Extending the Life of Infant Mobility Products: Implementing a Product Service System

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Extending the Life of Infant Mobility Products: Implementing a Product Service System

Report on DEFRA ABR112 (Project EV0534)/ Re-engineering Business for Sustainability

Foreword

Global material resource use is expected to more than double from 2011 to 2060; a stark figure considering that increasing primary resource usage means more waste to be managed, more pollution and GHG emissions and adverse impacts on landscapes and biodiversity as a result of extraction.

Using resources from nature more sustainably and efficiently forms part of the UK's 25 Year Environment Plan, published in 2018, which commits to double resource productivity by 2050. This plan will help us safeguard our natural capital in the UK and worldwide.

Resource efficiency is a key aim of the Resources and Waste Strategy for England. This Strategy sets England on the right path to shifting to the circular economy model. It sets out how we will preserve our stock of material resources by minimising waste, promoting resource efficiency and moving towards a circular economy. It combines actions we will take now with firm commitments for the coming years and gives a clear longer-term policy direction in line with our 25 Year Environment Plan.

We will push our policy focus up the waste hierarchy and have adopted a strategic vision which considers the entire lifecycle of resources. Through policies aimed at improving resource efficient production, consumption and end of life materials recovery, we will address issues relating to increased pressure on resources, as well as mitigate the environmental impacts associated with different stages of a product's lifecycle. These actions are of vital importance for the longer-term resilience of the UK and global economy.

In light of our policy objectives, DEFRA welcomes the publication of this report that presents the findings of Action Research on the implementation of a pilot Product Service System (PSS), a system of products and services designed to be resource efficient. This type of offering for consumption include examples where consumers access products for use but ownership is retained by providers, such as car clubs or where consumers purchase results without even possessing material products for the time of use, such as downloadable music or launderettes.

Available research on PSS claims that they are capable of measurable resource efficiency performance. Unfortunately, PSS implementation is challenging and successful cases of PSS other than car clubs and bicycle sharing schemes are rare. The Action Research focused on an offering featuring infant products to investigate consumers' likely response and key success factors for businesses to provide these offerings. The report is aimed at a readership of ministerial advisers, policy makers and business leaders and provides policy and strategy advice on the viability of this mode of production and consumption to provide consumer products in a resource efficient manner.

Executive Summary

In 2018, the UK Government published its Resources and Waste Strategy for England. That policy document identifies resource efficiency as a key strategy to reduce waste and rationalize the use of resources through the adoption of circular economy principles. Amongst the mix of strategies outlined in the document, there are examples that rely on innovative resource efficient business models. One example of such a business model is a Product Service System (PSS). This document reports the results of a project, DEFRA ABR112, which was aimed at exploring and developing ways to assist in extending the useful lives of products. The project implemented a pilot PSS, where infant mobility products such as car seats and pushchairs were supplied by way of renting rather than outright ownership.

Action Research (AR) was adopted as a research strategy for the project. The pilot project involved the design and implementation of a PSS offering featuring new and refurbished car seats and pushchairs. Such Infant mobility products are currently very difficult to recycle at the end of their life cycle.

The implementation of the pilot was preceded by a feasibility study, which included one to one and group interviews with industry experts along with focus groups involving parents of infants. The pilot commenced in January 2014 and the PSS offering was advertised on a parental charity's web site.

A variety of research methods were used within the AR framework, for example, in-depth interviews with consumers and business managers, expert workshops and surveys.

Customers took up 1048 leases, with more car seats being rented than pushchairs. A total of 183 refurbished car seats and 21 refurbished pushchairs were supplied to users. Some car seats were used up to four times.

The reason for the greater success of car seats when compared to pushchairs could be explained by participants' rational economic thinking. Car seats are costly in respect to their potential duration of use and so participants may have regarded leasing them as a better option than purchasing. Pushchairs have a relatively longer duration of use, in addition to being used across multiple births. This suggests that products with a shorter duration of use in respect to their cost might be more suitable for access through PSS.

A Pareto effect was observed in the leasing statistics in that only a small number of types of car seats and pushchairs were rented out.

Participants demanded a great variety of products to accommodate their life styles. This has implications for the financial viability of the PSS, because the greater the range of products required the greater the risk that some products would not achieve multiple uses, which means that renting such products would not be commercially viable.

Aside from rational economic considerations, other elements contributed to the difference in success of the PSS offerings of car seats and pushchairs. Car seats are not as visible a product as pushchairs, so their use may not necessarily be influenced by considerations of social approval or disapproval. In contrast, parents' desire to have pushchairs that are fashionable as they can communicate prestige and are a means of communication, a "showcase" to display their infant.

Parents seem to have health and safety concerns about leasing pre-used infant mobility equipment, as they might be damaged or unsafe. In order to address this, PSS providers should implement and certify a robust quality assurance process in order to eliminate these concerns. The reasons for the comparatively low take-up of pushchairs compared to car seats may also be due to conventions about outright ownership in western countries, such as the UK.

Parents are interested in the benefits associated with ownership, such as having the freedom to modify products and not having to comply with the responsibilities that the PSS brings about such as regular fee payments, keeping the product in standard specification, product maintenance and packaging stewardship. Participants were worried about being charged for damaged goods, especially if they entertained life styles that could risk damaging the product.

Findings suggest that environmental benefits (which some of the PSS literature presents as an advantage of PSS), seem not to be of great importance to consumers when making decisions about acquisition of infant mobility products. This raises questions about whether marketing communications to promote PSS offerings should include statements about its environmental benefits. Parents are generally more interested in practical benefits such as access on demand and cost savings. Some consumer types and possibly market segments (e.g. voluntary simplifiers[1]) may be more interested in environmental protection.

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[1] voluntary simplifiers are consumers who have elected to consume less (Craig-Lees and Hill 2002),

The findings of the study suggest that PSS need to be evaluated from the regulatory point of view. An understanding of the consumer credit legislation is necessary for the design and implementation of PSS. Accordingly, there is a role for policy makers in disseminating knowledge on PSS and providing information in order to enhance businesses' understanding of the relevant legislation and the possible need to acquire consumer credit licenses when they want to adopt PSS. The findings of the research suggest that legislation may also need amendments in order to accommodate PSS and provide the necessary quality assurance concerning specific standards covering PSS and other applications of refurbished products.

PSS presents issues of product liability, quality assurance and responsibility, as well as whether the service is delivered or not by qualified personnel. The pilot study generated new knowledge but this was a low risk scenario within a small-scale protected experiment. Large-scale implementation by businesses may be risky. Scaling up the PSS faces a number of other challenges, such as financial viability due to attrition - the writing off of products due to damages or theft and the number of cycles of use that can be achieved.

Attrition, or products having to be written off due to damage or not being returned, can be a limitation of PSS. In this pilot, 8.8% of the products had to be written off due to damage or failure to return. Since they are pre-used, the condition the products were in and their safety were a main concern for the parents participating to the study.

The success of the PSS pilot, especially as far as car seats are concerned, suggests that PSS deserves more attention and further research. Further studies could focus on types and brands of car seats and pushchairs, which are specifically designed to be supplied through a PSS. Research in different contexts and with different products should also be conducted in order to compare the findings of this project with those in different contexts. This would indicate the transferability of the present study.

The project also demonstrated the usefulness of combining Action Research with a variety of theoretical approaches. Whilst the effective consumption of car seats through the PSS in the action research was at odd with the findings from the RGT survey, the poor performance of the pushchairs confirmed the findings from the field research.

At the end of the project, the manufacturer discontinued the leasing programme of the PSS, partly because of the costs of implementing it on large scale. However, the insights the project gained in the PSS project contributed to the design of a smaller scale rental program aimed at parents with the hip dysplasia condition. The parental charity elected to terminate their involvement with rentals of products.

The actual resource efficiency and environmental benefits of the PSS were investigated through a Life Cycle Assessment (LCA) approach. A separate report is available as an Annex.

1 Contents

List of Tables and Figures

Glossary

Term	Definition
Access	A process by which consumers use and pay for the experience of temporarily gaining the use of products or services (Rifkin 2000)
Adoption	The process by which consumers initiate and repeat the use of a new product, idea or business model
Attrition	The number of products (e.g. car seats or pushchairs) that are written off through damage or failure to return the items by customers at the end of lease term in a PSS
Bassinet	A bed for infant from zero to six months. Also the part of a pram where an infant sleeps
Bipolar Constructs	The basic 'unit' of *construing* in Personal Construct Psychology (see Glossary entries) is the bipolar personal construct (e.g., *safe -vs- unsafe*; *cheap -vs- expensive*; *sustainable -vs- unsustainable*)
Brand	"Distinguishing name and/or symbol (such as logo, trademark, or pack design) intended to identify the products and services of either one seller or a group of sellers, and to differentiate those products or services from those of competitors" (Aaker 1991:7)
Car Seat	A safety device which is fastened on a vehicle seat and allows safe transport of infants on motorized vehicles
Carrycot	A light cot with handles, similar to but smaller than the body of a pram and often attachable to an unsprang wheeled frame
Consumer Culture Theory	A family of theoretical perspectives that address the dynamic relationships between consumer actions, the marketplace and cultural meanings"
Consumption	A process by which people acquire, use and dispose of commodified goods (including ideas, services, products, brands and experiences)
Construing	The process by which a person understands or interprets situations, people and things ("elements") using their *systems* of bipolar personal constructs (see Glossary entry). How a person construes situations, people and things determines their behaviour in relation to those elements and the choices they make

Contagion	The "disgust consumers feel when they are aware that a product they use has been physically touched by someone else"
Extended Producer Responsibility (EPR)	A policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products
Identity Construction	Co-productive ways in which consumers forge a sense of self with market generated material (Belk 1988)
Infant mobility products	Products which are used to transport infants (children in early ages) such as for example prams, infant car seats, strollers, slings, portable cots and more
Isofix base	A base with quick release couplings with allow installation on a car seat on the seat of a vehicle
Isofix coupling	A device which is fixed to the car seat and on which an infant car seat can be fastened with a quick release coupling
Leasing	A payment or series of payments made by a lessee to an owner in return for the use of property, machinery or equipment for a legally agreed short, medium or long term. From the provider's point of view leasing involves granting the possession over the medium or long term of such assets in return for the payment of rent from the lessee
Ownership	An institution which results in an individual having the right to possess and use an asset as and when they want and can exclude others from using and possessing the same asset unless the owner gives permission to do so (Snare 1972)
Participants	In the REBUS project, this term signifies human subjects who consented to be interviewed or surveyed. In the project implementation stages customers are also participants
Personal Construct Psychology (PCP)	PCP is a constructivist psychology created by Kelly (1955/1991). PCP holds that (i) a person's behaviour is determined by how they construe (understand, interpret) things, using their bipolar personal constructs (see entry in this Glossary), (ii) that a person's construing can change (and, therefore, so can their behaviour) and (iii) different people may construe the same thing in different ways
Pram	A type of wheeled infant transport, predominantly for early years
Practice Theory	A cultural theory, which analyses social practices to explain how human subjects make and transform the world in which they live through their daily routines
PSS Offering	The offering of a product, service or combination of the two which is configured as a PSS

Pushchair	Synonym of pram, pushchair, buggy, device which enables transportation of infants on wheels
Rental	A payment or series of payments made by a lessee to an owner in return for the use of property, machinery or equipment. From the provider's point of view renting involves granting the possession or enjoyment of such assets in return for the payment of rent from the tenant, hirer or lessee
Repertory Grid Technique	A research method created by Kelly (1955/1991 - see Glossary entry for Personal Construct Psychology). They are based on Kelly's theory of personal constructs and designed to measure how a person construes people (including himself/herself), situations and things. It is a structured interviewing technique using a matrix in which columns of "elements" (the people, situations or things construed) are rated on the rows of bipolar personal constructs (see Glossary entry) that a person (or a group of people) use to construe the elements in a particular context.
Reverse logistics	The transport activities needed to return physical products to the providers' warehouse
Stroller	Synonym of pushchair
Thrift / Thriftiness	Economical management; economy; frugality. Interest in selecting cost-effective products and services
Trust	"reliance by one person, group or firm upon a voluntarily accepted duty on the part of another person, group or firm to recognize and protect the rights and interests of all others engaged in a joint endeavour or economic exchange" (Hosmer 1995,392)

1 Introduction

1.1 Policy context

In 1987, the Brundtland Report articulated the concept of sustainable development (Brundtland et al. 1987) and since then concerns have persisted about the social and environmental sustainability of consumption (Peattie and Peattie 2009). A popular definition of sustainability is "*ways of living, working and being that enable all people of the world to lead healthy, fulfilling, and economically secure lives without destroying the environment and without endangering the future welfare of people and the planet*" (Johnston et al. 2007, 15). In recent years, environmental experts and policy makers have been exploring a variety of strategies to address the issues of material and energy requirements and waste generated by economic activity that lead to environmental degradation. These strategies are broadly aggregated around the notion of a "circular economy" - an economy in which resources are reused, recovered and regenerated to minimise environmental impact (WRAP 2018a). The desired effects of these strategies are extended life cycles of products, reduction of waste and greater resource efficiency. In 2018, the UK Government published its Resources and Waste Strategy for England (DEFRA 2018). This policy document identifies resource efficiency as a key strategy to reduce waste and rationalize the use of resources through the adoption of circular economy principles (Ibid.). The strategy sets out how the UK will preserve its stock of material resources by minimising waste, promoting resource efficiency and moving towards a circular economy (Cooper 2018, DEFRA 2018). These strategic options are part of longer-term policy direction in line with a 25 Year Environment Plan. Amongst the mix of strategies outlined there is one that relies on innovative resource efficient business models (WRAP 2018b, c), offerings for consumption which extend product life, conserve resources, prevent valuable materials from becoming waste and allow companies to exhaust all available profit from their products (WRAP 2018c). Consumption can be described as "the process by which people acquire, use and dispose of commodified goods (including ideas, services, products, brands, and experiences) (Lee et al. 2011, 2). Sustainable consumption combines the two concepts of consumption and sustainability and is defined as,

"*the use of goods and related products which responds to basic needs and brings a better quality of life, while minimising the use of natural resources and toxic materials as well as the emission of waste and pollutants over the life cycle, so as not to jeopardise the needs*

of future generations" (Seyfang 2006, 384). In further researching the policy, The *Department for Environment, Food and Rural Affairs* (DEFRA) has commissioned studies of sustainable business models and this document reports one such study.

1.2   Research Call

This document reports on a project funded by DEFRA (Project EV0534) in which a Product Service System (PSS) for nursery equipment was piloted. This project explored a number of different aspects including the

    (i)   business model;

    (ii)   behaviour change strategies; and

    (iii)   environmental performance of the PSS compared to a traditional/conventional business model.

This report is concerned with the aspects (I) and (II). A separate annex is published to address (III).

In 2011 the *Department of Environment, Food and Rural Affairs* (DEFRA) invited bids for research projects aimed at "*Exploring and developing ways to help people increase the useful life of products*". The University of Hertfordshire (UH) was offered the opportunity to undertake one of the research projects. The theme proposed by UH was a business model known as *Product Service System (PSS)*. Researchers have explored PSS from the perspectives of design, strategy and sustainability since the late eighties and proposed it as a sustainable business model (Tukker 2015).

1.3   Definition and explanation of PSS

Amongst the most cited definitions of 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).

PSS are business models which are a combination of service and product elements configured to maximise the use of resources and which, in some cases, do not involve the transfer of ownership of products. PSS are classified in different types and the most popular classification is in (Hockerts 1999; Cook et al. 2006):

- *Product Orientated*, when a service component is added to a product, which is purchased by the customer. For example, maintenance services or insurance can be added to a product, e.g. a car
- *Use Orientated,* this is when users access the use of a product without acquiring ownership of it, an example is represented by car clubs, organizations that allow their members to rent cars by the hour and bicycle sharing offerings such as London's Santander scheme. In this type of PSS, the product remains property of the supplier
- *Result Orientated,* this is when users buy a service, examples include when users buy data storage and computing power by using the "cloud", or when they use remote call answering services

The interest of researchers and policy makers in PSS is driven by the potential social and environmental advantages (Manzini and Vezzoli 2003). From an environmental perspective, Use and Result Orientated PSS automatically extend *producer product responsibility*[2]over the lifecycle (White et al. 1999). This provides an opportunity to manage products better, particularly at end of the product life cycle. In Use Orientated PSS, since providers are responsible for use, maintenance, disposal and costs associated with these, profit-seeking firms may be interested in addressing such issues. For example, by specifying more durable and efficient products for PSS than in traditional product-based consumption. Initial research has suggested that, in theory at least, significant gains in resource productivity would be achieved by consuming PSS instead of traditional ways of acquiring products (cf. Goedkoop et al. 1999). These claims have since been downgraded (Tukker and Tischner 2006, Gottberg et al. 2009, Tukker 2015). Furthermore, gains in resource productivity do not automatically arise from PSS consumption and their realization requires deliberate design being built into the PSS. Yet PSS are still thought to be one of the possible pathways to more sustainable futures (Cook 2014). Indeed, Tukker (2015) has linked PSS to the very concept of circular economy.

1.4   Challenges of PSS

The timeliness and usefulness of the research commissioned by DEFRA is notable because, in contrast with policy makers advocating the implementation of PSS (WRAP 2018b), its

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[2] Extended Producer Responsibility (EPR) is a policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products (oecd.org/)

implementation has met with considerable challenges (Vezzoli et al. 2015). Businesses need to acquire competences to design, implement and manage a PSS (WRAP 2018b, c). However, the transfer of knowledge on PSS between academia and business is difficult and often unsuccessful (Cook et al. 2006). When PSS are implemented in protected niches, problems arise when providers attempt to scale up PSS in the mainstream market (Ceschin 2013).

Relatively successful examples of PSS exist, for example in personal mobility, including bicycle and car clubs and car sharing offerings. However, car clubs still achieve limited market share compared to private cars (Catulli et al. 2016). Bicycle clubs and other sharing offerings have had some success but there have been considerable hurdles to overcome in relation to extracting financial benefits from these offerings. Some providers, such as Mobike in Manchester, have had problems with theft and damage to products and associated accessories, with numerous bicycles being stolen or dropped in canals (Pidd 2018a, b). This further challenges the providers' objective to operate financially viable offerings (Hern and Topham 2018). Contrasting these challenges with the potential environmental and resource efficiency benefits of PSS suggests that the research reported here is highly relevant.

1.5   Research questions and aims

This research sought to explore the challenges associated with applying the PSS model to consumer products and markets as noted by Vezzoli et al. (2015) and Catulli (2012). In fact, despite the promised benefits and some successful examples in business markets, PSS success stories in consumer markets are rare (Rexfelt and Hiort af Ornäs 2009, Catulli 2012).

In order to explore these challenges, some research on consumers and PSS has been conducted (cf. Meijkamp 1998, Schrader 1999, Meijkamp 2000, Armstrong et al. 2015, Gullstrand Edbring et al. 2016). Whilst useful insights on PSS uptake in consumer markets have been generated by these studies, they do not deal with the complexities of consumption (cf. Belk 1988). They also generally focus on a narrow range of applications, e.g. car clubs. Little of the PSS research has featured other products or explored the complex nuances of PSS consumption. Similarly, there are gaps in knowledge both of the policy and business implications of PSS diffusion (Mont and Lindqvist, 2003; Mont, 2004).

The project therefore aimed to address the following questions:

- How will parents relate to a Use Orientated PSS based around renting infant mobility equipment?
- What learning outcomes can businesses and policy makers gain from the implementation of a small scale Use Orientated PSS based around renting infant mobility equipment?
- What could be the possible dynamics of adoption and diffusion of such a proposition?

The Table below shows the various stages of the research and gives details of the terms used in this report.

Table 1-1 Summary of research stages in the project

Research Stage	Definition
Feasibility study	A preliminary research stage when the feasibility of the pilot project – Action Research was assessed prior implementation to prevent possible risk and stop implementation if necessary
Pilot project	The actual stage of action research, where a "test implementation" (= pilot) was conducted to test the viability of a large scale PSS offering
Feasibility focus groups	Focus group were conducted as part of the feasibility study to gauge the possible acceptance of the infant mobility PSS by consumers
Business Manager interviews	Expert interviews were conducted with managers of businesses engaged in production and / or marketing of infant product to collect data on managers' expectation on the feasibility of the PSS
Workshops	Expert workshops were conducted at the end of the pilot project to draw learnings from the project
Repertory Grid survey	Quantitative data were collected during the pilot project to establish how consumers construe PSS
Field Research	Qualitative interviews were conducted during the pilot project to collect data on consumers' sense making of the PSS

Table 1-1 summarizes the stages of research in the project.

1.6   Research context

The context selected for the research is infant mobility equipment, in particular pushchairs and car seats. The reason for this choice was that, following Mont et al. (2006), pushchairs

and car seats are thought to be suitable for PSS as they are durable, with a possible life cycle of 10 years and yet often have a useful life for a single family of 1-3 years. They can also be relatively costly, so families with modest means are not able to afford high specification products. Infant mobility products, car seats and prams are also very difficult to recycle at the end of their life cycle because of the diversity of their components (bbc.co.uk 2019). However, in the case of products such as car seats, the expert advice disseminated by the NHS, the National Childbirth Trust, Mumsnet and other information sources, discourage the use of pre-used products (Mumsnet.com, nhs.uk, nct.org.uk/ 2018, nhs.uk 2018). Manufacturers through their trade associations (Baby Product Association 2014) give similar advice. There are various reasons for this, such as the risk that a car seat might have been in a car accident and be structurally damaged; damage made by previous users and the lack of user information[3] being available. Without the possibility of reuse, these products contribute to unnecessary waste. In addition, it is widely documented (Thomsen and Sørensen 2006) that the transition to parenthood is a moment of change fertile for influencing behaviour both with regard to purchasing habits and to longer term lifestyle changes, even in respect of environmental attitudes and behaviour (Thompson et al. 2011, Thomas et al. 2018). This makes research in the infant products context particularly valuable.

The intended contribution of this research is to offer insights on:
- The dynamics of adoption[4] by consumers
- The type of consumers that may be more likely to use PSS
- Specific requirements and motivation of consumers that can be satisfied by PSS
- Possible benefits that businesses could derive from PSS
- Possible disadvantages that PSS could have for businesses
- Possible strategic options available to businesses wanting to implement PSS
- Possible learning requirements for organizations interested in PSS as well as policy makers
- Considerations useful to the design of PSS
- Communication strategies that could be adopted to promote PSS

The main contribution of the report is to draw insights from the implementation of a "real world" PSS involving infant products. This is new in a field where considerable research

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[3] User information includes user handbooks
[4] Adoption if the process by which innovations are communicated through communication and distribution channels and are ultimately taken up by consumers

focuses on cars and bicycles and on very small-scale projects as explained further in section 2.

The intended audience / readership for this report is:

- Policy makers (including ministerial advisors) who might be considering policies to encourage (or otherwise) the diffusion of PSS
- Business managers including leaders of social enterprises
- Research and activist organizations connected with the implementation of sustainable consumption and circular business models, e.g. WRAP and the Ellen McArthur Foundation
- Academics researching and teaching sustainable production and consumption.

In the report, we use certain terms to describe collaborators in the project. Because of the inclusion of product and service elements in PSS, we have used the term 'service provider' in this article to mean the collaborator who interfaces with users i.e., in this PSS the parental charity. The term "manufacturer" is used to designate the supplier of actual products. The report is structured as follows: after this introduction, existing research is summarized; the methodology used is explained; the pre-pilot feasibility study and the project implementation are described; the interpretation of quantitative and qualitative data on consumer reception is summarized, followed by findings from workshops with research partners. Finally, a discussion, conclusions and recommendations are presented.

2 Summary of literature on PSS consumption

This section presents a brief review of the existing research literature on PSS consumption. Since the REBUS project features a PSS aimed at consumers, the focus of this review is on PSS implementation in consumer markets from the point of view of consumer reaction to PSS. Furthermore, because of the nature of the AR project, this review focuses on the implementation of PSS from a commercial perspective and only limited attention is given to technical aspects of PSS such as PSS and product characteristics and product performance.

2.1 Possible benefits and barriers of PSS for providers

Mont (2002) identified a number of benefits and barriers that could accrue to providers from adopting PSS. The main benefits include new business opportunities, market opportunities arising from wider share of second hand markets, closer co-operation, customer retention and extension of product life cycles. Disadvantages reported include lack of market demand, anticipated low acceptance by customers, especially of refurbished products, costs incurred when delivering support services, reluctance to internalize use related costs and conflicts of interest in the supply chain. Table 2-1 summarizes these benefits and barriers.

Table 2-1 Providers' Benefits and constrain of PSS (Mont 2002)

BENEFITS

Compliance with regulation on health and safety, environmental legislation and recycling activities;
New possibilities of growth in mature markets and industries; extension of range into services;
Opportunities for customization of offer with service components;
Establishment of closer relationship with customers;
Servitization [5] can be a survival strategy (see IBM);
Revenue from remanufacturing operations;
Remanufacturing costs are lower than manufacturing costs;
Could increase margins by reducing passages of distribution;
Finding new business opportunities;
Gaining control over 2nd hand market;
Better knowledge of customers;
Developing higher quality, environmentally friendly products;
Opportunity to supply knowledge (education);
Revenue creation from lower product volumes.

CONSTRAINTS / BARRIERS
Conflicts of interest between actors in the provision/supply network;
Customer acceptance of service oriented offers;
Need to build trust towards function-based/service offers;
Lack of customers' knowledge of cost structures;
Emotional needs for ownership;
Cost related barriers;
Concept design barriers;
Organizational barriers;
Investment payback period;
Overstretching of internal capabilities;
Legislation (e.g. taxation);
Concerns with long term commitment;
Lack of acceptance of refurbished products;
Consumer presumed "stigmatization" effect;
Personnel preoccupation with jobs.

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[5] Servitization is the innovation of an organisations capabilities and processes to better create mutual value through a shift from selling product to selling PSS.

2.2   Difficulties in PSS implementation

Early studies on PSS featured cases of PSS implementation in business-to-business markets such as the Rolls Royce Total Care services, which consists of providing air miles to air carriers and Xerox printing services where copying machines are provided on lease to business users (cf. Goedkoop et al. 1999, White et al. 1999). Interest in PSS escalated between 2000 and 2005 with seminal studies such as Mont (2002) and Government funded studies such as Charter et al.'s (2004) *SusProNet* report. Despite this interest and in contrast with a number of successful applications in business-to-business markets, case studies focusing on PSS applications in consumer markets have been relatively rare. Indeed, as already reported, several commentators suggest that PSS faces implementation challenges in consumer markets (e.g. Vezzoli et al. 2015). Consumers may not find PSS suitable for their needs because they prefer using products they own so that they can have control over them (Tukker 2015). For these reasons, consumer culture tends to focus on consumption based on ownership (Mont 2004a, Briceno and Stagl 2006, Halme et al. 2006, Scholl 2008).

2.3   Scarcity of studies of PSS in consumer markets

Whilst research explicitly focusing on consumers and PSS is sparse, especially in the early research in the late 90s and early 2000s, some research that investigates consumer acceptance of offerings similar to PSS is available. However, such research tends to focus on phenomena akin to PSS such as eco-efficient services (EES)[6]. Schrader (1999) investigated acceptance of EES based on eco-launderettes and car sharing systems using attitude measurement surveys and Rogers's (1995) diffusion of innovation theory. Meijkamp (1998; 2000) similarly studied car sharing. Both studies found consumers to be positive about PSS although they dealt with small scale or hypothetical PSS.

2.4   Emergence and confluence of different research approaches to PSS

In contrast with large-scale successful Result Orientated PSS[7] such music downloading (Vernik et al. 2011), as mentioned in 1.5 product orientated PSS[8] is less successful. Research has focused on mobility PSS, such as cars (cf. Firnkorn and Müller 2012, Le Vine et al. 2014) and bicycles sharing offerings (cf. Beckmann-Dobrev et al. 2015, Zademach and Musch 2018). Several studies, similarly to Schrader's (1999) have hypothetical cases as

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[6] Market offerings that complement or substitute product ownership, have positive ecological effects, and do not involve ownership by the customer (Schrader 1999).
[7] Result orientated PSS was defined in Section 1
[8] Product Orientated PSS is defined in Section 1

units of analysis. Examples of these are Rexfelt and Hiort af Ornäs' (2009) and Catulli (2012) who conducted qualitative studies on "hypothetical cases of PSS", presented to participants by way of narratives and visual devices. The former study, based around products such as indoor climate control, car leasing, pay per view TV and clothing rental, concluded that consumers would not know what to expect from PSS and they might think that the added services are an excuse to charge more money (Rexfelt and Hiort af Ornäs, 2009). Catulli's (2012) research, around car clubs and rental of infant equipment, suggests that consumers accessing products and services through a PSS would be concerned with performance (including reliability), responsiveness (or on demand availability) and assurance, which are typical performance indicators of services. Assurance is defined as "knowledge and courtesy of employees and their ability to inspire trust and confidence (Parasuraman et al., 1988, 23). In practice, this means that consumers are concerned about not being able to access the product at the desired time or not finding it in a usable condition. Other studies focus on small-scale demonstrator projects including infant and adult clothes sharing (Armstrong et al. 2015), furniture lease and sharing (Gullstrand Edbring et al. 2016), coffee percolators and vacuum cleaners for lease (Pialot et al. 2017). Some of the themes emerging from this research involve hygiene, health and safety. For example, consumers could accept PSS furniture offerings including tables and shelves (Gullstrand Edbring et al., 2016) but would be far less amenable to PSS offerings involving products in contact with the skin, such as soft furnishings, mattresses and similar products (Gullstrand Edbring et al., 2016; Armstrong et al., 2015, Petersen and Riisberg 2017). Consumers even discriminate between different types of intimate products, such as infant car seats and pushchairs (Catulli and Reed 2017).

2.5 Consumers relationship with PSS

In respect of use situations, PSS may be preferred for specialist products used infrequently by consumers, such as party dresses, fashionable bags used for special occasions and carpet cleaners (Armstrong et al. 2015). Another significant theme emerging - in particular from the research of Pialot et al. (2017) and Catulli et al. (2017b) - is the relevance of Information Communication Technology (ICT) as an essential platform to operate a PSS. Consumers use mobile phone apps[9] to book products such as cars (Catulli et al. 2017b) and online applications such as web sites to customize their service offerings (Pialot et al. 2017). Catulli et al. (2017) suggest that superior familiarity with apps and ICT in general could be one of the reasons why younger consumers are more open to PSS.

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[9] Apps are software downloaded in mobile devices through platforms such as Android or Apple Store in order to satisfy various demands" (Ghose and Han 2014)

Recent interesting studies involving large-scale PSS-like examples emerged from research on Access Based Consumption: "transactions that can be market mediated but where no transfer of ownership takes place" (Bardhi and Eckhardt 2012, 1). This research offers insights into car sharing (Bardhi and Eckhardt 2012, Baumeister and Wangenheim 2014) and music downloads (Belk 2014). The insights gained were similar. For example, Bardhi and Eckhardt (2012) found that consumers would use car clubs, but see them as a temporary (and in some case, emergency) short term solution to their mobility problems and would not be loyal to the car club brand. They also found a fear of contagion from sharing products with other users. Contagion is the "disgust consumers feel when they are aware that a product they use has been physically touched by someone else" (Bardhi and Eckhardt 2012, 8). Catulli et al. (2013) studied infant equipment PSS and confirmed Bardhi and Eckhardt's (2012) thesis of fear of contagion. The issue of contagion associated with sharing products could be a considerable obstacle for PSS and recent research, (e.g. Armstrong et al. 2015) confirms this concern. Contagion is similar to the health, safety and hygiene concerns emerging from PSS research. This research also suggests that younger consumers are more open to PSS and that motivations for adoption could include relinquishing the responsibilities of ownership and the ratio between use intervals and cost, in other words whether a product is used frequently and for how long, in relation to cost.

2.6   Research perspectives for studying PSS

A decision that had to be made in designing this AR project was the selection of suitable theoretical perspectives to study a consumer PSS. Most of the studies discussed above used attitude measurement surveys to research PSS. Unfortunately this approach has been shown to be undermined by the so-called "attitude behaviour gap" (Kalafatis et al., 1999) or "value action gap" (Shove, 2010), which means that consumers' actions are not consistent with their stated attitudes or values. This has implications for the predictive power of these studies. Nevertheless, recent research on PSS has still utilized these behaviour change perspectives. Notable examples of this are research into car clubs and other car sharing offerings (Firnkorn and Müller 2012, Le Vine et al. 2014) and research into PSS offerings such as adult and infant clothes subscriptions[10], furniture leasing and luxury leather rentals (Armstrong et al. 2015,   Gullstrand Edbring et al. 2016, Efthymiou et al. 2013). Subscriptions can be considered a legal term for the relationship of consumers with a PSS (Petersen and Riisberg 2017).

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[10] A subscription is a business model where customers pay a subscription price to have access to products or services (Burez and Van den Poel 2007, Johnson et al. 2008)

The use of such research perspectives, focusing on consumers' determined action and arising from economics and psychology, have been criticised on the grounds that consumers are not always fully aware of their consumption, such as when they use heating and electricity (Shove and Warde 2002) and, when they are, they do not always have the freedom to chose sustainable consumption because of the various activities they are involved in (Shove 2010, Watson 2012). For example, consumers do not stop driving private cars because they need to move between different locations for work and entertainment (Watson 2012).

Recent contributions to PSS have included social sciences studies, for example values associated with PSS (Piscicelli et al. 2015), semiotics (Santamaria et al. 2016), Actor Network Theory (Petersen and Riisberg 2017) and transition management (Cook 2014). Bardhi and Eckhardt (2012) operationalized a constructivist perspective called Consumer Culture Theory[11] (CCT) to study car clubs. Scholl (2008) suggested that PSS offerings could not deliver the same symbolic value[12] that consumers could extract from using their own products. Catulli et al. (2017), also drawing on CCT, suggested that this could be indeed a problem: consumers are concerned with the ability of PSS offerings to deliver functional value [13], such as enabling safe and efficient transport. There are doubts however, whether or not PSS offerings are able to deliver symbolic value, for example to help people define themselves in social contexts. Consumers are also concerned about issues of social approval deriving from PSS use, e.g. the stigma of non-ownership and of using obsolete pushchairs. However, parents appreciated being members of a brand community made up of other parents. This is in contrast with Bardhi and Eckhardt's (2012) claim that users of a PSS do not want to be associated with a community of other users of a PSS brand and would not want others to know that they were renting pushchairs rather than using a product they own outright. Mylan (2015) suggested researching PSS using Practice Theory[14] (PT) as a theoretical perspective. Catulli et al. (2017) conducted research on an electric vehicles PSS offering using PT and the findings of that study confirmed that younger consumers are more open to mobility PSS and that older people with families found it difficult to access and unreliable. That research, which focused on the practices consumers perform in their daily lives, has revealed other aspects of PSS, for example the need for consumers to acquire new competences in order to operate the ICT resources discussed in 2.3.

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[11] Consumer Culture Theory is defined in Section 3
[12] Symbolic Value is the opportunity that possession or use of an object gives people for self-expression or identity construction and the association of that object to one's personal history (Richins 1994)
[13] The practical benefits that the use of goods and services confer to users
[14] Practice Theory is defined in section 3

Since research on PSS in consumer markets is mostly focused on small-scale examples and in some cases on hypothetical PSS, it was thought that the use of Action Research in this investigation would be useful because it offered a more realistic insight into the uptake of PSS by consumers. Acknowledging the recent critique of psychological and economics perspectives, the study adopts two sociological perspectives, CCT and PT[15], applied in conjunction with a psychological perspective - Personal Construct Psychology (Kelly 1955) - which is also able to absorb sociological insights. The sociological insights added essential background information in the form of indications of the social aspects that needed to be investigated by the psychological approach e.g., issues of social status and protecting the environment.

Summary
- PSS seems to face implementation challenges. In the view of some commentators consumers prefer using their own products – as opposed to having temporary access to products – because they want control over products they use and they value ownership   - Research on PSS in consumer markets has more often been based on small-scale examples and in some cases on hypothetical PSS and there is a scarcity of research in large-scale case studies and real life PSS implementation research. This justifies the use of Action Research on this investigation.   - Research conducted using different approaches seems to confirm that consumers may be deterred from using PSS offerings by issues such as health and safety and risk of contagion. This indicated a risk for the REBUS PSS as the products involved were in close contact with the user   - PSS has thus far been investigated through the lenses of individualistic approaches informed by economics and psychology. These approaches have been challenged because they fail to explain the implementation challenges that need to be met not only by PSS but also by other sustainable consumption models. Recent use of sociological approaches including CCT and PT is promising and therefore it has been selected for this research in conjunction with Personal Construct Psychology.

3 Methodology

3.1 Research Strategy

The strategy selected is Action Research (AR). AR was developed by Kurt Lewin (Lewin 1947). It is a flexible research design strategy to enable researchers to "study social systems by changing them" (Heale 2003,4). AR is a critical, participatory and emancipatory approach (Heale 2003, Robson 2011) to "democratic enquiry" (Greenwood and Levin 2007,72) in

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[15] Defined in section 3

which professional researchers collaborate with local stakeholders to seek and implement solutions to problems that are important and relevant to the stakeholders. AR consists of implementing a project with the aim of testing changes in practices and evaluating the effects (Robson 2011). It involves cycles of systematic collection of data relating to an on-going system in respect of some objective, goal or need of that system; feeding these data back into the system; altering selected variables within the system (based on both data and hypotheses) and evaluating results by collecting more data (French and Bell 1999).

AR is regularly used to inform policy (Mehta et al. 2004). It has the advantage of testing change, such as innovations, in a real world context (Argyris and Schön 1989, Heale 2003) and allows the use of a range of different methods for collecting data (Heale 2003, George and Bennett 2005). AR considers practice as generating theory rather than the other way round (Mehta et al. 2004), it involves "learning by doing". It also suggests acting before thinking and then reflecting on actions and their effect (Heale 2003), thereby reducing the theory-practice gap (ibid.). AR brings about both change and knowledge: change from actions taken and new knowledge from reflection on actions and results (Mehta et al. 2004), with more robust results than traditional research methods (Johnsen and Normann 2004), because the data is collected in a context similar to real world conditions.

In AR global or local coalitions of 'actors' come together (Fien et al. 2001, Johnsen and Normann 2004, Platteel et al. 2010). The researcher's role is to be a reflective resource as well as a collaborator (Johnsen and Normann 2004). This interaction and collaboration between different stakeholders is a typical feature of AR (Kocher et al. 2011) and communication is essential to obtain commitment from the various participants (Heale 2003).

The AR process involves "learning cycles" of implementation, assessment and evaluation in six stages: *diagnosing, planning, implementing, evaluating*, *learning* and *replanning* (Glasson et al. 2008). Whilst learning initiates new cycles, new problems may emerge that then need further research – whilst still focusing on the original problem. Likewise, early evaluation during cycles allows assessment of whether the research achieved it aims or whether further cycles are needed (Heale 2003). Figure 3-1 illustrates AR's research cycles.
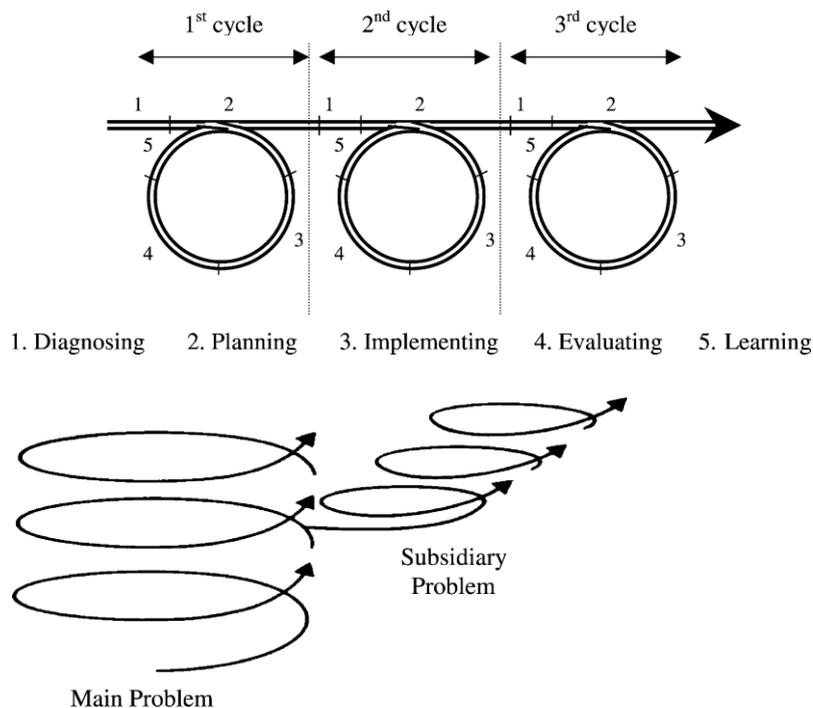
Figure 3-1 Cycles of AR stages, Heale (2003)

A key difference of AR compared with other research strategies is that whilst in other flexible research designs the methods used may change during the implementation (Robson 2011), AR is more likely to generate radically new questions and objectives during the conduct of the research. This happens as a result of the reflective loops of steering meetings between the stakeholders in the research (Heale 2003, Glasson et al. 2008). The new questions and objectives generated may then initiate "spin off" projects that enable researchers to react to "real world" developments (Robson 2011).

The challenge of AR is for the researcher to promote change through dialogue and collaboration (Platteel et al. 2010) as well as drawing conclusions (Johnsen and Normann 2004). The collaborative process of reflection is the "guiding thread" (Ibid., 227) that integrates the work.

However, AR has several disadvantages:

- The position and role of the researchers in AR projects may be problematic and generate conflict with other stakeholders. Because of this, researchers in AR projects need to make their role clear from the start (ibid.).
- There are issues of independence in research design and the risk that in some projects researchers might find themselves assuming a political role (Ibid), which means they would try to influence events according to vested interests.

- Even when successful, AR is context specific and the results are not easily transferable to other research contexts (Heale 2003).

- There is a risk of generating bias in the findings due to the researchers' participating roles. Self-evaluation and reflexivity are essential to evaluate how the researchers themselves might be affecting the results (ibid.)

- Robson (2011) claims that AR takes an a-theoretical posture because research may starts from action without considering formal theory. This risks generating insights, which are not relevant as they merely, restate prior knowledge.

However, researchers have different opinions on whether AR is a-theoretical or not. Although AR often involves an empirical inductive approach, collecting data prior to investigating existing theory (Ibid.), McNiff and Whitehead (2010) claim that AR can be used to test theories in a real life setting. AR is also a research strategy that enables data to be collected and analysed and for theories to be formulated during the course of a research project (McNiff and Whitehead 2010). Heale (2003) claims that practice based solutions sparked by AR may generate new theory through reflection and processes of abstraction (Mehta et al. 2004). This report adopts this position. AR projects must have a clear conceptual framework acceptable to the researcher (Mehta et al. 2004). AR is used here as a research strategy, which can draw on a number of theoretical perspectives as explained in section 3.2.

AR, because of its nature, often involves collaborations between industry and academia. Collaborations between academia and industry have a long history in the UK, currently facilitated by Government departments such as Innovate UK, part of BIS. Yet, Cook et al (2006) claim that collaboration on PSS and the transfer of PSS knowledge from academia to industry is problematic. The project's designers considered this. Ceschin (2013) describes the formation of consortia of diverse organizations to conduct AR such as academia, industry and social enterprises, including charities. These consortia, following Geels (2004), constitute themselves in a protected niche, a market place protected from competitive pressures, which enables the consortium to build up a "socio-technical innovation"[16] away from competitive pressures.

The REBUS AR project involved a university, a North American infant products manufacturer and a parental charity. The aim of the project was to generate evidence-based recommendations for the project in a real world context.

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[16] A socio-technical innovation is a change or innovation to the social and technical aspects of a system (Schwabe and Krcmar 2000)

Summary
• AR is a critical, participatory and emancipatory approach in which professional researchers collaborate with stakeholders to seek and implement solutions to problems of major importance to the stakeholders • A key difference of AR when compared with other research strategies is that as a result of the reflective loops built into research, new questions and objectives may emerge in the course of the project which then require new methods. New projects may result from the original research project • Whilst some researchers claim that AR is a-theoretical, others say that it can be used to test theory; this report adopts the latter view and uses AR to draw on a number of theoretical perspectives to research PSS implementation

3.2   Theoretical Models Used

The REBUS project, following McNiff and Whitehead (2010) and Mehta et al. (2004), uses theories as reference points for the design and interpretation of the research. The authors used three theoretical frameworks to inform the questions[17], to drive the inquiry and to guide the discussions that took place in the early reflective loops. This is entirely acceptable in AR (Glasson et al., 2008; Kocher et al., 2011), as input of theory as part of the reflection that supports future planning is a feature of AR (Heale, 2002; Glasson et al., 2007). The three theories that were drawn upon were *Consumer Culture Theory (CCT), Practice Theory* (PT) and *Personal Construct Psychology (PCP).*

The initial research design was expected to involve small-scale research and use qualitative methods. The literature reviewed in section 2 prompted the selection of CCT and PT to inform the methods to be used, in order to allow key theoretical concepts to inform the research. Those theoretical frameworks were informed by the debate on the effectiveness (or otherwise) of "traditional" behaviour change research. That debate has moved the emphasis to:

1. cultural perspectives involving the role of consumption in constructing individual identities (Arnould and Thompson 2005, Arnould and Thompson 2007) and,

2. complementary cultural perspectives involving the role of social conventions in shaping consumption (Warde 2015) and the role of social practices (Shove 2010,

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[17] The interview guides listing the questions are included in Appendix A.

Shove et al. 2012) integrated within the socio-technical landscape[18] in making existing consumption difficult to change (Watson 2012).

The initial research design took the view that these two perspectives could offer novel insights in PSS implementation in consumer markets, taking into account the limited success of traditional behaviour change approaches in implementing sustainable consumption (Southerton et al. 2005, Shove 2010, Shwom and Lorenzen 2012). In the course of this AR project, the periodical reflective loops originated by meetings involving the research stakeholders[19] indicated that we needed to take a wider view of the pilot and a decision was made to draw on Personal Construct Psychology (PCP, Kelly 1955) to conduct research to achieve this objective.

Consumer Culture Theory (CCT) is a multidisciplinary approach which "refers to a family of theoretical perspectives that addresses the dynamic relationships between consumer actions, the marketplace and cultural meanings" (Arnould and Thompson, 2005, 868). CCT explores contextual, symbolic and experiential consumption aspects including acquisition, consumption and disposal (Joy and Li, 2012). In simple terms, the object of analysis in CCT is the individual consumer and her/his consumption decisions, with the purpose of understanding the utility consumers draw from their decisions and how they project their identity to the outside world (i.e. to be perceived in the way they would like to be perceived) through making those decisions. CCT helped the researchers to understand what value consumers sought through acquisition by way of PSS. CCT offered the researchers theoretical constructs, which facilitated the understanding of PSS consumption. Those constructs include:

- The meanings consumers associate with ownership, such as status
- Meanings of social affiliation to groups and communities, such as feeling as they are part of a group of parents with shared meanings
- Relationships with products, such as emotional attachment and in particular consumer relationships with brands of products and services
- The functional value of consumption of products, for example the benefits deriving from using lightweight, foldable pushchairs
- The symbolic value of consumption of products and services, such as the utility consumers draw from consumption to define themselves and construct their identity

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[18] The socio-technical landscape is the exogenous environment including aspects of society such as material and spatial arrangement of cities, transport and energy infrastructure (Geels 2004, Watson 2012)

[19] The effect of AR reflective loops in cycles was explained in 3.1

These theoretical constructs informed the research design.

Practice Theory (PT) is a cultural theory that focuses on social practices as the unit of analysis to explain how people make and transform the world in which they live, through their daily routines (Feldman and Orlikowski, 2011). A social 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, 249). Social practices are therefore routine performances of activities. Practice elements are also conceptualized as *materials*, *meanings* and *competences* (Shove et al. 2012). PT offers insights on how consumers defect from existing practices and are recruited to new practices. In time, those new practices will either take hold or fade away (Ibid.). This approach helped the researchers to understand the "lock ins" and constraints preventing PSS diffusion in the context selected (members of the parental charity). PT offers theoretical constructs which also facilitated the understanding of PSS consumption. These constructs include:

- Understanding the parental practices of consumers, including the materials they use, the competences involved in using these materials and the meanings consumers extract from these practices
- The processes by which parents acquire parental competences
- How parental practice and its practitioners are networked in a constellation of other interrelated practices, such as shopping, driving and socialising and how these practices interact with parenting practice
- How the socio-technical landscape restricts the freedom of choice of consumers, for example how the geographical distribution of places of work and recreation forces consumers to drive

Personal Construct Psychology ("PCP"; Kelly, 1955) is a psychological theory that describes the ways in which people construct meanings ("construe") by applying (usually not consciously) their bipolar personal constructs (e.g. *good -v- bad; hygienic -v- unhygienic*) (Ibid., 1955, 1991) to situations, places or things. The REBUS project applied PCP methods (in particular, Repertory Grid Technique) to explore how people construe different ways of acquiring pushchairs, including access through a PSS. How someone construes something is different from the "attitudes" they may hold. How someone construes something determines how he or she will actually *behave* (Kelly, 1955; Fransella 1972), whereas an attitude towards something is usually far more abstract and tends to be a poorer predictor of behaviour (Kalafatis et al., 1999). PCP methods are used to understand why people are behaving as they are now and/or how they might behave in the future based upon their

current ways of construing. PCP can be used to understand the construing of individuals or groups of people.

PCP offers a more "individualistic" view than CCT and PT in the sense that it comes with no pre-conceived notions of how someone (or a group of people) construes something e.g. different ways of acquiring pushchairs. In that sense, PCP is content free. Once a person's constructs have been identified an understanding of the reasons why they make their decisions can be gained. PCP's most well-known method is Repertory Grid Technique and this method offered us the opportunity to have both qualitative and quantitative data in the same instrument. PCP is sometimes called a 'metatheory' (Winter and Neimeyer 2015) and so it was well placed to work in concert with CCT and PT, which supplied some theoretical constructs to explain consumer behaviour. The focus of the Repertory Grid survey was to find out how consumers construe different ways of acquiring pushchairs. The team decided that this was important since the pushchair product was the most problematic in terms of consumer acceptance in the context of PSS. Accordingly, it was felt that a focused study on how consumers construe different ways of acquiring pushchairs (including through a PSS for renting pushchairs) would help to shed light on the reasons for these difficulties.

3.3   Methods

A range of methods was used in the project, in two different stages: during the feasibility study and during the implementation of the project. Table 3-1 offers a summary of the research methods drawn upon in the project in the two different stages. The methods are then described in chronological order, including the design of the Action Research following the feasibility study.

Table 3-1 Action Research summary of methods

FEASIBILITY STUDY FOR THE ACTION RESEARCH PROJECT		
This stage aimed at gaining a view on the feasibility of an Action Research on PSS in the context of infant mobility products Secondary research: • Documentary information on infant products and market	*Expert interviews with 10 managers in infant product companies* *Purpose:* gain expert opinion on PSS implementation and management. *Method:* In depth semi-structured interviews *Conducted* Feb 2012 to May 2012 *Location:* Participants' Head Office / rented accommodation) *Recruitment* through Baby Products Association Database *Selection criteria*: Purposive sample *Evidence generated*: Qualitative data on expert opinions *Analytical tools used*: NVivo *Limitations:* Due to access difficulties, the sample was largely self-selecting. However, 10 is considered to be a sufficient sample size for expert interviews	
• PSS literature	*Focus groups with consumers* (5) Thirty participants *Conducted* from May 2012 to June 2012 *Location:* Nursery in Enfield, London *Selection:* Purposive sampling through parental charity *Evidence generated:* Qualitative data on consumers' reaction to PSS *Analytical tools*: NVivo *Limitations*: Context specificity and skewness of sample which was composed mostly of white people with fairly high incomes	
CONDUCTING THE ACTION RESEARCH PILOT		
RESEARCH PERSPECTIVE	*32 interviews with consumers* *Method*: In depth semi-structured interviews *Conducted* Nov 2014 to Oct 2015	**RESOURCE EFFICIENCY ASSESSMENT**
Consumer Culture Theory (CCT) Offers a view of how consumers think PSS projects their identity; the value they want to extract from PSS	*Location*: Participants' homes *Recruitment*: A link on the charity web site led to a UH recruitment web site *Selection*: Purposive sample *Evidence generated*: Qualitative data of parents' practices and meanings attributed to PSS *Analytical tool:* NVivo *Limitations*: Context specific; sample of mostly white, high income individuals	We decided to do this assessment following a steering committee meeting as part of one of the Action Research cycles
Practice Theory (PT) Offer a view of how PSS can blend in the various practices parents perform		
Personal Construct Psychology The conduct of this qualitative / quantitative research was decided at one of the steering committee meetings in order to gather quantitative data from a larger sample. The qualitative data was in the form of the constructs elicited from a sample of participants and the quantitative data was in the form of ratings and rankings.	*10 one to one construct elicitation interviews* *On line survey:* Total number of participants 166 *Research technique:* Repertory Grid Technique *Conducted* March 2015 *Location*: Administered online through Qualtrics web site *Recruitment:* Through email link sent to members of the parental charity *Selection criteria:* Participants were self-selecting *Evidence generated:* How the sample construed different ways of acquiring pushchairs, including by way of a PSS *Analytical tools:* SPSS v. 22 *Limitations:* Relatively small sample size; sample was self-selecting; the membership of the parental charity was largely white and middle class.	Life Cycle Analysis
CCT/PT Final reflective workshops	2 Expert workshops Management of parental charity (2), March 2016 Management of Manufacturer (6), Feb 2016	

3.4   Secondary research

Comprehensive secondary research on PSS and the infant mobility market was conducted prior to implementation of the pilot in order to assess its feasibility. The research team revisited academic literature on PSS, in particular in consumer markets, however what was more of a concern were the possible obstacles to the implementation of the pilot. The research team was well equipped to research the various aspects of this implementation, as one of the team members was formerly a qualified lawyer and is now a psychologist. A Research Assistant with good experience in secondary research supported the team. The aspects that were investigated are summarized in table 3-2.

Table 3-2 Secondary sources used

Issue	Source
Market size and characteristics	Mintel, Key Note reports
Main manufacturers and suppliers in the infant products sector	Key Note Reports, Mintel, the Baby Product Association web site
Legal implications of PSS	Office of Fair Trading
Consumption trends	Mintel, Key Note reports, the Baby Product Association web site
Likely consumer response to PSS	Academic literature
Prospective research partners' expertise and strategies	Key Note Reports, Mintel, the Baby Product Association web site, Annual Reports, general press
Use of infant mobility products practices, social convention and regulation	The NHS, the NCT, Mumset, the Baby Product Association web sites and literature

CCT and PT draw principally on qualitative data collected using ethnographic in-depth interviews, in some cases group interviews and observation in specific contexts of consumption. Both the approaches also draw on documentary analysis of secondary sources to understand the context (Halkier and Jensen 2011, Bueger 2014, Mylan 2015) or "sites" and background knowledge (Bueger 2014). These requirements drove the secondary research activities. The type of documents that can be analysed include handbooks, manuals and sets of instructions that can give clues on how practices are performed (cf. Ibid.). Historical documents such as monographs on the development of product design are also important as they give clues to changes in practices.

3.5 Approaches to conducts research in CCT and PT

CCT in particular draws on in-depth interviews with consumers in their everyday consumption context (Bengtsson and Ostberg 2006). PT in turn draws on observation and in-depth interviews with 'practitioners'. Whilst CCT looks at individual consumers' behaviour to express their identities, PT focuses on the routine aspects of consumption. In this framework, practitioners are expert performers of social practices (Bueger 2014) such as child rearing. PT considers an expert as someone who is or has been participating in a practice on an everyday basis or someone who has observed that practice for a substantial time (Ibid.). Thus, parents using infant equipment on a daily basis can be considered expert participants (cf. Ibid.). Managers of companies supplying these products can be considered expert observers.

A further reason for selecting qualitative research methods is because, as noted earlier, research on the use of PSS in consumer markets is relatively new, so the nature of the research was exploratory (Tanna, 2005) and thus more suited – at least initially – to the application of qualitative methods. The REBUS investigation focused on a socio-technical innovation - a change or innovation to the social and technical aspects of a system (Schwabe and Krcmar 2000) i.e. a new way of consuming infant products and the technical innovations in the refurbishing process. Rich data were therefore needed to elicit expert opinion on the feasibility of the pilot. At the same time, the qualitative research facilitated the exploration of the emerging sense making of the participants in the PSS network, including consumers, suppliers and intermediaries for the adoption of a PSS based on durable infant mobility products.

The following sections describe in detail the qualitative research conducted during the feasibility study of the pilot and during the implementation of the pilot study. CCT and PT informed the inception of the interview guides and the subsequent analysis. For example, the interviews probed how participants said they used car seats and pushchairs to project an image and gain social acceptance from peers. At the same time, interviews explored how the use of car seats and pushchairs on rent or lease fit in with consumers' other social practices.

3.6 Thematic Interviews with Managers

Ten one to-one in-depth qualitative interviews were conducted as part of a feasibility study before the implementation of the pilot study with managers of companies involved in manufacturing and supplying infant products including pushchairs and car seats. The objectives of these interviews were:

I.   To gain qualitative insight into the feasibility of the research from managers who had specialist expertise both of the market and of the products

II.   To explore the opportunities to collaborate with these organizations

The participants were recruited from the BPA membership list. The interviews were semi-structured according to an interview guide informed by the theoretical literature on PSS. Interviews were recorded digitally and then analysed with NVivo[20]. The interview guides can be found in Appendix A. The themes explored by the interviews included:

- Expectation of possible consumer response to PSS

- Existing producer end of life responsibility processes

- Existing refurbishing and remanufacturing activities

- Potential refurbishing and remanufacturing capabilities needed

- Perceived business and financial benefits of PSS for suppliers

- Perceived risks of PSS for suppliers

- Implications of PSS for marketing, training and service resources

- Current understanding of regulatory constraints

- Degree of interest of the company in experimenting with PSS

3.7   Focus Groups with Consumers

Five focus groups involving thirty people (26 women and 4 men, including expectant mothers and mothers with young babies) were conducted as part of the feasibility study before the implementation of the pilot. The purpose of the consumer focus groups was to assess likely consumer response to the PSS offering. The researchers selected this type of qualitative inquiry because they wanted to generate in-depth insights on the meanings attributed to PSS by consumers. The interview guides used for the focus groups were semi-structured. Three storyboards with images of parents using pushchairs and car seats were used to prompt participants to visualize the products relating to the proposed PSS and stimulate discussion. The participants were recruited through the parental charity from their membership. The venue selected for these focus groups was a nursery in Enfield. This was done to create a friendly environment that would be supportive of parents with young infants. Refreshments were offered and breaks were encouraged, as roughly a third of the participants were pregnant. The researchers hoped that the focus groups would generate themes that would help the research team to identify the issues that would shape the adoption of the PSS. All this data was recorded and transcribed. Transcripts of the recordings were analysed using NVivo.

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[20] NVIVO is a software package for qualitative data analysis

This feasibility stage was an important component of the project. If an adverse response from consumers had been observed, then the pilot might have been deemed inappropriate and not proceeded with. The next section summarizes the design of the AR framework

3.8   AR framework design

The organization that conducted the AR project, the University of Hertfordshire (UH), was in this project the same that conducted the delivery and the evaluation of the results.

This type of AR, with delivery and evaluation conducted by the same organization is in line with the model of Participatory Action Research (PAR) (Argyris and Schön 1989) as explained in section 3.1.

3.8.1   Recruitment of research partners

In the initial desk research performed before the pilot implementation, relevant organizations were identified. The NHS was investigated as a potential partner but this did not look as if it would be possible. Expert organizations were identified including the National Childbirth Trust (NCT) and Mumsnet, both being charities. The Baby Products Association (BPA), a trade association representing manufacturers and suppliers of infant mobility products was identified as a source of information on the infant products industry and markets. Informal talks were held with all these organizations. The BPA was also later interviewed formally as part of the initial feasibility study. The BPA supplied access to industry representatives for the initial interviews. These organizations were also prospected to enter a collaborative consortium. Together with information on the industry, one of the outcomes of this initial work was the identification of a charity and an industrial collaborative partner. Important events at this stage were two workshops within industry who had been identified as potential partners. Unfortunately, recordings were not taken at these stages because the workshops were at the time considered more negotiation events than data collecting opportunities. No significant data was collected in these two events that can be presented in this report. Two potential leading partners were selected. One of the partners was a parental charity and the other the UK branch of a large organization based in North America and specializing in infant products, as well as a wider range of juvenile products.

3.8.2   Set up of the relationship

Once the participants in 3.7.1 were identified, considerable time was spent on negotiations. Initial Memoranda of Understanding and Non-Disclosure Agreements were exchanged between potential collaborators. Once an agreement in principle was reached, contracts

outlining terms of collaboration (collaborative agreements) were exchanged with the support of the legal representatives of the participants, including the University of Hertfordshire.

The PSS consisted of an offering where pushchairs and car seats were leased to parents. Leases were for periods of six months, with the leasing fee being paid in advance. Leases could be renewed at the end of the lease term. Resources such as delivery vans and drivers were allocated to deliver products to users and collect them from users' addresses at the end of the lease. A refurbishing service was provided using the facilities belonging to the manufacturer. Both the manufacturer and the distributor allocated customer service resources to the project. A process of Quality Assurance (QA) to certify the refurbishment of car seats and pushchairs was designed and certified to users by means of a printed document. This process was deemed necessary because of the findings of the focus groups in the feasibility study, which underscored the importance of health and safety issues. Participants (users) were told in the communications that pre-used (refurbished) as well as new products were delivered and the QA reassured them of the products' safety.

3.8.3 Design of the PSS
The initial stages of the AR project involved the design of the PSS. The design was the result of collaboration between the partners:

- A parental charity,
- A supplier of infant products who supplied infant car seats and accessories (such as Isofix bases[21]) and pushchairs and accessories relating to pushchairs
- A logistics company
- An interdisciplinary team of researchers from the University of Hertfordshire
- DEFRA's Project Management team stood in the background and supplied advice and intelligence

3.8.4 Setting up a steering committee
Once the consortium was formed, it was agreed that bimonthly stakeholder meetings be held to discuss progress, extract learning outcomes, consider strategic options and agree decisions. The role of the parental charity was to act as an interface with users (renters of products). Importantly the users were members of that charity, therefore the charity also had the function of offering a database and a pool of customers, and this was an important benefit as will be seen in section 5.6. The role of the supplier was to provide products for

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[21] An Isofix base is a device which is fixed to the car seat and on which an infant car seat can be fastened with a quick release coupling.

rent. As users booked the delivery of a car seat or pushchair, the logistics company delivered the product and later would collect the product when the user had finished with it. Fig 3-3 uses Shostack's (1982) service blueprint as a model. The elements visible in front of the line of visibility were the parental charity's operations through their website and a telephone line, the telephone service personnel of the supplier and delivery vans. Behind the line of visibility (not visible to participant / users), a process occurred, which included:

1. Refurbishing and packaging operations in a specialized workshop which belonged to the supplier
2. Warehousing and internal logistics;
3. Quality assurance. Products returning were inspected for quality, refurbished and packaged. This was an essential activity to "legitimise" the PSS as is explained in sections 5.5 and 5.6
4. Management and marketing, this was a collaboration between all partners who communicated with the participants through the parental charity's web site and e-mail. These processes occurred in the supplier and charity's offices
5. UH researchers had a role in the background to monitor the operation and participated in the periodical meetings of the steering committee.

Figure 3-3 offers a view of these processes, which took place at various stages of each PSS life cycle with each set of participants [22]

Figure 3-2 Cabriofix Black Reflection Car Seat

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[22] A set of participants is here intended as a couple of parents
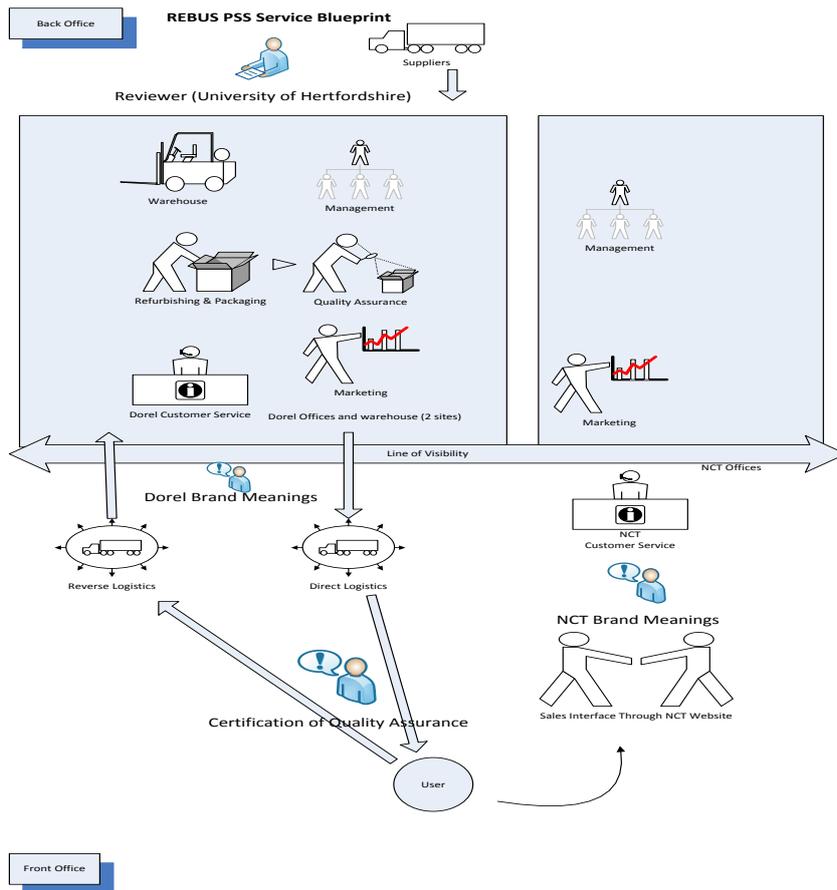
Figure 3-3 REBUS PSS Service Blueprint

The parental charity handled most of the contact with users during the access stage (booking) and the return of the product by users. The charity would charge upfront 6 months rental and then contact the customer towards the end of the period to extend the hire or return the goods.

3.8.5   Reflective loops and end of project workshops

As explained in section 3.1, reflective loops, consisting of regular "steering committee meetings" are an important feature of AR. UH led the operation of the steering committee meetings explained in section 3.1 and in figure 3-1. Periodic meetings of the steering committee (including representatives of the collaborative parties) were planned at the design stage of the project. These meetings were held to assess progress, formulate strategies and generate new objectives and questions. Representatives of DEFRA attended most of these meetings and had an opportunity to contribute to the reflection and planning. The project statistics, such as the number of products leased and lost by that point were presented at these meetings.

Final reflective workshops to record and discuss the learnings gained, were also planned at the design stage. Two separate final workshops were held with the collaborating

participants, the company providing infant products and the parental charity. Participants in the workshop with the manufacturer included the company's Managing Director, a Technical Director, a Marketing Executive and the researchers. The parental charity workshop involved the Project Manager at the charity, its Marketing Director and the researchers. The purpose of these workshops was to summarize findings and learning outcomes, i.e. to address the question stated in the introduction "*what learning outcomes can businesses derive from the implementation of a small scale use orientated PSS based around infant mobility equipment*?" The workshops collected qualitative data. However, as a follow-up to the workshops they also collected the sales and other data, which is presented in graphical format in section 5 of the report. These workshops had their own limitations: the researcher conducting the workshops had been involved with the organization and therefore there may be issues of bias. However, this limitation has been mitigated by a robust record trail: the workshops were digitally recorded and independently transcribed by an agency. These recordings are evidence of due diligence in the research. That data has then been analysed using NVivo.

3.9   In-Depth Interviews – Consumers

During the pilot, 32 ethnographic, semi-structured interviews were conducted. Those participating were aware of the PSS offering and some were already renting infant products. The participants were recruited through the parental charity's web site. Eleven participants were not renting any products, however 14 were renting car seats, one was renting a pushchair, one was renting a carrycot and a number rented a combination of products. Appendix B gives details of the participants and the products and product combinations they rented.

These participants were interviewed in their homes (as is typical with ethnographic interviews) to ascertain:

- the type of product that the participant had rented if they had rented products;
- what condition the product was in and how it was stored;
- whether the packaging had been kept;
- The location of the house in respect to retail outlets (one possibility was that people living far from retail outlets might be more likely to shop online and book the PSS online)
- Any clues about the ways in which the products were used.

Participants were selected with a purposive sampling strategy amongst a number that had volunteered to be interviewed. Interviews were recorded, transcribed and then analysed in NVivo. Finally, they were interpreted in the light of the theoretical frameworks outlined in 3.3.

The section below illustrates how PCP was used.

3.10 Repertory Grid Technique (RGT) survey

This research was conducted during the implementation of the pilot study, as it was thought that awareness by the charity's membership of the PSS offering would make it possible to conduct a survey that included questions on PSS. To see how a sample of potential pushchair users construed acquiring pushchairs in different ways (including through a PSS) from the PCP perspective, the researchers conducted a "Diagnostic Survey" (cf. Fransella 1985, McGettigan et al. 2013, Reed and Page 2016) using Repertory Grid Technique. Repertory Grids are unusual in that they include both qualitative and quantitative data in the *same* inventory. They are not "off-the-shelf" questionnaires, but are created and tailored to address the specific research question being asked (Fransella et al. 2004). Their aim is to collect highly focused data relating to the construing of a given population towards a specific issue, in order to gain an in-depth understanding of why people are behaving as they are now and/or how they are likely to behave in the future in a given context.

The Diagnostic Research Method consists of three stages:

Stage 1: In this stage qualitative data was collected by conducting 10 one to one structured, confidential interviews using PCP techniques to generate bipolar constructs (e.g., *hygienic - v- unhygienic*). The interviews were conducted with either expectant mothers or women who had young children. The purpose of the interviews was to elicit the bipolar "personal constructs" that the sample was using to construe different ways of acquiring pushchairs.

To elicit a representative sample of personal constructs from a homogeneous population in a particular setting, only small numbers of people need to be interviewed and, indeed, it was found that many of the same constructs were elicited from different interviewees.

The main technique used in the interviews was the PCP technique known as the "Triadic Method" (Kelly 1955). That method involves a participant being presented with three index cards (a "triad") at a time from a selection of cards. In this case, there were 12 cards and on each card, a different "element" (i.e. a way of acquiring a pushchair) was written. The elements were:

1	A brand new pushchair bought off a website
2	A pushchair bought from a friend
3	A fully refurbished pushchair that is rented to you by a pushchair company
4	A second-hand pushchair bought on eBay
5	In your opinion, the ideal way to acquire a pushchair
6	A pushchair used by another child in your family (a "hand-me-down")
7	A second-hand pushchair bought from a neighbor
8	A pushchair you see dumped at a waste recycling centre that you take home
9	A pushchair acquired through an NCT "nearly new" sale
10	A brand new pushchair bought from a specialist pushchair shop
11	A pushchair that is lent to you by a friend
12	A second-hand pushchair bought through an advert in a newsagent's window

Interviewees were asked to think of ways in which two of the elements in the triad presented to them were alike, but different from the third. When they gave their answer (e.g., *hygienic*), they were then asked for their subjective opposite in meaning (e.g., *unhygienic*) thus making a full bipolar construct i.e., *hygienic -v- unhygienic.*

To elaborate the meaning behind the construct labels, the PCP techniques of "laddering" (Hinkle, 1965) and "pyramiding" (Landfield, 1971) were also used in the interviews. A person's personal constructs do not exist in isolation, they are arranged in a hierarchical system with some being more important, value laden constructs ("superordinate constructs") and some being less important, more 'concrete' constructs ("subordinate constructs"). Laddering was used to elicit superordinate constructs, whilst pyramiding was used to elicit subordinate constructs.

Stage 2: Each of the constructs elicited in the one to one interviews was written on a record card and, after considerable discussion, the cards were sorted into piles of cards with similar meanings. The categorisers then decided on an appropriate "bipolar theme" to describe

each pile of constructs. These bipolar themes became the constructs used in the Repertory Grids.

Stage 3: Repertory Grids are a matrix form of questionnaire. The style of the matrix form used in the Diagnostic Research method, is to have a different element (i.e. a different way of acquiring a pushchair) on a separate page and underneath have rows consisting of the bipolar themes (the constructs), with a 7 point rating scale for each row. The elements used in the Grid were:

Table 3-4 Elements used in the Repertory grid

1	Buying a brand new pushchair online
2	Buying a brand new pushchair from a baby products shop
3	Buying a second-hand pushchair on e.g., Facebook or eBay
4	Buying a pushchair from a neighbor
5	Acquiring a pushchair that has been used by another child in your family or from a friend (a hand-me-down)
6	Hiring/renting a fully refurbished pushchair from a pushchair company
7	Acquiring a pushchair at an NCT nearly new sale
8	In your opinion, if you acquire a pushchair in the best possible way...

The authors decided that some of the approaches to acquire pushchairs (the elements) that were used in the one to one construct elicitation interviews were too similar to make it worth including them in the Repertory Grid used in the survey. The following elements were determined to fall into this category:

• A pushchair bought from a friend (too similar to 'Buying a pushchair from a neighbour').

• A second-hand pushchair bought through an advert in a newsagent's window. The researchers thought that this was too similar to 'Buying a second-hand pushchair on, e.g. Facebook or eBay'.

The element 'A pushchair lent to you by a friend' was considered to be too vague for use in the repertory grid, because too much further information (i.e. the precise terms on which it was lent) would have been needed by respondents to apply some of the constructs to it.

The element 'A pushchair you see dumped at a waste recycling centre that you take home'. This element was omitted from the repertory grid because although it represented an 'extreme' mode of acquisition that was useful for the purpose of comparing and contrasting elements in the construct elicitation interviews, the authors agreed that it was not likely to add useful information if it was included in the repertory grid. Indeed, it is very rare to see this acquisition behaviour cited in any literature on infant mobility.

Respondent fatigue was also a consideration in removing the elements in what was, in any event, a long questionnaire.

Table 3-5 The constructs used in the Repertory grid

1	Means that you know what condition the pushchair is in before you acquire it -v- Means that you cannot be sure what condition the pushchair is in before you acquire it
2	Is not an "environmentally friendly" way of acquiring a pushchair -v- Is an "environmentally friendly" way of acquiring a pushchair
3	Means that you are doing the best you can for your child -v- Means that you may not be doing the best you can for your child
4	Means that you don't have anywhere to go back to if there is a problem with the pushchair -v- Means that you do have somewhere to go back to if there is a problem with the pushchair
5	Means that you cannot be sure that the pushchair is coming from a source that you can trust -v- Means that you can be sure that the pushchair is coming from a source that you can trust
6	Means that you can do what you like with the pushchair -v- Means that you cannot do what you like with the pushchair because it is going to be handed over to someone else
7	Could be a complicated way of acquiring a pushchair -v- Is probably an easy way of acquiring a pushchair
8	Is likely to be an expensive way of acquiring a pushchair -v- Is likely to be a cheap way of acquiring a pushchair
9	Is going to be seen as a "high status" way of acquiring a pushchair -v- Is going to be seen as a "low status" way of acquiring a pushchair
10	Means that you can be sure that the pushchair is in a hygienic condition -v- Means that you cannot be sure that the pushchair is in a hygienic condition
11	Means that you can be sure that the pushchair is safe to use -v- Means that you cannot be sure that the pushchair is safe to use

The Repertory Grids were uploaded onto the Qualtrics website, which participants accessed through a link distributed by the parental charity via e-mails to their members.

Participants were asked to rate each of the elements on each of the constructs, using a 7-point rating scale. In the Repertory Grid used for this survey, there were 8 elements and 11 bipolar themes (constructs), so each participant could provide a possible 88 "cells" of ratings data. In addition, in order to get a measure of the relative importance of the constructs, participants were asked to rank the constructs in order of personal importance to them (equal rankings were not allowed). This combination of rating and ranking data enables a very detailed understanding of participants' construing of different ways of acquiring pushchairs to be obtained. The questionnaire also contained several questions relating to demographic and other variables. These related to: gender; age; ethnicity; number of children in the participant's family and household income. In addition, questions about the following were included:

1) pushchair ownership (and, if a pushchair is owned, the means by which it was acquired);

2) whether the participant thinks that hiring/renting a pushchair is a good idea;

3) whether the participant has ever hired/rented a pushchair;

4) whether the participant thinks that renting a car seat is a good idea and whether the participant had ever hired/rented a car seat.

When statistically compared, none of the sub-groups in the demographic and other variables was significantly different in their responses, so there will be very few references to these variables in the Findings section.

3.11 Limitations of the perspectives and methods used

3.11.1 Limitations of AR strategy in the project

The model of AR selected (see 3.6) brought limitations to the project, which were explained in section 3.1, in particular the possibility of bias and role ambiguity as well as independence in performing the evaluation (Johnsen and Normann 2004). This design was selected because the original brief from DEFRA had not specified an independent evaluation and costs considerations would have made the involvement of a further independent evaluating agency challenging. These limitations were mitigated to *some* extent because the researchers were removed from the "business" side of the pilot. The manufacturing partner and the charity handled the evaluation, collected and independently analysed performance

data. One overarching limitation in the project derives from the characteristics of the sample, which being composed of members of the parental charity, consists predominantly of white, high-income consumers.

3.11.2 Limitations of CCT and PT Frameworks

As explained in section 2.5 the aim of using CCT and PT was to address the limitations of the established behavioural change perspectives explaining consumer behaviour through rational decision making, in particular because of the lack of consistency between values and attitudes of consumers and their actions. However, the two approaches have their own limitations. CCT and PT both use qualitative data, which offers detail but it might be difficult to generalise the results to a wider population as they are highly context specific. In CCT, in particular there is a risk of social desirability affecting the claims by participants (Silverman 2003), also known as the "Hawthorne" effect. The small size of the sample and the direct involvement of the interviewer challenges the trustworthiness of the results to some extent. Those participating in the interviews were self-selecting and the majority of the participants had already made a decision to rent at least one product. The small scale of the research was a result of the resource limitations of the project. The small size of the sample might be problematic because it may limit credibility and transferability by reducing the number of "voices" that can be heard by having a small number of participants (Lincoln 1995, Seale 1999). These limitations encouraged the researchers to consider the use of an additional perspective (PCP) and method (Repertory Grid Technique), which could communicate with CCT and PT and collected quantitative data.

3.11.3 Limitations of PCP

PCP and its methods also have limitations. PCP is often criticised for not taking sociocultural influences on construing sufficiently into account (Fransella 1995). However, Kelly (1955) did recognise "that all experience must be appreciated in its cultural setting" (Burr et al. 2016). Even so, whilst sociocultural factors were appreciated by Kelly, he "was more interested in how individuals within particular subcultures made sense of their positions" (Ibid. 155). This is not surprising because the original focus of PCP was in the clinical context with individuals rather than groups. However, since those early days, PCP has often been used in social contexts (though still not as often as in clinical ones) and several books have been written on the relevance of PCP in social, cultural and group settings (e.g., Stringer and Bannister 1979, Kalekin-Fishman and Walker 1995, Scheer 2000). However, PCP is deliberately "content free" and does not impose the researcher's construing the population being studied. Whilst that impartiality is a strength, most contexts have benefited from previous studies that can very usefully inform work that is done with PCP. CCT and PT are examples of the

results of studies that have directly focused on a sociocultural perspective. Without the insights that come from such theories in a consumer behaviour setting, PCP methods could run the risk of failing to investigate consumer construing that is socioculturally based.

A specific limitation of the application of the PCP based Repertory Grid survey in this project was the relatively low response rate (and some survey participants dropping out after starting the survey). This resulted in relatively small sample sizes and this might have implications for the robustness of the results. Another limitation was that by far the majority of the sample consisted of white, female, middle class people. Whilst, for that reason, the sample was not representative of the pushchair buying population in general, it could well have been fairly representative of the white population of pushchair consumers.

3.12 Sense-making of the data

One of the limitations of using multiple perspectives and analytical approaches as described in the REBUS project is the incommensurability of perspectives and their associated interpretations (Blaikie 1991, Hammersley 2008). "Incommensurability" is a situation which prevents investigation of relationships between entities using competing (incompatible) systems of orientation because of differences in language and terms, lacking shared definition and solutions to problems and no accepted system of reference to evaluate the different perspectives exist (Scherer 1998). As CCT, PT and PCP measure different aspects of the phenomena investigated, the data by the three approaches needed to be analysed in parallel and sense then made of the findings.

Analytical approaches such as the ones described above were needed to draw usable insights from the project. However, these approaches had different objects of the investigation, individual consumers and their decisions for CCT and social practices for PT. PCP in turn tries to find out how people construe a particular place, thing, situation or another person(s). These perspectives initiate from different philosophical assumptions (Blaikie 1991, Kelly, 1955, Shove 2011), for example the assumption that consumers have agency and free choice vs the assumption that they are constrained in their consumption as described in section 2.5. Because of this, the analysis of the data had to be conducted separately and, in some cases, different members of the research team performed the analysis. Discussions had to take place so that the data and insights could be compared to ensure that a coherent story was generated. Figure 3-4 represents the research packages conducted in the whole project and attempts to illustrate the relationships between them.
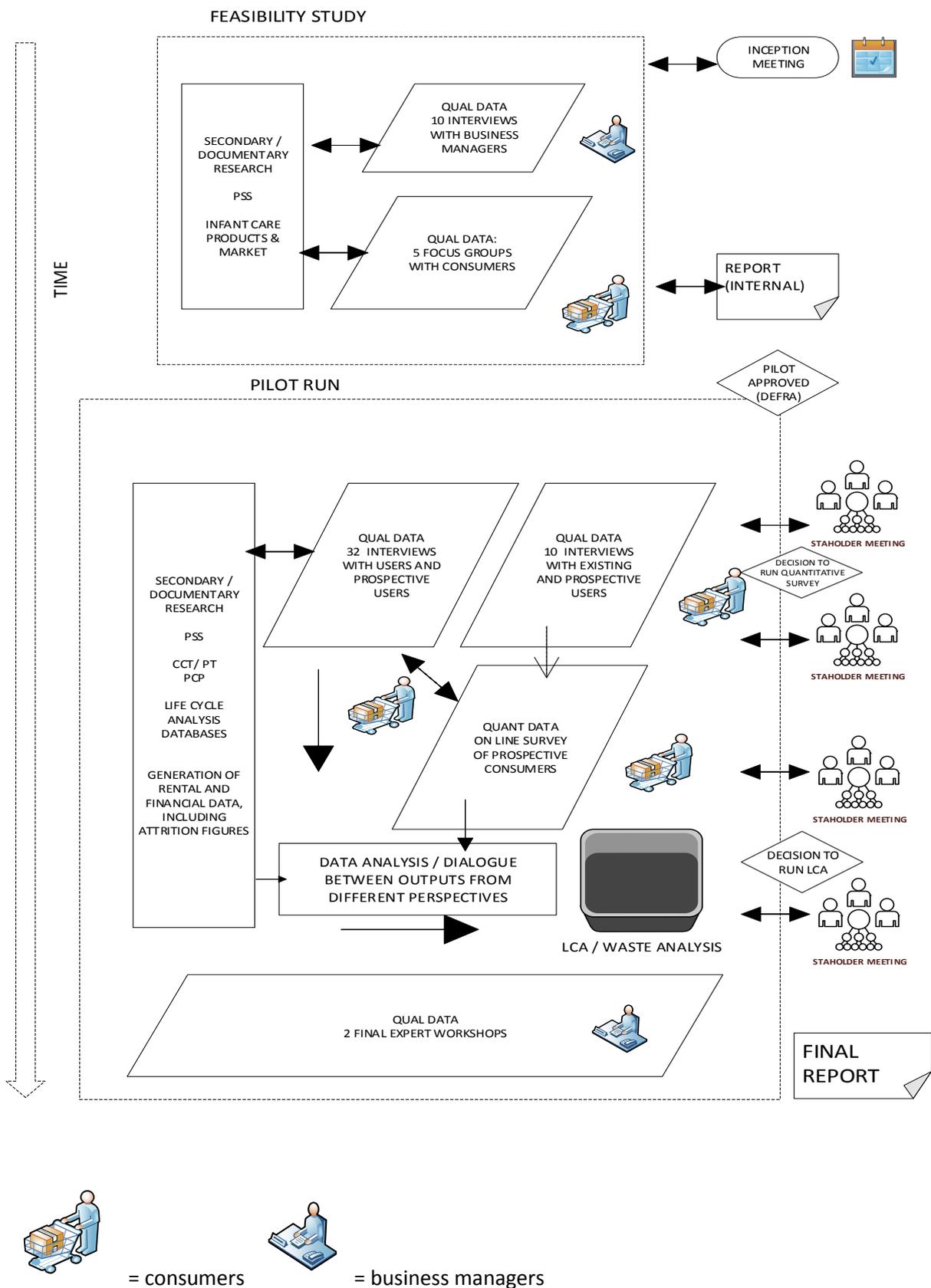
Figure 3-4 Action Research flowchart

Figure 3-4 represents the two stages of the project, the feasibility study and the pilot PSS. The flowchart represents the research packages in chronological order from top to bottom. In

the feasibility study, the researchers conducted the business managers' interviews and consumer focus groups as two independent research packages. The data was analysed independently and conclusions were drawn on the feasibility of the pilot, with a report being submitted to DEFRA. In the AR pilot, the perspectives of CCT and PT generated two streams of qualitative data that were analysed separately in parallel according to good research practice (Hammersley 2008, Shove 2011). The PCP Diagnostic Research survey was also conducted and analysed independently. A "dialogue" or juxtaposition, which aims to enrich knowledge *without* combining perspectives and methods (Hammersley 2008), represented by the arrows in figure 3-3, was conducted between the three sets of results, which account for different and equally important aspects of PSS adoption and consumption (Midgley et al. 2016). To enhance 'richness' (Fielding 2012) the research team discussed the insights generated by these different streams of data. Indeed, there are examples where data generated common themes, e.g. health, safety, and contagion that represent the same concerns consumers have about PSS. This process enhanced the robustness of the findings.

3.13 Trustworthiness of methods and data

The trustworthiness and robustness of the approach can be documented by the qualitative and quantitative data held both separately and within the NVIVO and Qualtrics files. The project received ethics clearance from the University of Hertfordshire's Ethics Committee. In compliance with the clearance, the personal data of the participants is confidential; therefore, the recordings have been kept in secure conditions. The recordings were checked to ensure that participants could not be identified from the data.

3.14 Recruitment of consumer participants

Participants were recruited both to investigate the likely response to PSS before the implementation of the pilot; and during the pilot, to explore actual response whether the participants were users – and what products were they using – or non-users. Recruitment took place in the following ways:

- Participants to the pre-pilot (feasibility) stage were recruited from the parental charity's membership, through the parental charity in exchange for a modest fee paid to the charity. Participants took part in five focus groups. As mentioned above, most of the focus groups were conducted in a nursery in Enfield. One focus group was staged in a different location, a community centre in Welwyn Garden City.

- Participants for the pilot PSS were recruited through the following process:
  - The participants would visit the parental charity's website where they had been shopping for infant equipment and were reviewing information on the PSS
  - They would click on a link that would take them onto the REBUS' website. There they would be informed about the research and offered a £20 gift voucher as a "token of gratitude" for participating in the interview. They would then fill in their details on the web site
  - Finally, they would be contacted by the research team

The participants in the focus groups and interviews were both selected using the parental charity membership with a purposive sampling strategy. This is common in qualitative research (Hoepfl 1997, Silverman 2003) and in REBUS it was necessary because participants had to be new parents or would be parents, the strategy was therefore adopted to ensure participants met these conditions (cf. Robson 2011). A limitation of this strategy is bias deriving from the subjectivity of the researcher's judgement. To address this an equal representation of different categories of participants, e.g. users and non-users of the PSS was included in the sample to ensure credibility by including opposing views (Seale 1999, Silverman 2003).

Finally, the participants to the qualitative stage of the PCP survey were recruited from the membership of the parental charity with a similar approach to the one described above and were selected with a purposive sampling strategy.

The participants to the quantitative survey were recruited as follows:

I. A link to the project Qualtrics web site[23] was sent through the parental charity membership
II. Participants would click on the link which would take them to the Qualtrics website where they could fill out the online questionnaire
III. Participants were offered the opportunity to take part to a lottery to win one £50 gift voucher.

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[23] An on line platform to administer data collection

4 Results

4.1 Barriers to PSS identified through the pre-pilot feasibility study

The use of infant car seats is a legal requirement for the transport of infants in cars. Car seats need to comply with UNECE Regulation 44 and Regulation 129 relating to restraining devices for child occupants of power-driven vehicles (Child Restraint Systems). Pushchairs and prams need to comply with standard EN 1888:2012 or BS EN 1888: 2003. It is necessary to test these products in a laboratory to ascertain the conformity of these products with the regulations. For example, correct working of primary and secondary locking devices and the condition of the safety harness has to be ascertained. The harness should be a secure five-point harness. Other components that need checking include wheel security and parking brakes.

As mentioned above, from the legal point of view, a PSS involving leasing of goods will often mean that the PSS is a regulated consumer hire business. At the time of the study, the operation of a regulated consumer hire business required a Category B Consumer Credit Licence (OFT, 2008). Carrying on such activities without a licence is a criminal offence. This means that the implementation of some types of PSS by businesses would require them to obtain such licenses.

In favour of PSS, the short useful life of infant products because of rapid infant growth may encourage interest in PSS. In 2013 it was reported that the birth rate in the UK had fallen by 4.3%, with a total fertility rate (the number of children per woman) falling from 1.94 to 1.85 (bbc.co.uk, 2014). The average age of first time mothers rose to 30, with over a quarter of live births to mothers born outside the UK (bbc.co.uk, 2014). These changes might make it more likely for families to have only one child, another aspect resulting in shortening of products' useful life and thus making relatively short-term rental of products more attractive. Finally, a wish to save money by selecting cost-effective offerings may shape the selection of materials used for PSS.

4.2 Business feasibility interviews

The participants in the interviews said that they saw PSS as a new business opportunity, e.g., to draw income from pre-used products at a discount and gain control of the second-hand market. Participants opined that this would benefit consumers because these products would be refurbished to supplier standard, therefore customer risk would be reduced and so would risk of reputational damage from failure of second-hand products. Business

opportunities could also arise from targeting segments of the market, such as consumers who are interested in environmental protection. However, participants claimed that parents would see environmental benefits as a secondary concern, well after affordability, health and safety. Participants said that they saw opportunities for brand and reputation enhancement as users could see the PSS as an environmentally sound offering. Interviewees also said that the PSS could facilitate compliance with regulations on recycling and waste reduction. Another benefit they saw for manufacturers was the opportunity to limit the power of retailers.

Interviewees claimed that they felt that financial advantages would be the main selling point for users. They said that they thought this would be particularly relevant at the time the interviews were conducted because that was when the UK was still in the wake of the 2008 recession. Interviewees also said that they thought that PSS might enable parents to avoid purchasing unnecessary products because they could try them first.

The views of most interviewees appeared consistent with the warnings by expert advisers to use new products such as car seats seen in section 4.1. Most suppliers expressed concerns about renting out pre-used products to consumers - even if they were refurbished, because of product liability. In some interviews participants reiterated that some infant mobility products, such as car seats are safety products and, if pre-used, they could have been damaged without the supplier knowing, resulting in compromised safety performance. There was also concern about possible damage to brand or reputation if any accident were to happen. This would perhaps result in the need for additional insurance cover.

Participants voiced concerns about refurbishing and remanufacturing operations. Interviewees included representatives from manufacturers and intermediaries and most said they felt that they could refurbish and reassemble equipment, but not their constituent parts. Some participants said that they would need partners or facilitators for these operations. Other issues: participants said that network partners could help with finance and insurance underwriting and management. Some thought that rented out products, especially pushchairs, would be returned in too poor a state to be used again.

Interviewees suggested that consumers could be diffident and suspicious about PSS and would wonder whether there was a "catch". Another concern they expressed was over conflict between the need to rent a product out several times in order to recover the investment, i.e. payback and the risk that consumers would not find such a product attractive because of obsolescence over the course of the lease period. Participants suggested that several cycles of use would be needed to break even and leasing would have become more and more challenging over time due to product obsolescence. This in turn would affect the

suppliers' cash flow. Participants also expressed concerns with the fashion value of pushchairs and the need for them to be current models. They claimed that this could limit the number of use cycles that could be extracted from a pushchair.

Interviewees said they were also concerned about the co-ordination of direct and reverse logistics, i.e. resources such as vehicles and drivers to deliver products to users and collect them after use. Another concern was to do with consumer service. If a product had to be collected from a user for service or repair, either a replacement would have to be issued or the product would have to be returned promptly, because users constantly need both pushchairs and car seats. In addition, if a consumer is continuing to pay the lease fee, he/she will expect to have a working product in his/her possession whilst the original product is under repair.

A conflicting aspect was the prospect of dealing directly with consumers (parents). A benefit perceived by participants was the insight that a direct relationship with consumers could generate. Participants also felt that such an offering would give them insights on product resilience and use when it was returned. Such a relationship would include opportunities to advise customers and possibly adapt products. This was contrasted with concerns about resources - in particular, the need to assemble consumer services operations, which would require new skills. Final concern were possible reprisals by retailers for what they could view as a circumvention and unfair competition by manufacturers and additional resources necessary to deal with consumers direct. Table 4-1 summarized the themes that emerged from the interviews as benefits and constraints. In the table, the items in bold match the themes identified by Mont (2002) (see 2.1)

Table 4-1 Providers' benefits and constraints

BENEFITS
Opportunity to draw income from pre-used, remanufactured / refurbished products
Gain control of the second hand market
Reputational damage from product failure is avoided if products are refurbished to professional standard
Opportunity to target consumers interested in environmental protection / brand enhancement
Facilitate compliance with regulations, e.g. extended producer responsibility
Opportunity to limit the power of retailers
Reduce passages of distribution
Offer users financial advantages by renting
Risk reduction for consumers (they would not buy unnecessary products)
Dealing directly with customers offer opportunities to better understand them
Closer relationship with customers
Opportunity to educate customers

CONSTRAINTS / BARRIERS
Risks of renting out pre-used products – e.g. if they failed in use, causing product liability
Car seats are safety products and could have been damaged in use
Possible damage to brand and reputation if product fails
Refurbishing and manufacturing operation require competence and resources
Finance management and underwriting is necessary
Risk of attrition, e.g. damages to products by consumers in use
Product needs to be rented out several times to recover investment; this might be difficult because of obsolescence
Direct and reverse logistics require co-ordination and resources
Dealing directly with customers requires resources and new competences

4.3   Focus groups for the feasibility study

This section summarizes the findings of five consumer focus groups (FGs) the aim of which was to explore the infant mobility PSS concept as part of the feasibility study. The findings of the focus groups suggested that, overall, participants seem favourable to the idea of the infant mobility PSS described to them, built around pushchairs and car seats for leasing.

Participants associated the PSS concept with the flexibility deriving from a subscription system, where equipment would be replaced seamlessly as the infant grew. The participants gave examples of when pushchairs suitable for early days could be replaced by different 'sitting up' pushchairs. Parents also said they expected to be able to swap colours when having two children of different genders. A PSS could therefore offer consumers an upgradable, flexible offering with reusing, recycling and remanufacturing built in it. Financial and space savings were seen as important benefits of PSS. The participants' rationale for whether using PSS or not was articulated around the themes of space, time and cost. For example, products that were perceived to be costly in relation to the duration of use were seen as being more suitable for rental or lease. Leasing or renting a product e.g., a pushchair, appears to be considered by participants as an opportunity to try a product before purchasing it. This could avoid the risk of committing to a product and not finding it satisfactory. For example, parents buy pushchairs and other products before birth and it might happen that they buy a product in a colour which turns to be unsuitable, e.g. when buying a blue pushchair and a baby girl is delivered - still an issue even in current times.

In the discussion, PSS was associated with environmental protection, but this seemed to be an important concern only for some of the participants. Pushchairs and car seats especially were seen as wasteful, as they outlast an average use cycle and eventually end up in lofts or in landfill, although some participants were optimistic about being able to recover some of the value of pushchairs, e.g., by selling them on e-bay.

More expensive, top of the range products were seen as more suitable for leasing. Double pushchairs were deemed as especially attractive for leasing because, unless a family has twins, they are used for short intervals as the older child grows. This means that such a product is wasteful, so respondents seemed to be very interested in leasing it. Furthermore, big gaps between children would definitely make this a valuable proposition, especially since products could in the meantime also become obsolete. However, for some participants, the possibility that the equipment could be used for more than one infant may make it seem more cost-effective for purchase than lease.

Participants expressed concerns that they could get obsolete products in the PSS, as they conceptualized it as being constituted mainly of pre-used, refurbished products. Participants said that older, old fashioned and remanufactured or refurbished models should be charged out at lower prices. They suggested that any green claims made on the PSS would need to be supported by a certification system. An expressed concern about leasing/renting was the responsibilities perceived as being attached to it, e.g. liability if the product was damaged and the complexity of the paperwork involved in leasing. Leasing and renting were also

considered stigmatizing and damaging to the consumers' self-image. An example of this might be a situation where the brand attached to the product was that of the leasing company, as opposed to the manufacturer.

Participants' responses differed between first time parents (who tended to be more emotionally engaged with the products, especially pushchairs) and experienced parents (who tended to exhibit a more "practical" approach). The more experienced parents tended to compare the rented product of the PSS with pre-used (second-hand) products. This seemed to make them look at the proposed PSS unfavourably because they seemed to think that it would be more expensive and involve responsibilities such as regular payments. Participants claimed that they would take care of the product better if they were leasing it, because of expected liabilities.

Half the participants said that they would prefer purchasing, rather than leasing pushchairs, as they would feel an emotional bond with the product. This was particularly true for first time parents. In addition, these products are often gifts, e.g. from grandparents. In these cases, the products could have a powerful symbolic value. Pushchairs were seen as important for consumers' identity construction.

Quality Assurance[24] (QA) emerged as an important success requirement of a PSS and participants expressed concerns about the condition the product would be in because of being pre-used, including health and safety. Contagion[25] was often mentioned (cf. Bardhi and Eckhardt 2012). Participants also expressed concerns about the history of the product before it was delivered to them. This seems to confirm that a quality assurance certification system may be necessary to reassure consumers.

For information and advice, participants say that they would look at online and offline forums and help groups. Parents also consult health practitioners and peers for information on the practices of parenthood, through virtual environments and social networks, as well as other parents. Participants seemed to think that seeing celebrities renting products would help legitimize the PSS. Endorsement by experts (the NCT for example) would be another way for the PSS to be legitimized.

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[24] QA here is defined as "a planned and systematic pattern of all actions necessary to provide adequate confidence that the item or project conforms to established technical requirements" (Gupta, 1989, 56).
[25] Contagion was explained in Section 2

4.4 Summary

In the negotiations with the organizations that became the eventual collaborative partners in the research, several factors led to the eventual design of the pilot:

- The interface with the participants would be the parental charity. This was thought to be the best strategy because the charity had a member database that could be used to enrol participants through their web site. Furthermore the charity had previous experience in renting infant products and other maternity products, e.g. TENS machines. In contrast the manufacturer had no experience of direct marketing to consumers

- The charity also offered considerable research expertise and understanding of the market (and parents) which would be useful as an input in research. At the time, it was also felt that the charity enjoyed a considerable credibility in the infant mobility sector, as being a charity, participants said they perceived it as an "honest broker".

- The manufacturer could call on a state of the art repair workshop where the refurbishing process could be performed efficiently. In addition the company had an ongoing relationship with a logistics company that could perform the necessary operations of direct and reverse logistics

- The legislative constraints explained in section 4.1 meant that a PSS requiring users to pay a monthly fee would have required the acquisition of a Consumer Credit License (CCL). This is a long process and involves costs. The research team took the view that it was not worth making such an investment in terms of time and resources for what was to be a short term research project

- Although the charity had acquired a CCL shortly before the pilot implementation, they had no resources to collect money from what became a quite large number of users (as can be seen in the following sections). This was the reason why a six months standardized lease with one payment in advance was selected as an option. It did not call for administrative resources to collect many monthly payments and it did not require a CCL because it only required one payment, a maximum of two in one year in the event of a user renewing the lease.

5 Narrative of pilot and findings

5.1 The blueprint for the project

Drawing on the results of the feasibility study, when designing the initial blueprint of the project, the research team intended to have a PSS where:

- Parents would be able to rent pushchairs with a flexible lease, so that they could discontinue the lease when required
- A thorough refurbishment of the products that were returned by users would be performed, with as many of the components as possible recycled for reuse
- The desired payment would be a monthly fee, which would make the PSS affordable
- Only a small upfront deposit would be required, in order to minimize the entry barriers to the offering
- Other products were considered in addition to pushchairs, for example car seats, baby grows and reusable nappies

The PSS blueprint was shown in Figure 3-2. Because of the nature of the project, which consisted of designing a working business operation where products would be rented to "real" parents, it was essential to work with collaborative partners which were businesses already engaged in the market. Once a date was agreed to conduct the pilot, a Steering Committee (SC) was established to manage the running of the pilot.

The SC of the project made a set of decisions such as the nature of the relationship with parents and the maximum amount of work that would be done on a returned product i.e. the "threshold" beyond which products would not be refurbished and reissued. This was based on:

- Available resources to refurbish products in the manufacturer's workshop
- Cost
- The fact that the products used for the pilot were not designed for recycling and indeed PSS

The results of these decisions was that, depending on the condition of the products when they were returned, not all of them would be refurbished and a proportion would be disposed of and written off. It would not be possible to recycle all components because funding limitations constrained the design of recycling and reuse processes. In addition, the refurbishing process would be standardized based on a costing model, which was agreed by the partners.

Because of a number of constraining factors, which are explained in section 4.4, the leasing was not based on a monthly fee and an initial small deposit. Instead, the participants paid an upfront fee.

5.2 Challenges of action Research as academia-Industry collaboration

Section 3.1 presented Cook's et al (2006) concerns about the difficulties of PSS specific knowledge transfer from academia to industry. The UH research team approached the REBUS project with an appreciation of these challenges and guidelines and with the recommendations by Ceschin (2013) in mind. A finding in itself is that despite these design strategies, the formation of the collaborative consortium presented considerable challenges, with an inception period of over a year. Indeed additional issues arose during the implementation, in particular in respect of the sharing of financial information the researchers wanted to investigate the financial viability of the PSS and other information to assess the environmental performance of the PSS. The former type of information was not shared by the manufacturer because of the confidential nature of the information, the latter because of the decentralized nature of the manufacturing processes of the industrial partner, which meant that critical information had to be forwarded by organizations based in other parts of the world, who were manufacturing partners to the industrial partner. The flow of both types of information was affected by the decentralized nature of the industrial partner's operations. Furthermore, as explained in 5.1, the attempt by UH to design a PSS based on a monthly fee payable by users clashed with expertise and resource limitations in the industrial and charity partner, which therefore limited the knowledge transfer, despite the valiant encouragement by DEFRA.

5.3 Detailed report on the pilot

The pilot started in January 2014, when it was advertised on the parental charity's website. In the period between January 2014 and December 2015 (when the pilot concluded), a total of 892 physical products had been leased to parents, of which 827 were car seats and car seat bases and 65 were pushchairs. A number of products were leased multiple times and 183 were leased two or more times to the same lessees. Because of this, the number of users does not match that of the products leased. 1048 leases were achieved, made up by access to 672 car seats with 251 bases, 56 carrycots and 59 pushchairs and accessories. Number of leases here means the number of times the products have been issued to parents. Table 5-1 summarizes these statistics.

This performance exceeded initial expectations from the feasibility study. In fact, the original objectives were conservative and at one point were quantified at only 30 users (leases). In this respect, the project was very successful.

Total physical products	892
Car seat and accessories	827
Pushchairs	65
Total accesses (leases) to products	1048
Products used accessed in two cycles	182
Products used accessed in three cycles	30
Products used accessed in four cycles	8

Car seat leases represented a larger proportion of the total leasing volume, with 923 accesses to 827 car seats/ Isofix base combinations. Thus, the pilot was far more successful for car seats than for pushchairs, which represented just 7% of the leases. Figure 5-1 summarizes the breakdown by volume of products, whilst Figure 5-2 summarizes the breakdown by value.
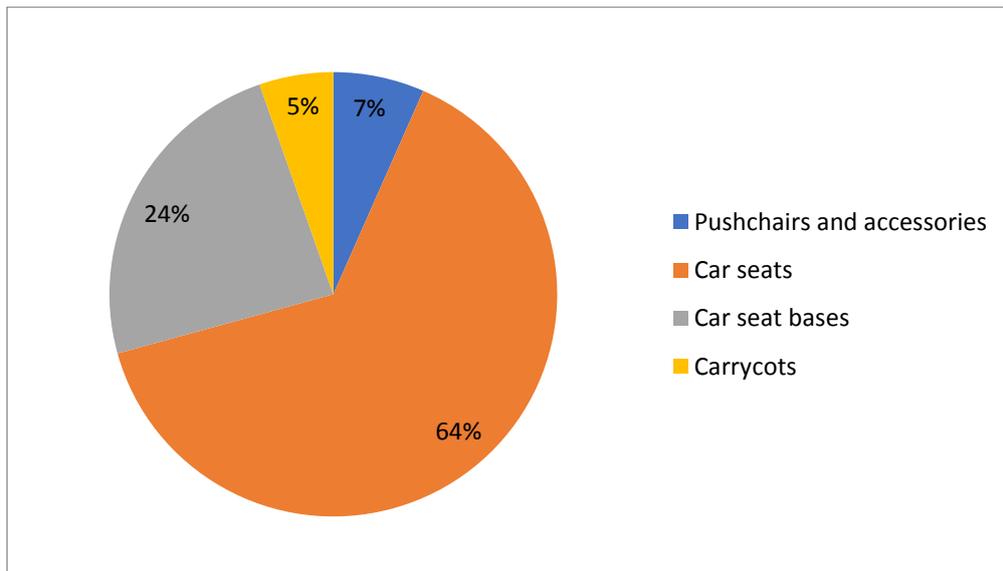

Figure 5-1 Breakdown of product type by volume

Figure 5-2 shows that whilst pushchairs made up only 7% of the accesses, they amounted to 15% of the value. The contrast is explained by the significant difference in prices between

car seats and pushchairs. A Quinny Mood for example, the most expensive pushchair featured in the trial, had at the time a trade price of £435.95, compared to a MC Pebble, the most expensive car seat in the trial, which had a trade price of £137. The lease fees for unit time of access were in proportion to these differences.
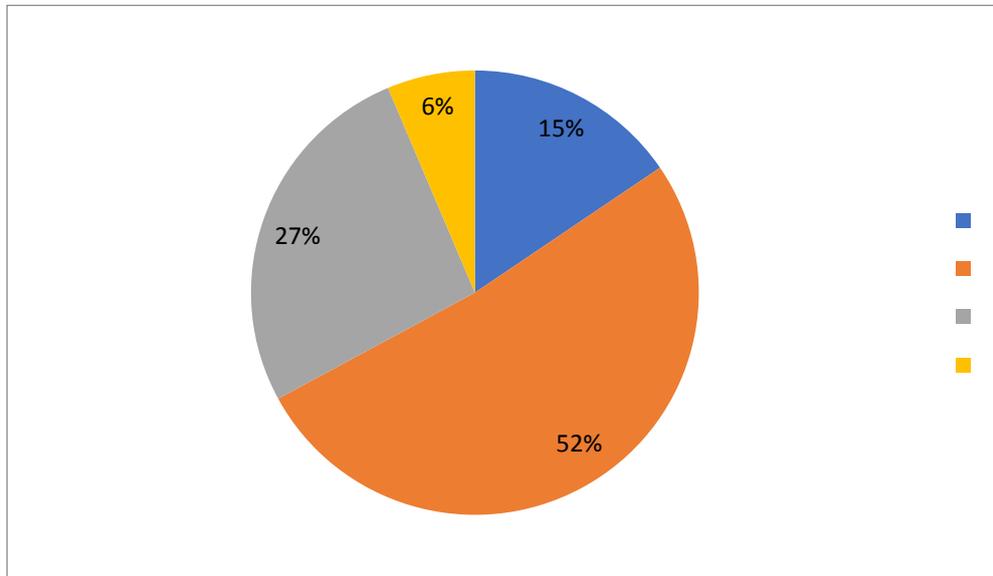
Figure 5-2 Breakdown of product type by value

Table 5-2 shows the geographical distribution of the products, which sees a considerable concentration of the leases in London.

Table 5-2 Geographical distribution of products

Region	Car Seats	Strollers	Totals	%
England (Excl London)	481	51	532	58
Wales	9	0	9	1
Scotland	32	2	34	4
London	305	12	317	37
Totals	**827**	**65**	**892**	**100**

5.4   Attrition

At the end of the pilot project, 63 units had to be written off (because they were damaged beyond economic refurbishment) and 16 were not returned, making a total attrition rate of 79 units. Attrition rate is defined as a calculation of the number of individuals or items that vacate or move out of a larger collective group over a specific period (Morris et al. 2003,

Terry 2007). In this report, attrition is defined as the number of car seats or pushchairs that are written off through damage or failure to return the items by customers at the end of the lease term. Consumers tended to retain car seats longer than six months and the manufacturer had to make considerable efforts to recover the products, e.g. due to difficulties such as contacting users to collect equipment at the end of the lease period. The attrition of 79 products represents circa 8.8% of the physical products. This could be problematic for the viability of a similar PSS, considering that only 20.4% of products were accessed at least twice. Figure 5-3 summarises the observed attrition by product.
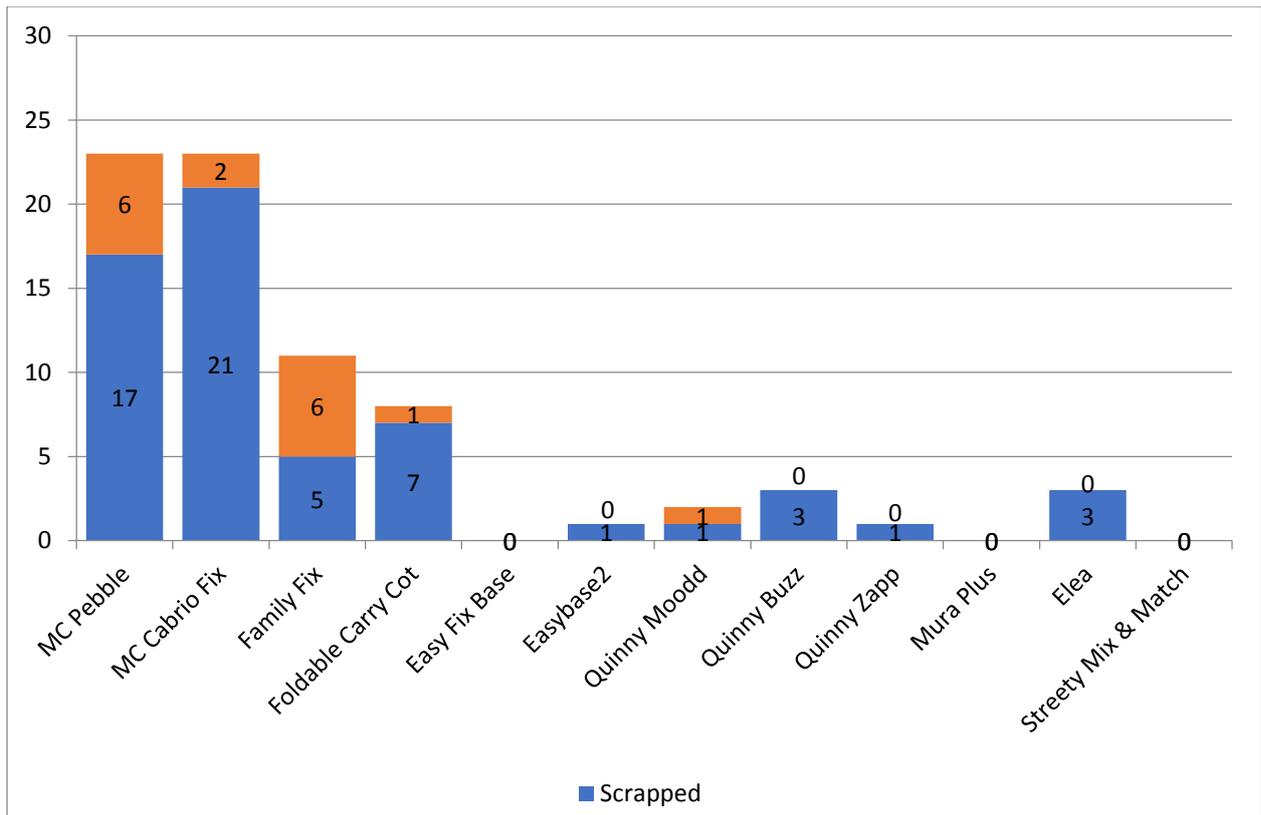

Figure 5-3 Products written off and not returned

Products were written off after loan periods one and two, respectively 6 pushchairs and 41 car seats and associated bases and accessories after the first cycle; and 1 set of accessories, 13 car seats and bases and 2 carrycots after the 2nd cycle. Tables 5-3 and 5-4 summarize the details.

Table 5-3 Products not returned after the first cycle

PushChairs	Car Seats
3 X Elea	18 X Pebble
2 X Buzz	15 X Cabriofix
1 X Zapp	5 X Family Fix Base
	2 X Foldable Carrycots
	1 X Easybase 2

Table 5-4 Products not returned after the second cycle

PushChairs	Car Seats
1 X Mix & Match Accessories	6 X Pebble
	6 X Cabriofix
	1 X Family Fix Base
	2 X Foldable Carrycots

An additional issue is the concentration of accesses to a reduced number of products. This is commonly known as the "Pareto effect", where a small proportion (e.g. 20%) attracts a much larger proportion (e.g., 80%) of trade. In our case, a small proportion of car seats were accessed, the Pebble (121) and the Cabriofix (203) models, 324 in total. As a proportion of the products issued this is circa 36%. However, the proportion is even higher in terms of uses on access.

5.5   Multiple use of products

Figure 5-4 represents the share of car seats used. The access to use of pushchairs across six models of pushchairs is much more evenly distributed, but these products represent only a small proportion of accesses.
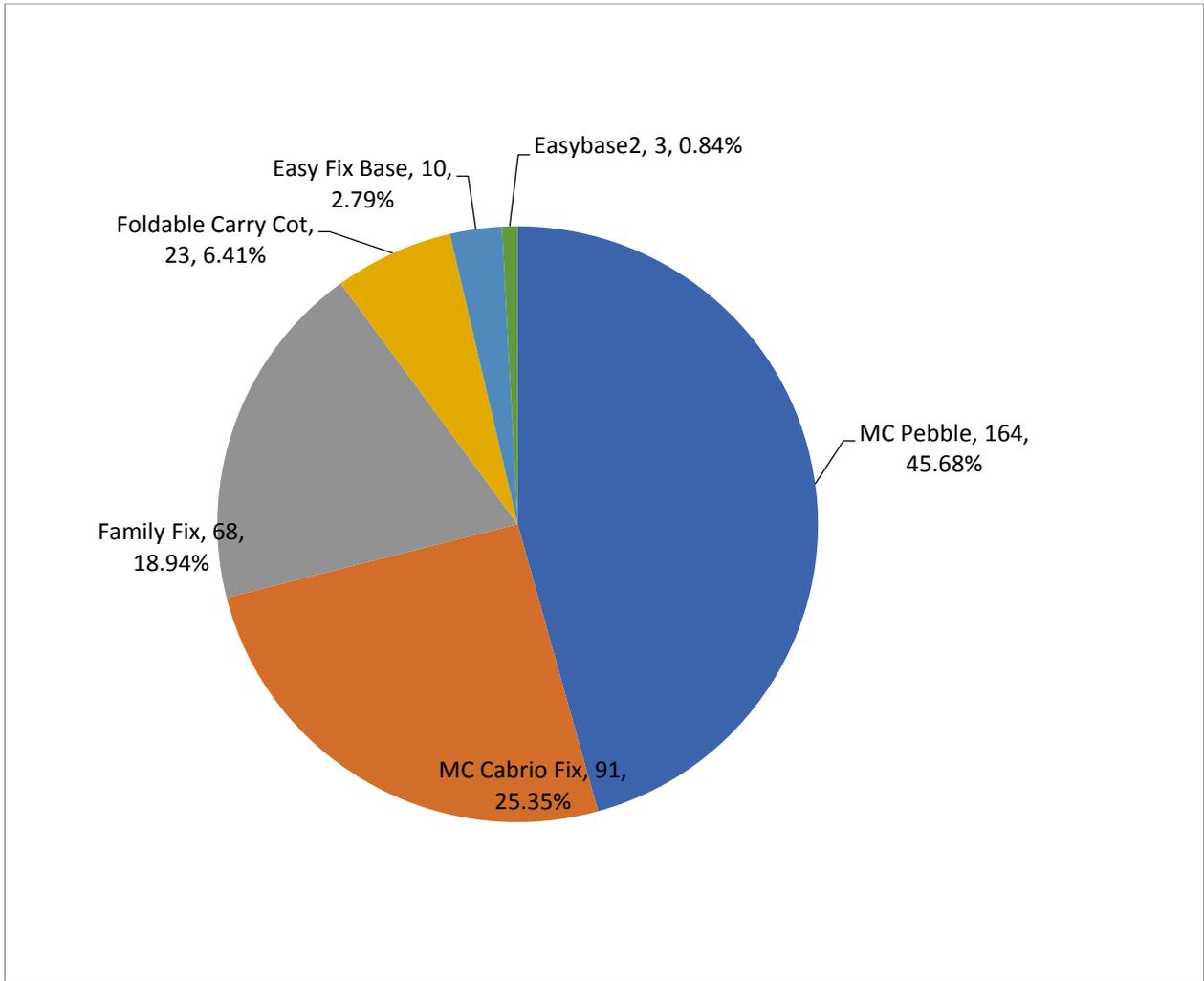
Figure 5-4 Breakdown of leases in types of car seats

Figure 5-5 shows that the Pebble and the Cabriofix car seats have been reissued far more times than the other products. Figure 5-6 shows that this difference is even greater as the Pebble car seat has an even greater share of the accesses. Figure 5-7 shows a more balanced picture for products issued four times, however as it can be seen this is a very small proportion of the accesses, so it might be not as representative. What we do not know, however, is what would have happened with multiple uses if the pilot had lasted longer.
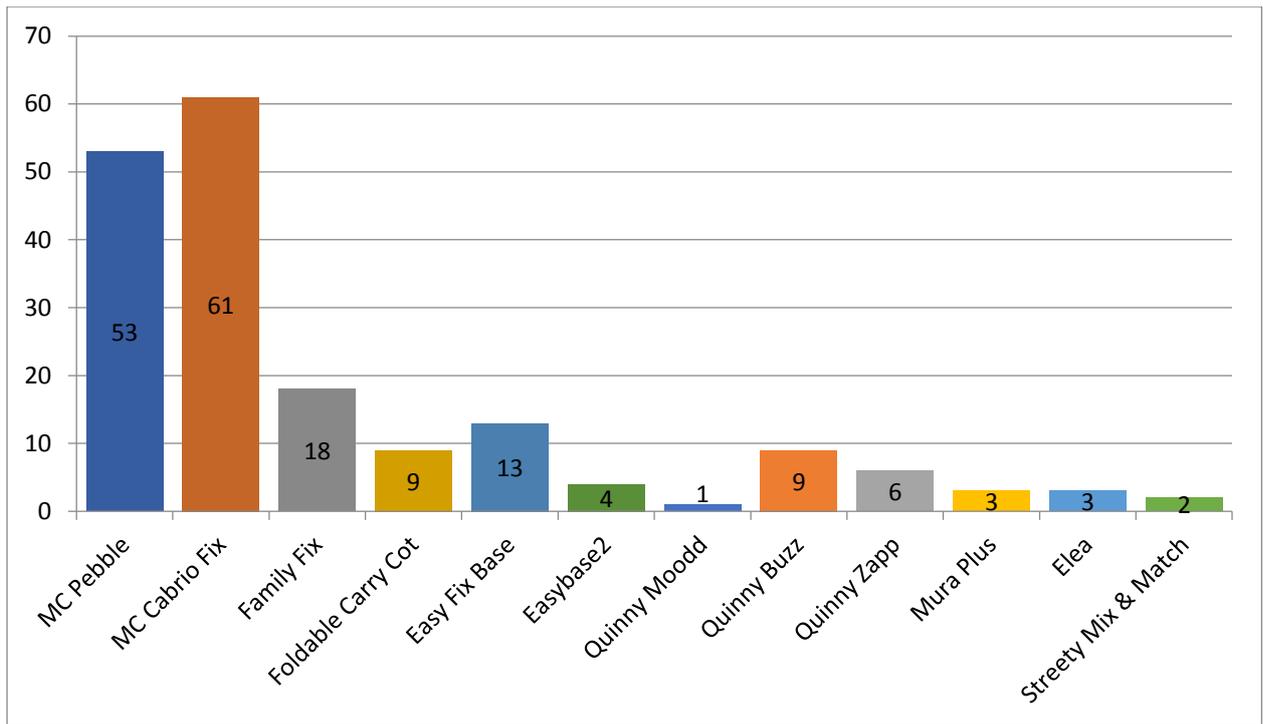
Figure 5-5 Products accessed two times

Figures 5-7 and 5-8 show that two types of products achieved the greatest proportion of multiple uses in the pilot. Figure 5-6 and 5-7 show that some products achieved three or more uses
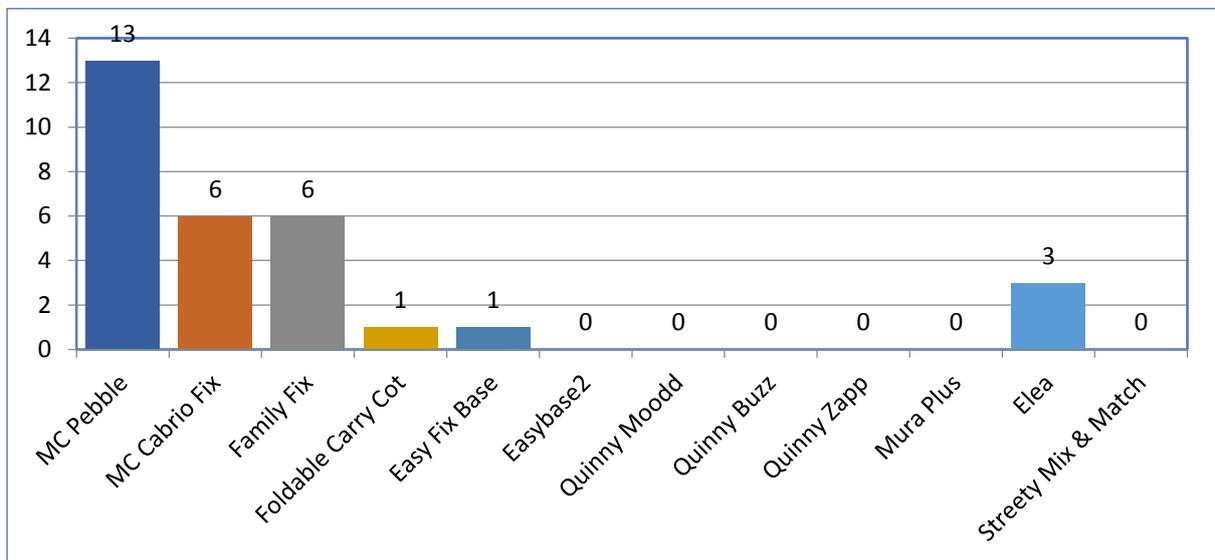
Figure 5-6 Products accessed three times
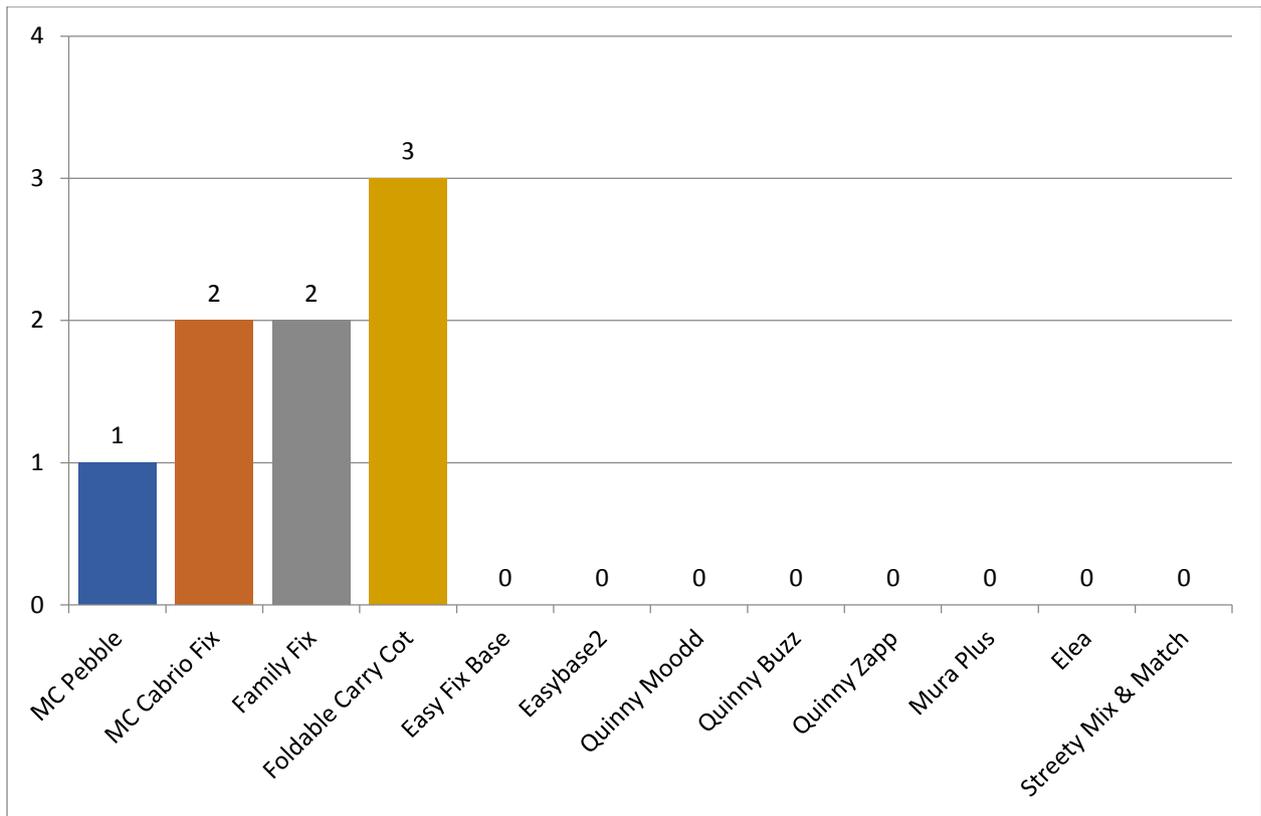
Figure 5-7 Products accessed four times

The discussions that occurred in the steering committee meeting generated decisions such as conducting the PCP survey and a limited life cycle analysis (LCA) of the project to demonstrate the environmental benefits of PSS for infant products.

Whilst the results of the LCA are reported elsewhere, the following sections report participants construing of the PSS, a qualitative assessment of the reaction of active users and those participants who had turned down the offer and finally a summary of the final workshop, which gives an insight into issues associated with a likely scaling up of the PSS.

5.6   How consumers construe a PSS for hiring pushchairs

In section 3, it was seen that different views of consumers' interaction with PSS were gathered. In the project, a survey of the construing (understanding, interpreting) of consumers was conducted, using a PCP method (Repertory Grid Technique). This survey was conducted after the start of the qualitative interviews. In this report, however, this view is offered first, in order to proceed from the wider to the more in depth, detailed view. Since the PCP survey has been run during the PSS trial, participants might have had some awareness of the trial. The results of the survey are reported below.

5.6.1 Repertory Grids Results

166 responses to the survey were downloaded from the Qualtrics website. In the survey questionnaire, a number of questions had the purpose of categorising the sample according to various demographic and other variables. The tables below give details of the breakdown for each of those variables:

Table 5-5 Breakdown in gender (n = 166)

Variable	Female	Male
Gender	86.75%	13.25%

Table 5-6 shows that by far the largest proportion of respondents were aged between 31 and 40 years. Our sample is in line with general population trends for having children as referred to in section 4.1

Table 5-6 Breakdown by age (n = 166)

Variable	18-21	22-30	31-40	Over 40
Age	0%	18.07%	77.11%	4.82%
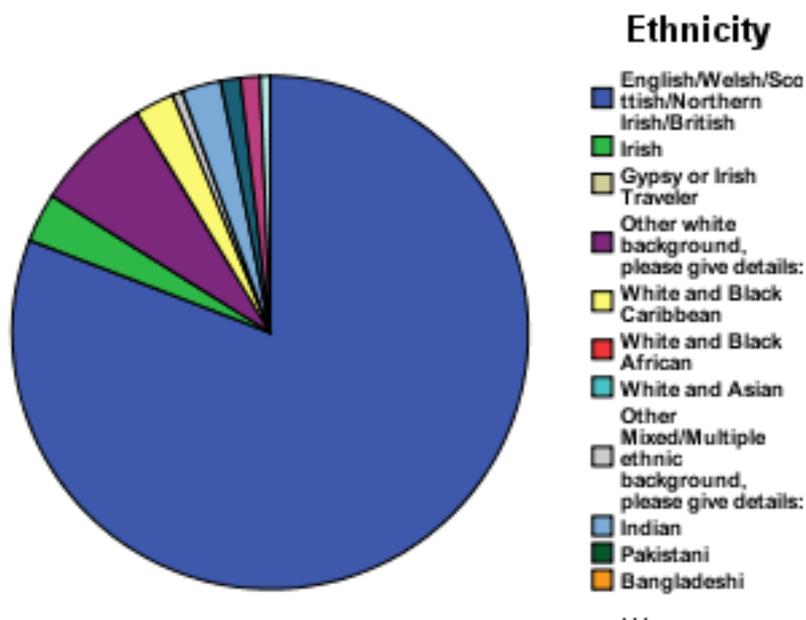
*Figure 5-8 Breakdown by ethnicity **(n = 162)***

Figure 5-8 shows the background of the participants by their ethnicity. The overwhelming majority of the sample was made up of people of white, British background.

Number of children	None	1	2	3	4 or more	Expecting first child
	0.64%	63.7%	3.2%	0%	0.64%	31.8%

Table 5-7 shows a breakdown of participants by number of children. It also shows the proportion of those expecting their first child. This is relevant because according to research reported in Mintel (2018) and as seen in Section 4.3 summarising the focus groups, first time parents are less likely to use pre-used products compared to experienced ones. An exception is when the providers of these products are members of their family and therefore trusted, who hand down products previously used by them (Thomsen and Sørensen 2006).

Figure 5-9 shows the breakdown of participants to the survey by income. In line with the broad parental charity's membership, a large proportion of the membership, over 80%, has a relatively high income.
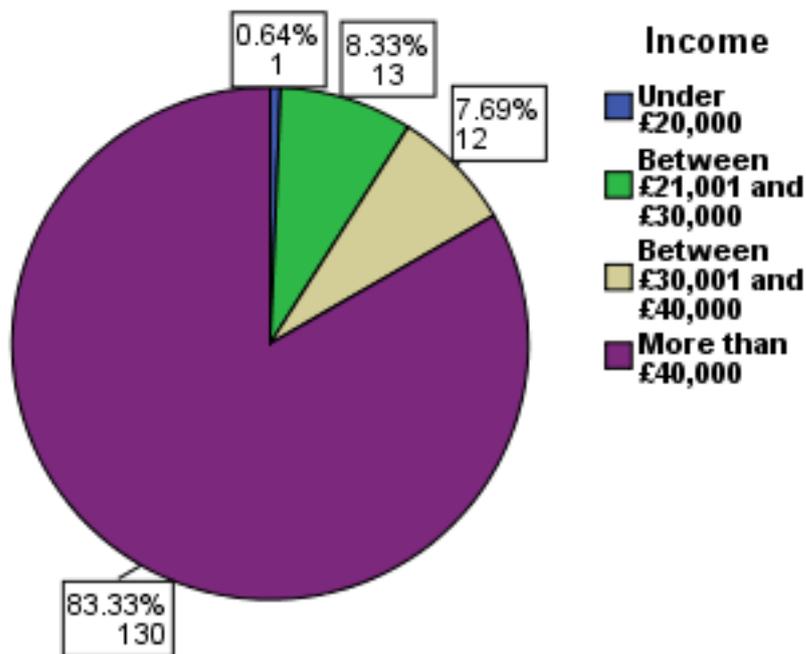
Figure 5-9 Participants breakdown by income (n = 156)

58
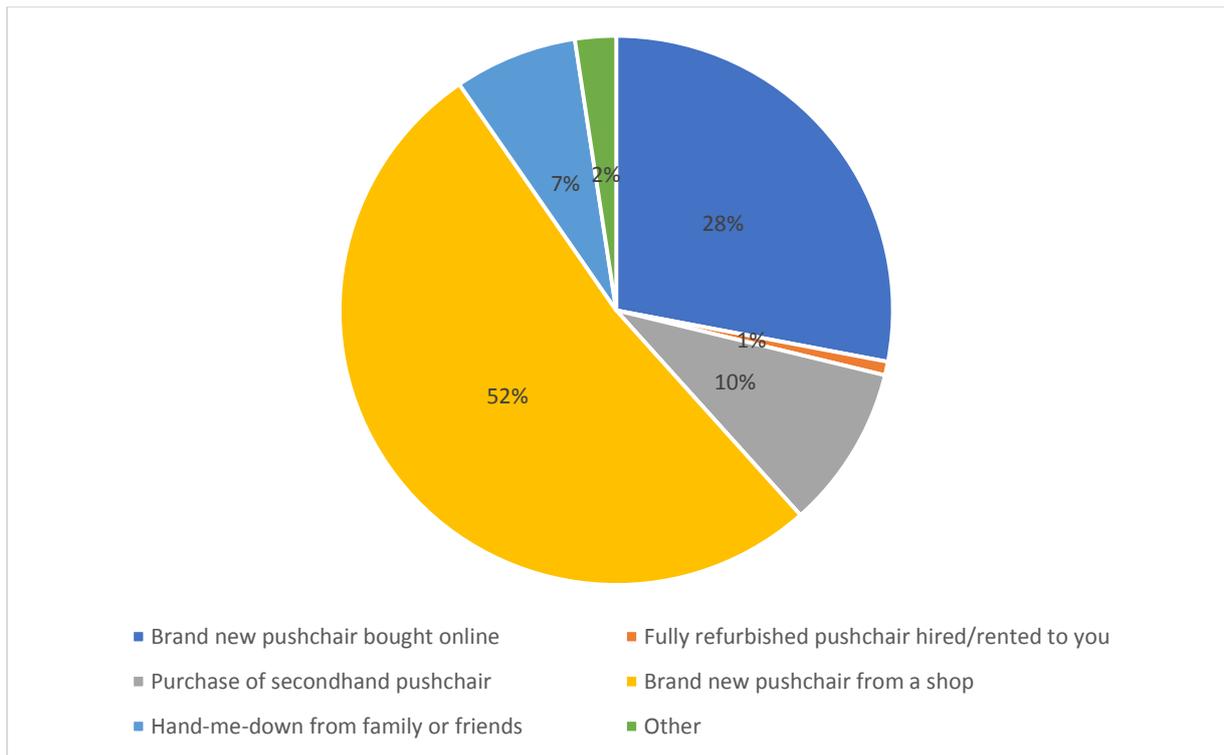
Figure 5-10 Mode of acquisition (n-125)

Figure 5-10 show how participants said they actually acquired pushchairs

Figure 5-11 Quinny Moodd 2015 Black Blackirony
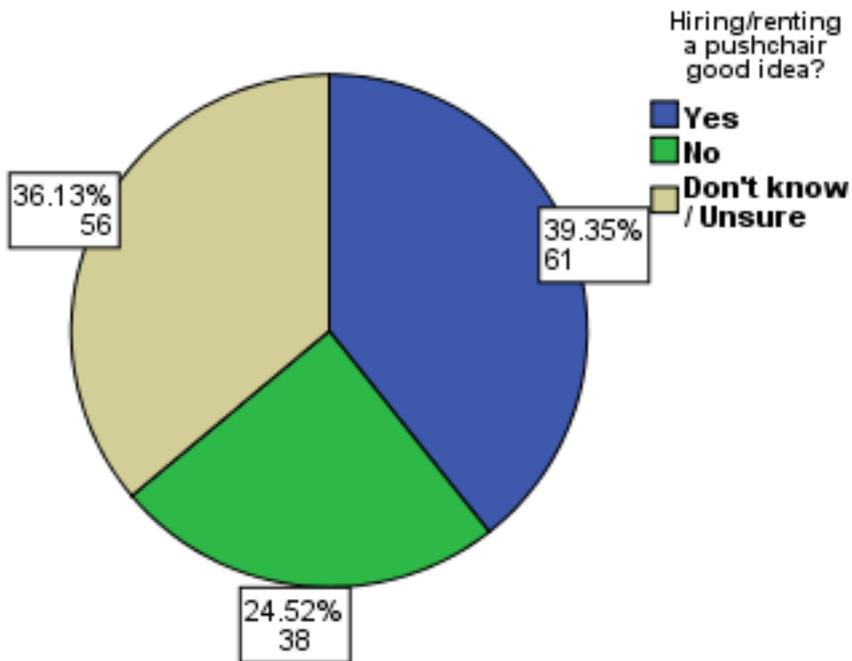
Figure 5-12 opinion on hiring and renting pushchairs (n = 155)

Comparing the results in figure 5-12 above shows that real access to product rentals by participants has not really been as frequent as it could be expected from the results presented in figure 5-12 and it was higher than it could be expected from 5-13.
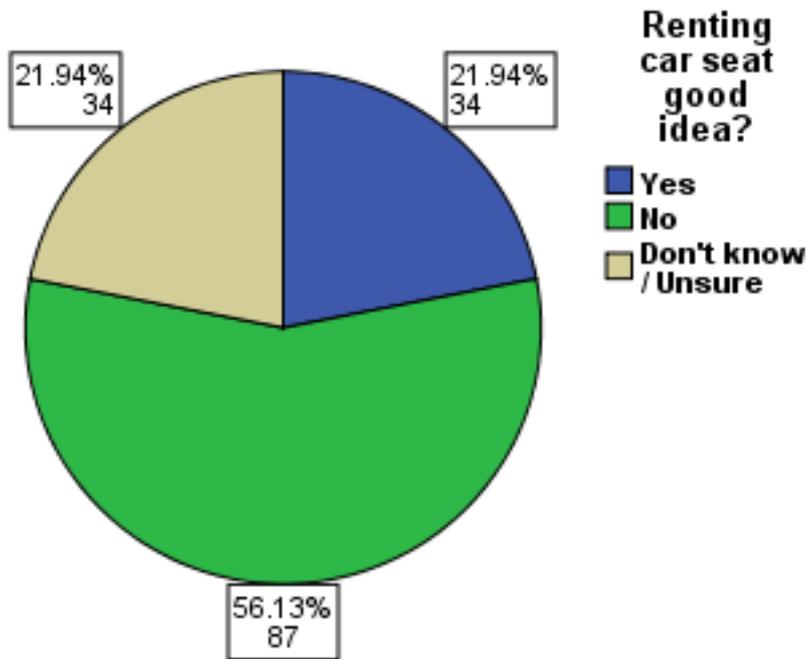
Figure 5-13 Opinion on hiring or renting car seat (n = 155)

With regard to the views of participants as whether they thought that renting a car seat was a good idea, it should be noted that participants were asked a simple question: "Do you think that renting a car seat (as opposed to buying one outright) is a good idea?" The answer options were "Yes", "No", "Don't know / Unsure". Participants were also asked if they had ever rented a car seat - only two of the 155 participants who answered that question said that they had rented a car seat. This is almost exactly the same figure for those who said that they had rented a pushchair. As the chart shows, more than 56% of participants thought that renting a car seat was not a good idea and, in addition, nearly 22% were unsure about whether it would be a good idea to rent a car seat. The number of participants who thought that renting a pushchair was not a good idea was a good deal less (about 25%) whilst those who were unsure about whether renting a pushchair was a good idea was about 36%. As the focus of the pilot study was the acquisition of pushchairs, participants were not asked for more information about their views on renting car seats.

Before looking at details of how different ways of acquiring pushchairs seem to be construed by the whole sample[26] in terms of the mean ratings given by participants, the relative rank order of the constructs (the *dimensions* on which those different ways of acquiring pushchairs were construed) is first considered.

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[26] As is not unusual with online questionnaires containing a substantial number of items, the samples size varied somewhat for the responses to different items. The number of participants responding is indicated for each item.

The mean rank order of the constructs running from 1st (most important) to 11th (least important) is:

Table 5-8 Construct rankings

Ranking n = 86	Construct
1st	Being sure that the pushchair is safe to use
2nd	Being sure that the pushchair is in a hygienic state
3rd	Knowing the condition of the pushchair before you acquire it
4th	Doing the best for your child
5th	Pushchair coming from a source you can trust
6th	Having somewhere to go back to if there is a problem with the pushchair
7th	Cost of acquiring the pushchair
8th	Being able to do what you like with the pushchair
9th	Ease/Difficulty of acquiring the pushchair
10th	Being an environmentally friendly way of acquiring the pushchair
11th	High/low status way of acquiring a pushchair

The charts shown in the Figures below show the construing of the whole sample. The mean ratings for each of the different ways of acquiring pushchairs (i.e. the elements) are shown. In order to illustrate results as clearly as possible, the construct poles have, where necessary, been "reversed", so that all the 'positive' poles are on the 7 side of the rating scale and all the 'negative' poles are on the 1 side of the rating scale. This process does not alter data validity, as long as both ratings and labels for the poles are reversed (Jankowicz, 2004). The graphical layout used by Fransella (1988) has been adopted to better illustrate the bipolarity of the constructs on which each element has been rated. Therefore, after "reversing" the constructs, the 1 to 7 point rating scale was converted into a -3 to +3 seven point rating scale, with zero representing the "4" on the original 1 to 7 scale. As both construct pole labels cannot be shown because of space limitations, only labels for the positive poles of the constructs are shown on the charts (on the vertical axis). The bars on the positive side of the rating scale on the horizontal axis show the mean positive rating.

The bars on the negative side show the mean rating for the negative (opposite) pole. For example, Figure 5-14 shows "Buying a brand new pushchair online" to be positively construed on the construct

"You know the condition of the pushchair when you acquire it" (as opposed to "*not being sure of its condition when you acquire it*").

However, this mode of acquisition is also somewhat negatively construed in that it is seen as <u>not</u> being a particularly *cheap way of acquiring a pushchair*. The charts will be referred to in the "Narrative on Findings" section that follows them.
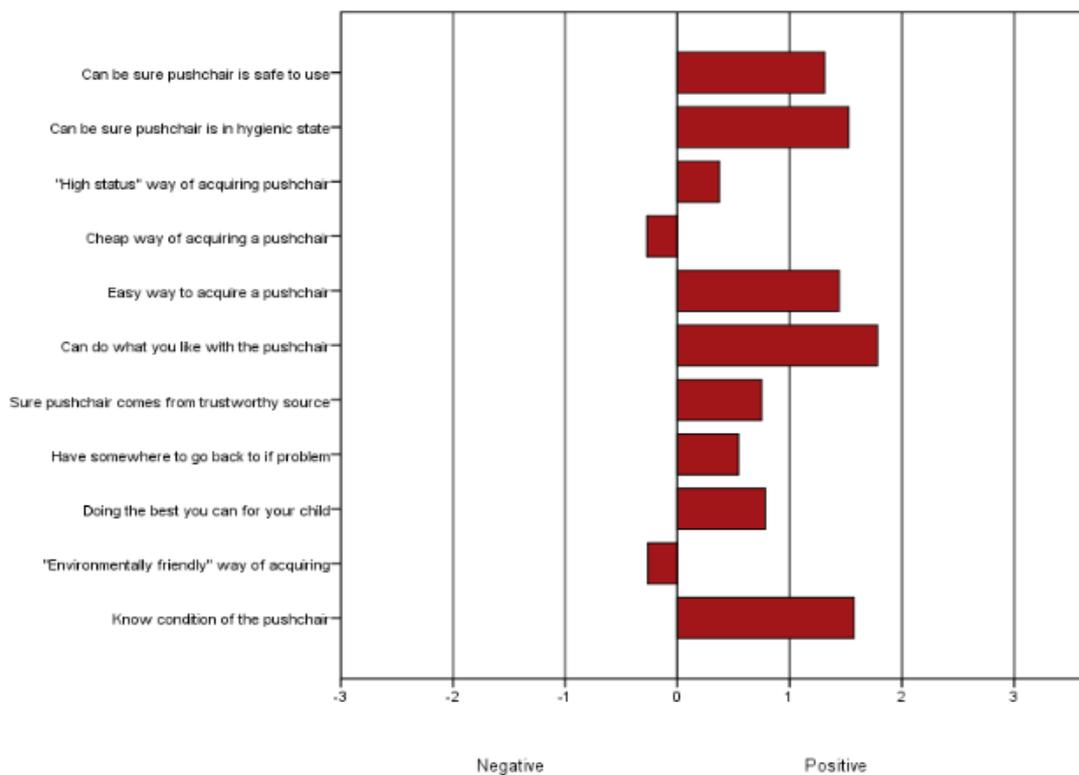
Figure 5-14 Buying a brand new pushchair on line (n = 129)
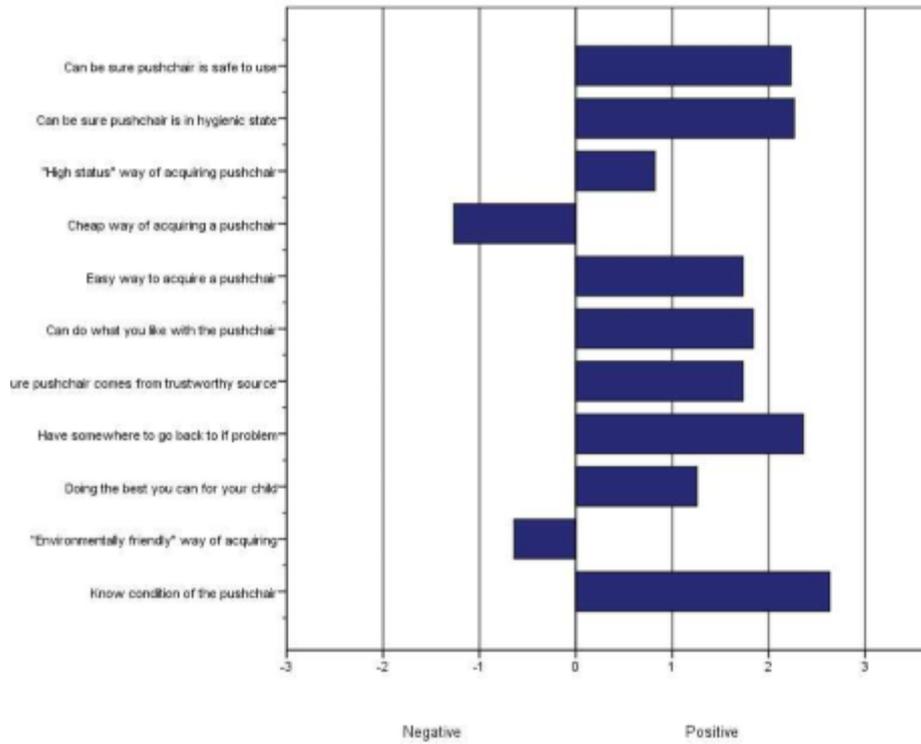
Figure 5-15 Buying a pushchair from a baby product shop (n = 117)
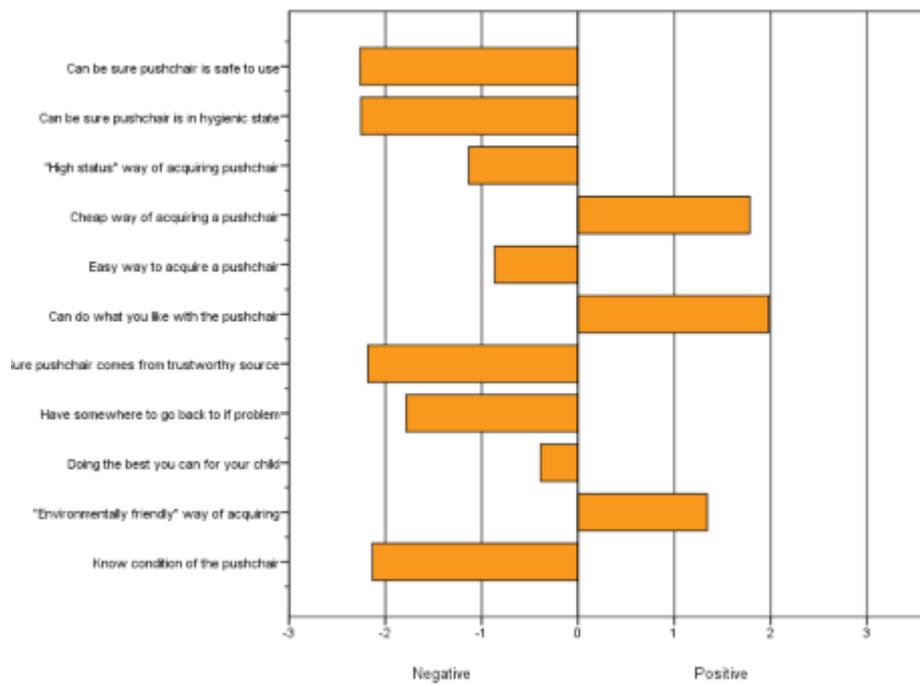
Figure 5-16   Buying a second hand pushchair (n = 111)
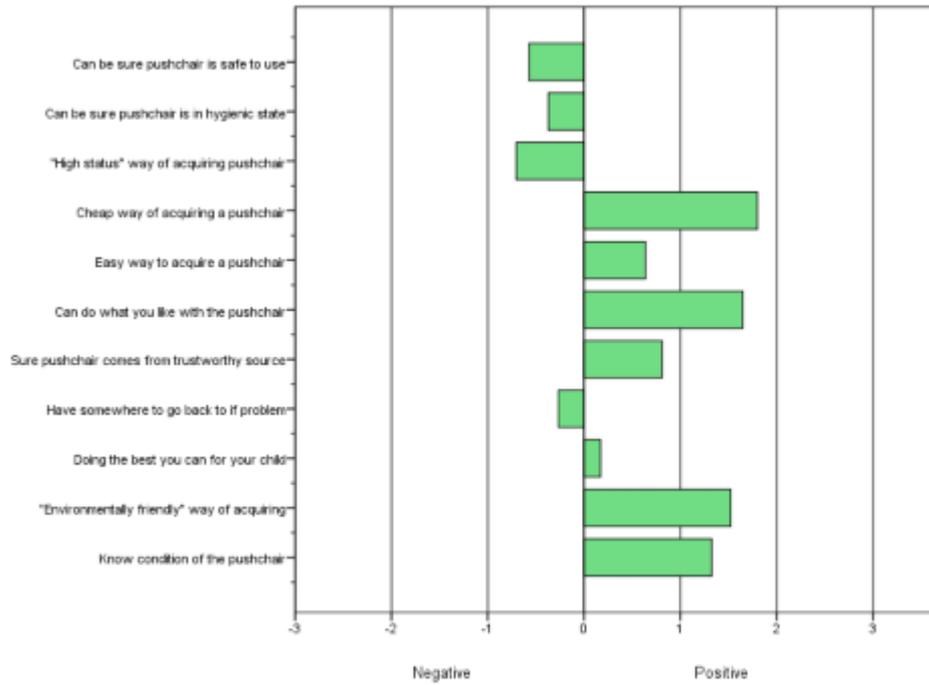
Figure 5-17 Buying a pushchair from a neighbour (n = 105)
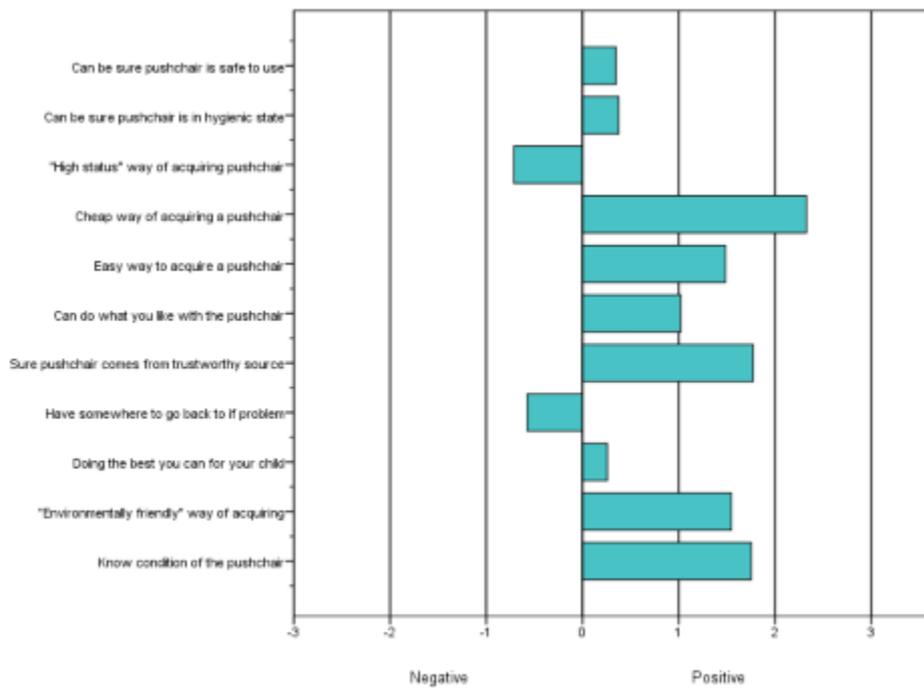
Figure 5-18 a "hand me down" pushchair (n = 101)
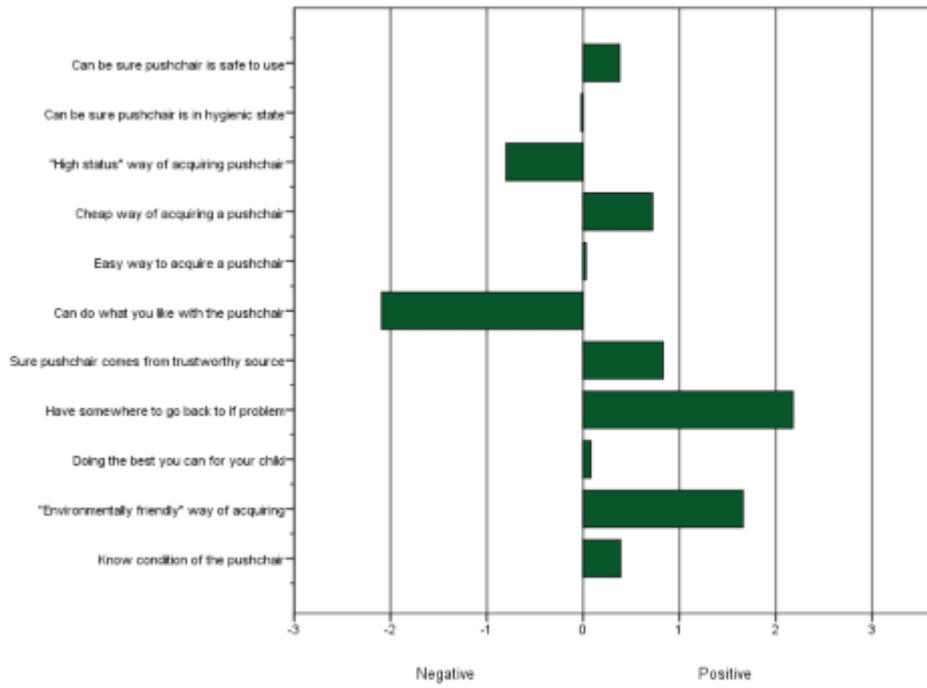
Figure 5-19 hiring / renting a fully refurbished pushchair (n = 100)
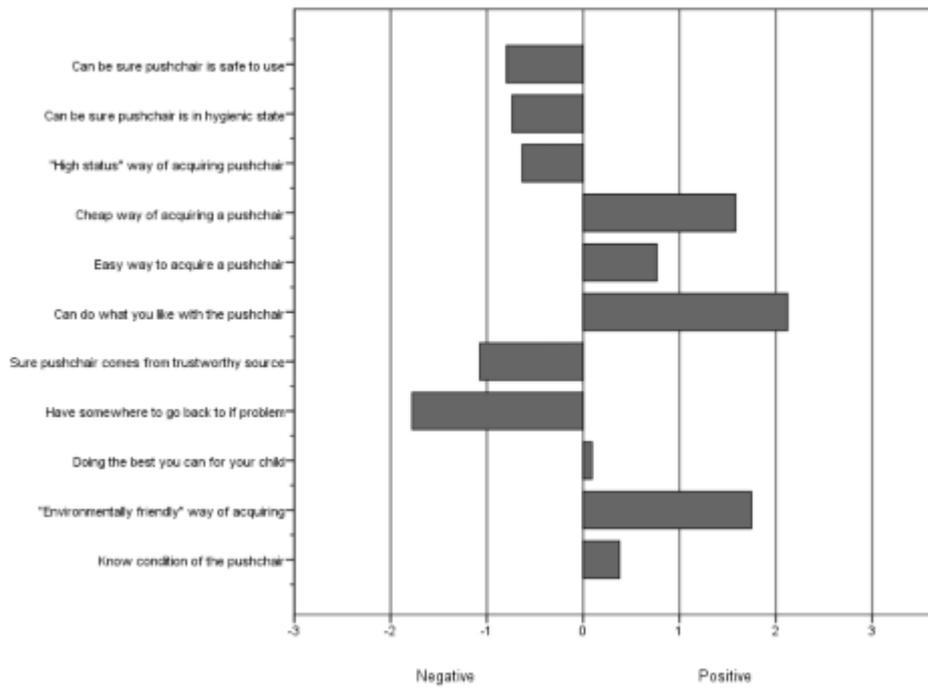
Figure 5-20 acquiring a pushchair at an NCT "nearly new" sale (n = 98)
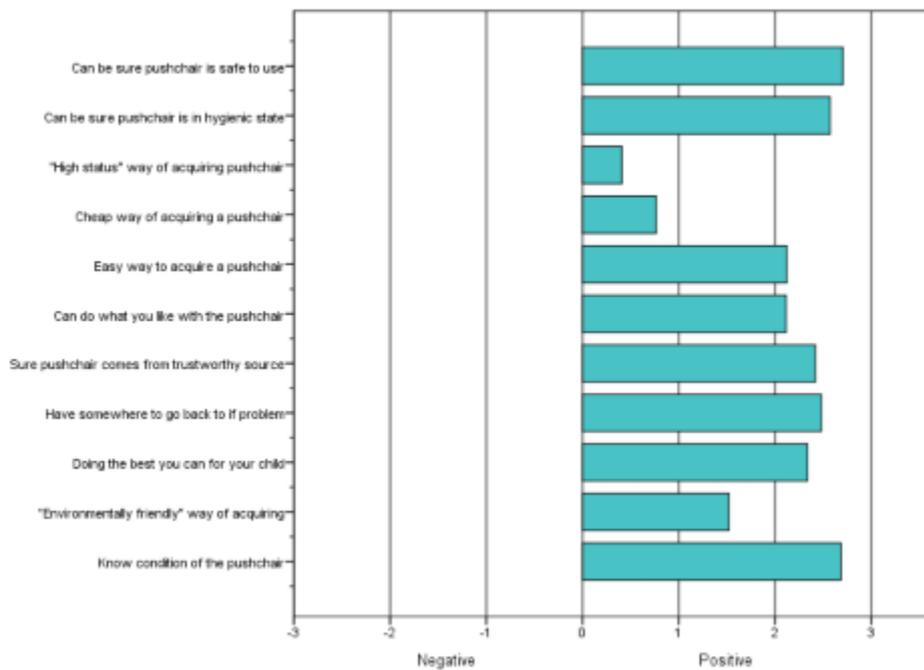
Figure 5-21 The "ideal way" of acquiring a pushchair (n = 98)

5.6.2   Narrative of the Findings

The findings reported above show how the whole sample construed different ways of acquiring pushchairs. The first part of this section will focus on how participants ranked the relative importance of the constructs. After that, the ratings participants gave to the hiring/renting pushchairs element on various constructs in the Grid are articulated. The findings in this report need to be read with the caveat that the survey sample is not representative of potential pushchair acquirers in general. However, it may be representative of a discrete population of white, middle-class subscribers to a parental charity, who made up the vast majority of survey participants. First, some general points will be made about the results:

The three *most* important constructs (i.e. ways of construing how pushchairs can be acquired) are, in order of importance:

1st: Being sure that the pushchair is safe to use

2nd: Being sure that the pushchair is in a hygienic state

3rd: Knowing the condition of the pushchair before you acquire it.

The three *least* important constructs are:

9th: Difficulty of acquiring the pushchair

10th: Being an environmentally friendly way of acquiring the pushchair

11th: High/low status way of acquiring a pushchair.

The rankings listed above need to be considered when the way participants construed different ways of acquiring pushchairs are examined. The same applies to the element "In your opinion, if you acquire a pushchair in the best possible way" (which will be called the "Ideal way of acquiring a pushchair"), as that suggests the "benchmark" way of acquiring a pushchair that participants would ideally like. In this section of the report, the element "Hiring/renting a fully refurbished pushchair from a pushchair company" will be targeted as a "proxy" of a PSS way of acquiring a pushchair. Comparisons with how the "Ideal way of acquiring a pushchair" is construed and with how some of the other elements have been construed, will also be drawn where relevant. Considering the issues participants regard as most important when acquiring a pushchair, we see that participants seem to construe hiring/renting a pushchair as follows:

1. *Don't really know if you can be sure that the pushchair is safe to use*
2. *Not certain that you can be sure that the pushchair is in an hygienic condition*
3. *Means you can't really be sure what the condition of the pushchair will be in before you acquire it*

These indicators suggest that acquiring a pushchair through a PSS would not be one of the most attractive ways of acquiring a pushchair (bearing in mind the limited understanding participants have of the hiring/renting process as set up in the PSS). This would set a challenge to PSS diffusion by this means. Indeed, according to the survey data, on the issues of safety and hygiene, renting a pushchair from an infant mobility equipment company doesn't rate any better than acquiring a pushchair from a neighbour - which is likely to be a cheaper option. However, participants seem to think that renting a pushchair *means that you do have somewhere to go back to if there is a problem with the pushchair*. Although this is not one of the most important issues, it is still quite important.

Participants seem to have expectations about which modes of acquiring pushchairs are *environmentally friendly* and which are not. They see renting a pushchair as being one of the more environmentally friendly ways. However, whilst on average participants say that they would like to acquire pushchairs in a "green" way (see Figure 5-21), this is unlikely to influence the way in which they actually acquire a product. The way which is closest to the

"Ideal" way of acquiring a pushchair is buying a brand new one from a shop (see Figures 5-15 and 5-21), even though participants see this as being the *least* environmentally friendly way of acquiring a pushchair. The construing of participants is entirely consistent because, as we can see from Table 5-8, the issue of "greenness" is almost the least important issue to them. In personal construct theory, the most important issues ultimately determine behaviour, whatever a person might state as being desirable from a *general* point of view. Indeed, this confirms the purchasing intentions revealed in the focus groups in the feasibility study, see section 4.3.

As mentioned above, the way of acquiring a pushchair which appears to be closest to the "Ideal" is "Buying a brand new pushchair from a baby products shop". As that is not seen as being a very environmentally friendly way of acquiring a pushchair, this would also seem to support the lack of importance attached to that construct. Of the participants who said they already owned a pushchair (n = 126), 65 had acquired the pushchair new from a shop and 35 online. Only 12 had acquired a second-hand pushchair and only nine a hand-me-down. Since buying online is such a common practice, the relatively small figure for online acquisition could be quite relevant. It may be that consumers really want to see this type of product before they buy it, which is consistent with the high ranking of *knowing the condition of the pushchair before you acquire it*. From the interviews that were conducted with consumers, it would perhaps be surprising if many of the purchasers who bought on line did not first examine products at retailers.

Returning to the results in figures 5-12 and 5-13, fig. 5-12 showed that 61 participants in the sample thought that renting a pushchair was a good idea (n = 155). In contrast only 34 participants thought that renting a car seat was a good idea (n = 155). A possible explanation for this was offered i.e. the risk of structural damage to the car seat following a car crash. Bearing in mind that leases of car seats through the PSS have been much more popular than leases of pushchairs were in the pilot project, Section 5.7 below explores why this apparent contradiction has occurred and why renting car seats were more successful than renting pushchairs.

Summary
- The results of the Repertory Grid survey indicate that acquiring a pushchair through a PSS may not be the most attractive way of acquiring a pushchair. That is because participants appear to believe that a rented pushchair may not be safe or hygienic and the survey results indicate that these two issues are very important to participants, in the context of the way in which they acquire a pushchair.   - Participants say they saw renting a pushchair as being an environmentally friendly way of acquiring a pushchair. They also say that the ideal way of acquiring a

pushchair would be a "green" way. This suggests that renting a pushchair could be attractive to consumers.

- However, when further interpreting the results, 'greenness' appears unlikely to significantly influence the way in which people would actually acquire a pushchair. This is because: (a) the means of acquisition that is closest to the ideal way of acquiring a pushchair is buying a brand new one from a baby products shop (which consumers believe is not an environmentally mode of acquisition) and (b) relatively speaking consumers give very low importance to the issue of environmental friendliness in the context of acquiring pushchairs.
- Survey results also indicate that, in contrast to previous research (cf. Manzini and Vezzoli, 2003, 2005), advertising the expected environmental benefits of PSS may be unlikely to attract consumers in the case of pushchairs.

5.7   Field research

This section reports the findings of fieldwork consisting of 32 ethnographic interviews with parents. The participants were mostly females, with only four males interviewed (in conjunction with their partners). Appendix B offers a summary of the characteristics of the participants and the products they rented. As can be seen, some of the participants had not rented any equipment. In some cases that was because they were at an early stage in their pregnancy. As in the focus groups, in these interviews we explored the relationship of participants (parents) with the products they had rented through the PSS.

Before entering into their leasing agreements, participants were made aware that car seats and pushchairs available for the trial were likely to be pre-used and refurbished. Those participants who had ordered a product for rent said it was in a "like new" condition when they received it. One participant said:

"*I was quite impressed by how sort of new and, you know, it (…) had the fresh labels and everything on it as well and, (…), I'm just quite impressed by what appeared to be the quality that we were getting*".

The products were clean and sealed and only in one case did a participant say that instructions were not included. The findings suggest that participants rationalize the decision of whether to adopt the PSS and rent products as opposed to buying them outright. For example, an often-cited criterion was the ratio between cost and length of use:

"*I wouldn't (want to) have to pay £150 for something I'd only use for a few months and then get rid of*".

Therefore, the participants compared the cost of acquiring the product with the likely length of use, which explains their decision to rent it as seen in Sections 5.4 and 5.5.   The

equipment that was more popular for rent were group 0 car seats - those used for infants between 0 and 9 months. This type of equipment is used for the shortest period and its use is compulsory when infants travel in cars. The short-term use of these products means that parents tend to have a somewhat instrumental relationship with them. According to participants in interviews as well as focus groups infant cars seats are also difficult to resell as pre-used products to other parents because they may have been damaged in a car crash as explained in Sections 4.1 and 4.3. As the quote below exemplifies,

"The car seat was a particular stress for me because (it) is un-saleable, well, it depreciates very heavily…"

Surprisingly these users did not mention space saving as one of the rational criteria for making their choice. This contrasts with the findings of the focus groups that were run initially to assess the feasibility of the project (see section 4.3).

Participants saw health and safety aspects as important criteria for decisions on acquisition of infant mobility products. References to hygiene and even health issues of previous users were frequent, which is comparable with the fear of contagion identified by Bardhi and Eckhardt (2012). Nearly all participants were aware of the risks of using pre-used car seats and could list sources of information about this issue, including both informal sources such as their peers and institutional sources such as health authorities' web sites. This aspect somewhat discouraged participants from acquiring pre-used products including those rented to them as part of the PSS project. The aspect of the PSS that overcame this difficulty was trust in the parental charity as a brand and its reputation as an institution, together with the quality assurance (QA) process that the PSS consortium had put in place. It was found, therefore, that despite the informal and institutionalized information that discourages the use of pre-used car seats, the distributor and manufacturer brand/reputation and specifically the QA process supported by these reputations, legitimized the PSS in the eyes of the participants. Some participants asked questions about how the QA process worked and they found the fact that a manufacturer had refurbished the equipment reassuring:

"…if it's done by a professional organisation, you can trust that it's been done properly. They're fully refurbished so they're, you know, as good as new when you get them".

Those participants who opted for the PSS were very satisfied with the QA certification features:

"Well, the main thing was that we were wondering how we would know that it was safe, so it came with a manufacturer approved label saying this is safe, so that was good".

The reputation of the parental charity also contributed to reassuring the participants about safety:

"*I trust the [parental charity] in…. not sending faulty equipment…., you know, so I had trust in them as an organization*".

This confirms the findings of the focus groups (see section 4.3). Participants' narratives suggested that one important outcome of their decision to rent equipment – or not – was the symbolic[27] and hedonic[28] value they got from it - parents saw pushchairs as a means to construct their identity or project their image to the outside world. They also drew pleasure from using pushchairs. They narrated that they would visit friends and go shopping transporting their infant in the pushchair. This product is important for their self-image. The product itself was imbued with meanings of health and safety, parental pride and competence. The participants' utterances suggest that for PSS pushchairs this is somewhat problematic and may help explain why leases of these products were in far smaller numbers than those of car seats. Parents seem to construct their identity by drawing symbolic value from using and owning brands.

"*What I really wanted was still a brand that I could trust… I still wanted to be able to* **buy** *the brand and the model that I was interested in, so I was still led by the buggy that I chose*".

Thus, most of the participants seem to prefer the option of buying the pushchair rather than renting it. These parents therefore seemed to prefer ownership rather than leasing of those products from which they could draw symbolic value, such as pushchairs. As a participant says

"*We bought a buggy. It's a Bugaboo… it's quite expensive. It's really, really light, and, (…) I suppose I will be around alone quite often, so I really was looking for something really light and easy to fold, because (…), I did a bit of search also on the buggies, of course, and some systems are just crazy and maybe they are cheaper, but they are not really user-friendly and I thought, no… I prefer to put more money on this and less on something else, just because I know I'm going to use it a lot.*"

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[27] the opportunity that possession or use of an object gives one for self-expression or identity construction (e.g. representation of values in which one believes or of which one believes he/she is endowed) and the association of an object (or a service) with one's personal history (Richins 1994b)
[28] the opportunity that possession or use of an object/services gives one to experience feelings, such as pleasure, pride or satisfaction (Graeber 2001)

Therefore, participants seem to rationalize the desire for ownership by the duration of use they expect to make of it, but the use of the right "new" equipment is important for the parent's reputation:

"*I am aware that certain people will judge me and I'm a little uncomfortable with that, they say, 'Oh, you're not doing your best for your baby, you're buying things that are old and falling apart".*

The PSS (the lease) appears to be imbued with meanings of thriftiness and environmental protection. The few participants who opted for a pushchair PSS did this so they could afford a top of the range brand for a fraction of the price but, crucially, they did not want their peers to know that the product was rented:

"*I think there's …. stigma attached to (it), oh it's second-hand or can she not afford it kind of thing. The area that I live in… everybody has the latest things and everybody has new things and it's, I don't know, maybe I feel like they'd look down on me for having rented".*

Therefore, it seems that a PSS based on a product that delivers symbolic value such as a pushchair, is problematic. On the other hand, we know that for experienced parents it is acceptable to purchase pre-owned pushchairs from outlets such as e-bay.

The lifestyles of participants' encourage them to seek variety in the products they require. Parents require different equipment depending on their particular lifestyles, which may call for specific product features. For example, a participant explains that:

"*….a pushchair has …. special storage baskets or hoods (…) and there's all these kinds of fandangle things that the manufacturers make for each one…"*

An example of the relevance of lifestyle is the performance by participants of practices such as jogging and hiking. These call for different materials, e.g. pushchairs with suspensions and large wheels. For example, one participant has:

"*…got something that's called a Mountain Buggy (a brand) and the (model) is a Swift and it's one that's also good for exercising so it's a three wheeler...and that was high on our priority list as well because we didn't want to end up with two buggies, one that we could run with and one that we sort of walked around with...pretty early on we made the decision that we wanted one that was specific to (this) activity".*

The participant chose to own this product because she could not see the features she desired in the products available for rent. Another participant explains that she wanted her pushchair to be suitable to go hiking with her child:

"… *for the pushchair we wanted something practical because we do a lot of walking, off-road, you know like in parks and stuff, we've got two dogs, so we wanted something, like these wheels are for like off-road and we also wanted something that wasn't too heavy, you know, to put in the car and this folds up quite easily*".

This has implications for a PSS built around a narrow range of products as discussed in section 5.8.1 below.

Some participants were concerned about using materials in extreme conditions and the possible liability for damages. One participant said they would:

"…*feel a bit restricted by (renting) because I wouldn't want to take it to the beach, for example, whereas if I have my own… I'd just make sure, wash it out afterwards and that sort of thing... whereas with a rental one, I'd kind of probably be a bit more circumspect about taking it to various places. Just because it's not mine so I'd be a bit sort of concerned about not getting my deposit back*".

As the supplier says:

"*you can understand fear of damage on renting is (greater for pushchairs), you're not really going to damage a car seat because it's sort of an inanimate lump….Whereas the pushchair gets way, way more abuse and issues*".

Thus participants are aware of the greater vulnerability of pushchairs compared with car seats. The qualitative research conducted in REBUS identified participants who claimed they led life styles that corresponded to the life styles associated with consumer profiles described by Bardhi et al. (2012) as "nomadic consumers". Nomadic consumers are "deterritorialized" consumers who engage in serial relocations and frequent short-term international mobility" (Bardhi et al, 2012, 510). Examples of nomadic consumers are highly paid executives who are located overseas on a temporary basis, or consultants engaged in short term projects. Nomadic consumers are thought to form situational attachments to objects, they appreciate objects primarily for their instrumental use-value. These consumers want to limit the amount of material goods they own to facilitate their mobility and this shapes their consumption practices (Bardhi et al., 2012). Because of their transient life styles, these consumers are said to "travel light", i.e., to minimize their possessions and develop an

instrumental relationship with them. A small number of participants identified through the interviews seemed to conform to this typology of consumers. Six of these consumers appeared more likely to adopt a PSS. They were renting a car seat but not a pushchair. In Bardhi's et al. (2012) conception, Nomadic consumers associate possessions with clutter. The data shows that some participants to the research did the same:

"*I didn't want to have a lot of clutter, you hear a lot of people who have children and they end up at the end with all the stuff they need to get rid of and we specifically wanted to try to not have that much clutter, just get the minimum of what we needed, because it's so easy to go overboard.*"

This therefore suggests how lifestyle profiles can affect participants' apparent acceptance or not of PSS. Parents need to develop new habits to consume PSS. These habits involve the acquisition of new competences. According to the manufacturer's management, the competences parents need to acquire for PSS include care for the product during use up to the end of the lease and safekeeping of the packaging. These can be considered user responsibilities towards the provider, in our case the manufacturer and the charity partnership.

Parents engage in closer interaction with the supplier because of their adoption of PSS, because of following the instructions for maintenance with which they are supplied. Participants seem able to adopt these behaviours. For example, they retain the packaging and maintain contact with the provider. We see therefore that PSS involves more than just using the products they have rented.

On the other hand, other behaviours are abandoned. For example, some participants using PSS are not concerned with reselling the product in the second hand market (e.g. through e-bay) or with disposing of it through other means. Participants expect the supplier to prompt them for collection of products and possibly issue replacement products for the infant as he or she gets older. One participant says:

"*…when the lease term is up we don't have to drive it to somewhere on the other side of London or something, you know, it's just ... simple, they ring me up, I repackage it and they come and collect it.*"

This is an innovative aspect of the PSS because it removes disposal activities, which are part of the traditional practice.

The desire of ownership is associated with customizing and personalizing the materials. For example, one participant describes adaptations she wants to make to her pushchair:

"*If we decided it was a good idea to use a different material for the handlebar grip, to add a handlebar-mounted brake or to stick a big colourful picture on the underside of the canopy - for (child) entertainment purposes, it's nice to think that we could without trouble.*"

Consumers customize products to make them more representative of the identity they want to project onto the world. The ownership-less aspect of PSS can therefore be problematic as it removes the freedom to personalize products.

Parents' everyday lifestyle practices shape their engagement with the PSS offering. Use of infant mobility products is linked with these practices, e.g., shopping and travelling, including driving and using public transport. Car seats are used secured to a car's back seat; pushchairs are routinely loaded onto vehicles. This combination of parents' concerns with responsibilities arising from the PSS and a desire for a wide range of products constrains the adoption of pushchair PSS by parents, who instead prefer to own their products (cf. Snare 1972).

Participants in the interviews were open to conversation and eager to share information. The majority had leased car seats, a few were renting pushchairs and some had not rented either. The favourable attitude to research seemed very much connected with their membership and appreciation of the parental charity. Some participants even stated that they felt part of a community of parents and that the use of products accessed through the PSS was a way to contribute to the work of the charity - in other words, there was evidence of benevolence. Therefore, the role of the charity seemed critical for generating trust in the offering. On the other hand participants seemed to associate the infant mobility PSS with potential liabilities for damages, resulting in loss of a deposit or a fine. PSS use in practices such as hiking or jogging, demands specialist equipment and therefore challenges the manufacturer's commercial desire to standardize the offering (see 5.8). The PSS also created concerns about the consequences of damaging a rented pushchair, both through use and personalization. The implications associated with renting products were an important concern for parents. This explains why some participants resisted the adoption of the PSS, especially with regard to renting pushchairs. Table 5-9 summarizes the themes that emerged from data analysis.

Table 5-9 summary of themes emerging from field research

Summary of themes emerging from the qualitative data
Participants are impressed by "like new" conditions of products
Consumers are reassured by quality assurance certificates
Ratio between length / duration of use and cost is a decision criteria
Health and safety and fear of contagion dissuaded participants from renting
Trust in the parental charity as a community legitimized PSS
Manufacturer's reputation legitimized PSS
A rented pushchair delivers less symbolic value than a purchased one
A rented pushchair delivers less hedonic value (pleasure) than a purchased one (e.g. product customization)
Customization and personalization are important to consumers but not allowed with a rented product
Lifestyles of participants discourage access through PSS (e.g. jogging, trekking, mobile customers), or in other cases encourages it
Consumers desire specialist products to match lifestyle (this requires a wide range of products)
PSS requires acquisition of competences (product access, maintenance and packaging stewardship)
Penalties for damages to a rented product discourage PSS
No need for disposal encourages access through PSS

Summary
- Participants claimed that they considered accessing car seats through PSS a good practice, because the product was used for a limited time and was relatively costly. Financial benefits featured predominantly in their decision.   - Some participants were resentful that they had to spend large sums on infant car seats which might in some cases only be used for a short time and could not be resold easily   - Participants considered pushchairs differently. Generally, participants preferred buying pushchairs to the idea of renting them. Justifications included financial reasons. However, the image-building role of pushchairs featured in all the interviews. The desire to personalize the pushchair and freedom to use it in places where it could be damaged meant that participants preferred ownership to avoid penalties for product damage   - The generally positive attitude towards the offering was shaped by the participants'

| membership and appreciation of the parental charity. This aspect contributed significantly to generate trust in the offering |
| • Participants responded to the offering differently. Some users were highly mobile and others environmentally conscious. Some wanted to avoid clutter |

5.8 Results of summative workshops

This section summarizes the findings of the end of project summative workshops, which aimed at consolidating the learning and insights generated by the Action Research project. The possibility of viability of the PSS was discussed and the researchers sought expert opinion separately from managers of the research partner organizations, i.e. the manufacturer, supplier of the products and the distributor, the charity that acted as an intermediary to recruit participants who rented the products. The structure of this section loosely follows the structure of the pilot narrative (see section 5.2). This section is therefore structured in the following sub-sections: 1) reflections on PSS design, 2) market receptiveness to PSS, 3) marketing and meanings linked to the PSS, 4) possible benefits and risks for providers PSS and finally a summary.

5.8.1 Reflections on PSS design

5.8.1.1 Product design

The end of project workshops discussed options for the design of the product, the tangible aspect of the PSS. This project utilized infant products that were not specifically designed for a PSS. However, the findings offer insights on what products are more suitable for PSS. In the REBUS project, some products were recycled with very little work needing to be undertaken before next use. The manufacturer kept a record of all work that needed to be done during the refurbishment.

Section 5.3 reported the relatively low number of pushchair rentals as opposed to car seat rentals and the better fit of some types of products than others for PSS design. The lack of success of pushchairs in the project raises questions about whether this product is suitable for PSS. The data suggests that some products are less suitable than others to be supplied as remanufactured (cf. Michaud and Llerena's 2010) as part of a PSS.

A rational economic explanation for this difference in performance may be considered. Users may have evaluated the relationship between the cost and the duration of use as a decision criterion (cf. Catulli et al. 2013, Catulli et al. 2017a), as it can be seen in Section 5.7. Users

could see an item which is used for a short time and is costly in relation to its use interval as being more appropriate for rent than purchase. As the citation below illustrates,

"*I think people see the initial car seat purchase as a short-term usage and they see it as an accessory to a pushchair, so therefore (they see) renting (as) a practical solution...*"

The most successful car seats in the pilot were indeed the ones belonging to "group 0", which are suitable to transport infants from zero to 9 months old and hence needed for short-term use. Participants agree that cost versus time considerations are important and said that the short-term usage is a deciding factor. This suggests that the cost/duration of use ratio plays a key role in the buy versus rent decision. However, participants commented that it was surprising that pushchairs were less successful than car seats in the trial, because they are the most expensive items in the PSS and participants expected parents to want to save money. On the other hand, all in the workshops agreed that pushchairs are a more emotive purchase and parents have a far more emotional relationship with that type of product, so perhaps they are more interested in owning it. As the quote below illustrates, parents want their pushchair:

"*…to show their child off, there's a big fashion element in it*"…"*…people see the pushchair as much more of a prestige item*".

Renting may therefore be viewed as undesirable as it might involve acquiring an unfashionable product (e.g. one designed for PSS application rather than for high fashion (cf. Catulli et al. 2013). In addition, emotional attachment may encourage parents to want to own the product outright.

As mentioned above the pilot featured standard, traditional products available on the market. In reality, as the manufacturer highlights, products need to be designed so that they can be more cost effectively refurbished and have more potential for effective recycling. For example, most car seat covers are not made to be washable because they are designed to be attractive and permanently fastened to the shell of the seat. Many of the car seats are designed to look good, to be soft and inviting and have complicated bits of sewing and therefore it is recommended that they just be sponged with a damp cloth. If they were made with a more robust fabric that was designed to be washed, it would be more suitable for PSS. It was also suggested that products should have a modular design and be easy to refurbish. The car seats therefore could be designed with fabrics which could be more easily disposed of or recycled. As the citation below illustrates:

"…the cover is a major part of the cost, there's a lot of labour and material in a cover, because that's the bit that makes it look really attractive. So I think if you really wanted to get it efficient, you have to design the covers so that they could be low cost and recycled".

So, as it might be expected more uses on access could probably be achieved if products were specifically designed for PSS. PSS specific design however would require considerable investment in tooling, making it a risky business strategy for a manufacturer. However, consumers might not see the result as desirable. Creating a car seat is costly, the testing protocols alone are phenomenally complicated and expensive, the tooling involved for creating a car seat costs millions. Therefore, a dilemma is created for a supplier considering whether to offer their products by way of PSS, as the citation below illustrates:

"…whether or not tooling something designed specifically for leasing will result in a desirable product for a consumer who wants something that looks nice with their baby in"

If there is concern about whether consumers would find products designed for PSS attractive, this is an issue requiring investigation.

5.8.1.2   Service design

The design of the service or intangible aspects of the PSS were also discussed in the workshops. Discussions of these aspects of the PSS suggested two parameters, which could be useful to shape a PSS where multiple products are offered for consumption namely:

- *Breadth: the number of customers who can be satisfied sequentially with the same item/material.*
- *Depth*: *the number of uses, which can be satisfied by a PSS for a given user across multiple product categories.*

The *breadth* of a PSS is important for its viability, as the income derived from it can cover the cost of a unit. For example, six people can rent a car sequentially in a given day. The breadth of a PSS is a function of the type of product (according to the value sought) and the suitability for refurbishment. Designing a product that is easier to refurbish may have

implications for the breadth of a PSS, because the ease of refurbishing products to a good standard enhances the capability of a product to be used by more users.

Depth is about supplying the same users with additional or substitute products as their requirements change. For example, as the infant grows, the group 0 car seat is replaced with a car seat suitable for older age groups. Depth is about "mining" a single user along their life cycle with different types of products and managing the relationship with the user. Therefore, a PSS could be designed to satisfy other types of needs in addition to the primary PSS - e.g. as infants get older the provider could provide access to bicycles. This would achieve customer retention through a subscription in the course of the child's growth stages. The suitability of a product to be hired multiple times is essential to deliver the service across the breadth of the PSS. As for depth, both suppliers and intermediaries can achieve cross selling of other products, e.g. over the duration of the child's life. This could be a result of relationship management. As people go to a sale planning to buy specific products they find the retailer also offers other products. This can apply to lease offerings too.

In order to make the PSS financially viable, multiple hires were considered more likely by focusing on a limited range of products, which would avoid a high cost of stock. Standardization of the offer appears therefore to be necessary if each of the products were to deliver a return on investment. A wider range would pose problems because some products would be more difficult to rent out than others and some products may only be hired once. Thus, a narrow range of products would minimize risks of producing non-viable PSS. However, as was seen in Section 5.7, this would be in conflict with consumers' requirements if they desire variants of products to meet their lifestyles, such as pushing pushchairs when jogging (Catulli et al. 2017, Catulli and Reed 2017). Clearly, there needs to be a balance between what the user wants and what the manufacturer can manage cost effectively.

A service design issue, which may have affected the pilot's performance, was the poor flexibility of the leasing offering based on advance payment. AS seen in 5.1 the alternative monthly fee would have cost, legal and resource implications. This type of leasing turned out to be less than optimal, as some of the products, e.g., the group 0 car seats are designed to be used for the first nine months of life of the infants. The six months lease/unit system was, therefore, problematic. This had an impact on the rate of attrition. Users tended to retain car seats for longer than six months and the manufacturer had to make considerable efforts to recover products, which further affected the viability of the PSS. Therefore, this suggests that a more flexible design should be adopted, where users have more freedom to opt for

length of use and seamless replacement of products, with flexible payment methods, e.g. a monthly rent.

This project featured a small-scale pilot PSS and workshop participants agreed that scaling up would require automation of business processes. The small scale of REBUS meant that all the administration was conducted manually, with considerable resource implications. This highlights another essential requirement for scaling, i.e. the back office administration. It needs to be automated, where orders are placed and paid online, thus providing an opportunity for proper customer data relationship management.

In summary, a successful PSS should utilize standardized products and have features designed for PSS, which would achieve economies of scale. Products could be designed for leasing by, for example, building in an element of recyclability and refurbishment and delivering a better service and a 'cleaner' product. The real scalability is about designing products for leasing so that recyclability and refurbishment are built into the process. This would come with scale, which, if correctly managed, could reduce the costs involved in the PSS offering. For example, products such as car seats should be designed with fabrics that can be taken off and machine-washed, with robust materials that are also recyclable.

5.8.1.3 Multiple uses

Since the rental fees for the average access for use by parents only covers part of the cost of a product, multiple issues for use are essential for the viability of the PSS. Multiple hires were possible by focusing on a limited range of products in order to make the PSS financially viable:

As Figures 5-5, 5-6 and 5-7 in Section 5.3 show, some products went through three and even four cycles, although this number of cycles involved only group 0 infant car seats, which are those that are only suitable for short-term use. Some products could be recycled with very little work needing to be undertaken before the next use. The manufacturer kept a very precise record of all work that needed to be done during the refurbishment. Participants in the workshops agree that the range of products offered in the PSS needs to be narrow to make the project viable. This is because only a small proportion of the types of products available were rented out, a Pareto effect as explained in section 5.4. Therefore, a wide range of products would have a high cost of stock and it would be difficult to break even. As was seen in Section 5.7 this is in contrast with the desires of consumers who want a wide range of products to accommodate their lifestyles.

5.8.1.4   Issues of refurbishment

The quality of the refurbishment process is a critical aspect of the PSS because, ideally, the user wants something that looks brand new, even though it is on its fourth or fifth use. It is necessary to find out what kinds of products are best suited for meeting this requirement and then, secondly, how the supplier can ensure that the product does not go out after the first use in a condition that is unattractive to users. As was explained in Section 5.1, the costs threshold for damage to the products was set by the project team to decide whether to write off or refurbish products. If it was not for this threshold, then perhaps some products could have been accessed more often. However, there were problems with refurbishing some products. For example, some products came back in such a condition that the only option was to write them off. As the comment below illustrates,

> "… there was no way we could re-use them again to send out to other customers (…)."

5.8.1.5   Logistics

Workshop participants agreed that logistics is a key challenge for scaling up the pilot PSS and of PSS in general. Managers stated that transport costs are a key issue that affects viability. The logistics are complicated by the need to package and repackage a product as it is delivered to and collected from users. The manufacturers' management team considered that the cost of packaging and transport was a major issue. Reusable packaging could contribute to keeping costs down. The person-hours required to package and repackage products need to be factored into the costs of supplying the products. Possibly, the performance of such logistics could be allocated to local contractors. However, because of the need to streamline the process, a manufacturer's manager said that in his view, centralized logistics would be necessary for efficiency. Localized storage would not reduce costs considerably as the parcel delivery costs are the same anywhere in the UK. Therefore, because of the need to streamline the process, the manufacturer thinks that a centralized delivery centre would be the best option.

As explained in Section 2, customers could be educated to keep the packaging in a good state for reuse - an idea which is, perhaps, not likely to be received well by consumers.
Efficient delivery is also a key issue for customer satisfaction. As the statement below illustrates,

"Most of the feedback was around the delivery… of the product. If there was a problem with delivery they were unhappy, if there was no problem with delivery they rated it 'super-duper'".

This is in line with Catulli's (2012) findings, where reliability of the supply and on demand access were important aspects of participants' expectations. Logistics challenges can also be associated with attrition, due to difficulties in contacting the users to collect equipment. Some of the problems with collections seem to be associated with users being not available at a given time or collection vans not finding customers. Therefore, delay in returning equipment by consumers affected the attrition rate by affecting the availability of products for subsequent customers.

5.8.1.6 *Access to market and partners*

Another aspect to be considered is access to market. A partner such as a retailer could perhaps address the limitations of over-standardized service. In business, retailers offer the benefit of aggregating the offer of different manufacturers in a consolidated offering. Thus, intermediaries could help satisfy the requirements of consumers for a broader range of products by consolidating offers from more suppliers. In the REBUS project, this was achieved with the help of a not-for-profit organization with an excellent reputation. This organization provided the assets of customer knowledge, credibility, trustworthiness and a database for promotion of the PSS to parents. This contributed to the creation of a protected niche for the "socio-technical innovation" following Geels (2004) and Ceschin (2013).

The nature of the consumers acquiring infant products (new parents), who are in a transitory life stage (parenthood), makes it hard to identify them. Scaling up this PSS would perhaps still require a partner facilitating identification of parents. Crucially, the partner needs to facilitate the initial contact with the consumer when they are pregnant and the distributor could then be a possible partner for scaling up.

Other intermediaries/partners in the infant mobility market could include, in the manufacturer's view, such companies as Bounty, who go into the hospitals and have an excellent way of identifying pregnant people, creating a dialogue with them and getting them to register on their hub. Therefore, as a source of data, they are probably the best in terms of knowing who those consumers are and identifying them.

These potential partners would of course require a margin and therefore attract distribution costs. In the manufacturer's case, the main role of the network partner was access to a database of consumers and contributing understanding of the target market. This however

would attract costs (distributor's margins) and would mean foregoing some important benefits for the manufacturer in a scaled up implementation, as they would miss a much-desired advantage - ownership of the relationship with customers and improved understanding of their needs. The manufacturer could gain a larger share of the income if it sold directly to the consumer, as the quote below illustrates,

"*We would probably have greater efficiencies (by selling to consumers) directly on line. (…), we could have the full income stream coming into us, (…) on a standard product (…) that's designed to be sold [directly] to consumers, that's then subject to refurbishing*".

The provider would need to design strategies to drive traffic to their website and profile customers. For the charity involved in the pilot, costs consisted mainly of setting up the trial. Running costs were negligible because the pilot was run through a website, so most of it was automated. On balance, the participants in the workshops in the main agreed that the PSS could be made to be viable.

5.8.2   Market receptiveness

Participants at both workshops agreed that younger consumers (e.g. millennials) might be more receptive to a PSS offering. All agreed that the relationship between people and the products they use has changed when comparing newer with older generations. Ownership is no longer the "default mode of consumption" (cf. Belk 1988, 2014). This is now socially accepted, which can be seen from the increase in people who lease rather than own cars and it would seem that there is no longer a stigma associated with lease or rental of such products. This sort of access to products is becoming increasingly accepted in the wider society - a phenomenon known as the sharing economy. The more renting and leasing equipment starts to become commonplace, the more likely people are to rent items instead of buying them outright.

Consumers are satisfied with acquiring some types of products second-hand and this overlaps with renting products and therefore PSS. Renting equipment therefore, including infant mobility equipment, may become increasingly socially acceptable. However, renting products may be construed differently across market segments. For example, in the view of the distributor, it might appeal more to young people. Indeed, a manager at the charity reported that people that shop at the parental charity's "nearly new" sales are a different demographic segment than those who buy parental courses.

5.8.3 Possible benefits for providers

The key benefits of a PSS to providers was discussed at the workshops. An important benefit that emerged is that PSS facilitates and gives providers incentives to comply with Extended Producer Responsibility (EPR) by retaining ownership of products. A more direct rapport with customers is a key expected benefit of implementing a PSS. This may be particularly beneficial in view of the crisis of high street retailing and the increase in online sales. Such a rapport could facilitate a better understanding of customer needs. As this quote illustrates,

"*we want to have much more of a relationship (…) with them (the parents), particularly given that they're going to have to buy another car seat in 9, 12, 15 months' time, so we want to identify who they are, not rely on them being pleased with Maxi Cosi and buying maybe another Maxi Cosi when they go into Mothercare* [29]".

Achieving an enhanced capability in relationship management can integrate well with marketing strategies, as it can result in good database management for consumers. However, when the REBUS project started, the manufacturer was not able, in the opinion of managers, to deal with consumers direct for reasons of competence and resource limitations. It was therefore necessary to use the charity as an intermediary. A better understanding of customer relationships was an important benefit achieved through the pilot PSS: for example, often the company didn't know any of the people who were buying their products, because they were selling it to a retailer, who were then selling it on to consumers. They only knew who the consumers were when they had a problem with the product and that was a minimal percentage. Therefore, whilst resource limitations may make direct customer contact problematic for manufacturers, it would be a desirable option. There was agreement in the manufacturers' workshop that despite the initial relationship being set up by the charity, the pilot brought about considerable learning about how to shape direct relationships with consumers. Examples of how this was done is through interaction with consumers to train them in product and packaging stewardship and response to calls by the manufacturer's customer service team. This suggests that PSS could support a more direct relationship of manufacturers with consumers. A specific advantage of direct consumer relationships is that it may inform communication strategy as explained below.

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[29] A UK based infant products retailer

5.8.4 Marketing and meanings

Insights into customers' behaviour and purchasing intentions gained through a relationship supported by PSS could inform marketing communications. One participant believes that environmental protection should have been emphasized more to promote renting pushchairs. For example, if the 'green' aspects of PSS were promoted more to the appropriate demographic segments, the pushchairs may have been more successful. However, the demographic characteristics of the membership that the charity has is, in the managers' opinion, probably the most likely to exhibit a green purchasing behaviour. Conversely, they are also exactly the people who desire status symbols so they may be more likely to want to own products outright.

The notion of relevance of environmental protection to consumers is contradicted by the PCP survey, which suggests that environmental protection is ranked as one of the least important aspects (see Section 5.6). Although consumers recognized that access through PSS was a more environmentally friendly mode of acquisition than other ways to acquire products, the supposed environmental benefits of PSS seemed not to be of great importance to consumers when making decisions about how to acquire pushchairs. Parents generally seemed much more interested in safety and hygiene, so those interested in environmental protection might be limited to specific market segments (cf. Moisander and Pesonen 2002, Craig-Lees and Hill 2002) as Section 5.7 showed.

A participant also said that, having seen the results of the analysis of the data collected in the project (see Sections 5.7), she said that she thought that the trade-off of prestige versus practicality was a good insight. Interestingly, whilst some participants in the consumer interviews saw a pushchair as a functional item and chose to rent both pushchairs and car seats, others seemed to consider them products they would probably want to own (see Section 5.7).

5.8.5 Risks for providers

5.8.5.1 Attrition

As seen in Section 5.4, attrition (the proportion of products that are damaged beyond economic repair or which are not returned by users and, therefore, cannot be used again) emerged as a key risk of PSS. Attrition might affect the likely return on investment of the PSS, so a high rate of attrition would represent a threat to the viability of scaling up the PSS. Section 5.4 evidenced that the rate of attrition in the PSS was 8.8%

This could perhaps be addressed with a more flexible design of the service, where users have more freedom to opt for length of use and seamless replacement of products, with flexible payment methods, such as a monthly fee and by selecting users based on their trustworthiness. The manufacturer and charity did not have the resources to recover products in cases where they were not returned on demand. This, like the issues of theft and damage described in Section 1.4 in the introduction to this report, suggests that PSS may present a high level of risk for providers. Scaling up the PSS would require considerable investment in resources to reduce attrition rates and to recover products.

5.8.5.2   *Product liability and other risks*

The issue of product liability, i.e. the responsibilities of suppliers for damages suffered by customers in case of product failure is a notable risk in relation to product refurbishment. This also entails the supply of correct information to customers when they access refurbished products, to match the information they would be given when being supplied with a brand new product.   The introduction to the UK Government product liability website illustrates the seriousness of this matter. Manufacturers and distributors - such as shops and wholesalers of a product have legal responsibilities for damage caused by product failure. These responsibilities may result in legal action for damages for personal injury or damage to property because of using a defective product, with possible fines or even imprisonment (Gov.UK 2012).

This makes a quality assurance process essential for PSS. The refurbishing process is the most critical and the participating manufacturer appreciated the need to keep control of the refurbishment process in order to assure quality. When a car seat is refurbished, it is safety inspected to ensure the integrity of the harness system and of the shell that takes the impact. Whilst cleaning can be left to consumers, refurbishment should be done at a controlled centre and the manufacturers' management team recommended discouraging consumers from performing any refurbishment. The supplier felt that quality assurance could not even be delegated to other professional companies. As the quote below illustrates, it would be therefore important that the company:

"*....had control over quality standards that are being applied to it [the car seat], given its safety function*".

Product liability is a critical aspect of PSS. A manufacturer who designed and implemented a PSS may well **not** consider delegating refurbishment to businesses that are local to users, they would prefer to centralize these operations to have total control of them and ensure

quality. That would affect the environmental benefits of the PSS (as the product would travel less far if refurbished locally) and, possibly, could prevent the creation of employment opportunities (at decentralized refurbishment centres). Participants in the workshops agreed that since the pre-pilot focus groups, the RGT survey and the field research all suggested that Quality Assurance is a key concern of users, the provider would need a QA process not only to make the product acceptable to consumers but also to assure performance safety. This is important to address product liability.

5.8.6 Managing a PSS

The data collected in the workshops, compared with consumer data presented in Sections 5.6 and 5.7 presents some insights in how managing a PSS differs from conventional businesses based on selling goods outright. A PSS provider needs to design an offering which takes into account the costs of stock and the responsibilities of providing a service where customers use products owned by the provider. This involves regular contact with customers and processes for educating customers to exercise product and packaging stewardship with a view to returning the products at the end of the lease. Good logistic management is essential. Providers also need to track goods, for example with electronic tags to mitigate the risk of attrition. Insurance is necessary – in addition to customer education – to reduce product liability risks. Providing a PSS is likely to require the use of applications such as mobile phone apps (cf. Catulli et al. 2017b) to enable consumers to book products for use when they need them. All these requirements call for considerable investment in resources to interact with consumers that can be significant barriers for manufacturers, as at the moment they are better placed to interact with customers through intermediaries (cf. Cook et al. 2006).

Summary
- PSS seems to work for products with a perceived short duration of use. For consumers, duration of use to cost ratio is an important decision criterion.   - Scaling up this type of PSS faces a number of challenges such as issues with financial viability due to attrition and the number of cycles of use that can be achieved.   - PSS could perhaps work with products expressly designed for PSS, centralized automated refurbishing or remanufacturing facilities, direct contact with customers through online facilities (such as web sites or mobile phone apps) and higher rental or leasing volumes   - A key benefit of PSS is that it facilitates compliance of manufacturers and providers with *Extended Producer Responsibility*. Further, it supports the development of direct relationships between manufacturers and consumers   - Logistics is a critical performance area for PSS. Literature shows that on demand access to products by users is a key performance aspect for consumers to accept PSS.

6   Discussion

This report has explored the implementation of a PSS in practice through Action Research, with the purpose of learning by doing. This section discusses the findings. The discussion is structured according to the three main questions, which guided the work.

> i.   *How will parents relate to a Use Orientated PSS proposition based around infant mobility equipment?*

One theme that emerges across the data collected by different methods in the study is participants' uncertainty on whether pushchairs and car seats accessed through a PSS would be safe to use, hygienic and on their general condition. This is consistent with the findings of the focus groups conducted in the feasibility study before the implementation of the pilot. These concerns are in line with the study of Michaud and Llerena (2010) on consumers and remanufactured products, which found that consumers were willing to pay less for a remanufactured product and with the study of Bardhi and Eckhardt (2012) which highlighted concerns about contagion. All the qualitative data evidenced the participants' concern with quality assurance - often explicitly cited in the data as "quality control". In respect of product characteristics, the utility features participants expected for pushchairs were: a light, foldable frame, storage space underneath the chair and suitability for all terrains, jogging and trekking. This suggests that a wide range of products would be needed.

From a cultural perspective, Warde (2015) claims that ownership is an established western convention. Conventions are a degree of consensus on understandings, procedures and engagements within practices (Warde, 2005). Ownership is also associated with meanings of status and materialism (Richins, 1994) although car seats do not seem to present the same issues to do with symbolic value and personalization that pushchairs do.

The convention that ownership gives the right to modify products (Snare, 1972) is relevant to whether PSS is acceptable to consumers or not. Participants wish to match and adapt their pushchairs to their practices and lifestyles, therefore they said that they wanted to be free to personalize products and in some cases, they prefer using products that they own outright. This may be a barrier to PSS.

The need to match products with consumer lifestyles also means that the need to design a PSS based on a small range of products (which the manufacturer said they would prefer - see Section 5.5) is a major obstacle for the success of a PSS based on pushchairs, as consumers prefer variety. One important output of the project is the identification of types of products suitable for PSS. From the point of view of the practices consumers are involved with and perform, it appears that use of products owned outright is particularly ingrained for pushchairs. Concerns about damaging these products whilst performing practices such as jogging on rough terrains may indicate that consumers will prefer to use their own pushchairs rather than rented ones. PSS also requires consumers to acquire new competences such as booking products for use through apps on mobile phones/laptops and product and packaging stewardship.

All the data evidences that consumer participants are aware of the need for environmental protection and they associated the PSS with resource efficiency and environmental benefits. Whilst quantitative data showed that this was of little importance for consumers, in depth qualitative analysis showed that some types of consumers do have interest in environmental benefits. However we see that in line with the value action gap identified by Blake (1999), these attitudes and values only translate in action for a few of the cases. This is because environmental protection is, relatively speaking, unimportant when weighing up the issues taken into account by consumers when choosing the way in which they decide to buy a car seat or pushchair. Even in those cases, the relevance of environmental issues is uncertain, since participants showed they had rationalized the purchase from other points of view, e.g. based on financial benefits in respect to cost versus duration of use.

An interesting aspect is the decision that was made to charge a standardized 6 months lease paid in advance, which was not in line with the original plan for the reasons explained in 4.4. Pushchairs were not as successful as car seats and a considerable upfront fee was necessary to lease them. One research question that arises is whether paying a smaller monthly fee would encourage consumers to rent pushchairs.

Of less importance is the association of using pre-used products and therefore PSS, with economic disadvantage and fear of "stigmatization". This questions the findings of Williams and Widebank[30] (2006), who claim that consumption of pre-used products is perceived as being associated with social disadvantage.

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[30] A specific analysis of the economic background /SEG/Income of respondents was not conducted because it was outside the remit of the project

It should be remembered that as seen in 3.10.1, the characteristics of the participants' sample being skewed towards white high income families is a limitation of the study. This was beyond the control of the researchers because the ethnicity of participants reflects the composition of the parental charity's membership.

> *ii. What learning outcomes can businesses derive from the implementation of a small scale Use Orientated PSS based around infant mobility equipment?*

The data collected both from businesses and consumers evidences that amongst the requirements of consumers, financial advantages in combination with time-limited use seem to be key aspects of the decision to adopt a PSS or not. Pre-used products appear to be associated by consumers with risks of damage and poor hygiene. In the case of businesses, this was also an operational issue as they were concerned that products would be returned in too poor a state to be refurbished. The findings from the focus groups (4.3) and the PCP study conducted during the pilot (5.6) agree that health and safety and associated quality assurance are important. The learning outcome therefore is that suppliers need to provide evidence of QA for consumers to adopt the PSS.

Whilst the PCP data showed that consumers would, in principle, be against renting car seats, in the pilot these were the most successful product. This might be due, amongst other things, to a lack of awareness of the PSS pilot at the time participants acquired these products. The contradiction between quantitative and qualitative data can perhaps be explained as follows:

- Analysis of the quantitative data rightly highlighted an interest in renting pushchairs due to rational economic considerations, i.e. saving money on a product which is used for a short time
- The analysis of field qualitative data revealed that consumers' lifestyles and the importance of pushchairs as identity producers is an obstacle for adoption of the PSS as ownership is preferred. This may partly explain the lack of success of pushchairs in the pilot.

The manufacturing partner in the project suggested that one of the causes of lack of success of pushchairs in the project might be a wish of participants to purchase specific brands. This suggests a need for businesses to invest in their brands.

The freedom given by ownership also leads parents to prefer using their own products, which challenges PSS, especially for pushchairs. After all, quantitative data analysis evidenced PSS as a "second best" option to buying (i.e. outright ownership) from a specialist retailer. In turn, car seats had been seen as a harder sell to parents. However, field research suggests that quality assurance and strong supplier reputation make a car seat PSS likely to be a more successful offering than pushchairs.

PSS appears able to enable more direct relationships between manufacturers and consumers (cf. Mont 2004b). This could both capitalize on the shift of consumers away from high street retailing and into online buying and selling (Mintel 2018) and address this threat. However, the management of this relationship demands considerable investment in facilities and resources to manage the customer interface, including human resources and training (Cook et al. 2006), logistics management and ICT resources such as apps (Catulli et al. 2017b, Pialot et al. 2017, Catulli 2019). In fact, PSS provisions might even require the design of specific mobile phone apps to enable consumers to access the PSS (Catulli 2019).

Data collected from suppliers' interviews and quantitative data agree that environmental protection is of secondary importance to consumers, however qualitative data suggests that some types of consumers do give resource efficiency and environmental issues greater importance, in agreement with Moisander and Pesonen (2002). Providers need to consider these smaller segments as a possible target market. One important aspect for marketing of infant product PSS is that providers would need to interact with expert organisations such as the NHS and the NCT for help to legitimise use of infant products through PSS.

PSS presents several challenges for implementation as an acceptable offering for consumers whilst being financially viable. The findings suggest that multiple uses of infant equipment PSS are indeed possible, at least for car seats. This was one of the key objectives of the research. The issue is important because PSS literature considers multiple uses of products as a source of its environmental benefits, by reducing product proliferation (cf. Mont, 2002; Manzini and Vezzoli, 2003; 2005). Furthermore, multiple uses are also necessary for the PSS business model to be financially viable. The rental of a product for a limited time, charged out based on the length of use, can only recover part of the cost of the stock of products. In order to break even, a number of uses needs to be achieved. The possibility of charging multiple times for the use of the same unit can make it possible for it to break even and contributes to its viability.

As was seen in sections 5.5, the Pareto effect, i.e. the disproportionate number of accesses achieved by a small proportion of the product range could be a challenge for the viability of the PSS, if it continued in the same way in a scaled up PSS because only a small proportion of products would break even. This is even more so when considering that the dominant car seats – Pebble and Cabriofix – are what are called in the infant equipment industry "group 0" car seats, suitable for infants from birth to 9 months. The small number of multiple uses for some models, which is summarized in figures 5-5, 5-6 and 5-7, would be problematic if it continued in the same fashion in a scaled up PSS. What remains to be explored is what would happen with a product specifically manufactured for PSS (i.e. a more durable and expensive product).

A major challenge to PSS implementation might come from consumers requiring a wider range of products than suppliers are willing to supply by way of a PSS. A wider range of physical products would imply high costs of stock and the risk that some of the products are not used sufficient times to break even due to Pareto effects. The design of the PSS, including both the physical tangible and service components, needs therefore to account for these challenges. These design imperatives might use the concepts of breadth and depth of the offering as criteria to design a PSS. Designers may aim at designing the PSS to maximize either *the number of users that can be satisfied with a single product* or *the number of products users can access in their subscription* or both these objectives. This focus on the achievement of multiple uses by following these criteria in the design might contribute to make a PSS offering financially viable.

There is, however, a further challenge to financial viability namely, attrition: the products that have to be written off due to damage or not being returned. Whilst some commentators such as Mont (2002) overlook this risk (see Table 2-1), Roy (2000) and Manzini and Vezzoli (2003) claim that renting customers would be less careful with products. This claim is contradicted by the result of the pre-pilot focus groups (4.3). However, in fact the consumption in the pilot was affected by attrition. This risk needs to be addressed for example by product tracking or insurance.

An important benefit of PSS is that it can help suppliers to comply with extended producer responsibility; there are however concerns about product liability, as PSS involves delivering a service whilst the provider retains the ownership of the product. Providers should therefore put measures in place – insurance for example – to address these liabilities.

After the end of the project, the manufacturer discontinued the leasing programme of the PSS, mostly because of the costs and risk implied in large-scale adoption. However, the insights gained in the project contributed to the design of a smaller scale rental program aimed at parents of infants with the hip dysplasia condition. The parental charity elected to terminate their involvement with rentals of products.

In summary, the findings suggest that when confronted with consumers' response, a PSS based only on pushchairs as proposed by Mont et al. (2006) may not be feasible. A PSS based on car seats seems more acceptable for consumers but it presents the financial risks illustrated above for providers.

iii.   What could be the possible dynamics of adoption and diffusion of such a proposition?

A possible theoretical lens to study adoption and diffusion of the PSS could be drawing on Rogers's (1995) theory of diffusion of innovations. That perspective segments consumers in different types, depending on their propensity to adopt innovations such as the PSS. These segments are (Rogers 1995):

- Innovators
- Early adopter
- Early majority
- Late majority
- Laggards

According to the theory, consumers would progressively adopt the innovation, which would then diffuse through the various segments. Rogers' (1995) theory however has been challenged on the grounds that it was originally formulated in a specific national, social and cultural context and it is a highly rationalistic and deterministic framework based on assumptions, such as that innovation equates progress (Greenhalgh et al. 2005). The theory overlooks many behavioural and cultural aspects (Arnould 1989) and has limited predictive power (Hsia-Ching 2010). The REBUS project however has offered some possible insights in how some types of consumers might be innovators or early adopters. For example, cases included older parents having a first – and perhaps only – child who were more likely to adopt the PSS because they could not use a product across multiple births. Similarly, parents who are highly mobile like those which Bardhi et al. (2012) call "nomadic" or interested in resource efficiency, may be more likely to choose acquisition through PSS. CCT based data analysis offered insights on individual adoption, where consumers saw using the PSS as a source of symbolic value to project an image of environmentally

responsible parents. Participants follow advice on PSS from expert advisers such as parental charities and other users, both offline and online through forums. This could result in diffusion by "social contagion" (Shove et al. 2012). Providers' quality assurance processes seem to legitimise the use of PSS and this could support this diffusion dynamic. PT based data analysis however offered insights in the stability of conventional practices, such as parents preferring using their own products for fear of damaging leased products in their activities. This may hamper adoption and diffusion of PSS.

The results of the PCP, CCT and PT research about how participants felt about the idea of renting car seats and pushchairs respectively generate some interesting questions in the light of the number of car seats and pushchairs actually rented out in the pilot. As detailed elsewhere in this report, renting car seats was far more successful in being adopted than renting pushchairs. How might we explain this apparent contradiction given the expressed views of participants about the idea of renting car seats and pushchairs respectively? Here are some possible reasons:

I.   Parents can only rely on their present knowledge to make decisions. The accepted wisdom about renting car seats is that using pre-used car seats is not good practice. This is because a parent using such product (whether by way of renting, buying second-hand or otherwise) cannot be sure whether the seat has incurred structural damage (e.g., been in situ in a car that has been in an accident) that might render it unsafe to use. This possibility emerged in the consumer focus groups reported in section 4.3 (cf. Catulli et al. 2013). In this regard, it is worth stressing that the ultimate function of a car seat is to protect a child in the event of an accident. Therefore, any risk that the seat may be damaged and thus rendered less able to perform that function is a risk that would make the PSS extremely unattractive to parents. However, the car seats actually rented out in the pilot were either new or, if refurbished, they were certified by a quality assurance label. In fact, as the qualitative data reported in section 5.7 shows, this certification was a good explanation of why car seats were successful despite reservations observed in the survey.

II.   In the participants' view as noted in section 5.7, car seats, unlike pushchairs, have little value on the second-hand market because of the safety considerations mentioned above. Pushchairs in good condition can sell for a substantial percentage of their initial purchase price (Mintel 2012). This may be a possible reason why their rentals were comparatively modest - if a parent can get, say, 50% of the purchase price that they paid by selling on the second-hand market, that will obviously affect whether or not renting makes financial sense.

These considerations may help shape the patterns of adoption.

7   Conclusions and recommendations for policy

Car seats are costly in relation to the duration of use, so participants see renting as a better option. These products are considered shorter-term use in relation to their cost and not of public consumption as they are installed in cars, so their use is not necessarily influenced by social approval or disapproval. Car seats therefore appear to be the easiest product to propose as part of an infant product PSS. In contrast, the possible reasons for the lack of success of pushchairs might be explained by the fact that parents see this product as one which is used for longer periods. For example, participants say that pushchairs might be used across multiple births.   Additionally, pushchairs are a product of social consumption, therefore ownership is seen by consumers as the right way to consume these products.

Parents' lifestyles also seem to play a role, because parents may demand a wider range of products to match their lifestyles. This contrasts with the need of suppliers to make a satisfactory return on their investment because of costs of stock and possible unrented products. This could be resolved by expressly designing modular products for PSS that can be easily adapted to various applications and life styles.

From the marketing communications point of view, since environmental benefits, considered a main advantage of PSS, seem not to be of great importance to consumers, perhaps communication strategies for PSS offerings should not include environmental benefits at all. Parents generally seem more interested in hygiene, safety and cost savings.   Some consumer types and possibly market segments, e.g. voluntary simplifiers (cf. Shama, 1985; Craig-Lees and Hill, 2002) may be interested in environmental protection.

As for the environmental performance of PSS, the results of the LCA performed as part of the PSS pilot shows that there are some benefits in terms of resource efficiency and waste prevention. A separate report is available as an annex available from [?]

The findings of this study suggest that PSS need to be evaluated from the regulatory point of view. There are examples that can be considered PSS, including Airbnb (sharing of accommodation) and Uber (sharing of cars). These have attracted attention (not always favourable) on legal aspects (cf. Economist 2013b; a). In fact, both companies have attracted controversy in some countries. Despite their relative success, these examples proved challenging for policy and legislation in many countries and markets.

An understanding of Consumer Credit legislation seems to be necessary to the design of PSS. An implication is that if policy makers desire the diffusion of business models based on PSS, they need to undertake a considerable program of education and information of businesses, for example on business' understanding of relevant legislation and on the need and methods to acquire Consumer Credit licenses if they want to implement PSS in consumer markets. These findings also suggest that legislation may need reviewing to accommodate these business models and to provide the necessary quality assurance with regard to specific standards covering PSS and other applications of refurbished products. Gottberg et al. (2009) has already proposed this.

The issues of product liability, quality assurance and responsibility, as well as whether the service is delivered or not by qualified personnel is a challenge for policy makers. Further, Cook's et al. (2006) suggest that the transfer of knowledge on PSS from academia to business (section 3) is a challenge, which policymakers have yet to meet fully. This report supports that suggestion. In the pilot reported here both the manufacturing and distributor partners have generated new knowledge but this was in a low risk scenario within a small scale, protected experiment. Large-scale implementation by businesses may be risky as the implications of costs of stock, difficulties to extract value from each product and attrition show.

The success of the PSS pilot, especially as far as car seats are concerned, suggests that PSS warrants more attention and further research and support. However, the issues the study revealed pertaining to the suitability of different products for PSS suggest that at this stage business managers, policy makers and activist organizations need to be aware of the risks that this business model presents from the point of view of its financial viability.

The study confirms the need and utility to conduct more Action Research to learn about PSS and other sustainable business models. There are risks arising from PSS implementation such as attrition, which are identified only when PSS are implemented in real life, as in the case of the theft and damage to products endured by Mobyke in Manchester (Pidd 2018a). In the REBUS project, the same phenomenon was identified in this project through AR. This means that AR can potentially help identify such risks, which might include among other things manufacturer's product liability, before these business models are implemented on a large scale. Further work should focus on types and brands of car seats and pushchairs, which are specifically designed to be supplied as part of a PSS. Research in different contexts and involving different products should also be conducted in order to compare the findings of this project with those of these different contexts. This would assist testing the

transferability of the research and its findings to other contexts (cf. Robson 2011). In summary, policy makers should stimulate and support further collaborative research between universities and business, where the issues deriving from the diversity of products that could be designed into PSS could be explored further.

References

Argyris, C., and D. A. Schön. (1989). Participatory action research and action science compared. Am Behav Sci **32**:612-623.

Arnould, E. J. (1989). Toward a Broadened Theory of Preference Formation and the Diffusion of Innovations: Cases from Zinder Province, Niger Republic. Journal of Consumer Research **16**:239-267.

Arnould EJ and Thompson CJ. (2005) Consumer Culture Theory (CCT): Twenty Years of Research. *Journal of Consumer Research* 31: 868-882.

Arnould, E. J., and C. Thompson. (2007). Consumer Culture Theory (and we really mean Theorethics): dilemmas and opportunities posed by an academic branding strategy. Pages 3–22 *in* R. W. B. a. J. F. S. J. (eds), editor. Research in Consumer Behaviour. Elsevier, Oxford.

Armstrong, Cosette M., Kirsi Niinimäki, Sari Kujala, Essi Karell, and Chunmin Lang (2015) Sustainable product-service systems for clothing: exploring consumer perceptions of consumption alternatives in Finland. *Journal of Cleaner Production* 97:30-39

Baby Product Association. (2014) Don't gamble with your child's safety. In: Association BP (ed) *Baby Product Association.* London: Baby Product Association.

Bardhi F and Eckhardt GM. (2012) Access-Based Consumption: The Case of Car Sharing. *Journal of Consumer Research* 39: 1-18.

Bardhi F, Eckhardt GM and Arnould EJ. (2012) Liquid Relationships to Possessions. *Journal of Consumer Research* 39: 510-529.

Baumeister, C. K., and Wangenheim, Florian v. (2014). Access versus Ownership: Understanding Consumers' Consumption Mode Preference.*in* T. U. M.-S. o. Management, editor., Zurich, Switzerland.

bbc.co.uk. (2014) *Large decrease in number of births, ONS figures show*. Available at: http://www.bbc.co.uk/news/uk-28330429.

Bbc.co.uk. (2020) Child car seats: Why is it so hard to recycle them? Available at: https://www.bbc.co.uk/news/uk-50273625

Beckmann-Dobrev, B., S. Kind, and R. Stark. (2015). Hybrid Simulators for Product Service-Systems – Innovation Potential Demonstrated on Urban Bike Mobility. Procedia CIRP **36**:78-82.

Belk R. (1988) Possessions and the Extended Self. *Journal of Consumer Research* 15: 139-168.

Belk RW. (2014a) Sharing Versus Pseudo-Sharing in Web 2.0. *Anthropologist* 18: 7-23.

Belk RW. (2014b) You are what you can access: Sharing and collaborative consumption online. *Journal of Business Research* 67: 1595–1600.

Bengtsson, A., and J. Ostberg. (2006). Researching the cultures of brands.*in* R. W. Belk, editor. Handbook of Qualitative Research Methods in Marketing. Edward Elgar Publishing Limited, Cheltenham, UK.

Blaikie, N. W. H. (1991). A critique of the use of triangulation in social research'. Quality and Quantity **25** 115 -136.

Blake, J. (1999). Overcoming the 'Value-Action Gap' in Environmental Policy: tensions between national policy and local experience. Local Environment **4**:257-278.

Briceno, T., and S. Stagl. (2006). The role of social processes for sustainable consumption. Journal of
    Cleaner Production **14**:1541-1551.

Brundtland, G., M. Khalid, S. Agnelli, S. Abdulrahman Al-Athel, P. Gonzalez Casanova, B. T. G.
    Chidzero, L. M. Padika, V. Hauff, I. Lang, M. Shijun, and a. others. (1987). Report of the World
    Commission on Environment and Development: Our Common Future. World Commission on
    Environment and Development, Geneva.

Bueger, C. (2014). Pathways to practice: praxiography and international politics. European Political
    Science Review **6**:383 - 406.

Burr, V., T. Butt, and M. Giliberto. (2016). "Culture's like an extra layer on top isn't it?" Sociality and
    superordination in Italian and English people. Pages 154-166 *in* D. W. N. R. (Eds.), editor. The
    Wiley handbook of personal construct psychology. Wiley, Chichester, UK.

Catulli M. (2012) What Uncertainty? Further Insights on why consumers might be distrustful of
    product service systems. *Journal of Manufacturing Technology Management* 23: 780-793.

Catulli, M. (2019). An Investigation into the Social and Cultural Dynamics that Shape Product Service
    Systems Consumption. The Open University, Milton Keines.

Catulli M, Lindley JK, Reed NB, et al. (2013) What is Mine is NOT Yours: Further insight on what
    access-based consumption says about consumers. In: Belk RW, Price LL and Penaloza L (eds)
    Research in Consumer Behaviour. : Emerald, 185-208.

Catulli, Maurizio, and Nick Reed (2017) A Personal Construct Psychology based investigation into a
    Product Service System for renting pushchairs to consumers   *Business Strategy and the
    Environment*.

Catulli, M., M. Cook, and S. Potter (2016 PSS Users and Harley Davidson Riders; The importance of
    consumer identity in the diffusion of sustainable consumption solutions. Journal of Industrial
    Ecology.

Catulli, Maurizio, Matthew Cook, and Stephen Potter (2017) Consuming use orientated product
    service systems: a Consumer Culture Theory perspective. *Journal of Cleaner Production*
    141:1186-1193.

Catulli, Maurizio, Matthew Cook, and Stephen Potter (2017) A Double diffusion of innovations: The
    case of electric automobility Product Service System. PLATE conference Delft University of
    Technology 8-10 November 2017.

Ceschin, F. (2013) Critical factors for implementing and diffusing sustainable product-Service
    systems: insights from innovation studies and companies' experiences. Journal of Cleaner
    Production **45**:74-88.

Charter, M., G. Adams, and T. Clark. (2004) Suspronet Report. The Centre for Sustainable Design,
    London.

Cook M. (2014) Fluid transitions to more sustainable product service systems. *Environmental
    Innovation and Societal Transitions* 12: 1-13.

Cook MB, Bhamra TA and Lemon M. (2006) The transfer and application of Product Service Systems:
    from academic to UK manufacturing firms. *Journal of Cleaner Production* 14: 1455-1465.

Cooper, R. 2018. UK Government announces new waste strategy for a circular economy.
    Climateaction.org, London.

Craig-Lees M and Hill C. (2002) Understanding Voluntary Simplifiers. *Psychology and Marketing* 19:
    187-210.

DEFRA. 2018. Our waste, our resources: a strategy for England. DEFRA, London.

Economist T. (2013a) All eyes on the sharing economy. *The Economist.* London: The Economist
    Group.

Economist T. (2013b) The rise of the sharing economy. *The Economist.* London: The Economist
    Group.

Efthymiou, Dimitrios, Constantinos Antoniou, and Paul Waddell (2013) Factors affecting the
    adoption of vehicle sharing systems by young drivers. *Transport Policy* 29 (0):64-73.

Feldman MS and Orlikowski WJ. (2011) Theorizing Practice and Practicing Theory. *Organization Science* 22: 1240-1253.

Fielding, N. G. (2012) Triangulation and Mixed Methods Designs: Data Integration With New Research Technologies. Journal of Mixed Methods Research **6**:124-136.

Fien, J., P. Kumar, and M. J. Ravindranath. (2001) An action research network as a strategy for educational change: the "learning for a sustainable environment" project. Journal of Eductional Change **2**:207-221.

Firnkorn, Jörg , and Martin Müller (2012) Selling Mobility instead of Cars: New Business Strategies of Automakers and the Impact on Private Vehicle Holding. *Business Strategy and the Environment* 21:264–280.

Fransella, F. (1985) The Idiographic Research Unit of the Centre for Personal Construct Psychology.*in* 6th International Congress on Personal Construct Psychology, Cambridge, U.K.

Fransella, F. 1995. George Kelly. SAGE, London.

Fransella, F., R. C. Bell, and D. Bannister. (2004) A manual for repertory grid technique. John Wiley & Sons, Chichester, U.K.

French, W. L., and C. H. Bell. (1999) Organization Development - behavioural science interventions for organizational improvement. Person Education Asia, Delhi.

Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. Research Policy **33**:897-920.

George AL and Bennett A. (2005) *Case Study and Theory Development,* Cambridge, Massachussetts: Belfer Center for Science and International Affairs.

Ghose, A., and S.P. Han. (2014). Estimating demand for mobile applications in the new economy. *Management Science* 60 (6):1470-1488

Glasson JB, Chang EML and Bidewell JW. (2008) The value of participatory action research in clinical nursing practice. *International Journal of Nursing Practice* 14: 34-39

Gottberg A, Longhurst PJ and Cook M. (2009) Exploring the potential of Product Service Systems to achieve household waste prevention on new housing developments in the UK. *Waste Management & Research* 0: 1-8.

Glasson, J. B., E. M. L. Chang, and J. W. Bidewell. (2008). The value of participatory action research in clinical nursing practice. International Journal of Nurseing Practice **14**:34-39.

Goedkoop, M. J., C. J. G. van Halen, H. R. M. te Riele, and P. J. M. Rommens. 1999. Product Service Systems, ecological and economic basis,. N.V. Pil MC Storrm C.S. Pre Consultants, The Hague, The Netherlands.

Greenhalgh, T., G. Robert, F. Macfarlane, P. Bate, O. Kyriakidou, and R. Peacock. (2005). Storylines of research in diffusion of innovation: a meta-narrative approach to systematic review. Social Science & Medicine **61**:417-430.

Greenwood, D. J., and M. Levin. (2007). Introduction to Action Research. SAGE, Thousand Oaks, California.

Gullstrand Edbring, Emma, Matthias Lehner, and Oksana Mont (2016) Exploring consumer attitudes to alternative models of consumption: motivations and barriers. *Journal of Cleaner Production* 123:5-15.

Gupta YP. (1989) Software Quality Assurance. *International Journal of Quality & Reliability Management* 6: 56-67.

Halkier, B., and I. Jensen. (2011). Methodological challenges in using practice theory in consumption research. Examples from a study on handling nutritional contestations of food consumption. Journal of Consumer Culture **11**:101-123.

Halme, M., M. Anttonnen, G. Hrauda, and J. Kortman. (2006). Sustainability evaluation of European household services. Journal of Cleaner Production **14**:1529-1540.

Hammersley, M. (2008). Troubles with triangulation. Sage, London.

Heale G. (2003) Applying theory to practice: an action research resource pack for professionals. *Reliability Studies* 6: 4-14.

Hern, A., and G. Topham. (2018). Investors lured by figures that don't relate to the real world. The Guardian. The Guardian Plc, London.

Hockerts K. (1999) Innovation of Eco-Efficient Services. In: Charter M and Polonsky Mj (eds) *Greener Marketing.* Sheffield: Greenleaf Publishing Ltd.

Hoepfl, M. C. (1997). Choosing Qualitative Research: a Primary for Technology Education Researchers. Journal of Technology Education **9**:47-63.

Hsia-Ching, C. (2010). A new perspective on Twitter hashtag use: Diffusion of innovation theory. Proceedings of the American Society for Information Science and Technology **47**:1-4.

http://news.bbc.co.uk. *Car seat danger to new babies*. Available at: http://news.bbc.co.uk/1/hi/health/1526517.stm.

Kalafatis S, Pollard M, East R, et al. (1999) Green Marketing and Ajzen's theory of planned behaviour: a cross-market examination. *Journal of Consumer Marketing* 16: 441-460.

Kalekin-Fishman, D., and B. Walker. (1995). The construction of group realities: Culture, society and personal construct theory. Krieger, USA.

Kocher P-Y, Kaudela-Baum S and Wolf P. (2011) Enhancing Organizational Innovation Capability Through Systemic Action Research: A Case of a Swiss SME in the Food Industry. *Syst Pract Action Res* 24: 17-24.

Kelly, G. A. 1955. The psychology of personal constructs (Vols. 1 & 2). Norton, New York.

Johnsen, H. C. G., and R. Normann. (2004). When Research and Practice Collide: The Role of Action Research When There is a Conflict of Interest With Stakeholders. Systemic Practice and Action Research **17**:207-235.

Johnston, P., M. Everard, D. Santillo, and K.-H. Robert. (2007). Reclaiming the definition of sustainability. Environmental Science and Pollution Research **14**:60-66.

Joy, A. and Li EPH. (2012) Studying Consumption Behaviour through Multiple Lenses: An Overview of Consumer Culture Theory. *Journal of Business Anthropology* 1: 141-173.

Le Vine, S., L.-G. Martin, A. Sivakumar, and J. W. Polak. (2014). A new approach to predict the market and impacts of round-trip and point-to-point carsharing systems: Case study of London. Transportation Research Part D **32**:218–229.

Le Vine, Scott, Orestes Adamou, and John W. Polak (2014) Predicting new forms of activity/mobility patterns enabled by shared-mobility services through a needs-based stated-response method: Case study of grocery shopping. *Transport Policy* 32:60-68

Lee, M., D. Roux, H. Cherrier, and B. Cova. (2011). Anti-consumption and consumer resistance: concepts, concerns, conflicts and convergence. European Journal of Marketing **45**:null.

Lewin, K. (1947). Frontiers in Group Dynamics. **1**:143-153.

Lincoln, Y. (1995). Emerging Criteria for Quality in Qualitative and Interpretive Research. Qualitative Inquiry **1**:275-289.

Madeformums.com. (2015) *Bednest: NCT says there is a "small but plausible risk" when using the co-sleeper*. Available at: http://www.madeformums.com/news-and-gossip/bednest-nct-stops-selling-bedside-crib-following-death-of-7-week-old-baby/37770.html.

Manzini E and Vezzoli C. (2003) A strategic design approach to develop sustainable product service systems:examples taken from the 'environmentally friendly innovation' Italian prize. *Journal of Cleaner Production* 11: 851-857.

Manzini E and Vezzoli C. (2005) Product-Service Systems and Sustainability. Milano: UNEP, 31.

McGettigan, P., J. McKendree, N. Reed, S. Holborow, C. Devereaux Walsh, and T. Mace. 2013. Identifying attributes required by Foundation Year 1 doctors in multidisciplinary teams: A tool for performance evaluation. BMJ Quality & Safety **22**:225-232.

McNiff, J., and J. Whitehead. (2010). You and Your Action Research Project. Routledge, New York.

Mehta, D., J. Pancholi, and P. Shukla. (2004). Action research in policy making: a case in the dairy industry in Gujarat, India. AI and Society **18**:344-363.

Meijkamp R. (1998) Changing Consumer Behaviour through Eco-Efficient Services: An empirical Study of Car Sharing in the Netherlands. *Business Strategy and the Environment* 7: 234-244.

Meijkamp R. (2000) Changing consumer behaviour through Eco-efficient Services. *Ingegneria Industriale.* Delft: Delft University, 294.

Midgley, G., J. D. Nicholson, and R. Brennan. (2016). Dealing with challenges to methodological pluralism: The paradigm problem, psychological resistance and cultural barriers. Industrial Marketing Management **XX**.

Michaud C and Llerena D. (2010) Green Consumer Behaviour: and Experimental Analysis of Willingness to Pay for Remanufactured Products. *Business Strategy and the Environment*.

Mintel. (2012). Baby and Nursery Equipment UK. Mintel, UK.

Mintel. (2018). Baby and Nursery Equipment UK. Mintel, UK.

Moisander, J., and S. Pesonen.(2002). Narratives of sustainable ways of living: constructing the self and the other as a green consumer. Management Decision **40**:329-342.

Mont O and Tukker A. (2006) Product-Service Systems: reviewing achievements and refining the research agenda. *Journal of Cleaner Production* 14: 1451-1454.

Mont OK. (2002) Clarifying the concept of Product Service System *Journal of Cleaner Production* 10: 237-245.

Mont OK. (2004) Drivers and barriers for shifting towards more service-oriented businesses: analysis of the PSS field and contributions from Sweden. *The Journal of Sustainable Product Design* 2: 89-103.

Mont, O. (2004a). Institutionalization of sustainable consumption patterns based on shared use. Ecological Economics **50**:135-153.

Mont OK, Dalhammar C and Jacobsson N. (2006) A new business model for baby prams based on leasing and product remanufacturing. *Journal of Cleaner Production* 14: 1509-1518.

Mont OK and Lindqvist T. (2003) The role of public policy in advancement of product service systems. *Journal of Cleaner Production* 11: 905-914.

Morris, J. B., T. J. Leibrandt, and R. S. Rhodes. (2003). Voluntary changes in surgery career paths: a survey of the program directors in surgery. Journal of the American College of Surgeons **196**:611-616.

Mylan J. (2015) Understanding the Diffusion of Sustainable Product-Service Systems: Insight from the Sociology of Consumption and Practice Theory. *Journal of Cleaner Production* 97: 13-20.

Mumsnet.com.

nct.org.uk/. (2018). Accessed 1/01/2018

nhs.uk. (2016) Sudden infant death syndrome (SIDS), accessed 01/2016

nhs.uk. (2018). Choosing a baby car seat. Your pregnancy and baby guide, UK.

oecd.org/. (2011) Extended producer responsibility. OECD.

OFT. (2008) Do You Need a Credit Licence? In: Trading OoF (ed). London: Office of Fair Trading.

Parasuraman A, Berry LL and Zeithaml VA. (1988) SERVQUAL: A Multiple - Item Scale for Measuring Consumer Perceptions of Service Quality. *Journal of Retailing* 64: 12-40.

Peattie, K., and S. Peattie. 2009. Social marketing: A pathway to consumption reduction? Journal of Business Research **62**:260-268.

Petersen, Trine Brun, and Vibeke Riisberg (2017) Cultivating User-ship? Developing a Circular System for the Acquisition and Use of Baby Clothing. *Fashion Practice* 9 (2):214-234

Pialot, Olivier, Dominique Millet, and Justine Bisiaux (2017) "Upgradable PSS": Clarifying a new concept of sustainable consumption/production based on upgradablility. *Journal of Cleaner Production* 141:538-550.

Pidd, H. (2018a). Manchester put on warning after bikeshare vandalism. The Guardian. The Guardian Plc, London.

Pidd, H. (2018b). On yer bike! Vandals puncture dream of dockless byclycles across UK. The Guardian. The Guardian Plc, London.

Piscicelli, Laura, Tim Cooper, and Tom Fisher (2015) The role of values in collaborative consumption: insights from a product-service system for lending and borrowing in the UK. *Journal of Cleaner Production* 97:21-29.

Platteel, T., H. Hulshof, P. Ponte, J. van Driel, and N. Verloop. (2010). Forming a collaborative action research partnership. Educational Acion Research **18**:429-451.

Reckwitz, A. (2002). Toward a Theory of Social Practices. European Journal of Social Theory **5**:243-263.

Reed, N., and Page, N. (2016). Changing behaviour to being more environmentally friendly: A PCP perspective. In D. Winter & N. Reed (Eds.), *The Wiley handbook of personal construct psychology* (pp. 487-498). Chichester, UK: John Wiley & Sons Ltd.

Rexfelt O and Hiort af Ornäs V. (2009) Consumer Acceptance of Product Service Systems - designing for relative advantage and uncertainty reductions. *Journal of Manufacturing Technology Management* 20: 674-699.

Richins M. (1994) Valuing Things: The Public and Private Meanings of Possessions. *Journal of Consumer Research* 21: 504-521.

Robson C. (2011) *Real World Research,* Chichester: John Wiley & Sons.

Rogers E. (1995) *Diffusion of Innovations,* New York, NY: Simon & Schuster.

Roy R. (2000) Sustainable product-service systems. *Futures* 32: 289-299.

Santamaria, Laura, Carolina Escobar-Tello, and Tracy Ross (2016) Switch the channel: using cultural codes for designing and positioning sustainable products and services for mainstream audiences." *Journal of Cleaner Production* 123:16-27.

Scheer, J. W. (2000). The person in society: Challenges to a constructivist theory. Psychosozial-Verlag, Giessen, Germany.

Scholl, G. (2008) Product Service Systems Taking a functional and symbolic perspective on usership. In *System Innovation for Sustainability*, edited by A. Tukker, M. Charter and C. Vezzoli. Sheffield: Greenleaf Publishing.

Schrader U. (1999) Consumer acceptance of eco-efficient services. A German perspective. *Greener Management International* 25: 105-122.

Schwabe, G., and H. Krcmar. (2000). Piloting Socio-technical Innovations Pages 132– 139 *in* 8th European Conference on Information Systems ECIS 2000, Wien.

Seale, C. (1999). Quality in Qualtative Research. Qualitative Inquiry **5**:465-478.

Seyfang, G. 2006. Ecological citizenship and sustainable consumption: Examining local organic food networks. Journal of Rural Studies **22**:383-395.

Shama A. (1985) The voluntary simplicity consumer. *Journal of Consumer Marketing* 2: 57–64.

Shostack, L. (1982). How to Design a Service. European Journal of Marketing **16**:49-63.

Shove E. (2010) Beyond the ABC: climate change policy and theories of social change. *Environment and Planning* 42: 1273 - 1285.

Shove, E. (2011). On the difference between chalk and cheese a response to Whitmarsh et al's comments on ``Beyond the ABC: climate change policy and theories of social change''. Environment and Planning A **43**:262-264.

Shove E, Pantzar M and Watson M. (2012) The Dynamics of Social Practice: Everyday life and how it changes. SAGE Publications.

Shove, E., and A. Warde. (2002). Inconspicuous Consumption: The Sociology of Consumption, Lifestyles, and the Environment. Pages 230-249 *in* R. E. Dunlap, F. H. Buttel, P. Dickens, and A. Gijswijt, editors. Sociological Theory and the Environment. Roman & Littlefield Publishers, Lanham.

Shwom, R., and J. A. Lorenzen. (2012). Changing household consumption to address climate change: social scientific insights and challenges. Wiley Interdisciplinary Reviews: Climate Change **3**:379-395.

Silverman, D. (2003). Doing Qualitative Research. SAGE, London.

Snare F. (1972) The Concept of Property. *American Philosophical Quarterly* 9 200-206.

Southerton, D., E. Shove, and A. Warde. 2005. Sustainable Domestic Technologies: changing practice, technology and convention. Manchester, UK.

Stringer, P., and D. Bannister. (1979). *in* P. B. Stringer, D. (Eds.), editor. Constructs of sociality and individuality. Academic Press, London.

Tanna NK. (2005) Action Research: a valuable research technique for service delivery development. *Pharm World Sci* 27: 4-6.

Terry, N. (2007). Assessing Instruction Modes for Master of Business Administration (MBA) Courses. Journal of Education for Business **82**:220-225.

Thomas, G. O., R. Fisher, L. Whitmarsh, T. L. Milfont, and W. Poortinga. (2018). The impact of parenthood on environmental attitudes and behaviour: a longitudinal investigation of the legacy hypothesis. Population and Environment **39**:261-276.

Thompson, S., Michaelson, Abdallah, V. Johnson, D. Morris, Riley, and A. Simms. (2011). Moments of change" as opportunities for influencing behaviour: A report to the Department for Environment, Food and Rural Affairs. DEFRA, London

Thomsen, T. U., and E. B. Sørensen. (2006). The First Four-wheeled Status Symbol: Pram Consumption as a Vehicle for the Construction of Motherhood Identity. Journal of Marketing Management **22**:907-927.

Tukker A. (2015) Product services for a resource-efficient and circular economy – a review. *Journal of Cleaner Production* 97: 76-91.

Tukker A and Tischner U. (2006) Product-services as a research field: past, present and future. Reflections from a decade of research. *Journal of Cleaner Production* 14: 1552-1556.

Vernik, D. A., D. Purohit, and P. S. Desai. (2011). Music Downloads and the Flip Side of Digital Rights Management. Marketing Science **30**:1011-1027.

Vezzoli C, Ceschin F, Diehl JC, et al. (2015) Why have 'Sustainable Product-Service Systems' not been widely implemented? Meeting new design challenges to achieve societal sustainability. *Journal of Cleaner Production* 35: 288-290.

Warde A. (2005) Consumption and Theories of Practice. *Journal of Consumer Culture* 5: 131-153.

Warde A. (2015) The Sociology of Consumption: Its Recent Development. *Annual Review of Sociology* 41: 117–134.

Watson, M. (2012). How theories of practice can inform transition to a decarbonised transport system. Journal of Transport Geography **24**:488-496.

White, A. L., M. Stoughton, and L. Feng. (1999). Servicizing: The Quiet Transition to Extended Product Responsibility. U.S. Environmental Protection Agency - Office of Solid Waste.

Williams CC and Widebank J. (2006) Why do households use alternative consumption practices? *Community, Work & Family* 8: 301-320.

Winter, D., and R. Neimeyer. (2015). Constructivist therapy.*in* E. S. N. (Ed.), editor. The Sage encyclopedia of theory in counseling and psychotherapy. Sage, London.

WRAP. (2018a). The Circular Economy - Definition. Waste & Resources Action Programme.

WRAP. (2018b). Innovative Business Models. Waste & Resources Action Programme.

WRAP. (2018c). What is an 'Innovative' or 'Resource Efficient' Business Model? Waste & Resources Action Programme.

www.nhs.uk. *Sudden infant death syndrome (SIDS)* Available at: http://www.nhs.uk/Conditions/Sudden-infant-death-syndrome/Pages/Introduction.aspx.

Zademach, H.-M., and A.-K. Musch. (2018). Bicycle-sharing systems in an alternative/diverse economy perspective: a sympathetic critique. Local Environment **23**:734-746.

Appendix A

PSS Business Managers Questionnaire

1. What products do you supply your customers with?
2. Are your customers: Consumers ☐ Businesses ☐ Other ☐ (specify......................)
3. Are these products sold outright?
4. In how many cases does the supply NOT involve outright sales? (e.g. leasing, rent)

[If significant, >Q5;   If negligible, >6]

5. How does this arrangement work?[> Q7]
6. How do you feel about increasing this type of provision? (based on share, lease, rent)
7. What are your company's responsibilities during the product's life cycle?
8. What are you company's responsibilities at the end of the life cycle?
9. Do you take back your products after your customers dispose of them?
10. What are the regulations that govern this aspect of your business?
11. What is your opinion on the advantages of this type of provision?
12. Imagine that your company decided to run the business on a share/lease/rent basis. What do you think would be the implications for your company in general?
13. If you decided to adopt this type of provision, what other types of companies would your company need to work with?
14. To what extent do you think your customers would accept it?
15. What would the financial implications be of adopting or maximising these business models?
16. What new competences do you think your company would need to acquire?
17. What would be the other areas for concern? (e.g. PSS design, technology)

Draft Questioning Route for field interviews

1. What products (artefacts) do you / did you get as part of the scheme?

2. How did you go about getting (your pram/stroller / cot)?

3. Whom did you ask for advice in order to make this choice?

4. Why did you seek information and advice from that direction?

5. What other sources could you have gone to for advice?

6. What is good about it for you?

7. What is the value to you? What value (benefits) do you get from it?

8. Why did you select the option of getting this product as a lease / rent instead of buying it?

   (or, the opposite if the option was turned down)

9. What do you think is good about it in general?

10. If you were to think about the values you care about...what do you think are the values that influenced your choice of option between leasing / renting your pram and buying it?

11. How do you use this product?

12. Why?

13. If you were to recommend this scheme to a friend...what do you think you would say to them?

14. Compare getting a pram through such a leasing scheme, against getting a cot. What would you say are the differences?

15. What are the aspects you like the most in this scheme?

16. What aspects you would like to change?

Appendix B

Participant	Age Range	Background	Expecting	First baby	Income Range	Location	Children	Product Rented	Profession
1	34-40	Canadian	No	Yes	over 60K	London	1	None	Advertising Strategist
2	34-40	Canadian	No	No	£20K - £39K	Oxford	2	Car seat	Researcher
3	34-40	American	No	Yes	£20K - £39K	Brighton	1	Cot	Social Worker / Music Technician
4	27-33	English	Yes	Yes	60+	London	0	None	Researcher
5	34-40	English	No	Yes	32K-£39	Birmingham	1	Carrycot	Software Tester
6	34-40	British Pakistani	Yes	No	£20K - £39K	London	1	None	Teacher
7	27-33	English	Yes	Yes	£20K - £39K	Cambridge	0	Car seat and Cot	Copywriter
8	27-33	English	Yes	No	£20K - £39K	Baldock	1	Car seat	Chemist
9	34-40	UK West Indian	Yes	No	£<20K	Oxford	2	Carrycot and cot	Assistant Nurse
10	34-40	English	Yes	Yes	£40K-£59K	Leeds	0	Car seat and stroller	IT Tech / Office worker
11	27-33	English	No	No	£<20K	Telford	3	Pushchair	Chef
12	25-34	Canadian	No	Yes	£40K-£59K	Oxford	1	Car seat	Mechanical Engineer
13	25-34	Italian	No	Yes	60+	London	1	Car seat	Researcher
14	27-33	Canadian	No	Yes	£40K-£59K	London	1	None	Teacher
15	34-40	British	Yes	Yes	£20K - £39K	Solihull	0	Car seat	Health and Safety expert
16	27-33	Spanish	Yes	No	£20K - £39K	Hull	2	None	Childcare trainee
17	34-40	English	Yes	Yes	£20K - £39K	London	0	Car seat	Psychologist/ Environmental Journalist

18	34-40	English	Yes	Yes	32K-£39	London	0	Car seat	Actor
19	27-33	English	No	No	£46K-60K	London	2	None	Researcher
20	34-40	New Zealand	Yes	Yes	£20K - £39K	Canterbury	0	Car seat	Lecturer / researcher
21	34-40	English	Yes	Yes	£20K - £39K	Bristol	0	None	Radiologist
22	21-26	British	No	Yes	£<20K	Chester	1	None	Stay at home mum
23	35-44	English	No	Yes	£40K-£59K	Cambridge	1	Car seat	Nurse / Researcher
24	34-40	American	No	Yes	< £20K	Plymouth	1	Car seat / stroller	Marketing Consultant
25	34-40	English	Yes	Yes	£40K-£59K	London	0	Cot	Hospital Administrator / Teacher
26	>40	British	No	Yes	£<20K	Beverley (Hull)	1	None	Researcher
27	34-40	Scottish	Yes	Yes	60+	London	0	None	Sport therapist
28	21-26	Asian	No	Yes	£<20K	Burnley (Preston)	1	Car seat	Teaching Assistant
29	25-34	English	No	Yes	>£60K	London	1	Car seat	Accountant
30/31	34-40	Canadian	No	Yes	£20K - £39K	Frome (Somerset)	1	Car seat	Actor
32	27-33	American	No	Yes	£20K - £39K	London	1	None	Marketing Executive / Student
33	27-33	British	Yes	Yes	£40K-£59K	Bristol	0	Car seat	NHS Quality Assurance