.5.3 – Labor leads to love												
	S.5.5 – Communicate intention												
Integrity	S.7.1 – Be authentic and honest												
	S.7.2 – Promote reflection of use												
	S.7.5 – Ensure quality, durability and reliability												

## 4 DISCUSSION

It is now widely recognised the potential of PSS solutions across many categories of products and services, including *Business to Business* and *Business to Consumer* models. The analysed articles presented a diverse range of objects of study, although it can be noticed that washing machine and clothing account for almost half of the sample, followed by a high representation of mobility cases. Among the cases studied in this paper, only two present product-oriented PSS. Use-oriented PSS was the most analysed in the cases, mainly focusing on the sequential use of a product by sharing and renting. Lastly, three cases of result-oriented PSS were identified in the sample. Both qualitative and quantitative approaches were used, with emphasis on case studies and surveys, respectively. European countries were recurrent, particularly the Netherlands and the United Kingdom, but the Asian context (mainly the Chinese) was also studied.

In the two articles that studied product-oriented PSS, only one theme was found: Imagination, linked to the comprehension that objects can be fulfilled with mechanisms to trigger the maximization of feelings of love and discovery. The fact that only one emotional durability strategy in each case was reported indicates a possible convergence to the point of view of [Zhao et al. \(2015\)](#), i.e., that there is a possible counterbalance when checking the customers' emotions towards a PSS, indicating that services account for a more positive effect. The proposition is that service intangibility entails a certain level of subjectivity regarding the users' judgment, leaving room for ambiguity.

Identity, Relationship, and Integrity were the predominant themes screened by the articles, especially the ones related to use-oriented PSS. The predominance of these strategies is seen when analysing articles that dealt with bicycle sharing. Besides taking place in the same geographical location, [Amstel et al. \(2022\)](#) and [Tunn and Ackermann \(2020\)](#) observed that the sense of ownership was facilitated by clustering the users and allocating a joint responsibility for the bicycle service, even appealing to penalties in the case of negligent behaviour. In this sense, in the use-oriented PSS, most strategies provided interactions between the user and the product (such as the ones grouped in Relationships theme) and interactions between the user and the service provider, creating reciprocity and the feeling of collaboration (such as the ones grouped in Integrity and Conversation themes). Thus, psychological ownership and stimulating user agency are considered drivers derived from emotional attachment to potentialize PSS proposals. Nevertheless, the trust in the service provider is not always so simple to achieve and might represent a challenge in these situations.

Despite their interest in investigating alternative business models in the clothing sector, it is worth comparing two studies: [Loussaïef et al. \(2019\)](#) and [Armstrong et al. \(2015\)](#). On the one hand, [Loussaïef et al. \(2019\)](#) investigated both non-ownership (access and borrowing) and joint ownership (sharing and shared purchase) business models in the luxury fashion area, showing that they can represent a facilitated direction toward the desire for self-expression and group affiliation. These are characteristics linked to the Identity theme, giving a new meaning to the search for self-discovery. It indicates that liquid emotional transformation and use innovativeness can be seen as drivers to PSS, scaffolding its successful operationalization. On the other hand, [Armstrong et al. \(2015\)](#) adopted a broader approach examining other PSS solutions, including renting, swapping, fashion result, redesign, repair/maintenance, customization, and consultancy. In this study, it was possible to observe strategies from other themes besides Identity, including Relationships and Narratives, reflecting the potential of these business models in creating experiential and innovative opportunities for the users, focusing on social interaction. But one relevant result from the research of [Armstrong et al. \(2015\)](#) was that some participants reported understating renting as a 'pre-purchase' state, in which they could test new styles and select the best options for the upcoming purchase. This behaviour was also perceived in the study carried out by [Catulli et al. \(2017\)](#), which demonstrated that car-renting users considered the service an intermittent and provisory solution that anticipates the purchase. These findings support the argument that the temporary nature of PSS and the little sense of belonging might inhibit PSS. Moreover, given that the purchase was seen as an end and renting as a means, the emotional satisfaction of buying a long-desired product is also a hindrance to PSS.

Lastly, checking the studies focused on result-oriented PSS, Relationship and Integrity remained the principal focus. However, it is important to highlight that these articles emphasized the role of contingencies aspects. For instance, after observing different realities in two Asian countries, [Moon et al. \(2021\)](#) pointed out that cultural aspects concerning the emotional value attributed to personal devices might influence the perception of PSS benefits. Similarly, [Cherry and Pidgeon \(2018\)](#) noticed that the contractual agreements in pay-per-use models can trigger negative emotions in users. These



perceptions possibly indicate that Zhao et al. (2015) proposition that services account for a more positive effect on users is not entirely assertive. Both studies share the point of view that strong emotional value attached to certain products and a high level of anxiety concerning the need for caring are seen as hindrances to PSS operation.

## 5 FINAL REMARKS

This research aimed to systematize PSS cases reported in recent academic literature linked to strategies of emotional attachment, verifying how these strategies might function as drivers or hindrances to PSS solutions. This study contributes to the PSS design and development, from a theoretical and empirical point of view. From a theoretical point of view, this study complements current PSS research by expanding the understanding of how emotional attachment strategies have been employed in circular business models. To the best of our knowledge, this is the first study to explore the integration of emotional attachment strategies into PSS cases, underscoring the main drivers and hindrances that emerge from this synergy. Among the twelve analysed papers, seventeen strategies were identified, along with four drivers and six hindrances. Using the Design Nine framework (Haines-Gadd et al., 2018) as a lens, the strategies linked to building active partnerships, understanding user's identity, and promoting enduring values were the most predominant.

From an empirical perspective, a substantial contribution of the present study is gathering recommendations for PSS providers to overcome the listed obstacles. For user-oriented PSS providers, alternatives to increase the interaction with the product encompass different directions, such as design for care, design to reduce the need for care and impose penalties for negligent behaviour (Tunn and Ackermann, 2020). For result-oriented PSS, the suggestions are to consider how to make users see the mutual agreement as a win-win solution (based on the tripod trust, flexibility, and responsibility) and not a source of anxiety to meet contractual requirements (Cherry and Pidgeon, 2018). Another recommended action is to focus on setting the conditions for developing an emotion-centred PSS (Stacey and Tether, 2015) through user agency, transforming the user role from passive to actively taking the lead when interacting with the solution provided. Lastly, for product-oriented PSS, even technological assets, such as smart-PSS, can be designed to integrate emotional factors, aiming, for instance, to create a surprise effect and surpass the user expectation (Yang et al., 2021).

It is important to recognize that this study presents limitations related to the techniques used in the literature review. Only articles that contained keywords related to emotional attachment and PSS were evaluated, and the choice of focusing on empirical cases imposed a boundary. Opportunities for future research lie in investigating how the listed drivers are considered in the initial phases of PSS propositions, stimulating the consideration of new trends and covering the bonds established by users and a product or a brand through emotional and psychological involvement. Moreover, looking at the hindrances, it is relevant to run investigations on PSS providers' awareness of these factors and how they are possibly linked to rebound effects, hampering the expansion of useful lifespans and the reduction of product substitution.

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