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How to consume a Product Service System:

Antecedents and Consequences of the
practice of Access

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Maurizio Catulli, Centre of Research In Just Transitions (www.crijt.org) , e-mail: mcatulli@crijt.org
Tel. 07946450672, 01923254146

Abstract

This study investigated the practice of access that consumers perform to gain temporary use of materials and its implications for Product Service System (PSS) consumption. A PSS is a combination of products and services designed to be resource efficient. The study, which drew on Practice Theory, was a socio-technical experiment where couples of users were encouraged to access infant mobility products via a PSS. Analysis of the data suggests a framework which can be used to explain consumers' response to PSS. Despite safety concerns, more users selected safety car seats than strollers. In all cases, users and non-users were deterred from accessing the PSS by the extra work required by performing access practices.

The results suggest that Practice Theory is useful to explain the difficulties consumers find in accessing PSS' offerings, which may deter them from adopting them. However, it also highlights limitations in failing to account for the role of the diverse consumers' profiles in engaging with PSS consumption.

Key Words

Access Practices, Access-Based-Consumption, Infant Mobility Products, Practice Theory, Product Service Systems.

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1 Introduction

Responsible consumption and production of artifacts supporting humans' lifestyle is goal 12 of the United Nations Sustainable Development Goals (UNECE). This aims to address the damaging impacts of human consumption on the environment, which include emissions and pollution from materials such as plastics. Consumers and producers alike must improve the resource efficiency of their activities if goal 12 is to be achieved. With consumers, achieving this goal requires changing consumption practices (Warde, 2005). Suppliers, including manufacturers and service providers, need to implement extended producer responsibilities, which involve preventing the production of waste and maximizing its valorisation and reuse. Plastic pollution is becoming an especially dire problem (Greenwood et al., 2021), which results from various streams of waste including disposable products and packaging ending up in landfill and in the marine environment. These environmental issues demand innovative business models that deliver responsible production and consumption (Stål et al., 2023). Managers and policy makers may be interested in encouraging alternative forms of sustainable consumption by accessing products and system combinations from common pool or resources (Möhlmann, 2015). Amongst the strategies proposed by researchers to minimise waste and maximise reuse, one type of offering for more sustainable consumption has been extensively researched: *Product Service System* (PSS).

The most popular definition of a PSS is a system *"of products, services, networks of actors and supporting infrastructure that is developed to be competitive, satisfy customers and be more environmentally sound than traditional business models"* (Mont, 2002: 239). Although eight types have been proposed (Tukker, 2004), three types of PSS have been consistently described in literature (Cook, 2014), arranged in three levels (Enoch & Potter 2023):

Level 1 (L1), or Product Orientated PSS, where services are added to products owned by customers, e.g., remote cartridge ink use monitoring, automatic reordering and delivery in addition to a printer purchased outright.

- Level 2 (L2), or use orientated, where customers use products without owning them, e.g., cars accessed through car clubs and leasing arrangements.
- Level 3 (L3), or result orientated, where customers purchase results and outcomes, e.g., thermal comfort in buildings.

Although the potential of PSS for sustainability has been disputed (Gottberg et al., 2009), they involve maintenance and product care by suppliers, including remanufacturing and disposal (Sundin et al., 2009). PSS could extend suppliers' responsibility beyond the end of product lifecycle and promote recovery and reutilization of resources (White et al., 1999) and therefore facilitate transition to a more circular economy (Tunn et al., 2021; Stål et al., 2023), a necessary shift for business (Clube and Tennant, 2020).

This article describes research conducted on a L2 PSS, where infant mobility products such as strollers and safety car seats were provided on rent to couples of parents as part of a sociotechnical experiment. Mont et al. (2006) first proposed such an offering and explained that this type of product is wasteful. Used by parents for 2-3 years, these products, which include numerous plastic components, can last over ten years. Once used, these products are often used by other members of a family but are ultimately disposed of in landfill (Intel, 2018). Similarly to all types of PSS (Inagaki et al., 2022), a PSS based on infant mobility products may encounter implementation problems especially in consumer markets (Tunn et al., 2021). Research on PSS consumption has been undertaken to help address this issue (Ibid.), founded in behavioural approaches drawing on Psychology and Economics, using attitude and value surveys (Armstrong et al., 2015; Gullstrand Edbring et al., 2016). These views all focus on consumers' decisions and consequent behaviour. However, the utility of these approaches has been questioned, because of attitude-behaviour and value-action gaps, where consumers' behaviour deviates from their attitudes and values that such approaches rely upon (Shove, 2010). A further weakness of these frameworks is that they do not enable investigation of PSS in use, which is necessary to understand how PSS consumption can be environmentally beneficial.

In this paper, we draw on theories of social practices to research PSS, as proposed by Mylan (2015) and Retamal (2019; 2017), with a focus on the practice of access, which needs to be

performed by users when consuming a PSS (Catulli, 2019). Mylan (2015) explains that PT “shades off” acquisition from the study of mundane consumption. Here we propose that this is a fatal limitation in how PT has been used to study PSS so far, because *acquisition* is a key aspect of consumption (Belk, 1988). In PSS consumption, acquisition is replaced by *access practices*. Tunn et al. (2021) pointed out that access is a key aspect of PSS, indeed they proposed the term “Access-Based Product Service System (AB-PSS)” (Ibid.:1). Access is a process by which consumers book and pay for the experience of temporarily gaining use of products or services (Rifkin, 2000). Access Based Consumption consists of “market-mediated transactions that provide customers with temporarily limited access to goods in return for an access fee, while the legal ownership remains with the service provider” (Stough and Carter, 2023: 833). To be able to consume a PSS, users need to perform access practices. We argue that studying PSS without investigating access practices as part of the study significantly limits the insights into PSS consumption, because it fails to fully account for the consumers’ performance of PSS consumption. The research questions are:

- 1) *What is the role of the practice of access in shaping PSS consumption?*
- 2) *How does the need to perform access practices to consume PSS affect its acceptance by consumers?*

The contribution to knowledge the paper aims to provide is to develop insights into the role of the practice of access in the theory of consumption of PSS, a framework for analysis and the implications the need to perform this practice to consume a PSS has for its diffusion, which partly explain the PSS implementation gap identified by Tunn et al. (2021) amongst others. The relevance of the research to the sustainability debate is that a PSS involving infant products offers opportunities to extend the life cycle of the products (Kerdlap et al., 2021), conserve resources such as packaging and components, reuse them and recycle some of the components at the end of the life cycle (Mont et al., 2006). Indeed, Akbar and Hoffmann (2018) suggest that environmentally conscious consumers may be more likely to use PSS because of these benefits PSS offers. However, to study how such benefits occur, researchers need to study PSS consumption “in use.” The paper is structured as follows: we review the relationship between access and PSS consumption; we explain the theoretical framework and methods we used, we present the findings, discuss the result and finally conclude and suggest directions for research.

2 Access and PSS consumption

The performance of access is an essential task consumers must perform to consume a PSS (Retamal, 2017). Access often requires use of physical resources to gain the use of products, e.g. users of shared vehicles use smartphone apps to access vehicles (Enoch and Potter, 2023). Users who access products for use through digital resources are more likely to do so if they have digital confidence, indeed Tunn et al. (2020) suggested that less digitally competent consumers can be excluded from PSS consumption. Digital resources are also used to consume products through gaining their ownership, for example by ordering books from Amazon (Belk, 2014). The Covid-19 pandemic has accelerated the growth of e-commerce and online shopping (Wang et al., 2022; Mason et al., 2020). However, post-pandemics, many consumers returned to preferring to shop in brick-and-mortar stores (Wang et al., 2022), as they find online transactions inconvenient and inflexible, with needs to fill up lengthy membership forms (ibid.). Further concerns about shopping online include lack of secure bank transactions and mistrust (Kim, 2020) when sharing financial details, reputation, service provided, insufficient product information (Daroch et al., 2021; Kim, 2020), high shipping fees, hard to navigate web sites (Statista.com, 2023) and delivery times (Statista.com, 2023), as consumers may desire immediate product acquisition (Wang et al., 2022). Consumers also doubt they can get competitive prices online (Wang et al., 2022). Finally, there are sizeable segments of the markets that are unable to use digital resources in their consumption, for example aged, disabled and low-income consumers, a phenomenon called the digital divide (Choudrie et al., 2018). Wang et al. (2022) suggest that 84% of sales still occur in physical stores, often after consumers viewed products online. 46% of consumers value interaction with 'human' sales staff and physical inspection, including touching and testing, of especially infant mobility products, where trust is essential (Pradeep and Arivazhagan, 2021) before committing themselves to a purchase.

Here, we agree with Tunn et al. (2021) that access-based consumption requires digital confidence and more effort than traditional product-based consumption. Three important studies on PSS by Mylan (2015), Retamal (2017) and Retamal (2019), drawing on theories of social practices, made important contributions to the field. Mylan (2015) explained that everyday practices drive consumption and a novel business model such as PSS would fail to diffuse if it was not aligned with the inherent dynamics of social practices. This contribution is useful but fails to account for the role of access practices in shaping PSS consumption. Retamal (2017)'s useful description of access as part of PSS consumption outlines the business practices that are relevant to PSS. Retamal (2019) offers a view of Collaborative Consumption as a Practice. From a practice

perspective, the additional effort (Tunn et al., 2021), the type of payment and consumer engagement (Muylaert et al., 2022) have impact on the perception and adoption of PSS by consumers. None of these contributions, however, describes the practice of access or explains its role in shaping consumption. In summary, all these contributions overlooked the role of access practices in shaping and possibly hindering PSS diffusion.

The studies involving strollers and drawing on Practice Theory cited here have used methods of scenario analysis to research PSS consumption. In contrast, the study described in this article used a real implementation case. The next two sections outline the theoretical framework and the methods we used.

3 Theoretical Framework

Practice Theory (PT) is a cultural theory (Reckwitz, 2002) which focuses on social practices as the main unit of analysis (Shove et al., 2012). A practice is a *“routinized type of behaviour which consists of several elements, interconnected to one another: forms of bodily and mental activities, “things” and their use, a background knowledge in the form of understanding, know how, states of emotions and emotional knowledge”* (Reckwitz, 2002).

To simplify with Shove et al. (2012), constituent elements of practices include:

- *materials*, the things that human subjects use to perform their practices, e.g., fork and knife to eat a meal at a restaurant with friends.
- *competences*, the knowledge and skills required to perform a practice e.g., in the practice of automobility, drivers use cars to move between locations and
- *meanings*, the emotions and values the practice and its materials are associated with, and the value practitioners extract from the practice, e.g., cars are associated with independence and status and the value is the ability to travel between locations.

Social Practices are collective (social in nature), recursive (they are performed multiple times) and have scale (Warde, 2005). Further, practices are connected and dependent on each other, for example, practices linked with work and the practice of shopping depend on mobility practices (Watson, 2012). Therefore, practices are aggregated in practice constellations (Schatzki, 2003). The term “practices’ constellation” has been first used by Schatzki (1996: 170). Practices aggregate in systems (Shove et al., 2012) or “bundles” of interdependent practices (Hydle and Billington, 2021). For example, the practice of conducting management meetings online depends on the practice of using digital technologies. Constellations are larger interdependent bundles of

practices and material arrangements (Ibid.), including distributed activities, ends, purposes (meanings in Shove et al. (2012)' terms), rules and material arrangements, including infrastructure, which can be encompassed in the term *sociotechnical landscape*. In line with Shove et al. (2012) and Watson (2012), we borrow the latter term from Geels (2012), who defines it as external structures of the context of society, e.g., material and spatial arrangements of cities, factories, highways, electricity infrastructures and heterogeneous factors such as economic growth, wars, emigration /immigration, political coalitions, cultural values and environmental problems, which shape actors' interactions (Geels, 2002). Finally, practices are dynamic (they change in time), and their constitutive elements may be tightly or loosely coupled (Mylan, 2015).

Berg and Henriksson (2020) define shopping as a social practice; Makkonen et al. (2010) define acquisition practices as linear progressions from identified needs, through systematic information gathering and processing, to objective evaluation that leads to buying decisions.

Here we conceptualise acquisition as a social practice, constituted of materials (credit cards, smartphone/ websites) (Berg and Henriksson, 2020), meanings (brand values contributing to identity construction) and competences (research skills to identify products to buy and ability to use apps). Similarly, as an *alternative* to acquisition, access is a practice itself (Gruen, 2017) and it is defined as a “*performance of activities required to gain the use of materials temporarily as needed*” (Catulli, 2019: 196). The elements of the practice of access to products are:

- *Materials*: product and packaging, smartphones and websites (for booking delivery),
- *Meanings*: positive (= *environmental benefits*) but also negative, e.g., *risk sharing* (see covid) and risks that products are defective (pre-used products).
- *Competences*: digital skills and product stewardship as products need to be returned (Catulli, 2019).

Table 1 compares acquisition and access practices.

Table 1 Acquisition (purchasing) Vs Access practices.

Purchase (acquisition) of products	Access to products
Infant mobility products can be purchased from physical retail stores and web sites. If consumers do not know how to navigate web sites, they can visit retail stores. In such stores parents may benefit from informed advice by retail assistants. Purchasing of a durable product which is used recursively in practices is	Access needs to be performed recurrently and requires mastering of materials, including mobile phone or laptop apps and competences to use these to book products and return them. As well as being recursively performed, access is a practice integrated with the return of products to the provider.

performed only once for a specific product and it is a practice distinct from disposal.	
Where a consumer has purchased a product sometime in the past and owns it, the consumer can use the product as and when they wish (Tukker, 2015).	Access practices include return of products in good condition for use by other users.
Acquisition can be followed by other practices such as maintenance and product modifications (Grubbauer, 2015) and eventually disposal. This means that it is possible to “lose sight” of acquisition (purchasing) since it is in the past and not in the mundane practices of consumers	Users perform access every time they need to secure the use of materials and follow it up with product return supported by product stewardship.
In product orientated PSS, where the product is purchased rather than accessed, the service components make it easier for consumers to use products, i.e. they augment functional value (Mont, 2004).	Access requires efforts by consumers, which they may or may not be amenable to make. The efforts to secure use of products including planning make of PSS a potentially unattractive proposition.

Source: Catulli (2019)

Access practices affect consumption in several ways. Access involves, more than product acquisition, practices such as maintenance and product stewardship. For example, when renting cars, drivers need to avoid damaging them and ensure their roadworthiness before driving and returning them. This may be argued to be applicable when a user drives their own car (although this is not always the case as users often skip services (SMMT, 2018)), but in the case of rentals, users are contractually liable to providers for damages when returning the car. On the other hand, important meanings are linked to acquisition of ownership of products, such as control, which are not associated with access. Ownership of tangible products is associated with freedom to use, modify, dispose of or selling them on as one sees fit (Snare, 1972). Since access does not result in acquisition of ownership of tangible products in L2 and L3 PSS, access is associated with limited control, freedom to use as one see fit and risks associated with damages, resulting to products from use, which could have financial implications for users.

Returning to the integration of the entities of social practices in practice constellations, practices are performative (Shove et al., 2012) and change in the way a practice is performed, or the introduction of new practices, such as access replacing acquisition, shapes the way other practices in the constellation are constituted and performed. Therefore, links between practices have implications for how access shapes consumption of a PSS. In summary, access is a key practice essential to consume L2 and L3 PSS, it is constitutive of PSS consumption, resulting in consequences for it. Access practices are associated with meanings that shape consumption.

4 Methods

Data were drawn from a UK government funded action research project: *Re-engineering Business for Sustainability* (REBUS). The context of research was a socio-technical experiment involving a Canadian - UK infant mobility products provider, a UK based parental charity, a UK university and the UK *Department for Environment, Food and Rural Affairs* (DEFRA).

Infant mobility formed the focal practice of this research. New parents were asked to perform access to temporarily gain possession for use of infant mobility products such as safety car seats, strollers and carry cots - for periods of six months or more, using these products accessed via a L2 PSS. The manufacturers of safety car seats and strollers provided the PSS, with promotion to parents and carers being by the parental charity.

Safety car seats and strollers were selected to form the basis of the PSS provision, because of unmet demand by parents for quality affordable infant equipment, which are often discarded before becoming unserviceable (Mont et al., 2006). This produces waste, because whilst some products are re-sold on the second-hand market, with implications for product safety (BabyProductAssociation, 2014), many are disposed of in landfill. The PSS was deliberately designed for products to be used sequentially before end of life. At the end of the lease period, the manufacturers took the products back, refurbished them and subsequently made them available to other consumers. To ensure the safety of refurbished products, the manufacturers established a Quality Assurance (QA) process, certified it by means of labels and tracked products by serial numbers. To access products, users booked them through the parental charity's website. A limited range of models of safety car seats and strollers were available. For example, one model of car seat was priced at £24.38 and one of stroller at £90.00 for delivery, 6 months use and collection. This PSS rental compared with a purchase cost of about £135 and £450, respectively. For the duration of the REBUS project (January 2014 - October 2015), 827 safety car seats and accessories and 65 strollers were provided via the PSS offering. Infant car seats enjoyed a good uptake, but strollers had low uptake. Out of the 32 participants interviewed, fifteen adopted safety car seats for their infant mobility practices. Access to strollers was promoted to parents through the same means as car seats, via the web site of the parental charity and targeted e-mailings. The project started in January 2014 and concluded in January 2016. Figure 1 presents the percentages of accesses to each type of product.

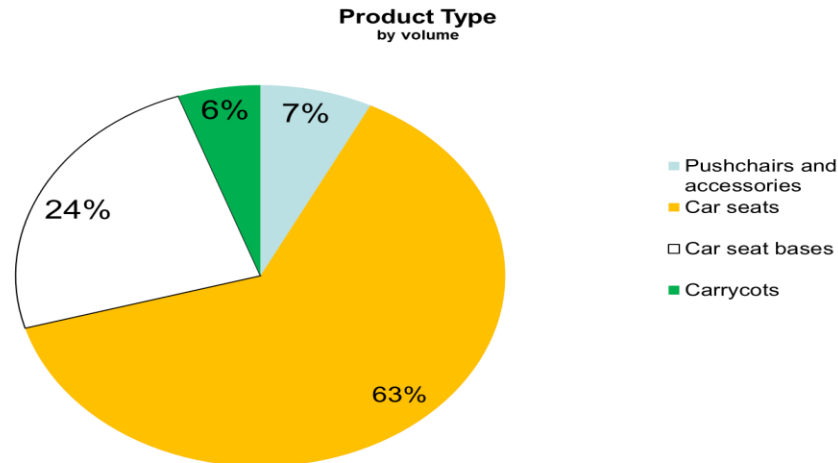


Figure 1 Accesses to products in percentages.

The total number of accesses was 1044. The chart shows that only 7%, or 73 strollers, were accessed. The evolution of infant mobility practices was investigated by reviewing academic and commercial literature as well as web sites such as nhs.uk, nct.org.uk and b-p-a.org, the web site of the Baby Products Association (BPA). Data were collected between May 2014 and October 2015, via 32 semi-structured interviews with a self-selected group of parents. Participants were recruited through the parental charity's web site and interviewed in the UK. Most participants were professionals, with ages ranging from 21 to over 40 years and income from under £20K to over £60K. 35% of the participants lived in rural and 65% in urban areas. 73% of participants were first time parents and most were members of the parental charity. The charity's membership is disproportionally composed of families from a white British background with high income. This must be considered a limitation of the study because many people outside this segment would face financial and skills disadvantages that preclude use of some of the resources to perform access. Two thirds of the participants to the interviews had chosen to adopt the PSS. Narratives of participants are considered a valid alternative to the direct observation of practices (Halkier and Jensen, 2011). Interviews, averaging 1h30m in duration and observation of the surroundings and the state the products were kept in, were conducted in participant's homes. These methods are typical of PT studies (Bueger, 2014). Importantly, interviews enable the collection of information rich data to fully document the details of user practices (Böcker et al., 2020). The interview questions focused on the proto-practice and investigated meanings, competences and use of materials. Data were analysed using a flexible template approach (cf. Miles and Huberman, 1994) where the coding was informed by PT theoretical concepts. An initial start list of codes was generated in NVIVO from primary data collected and literature reviewed.

5 Findings

From a PT perspective, if overlooking the performance of the access practice, the routine consumption in use of infant mobility PSS' does not differ from traditional use of *infant mobility products (IMP)* purchased outright. If it is considered a constellation of consumption practices of diverse PSS,' access is a routine, because it is recursive and it is supported by a sociotechnical landscape, which includes the practices performed with the accessed object and the infrastructure used to secure access, e.g. a smartphone app, as people routinely perform access to diverse products for use in their lives. As described by Berg and Henriksson (2020), the PSS involves online access. Traditionally, strollers are handed down between siblings and parents (De La Garza, 2009; Mintel, 2018). However, this now happens less, as family sizes decrease, and people move away from their home for work (Mintel, 2018). Indeed, some participants did not adopt the PSS because they had their stroller handed down by relatives.

In the parental practices context, information about the PSS reached parents not only from sources such as retailers and manufacturers' websites but also via National Health Service (NHS) websites, the National Childbirth Trust (NCT) and, crucially, other parents and relatives. Therefore, mobility practices using products accessed through REBUS may diffuse by social contagion (cf. Shove et al., 2012), via conversations with others who had already tried REBUS. These communications spread the competences to perform infant mobility practices including access, the meanings associated with the practices and information on materials with which they are performed. Access shapes consumption of IMPs in subtle ways, which are described below:

5.1 The socio-technical landscape

With the United Kingdom's birth rate and average number of infants per woman falling to 1.54, the second lowest rate since 1938 (ons.gov.uk, 2021) and average age of first-time mothers rising to 31 years (Ibid.), families have less opportunity to use products to transport multiple infants. Indeed, some participants in the research, who used the PSS for both safety car seats and strollers, gave as a reason that they were not expecting further children. Industry representatives argue that resale of pre-used safety car seats is difficult (Catulli et al., 2020) and participants interviewed cited this concern as a reason against buying safety car seats. These products are divided in age groups, so each model has a brief period of use before a child grows out of it. Use of some infant mobility products, such as car seats, is compulsory by law in the UK. In addition, authoritative sources such as the NHS and the NCT actively discourage use of pre-used products (nct.com 2018, nhs.uk 2018). Whilst safety car seats are fastened to the seat of a car, strollers

are used on diverse terrains. For example, they can be used to stroll on the high street with an infant, on the beach and in parks with rough terrains and even used to push infants whilst jogging. The diversity of these terrains determines needs of users for diverse types of products.

Whilst a few participants adopted the use of the PSS strollers, most participants could not use the PSS, either the strollers or the car seats, because social convention discouraged it. In addition, all parents interviewed expressed concerns over damages and poor hygiene deriving to the products in use. They said that they would not trust previous users on the condition of the products and as users, they were concerned about damage and wear and tear to the products, deriving from their own use of it, including damages inflicted by their infants, such as ripped fabrics and stains from fluids. Nevertheless, manufacturers' own research suggests that younger families increasingly opt for use of rented products (Ibid.). Despite occasional news coverage of accidents involving IMPs and producers' recommendations, consumers routinely buy pre-used strollers from other consumers, in person or through online platforms such as e-bay. These practice dynamics may have encouraged users' consumption of car seats accessed through the PSS; however, these materials have strong links with meanings of *health and safety*, because of communications by the expert bodies listed above.

5.2 Perceived and real risks of access practices

As mentioned in 5.1, IMPs are considered safety critical and the linkages with meanings of risk to safety discourage adoption of safety car seats accessed through REBUS. This is reinforced by social convention, as this statement illustrates:

"...every (...) advice that I've heard is, (...), you never use second-hand car seats, just in case it's been in an accident or it's not safe...."

Therefore, users were a minority, because of perceived risks by the bulk of the participants. Social convention, encouraged by expert informers and peers, is that safety car seats and to lesser extent strollers, *must be purchased new* to avoid risks that they are damaged as seen in section 5.1. Access involves using products that have been used by others and therefore it is not compatible with these social conventions. For safety reasons, use of pre-used safety car seats is consistently discouraged, because of the risk of using safety car seats damaged in car accidents. Therefore, performance of the practice with pre-used safety car seats is associated with safety risk. For the access practice to be performed by users, these links need to be severed and linkages of REBUS with safety need to be made by users. The Quality Assurance (QA) certification of refurbished products and conformity with safety regulations (see section 4)

released by the providers within the pilot reassured participants that the PSS was safe and indeed many participants mentioned this. In addition, users perceived the not-for-profit parental charity as an “honest broker.” Thus, the charity’s brand legitimized the access practice. As this statement illustrates,

“...we know that it’s been safety tested. (...). I read all the terms and conditions to ensure that it was taken back to the manufacturers, and it was refitted to new standard.”

However, participants to the study selected safety car seats for use in far greater numbers than they selected strollers, by a ratio of 7:1. The linkages of new strollers purchased outright with meanings of safety were weaker than for safety car seats, however it was still a concern, which prompted them to prefer purchasing new strollers to renting them from REBUS. In summary, access as a practice is associated with several perceived safety risks and provider’s communications on quality assurance were necessary to reassure users about these risks. However, there were issues with the specifics of using rented products, which the next section outlines.

5.3 Degrees of freedom accruing or lessening from accessing products

The infant mobility practice is linked to other practices. For four participants, the practice is linked to sport activities such as jogging and trekking performed whilst pushing their infants. Whilst these practices were performed by few users, these links meant that these users preferred *purchasing* specialist equipment with special wheels and suspensions, suitable for use on rough terrains. Some parents want to use strollers on these terrains and therefore have concerns for liability connected with PSS consumption, such as damage to IMPs due to sand, bumps, etc. Indeed, these niche activities diversified the focal practice, where parents use strollers whilst running or trekking off-road in parks and rough terrains. This led to a proliferation of specialist products, such as strollers with suspension, three-wheeled models, inflatable tyres and brands explicitly designed for such exercise practices. REBUS offered a limited range of standard strollers, which did not include specialist products designed for activities such as running and trekking, therefore did not appeal to those participants who wanted to pursue those activities. These participants claimed that they prefer to acquire and retain ownership of (specialist) products instead of accessing them via a PSS. Therefore, accessing the limited product range provided via REBUS to perform these specialist infant mobility practices did not offer the performance some of the participants wanted. This suggests that a PSS needs to offer a wider range of products to suit users than was available in this case.

Of course, this may not be relevant to most parental couples, because of the small percentage of parents expressing this need. Indeed, it might be difficult to make a PSS so flexible because a product needs to be reusable by many types of people. If the customization is made extreme, then it might just not be possible to find people who have these needs, this can be an intrinsic limitation of PSS. However, these aspects would not completely hinder PSS diffusion.

Catulli et al. (2021b) claim that PSS providers are concerned with attrition from supplying products on access, which results in having to write off products because of damage or because they are not returned. Participating users to the research in turn claimed that they were concerned about liability for damage to the products they accessed. Twenty-seven participants cited use of strollers in extreme conditions as a reason the REBUS offering was not suitable to them. They stated that they would feel restricted in taking rented strollers to the beach or similar places. Whilst with an owned stroller a user could wash or repair it afterwards, as this statement illustrates,

“...with a rental one, I’d (...) probably be a bit more circumspect about taking it various places. Just because it’s not mine so I’d be (...) concerned about not getting my deposit back.”

Indeed, participants who did not access the PSS claimed that damaging a product they did not own could render them liable for penalties, which they claimed they could also incur for wear and tear of leased products. Therefore, participants said that the practice of accessing infant mobility products for use through REBUS was not compatible with their infant mobility practices. Not only the linkage of the focal practice with practices of jogging and trekking but also with more common leisure practices, reduces the perceived freedom of using products, because of possible damage, with consequent liabilities when returning products and therefore requires enhanced product stewardship.

Product ownership is linked to meanings such as *freedom* to use, modify and customise products as participants saw fit, which the PSS would not allow. Access precludes transfer of ownership by definition and therefore it is associated with reduced freedom in using products (cf. Snare, 1972). No modifications or customizations are permitted with access. Parents have less freedom to decorating products with adhesives and other products. In contrast, participants stated that they wanted freedom to replace components in strollers, such as different handlebar grips, handlebar mounted brakes and they wanted to affix colourful pictures on the underside of the canopy. Social

convention is that rented products do not grant this freedom, access gives *less control* than acquisition and this hindered the adoption of the PSS.

5.4 Labour intensiveness of access practices

The materials constituting the practice of access to infant mobility products include:

- Strollers, carry cots & safety car seats.
- Laptop, smartphone and associated apps to book rental of products and arrange delivery and pick up for return.
- Web site managed by the provider, in this case by the parental charity, where users could view and book products for access.
- Packaging, which had to be returned for reuse by the provider.
- Vans for delivery to and from consumers.

A direct consequence of the limited freedom in using materials that access entails and described in 5.3, is the additional work required in performing the product stewardship that the access practice requires. Since the products needed to be returned, users needed to exercise strong stewardship of the product *and* the original packaging, for refurbishing and use by other parents. Of course, consumers do normally look after their possessions, however in the PSS case, this was part of a contractual relationship. Product return involved closer interaction of users with the PSS provider than when using owned products. The provider communicated instructions about product and packaging stewardship. Thus, the PSS offering did not simply slot into existing infant mobility practices but shaped these and added additional tasks integrated in PSS consumption. Practically, users expected the provider to prompt them when products were due for collection and users would clean and repackage the product ready for the provider's agents to pick it up. The provider's communications linked these competences with REBUS. These linkages discouraged recruitment of users into the access practice of both safety car seats and strollers. Indeed, users claimed that they found these tasks a disincentive, as this comment illustrates,

"I don't have the box anymore. I can't remember exactly what I need to do to return it (...). I hope it's not a huge inconvenience to have it returned ... (laughs)."

In comparison with the acquisition practice in traditional consumption, where consumers could travel to a specialist or general retail outlet, access depended on use of materials such as computers and smartphones and associated apps. In addition, the practice of access requires the ability to book products through a laptop or smartphone. Therefore, users needed to possess or acquire competences in using smartphone and computer apps that might be new for them

(Choudrie et al., 2018). Indeed, a few participants said that they found access through digital means difficult. Returning the product to the provider was another digital competence that was part of access. For example, users had to phone the logistics company or book a pickup by the providers' van, through the parental charity web site. To acquire these competences, users drew on the following sources:

- The parental charity web site. Here, the instructions for users were codified in a straightforward way.
- Other parents (peers), this was a diffusion by social contagion (cf. Shove et al., 2012)
- Elders and grandparents.

On balance, REBUS required users to be digitally confident with web sites and apps, have access to these and being organized enough to store the product packaging and keep the product in good conditions. However, REBUS made other competences such as ability and work to sell products on to other consumers redundant. Indeed, whilst some users saw the additional work as a disincentive, others found the PSS appealing, because it removed the work necessary to sell the products on.

5.5 Access practices' positive meanings

Users made associations to meanings that encouraged access to materials through REBUS. Participants associated the PSS to *cost-effectiveness* and savings, because users would only pay for usage of products as required and therefore save money and be able to afford higher standard products than if they had purchased them. This meaning contributed to the appeal of the PSS because of, inter alia, the financial disadvantages of parental leave when purchasing products. Furthermore, users would not need to re-sell safety car seats, as the provider would collect them. Provider's communications linked REBUS to *resource efficiency* meanings. All this was further encouraged by strong linkages of buying safety car seats outright with meanings of *waste of resources* and *money*, as users stated that they would have to pay considerable sums for products that would be used for a brief time (group 0 car seats) and that would rapidly lose value. All participants associated the PSS with *care for the environment*, so its perception was positive in this respect. Users claimed that new safety car seats would eventually end up in landfill. Buying safety car seats was also associated with *coercion*, as users would *have* to use them, which is compulsory when leaving hospital in a car following a child's birth. In this case, accessing safety car seats instead of purchasing them meant that users could use a car seat, which they were bound to by social convention and regulation, without being forced to acquire ownership of it and therefore users benefited financially.

In summary, links between new safety car seats purchased outright with meanings of health and safety inhibited consumers' choice to adopt the REBUS offering but were not strong. The providers' QA process legitimated that choice and the interest of the users in these benefits encouraged them to perform the additional tasks integrated in the practice of access described in 5.4.

5.6 Inclusivity of access practices

The infant mobility practice is linked to mundane practices such as shopping and social practices, associated with patronising coffee shops together with friends and strolling on the high street. This means that users cared for using fashionable brands. The effect of these linkages therefore was, especially for strollers, to hinder the adoption of the access practice. The PSS offered less opportunity to conform with fashion, as the range of products was limited. Participants who did not accept the stroller PSS, especially, said that they did not take it up, because it did not offer fashionable brands, even when purchasing these branded products would be expensive.

Strollers, however, have strong linkages with meanings of *status* and *fashion value*. Participants often motivated their inability to access the PSS with the fact that it did not offer fashionable brands and stated that pre-used products were often obsolete. They were therefore unable to make linkages between REBUS and meanings of fashion and status, which were important to them. For some, the practice of using rented, pre-used products was associated with social disadvantage. As this comment illustrates,

"I think there's (...) stigma attached to (it), oh it's second-hand or 'can she not afford it.' (...) I feel like they'd look down on me for having rented."

In contrast with the stigma of renting products, the practice of access may not be necessarily inclusive, because it requires the use of apps through smartphones and computers, which not all users may be able to afford (Gekoski et al., 2017). Further, users may lack the confidence to perform digital access (Tunn et al., 2020).

The diversity of design prompts users to associate strollers with special meanings. Strollers designed for jogging or trekking are linked with meanings such as parent's health. The narrow range of products available through REBUS did not enable participants to make these linkages. A minority of over 35-year-old participants in the sample, who thought they would have only one child, associated strollers accessed through REBUS with positive meanings as with safety car seats. However, few participants were able to make these linkages, which illustrates why uptake

of safety car seats accessed through REBUS outnumbered strollers by twelve to one. New strollers purchased outright were linked to meanings that were conditional to a wide choice of up-to-date models, which a PSS did not offer. For these users, the practice of access – and therefore PSS – is not compatible with users' other practices.

5.7 Summary

Access via a PSS does not give users the flexibility to have specialized products. In addition, using accessed products excludes the possibility of customizing products and does not grant the freedom to use the products in conditions that might damage them. The links between the elements of the practice of access and infant mobility and of these practices with other practices made the access practice a challenge for integration with the main practice. Meanings were affected because the link of infant mobility practice with sport practices could have associated it with parents' health, but accessing the products would not enable this. The next section discusses the implications of these findings for the implementation of PSS.

6 Discussion

The diffusion of PSS consumption is desirable, because an infant mobility PSS offers opportunities to extend the life of products (Mont et al., 2006; Kerdlap et al., 2021), to reuse them and recycle their plastic components. However, to consume a PSS, consumers need to perform the novel practice of access. With acquisition of products, parents might travel to a retail outlet to take possession of them, but in the REBUS case, they have IMPs delivered to their home after booking their rental online (Berg and Henriksson, 2020) through online transactions. After their use, products were recovered by the provider and returned to a warehouse and workshop for refurbishing, incurring additional environmental impact of transport (Catulli et al., 2021b).

Access shapes relationships of users with products (Gruen, 2017). Here we found that because of a weak link between access and *control* and *freedom* to use products, users did not feel comfortable with using strollers in extreme conditions. Therefore, access becomes associated with a meaning of *liability*. Importantly, as a practice, access is performative (Shove et al., 2012) and some consumers may not be willing or capable to perform it. For example, users with low digital confidence may be excluded from performing access, which confirms Tunn et al. (2020)'s claim.

Whilst some of the practices of using strollers and safety car seats do not change with PSS, accessing these products instead of acquiring them shapes other practices such as stewardship of IMPs. Users refrain from customising or damaging IMPs not to incur in liabilities.

The research generated six antecedents and consequences of performing access practices to consume a L2 PSS. These are summarized in table 2:

Table 2 Antecedents and consequence of Access Practices

1. Socio-technical landscape – the features affecting the acceptability of access practices.
2. Perceived and real risks of access practices
3. Degrees of freedom accruing or lessening from accessing products
4. Labour intensiveness of access practices
5. Access practices' positive meanings
6. Inclusivity of access practices

One implication of the table above and the discussion preceding it, is that access to consume PSS requires more planning and management by consumers than traditional consumption and users do not welcome this extra work (cf. Tunn et al., 2021). In the REBUS PSS, users needed to perform access for a specific product only once, to gain the use and then to return the product. However, consumers can perform access multiple times to gain temporary possession of other products, such as strollers for later years. This compares with other types of PSS, such as car clubs and even a L3 PSS, which enable users to recursively access multiple means of transport such as shared cars, bicycles and public transport (Enoch and Potter, 2023). In these instances, differently from REBUS, users perform access multiple times to obtain the same product, e.g. a car, or multiple products, e.g. a car plus a scooter, a bicycle and more. In this way, access becomes a mundane practice, which consumers perform regularly. Access to products is sequential and performed by multiple users, so it is quite different from owning and using a private car. In the case of REBUS, although products could be accessed sequentially by different users, use of products was akin to traditional consumption but with some additional activities. Considering the sophisticated planning required for using shared mobility (Catulli et al., 2021a) and the work needed by consumers to access infant mobility products, this paper suggests that PSS consumption is more demanding than traditional consumption and this may contribute to implementation difficulties, which Tunn et al. (2021) and Inagaki et al. (2022) attribute to scarce digital confidence. To address this issue, providers should design user friendly, easy to navigate and secure apps (Daroch et al., 2021) and provide more information on products (Wang et al., 2022). Communications should also emphasize positive meanings identified by research that consumers can associate the practice of access with, such as trust, and utility option (Möhlmann, 2015) and which would encourage them to perform the extra work required by consuming PSS.

For the safety car seats PSS, the provider succeeded in breaking the link between access and risk, including the concerns for contamination noted by Mittal et al. (2023) and Clube and Tennant (2020). However, acquisition of ownership rights is linked to meanings of control and freedom to use products in all circumstances. This entrenches use of own strollers. Here, users who wish to run on rough terrains find that the PSS does not grant this freedom and this, combined with limited range of types of IMPs, makes acquisition of products obdurate and impedes PSS diffusion.

Insights include tension between a desire of freedom to use these products and adapt them to the infant and parents and make of the product / brand a means of self-expression and the inflexible relationship afforded by access as a practice. Indeed, in contrast with Tunn et al. (2021), this paper posits the view that even with a long-term access such as the one described in this paper, consumers do not equate long term access with ownership.

Retamal (2017) usefully points out that access is a key aspect of PSS, this paper goes a step further and describes the practice of access, its antecedents and consequences in detail. We argue that from a theoretical perspective, studying PSS consumption without also focusing on access on the basis that PT “shades off” acquisition (Mylan, 2015) precludes understanding of key aspects of it.

Furthermore, whilst we agree with Mylan (2015) that structural factors shape consumption and may hinder PSS diffusion, we argue that in this respect, PT should not be intended to suggest that structural aspects of the sociotechnical landscape uniformly shape consumption. For example, in some cases, consumers may not adopt PSS because it does not align with some of their practices. However, in our study only four participants were affected in this way, which clashes with the “collective” characteristic of social practices. Schatzki (2016) explains that PT is a flat ontology, considering all objects as having equal relevance, but when studying consumption, this overlooks too much detail. Therefore, the differences between different types of consumers need to be accounted for to fully understand PSS consumption.

7 Conclusions and managerial implications

Consuming level 2 PSS, instead of purchasing products, is desirable to render consumption and production responsible but requires users to perform the practice of access. That performance requires distinctive competences and materials, is linked to meanings of care for the environment but also of limited freedom in using products. Access requires labour, which users may or not be willing or even capable to perform. This may shape PSS consumption and constrain its implementation.

From a business strategy perspective, providers need to facilitate access to PSS by designing user friendly PC or smartphone apps and making them financially inclusive. It is important that consumers are researched to identify the meanings they associate with access and the communications users can implement that can promote useful associations.

PSS providers need to protect their investment from risks resulting from the implementation of PSS, by adopting specialist insurance cover to address risks resulting from the practice of access, because users may damage artifacts which belong to providers, by using them in extreme conditions. Similar insurance should also protect users from financial and physical damage. This cover may be an important part of the service that may contribute to the perceived flexibility of the PSS.

More research is needed to explore how accessing diverse types of products and services instead of purchasing them shapes everyday consumption practices and consumers' willingness to perform access. The six antecedents and consequences of access practices need testing across different consumption contexts to ascertain their relevance to PSS consumption.

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