To Repair or Not to Repair

An Investigation of the Factors

Influencing Prosumer Repair Propensity

By

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ABSTRACT

The Circular Economy is a sustainable system of production and consumption that aims to minimise waste, emissions and energy leakages through a closed system. Repair is one of the strategies to facilitate the transition towards the Circular Economy (CE). Repair is also a behaviour that the prosumer can adopt and enact in collaboration with other citizens in society. The inclination to repair, called explicitly in this thesis, 'the prosumer's propensity to repair' is influenced and affected by a myriad of complex and inter-related elements. Those elements need to be further investigated to support the actors involved in the transition towards the CE to develop interventions to support the prosumer to repair further.

The investigation was set in an extreme case scenario by choosing to engage with individuals who, by their affiliation with pro-environmental organisations, appear to be more inclined to engage with pro-environmental behaviours. The investigation focuses on them trying to repair small electrical items because there have been conflicting results in previous research, on the extent to which environmental concerns influence Prosumer Repair Propensity.

The literature explores Repair as an activitiy to be embraced by prosumers and strategy to facilitate the transition towards a CE. The review discusses the role, and capacity of the prosumers in to both produce and consume value to support the transition. The literature explores the role of Design in developing solutions to extend product lifespan and to influence prosumer behaviour. The literature in the field of Design for Sustainable Behaviour emphasises the significance of investigating prosumer behaviour before developing interventions. As a result, the literature reviews past research on the factors influencing Prosumer Repair Propensity and behavioural frameworks that could support the investigation. The Theory of Trying and the Transtheoretical model of Change are selected as tools for understanding prosumer repair behaviour as a multi-dimensional object.

Two studies are undertaken to meet the research objectives set out for the investigation. Two hundred and eight respondents completed a survey for the Survey study. For the Prosumer study, 10 participants completed a survey, a semi-structured interview and two video-elicitation exercises.

The analysis and integration of the findings from the Survey study and Prosumer study helped to consolidate five sets of findings. The first set of findings presents the range of factors influencing Prosumer Repair Propensity; it includes the most significant factors to support the engagement with repair practice and the most critical factors to successfully repair an item. The second set of findings examines the attitudes towards trying to repair. The third set of findings presents the processes of change affecting the prosumer to repair. The fourth and fifth set of findings presents the repair process and considers how the factors and attitudes influence the prosumer at different stages of the repair process. From the findings, suggestions are given on the prosumer actions that can be adopted to support the transition towards the CE. The thesis finally closes on the limitations of the research project and recommends areas for further research to support the prosumer to change.

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ABBREVIATIONS

AF – Asset Factors

BP - Behavioural processes of change

CE – Circular Economy

CF – Consumer Factors

DfSB – Design for Sustainable Behaviour

EEE – Electrical and Electronic Equipment

EP – Experiential processes of change

LE – Linear Economy

TT – Theory of Trying

TTMC – Transtheoretical Model of Change

MF – Market Factors

SF- Social Factors

PS – Product & Services Factors

PSS – Product-Service-System

PRP – Prosumer Repair Propensity

WEEE – Waste Electrical and Electronic Equipment

WW2 – World War II

CHAPTER 1: INTRODUCTION

This chapter introduces the research project. It begins by providing a background to the research problem and an understanding of the background and motivations of the researcher. It then presents the aim, objectives and research questions. Finally, the subsequent chapters of the thesis are introduced.

1.1 Background to the research project

Citizens have a central role in supporting the transition towards a sustainable production and consumption system and departing from what is known as the Linear Economy (LE) towards the Circular Economy (CE). However, most advocates of the CE keep on regarding their role as being limited to the role of the 'consumer' or the 'user' who only accept or reject the solutions developed by professional practitioners in the field of design, economy, engineering, and policymaking (Hobson, 2015). There is a need however to define their role further to facilitate the transition towards the CE (Hobson, 2015; Lofthouse & Prendeville, 2017).

The role of the 'prosumer' aligns better with the intent of the CE (Hobson, 2015) which is to blur the lines between production and consumption to make apparent the movement of material, energetic and human resources while reducing the throughput cycling through the loops (Cooper, 1994, 2005; Lorek & Fuchs, 2013). Alvin Toffler first coined the term prosumer, in his book The Third Wave. A prosumer is a person that produces some of their goods and services which are entering their consumption (Toffler, 1980). They can be found making their own clothes, cooking their own food, decorating their own home and even repairing their own items. The prosumer has a dual and simultaneous function to destroy and create value (Ritzer & Jurgenson, 2010) blurring the dichotomy between consumption and production.

One of the CE processes the prosumer can engage in is Repair. Repair as a process of the CE offers the most environmental benefits compared to remanufacturing, refurbishment and recycling, (King, Burgess, Ijomah, & McMahon, 2006). Through Repair, the prosumer can participate in the reduction of Waste Electrical and Electronic Equipment (WEEE). It is a growing stream of waste to which prosumers contribute to through the take-make-dispose model that reached 48.1 million tonnes in 2014 and is due to reach 50 million tonnes by the end of the decade (Baldé, Wang, Kuehr, & Huisman, 2015). The repair of small electrical items by the prosumer is more related to reconditioning than actual repair which makes it a more natural skill to adopt (van Nes & Cramer, 2005).

However, barriers remain for the adoption of repair by the prosumer as internal and external forces encourage the prosumer to dispose and replace as opposed to repair.

To alleviate the barriers to repair, there is a need to shift the prosumer perspective on their role which is not limited to a 'consumer' of solutions by joining movements of thoughts that raise awareness on the impacts of the LE and the drive for economic growth on the environment and their health, and that support the reduction of consumption (Hobson, 2015).

The prosumer needs also to support the development of solutions that support the repair of items. In that regard, the Design for Repair field is currently under-researched (King et al., 2006; van Nes, 2010; Hertz, 2014; Lilley et al., 2013). Research in the field of Design for Sustainable behaviour

(DfSB) to understand repair behaviour and motivations resulted in the development of conceptual designs that can support repair (Lilley, Bailey & Charnley, 2013). However, some criticisms linger in the field of DfSB concerning how the designer defines their intent, formulates and selects strategies to influence prosumer's behaviour (Wilson & Lilley, 2013). Lockton (2013) suggests that the designer needs to become more of a counsellor than an interventionist to support the prosumer in their evolution. Subsequently, it is significant for the prosumer to understand further the reasons why prosumption behaviour, such as repair, is 'difficult' to adopt (Xie, Bagozzi, & Troye, 2007) from a behavioural and psychological perspective.

Trying to repair is 'difficult' even for the prosumer affiliated to environmental organisations that promote the reduction of prosumption. Previous research on the prosumer's willingness to repair revealed conflicting results on the extent to which environmental concerns influence repair behaviour (Lilley, Bailey & Charnley, 2013; Scott & Weaver,2014; Terzioglu, Brass & Lockton, 2015). Extensive research carried out on the gap between environmental concerns and pro-environmental behaviour in the last 40 years echoes the gap between pro-environmental attitudes and behaviour (e.g. Kollmus & Agyeman, 2002), highlighting the myriad and complex inter-related elements that influence behaviour. Furthermore, a key characteristic of Repair is that it is singular and idiosyncratic whereby the prosumer devises a solution that is best in relation to their skills, circumstances and object state (Graham & Thrift, 2007) and it is a process where the prosumer's ingenuity in interacting with the item and others is revealed (Graham & Thrift, 2007). The use of previous research on factors influencing prosumer repair propensity as well as behavioural and psychological frameworks that recognises the prosumer's circumstances, past experiences, attitudes towards trying to repair and how non-fixated and cyclical the repair process is can support the understanding of repair behaviour further.

In light of the background of the investigation, the research intends to gain a greater appreciation of the elements influencing repair behaviour of prosumers with pro-environmental inclination to offer a stronger foundation for future efforts to support the prosumer to identify the prosumption behaviours that support the transition towards the CE and to accept further their role as a consumer and producer of value affecting the material realm.

1.2 **Author's** background and motivations

The author studied marketing to understand the reasons why consumers consume so much while the rest of the world is in such a pitiful state. The main process in a marketing strategy is to determine customer needs and wants in order to drive the working force behind the company's products or services. The author's rising awareness of environmental issues encouraged her to do a master's in Design & Innovation for Sustainability to understand the processes for developing sustainable design solutions for the prosumer to change.

For her master thesis, the author investigated the design skills and abilities to facilitate the transition towards the CE by interviewing experts and company leaders. The results of the research revealed conflicting interests on what the CE should look like and who should be the primary beneficiary of the transition: the consumer or the producer. The participants recognised the role of corporations in slowing down the transition because of short-term financial objectives. They all agreed that the most desirable change for all parties was for the consumers to change, yet they did not believe that the consumers could, considering the context in which they live.

Following up the thesis, conversations with Janet Gunter from the Restart Project and Duncan McCann from the New Economics Foundation about the CE contributed to the decision to pay

greater attention to the role of grassroots and civil societies. They create enabling spaces for the production of economic, social and environmental values that support citizens to participate in systemic change. At the time, the literature around the CE overextended on the role of corporations and design as the main productive forces for change.

In 2013, the author started her involvement with Footpaths Leicester, an organisation that engages residents in Leicester and across UK towns to reduce their carbon footprint. Discussion with Zina Zelter, founder of Footpaths, on the social and economic impoverishment of communities through the loss of skills and abilities to repair inspired the author to look further at prosumer inclination to repair through the thesis. It also inspired the organisation of the Green Festival of Making and Mending in collaboration with Footpaths Leicester between 2014-2015 as well as the creation of Leicester Fixers in 2015, a community of citizen that strives to inspire Leicestershire residents to try to repair.

The personal motivations are to contribute to the debate on the role of the prosumer in the CE and to aid in identifying the behaviours that the prosumer can embrace to facilitate the transition.

1.3 Citizen, Prosumer and Repair Propensity

Within this thesis, the terms citizen and prosumer are used interchangeably to assert the multiple facets of a person as a 'designer, consumer, prosumer, repairer, policymaker, educator, activist' who can, through their everyday activities, support the transition towards a CE. The term citizen is to be viewed through the lens of ecological citizenship, delineated by Dobson (2003) where a citizen is an inhabitant of the earth, and has duties and responsibilities to act in the interest of the common good through their day-to-day activities in both the private and public sphere making in turn 'the personal political' (Seyfang, 2006). Hobson (2015) emphasizes the role of citizen and the everyday sustainability of their practice as being significant to support the transition towards the CE. The citizen's role is not limited to consumption. The citizen is seen as being able to both produce and consume value for the transition toward new industrial system of consumption and production. Hobson (2015) uses the term 'prosumer' to emphasize the multifaceted role of the citizen.

The intention is to assert the possibility of a person to use their skills and resources to produce value regardless of their circumstances. Terms such as 'consumer', 'user' or 'service user' still emphasise on the prominent role of the 'producer' or 'service provider' to produce value to meet the need of a passive person.

Prosumer Repair Propensity refers to the prosumer willingness or inclination to try to repair an item (Scott & Weaver, 2014).

1.4 Research intent

This section states the principal aim for the research project, and sets out the intentions, objectives and main research questions, which directed the investigation of the activities.

1.4.1 Research aim

The aim of the research is to explore the elements influencing prosumer's propensity to repair small electrical items.

The intent is to obtain a broader view of prosumer repair behaviour by defining the factors influencing PRP, the attitudes towards trying to repair, processes of change, and the prosumer's repair process and how those elements impact on different stages of the prosumer's repair process.

1.4.2 Main Research questions

The following research questions guided the research investigation:

1. What are the factors affecting and influencing prosumer repair propensity?
2. What are the attitudes of the prosumer towards trying to repair?
3. What are the processes of change influencing prosumer repair propensity?
4. What is the prosumers' process to repair small electrical items?
5. How do the factors, attitudes towards trying to repair and processes of change affect the prosumer at different stages of the repair process?

1.4.3 Research objectives

To meet the aim and answer the research questions, the following research objectives were developed:

1. To critically review substantial literature and secondary sources relating to Repair as a strategy to facilitate the transition toward the CE, Design as a tool to develop products and services to support the adoption of repair, and Prosumer repair behaviour.
2. To identify the array of factors and attitudes towards trying to repair influencing and affecting PRP.
3. To delineate the process by which the prosumer undertakes the repair of small electrical items as a mean to identify how the factors influencing PRP and their attitudes towards trying to repair affect and influence the prosumer's repair experience at different phases of the repair process.

1.5 Thesis structure/thesis structural overview

The thesis is comprised of six further chapters.

Chapter Two: Literature Review

This chapter presents the literature review that informed the direction of the research, refines the research questions and identifies the initial conceptual frameworks and behavioural frameworks to guide the subsequent research stages.

Chapter Three: Research Methodology and Methods

This chapter presents the research methodology that was designed to answer the research questions drawn from the literature review and presented in Chapter 1. It presents the research purpose, the research paradigm, the type of research carried out and the overall approach, the methods to collect and analyse data.

Chapter Four: Survey study Findings

This chapter presents the results from an extensive survey completed by 208 respondents.

Chapter Five: Prosumer Study Findings

This chapter presents the results from the contemplation ladders, in-depth interview and video elicitation exercises completed by 10 prosumers with pro-environmental inclination.

Chapter Six: Discussion

This chapter reflects on the research project and discusses its outcomes. The chapter begins by reviewing whether the research addressed the research questions. It discussed the implications of the findings in practices and the contribution of the research to wider debateThe discussion closes with a reflection on the pragmatic approach taken in this research using behavioural frameworks and additional thoughts.

Chapter Seven: Conclusions

This final chapter reflects on the significance, and contribution, of the investigation to knowledge. It assesses how the research aim and objectives were met, and summarises the main conclusions drawn from the research. The limitations of the project are discussed and suggestions for future work are made.

CHAPTER 2: LITERATURE REVIEW

This chapter presents the literature review that informed the direction of the research, refines the research questions and identifies the initial conceptual frameworks and behavioural frameworks to guide the subsequent research stages.

2.1 The need for the transition from a Linear Economy to a Circular Economy

The catastrophic and disastrous vision of human civilisation disappearing under mountains of waste and experiencing the negative externalities of climate change invited citizens across the globe to consider the transition towards a sustainable system of consumption and production. The Sustainable Consumption and Production concept (SCP) emerged to direct the various debates and help to define sustainable goals (Akenji & Bengsston, 2014). The Sustainable Symposium in Norway defined Sustainable Consumption and Production as:

> *"The use of goods and services that respond to basic needs and bring better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the lifecycle of the service or product, so as not to jeopardize the needs of future generations* (Norwegian Ministy for the Environment, 1994)*."*

This definition encompasses the two criteria embedded within the definition of sustainable development coined within the Brundtland report in 1987 (WCED, 1987) to meet basic needs and limit the impact of the current socio-technological regime to meet present and future needs (Lorek & Fuchs, 2013). As in the concept of sustainable development, it is agreed that the meaning of SCP remains unclear (Dolan, 2002; Jackson, 2004; Marchand & Walker, 2008; Seyfang, 2004). As Seyfang (2007, p. 2) notes:

> *''The current apparent consensus about the meaning of sustainable consumption and production masks underlying debates and ideological battles over what might constitute sustainable consumption in practice''.*

The descriptive nature of the definition (Akenji & Bengsston, 2014; Seyfang, 2004) appears to fall short of the wide application of the concept in various fields, encouraging different interpretations (Robins, 1999; Jackson & Michaelis, 2003). The lack of clarity surrounding the definition contributes to ongoing debates at both regional and international levels within policy and research about the appropriate strategy to meet this specific goal (for current state of debate on SCP, see Vergragt, Akenji, & Dewick, 2014). Jackson and Michaelis (2003) suggest that this is because of the division between consumption and production which does not make apparent all the intermediate consumption of resources (material, energetic, and human).

Some authors suggested that to achieve the transition towards a sustainable system of production and consumption the lines between consumption and production has to be blurred acknowledging the material, energetic and human resources cycling through loops and the throughput of resources which need to be reduced to create a zero-waste world (Cooper, 1994, 2005; Lorek & Fuchs, 2013). The CE concept was introduced to achieve this aim and to depart from what authors conceptualised as the LE (Boulding, 1966; Cooper, 2004; Greyson, 2007; Prendeville, Sanders, Sherry, & Costa, 2014; Stahel & Reday, 1976).

2.1.1 The Linear Economy

The LE is a system of production and consumption that erases the regenerative features of human civilization by putting more emphasis on production and consumption to meet economic goals. Various terms used to describe this model such as 'cradle to grave' (Braungart, McDonough, & Bollinger, 2007), the 'take-make-use-dispose model', or, the 'throwaway society'(McCollough, 2009). The LE models the value chain where producers extract valuable resources for them to be converted into items which are purchased and finally disposed by consumers (Schulte, 2013). Its characteristics include low recycling and reuse and short replacement cycles (e.g. Suckling & Lee, 2015). Producers in the LE tend to embrace a policy of planned obsolescence where the items are developed and manufactured to become rapidly obsolete and so require disposal and replacing. For Boulding (1966), the basic attitude towards consumption is what differentiates the LE from other economies. In this model, consumption and production are a good thing, and the success of the economy is measured by how many goods and services are produced by 'factors of production' (i.e. cost x time x labour). The LE hence sets out to achieve the central goal of most western civilisations by neoclassical economics thinking (Mont, 2007) to achieve economic growth. Unfortunately, the LE focus to increase the production of items at a cheaper rate, in the fastest time and with the biggest capacity results in the increase of waste. An example to illustrate the impact of the LE are WEEE. WEEE is an emerging and fast-growing waste stream with complex characteristics (Baldé, Wang, Kuehr, & Huisman, 2015). It is an output of electrical and electronic equipment (EEE) from household and business activities which broke, degraded and declined. It includes all components, subassemblies, and consumables; all part of the product at the time of discarding (Chancerel & Rotter, 2009). Other terminologies describing WEEE are 'e-crap' and 'e-waste' (Chancerel & Rotter, 2009). Worldwide, 41.8 million tonnes of WEEE were recorded as generated and collected, bearing in mind the limitation of many countries in documenting systematically informal collection of waste in 2014, (Baldé et al., 2015). In the UK, the Environment Agency (2015) records a total of 1,761,233 tonnes of waste; a 5% increase from 2014, including both household and business e-waste. Considering the UK population in 2015 of 65.13 million, approximately 27 kg of waste was thrown away per capita. To be more descriptive, in 2015, each UK resident would have thrown away a computer desktop (15-17kg) with a microwave (10-11kg), or 27 hairdryers.

The disposal of WEEE has significant impacts on both the environment and human health as the composition of e-waste is made up of a variety of toxic elements. Sankhla et al. (2016) describe the health hazard of some of the components such as Mercury which impairs senses and contributes to memory loss and Sulphur which damages vital organs such as the liver, kidney and heart as well as increases the occurrence of acid rain. Landfilled waste produces contaminated leachates which pollute groundwater and contribute to soil acidification (Basel Action Network, 2011; DEFRA, 2011; AMDEA, 2011).The example of the impact of WEEE exemplifies LE as an extension of the human's dissociation from the natural system (Røpke, 1999). Human's focus on achieving technological progress and economic growth is a device safeguarding them from recognizing the detrimental impacts of their actions on both the environment and their health (Røpke, 1999).

2.1.2 *The Circular Economy*

The CE is a *''a regenerative system in which resource input and waste, emission and energy leakage are minimised by slowing, closing and narrowing material and energy loops''.* (Geissdoerfer, Savaget, Bocken, & Hultink, 2017, p. 766). The term 'CE' cannot be traced to a single author nor can its emergence be pinpointed to a definite date (Ellen MacArthur Foundation, 2012). In the late 60's, Boulding (1966) described the CE as a closed spaceship so no matter can be added nor subtracted. Over the decades, numerous incarnations and supporting concepts to the circular economic model have emerged such as Cradle to Cradle, The Performance Economy, and Industrial Ecology (Hawken, Lovins, & Lovins, 1999; McDonough & Braungart, 2002; Stahel & Reday, 1976). The various incarnations stem from aspirations for a paradigm shift where the norm is in the retention of value through careful management of a product's end of life. They each contributed to the refinement and redevelopment of the CE concept as well as their strategies (Ellen MacArthur Foundation, 2012). Compared to the stringent division between consumption and production put forward within the LE, the CE is progressive as it acknowledges the blur between the two. As such, a central component of the various CE definitions is the concept of closed loops which help to understand the way materials and energy moves between consumption and production processes (see Appendix A - CE Definitions).

2.1.3 *Repair as a CE Consumption and Production process*

The processes to reduce the throughput of resources include, amongst others, repair, remanufacturing, refurbishment and recycling. Repair within the CE is a visible means to reduce the throughput of resources by extending product lifespan. Through repair, the intent is to slow the flow of material and energy through the loop by extending product lifespan (Bocken & Short, 2016). Repair has identified benefits compared to other intermediate closed-loop processes such as remanufacturing, refurbishment, and recycling. It is a logical route for broken items to become functional again (King et al., 2006) and a viable option to divert and recover materials from the waste stream (van Nes & Cramer, 2005; King et al., 2006; Brook Lyndhurst, 2010; Cooper, 2010). It is the better option in term of environmental benefits as it does not require further secondary processing of materials as seen within recycling (Truttmann & Rechberger, 2006). Recycling ''requires more 'corrective energy''' than remanufacturing which in turn requires more than reconditioning and repair where most materials and assemblies are kept (King et al., 2006, p. 264). It is also an activity that all citizens can embrace to a varying degrees. As such, van Nes and Cramer (2005) highlight that repair, particularly with electrical items, is more related to replacement of broken parts, in other words, reconditioning (King et al. 2006), or upgradability (van Nes & Cramer, 2005). Although, the benefits of Repair are recognized, challenges remain for Repair as a process to be adopted by citizens because of the pervasive mode of thinking set to achieve economic goals which blinds citizens to recognise their multi-faceted role in affecting the material realm.

As such, citizens in corporations support the LE by choosing to strategically weaken the capabilities of the regenerative agents such as repair businesses or even the keen hobbyist tinkerer in their attempt to repair. They can choose to deskill the repairer to try to repair through the transfer and protection of repair knowledge into software (Henke, 2000). Some manufacturers choose to attack the repair industry infrastructure by closing down the access to parts securing, in turn, their monopoly. An example is Nikon which in early 2012 indicated to the independent services network that it would only supply repair parts to 23 Nikon authorised repair facilities (Repair.org, 2017). They can also choose not to provide repair guides for repairers. Deloitte (2016) describes the example of Future Proof, a repair guide website, being forced by Toshiba to delete every company's repair

manuals they had. Repair businesses are found to suffer from ''technical, operational and logistical limitations'' such as lack of repair manuals, inappropriate repair tools and unavailability of spare parts (Sabbaghi, Cade, Behdad, & Bisantz, 2017, p.137).

In the battle of the mind to achieve economic advantage and weaken repair capabilities, the neo-classical linear civilisation profits from society's perception of the repair and maintenance workers who have low wages, long work hours, and poor work conditions (Graham & Thrift, 2007). Their role tends to be dismissed in the design of products as much as in the architecture of buildings. Brand illustrates this point in his book *''How buildings learn''* (1994) where he indicates that architects rarely consider the business of maintenance and repair in their design. He says ''they see the people who do the maintaining as blue-collar illiterate and the process of upkeep as trivial, not a part of design concerns'' (Brand, 1994, p. 112). McCollough (2009) also recognises the influence of the image of the repairer to impact on young workers entering the workforce. The desirability of blue-collar work is a significant determinant in whether the repair trades can continue to be replenished with young workers.

In the CE, the pervasive mode of thinking still holds. Repair still retains a lesser role in achieving the vision for economic growth as defined by manufacturers and retailers. King et al. (2016) indicate that repair does not provide the same economic benefits as remanufacturing and refurbishment. Furthermore, the quality of repaired products is inferior to those of remanufactured and reconditioned alternatives which may reduce the sales margin. The remanufacturing and refurbishment processes protect manufacturers' demand for future sales and circumvent consumer's complex barriers to repair by outsourcing the implementation of strategies for product life extension to manufacturers (King et al., 2006). Nevertheless, the value of repair in the social economy is recognised. A study on the socioeconomic impacts of increased reparability run by Deloitte (2016b) indicates that by increasing the reparability of products, it provides opportunities at a regional level to promote the growth of the second-hand market of appliances that could benefit low-income households and to increase employability for marginalised communities and members of society. Social enterprises drive this development by providing jobs and training to repair and sell items. In the European Union, 11 million jobs were accounted for in the social economy, representing 11% of total employment. A larger number of social enterprises operate in the market of second-hand products than in the repair of items. Repair cafes have a smaller share, yet it is a growing trend.

Charter and Keiller (2014) as well as Gnanaparasam and Cole (2017) acknowledge the growing number of community repair events with their army of volunteers, which not only create a social space enabling support for people regardless of their background but also support Circular Thinking by extending product lifespan. Repair, as a leisure activity, whereby professional engineers and repairers transfer some of their activities to the amateur economy (non-paid and voluntary) holds promise for slowing the flow of material and energy through the loop. Nørgård (2013), from his analysis of historical perspectives on the input of work to the economy recognises the amateur economy as less productive, using fewer resources and providing greater life satisfaction than work. It provides the leisure time for the amateur to repair, design, and make items while obtaining direct utility from what they produce including satisfaction and pride and indirect utility such as being able to offer a gift to their peers (Kaskarelis, 2009). The central suggestion given by Nørgård (2013) and other authors (Kaskarelis, 2009; Robertson, 2005; Wann, 2007) are to increase leisure time to support further people-development in contrast to economic development driven by the production of goods while reducing the throughput of resources.

However, challenges remain as discussed in dismantling beliefs in economic growth in the minds of industry and professionals. Furthermore, while social consumption for increasing reuse and repair may support people-centred development, it is unclear whether this form of activities benefit the environment. There is a significant gap in research because researchers tend to focus their research on CE-related environmental assessment for industrial and business practices and infrastructures as opposed to social ventures. Petit-Boix and Leipold (2018) confirm the latter by reviewing the implementation of CE strategies in 83 cities and the existing CE-related environmental assessment literature. Through their review, they identified 300 CE initiatives implemented across 83 cities. The strategies were predominantly related to improving urban infrastructures (i.e. water and agricultural infrastructures) (58%), followed by trying to enhance social consumption (i.e. increasing repair and reuse) (24%) and then to support businesses and industries (22%). They also found that environmental assessment focused on industrial and business practices (58%) and infrastructures (35%). Only 6% of the studies were identified to deal with social consumption to a certain extent. Only Castellani et al. (2015) was found to apply LCA to understand the impacts and benefits of second-hand shops as an example of product repair and reuse initiatives. While it is partly due to the difficulties in measuring social activities impacts, the lack of input in trying to measure environmental impacts on a large scale has weakened the value of Repair as a process to facilitate the transition towards a CE.

Nevertheless, the citizen can respond to challenges set by the LE by embracing their multi-faceted role as a prosumer.

2.2 The Multifaceted Role of Citizen in facilitating the transition towards the CE

For the transition towards a CE, advocates of the CE have regarded the role of citizen as being limited to the acceptance or rejection of new practices formulated on their behalf by designers, marketers, engineers, economist, and policymakers (Hobson, 2015). Its role remains closely related to one of 'the consumer' recognizing their needs and yet dismissing their capacities and properties to affect and improve the material realm actively. The various facets of the citizen who is altogether a ''*designer, consumer, prosumer, repairer and citizen*'' (Hobson, 2015, p.99) is diminished. It is rightly so that Hobson (2015) put forward the concept of 'prosumer' (Ritzer & Jurgenson, 2010) to aid in re-thinking the recalibration of the role of the consumer, its practices and the nature of its relationship with industry to support change for a CE.

2.2.1 The Citizen as a Consumer

The citizen as a consumer engages in three main consumption activities: selection, use and disposal (Koskijoki, 1997). The consumer can overconsume whereby they select, use and dispose at a faster frequency and rate than if they were repairing. The consumer has needs which designers, as such, use for developing new products and services offering that ignite desire. The power relationship between the consumer and the designer contributes to the rise of waste as the consumer replaces the produced item when they perceive the item to be obsolete to their needs. The reasons for replacement are not always due to malfunction. Mawle and Smalley (2012) mapped out different reasons for obsolescence influencing the consumer decision to replace (See Appendix B – Type of Obsolescence). In the case of small electrical products, their journey ends in household storage waiting for their fate as the consumers hold onto them before their disposal (Gelbmann & Hammerl, 2014; Sabbaghi, Esmaeilian, Raihanian Mashhadi, Behdad, & Cade, 2015; Wilson et al., 2017). Ultimately, electrical items find their way to household waste disposal, ending their days in UK landfills or developing countries (Basel Action Network, 2011; DEFRA, 2011; AMDEA, 2011). 72% of small electrical items are disposed at the end of their life (WRAP, 2011) with few recycled (Darby & Obara, 2005) or repaired. Independent testing of 112 WEEE items in 2011 found that '12% of WEEE at HWRCs [Household Waste Recycling Centres] was in full working order' when disposed of (WRAP, 2011).

2.2.2 The Citizen as a Prosumer

The citizen as a prosumer engages in prosumption. Prosumption is a model of consumption based on production, or co-production of the consumed commodity. It blurs the dichotomy between production and consumption as the prosumer is recognised to have dual and simultaneous function to destroy and create value (Ritzer & Jurgenson, 2010). It suggests that humans are resources to leverage for wider systemic and organisational purposes. Hence, the prosumption concept provides a more multi-faceted picture of the consumer. Different terms have been put forward to describe the prosumer. In the field of design, they are recognised participants/co-designers to the development of design solutions. Value co-creation is, for example, another term to describe prosumption (Prahalad & Ramaswamy, 2004). Within the marketing literature concerned with service design, customers are seen as co-creators of value (Xie, Bagozzi, & Troye, 2007). The prosumer is a creative actor rather than a passive responder. They are a participant in the customisation of one's worlds (Firat & Venkatesh, 1995). Lusch and Vargo (2006) describe them as resource integrators where individuals use their competences, materials and services to produce and consume – cook entertainment meals or repair broken items.

Although the Ellen MacArthur Foundation (2013) replaced the concept of the consumer with one of the prosumer responding to the emergence of new business models and PSS favouring access, as opposed to ownership, Hobson (2015) indicates that advocates of the CE are not sufficiently addressing questions surrounding the shift in ''the role and perception of consumption, consumerism and property'' and that the prosumer needs to take greater responsibility for the items they own. The term 'user' still emphasises that the production of value is the remit of the company or designer fulfilling a need as opposed to the remit of the prosumer. While PSS and servitisation frameworks attempt to look in more detail at the role of consumer, Hobson (2015, p.99) suggests that further analytical research on ''forms of everyday activism that foreground ''vital materialism''' need to be deployed given the 'transformative change' required for the transition towards the CE. Everyday activism is enacted within everyday life and is not consciously coordinated with the actions of others, but is (1) to some degree caused (inspired, encouraged) by a social movement and (2) consciously intended to change others' ideas or behaviour in directions advocated by the movement (Mansbridge, 2013). In other words, more research needs to be carried out to understand the impact of movement of thoughts that promote the reduction in consumption and their impacts on the behaviour of individual prosumers. There is a long history of pro-environmental initiatives in cities that try, through education and citizen engagement, to slow down consumption (Petit-Boix & Leipold, 2018). The prosumer involvement with environmental initiatives can encourage carbon-reducing behaviours as the prosumer aligns their attitudes towards the environment with those of the environmental group they are affiliated to (Olli, Grendstad, & Wollebaek, 2001; Middlemiss & Parrish, 2010; Fisher, 2013; Büchs, 2014). Concerning the promotion of repair behaviour, in 2017, the Open Repair Alliance was formed bringing together the Repair Café Foundation, The Restart Project, iFixit, and the FixitClinic (Openrepair.org, 2017). Together, they promote repair to the prosumer through events and communication, collect data on prosumer repair to influence policymakers to provide rights of repair, and engage with designers to influence the way that products are designed (Openrepair.org, 2017). The alliance participates in the debate on the role of the prosumer and its potential to participate through everyday activities in prosumption behaviour.

Vital materialism *'is the belief that matter itself has vitality and life, no matter how lifeless it may appear to be. In this way, objects and things are described as having agency. Part of the project is to put some pressure on human's self-proclaimed uniqueness and consider the ways humans are affected by the things around them'* (Kramer, 2014). In other words, vital materialism is an invitation for the prosumer to accept the role of objects, even broken ones in having an impact on their lives. Hence, in light of those definitions and the suggestion of Hobson (2015) on the requirements to aid the transition towards a CE, a more nuanced understanding of everyday life is required.

The perspective based on socio-material practices favours a social science understanding of how people interact with their surroundings. It dismisses the prosumers' agency and self-efficacy which beyond the influence of social movement is used to engage with prosumption activities considering the influence of factors such as their attitudes, values, and motivations as well as the conceptions of 'normality' which are culturally and socially shared as much as personally negotiated (Piscicelli, Cooper, & Fisher, 2014). It also dismisses the individual's readiness to change and the stages they go through cyclically to contemplate, try, adopt, and maintain behaviours. Prosumption behaviour from a behavioural psychology perspective, on the other hand, is an involved behaviour which can be deemed as *'difficult'* psychologically or physically to engage in on the part of the prosumers (Xie et al., 2007). It requires ongoing trial until the behaviour is normalised. Hence, the reframing of consumption as prosumption in the mind of citizen has to be done concurrently to the development

of strategies to support behavioural change so the citizen can adopt behaviours such as Repair that are supportive of the transition towards the CE. The field of Design attempted to develop interventions to affect the material realm and influence behaviour for the transition towards a CE. They are further explored in the following section.

2.3 The role of Design

The traditional role of Design supports the linear system of production and consumption. The transition towards the CE requires product life extension strategies and strategies that influence prosumer behaviour (Blomsma, 2017) which designers made attempt to develop solutions for. DfSB, in particular attempted to understand prosumer repair behaviour to develop conceptual designs.

2.3.1 Traditional role of Design

The traditional role of Design is concerned with the physical, material, and visual aspects of the construction and manufacturing of the economy with the main prerogative to support international economic growth (Thorpe, 2012). It is a feature of the LE contributing to the growing ''illth'' (in reference to Ruskin, 1880); or in other words, trouble and devastation maintained by the division of production and consumption. Design is a significant catalyser of the ''take-make-use-dispose'' model as it directs the design and production of goods beneficial for achieving economic growth. It embraces, pervasively and routinely, the planned obsolescence philosophy, which emerged after the First World War to spark a new wave of consumerism (Webster & Johnson, 2010). Design contributes to the invention of new plastics materials and manufacturing processes that meant cheap, mass-produced products could be made available to the market (Cooper, 2004). The impact of design within the current linear prerogative was recognised early to be detrimental to the social and environmental spheres with. Papanek (1971), for example, dubbed designers as responsible for shaping the development of wasteful products and services contributing to consumer dissatisfaction and negative impact on society and the environment. Evidence shows that 80-90% of most artefacts' lifecycle economic and ecological costs are already inevitable by the time their designs are complete and this before their manufacturing. (Stasinopolous, Smith, Hargroves, & Desha, 2009). Guiltinan (2009) describes industrial designers and engineers as being participative in ''Creative Destruction'' processes by constantly driving the tendencies for replacement through their ''destructive creations'' which become quickly obsolete and are difficult to recycle due to the choices of components and materials designers have made. Guiltinan (2009) describes some of the planned obsolescence practices that designers engage in contributing to both physical and technological obsolescence such as designing for limited repair or designing for fashion (see Appendix C – Type of obsolescence strategies). The practices of designers are an accelerant to the cycle of consumption, from the selection of product to disposal as it impacts on consumer behaviour (Hamari & Lehdonvirta, 2010). With regard to supporting repair, Design makes a deliberate attempt to make repair inaccessible to the prosumer (Verbeek, 2004). As such, the means to repair the items are not transparent. Dismantling the item can be strenuous or close to impossible, especially if the item is sealed (Mashaddi et al, 2016). The advances in technologies for EEE complicates the repair activity partly because electronic components are becoming smaller. The design of the item does not always consider disassembly for the repair of the item (van Nes et al., 2003). Design also impacts on consumer perceptions who may perceive their product as 'old', 'unfashionable', or 'undesirable' giving them more reasons to justify their obsolescence (see Mawle & Smalley, 2012 for reasons of obsolescence) and dispose of it whilst perceiving a new item to be more beneficial and desirable (Guiltinan, 2009).

2.3.2 *Design for Product life extension*

Designing for product life extension is one of the strategies to support the transition towards a CE (Blomsma, 2017). A number of eco-design strategies exists to extend product lifespan. Appendix D introduces some of the product life extension strategies covered within the literature. In regard to the challenges to implement a product life extension strategy, Design research struggles with defining the appropriate life extension strategy for a particular product (Bakker, den Hollander, van Hinte, & Zijlstra, 2014). While for the majority of products, increasing life span is environmentally desirable (van Nes & Cramer, 2005), it appears that designers lack the expertise to design for product life extension (Bakker et al., 2014).

Design for repair is recognised to be an undervalued area of research (King et al., 2006; van Nes, 2010; Lilley et al., 2013; Hertz, 2014). The requirements to make repair accessible to the prosumer remains limited. They include encouraging easy access to module parts, and easy handling so that actual consumers or repair professionals and hobbyists can repair items themselves (van Nes & Cramer, 2005). Although the EU directive 2011 waste hierarchy prioritises repair and reuse (EC, 2011), organisational and institutional barriers due to the prevalence of recycling practices contribute to slow and incremental innovations in the field of design for repair (Gelbmann & Hammerl, 2014). The other challenge is that most product life extension strategies are not yet adopted and considered as 'business as usual' by designers and engineers (Hatcher, Ijomah, & Windmill, 2011).

2.3.3 *Design for Sustainable Behaviour*

DfSB is a field of design research at the intersection between Sustainable Design and Interaction Design concerned with the application of design strategies that influence prosumer behaviour through their interaction with designed objects. DfSB aims to reduce the negative environmental and social impacts of products by moderating prosumers' interaction with them (Lilley, 2009).

It is built on a constellation of findings and structured upon three main components: Prosumer-centred Design, Behavioural-Psychology/Practice and Sustainability (Daae, 2014). Since the embedded products within a system influence prosumer behaviour (Lockton, 2013), DfSB offers the opportunity for designers to influence an individual's behaviour that could, in turn, support the transition towards a circular system.

The field of Design for Sustainable Behaviour (DfSB) has attempted to understand prosumer repair behaviour from a behavioural psychology perspective and develop conceptual strategies that would support the prosumer to increase their PRP and in turn support the CE (Lilley et al., 2013).

Concerning supporting the prosumer to repair, an attempt was made by Lilley et al. (2013) to explore the strategies that can influence behavioural shift towards the repair of small electrical appliances. A household survey focusing on product breakage and consumer attitudes and behaviour towards repair (Details on findings on prosumer behaviour in Section 2.4.1) and a design workshop were conducted. The survey analysis resulted in the development of four mending typologies with associated personas. Designers used the personas to develop a total of 30 design concepts for repairing a kettle. Seven concepts were consolidated for each typology by grouping ideas with shared similarities. They aligned along the central concept of 'power in decision-making' (Lilley, 2009) with the prosumer or individual at one end of the axis and the product at the other, with associated named strategies – Feedback, Behaviour Steering and Persuasive Technology.

Appendix E presents the different propensity profiles, the suggested concepts, and their association with DfSB strategies (Lilley et al., 2013).

Twelve participants validated the concepts and their preferences aligned with the suggestions made for designers (Lilley et al., 2013). The paper concludes with a discussion of the potential efficacy of the design outcomes from a consumer perspective. It emphasises the possibility for designers and manufacturers to further their understanding of prosumer's attitudes and behaviours to develop repairable items adapted to their skills, competencies and perspectives. The paper also introduces some potential ramifications for design practice by identifying some standards for repairable items:

> *''The use of transparent product architecture and standardised hardware that does not require proprietary tools; location of replaceable parts or problem-components which are probable candidates for failure in easily accessible positions; incorporating self- diagnostic systems designed with prosumer input, a comprehensive labelling system which denotes the purpose and functionality of components and comprehendible repair manuals for non-specialists.''* (Lilley et al. 2013, p. 26)

It considers broader influences on prosumer repair behaviour such as the legal system (Chismar, 2008) and financial mechanisms (ERM, 2011). Finally, the paper recognises the importance of accepting that every item will eventually go to entropy and may not be worth repairing for financial reason but also because they may not be environmentally efficient compared to newer items. Hence, more research is needed for designers and manufacturers to optimise the lifetime of the product (Lilley et al., 2013).

Overall, the potential of DfSB to address repair behaviour was recognized.

The limitations of the research relate to lingering issues within the DfSB field concerning how design intent is formed and how strategies are selected as discussed in Wilson & Lilley, (2013). In Lilley et al. (2013), design concepts were developed from personas and align along the power decision making spectrum devised by Lilley (2009). The associated design strategies for individuals with a higher propensity to repair (Fixers) were in the feedback end of the spectrum while strategies for non-fixers related to persuasive technology outputs (Appendix E). Questions arise on the ethical reasons for choosing to force a design solution on individuals who do not have the competencies, skills or knowledge by retrieving the item away from them through product-service-system as opposed to encouraging them to engage with the new behaviour. Further research needs to look into understanding the designers' role in making the prosumer the subject of design (Renstrom, 2006) and their relationship with them.

Lastly, it can be argued that the validation made by 12 participants for the design concepts developed in Lilley et al. (2013) suggest the appropriateness of the strategies along the spectrum. The dismissed element is the non-fixated, non-decisive, and cyclical patterns of behavioural adoption. It suggests that at any stages of behavioural adoption informational or controlling cues can translate or not in a reaction by the prosumer which can be either positive, negative or non-existent. In other words, regardless of the PRP, feedback, behaviour steering, and intelligent strategies can be used to influence behaviour, yet none can predict a change of behaviour. The argument aligns with Tromp et al.'s (2011) injunction that where a product sits in the dimension set by the designers is not fixed but depends on the prosumer as their perception of the intervention alters over time. The alteration of prosumers' perception over time can relate to many factors which influence how receptive they are to the design interventions.

Further research needs carrying out on the receptiveness of prosumers to change and design interventions drawing from behaviour and psychology frameworks on the cyclical and non-decisive nature of behaviour adoption.

To this regard, the work carried out by Daae et al. (2012) and He, Greenberg and Huang (2010) appears promising. Drawing from the Comprehensive Action Determination Model, Daae et al. (2012) developed a set of guidance from a psychological perspective on how to achieve change. Challenges remain when applied. It uncovers the conflict between the uniqueness of each with their behavioural antecedents and desires and the standardised behavioural solutions. He, Greenberg and Huang (2010) made use of the TTMC to develop energy feedback technology designs, and they develop recommendations using motivational literature. They recognise that the prosumer is never simply in one stage or another but show patterns of differential involvement in each stage. Subsequently the effect of interventions is unlikely to have the same effect on all individuals. Furthermore, the model does not account for the prosumer's circumstances. Nevertheless, it offers the opportunity to be investigated further in combination with the factors affecting propensity and the attitudes towards trying to repair to understand further the prosumer repair behaviour.

Nevertheless, the question remains on how to select the appropriate strategies for repair through DfSB. Other variables apart from behavioural antecedents such as cost, environmental impact, time and the input of relevant stakeholders need to be used to choose the appropriate strategy (Wilson, 2013). The end product might not translate in behavioural change. Is therefore DfSB a lost cause? No, designers are in a unique position to create change through a greater understanding on prosumers' interaction with products (Kannengiesser & Gero, 2012) but more significantly in understanding prosumer experience in changing their perception, attitudes, and behaviour over time. Rather than being an interventionist of change, as Lockton (2013) suggests, designers could become the counsellor, supporting prosumers to change their perceptions (and, therefore actions) overtime.

2.4 Prosumer Repair Propensity

The following sections provide a review of the factors influencing repair propensity, behavioural frameworks and additional aspects on the repair activity.

2.4.1 Factors influencing Repair Propensity

Prosumer Repair Propensity (PRP) refers to the inclination or willingness of the prosumer to engage with repair (Scott & Weaver, 2014). Studies attempted to understand the prosumer motivational factors (Lilley et al. 2013; Scott & Weaver, 2014; Terzioglu et al. 2015; Mashhadi et al. 2016). The literature on voluntary replacement influenced the development of a list of factors influencing PRP in both Scott and Weaver (2014) and Lilley et al. (2013). The reason for the influence is that replacement, disposal and repair are alternative routes to deal with a broken item. Replacement purchase can be the result of a 'forced' or *'unforced situation'* (Bayus, 1991). For example, if a computer broke beyond repair and the prosumer replaced it, this is a 'forced' situation for replacement. However, if the prosumer finds the computer not to meet their needs or desires yet it is still working, this is an 'unforced' replacement. A forced situation does not equate to an immediate replacement. The unforced replacement situation is where the complexity of the motivations to repair appears as various factors may encourage the prosumer to replace as opposed to extend the product lifespan through a repair. Scott and Weaver (2014) developed a conceptual framework following on from van Nes's (2003) framework (Appendix F) to understand PRP with consideration of specific characteristics of the repair context. Three broad categories were delineated to understand the circumstances that precede the intention or attempt to repair (antecedents). An additional category concerns specifically the outcomes resulting from PRP (See Table 2-1 for definition). Scott & Weaver (2014) used the framework to survey two samples of individuals, 300 individuals considered to have an average PRP from Amazon Mechanical Turk and 492 individuals considered to have a higher PRP from iFixit.com.

Table 2-1 -Description of the categories influencing repair motives by Scott and Weaver (2014)

> **Product Characteristics.** Product factors refer to those aspects of the product that may support or hinder the prosumer to try to repair it > **Market Factors.** Factors extrinsic to the product related to the way the prosumer perceives the repair industry and the role of manufacturers and retailers in either supporting or impeding the repair of their items. > **Consumer Characteristics.** The consumer characteristics refer to those differences between people that explain why, in the same situation, different people chose to repair or not. > **Repair Outcomes.** Behaviours influenced by PRP

The figure below provides an extended view of the conceptual framework developed by Scott and Weaver (2014).

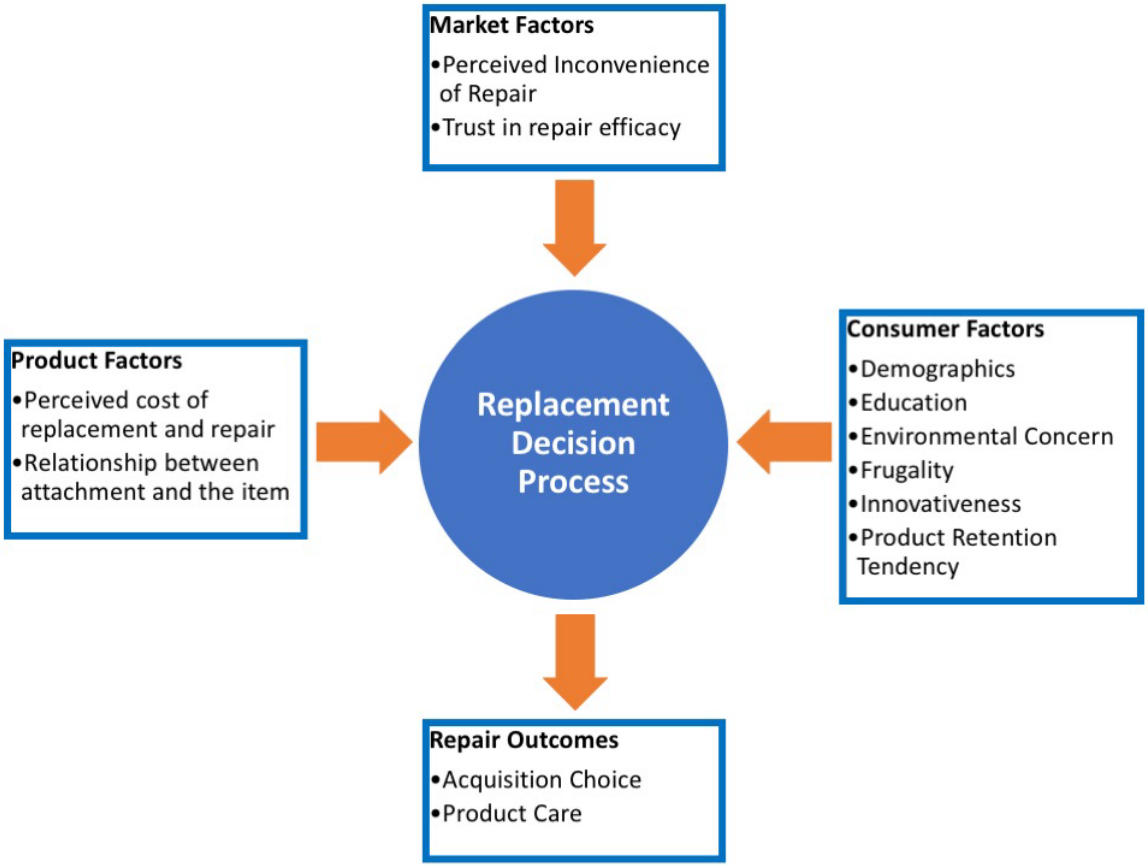


Figure 2-1 - Conceptual Framework on PRP by Scott & Weaver (2014)

A review from Lilley et al. (2013) suggested a list of factors influencing the prosumer to repair encompassing the ones recognised by Scott and Weaver (2014) including the cost of repair, design related issues making the repair inconvenient, the education of the prosumer as well as product attachment. As introduced in section 2.3.3, Lilley et al. (2013) conducted an extensive online survey and the analysis resulted in the development of conceptual designs. The results of the online survey are discussed here in more details as it is relevant to understand PRP. The online survey asked individuals whether they had attempted to repair an electrical item in the last five years and their attitudes towards repair. The analysis of the survey resulted in four profiles of repairers:

- Fixers are those that always attempted repairs (14%)

- Sometimers are those that attempted repairs on some but not all products (38% of responses)
- Non-fixers are those that had not attempted repairs in the past (45% of responses).
- Extreme non-fixers are a sub-group of the non-fixers.

Other more recent studies on motivation to repair and care for items using cultural probes (Terzioglu et al., 2015), data mining (Mashhadi, Esmaeilian, Cade, Wiens, & Behdad, 2016) and in-depth Interviews (Ackermann, Mugge, & Schoormans, 2018) also corroborate some of the identified factors. Appendix G – Factors influencing PRP presents the factors influencing PRP using the broad categories delineated by Scott and Weaver (2014), indicating the associated references. The following sections discusses the significant factors identified as influencing PRP.

2.4.1.1 *Frugality & Environmental Concerns*

Scott and Weaver (2014) identified stewardship, a latent construct of frugality as another significant factor influencing repair propensity. Stewardship involves seeing the value and potential in material possessions (Scott & Weaver, 2014, p.15). They suggest that what links stewardship to innovativeness needs further investigation to understand their significance on wellbeing (Scott & Weaver, 2014). The literature on frugal behaviour recognizes different logic of frugality. They include, to cite a few, wanting to adopt a voluntary simplicity lifestyle (Craig-Lees & Hill, 2002), wanting to avoid the pain of paying by being thrifty (Rick, Cryder, & Loewenstein, 2008), wanting to achieve a long-term goal by restraining consumption (Lastovicka, Bettencourt, Hughner, & Kuntze, 1999), wanting to see the value and potential in material possessions through stewardship (Scott & Weaver, 2014), wanting to achieve one's own project of protecting the environment, meeting one's faith or doing what is morally right (Boucher, 2017). Overall, frugality inherently invites people to have a 'way of life' in which the reduction of consumption is sought (Nepomuceno & Laroche, 2015).

On the other hand, Scott and Weaver's (2014) did not identify environmental concern as a significant strong element influencing PRP. It contrasts with Lilley et al. (2013) research where the fixers and the sometimers considered their concern for the environment as being a motivation to pursue repair. Terzioglu et al. (2015) also identified environmental considerations as a motivator to try to repair an item.

Scott and Weaver (2014) and Lilley et al. (2013) approached samples, and their association with specific social setting may affect the results on the factors on PRP. In Scott and Weaver (2014) studies, the approached samples were from Ifixit and Amazon, two technologically oriented platforms whereas Lilley et al. (2013) used a snowballing technique to recruit the survey participants. It may have resulted in an over-representation of individuals interested in both repair and the environment.

Scott and Weaver (2014) measured environmental concerns using Ellen's (1994) scale. The scale measures environmental concerns by considering the individual trade-offs between the cost and benefits of individual action on environmental problems and immediate personal rewards. A limitation of the scale is that the translation from attitudes towards the environment to behaviour does not limit itself to trade-offs between personal, immediate rewards and environmental benefits. Extensive research carried out on the gap between environmental concerns and pro-environmental behaviour in the last 40 years echoes the gap between pro-environmental attitudes and behaviour (e.g. Kollmus & Agyeman, 2002). The research highlights a complex set of factors embedding values,

personality traits, and internal and external factors which may influence the adoption of pro-environmental behaviour (Kollmus & Agyeman, 2002).

Research interested in pro-environmental consumption behaviour recognises the role of frugal traits in influencing greater product retention tendency and innovativeness (Haws, Naylor, Coulter, & Bearden, 2012). Research interested in frugality amongst affluent environmentalists (Boucher, 2017) discussed in their findings the extent to which frugal behaviours are rationalised and explained by what the individuals wanted to reproduce from their parents, childhood and the experiences over their lives as opposed to their strong environmental inclination. Boucher (2017) suggests that frugal behaviour exists a priori of emerging attitudes towards the environment. The behavioural demands of environmentalism align with frugal behaviour. In other words, the prosumer easily links and rationalises his attitudes towards the environment and the pre-existing attitudes favouring the preservation of resources (Boucher, 2017). Boucher (2017) referring to Bem (1972) and Swidler (1986) to contextualise his findings highlights a reversal of what is commonly known as 'attitudes is followed by behaviour' for instead 'behaviour is followed by attitudes'. Following the hypothesis by Boucher (2017), it would suggest that the inclination to repair may be foremost motivated by frugality as opposed to their environmental concern.

2.4.1.2 *Innovativeness & Education*

Scott and Weaver (2014) identify innovativeness as one of the most significant factors influencing PRP. Within Lilley et al. (2013), fixers agreed with the notion of being creative and practical and identified themselves with being more likely to lead an alternative lifestyle. Although it is not clear from the paper what alternative lifestyle entails, it suggests that the adoption of repair behaviour relates to a tendency for personal expression and identity creation. Hence, the engagement with repair may provide the innovative prosumer with an outlet to express their creativity and ingenuity that may enhance the way they perceive themselves, their role and sense of place in a particular social setting. It is recognised that self- and social identity are essential elements in the understanding of a person's striving for health and wellbeing (Sharma & Sharma, 2010). Terzioglu et al. (2015) through a cultural probe exercise also identified amongst the participants a sense of personal satisfaction from the challenge of trying to repair and the possibility to display skills as a motivation to repair. It aligns with the latent constructs of innovativeness traits which include risk preference, creativity, voluntary simplicity, and curiosity (Price & Ridgway, 1983). In the study by Lilley et al. (2013), the non-fixers and sometimers expressed annoyance and stress from struggling to diagnose broken items and from perceiving safety risks. The stress may impact on prosumer's wellbeing as they do not have the skills and knowledge to pursue the repair of the item safely. As a result, the prosumer may choose to replace the item. Some studies have recognised the extent to which conspicuous consumption and embracing materialism may be a defence mechanism developed in a period of induced stress in children and may have in turn a functional role in supporting prosumer wellbeing (Burroughs & Rindfleisch, 1997). Education was an identified element that nurtured innovativeness. Scott & Weaver recognized that the type of education had significance for prosumers with higher PRP. Lilley et al. (2013) also identified that the fixers held tertiary and vocational education providing them with the necessary skills and knowledge.

2.4.1.3 *Perceived Cost of Repair and Replacement & Trust in Repair Efficiency*

Lilley et al. (2013) recognise the cost of repair as the most common reason not to repair for non-fixers and extreme non-fixers. Scott & Weaver (2014) also recognised the cost of repair as influencing prosumers with lower PRP. The prosumer is recognised by McCollough (2009) to have

difficulty to justify the repair of goods because the repair cost is rising, and the price of newly manufactured goods is declining steeply. The cost of UK labour conflates the cost of repair and the nature of the practice which is singular and idiosyncratic does not allow the possibility to achieve economies of scale (Graham & Thrift, 2007; McCollough, 2009). On the other hand, the mass production of items by cheap labour, often based in foreign and developing countries reduces the cost of items because it permits industrial cost saving which impacts retail prices. The literature recognises the role of economic obsolescence in driving more replacement than repair (Mawle & Smalley, 2012). Findings by Scott & Weaver (2014) also highlighted that economic factors were more critical with individuals with lower levels of PRP. The findings from the research do not provide an indication of other routes for repair taken by the prosumer that do not involve monetary transaction. One of the characteristics of repair is that different actors can perform repair (Reike, Vermeulen, & Witjes, 2018). The prosumer can request the services of a repair shop or return the broken item to the manufacturer who will try to repair it through their repair centres. They can also join non-commercial community workshops to get support from hobbyist tinkerers (Charter & Keiller, 2014; Cole, Cooper, & Gnanapragasam, 2017). They can request their family members to repair the broken items. DIY and repair within the home is the unpaid household activity that remains a large reserve of men (Evertsson, 2006). The literature interested in the value and impact of both the informal and unpaid sector provides some indication on what influences the prosumer to choose not to pay for a service and choose instead informal exchanges.

The informal economy refers to the ''remunerated exchanges unregistered by, or hidden from, the state, for tax, social security and/or labour law purposes but that is legal in all other respects'' (William & Martinez-Perez, 2013, p. 2). The unpaid economy involves no money exchanged. There are different explanations to understand why prosumer are motivated to use the informal sector as described by William and Martinez-Perez (2013). It includes financial gain (Allingham & Sandmo, 1972; Richardson & Sawyer, 2001), social and redistributive rationale whereby the prosumer wants to give money to someone in their sphere of influence, and the failure of formal services to respond to one's needs (Maloney, 2004; Small Business Council, 2004; Soto, 2001, 2002). The analysis of 26,659 face-to-face interviews in 27 countries on the motivation to engage in the informal sector revealed the significance of cost for 44% of the interviewed sample (William & Martinez-Perez, 2013). The research recognised that people, who do not have the means to purchase through formal routes, favour the informal sector. It highlights the possibility of another route for the prosumer with low PRP to engage with repair. For 28% of the sample, the failed reliability, speed and quality of their interested sector influenced their behaviour, and for the other 28%, they were motivated by redistributing and exchanging value with their sphere of influence. The failed reliability, speed and quality of repair shops is also likely to encourage the prosumer to choose informal route to repair. Scott & Weaver (2014) also recognised the lack of trust in repair efficiency as affecting PRP. Combined together the cost of repair and the lack of trust in repair shops' abilities to meet the prosumer needs may influence them to use informal routes of repair that alleviate financial losses.

2.4.1.4 *Acquisition Purchase*

Both research studies highlight that the higher the PRP, the greater the prosumer considers their purchase decision. Lilley et al. (2013) illustrated that fixers are more likely to purchase premium brands as opposed to non-fixers. The findings are consistent with other research that suggests that consideration of the reparability of a product in the initial purchase decision may impact the likelihood of repair later (Guiltinan, 2009; Mashhadi et al. 2016).

2.4.1.5 *Attachment*

There were some elements where the findings of the two studies differed. In Scott and Weaver's study (2014) product attachment was more prominent with higher PRP. Research interested in prosumer product care tendency highlighted that prosumer might be motivated to care for an item because it expresses an aspect of their identity (Ackerman et al., 2017), suggesting that prosumers with higher PRP may be attached to care for an item because of the perception they have of themselves. However, product attachment amongst the fixers was not identified as a feature within Lilley et al.'s (2013) study.

2.4.2 Behavioural frameworks

The Theory of Trying (TT) and The Transtheoretical model of change (TTMC) emerged as being relevant for the research project to understand further PRP and reduce the gaps in research in the DfSB field to understand prosumer non-fixed and cyclical behaviour. See Appendix H – Review of Behavioural models presents other behavioural frameworks reviewed through the investigation. The TT (Bagozzi & Warshaw, 1990) is relevant to understand repair behaviour as it was used to understand the values at play in influencing the adoption of prosumption behaviours such as cooking (Xie et al, 2007). The TTMC (Prochaska, DiClemente, & Norcross, 1992) presents the adoption of behaviour as a process where at different stages of engagement with the behaviour, the prosumer will make use of processes to help them maintain the sought behaviour. It recognises the change in behaviour as non-decisive and cyclical. Each framework provides a different lens to help understanding the propensity to repair. The frameworks can help in answering two different research questions. The TT can support in understanding the attitudes towards trying to repair while the TTMC can help in understanding the processes that can influence the propensity to repair at different stages of the repair process. Using both frameworks, enhances the researcher's ability to explore why prosumers repair or not. The frameworks work independently from each other as they strive to understand the propensity to behave in a certain way from different perspectives. The following review of the frameworks is to support the design of the research investigation.

2.4.3 *Theory of Trying (TT)*

The TT (Figure 2-2) was developed to comprehend the process of striving to perform difficult; behaviours or achieved involved goals (Bagozzi & Warshaw, 1990). Xie et al. (2007) used the TT to understand the propensity to engage in prosumption behaviours using a socio-psychological perspective. Xie et al. (2007) considered that the TT construct is more suitable than traditional attitudinal theories because the process of prosumption is vulnerable to failure and requires effort at goal striving. It makes the TT an appealing framework to study repair behaviour. In Xie et al. (2007), the attention is on the individual's understanding of their role, risk and responsibilities as prosumers as opposed to the meaning of consumption. The TT broadens and deepens the Theory of Planned Behaviour (Ajzen, 1991).

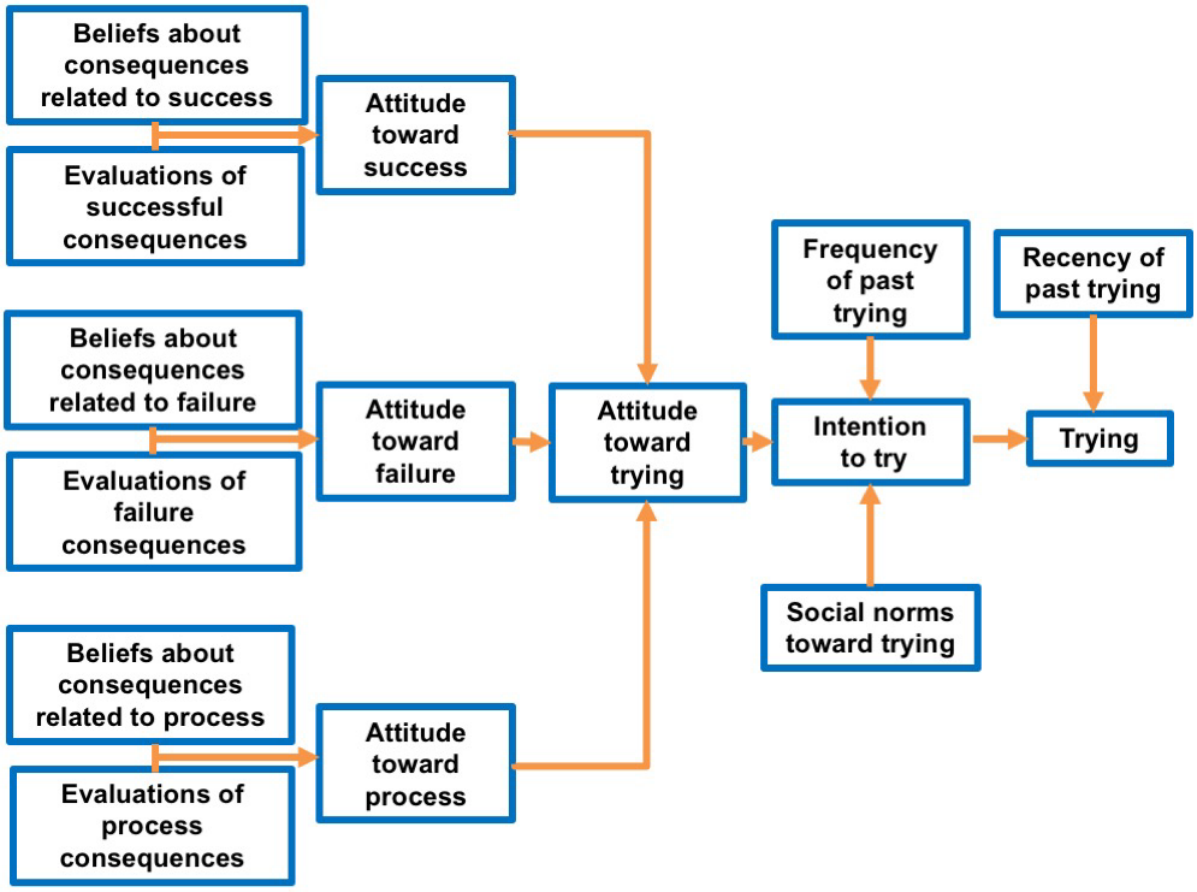


Figure 2-2 - TT model (Bagozzi & Warshaw, 1990)

The TT models' goal-directed behaviour as opposed to volitional behaviour. Volitional behaviour is under the control of the decision maker. Goal-directed behaviour is affected by circumstances beyond one's control (Madden, Ellen, & Ajzen, 1992). The theory of reasoned action which became the Theory of Planned Behaviour was first intended to model volitional behaviour (Bay & Daniel, 2003). The addition of measure of self-efficacy, called by Ajzen (1988) perceived behavioural control, was an attempt to reflect the subject's perception of how easy or difficult it would be to perform an action or to engage in a goal-directed behaviour where circumstances and the actions are beyond one's control (Ajzen, 1991). The TT proposed by Bagozzi and Warshaw (1990) is a more extensive modification of the Theory of Reasoned Action. Within the TT, the inability of the decision maker to

control outcomes is given greater emphasis in the behaviour. It is relevant for the repair of items as the prosumer cannot predict whether the item will function after their repair attempt. Hence, self-efficacy, conceptualised as the subject's subjective assessment of the probability of success and the probability of failure (Bagozzi & Warshaw, 1990), is given emphasis.

In the TT, *"an attitude toward a reasoned action is replaced by an attitude toward trying and an intention is restricted to an intention to try"* (Carsrud, Brannback, Elfving, & Brandt, 2009, p. 155). There are three acts or attitudes within the concept:

- Trying and succeeding
- Trying and failing (trying and succeeding and trying and trying and failing are both anticipated outcomes)
- Process of Striving itself (it is about assessing the pleasures and pain that will be experienced in pursuing a goal)

Research carried out by Bagozzi and Warshaw (1990, 1992) and Bagozzi, Davis and Warshaw (1992) supported the TT empirically suggesting that both attitudes to success and failure are essential in determining intentions and because of this differentiate itself from the theory of planned behaviour. However not all the predictor variables were equally significant in all tests (e.g. Bagozzi, Davis, & Warshaw, 1992; Bagozzi & Kimmel, 1995; Bagozzi & Warshaw, 1990). In some studies, attitudes toward failure were less significant than attitudes toward success (Bagozzi & Kimmel, 1995; Madden et al., 1992). In other studies, neither predictors of attitudes were significant (Bagozzi et al., 1992) and sometimes other variables such as the perception of risk was a predictor of intention (Dehart & Birkimer, 1997). For this research on repair, the perception of safety risks might have a more significant impact on the prosumer on their attempt to repair than their attitudes towards trying to repair depending on their PRP, considering the findings of previous research on repair (Lilley et al., 2013).

Other variables that are also important within the theory are past behaviour. Past behaviour or habits within the TT have two variables: recency of past behaviour and frequency of past behaviour (Bagozzi & Warshaw, 1990). Bagozzi et al. (1992) recognised the role of habits in shaping both behaviour and intentions. The frequency of past behaviour comes into play when intentions are not fully conceptualised on a cognitive level leaving the space open for automatic, unthoughtful behaviour (Bagozzi & Warshaw, 1990, 1992). Recency of past behaviour may also affect attitudes towards trying due to recency effect, and it may disturb the link between intention and behaviour as circumstances may prohibit intentions to be enacted (Bagozzi & Warshaw 1990, 1992). There were mixed results on the influence of recency and frequency of past behaviour (Bagozzi and Warshaw, 1990; Bagozzi & Kimmel, 1995). In some studies, the findings indicated that the significance of attitudes and intentions may disappear with the inclusion of past behaviour (Bagozzi & Warshaw, 1992; O'Callaghan, Chant, Callan, & Baglioni, 1997) indicating the importance of habits or past behaviour on final behaviour. For this research on repair, the experience of trying to repair, and repeated attempts to try to repair may have greater significance than the prosumer attitudes towards succeeding or failing to repair as the prosumer may have gathered more competencies and knowledge. Some research studies recognise the impact of past behaviour or habits on predicted future behaviour (Ouellette & Wood, 1998; Sheppard, Hartwick, & Warshaw, 1988).

After reviewing Ouelette and Wood (1998)'s mixed results from studies on the effect of past behaviour in different unstable/infrequent context and stable/frequent context, Bay and Daniels (2003) hypothesised that past behaviour might have less importance in decisions involving higher

level goals. Bay and Daniel (2003) suggest that past behaviour stops being critical with higher level goals because the prosumer gives more consideration to the process of striving. Subsequently, it is suggested to place goal-oriented directed behaviour onto a continuum from high to low level of importance. For the research on repair, the prosumer may place items onto a continuum from high to low level of importance and decide to repair items they are unfamiliar with because the prosumer considers them essential for him. For example, the prosumer may have more past experiences in trying to fix clothes than trying to repair a computer. However, repairing a computer may be a higher-level goal because of the pictures it holds.

The TT has a potential weakness as suggested by Bagozzi (1992). It concerns the inability for predicting the circumstances under which the prosumer is in when engaging with a behaviour. Bagozzi and Warshaw (1990) insert that the situational differences may influence the prosumer to form an intention to act more reactively. It could be interpreted in the context of this research as ''if an item breaks and the prosumer do not have the tools to repair, he is more likely to react impulsively and choose to replace as opposed to repair'' and the opposite applies. It is important for the purpose of this research to consider both the factors influencing PRP, and the process by which individual try to repair. The process is likely to be non-fixated and cyclical as the prosumer interact with the item. For that reason, the TTMC was also chosen for review and used to further understand the adoption of new behaviour.

2.4.4 The Transtheoretical Model of Change (TTMC)

The Transtheoretical Model of Change (Prochaska et al., 1992) is one of the most prominent psychological models of behaviour change. It has been used predominantly to provide order and direction for health intervention programmes targeting addictive behaviours as well as the promotion of physical activity (smoking: Andersen & Keller, 2002; exercise: Clarke & Eves, 1997; Kazi, 2013; Prochaska & DiClemente, 1982, 1983). The influence of social relationships at different stages of the model was measured for prosumers struggling with mental health issues, weight and addiction and recognised as significant in the implementation of health programme (e.g. Sherman & Carothers, 2005; Sorensen, Stoddard, & Macario, 1998; Wagner, Burg, & Sirois, 2004).The focus of the model is on individual decision making and intentional change. The TTMC was developed both from therapy literature (Prochaska and Diclemente, 1983) and from data on self-changers (Prochaska and DiClemente, 1982). Figure 2-3 provides an overview of the TTMC.

TTMC is a model rather than a theory; it suggests five stages of change on which the research can apply behavioural theories to understand a behaviour further. The primary assumption on individual behaviour change within the model is that it is a long, continuous, cyclical and non-decisive process, especially for changing habitual behaviour where people go through distinct stages in the course of modifying behaviours (Callaghan & Herzog, 2006; Velicer et al., 1995). Another important assumption is that different factors play an essential part in different stages of the process (Sutton, 2005).

The four related constructs considered central to behavioural change which are (Callaghan, Khalil, & Morres, 2010):

- stages of change
- self-efficacy
- decisional balance

- processes of change

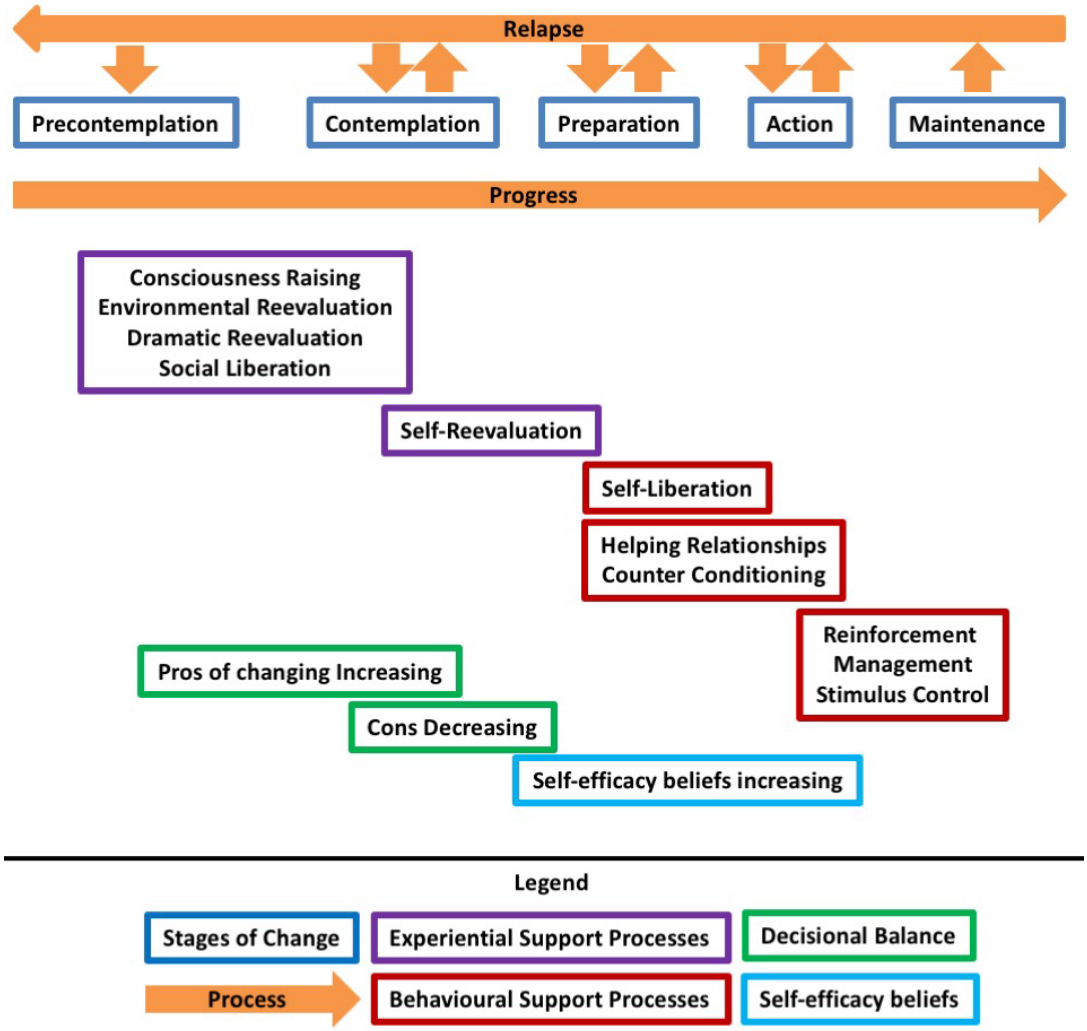


Figure 2-3 - Transtheoretical Model of Change (Prochaska and Diclemente, 1983) - Stages by Processes of Change

The Stage of Change is the central construct of the Transtheoretical model. The stages of change are sometimes referred to as the theory name interchangeably (Kazi, 2013). The stages of change reflect the temporality of the attempts of an individual to change. Behaviour change is reflected to be dynamic rather than static (Marshall & Biddle, 2001). The movement through these stages is cyclical rather than linear as there are chances for an individual to relapse which means the individual may attempt the task several times in order to reach their goals. (Marcus, Simkin, Rossi, & Pinto, 1996). Table 2-2 describes the different stages of change.

Table 2-2 - Stages of Change (Prochaska and Diclemente, 1983)

Stages of Change	***Description***
Precontemplation	No intention has been formulated into changing within the next 6 months. Individual are either unaware of negative impacts of their action. In this stage, individual tend to be defensive about any suggestions for change as they place more emphasis on the cons of changing behaviour (Prochaska and Diclemente, 1983)
Contemplation	People are intending to start a behaviour within the next 6 months. there is an intention to change within the next six months. there is the recognition that the behaviour is problematic. At this stage, individual give equal emphasis to pros and cons of changing behaviour.

Preparation	In this stage, people are ready to act within the next 30 days. People start to take small steps toward the behaviour change, and they believe changing their behaviour can lead to a healthier life
Action	In this stage, people have recently changed their behaviour within the last 6 months and intend to keep moving forward with that behaviour change. People may exhibit this by modifying their problem behaviour or acquiring new healthy behaviours. A spill-over effect can be recognised at this stage as people adopt more healthy behaviour
Maintenance	In this stage, people have sustained their behaviour change for a while (defined as more than 6 months) and intend to maintain the behaviour change going forward. People in this stage work to prevent relapse to earlier stage

2.4.4.1 *Decisional Balance*

Decisional balance is the relative assessment of the benefits (pros) and costs (cons) of changing a specific behaviour (Velicer et al., 1995). For individuals who do not perform any repairs, decisional balance is generally negative. They perceive more cons in trying to repair an item. Alternatively, individuals who regularly repair items have a positive decisional balance where positive beliefs outweigh the negative. In the pre-contemplation stage, cons tend to outweigh pros for repair activities. At contemplation and preparation stage there is a decisional balance point where pros and cons are simultaneously considered (Prochaska, Norcross & DiClemente, 1994).

2.4.4.2 *Self-Efficacy*

Self-efficacy refers to an individual's belief in their capacity to execute behaviours necessary to produce specific performance attainments (Bandura, 1997). Self-efficacy reflects an individual's confidence in the ability to exert control over their motivation, behaviour, and social environment. Self-efficacy beliefs tend to increase as the individual repeatedly attempts to achieve a particularly tricky task. Repair may, in most cases, be characterised by uncertainty and unpredictability that suppose confidence in one's ability to come up with a solution. The uncertainty related to the repair outcomes can hinder individuals' self-efficacy beliefs. The more an individual can navigate through unpredictable and uncertain circumstances through repeated attempt to repair, the more their self-efficacy beliefs increase. The more confident they can become towards their ability.

2.4.4.3 *Processes of Change*

Habit strength is an essential element within the theory; it relates to the strength of the behaviour already in place. At each stage of change, individuals use different processes of change to weaken the hold of a habit. There are ten cognitive, affective and evaluative processes of change divided into experiential or behavioural factors. Some processes are more relevant to a specific stage of change than other processes (Prochaska & Diclemente, 1983). Experiential factors tend to be used by people in the precontemplation and contemplation stages as they involve emotional and cognitive activity. These processes result in strategies that help people make and maintain change (Table 2-3):

Table 2-3 - Transtheoretical Model of Change processes of change

Construct		***Description***
Process of change		
Experiential	Consciousness-raising	Increasing awareness about the healthy behaviour.
	Dramatic relief	Emotional arousal about the health behaviour, whether positive or negative arousal.
	Self-re-evaluation	Self-reappraisal to realize the healthy behaviour is part of who they want to be.
	Environmental re-evaluation	Social reappraisal to realize how their unhealthy behaviour affects others.
	Social-liberation	Environmental opportunities that exist to show society is supportive of the healthy behaviour.
Behavioural	Counter-Conditioning	Substituting healthy behaviours and thoughts for unhealthy behaviours and thoughts.
	Stimulus Control	Re-engineering the environment to have reminders and cues that support and encourage the healthy behaviour and remove those that encourage the unhealthy behaviour.
	Reinforcement management	Rewarding the positive behaviour and reducing the rewards that comes from negative behaviour.
	Helping relationship	Finding supportive relationships that encourage the desired change.
	Self-liberation	Making a commitment to change

2.4.4.4 *Criticisms and Value*

Davidson (1998) criticised the TTMC model because:

- the lines between the stages can be arbitrary with no set criteria of how to determine a person's stage of change.
- The questionnaires that have been developed to assign a person to a stage of change are not always standardized or validated.
- There is no clear sense of how much time is needed for each stage, or how long a person can remain in a stage.
- The model assumes that individuals make coherent and logical plans in their decision-making process when this is not always true.

While the model ignores the context in which change occurs, its application to understand individuals' processes of change and to develop strategies to help individuals withdraw from addicted substances has been widely recognised in medical and therapeutic settings. It offers inspirations to develop a model related to specific prosumption behaviour such as repair from which design interventions can be developed to support the CE. The survey developed by Prochaska et al. (1973) to assess prosumer repair propensity to change appears particularly relevant to understand further the factors that may affect their propensity to repair. The contemplation ladder is a method used to usually assess the readiness to change in a population (Biener & Abrams, 1991; Slavet et al., 2006). It is rooted initially within the TTMC (Prochaska, Diclemente & Norcross, 1992). It is a straightforward and quick procedure generally used in the initial therapeutic encounter between a therapist and its patients.

2.4.5 Repair as an opportunity to learn and affect material realm

There are different types of repair often arranged on a spectrum from planned through to ad-hoc repair (Reike et al., 2018). Terzioglu et al. (2015) drew a spectrum of repairs from *'Assembly repair'* where the repair does not require any skill or knowledge such as putting products parts together, gluing or binding them to more 'advanced level of repair' that require advance skill and knowledge. Gregson et al. (2009) drew a spectrum of maintenance in their investigation of prosumer repair. In Gregson et al. (2009), maintenance referred to the activities to extend the lifespan of an item. The activities are arranged by level of difficulties from cleaning, polishing and wiping to engaging to quick fix repair or more advanced restorative activities. Both spectrums reflect the repairer's level of competences, skills, and knowledge in engaging in specific maintenance activities. The level of abilities of the prosumer in bringing the item back and making it ready-to-use reflects another vital characteristic of Repair. Repair is singular and idiosyncratic because the individual's circumstances, level of skills, and the object's state are themselves singular and impose the production of a specific solution (Graham & Thrift, 2007). It highlights the importance of considering both the conditions that affect the prosumer to repair as well as their level of skills in relation to their decision to take the opportunity to learn. Through the process of repair, the prosumer can foresee the ''importance of peoples' labour and ingenuity'' (Graham & Thrift, 2007, p. 4). Repair as an opportunity to learn was exemplified in the ethnographies of technical workers by Orr (1996), Downey (1998) and Henke (2000) (in: Graham & Thrift, 2007). The accounts of the technical workers portray how the broken, non-functional, failing items embed within themselves a plethora of new knowledge.

The interactions of the labourer with the object contributed to positive outcomes including:

- the development of practical archives in the case of Orr's technical workers (1996),
- the validation that a design program is alive because it identified its failures in the case Downey's student computer engineers and
- the increased quality of improvisation in finding, diagnosing and solving faults by Henke's building mechanics (2000).

Research on repair practices has been interested in how hobbyist becomes professional repairers, and the proxy they used to learn to repair items (Maycroft, 2015)

Ifixit, the free repair guide library, is a contemporary example of the aggregation of repairers' labour and ingenuity, contributed to by Independent professional and amateur repairers. As of July 2018 Ifixit's library, contained 43045 free repair manuals, providing 130735 solutions to the problems for approximately 11475 devices (Ifixit.com, 2018). Cities in the Global South where buildings keep evolving through improvement, adaptation, innovation, and even growth also witnesses an aggregation of repair talents amongst their residents (Brand, 1994). Frugal forms of innovation (i.e. Juggaad) where the prosumer fixes and customises items in order to survive (see Singh, Gupta, & Mondal, 2012) are also expression of the repair talents in communities. In this context, Repair challenges Western views on the permanence of infrastructures and the built environment (Graham & Thrift, 2007) as much as the role of the prosumer in relation to institutions. The aggregation of new knowledge has created interests in how repair can potentially impact on the study of design and technology (Hertz, 2014) and how the inclusion of DIY hobbyists into the design process can support the transformation of items at the end of their life (Salvia, 2013). There have also been suggestions to tap in the social economy where community repair events take place to learn from amateur repairers in the way product perform in term of reparability (Charter & Keiller, 2014).

2.5 Conclusions

The chapter reviews the current understanding of the role of the prosumer and Design in supporting the transition from a LE to the CE by adopting Repair as one of the processes to extend the lifespan of small electrical items and reduce, in turn, the impact of the EEE stream of waste on human health and the environment. The review established the context and background of the research investigation and examined current understanding of what affects and influences the prosumers to try to repair. It also reviewed behavioural frameworks that would support the research investigation and obtain a more holistic view of the elements influencing PRP.

The main identified gap concerns the lack of understanding of the prosumer's propensity to repair from a behavioural and psychological perspective that consider simultaneously prosumer repair behaviour as being:

- affected by a myriad of complex elements,
- 'difficult' to engage with from an attitudinal perspective,
- a learning process which is non-fixated and cyclical.

It is also evident that the details of the prosumer's circumstances and past experiences trying to repair need to be further investigated to determine a more detailed and representative understanding of what affects prosumer behaviour. The review of previous research helped in identifying conflicting results regarding the extent to which environmental concerns influence PRP. Nevertheless, the influence of environmental organisations in supporting the citizen reduction of the carbon footprint was identified when discussing the role of the prosumer in the CE. In this context, it was chosen to select prosumers with pro-environmental affiliation to environmental groups to take part in the research investigation.

2.5.1 Emergent research questions

From the investigation of the literature, five research questions have been formulated to guide the primary research.

Firstly, the review identified many factors influencing repair propensity. The conflicting results on the extent to which environmental concerns influence repair propensity requires further research on this specific group of individuals. It is also necessary to establish whether there are further factors linked to the prosumer circumstances that affect their repair propensity. Finally, there is a need to have a more in-depth conversation with prosumers to understand how their past experiences affect the factors influencing PRP. As a result, the first research question is:

What are the factors influencing PRP?

Secondly, the literature identified the TT as a potential framework to understand further prosumer behaviour as a ''difficult'' and goal-oriented behaviour for which the prosumer develops attitudes towards the success, failure and process of striving. The review identified the importance of understanding their attitudes towards trying to repair further to identify the elements that may enable or hinder them from repairing:

What are the attitudes towards trying to repair?

Thirdly, the literature identified the TTMC as a framework that can aid in understanding the cyclical and non-fixated nature of repair behaviour in order to identify the prosumer behaviours that are

supportive or unsupportive of repair. Three research questions revolve around the TTMC. First, it is necessary to determine the experiential and behavioural processes of change that affect the prosumer to try to repair. Secondly, as repair is singular and idiosyncratic, it is necessary to develop a repair process inspired by the TTMC model which can be used to identify how the factors influencing repair propensity, the attitudes towards trying to repair and processes of change affect the prosumer to repair. The TTMC lacks the understanding of the circumstances by which the prosumer which can be alleviated by further understanding of the factors and in-depth conversation with the prosumers. The research questions include:

What are the processes of change influencing repair propensity?

What is their repair process?

How do the factors influencing repair propensity, the attitudes towards trying to repair and processes of change affect the prosumer at different stages of the repair process?

The following chapter introduces the methodology and methods that frame the research investigation.

This chapter presents the research methodology that was designed to answer the research questions drawn from the literature review and presented in Chapter 1. It presents the research purpose, the research paradigm, the type of research carried out and the overall approach, and the methods to collect and analyse data.

3.1 The Research and its Purpose

Research is *'formalised curiosity'* (Hurston, 1942, p. 91) where the researcher engages in a systematic process of enquiry to gain new insights on a particular phenomenon (Bell, 2005; Drew, 1980; Preece, Rogers, & Sharp, 2002). It is done with purpose, hence its formal nature. The purpose relates to the desire to develop or contribute to one's own and other knowledge of a particular subject was through and at a time. According to Robson (2011), the research enquiry can apply and combine four research purposes: exploratory, descriptive, explanatory and emancipatory. The characteristics of each research purpose aid to classify the type of studies to be designed to meet the intent of the research since the sought results differ from one study to another (see Figure 3-1).

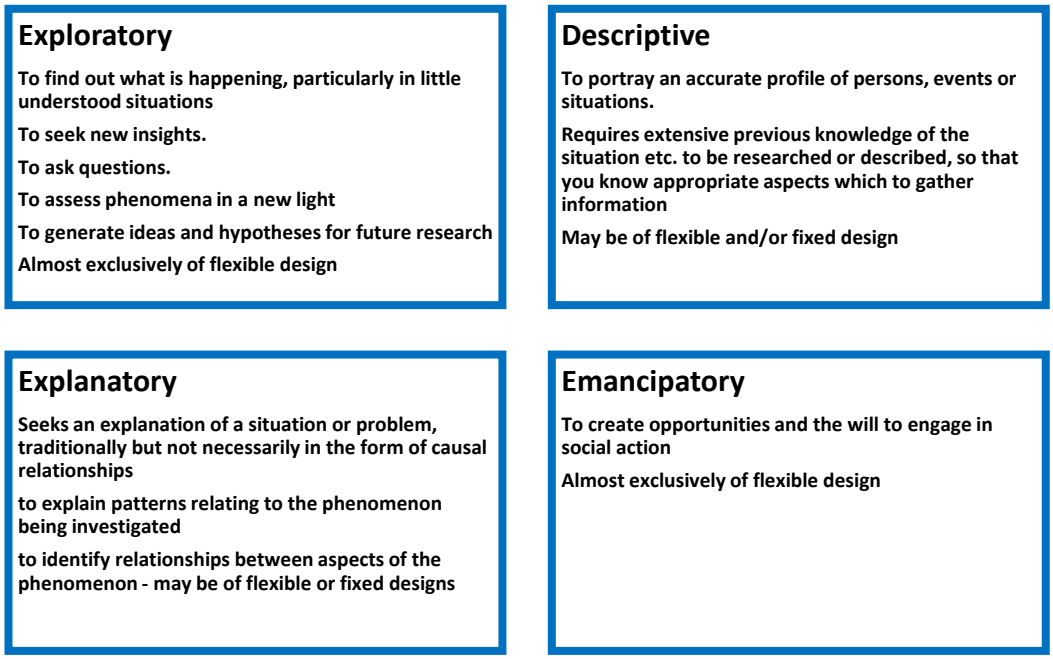


Figure 3-1 – Research Purpose description in Robson (2011)

The choice and combination of the research purpose(s) suggest the primary intent of the research. The researcher's definition and understanding of the research problem, the nature of research questions, the assumptions, world views, and the theoretical lens of the research inform the research intent (Creswell, 2007).

In this research project, the research problem relates to PRP. It cannot be investigated in a vacuum, a laboratory or in a 'closed system' where components are controlled and defined. The real world is the stage for the research investigation. The research questions emphasise on gaining new insights on PRP, prosumer process of actions and the factors influencing their behaviour. Together, the research problem and research questions indicate that the research has an exploratory purpose. The intent is to provide new perspectives to the reader on the role of the prosumer as a repairer to aid in

developing strategies to support the transition towards the CE. Confirming the purpose of the research by assessing the research problem and the research question is not sufficient (Denzin & Lincoln, 2000), the beliefs of the investigator in the way reality and knowledge is to be perceived are essential to assess the selected purpose of the research. It also helps in designing the research, and in understanding the contribution of the findings to knowledge.

3.2 Research Paradigm

The Research paradigm is defined as *''a set of beliefs that guide action''* (Denzin & Lincoln, 2000, p.157). It is a belief system or worldview that informs how the research is to be carried out (Guba, 1990; Guba & Lincoln, 1994). Most research paradigms suggest a particular nature of reality (Ontology), nature of knowledge (Epistemology) as well as a way of acquiring it (Methodology) (Denzin & Lincoln, 2000). Many paradigms exist (Robson, 2011) and the major worldviews are described as (Guba & Lincoln, 1994):

- Positivism where reality is real and apprehensible. The researcher is objective by viewing reality through a 'one-way mirror' in other words what is tested on human experience is reality.
- Constructivism where multiple local and specific 'constructed realities' exists – there, the findings are created by the researcher through their participation in the world being investigated
- Critical Theory where 'virtual' reality is shaped over time by a society's values. By virtual reality, it is inferred the notion of a prevalent illusion of knowledge shaped by human interests. The findings are mediated by value – those of the participants, the researcher/practitioner for social change.

In this research, pragmatic constructivism was chosen as the theoretical perspective to guide the research project. The combination of pragmatism as one paradigm within critical theory and constructivism influenced the research.

Pragmatism is a perspective which *''emphasises upon the practical application of ideas by acting on them and test them on human experiences''* (Gutek, 2014). Through the pragmatism lens, the function of thought is oriented *''towards solving practical problems in ''the real world''*(Feilzer, 2010, p. 8). The function of thought is not to describe, represent or mirror reality; instead, the thought is a device intended to foster practical change (Hickman, Neubert, & Reich, 2009). The pragmatist researcher is a practitioner of change because they decide what conceives research and what research to gather and interpret as findings;they also accept that the universe is always changing. Through this process, the practitioner conceives an object of knowledge. It can be argued that pragmatism is the foundation for mixed research methods (Tashakkori & Teddlie, 1998).

Constructivism regards reality as a construct of human minds where both the researcher's subjectivity and social inter-subjectivity are valued (Vanderstraeten & Biesta, 1998). Contructivism contends with the existence of multiple realities because knowledge is constructed by a researcher who brings in its practice personal values, and interacts with participants who have a different understanding of the world, in order to finally generate knowledge.

Pragmatic constructivism is an approach outlined in the writing of Dewey (1907) where the researcher comes to understand the existence of multiple subjective realities through social interaction, yet the researcher seeks change through action and collaboration (Hickman et al., 2009; Vanderstraeten & Biesta, 1998). The research practice becomes a transaction between the

researcher and the participants with the ultimate intent to create change through the construction of knowledge (Dewey, 1907).

The focus of the Literature Review in this thesis on the transformative abilities of Repair to contribute to the transition towards the CE and the understanding of the capacity of humans to change their attitudes, beliefs and behaviours through their interaction with an object influenced the selection of pragmatic constructivism. Through the pragmatic constructivism lens, there is a recognition of the extent to which the transition towards the CE involves the change of multiple subject realities as they interact with the CE object. Nevertheless, most of those realities are unknown and specifically the realities of individuals who try to repair. The review of multiple behavioural frameworks and the factors influencing PRP also provided the impetus to use the different approaches to understand prosumer repair behaviour as a multi-dimensional object. Together, those arguments strengthen the exploratory nature of the research.

3.3 Research type and strategy

The purpose of the research, the research questions and the research paragdim influence the selection of a mixed method approach for the research design. In Dewey's perspective, mixed methods are appropriate to use if the researcher seeks to apply findings to a reality that is once plural and unknown (Teddlie & Tashakkori, 2008). In the context of the thesis, the research project uses mixed methods to apply what is known about prosumer repair behaviour to participants' reality that is plural and unknown.

Multiple design strategy or mixed methods suggests the combination of both flexible and fixed design strategies. Greene, Caracelli and Graham (1989) as well as Creswell and Plano Clark (2011) identify different characteristics of mixed methods. It includes triangulation, complementarity, development initiation and expansions (Greene et al., 1989).

Table 3-1 provides further definition of the purposes of mixed methods.

The research purpose is to explore the factors influencing PRP using existing knowledge and behavioural frameworks. In that regard, a mixed methodology is ideal to find convergence through triangulation, to gain a multifaceted understanding of the phenomenon (i.e. prosumer repair behaviour) through complementarity (Strauss & Corbin, 2008). A mixed method approach aids to identify similitude and discrepancy between the existing knowledge on the research problem and the new findings. The approach also supports the increase of the scope and breadth in the understanding of the research problem.

Table 3-1 – Purposes of mixed methods – Adapted into a table from Graff analysis of the purpose and characteristics of mixed methods research

Purposes of mixed methods as suggested by Greene, Caracelli and Graham (1989)	***Definition***
Triangulation	The use of qualitative and quantitative methods in an effort to reach convergence of findings
Complementarity	The use of qualitative and quantitative methods to examine the overlapping and different facets of a phenomenon in order to obtain a more meaningful understanding of the phenomenon

Development	The use of one method after the other so that the first method guides the second in terms of decisions made about sampling, measurement and implementation
Initiation	The use of qualitative and quantitative method to discover paradox, consistencies and discrepancies in qualitative and quantitative findings for comparison and analysis of new perspectives and insights that can yield new questions
Expansion	The use of qualitative and quantitative methods are used to increase the study scope and breadth

3.4 Research strategy

The selection of a mixed method approach elicits the choice of a specific strategy to guide the research investigation. The review of the systematic framework for approaching mixed methods developed by Creswell (2003) (see Appendix I – Mixed Methods Strategies) helped in selecting the sequential transformative strategy. The purpose of the strategy is to employ the methods that best serve a theoretical perspective. In this research, the use of the behavioural perspective is made explicit within the research questions and the selection of the behavioural frameworks. It is the primary theoretical lens used throughout the research project because it can provide diverse understanding of PRP.

3.4.1 Integration of the qualitative and quantitative data

The most challenging phase of the research investigation is the integration of qualitative and quantitative data. The use of both qualitative and quantitative data increases the complexity of evaluations (Wisdom & Creswell, 2013). For those reasons, it was chosen to integrate the findings through a triangulation process after each study to identify how new insights augments understanding of PRP. The reference model that presents the factors influencing PRP in Chapter 2 was drawn out as a base to expand upon in both studies, namely the Survey study and the Prosumer Study. In the Survey study, a repair process was delineated which was used as a base to foresee how the attitudes towards trying to repair and the factors influencing PRP affects the prosumer at different stages of the repair process. The repair process was augmented with the insights gained from the Prosumer study.

With the understanding of the type of research and strategy to be conducted and how they are to be combined and integrated, the following section provides the details of the research design with its process and selection of methods for data collection and analysis.

3.5 Research Design

The research design refers to the overall strategy chosen to integrate the different components of the study coherently and logically to address the research problem (De Vaus, 2001). It unfolds throughout the research project due to the real-world context in which the research is situated (Robson, 2011). The research design emerges from the prior choices made by the investigator concerning the chosen research purpose, research paradigm and research strategy. It forms *''the overall configuration of a piece of research''* (Saunders, Lewis, Thornhill, Lewis, & Thornhill, 2010, p. 126) which in the case of this research involve three phases to answer the research questions – The Literature Review (Chapter 2), the Survey study (Chapter 4), the Prosumer Study (Chapter 5). Each phase informs the next step and contributes to achieving the overall aim of the research.

The research aims to gain a broader view of the elements influencing prosumer repair behaviour. The use of different data collection techniques as methods of investigation are to meet the aim of the research. Each technique provides a different perspective on the sought answers (Kane & Brun, 2000). In this project, the influence of the reviewed conceptual framework on prosumers' PRP and the techniques applied to understand the prosumer through the identified behavioural models influenced the selection of methods. The methods were selected according to their suitability to address the objectives of each phase of the investigation while considering the prescriptions from the theoretical lens.

Figure 3-2 illustrates the research design of the research project, considering the objectives, methods and outcomes for each phase of this investigation. Table 3-2 illustrates how the research questions relates to each study.

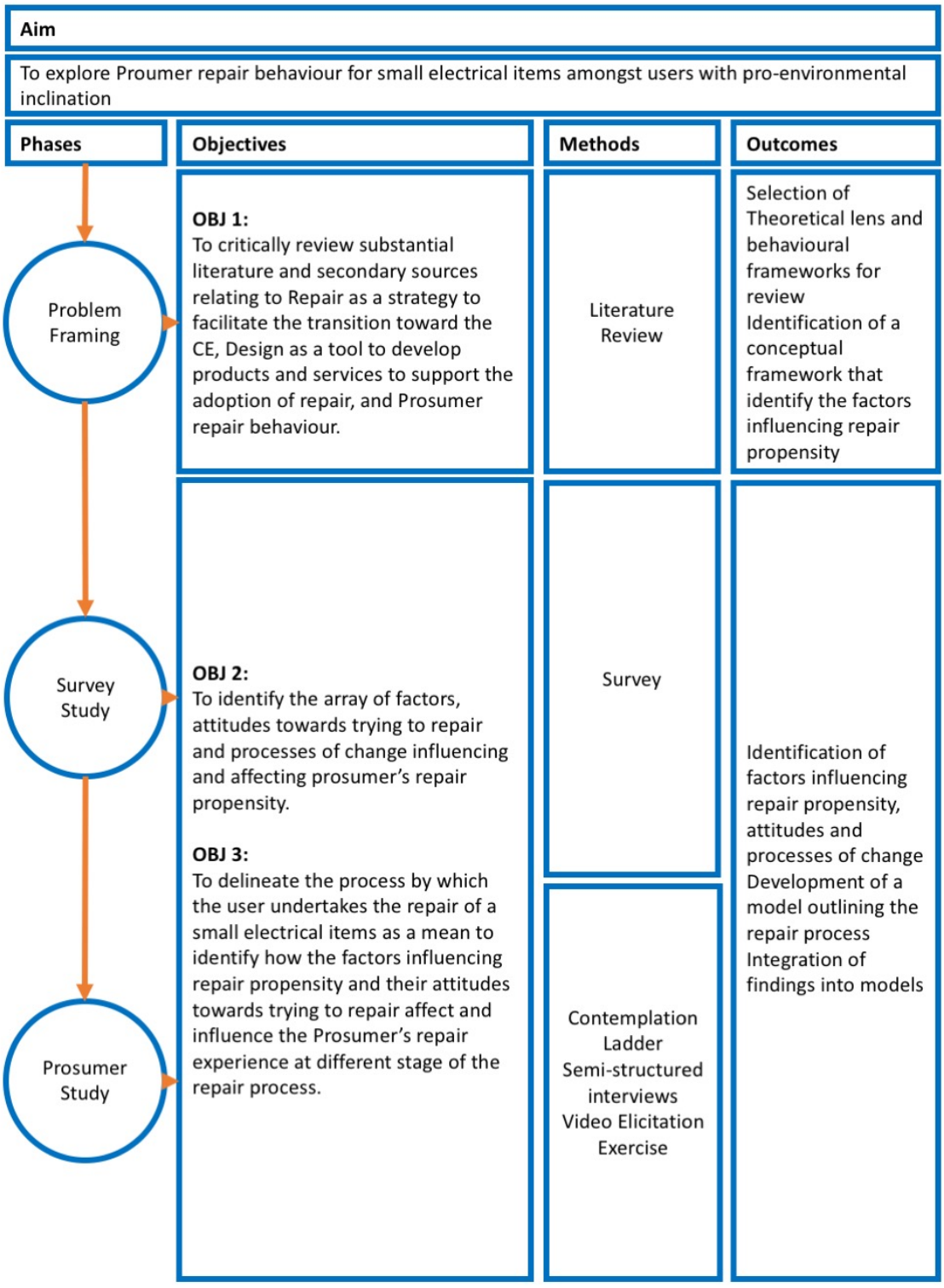


Figure 3-2 Research design of the doctoral research

Table 3-2 – Research Questions answered by each study

Research Questions	Survey Study	Prosumer study

1.	What are the factors affecting and influencing prosumer repair behaviour?	X	x
2.	What are the attitudes of the prosumer towards trying to repair?	x	x
3.	What is the prosumers' process to repair small electrical items?	X	x
4.	What are the processes of change affecting and influencing prosumer behaviour?		X
5.	How do the factors and attitudes towards trying to repair affect the prosumer at different stages of the repair process?	X	x

3.6 Data collection methods

The mixed methods strategy combines both open-ended observations and closed-ended measures that can be collected either simultaneously or sequentially to understand the research problem (Creswell, 2003) best. The following sections describe first the rationale behind the choice of the multiple data collection methods used through the research project, and then the means for analysis and the details on the sample under study.

3.6.1 Survey study

Informed by the literature review, the Survey study was designed to explore the element affecting and influencing prosumers affiliated to pro-environmental organisations to repair small electrical items. Two hundred eight individuals responded to the survey distributed both online and offline. The Survey study was used to explore and try to answer in part the following research questions

1. What are the factors affecting and influencing PRP?
2. What are the attitudes of the prosumer towards trying to repair?
3. What is the prosumers' process to repair small electrical items?
4. How do the factors and attitudes towards trying to repair affect the prosumer at different stages of the repair process?

The following sections explain the rationale for the choice of the survey method and how it was developed.

3.6.1.1 *Rational for survey choice and development*

Surveys are one of the most common methods used in research, particularly in social research (Robson 2011). The following elements influenced its selection for this research:

- While divergent opinions emerge on whether a survey is an appropriate and efficient method for exploratory purposes (Robson 2011), the method is used to quickly map out the attitudes towards trying a specific behaviour (Bagozzi & Warshaw 1990). Further, as research in the area of repair behaviour remains limited, exploratory questions in a survey can also lead to the development of propositions for further study.
- Surveys were used in prior work to explain and describe prosumers' repair behaviour (Lilley et al., 2013; Scott & Weaver, 2014; Terzioglu et al., 2015).

Considering the advantages and disadvantages of the survey (Robson, 2011) (Table 3-2), the possibility to retrieve a large amount of data quickly to identify behaviour patterns as well as to study attitudes and beliefs met the purpose of the prosumer study.

Subsequently, in light of those considerations, the survey was designed with both closed-ended standardised measures and open-ended questions to get in-depth insights on prosumer repair behaviour.

Table 3-3 – Survey advantages and disadvantages (Robson, 2011)

Disadvantages	***Advantages***
The characteristics of the respondents (inc. memory, knowledge, experience, motivation and personality) can affect the data	It is a relatively simple and straightforward approach to study attitudes, values, beliefs and motives
The accurate report of respondents' beliefs, attitudes, values and motives can be diminished by respondent bias towards social desirability. Respondents can choose to answer in a way that enhance their characteristics	The method allows standardisation and generalisation of the collected data across almost any human population.
Further than having typically have a low response rate, respondents may not treat the exercise seriously, and this cannot always be detected	It is one of the only or easiest way of retrieving information from a large set of people at relatively low cost, in a short period of time
The detection of misunderstanding of the survey questions by the respondents may be difficult, seen impossible.	The anonymous nature of the method can encourage frankness when sensitive areas are involved

The rationale for the survey development encouraged the selection of a self-completion questionnaire for the administration of the survey. The pros of the methods are that the minimal cost, the ease of data gathering and the possibility of collecting a large amount of data (Robson, 2011). The cons relate to the low amount of control by the research, the risk for low response and a misaligned sample (Robson, 2011). These risks were reduced by the cooperation with Footpaths Leicester in organising the Green Festival of Making and Mending and combining both online and offline survey.

3.6.1.2 *Developing the survey*

According to Robson (2011), the survey questions are designed to help achieve the goals of the research: to answer the research questions. A good questionnaire should have the capacity to (Robson, 2011):

- Provide a valid measure of the research questions
- Get the cooperation of respondents
- Elicits accurate information

There were four parts to the survey designed to answer the research questions:

- The first part assessed the factors influencing PRP, and patterns of behaviour amongst the sought population. It models the studies of Lilley et al. (2013) and Scott and Weaver (2014). It incorporated pre-coded questions (quantitative).
- The second part of the survey collected attitudes towards trying to repair. It modelled Bagozzi and Warshaw's (1990) attempt to map out salient modal beliefs associated with trying. Participants were asked using open elicitation questions as suggested by Bagozzi and Warshaw (1990) to list anything associated with trying and succeeding, failing, and trying per se to repair a broken electrical item.
- The third part collected individuals' experiences in trying to repair electrical objects.

- The last part collected demographic information which contributed to the understanding of the factors influencing PRP.

The Survey can be found in full in Appendix J. To ensure the questions were not misleading Ten individuals piloted the questionnaire (5 online version, 5 paper-based).

Section 3.7 provides details on the sampling for the distribution of the survey

3.6.2 Prosumer Study

An in-depth prosumer study was conducted with 10 participants to collect a more considerable amount of qualitative data to understand their reality in trying to repair an item. The study was comprised of 3 sequential steps:

- Step 1: A three-minute-long pre-interview exercise which included a contemplation ladder developed to assess their readiness to repair and a small questionnaire
- Step 2: An hour-long semi-structured interview
- Step 3: Two video elicitation exercises

The design of the study drew on the TTMC research methodology. The participants also answered questions related to their attitudes towards trying to repair and their experiences when dealing with a broken item.

The aim was to answer the following RQs and augment the model developed in the Survey study:

1. What are the factors affecting and influencing PRP?
2. What are the attitudes of the prosumer towards trying to repair?
3. What is the prosumers' process to repair small electrical items?
4. What are the processes of change affecting and influencing PRP?
5. How do the factors and attitudes towards trying to repair affect the prosumer at different stages of the repair process?

The full documentation for the Prosumer study is in Appendix K – Prosumer Study.

3.6.2.1 *Step 1: The ''Repair'' Contemplation Ladder pre-interview exercise*

A contemplation ladder is a method used to usually assess the readiness to change in a population (Biener & Abrams, 1991; Slavet et al., 2006). It is rooted initially within the TTMC (Prochaska, Diclemente & Norcross, 1992) described in the literature review. It is a straightforward and quick procedure generally used in the initial therapeutic encounter between a therapist and their patients.

A contemplation ladder is a single-choice, visual analogue scale that depicts a ladder whose higher rungs represent greater levels of readiness (Biener & Abrams, 1991; Slavet et al. 2006). It has 11 rungs and anchor statements representing stages of change where (0) is the least motivated and (10) is the most motivated (see Figure 3-3). The response options (0) to (3) correspond to the stage of pre-contemplation, (4) to (6) represents the stage of contemplation, (7) and (8) refers to the stage of preparation, (9) and (10) represents the stage of action and stage of maintenance respectively. The response -1 provide the choice to not respond to the participant.

For the research, two ladders were developed to assess the readiness of the participants to repair any items regardless of their categories and their readiness to repair small electrical items. These were piloted with students at Loughborough Design School to ensure clarity.

In addition to the contemplations ladder, participants answered how recently they engaged with repair for different product categories as well as some demographic questions related to their age, work status, income and education. The main aim was to provide the participants with the opportunity to reflect on their repair behaviour. The Contemplation Ladder was sent to the participants before the semi-structured interview via email. However, most participants chose to complete the contemplation ladders during Step 2 which facilitated clarification where required.

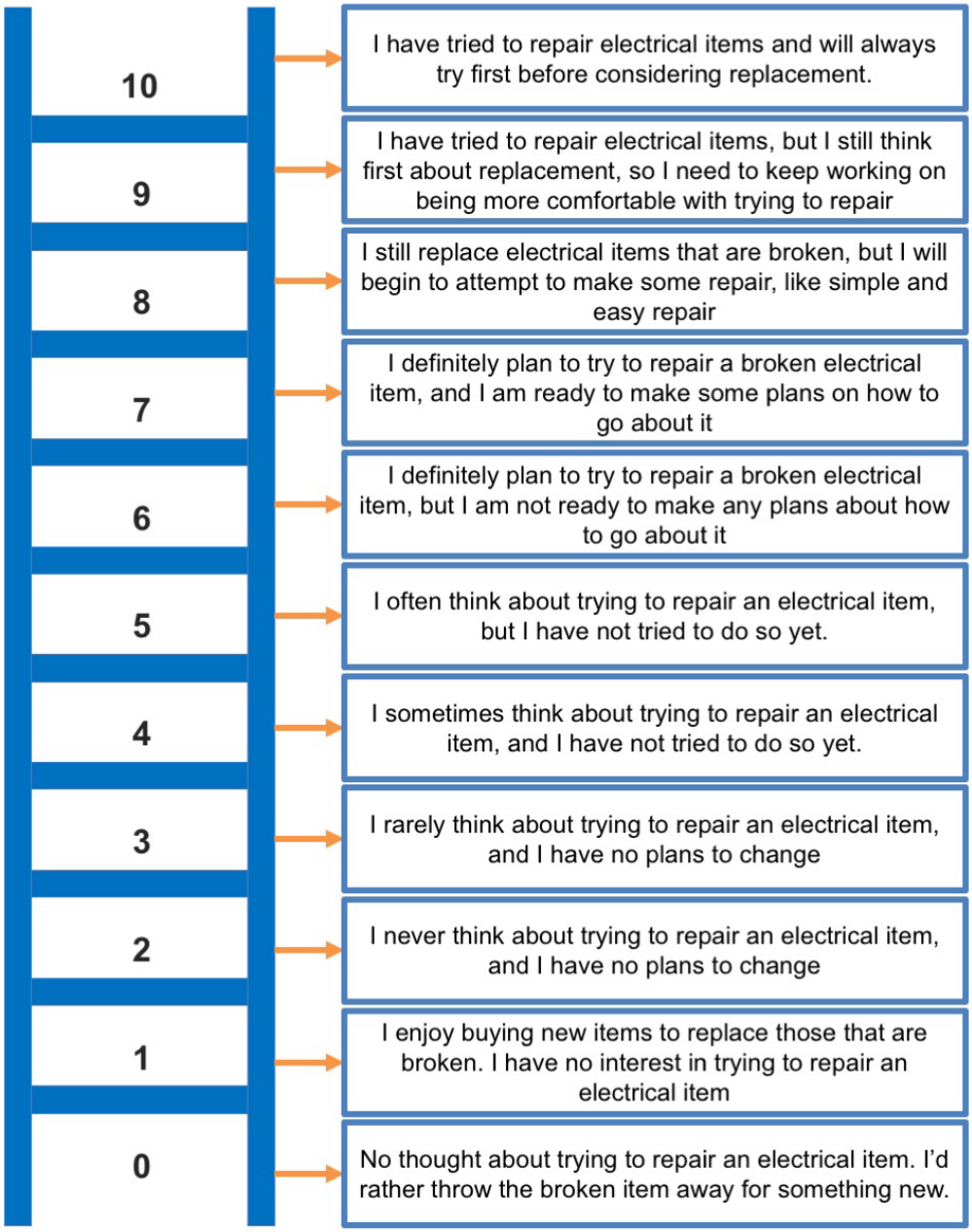


Figure 3-3 – Developed Contemplation ladder

3.6.2.2 *Step 2: Semi-structured Interview in participants' home*

Interviews are suited to investigate the attitudes and experiences of participants (Robson,2011). Three types of interviews differ on the basis of their structure or standardisation (Robson, 2011):

- Fully structured interview has predetermined questions with fixed wording, usually in a pre-set order. The use of mainly open-response questions is the only essential difference from an interview-based survey questionnaire.
- Semi-structured interview has predetermined items, but the order can be modified based upon the interviewer's perception of what seems most appropriate. Questions wording can change, and the interviewee can receive explanations; particular questions which seem inappropriate with a particular interviewee can be omitted, or additional ones included.
- For unstructured interviews, the interviewer has a general area of interest and concern but lets the conversation develop within this area. It can be completely informal.

Flexible qualitative designs use predominantly semi-structured and unstructured interviews. The decision for the research was to design a semi-structured interview because the intention was to obtain detailed and in-depth information about the participant's thoughts and behaviours using existing methods. It enables the interviewer to adapt the questioning to suit the direction the interview takes. King (1994) refers to them as qualitative research interviews and suggests four steps in constructing them (p.18):

1. defining the research question;
2. crafting the interview guide;
3. recruiting participants;
4. carrying out the interviews.

The semi-structured interview allows the researcher to collect information that is directly in line with its aim and objectives but also lets the interviewee develop their ideas in response to the issues raised by the interviewer (Denscombe, 2007). The design of an interview guide that aligns with the research questions and that communicates properly to the interviewee the main interest of the research (King 1994, p.18) includes (Robson, 2011):

- An introduction to the interview
- Main area of interest
- Set of questions for each area
- Prompts to direct and feed the conversation.

The set questions were inspired by the TTMC Extensive Survey by Prochaska (1983) to explore further the processes that influence change. The interviewees also answered questions about their attitudes towards trying to repair. Each interview was in the participant's home and lasted approximately 1h10. The session was recorded using a Dictaphone. The interview guide included eight parts described in the table below:

Table 3-4 – Interview guide

Part	***Details***
1	Introduced the research and framed the discussion around the process of change and the repair of small electrical items.
2	Focused on the participant's story, their home and their relationships with repair.
3	Investigated how they responded to the contemplation ladders. It was asked to provide a description of their answer out loud and to describe what statement resonates the truest for them.
4	Focused on the repair process they engage in.

5	Focused on their attitude towards failure
6	Focused on their perception of how supportive their social circle is
7	Focused on their future repair self
8	Outlined what will happen next, particularly in relation to the video elicitation exercise. This was an opportunity to frame in the mind of the participant that cameras are not as distant or scary to use but to be regarded as a companion in telling their own story in relation to repair.

The full script of one sample interview can be found in Appendix M - Sample interview transcript.

3.6.2.3 *Step 3: Video-Elicitation Exercise*

The participants were asked to complete, in their own time at home, two recordings, named Missions, narrating their experience in trying to repair a broken object. The missions were used as a basis for reflection, to stimulate recall and prompt discussion (Roth, 2009). The focus of a video-based reflection can be on reconstructing past thinking, post activity narratives or on reflecting on the present and future actions (Tochon, 2009). It can be used to gain insights on a point of view or to learn more about the meaning of practices and structure of knowledge in a site. Video elicitation interviews are particularly useful in helping to generate accounts of the characteristics of invisible phenomena that is in the context where something may be invisibly buried in the routines of day to day activities or may be conducted in the silent isolated activities of machine operation (Schubert, 2006).

The participant received one mission first. After completion, they received the second one. For each mission, the instructions were developed, piloted and sent. The participant used a camera they owned to record their answer. Following the receipt of their video, the content was analysed. In mission 1, the participants were requested to list items they have tried to repair in the last five years and to explore their experiences in trying to repair those items. In mission 2, the participants were requested to list broken items they retained and to examine the reasons why they have not attempted to repair those items as yet.

The instructions and mission can be found in Appendix K.

3.7 Sampling

Taking the pragmatic constructivist stance of the research and practicality, it was decided to use purposive sampling techniques across the research studies. Purposive sampling reflects a group of sampling techniques that rely on the judgement of the researcher when it comes to the selection of the units for study (Lavrakas, 2008). It is also known as judgmental, selective or subjective sampling. The cases are deliberately chosen and varied on a theoretically made distinction (Silverman, 2000). The usage of purposive sampling aims to maximise the acquisition of relevant information and get further insights within the research setting (Esterberg, 2002; Lincoln & Guba, 1985). They have a number of advantages and disadvantages. One of the major benefits of purposive sampling is that they can provide researchers with the justification to make generalisations from the sample that is being studied, whether such generalisations are theoretical, analytic and/or logical in nature.

One of the disadvantages is that purposive sample, irrespective of the type of purposive sampling used, can be highly prone to researcher bias. However, this judgemental, subjective component of purpose sampling is only a major disadvantage when such judgements are ill-conceived or poorly considered; that is, where judgements have not been based on clear criteria, whether a theoretical framework, expert elicitation, or some other accepted criteria. The subjectivity and non-probability nature of unit selection (i.e., selecting people, cases/organisations, etc.) in purposive sampling

means that it can be difficult to defend the representativeness of the sample. Hence, one implication of this selection is that any possible generalisation has to be done carefully and consistently with those conditions and not on a statistical basis.

In this research, the purpose of the sampling was to engage with individuals who were affiliated to an environmentally concerned organisation. The cooperation with Footpaths Leicester helped in reaching those individuals.

3.7.1 Cooperation with Footpaths Leicester

Footpaths Leicester is a carbon reduction programme for individuals in Leicester (Footpaths Leicester, 2017). It is supported by Transition Leicester which is an umbrella organisation for many environmental initiatives in Leicestershire. Footpaths Leicester's primary aim is to get people together to create resilient communities in the face of climate change. Footpaths' participants are invited to create a supportive group environment and for eight sessions, to complete activities to help reduce their carbon footprint at home. The structure of the programme increases understanding, feelings of competence and reduces confusion on the appropriate behaviours to adopt. Fisher (2013) evaluated the effectiveness of the Footpaths Leicester programme in promoting low carbon lifestyles. The results of the longitudinal study identified that participants reduced their carbon footprint by 15% through the course of the programme and continued to reduce their carbon footprint by 20% after a year.

In addition to the carbon footprint programme, Footpaths Leicester runs events and workshops to engage individuals with low-carbon lifestyles. It organises a facilitation programme to train individuals to run the carbon footprint sessions across the United Kingdom. It coordinates an event called ''Open Green Homes'' where households in Leicester open their homes to introduce Leicester residents to the technologies and behaviours they have implemented to reduce their carbon footprint (Footpaths Leicester, 2017)

Footpaths Leicester community are inclined to engage with pro-environmental behaviour and use the course and events as a resource to help them engage further with pro-environmental behaviour.

The author has been involved with Footpaths Leicester since 2013, first as a facilitator and then as a collaborator in the design of a one-day workshop on the perceived impact of money on behaviour and climate change.

It was in 2014 that the relationship between Footpaths Leicester and the author evolved from a voluntary partnership to a research opportunity when it was decided to organise the first Green Festival of Making & Mending in Leicester in 2015 and to distribute the questionnaire for the Survey study through their network.

3.7.1.1 *The Green Festival of Making & Mending*

The Green Festival of Making & Mending consisted of a year-long programme of small events culminating in a free festival on the 31st October 2015 in Leicester. The main aim was to increase confidence and competencies of participants to enable them to repair their possessions and ask for support as needed. In terms of impact, 600 people attended the festival itself and over 100 came to the pre-festival workshops. From the festival, Leicester Fixers emerged as an initiative which organises repair events in Leicester in collaboration with the Leicester Hackspace.

3.7.2 Sampling strategy for the Survey study

The intention was to engage with individuals with affiliation to pro-environmental organisations. Working with Footpaths Leicester, the distribution of the survey happened at the Green Festival of Making and Mending and through Footpaths Leicester's mailing list. Affiliated organisations and social networks to Footpaths Leicester including Zero Waste Heroes, Transition Leicester, Leicester Green Party, the Leicester Hackspace and the Restart Project were also approached to distribute the survey. Two hundred and eight people answered the questionnaire after a month and a half of launching it.

3.7.3 Sampling strategy for the Prosumer Study

The survey respondents were contacted by the researcher via email to invite them to get involved in the Prosumer Study. Ten individuals responded positively. Most were affiliates of Footpaths Leicester, the carbon reduction community programme (Footpaths Leicester, 2017). Table 3-4 presents the profile of the ten participants in the study. In summary, the three male participants had more experience in trying to repair. They had higher PRP because they provided numerous examples where they attempted and succeeded to fix small electrical items. Their community and family often asked for their help. They were not in full-time employment; instead, they were self-employed or retired. The remaining female participants had lower PRP and, mainly, sought support from their spouses and community. They had various work status from full-time employment to retirement. The majority of participants were involved with their community through volunteering. Their living, working and volunteering situation, as well as their income and education, had different impacts on their PRP. Chapter 5 explores further their status.

3.7.4 Electrical items mentioned by participants in the two studies

Appendix L provides an overview of the range of items mentioned by participants in the two study. It was not limited to small electrical items but included large appliances and electronic devices.

3.8 Data analysis methods

The following sections provide more details on the methods used for the qualitative and quantitative analysis.

3.8.1 Qualitative analysis – Thematic analysis

Thematic analysis was used to analyse the qualitative data for part of the Survey study and the Prosumer study. Robson (2011) identifies three types of qualitative analysis: quasi-statistical, thematic coding and grounded theory analysis. In the first case, the idea is to convert qualitative data into quantitative data that allows the researcher to work with word frequencies and correlations between terms. The second approach is thematic analysis, and it refers to the process of coding the data, splitting it into different groups of codes to form themes and then analysing and interpreting the themes according to the research interest. Finally, grounded theory approach is considered as part of the thematic analysis but with the condition that the codes emerge during the interaction with the data and there are no preconceptions with the analysis, in this approach the interpretation plays an important role.

Table 3-5 – Prosumer Study Profile of participants with pro-environmental inclination

Interviewee Coded Name	*Gender*	*Age*	*Living situation*	*How many people in the accommodation*	*under 18*	*In a relationship*	*Working situation*	*Volunteering*	*Education*	*Income per annum*	*Level of PRP*
DMT06A	F	37	Shared accommodation	4		Married	Self-employed	Yes	Bachelor's degree	-10000	Low
SW04A	F	54	Homeowner	5	3	Married	Part-time employment	Yes	Registered General Nurse Certificate (RGN)	20000-35000	Low
RB05A	F	67	Homeowner	2		Married	Retirement	Yes	Bachelor's degree	10-2000	Low
JC06A	F	40	Homeowner	4	2	Married	Full-time employment	Yes	Master's degree		Low
HW01D	F	32	Homeowner	1		Single	Full-time employment	Yes	Bachelor's degree	20000-35000	Low
FW03C	F	63	Homeowner	2 with 1 renting room		Single	Part-time employment	Yes	Master's degree	20-35000	Low
D08A	F	67	Rent accommodation	1		Single	Self-employed	Yes	-	- 10000	Low
WK07A	M	40	Homeowner	4	2	Married	Self-employed	Yes	HND	20-35000	High
JB09A	M	76	Homeowner	6 with 4 renting room		Married	Retirement – self-employed	Yes	Bachelor's degree	10-20000	High
TB01E	M	63	Homeowner	4 adults with 3 renting room		In a long-term relationship	Retirement	Yes	Master's degree	10-20000	High

Thematic analysis is one of the foundational qualitative analytic methods in qualitative research It *''is a method for identifying analysing and reporting patterns (themes) within data''* (Braun & Clarke, 2006, p. 6).. It is for the researcher, one of the core skills to acquire to identify across qualitative approaches ''*thematised meanings''*(Holloway & Todres, 2003, p. 347). Apart from providing a rich description of the data set, it also offers some interpretation of various aspects of the research topic (Boyatzis, 1998). While some authors consider it as being a tool performed within other analytic approaches (i.e. grounded theory) (Boyatzis, 1998; Ryan & Bernard, 2000) in this thesis and alike Braun and Clarke (2006), thematic analysis is a method in its own right.

Thematic analysis has many advantages. First, it is a flexible method with application across theoretical and epistemological approaches (Braun & Clarke, 2006). It provides a rich and detailed description of the data set, yet sophisticated and unanticipated insights (Braun & Clarke, 2006), highlighting both similarities and differences across the data (Braun & Clarke, 2006). The results tend to be accessible to a general audience (Braun & Clarke, 2006). For the researcher, the method is a relatively easy and quick method to learn and apply (Braun & Clarke, 2006).

One of the main downfalls of the method is its flexibility because it offers a range of analytic options. Without clear and concise guidelines, appropriate research questions and choices made about the analytic options, many things can be said about the data making it difficult for the researcher to focus on particular aspects (Braun & Clark, 2006). It is important also to choose a theoretical framework to expand the interpretative features of the thematic analysis; otherwise, it becomes a mere description of the data (Braun & Clarke, 2006). Hence, the downfall of the thematic analysis depends on the research questions, the framework and choices made about the study.

3.8.1.1 *Thematic analysis process*

Some authors argue that although thematic analysis is widely used, there is no clear indication or agreement on how to do it (see Attride-Stirling, 2001; Boyatzis, 1998; Tuckett, 2014 for examples). Braun and Clarke (2006) present a step-by-step guide for conducting a thematic analysis to aid the researcher in the analytic endeavour (see Table 3-5).

Table 3-6 – Phases and description of the process for thematic analysis – table taken from Braun and Clarke (2006)

Phase	***Description of the process***
1. Familiarising yourself with your data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes	Coding interesting features of the data of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes	Collating codes into potential themes, gathering all data relevant to each theme. Visual representation might be useful.
4. Reviewing themes	The phase involves the refinement of the theme whereby some theme might merge with one another whilst other might collapse into separate theme. Dual criteria by Patton's (1990) might be useful – internal homogeneity and external heterogeneity. One of the reviews involves, reading all the collated extracts for each theme to figure whether they form a coherent pattern. The other review if the first level seem coherent is to review the individual theme in relation to the entire data set. This is to aid in generating a thematic 'map' of the analysis.
5. Defining and naming themes	When a satisfactory thematic 'map' of the data has been carried out, the theme can be further defined and refined, generating clear definitions and names for each themes. Braun and Clarke (2006) highlight that define and refine' mean identifying the 'essence of what each theme is about and determining what aspect of the data each theme capture'.

	For each individual theme, a detailed analysis needs to be conducted and written. It is important to indicate the 'story that each theme tells plus how the theme fits in the overall broader set of data in relation to the research question. It is important to identify as well if each theme contain subthemes.
Producing the report:	The final opportunity for analysis involves the selection of vivid compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

In analysing the data set, one must be familiar with the differences between code and theme and how are they generated. Code refers to ''the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon'' (Boyatzis 1998, p.68). Code differs from a theme; a theme tends to be a lot broader (Braun & Clarke, 2006). A theme is an element within the data that is deemed important in relation to the research questions. It has to have some type of significance across the data set under the judgement of the researcher. Hence the frequency/prevalence of a theme does not mean that the latter is crucial (Braun & Clarke, 2006). The factors influencing PRP and the variables identified in the behavioural frameworks (i.e. TT and TTMC) were included as codes to ease the analysis process. The full list of codes used for the analysis of Survey and Prosumer study can be found in Appendix N. Repair processes were drawn with the associated description given by the participants on how they tried to repair the item. The narrative was coded accordingly to identify the most critical factors that support the prosumer to repair as well as the categories of factors influencing and or affecting the prosumer to repair. A sample of coded repair processes can be found in Appendix O.

3.8.2 Quantitative data analysis in Survey study

The survey was distributed both online through Survey Monkey and offline with a paper-based questionnaire. At the end of the distribution period, a data export from Survey monkey and manual entry to Nvivo were completed. In total 208 respondents completed the survey. The first part of the survey assessed the factors influencing PRP.

The respondents answered 1-5 ''strongly disagree'' to ''strongly agree'' Likert scale questions to assess the following elements:

- Consideration of repair at acquisition
- Frugality
- Environmental concern
- Lack of trust in repair efficacy
- Innovativeness
- Perceived cost of repair
- Perceived cost of replacement
- Perceived inconvenience of repair
- Product Care
- Product retention tendency
- Relationship between attachment to item and repair
- PRP

They also answered demographic questions to assess income, age and education.

The value for each question was averaged out per categories to find the mean. Then, two subsequent analyses were made. First, a correlation analysis was carried out for each category against PRP as a mean to identify the significant factors influencing PRP. The mean for data lines with missing values was not included in the correlational analysis. In the second analysis, all the significant variables were analysed together into a regression model to identify the most significant variables. Product care and consideration of repair during acquisition were not included in the correlation analysis because they are outcomes of PRP as opposed to a factor influencing PRP. Multicollinearity for the sample was examined using the Variance Inflation Factor (VIF) which indicated an absence of multicollinearity effects with VIF statistics all under 2.0, well below the guideline of 10 (Hair et al. 1998 in Scott and Weaver 2014). With approximately 208 answers to the survey, the richness of the data was compelling allowing the researcher, in a straightforward way, to understand better attitudes towards repair of small electrical products. The main limitation is that the study used SPSS as opposed to Lisrel like Scott and Weaver (2014).

For quantitative data information on decisions made on the appropriate course of actions in case the item was broken, graphical displays were made to organise the responses.

3.9 Ethics

In accordance with the University Ethical Advisory Committee, an Ethical Clearance Checklist was completed for the studies undertaken involving human participants and was deemed to conform to the ethical checkpoints. Each participant was informed of the purpose and details of the study prior to their involvement. Informed consent was sought from each respondent for their involvement and for the recording of the information (see Appendix K). Participants were also made aware that their involvement was voluntary and could be retracted at any point before, during, or after the study. Further to this, information was provided relating to the whistle-blowing policy and who to contact should they have any concerns or issues with the study. All information provided by participants was kept confidential to the researchers, and the storage of all data complied with the Data Protection Act 1998.

3.10 Research quality

The choice of research strategy determines the criteria to assess the quality of research. In a fixed design, the criteria for research quality are validity, reliability, replicability and generalisability are the criteria used. For qualitative research, Lincoln and Guba (1985, p.290) developed their own criteria based on Trustworthiness which are the findings that are ‘’worth paying attention to’’. This concept is divided into credibility, dependability, transferability, and confirmability. For mixed methods, the stance is pragmatic where the effects of an action are assessed. The framework GRAMMS by O’Cathain, Murphy and Nicholl (2008) was chosen to assess the research quality as it fits more appropriately the pragmatic paradigm where the stance is interested in the effects of action. They offer 6 criteria to assess mixed methods research quality.

The table below present the 6 steps and indicate what has been completed by the researcher.

Table 3-7 – Research Quality for Mixed Methods

Describe the justification for using a mixed methods approach to the research question	YES
Describe the design in terms of the purpose, priority and sequence of methods	YES
Describe each method in terms of sampling, data collection and analysis	YES
Describe where integration has occurred, how it has occurred and who has participated in it	YES
Describe any limitation of one method associated with the presence of the other method	YES

Describe any insights gained from mixing or integrating methods	See Discussion Chapter 6

3.11 Summary

To conclude this chapter, the research design for this project can be summarised as follows:

- The purpose of the study was to carry out an exploratory study in order to gain new insights on prosumer repair behaviour.
- A mixed method strategy was selected because first, it aligns with the pragmatic constructivist stance of the research and second, it meets the prescription of the selected behavioural frameworks and models.
- The collected qualitative and quantitative data are integrated through a triangulation process into reference models to better visualise how the factors influencing PRP may influence the prosumer at different stages of the repair process. Qualitative data are used to augment understanding of the quantitative data and expand the scope and breadth of understanding of the prosumer.
- Data was collected through different data collection techniques including literature review, survey, semi-structured interviews, contemplation ladder and video elicitation exercise predominantly from participants with affiliation to pro-environmental organisation.
- Quantitative data was analysed using correlation and regression analysis. Qualitative data was analysed through thematic analysis.

The two following chapters present the results from the applied research methodology presented in this chapter.

CHAPTER 4: SURVEY STUDY FINDINGS

This chapter presents the results from the Survey study presented in the Methodology (see Chapter 3). It was designed to partially addressed the research questions outlined in Table 3-2.

The chapter begins by presenting the results from the quantitative analysis of the factors influencing PRP. It continues with the findings from the thematic analysis of the factors. The chapter then presents the findings on the attitudes towards trying and succeeding, failing, and the process of striving. It continues with the introduction of the Repair Process Model with consideration for the influence of the factors and attitudes at different stages of the repair process. The chapter ends with the presentation of the two conceptual frameworks resulting from the study and some conclusions.

4.1 Significant factors in the quantitative analysis

In the first section of the survey, respondents answered a series of scaled questions on different factors influencing their propensity to repair. A correlation analysis was carried out to provide an initial understanding of the factors that correlate the most and the least with PRP. Table 4-2 highlights in ranked order the factors that correlated most significantly with PRP. Innovativeness or in other words the receptiveness to creativity and innovation was the most significant factor. Product care was a significant outcome correlating with PRP. The respondent's attachment to the item also influenced attitudes towards repair. Frugality traits, particularly thriftiness, encouraged

repair. Finally, the data indicated that a lack of trust in third party repairers encouraged prosumers to engage in repair activities themselves.

Consideration of repair at acquisition correlates negatively with PRP. It may be because of the lack of offers for repairable items and the premiums price put on those that do exist. It was found that the perceived cost of repair encouraged replacement over repair. Stewardship traits did not correlate with an inclination to repair whilst in previous research it was a significant factor influencing PRP (Scott & Weaver, 2014). Thriftiness trait was a more significant factor influencing PRP in the sample. Environmental concerns correlate negatively with PRP.

Table 4-1 - Correlation analysis results

Broad Factor Categories	Ranking order	Factors influencing URP	Correlation	Sign (2 tailed)	n
Consumer	1	Innovativeness	.462**	.000	192
Repair Outcome	2	Product Care	.222**	.002	198
Product	3	Relationship between attachment to item and repair	.202**	.004	201
Consumer	4	Frugality including thriftiness and stewardship	.172*	0.16	194
Market	5	Lack of trust in repair efficacy	.164*	.020	201
Consumer	7	Thriftiness	.140*	.048	201
Product	8	Product Retention Tendency	.126	.076	200
Consumer	9	Education	.117	.97	201
Product	10	Cost of repairs	.093	.191	201
Market	11	Inconvenience of repair	.085	.231	201
Consumer	12	Income	.080	.260	208
Consumer	13	Stewardship	.076	.281	201
Consumer	14	Environmental Concern	.074	.294	200
Consumer	15	Age	.015	.838	201
Product	16	Perceived cost of replacement product	.010	.890	201
Repair Outcome	17	Consideration of repair at acquisition	-0.18	.803	201

For the regression analysis, thriftiness was removed from the analysis to reduce multicollinearity with frugality. The two variables that were the most significant were innovativeness (t=6.819. p <.001) and traits of frugality (t= -2.841, p <.005) (See Table 5-4).

Table 4-2 Regression analysis results

	Beta	***T***	***Sign***
Innovativeness	.646	6.547	.000**
Frugality including thriftiness and stewardship	-.262	-2.841	.005*
Relationship between attachment to item and repair	-.073	-.955	.341
Lack of trust in repair shops	-.014	-.172	.864

Note: * p <.005, ** p <.001

4.2 Factors identified through qualitative analysis

The thematic analysis allowed the identification of two additional category of factors, namely 'Assets factors' and 'Social Factors'. Product & Services, Market, Consumer Factors are categories from the literature (Stewart & Weaver, 2014). Table 4-4 describes the category of factors influencing PRP.

Table 4-3 - Description of the category of factors influencing PRP

Category of factors	Description
Asset Factors	The available and needed resources the prosumer gathers and applies to repair an item.
Consumer Factors	The consumer factor refers to those differences between people that explain why, in the same situation, different people chose to repair or not
Market Factors.	Factors extrinsic to the product related to the way the prosumer perceives the repair industry and the role of manufacturers and retailers in either supporting or impeding the repair of their items.
Social Factors	The prosumer's sphere of influence supporting repair including peers and family.
Product & Service factors	Product factors refer to those aspects of the product that may support or hinder the prosumer to try to repair it
Repair Outcomes	Behaviours influenced by PRP such as product care and the consideration of acquisition

The following sections present the findings for each category of factors.

4.2.1 Asset Factors

Assets are the available and needed resources prosumers gather and apply to repair an item. They include:

- Skills and knowledge
- Tools (inc. written resources, repair tools and parts)
- Conducive environment
- Financial resources
- Time

4.2.1.1 *Skills and knowledge*

The possession of skills and knowledge to repair is a significant asset for the prosumer to re-establish the item function. Some respondents considered themselves *''knowledgeable and skilled''* and *''normally quite good at fixing stuff''*. One respondent highlighted that he was able to repair because of his professional background as an *''electrician and a physicist''*. The chosen profession supports the development of the necessary skills for repair.

Not everyone is interested in gaining repair skills. One respondent indicated that they *''no interests to gain the skills''*.

For many respondents, the lack of skills discourages repair. They did not believe that they could re-establish the item function:

> *''*[if I try to repair, it will] *probably not work as I know nothing about electrical stuff''*

Other respondents used repair activity as an opportunity for self-development by perfecting their repair skills and gathering more knowledge through research. They reflected that even if they failed to repair an item, they would still *''learn from their mistakes.''*

The expressed intent to develop skills through the process of repair highlights a different intention from trying to repair which is not limited to re-establishing an item function and expands to the acquisition of skills and knowledge.

4.2.1.2 *Access to documentation, tools and parts*

Some respondents used written resources to understand how to repair. They either *''looked online to find out how to do it''* or *''refer to a manual''*. They also used the internet to diagnose the item's fault. On the one hand, the use of online resources to self-diagnose an item can present some safety risks for the prosumer particularly if the prosumer does not have the skills and abilities to repair the item. On the other hand, the internet provides a great opportunity for the prosumer to engage in self-learning activities to develop his repair skills. The lack of access to online resources and *''lack of information''* provided by manufacturers and retailers can be a significant barrier to repair. If individuals do not share their process of repair on social networks for the prosumer to retrieve information from their repair experiences, it contributes to a lack of online knowledge and in turn hinders the repair process.

Guidance alone is not always sufficient to enable the repair of an item. The availability of tools and parts are significant elements for fixing an object. Several respondents used tools such as *''tape'', ''PAT tester'', ''screwdriver''* to open, unscrew, disassemble, reassemble, and safety check an electrical item. Respondents indicated that they could not repair items because they had *''limited access to tools''* or they did not *''have the right tools''*. The design of some items may require specific tools for disassembly.

The availability of parts is also an issue that was identified by the participants. Some respondents delayed the repair because they were *''Still attempting to source [a] part''* or had to give up the repair because *''parts for repair were not available''*. Other respondents identified the internet as an enabler for the acquisition of parts and tools:

> *''I went on the internet, bought a new screen for £25 and fitted it myself. Fixed successfully''*

4.2.1.3 *Conducive environment*

Respondents indicated that they needed a conducive environment to carry out repair and store both written resources as well as tools and parts. One respondent mentioned the importance of having a clean space to repair:

> *''need to work in a dust free environment''*

The appropriateness of the home environment to engage with activities such as repair of small electrical items where other activities such as entertainment and self-care may take priority was questioned.

4.2.1.4 *Financial resources*

Respondents identified a lack of financial resources as a barrier to repair. The cost of repair, spare parts and tools may discourage respondents from fixing if they do not have the financial resources or have other competing economic priorities to attend to (i.e. paying bills). It was only in a few cases; the respondents indicated that they could not afford to replace the item and that drove them to repair it.

4.2.1.5 *Time*

Many respondents indicated a *''lack of time''* as a factor that discouraged them from repairing items. They did not specify why they did not have the time to engage with the repair. The assumption is that prosumers in full-time work may have less time to allocate to the repair of small electrical items. One respondent emphasised his status as a pensioner to explain that he had the time to try to repair items. The work status of the respondents may, in that regard, have some impacts on the extent to which they can allocate time to gather the assets for re-establishing the item function.

4.2.2 Consumer Factors

Environmental concerns, product retention tendency and safety concerns as additional factors were identified through the qualitative analysis.

4.2.2.1 *Environmental Concerns*

Through the quantitative analysis environmental concerns was not a significant factor influencing PRP. When analysing the survey thematically, it was identified that some respondents expressed their concern for the environment which motivated them to try to repair an item:

> *''I fear for the planet''*

Others regarded *''saving the environment''* as a benefit from trying to repair an item.

4.2.2.2 *Product Retention Tendency*

The tendency to retain an item did not correlate with PRP through the quantitative analysis. Through the qualitative study, the respondents were motivated to repair so they did not have to replace the item:

> *''I would far rather repair than buy another item''*

> *''By Repairing it, it means it does not need replacing.''*

Other factors related to product retention tendency were frugality traits as well as the tendency to care for an item (product care) which were important factors influencing PRP in the quantitative analysis.

4.2.2.3 *Safety Concerns*

Concern for safety was an additional consumer factor identified through the analysis. The lack of skills and knowledge in trying to repair may influence respondents to perceive more significant risks concerning their safety. Electrical items are also a type of product which bear many risks if they are not appropriately repaired (inc. body harm, fire risks, electrocution etc.). The perception of risks can also induce the respondents to reach out for help to try to repair an item, rather than fixing an object themselves:

> *''I would NEVER try to repair an electrical item. I would get someone else to do it.'''*

4.2.3 Social factors – Peer and Family Support

The support of peers and family falls under the social factors. The support might alleviate the lack of skills, knowledge and resources. Drawing on the support of others, respondents were able to assess whether the repair was possible, receive advice on how to carry the repair or give the item to

someone else who was better equipped to carry out the repair. Respondents would rely on others for help with their broken items:

'' [I'll] *speak to a friend with experience''*

'' [I'll] ask Steve (hubby) *to do it, he is much better at this than me''*

4.2.4 Market factors

The market factors included the lack of support from manufacturers and retailers and access and visibility of repair shops.

4.2.4.1 *Lack of support from manufacturers and retailers*

Through the quantitative analysis, it was found that the lack of trust in repair services correlated with PRP whereby the prosumer chose to repair by themselves because they do not trust repair shops. Through the qualitative analysis, a few respondents reported dissatisfaction with the services they received from manufacturers and retailers which probably fuelled their lack of trust. One respondent stated that the manufacturer was not compelled to help him with the repair he had. Another respondent indicated that he was annoyed by the retailer, who tried to make him pay for the repair services. One respondent did not have proof of purchase and, subsequently, the retailer was not interested in helping him. Manufacturers, retailers and repair shops can act as gatekeepers for the prosumer to access resources such as parts and information to repair the item. As seen in the previous section (see 5.2.1 Asset Factors), some respondents had difficulty in acquiring the spare parts.

4.2.4.2 *Access and visibility of repair shops*

Some respondents reported that the access to repair and retailing infrastructures influenced their repair and replacement decision. Some did not know where to find a repair shop and therefore decided not to repair the item. The lack of access to repair shops might encourage prosumers to favour the support of peers and family or to replace the item because searching for a suitable repair shop might be more inconvenient than purchasing an item online. In few cases as such, respondents indicated that it was easier to buy a new item online than to try to repair it:

''[Repair is] *too much hassle, buying a new one can simply be done just ordering it online''*

Few respondents appeared to favour repair over replacement because they lived a considerable distance from retailers.

''[I] *live in back of beyond, little choice if things break, let's repair it''*

4.2.5 Product & Services Factors

Product factors refers to those aspects of the product that may support or hinder the prosumer to try to repair it. Services were added as an aspect attached to the product which also influences the prosumer propensity to repair the item. The identified factors in this category includes:

- Perceived cost of repair and replacement and initial cost of the item
- Perceived reparability
- The age of the item
- Design features
- The relationship between attachment and the item

4.2.5.1 *Perceived cost of repair and replacement and initial cost of the item*

The perceived cost of repair and replacement did not correlate significantly with PRP in the quantitative analysis. It emerged as an important factor in the thematic analysis. The cost of repair relates to financial, time and effort expenditure, all of which influence the respondent's propensity to repair. The findings showed that economic considerations were the main criteria, for half of the respondents, in determining the degree to which repair is perceived more or less convenient than its alternatives - return, replacement, recycling.

On the one hand, repair saves money and that it is cheaper than replacement:

> *''[Repair is] much cheaper than buying a new one''*

> *''Repair saves money''*

However, for others, the cost of repair and replacement influenced the prosumer's decision to replace, recycle or return an item as opposed to repair. In the majority of cases, the respondents chose to replace because they assume that repair would be expensive:

> *''I presumed repair cost would outweigh the price of new one''*

One participant indicated that they chose to recycle because it is less costly:

> *''*[I recycled] *because it was cheaper than getting it repaired.''*

The warranty and returns guarantee services offered by retailers offer financial incentive to return and replace. One participant decided not to fix and returned an electric bathroom scale from John Lewis because it was still under guarantee. Respondents also chose not to repair because spare parts were too expensive to purchase:

> *''A new motherboard was the same price as a second-hand mac''*

> *''I knew the motor accounts for most of the cost of the hand blender and repair was not an option''*

The role of manufacturers and retailers in setting the initial cost value of the item might influence the perception of costs of repair and replacement considerably. The initial cost value of the item also influenced the respondents in their decision to opt for repair or disposal. The more expensive the item was, the more likely respondents tried to repair it. Contrastingly, the low cost of some items discouraged respondents from repairing the item:

> ''[the item] *was inexpensive (i.e. £15-20)''*

> ''[I did not repair it] *Because it only cost 8 quid in the first place''*

Some respondents were discouraged from repairing items because of the time it can take. It is typically faster to purchase a new item online or to throw it in a bin than trying to gather all the resources (inc. knowledge, tools, documentation) and then attempt to make the item functional again. It requires more effort on the part of the respondents to try to repair the item. It was only in a few cases that respondents perceived replacement to be more challenging to fixing. One participant indicated that setting up a new item to work can be more inconvenient than trying to repair:

> *''*[repair is] *much less hassle than setting up a new laptop''*

Another respondent said he *''hates the stress of shopping''* and that this was a motivation to try to repair an item. The replacement might involve many purchase decisions, such as choosing the item, comparing it against alternatives, travelling to a retail store, which might cause decision fatigue and the prosumer might perceive repair to be more convenient for those reasons.

4.2.5.2 *Perceived reparability*

Perception of the reparability of an item influenced respondents' decision to repair. In most cases, respondents anticipated that the item is fixable. A few considered the possibility to extend the product lifespan. Others considered the item as irreparable. In some cases, respondents used their knowledge and experience to assess the item's repairability:

> *''From experience I know that leaking kettles are rarely fixed successfully.''*

In other cases, respondents made assumptions on the item's repairability. As such, one respondent did not repair an item because he *''did not know if it could be repaired''*. The use of the word *'could'* indicates possibility but not a certainty.

A few respondents dismantled items to verify if they could attempt the repair. Through reviewing the findings on perceived reparability, questions emerged on the extent to which manufacturers and retailers, peers and family may also influence the respondents' perception of the item repairability. The retailers and manufacturers generally do not promote reparability features, and peer and family may not have the knowledge or experience to try to repair items.

4.2.5.3 *Age of the item*

The age of the item was an element that the respondents used to evaluate the item's value. The older the object was, the more likely the respondents would replace it. The older the item was, the less concerned respondents felt about failing to repair and subsequently disposing of it. For example, one respondent reported:

> *''I would not be unhappy [by failing to repair it], since the [toaster] was old enough and has aged enough to be thrown away.''*

One participant indicated that the age of the item made him presume that the cost of repair would be unreasonable, and this discouraged him from repairing it.

In a few cases, the newness of the item influenced prosumers to replace the item rather than repairing it. Respondents returned articles to retailers because they were recently purchased and met return criteria. Whether consciously or not, this allowed respondents to defer the responsibility of handling the item to retailers:

> *''[I did not repair it] because the product did not function as described, and it was very recently purchased''*

4.2.5.4 *Design features*

Through the analysis, there were some indications that the design features of the item hindered the attempt to repair. The responses from the respondents illustrated how design decisions such as the use of sealed components, can discourage an individual from repair:

> *''I could not repair a sealed in switch unit''*

There were no findings related to the loss of aesthetic features through the repair. The emphasis was on the access to parts inside the item.

One respondent indicated that the design increases the cost of repair. He did not mention why and how the design may increase the cost:

> *''It would not be possible to repair in a cost-effective manner due to the way it has been manufactured''*

It might be related to the tools and skills necessary for opening and reassembling the item.

4.2.5.5 *Relationship between attachment and repair of the item*

Through the quantitative analysis, the relationship between attachment and repair correlated positively with PRP (Table 4-2). Through the qualitative analysis, the change of status of the item from working to broken created some dissonance in the respondents who became either motivated or discouraged to repair. An identified form of attachment on the part of the respondent was the item's initial status. As such, some respondents disliked the association of the item with the term ''waste''. It created dissonance with most respondents as they expressed alongside it their environmental concerns as to why they prefer to repair an item:

> *''I hate waste and fear for the planet*

In a few cases, respondents used demeaning terms to describe the item. The use of negative terms was a means of redefining the purpose of the item from useful to valueless and detaching oneself from it. It aids justifying disposal. In one case, the item was associated with 'waste' to dissuade the respondent from repairing it:

> *''it was a hunk of junk when I bought it - ugly and unreliable''*

Few respondents indicated that they *''no longer need''* the item, that it was of *''no purpose''*, *''non-important''* or *''not essential''* which devalued the item. Many items are purchased to fulfil a need at a particular point in time. Once there is the satisfaction of the need, the item can become irrelevant to the person. The findings highlight how the item's change of purpose influences how the prosumer defines their attachment to it. The attachment to the item's embedded data could influence PRP either positively or negatively. In two cases as such, data stored within an object affected whether the respondent chose to repair or not repair their device. On the one hand, the data held on the computer in question encouraged the respondent to fix it. On the other, the lack of trust in a third party to deal with sensitive data on a device discouraged repair:

> *''I was not happy about someone I didn't know repairing it as it had sensitive data on it (research data, stored passwords etc.)''*

Although negligible, it is essential to consider how the rise of embedded electronics and data storage would affect the prosumer in their decision to extend their product lifespan and how repair shops would try to achieve credibility in dealing with their precious information.

4.2.6 Repair outcomes

The thematic analysis did not identify that respondents had greater care of the item as a result of trying to repair the item or considered acquiring a premium or repairable item as a result of their

experience. However, it identified the acquisition of skills and knowledge as an outcome of repair. This is expanded upon in section 5.3.2.1.

4.3 Attitudes towards trying to repair

Attitudes towards trying to repair concern the act of repair as opposed to the fixed object. Within the concept as reviewed in Chapter 2, there are three acts/attitudes:

- Trying and succeeding
- Trying and failing
- Process of Striving

Trying and succeeding and Trying and failing both relate to the anticipation of outcome, whereas the process of striving is about assessing the experienced pleasures and pains in pursuing a goal. The following section presents the findings resulting from the thematic analysis.

4.3.1 Attitudes towards trying and succeeding to repair

Trying and succeeding to repair an item generated positive attitudes from a significant number of respondents. Predominantly, respondents expected to experience happiness and pride from their success. Many respondents also anticipated that the item was going to *''be fixed''* and that they would keep using the item. Respondents also considered some of the benefits from succeeding to repair including *''saving money''* and protecting the environment. Some respondents reflected that succeeding in repair encouraged them to ''*try to repair more items.''* Recent successes might encourage prosumers to try to repair again as they have a more positive attitude towards trying to repair. Some respondents indicated that in the event where they succeed to repair they will *''tell people''*. In some cases, it was a means of inspiring people as much as to strengthen a sense of achievement:

> *''I'll be delighted and show off, trying to inspire others!''*

One respondent documented and published his success online. The publication might be an evidence that the respondent attempted and achieved the repair. It might also be a means of increasing confidence in skills as much as helping others to repair:

> '' [If I try and succeed to repair] *I would document it and publish it online when I have the chance, along with my other documented repairs!''*

In a few cases, the fear that the item is unsafe weakened positive attitudes towards trying and succeeding:

> ''[If I try and succeed to repair, I'll] *be pleased but still wary about electrocution''*

There were concerns that the item was going to *''probably break again''*. Some respondents paid more attention to the newly repaired item. It might be a means to extend the product's lifespan as much as the need to extend their sense of achievement they experienced in the first place:

> ''[If I try and succeed to repair, I'll] *look after it carefully, so that it doesn't break again too soon''.*

On the other hand, negative attitudes towards trying and succeeding were reported by many respondents. They did not believe that they would succeed in repairing the item when asked and indicated that:

''[If I try to repair, it will] *be a miracle if it ever worked again''*

'' [If I try to repair, it will] *probably still be broken''*

'' [If I try to repair, it will] *probably not work''*

The negative attitudes towards trying and succeeding to repair may be related to not having the skills and knowledge.

In summary, the attitudes towards trying and succeeding to repair are overall positive with recognised yield benefits such as saving money and protecting the environment. It encourages prosumers to repeat the repair behaviour and engage others in repair activities. Safety concerns, concern that the item may break again and the lack of skills and knowledge influence negative attitudes towards trying to repair.

4.3.2 Attitudes towards trying and failing

Trying and failing to repair generated negative emotions for a large proportion of the respondents. These emotions included frustration, annoyance, disappointment, anger and sadness. In some cases, respondents blamed themselves for the failure of the attempted repair. In other cases, respondents directed their anger and frustration towards the item or the manufacturer. In a few cases, respondents were frustrated because they had to purchase a new item:

'' [if I try and fail, I will be] *frustrated that I have to buy a new one''*

In a few cases, respondents indicated feelings of satisfaction with their attempt to repair even though they failed:

'' [If I try and fail to repair], *I would feel better knowing I had at least tried''*

In another few cases, respondents had neutral responses towards failing to repair:

''[If I try and fail to repair, it will], *not be the end of the world*

''[If I try and fail to repair, it will be] *no problem''*

The respondents appeared to not have a strong attachment on the outcome.

In summary, the attitudes towards trying and failing are overall negative and can be directed either to oneself, to the manufacturers, or to other actions needed to replace the item. In a few cases, some feelings of satisfaction can still be yielded mainly when the respondents focus on the process as opposed to the outcome. Neutral responses to failing to repair may indicate less attachment to the issue.

4.3.3 Attitudes towards the process of trying to repair

For the attitudes towards the process, respondents managed emotions such as frustration, fear and anger to carry through the repair:

> ''[I was] *worried, anxious* [during the repair]''

> ''[I was] *frustrated that it wasn't as easy as it could have been''*

Some respondents appeared more self-controlled throughout the process of repair accepting the ups and downs of the activity which might relate their level of skills and experience in trying to repair items:

> '' *mixed - enjoyable challenge with moments of frustration''*

> '' *up and down. Find a problem (down) but find a novel way to get past it (up).''*

> '' *frustrated but hopeful by turns''*

In summary, the attitudes toward the process of trying to repair rely on the prosumer ability to acknowledge and deal with the emotions that emerge through the interaction with the item and to carry through the process even though they might experience quite negative emotions.

Having reviewed the various attitudes towards trying to repair, the following section explores the different phases of the repair process and considers how the factors influencing PRP and the attitudes towards trying to repair relate to each stage of the repair process.

4.4 The Repair Process

The repair process emerged through the analysis of the survey with four main stages:

- Stage 1 – **Decision**. It includes all the activities where the individuals assess whether the repair can be carried out or not.
- Stage 2 – **Preparation**. It includes the gathering of knowledge and resources necessary to carry out the repair.
- Stage 3 – **Repair**. It incorporates all the activities necessary to re-establish the item's functionality
- Stage 4 - **Post-repair.** It is the assessment of the repair outcome and associated effects from the evaluation.

In parallel to those stages, there are Non-repair alternatives as outliers, explored further in section 4.5. The following figure presents the repair process:

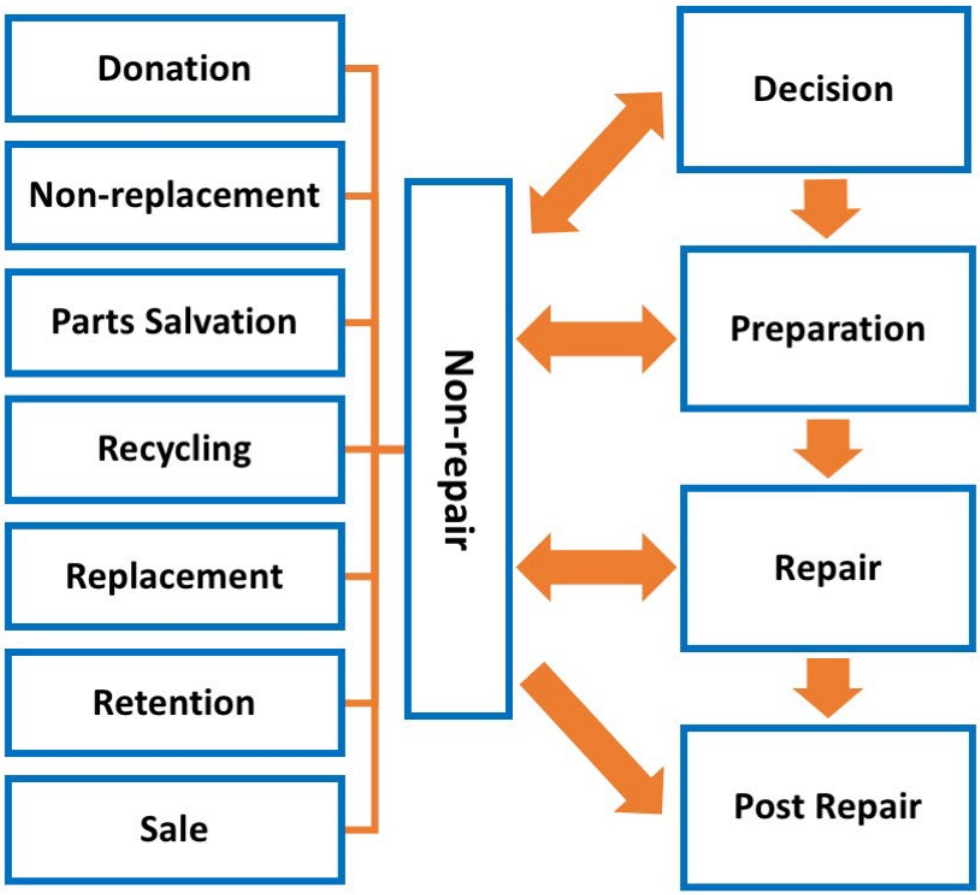


Figure 4-1 - Repair Process

The following sections expand on the relationship of the phases with the described factors influencing PRP and attitudes towards trying to repair.

4.4.1 Stage 1 - Decision

The decision stage includes the activities where the individuals assess whether the repair can occur or not. The respondents anticipated, during this phase, outcomes, benefits, assessed trade-offs and perceived risks related to the attempt to repair. In the decision phase, the factors supporting and hindering repair include predominantly 'Product' and Services' factors where the cost of repair may be too high to repair, the characteristics of the item such as initial value, age and design may discourage the respondents from repairing. The 'Assets Factors' whereby the prosumer has the skills, knowledge, tools, time to repair also influenced their decision. It also included factors related to 'consumer' traits including concerns for safety, environmental concerns and product retention tendency. The respondents also used past experiences and their attitudes towards repair to help them decide to pursue the repair. In the decision phase, the respondents can choose alternative to repair including retention, recycling and replacement.

4.4.2 Stage 2 – Preparation

The preparation stage includes the gathering of knowledge and resources necessary to carry out the repair. The prosumer draws on their 'assets' including their skills and knowledge as well as the resources they have and gather tools, parts, documentation, financial resources, time, conducive

environment in order to repair the object. The lack of access to spare parts or documentation to repair because of the lack of support of actors within the market from retailers, manufacturers and repair shops can discourage the prosumer to pursue the repair, worsen their attitudes towards repair as it may be considered too difficult compared to alternatives such as replacing an item online or putting the repair of the item on hold until they have gathered all the necessary resources. They also can turn to the support of peers and family or a professional repairer to try to repair the item.

4.4.3 Phase 3 – Repair phase

The repair stage incorporates all the activities necessary to re-establish the item's functionality. It is where the gathered assets are applied. The repair activities are likely to be different for different items. For small electrical items, respondents engaged predominantly in the following activities:

- Disassembly of the item to help assess whether the item can be repaired, to access specific parts and/or to figure how the item works
- Removal and replacement of parts
- Reassembly

Other activities were mentioned such as soldering, cleaning and descaling, oiling and handling software data.

Some respondents engaged in *''quick repair''* which refers to temporary solutions to mend the item using Sellotape and glue. The prosumer may choose to do some quick repair because of their level of skills and knowledge.

Occasionally, respondents also improved the item. The improvement suggests some innovativeness in the respondents and a higher level of skills and knowledge

The most mentioned repair activities were the manipulation of parts and components. Respondents ordered, replaced, made or modified the parts depending on their experience and abilities.

The repair stage also includes checking if the item is safe to use. A few respondents checked the internet to ensure that the item was safe to use:

> *''I look up on the Internet how to do so to make sure it is still safe to use''*

One respondent used a PAT tester to find out if the item was safe:

> ''*I PAT tested afterwards''*

The use of the PAT tester suggested that the individual was of higher PRP because of the training requirement to become a qualified PAT tester and the potential expense being made to acquire a PAT tester.

During this stage, some respondents chose not to engage with the item and sought services from third parties instead.

4.4.4 Stage 4 – Post-repair

The post-repair stage is the assessment of the repair outcome. It relates to the decision phase as the prosumer uses their experience to make future decisions about repair attempts. The evaluation

contributes to the formation of attitudes towards trying to repair and towards success and failure and influences behaviour.

Some respondents told their peers about their success. One respondent chose to record and document the success of his repair:

> *''I would document it and publish it online when I have the chance, along with my other documented repairs!''*

If they failed to repair, they engaged in non-repair behaviour described in the following section.

4.5 Non-repair alternatives as outliers

The non-repair alternatives run in parallel to the repair process' four stages because, at any stage, the prosumer can decide to stop the attempt and choose instead to engage in an alternative course of action. They act as outliers and include product retention, recycling, replacement, sale, donation, return and non-replacement of the item.

The following section expands on findings related to the non-repair alternatives considering the thematic analysis and analysis of the courses of action taken by the respondents in the last five years on EEE.

4.5.1 Product retention

Product retention was the main course of action mentioned by respondents who failed to repair followed by replacement and recycling through the thematic analysis (See Figure 4-2 - Non-repair courses of action (QUAL) (%)

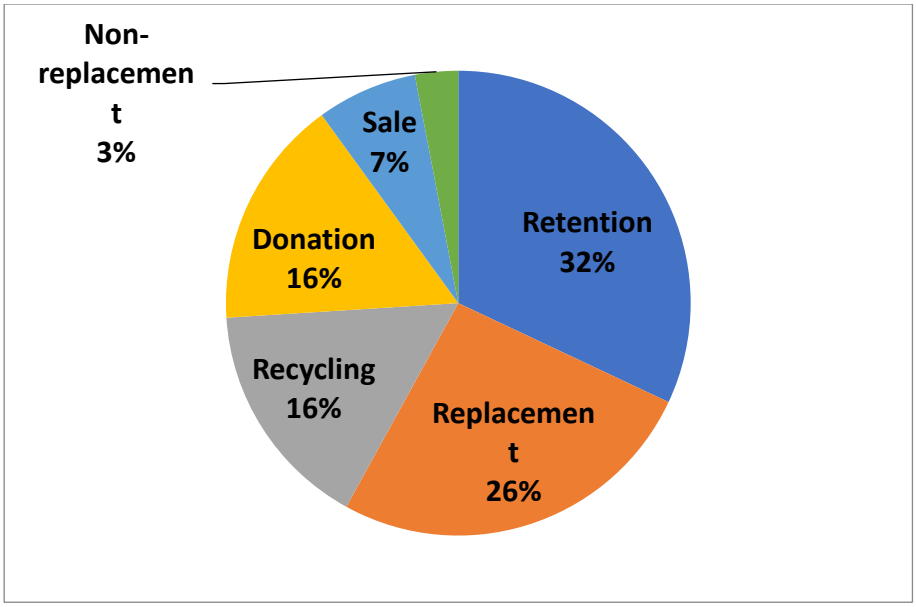


Figure 4-2 - Non-repair courses of action (QUAL) (%)

Many respondents indicated that they were going to try to get help from their peers and as a result retained the item.

Many other respondents indicated that they were to retained the item in the hope that they would repair it in the future:

''[I'll] *probably hold onto it in the hope of eventually fixing it''*

Only a few expressed the clear intention to repair it. One response highlighted a specific place where the item will be repaired:

''[it will] *go on a shelf and wait for a time to do it at Leicester Hackspace''*

Access to a conducive space to repair may support the retention of the item until the repair can occur. The thematic analysis identified a conducive environment as an supportive asset.

In other cases, respondents were to acquire the knowledge needed in order to make another attempt:

''[I'll] *get more knowledge and then fix it''*

Most respondents appeared inclined to retain the item for some of the cited above reasons, so they can gather the necessary assets to pursue the repair. It relates in turn with the preparation phase of the repair process. The acquisition of knowledge is a means to get the appropriate skills and abilities to apply to the repair process. However, if they do not engage with this process of acquisition of skills and any other capital, the item is most likely to be replaced or recycled. The analysis of the course of actions taken in the last five years showed the discrepancy between the thematic analysis and the actual behaviour of the respondents (See Figure 4-3 - Non-repair courses of action (QUAN) (%). Recycling and replacement followed by retention were the main course of action taken in the last five years.

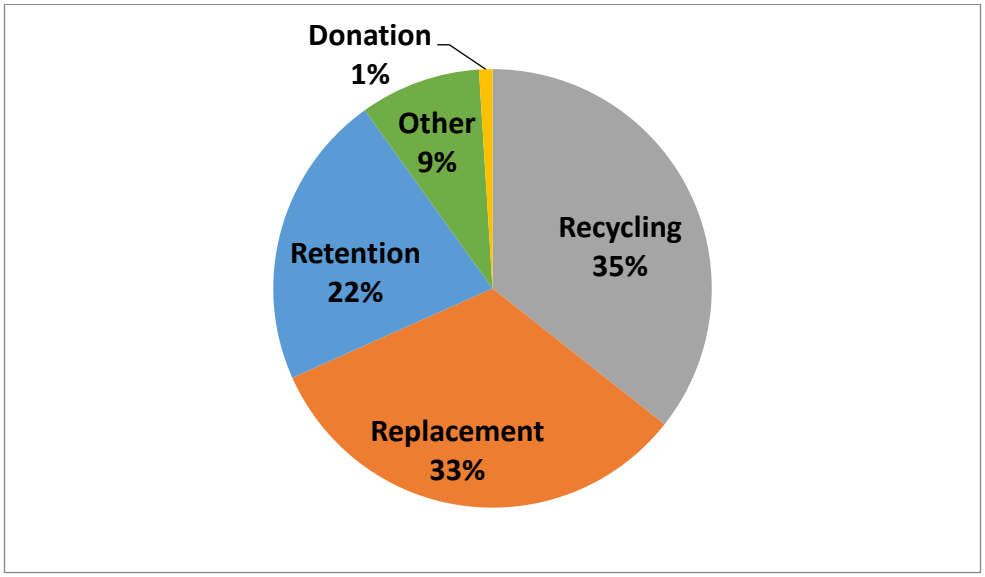


Figure 4-3 - Non-repair courses of action (QUAN) (%)

The discrepancy between attitudes and actual behaviour can be influenced by the range and combination of factors influencing PRP described within this chapter and the literature review. In this chapter, respondents displayed product retention tendency. They also expressed the intention to repair the item in the future. However, the attachment to the item can either lessen as the respondents interact less with the item and ultimately the respondents choose to dispose of or replace the broken item. Or, after retaining the item, they found no satisfactory solution to re-establish the item and had to dispose of it.

Through the analysis, the tendency to retain an item related to the respondent's intention to express their creativity and innovativeness. Hence, some respondents chose to upcycle to use it for other purposes or downcycle to *''use for spare''.*

Others chose to scavenge the parts to use for future repair. This type of behaviour suggests some innovativeness traits from the respondents. By retaining and repurposing the items, respondents were taking the opportunity to consider creative means that avoid disposal.

In a few cases, respondents chose to retain the item because of the reluctance of creating waste:

> "[I] *kept it because hate throwing things away but don't know how to fix it".*
>
> *"I have kept it, reluctant to throw it out"*

It remains that product replacement, recycling and disposal are the main course of action taken when the item breaks.

4.5.2 Disposal through Product replacement, recycling, return, donation and sale

The analysis of the course of action taken in the last 5 year shown that recycling and replacement are the main course of action that were taken by respondents. Through the thematic analysis, the best intention to retain items tends to be overridden by the need to dispose and replace as discussed in the previous section.

One respondent's answer highlighted the extent to which replacement prevailed as the favourite option. The respondent chose to acquire a new item before investigating how to deal with the broken object:

> *''I end up acquiring replacements before dealing with the original broken thing''*

It suggests that some prosumers may experience a sense of urgency to have a functional item and as such the repair of the item is not a priority. It also shows how prevailing replacement is as an easier process to engage in supported by retailers, manufacturers and social settings.

Through the analysis of the factors influencing PRP, the cost of repair and replacement influenced the prosumer's decision to replace and recycle as seen in section 4.2.5.1.

Return was also chosen because warranty and returns guarantee services offered by retailers are financial incentives to replace as opposed to repair. The warranty is a feature of the item that eases the decision to not repair the item during the decision phase as the respondent recognises that there is an already available process to engage with in order to deal with the item.

A negligible number of respondents chose to donate the item or sell it. The preference for donation or sale might be to extend product lifespan, reap some perceived value (profit, enjoyment or recognition for donation) and lessen guilt for disposal of the item:

> ''[I'll] *give it to charity shop to send for recycling as they can get money even from the brass pins on the plug''*
>
> *''I sold it for spares and repairs on eBay''*

It displaces the responsibility for the item to the receiver individual or organisation to deal with the broken item.

4.5.3 Non-replacement

In a small number of cases, respondents chose not to replace the item and *''try to live without it''*. Some items might not create the same sense of urgency and pressure to replace and repair.

4.6 Conclusions and Integrations

The Survey study provided valuable insights into the factors influencing PRP, attitudes towards trying to repair and the process by which prosumers engage with the repair activity.

Regarding the results, the most significant factors were innovativeness and frugality in the quantitative analysis. The qualitative analysis identified the cost of repair as a significant factor influencing repair propensity.

Safety concerns is an additional consumer factor that can hinder the decision to repair and can weaken attitudes towards succeeding to repair. The concern for safety can also support the prosumer to ensure that the item is safe to use during the repair stage.

Assets and Social Factors are two additional categories. The assets are the necessary resources gathered and applied by the prosumer to restore the item. Retailers and manufacturers can play a role in limiting access to those assets which can hinder the prosumer from repairing. The lack of skills and knowledge can discourage repair. The work status of the prosumer also affects the extent to which time is available to engage with the activity.

Not having the skills to repair does not stop the prosumer from fixing. Social factors are essential to support the prosumer to gather resources as well as help fixing. When succeeding to repair, the respondents also share with family and peers their achievement. The lack of trust in repair shops is a significant factor in the quantitative analysis, and the result may explain why the prosumer might choose to turn towards peers and family for support.

Product and Service factors affect the prosumer throughout the repair process apart from the post-repair phase. There is a relationship between the level of skills and knowledge of the prosumer and their perception of repairability. The role of manufacturers and retailers as well as peers and family may also have a role influencing the prosumer perception.

Regarding the attitudes towards trying to repair, respondents with positive attitudes towards the process of striving appeared to manage better the various emotions experienced during the repair process. Respondents with positive attitudes towards failing were able to identify the benefits of acquiring repair skills as an outcome of repair.

The central limitation of the survey relates to the lack of depth in insight from the qualitative analysis on the elements influencing PRP. Further investigation needs to identify whether innovativeness traits support the prosumer in other stages of the repair process and what are the elements that fosters innovativeness traits in a prosumer. Environmental concerns did not correlate positively with PRP in the quantitative analysis. In the qualitative analysis, the respondents expressed their dislike of waste and its impact on the environment. Through the literature, it was identified that the reasons to engage with pro-environmental behaviour are complex and are not limited to higher level of environmental concerns but come as a result of a complex combination of factors (Kollmus & Agyeman, 2002). The literature also highlights the relationship between frugality and environmental concerns in encouraging the maintenance and repair of items (Haws et al, 2012). There is, therefore, a need to understand further the relationship between frugality traits and

environmental concerns to determine more accurately what are the complex reasons affecting prosumers with pro-environmental inclinations to repair. Those considerations encourage further investigation of prosumer with pro-environmental inclination repair propensity through in-depth interviews and engagement. Further clarification on the role of peers and family, manufacturers and retailers as well as repair shops at different stages of the repair process may also provide an understanding as to why the prosumer chooses to turn towards peers and family as opposed to other actors. Finally, there is a need to investigate the prosumer repair process and how the prosumer relates to the broken item.

The main outputs from the study are two conceptual frameworks which resulted from the integration of the findings. Figure 4-4 provides an extended view of the conceptual framework developed through the study with the most significant factors identified through the quantitative analysis. The research supported the development of an initial repair process that presents the influence of the factors and the attitudes towards trying affect at each stage of the repair process (Figure 4-5).

The following chapter attempts to address some of the identified gaps, answer further the research questions and augment the two conceptual frameworks with further insights.

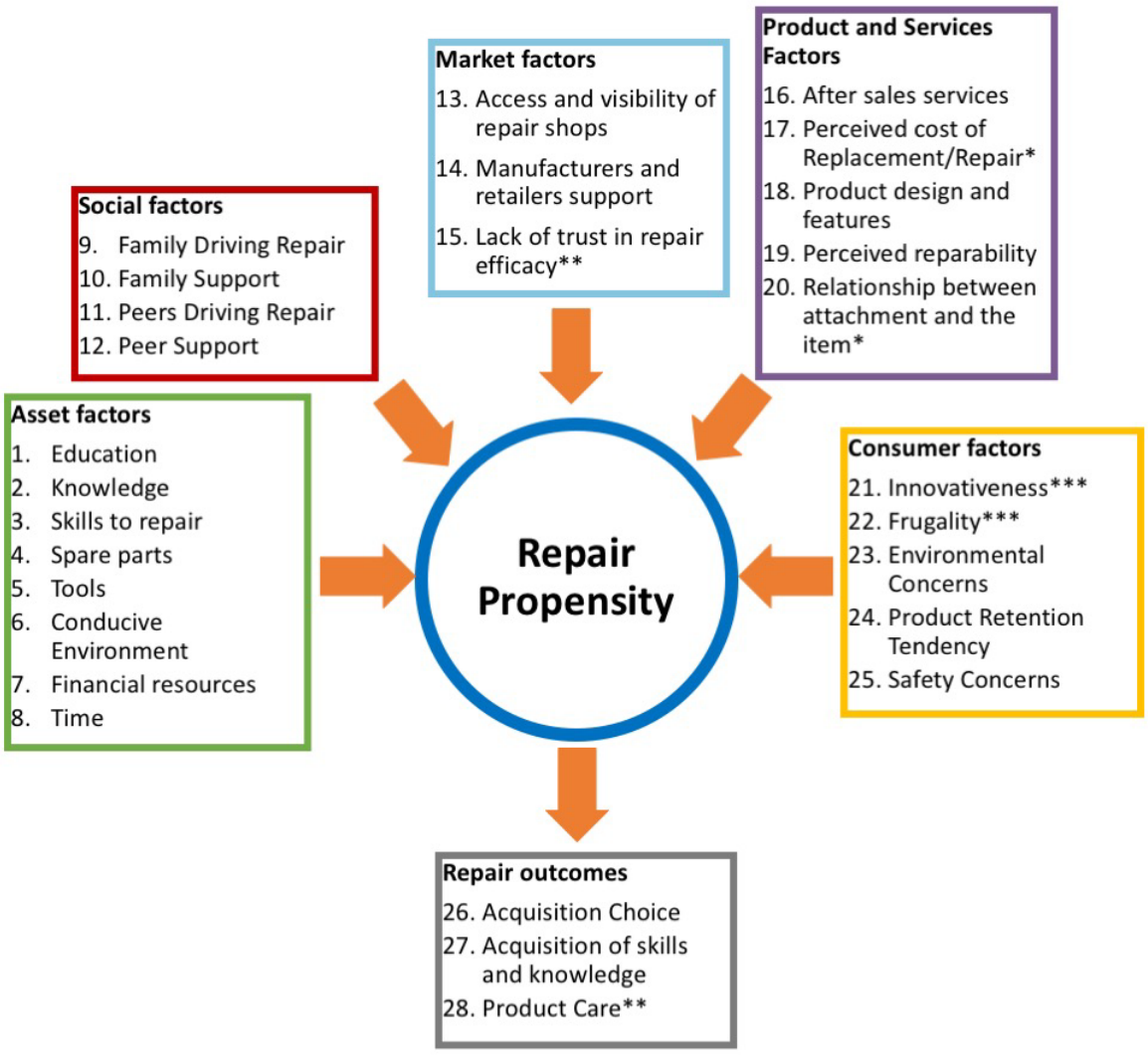


Figure 4-4 - Conceptual Framework on PRP

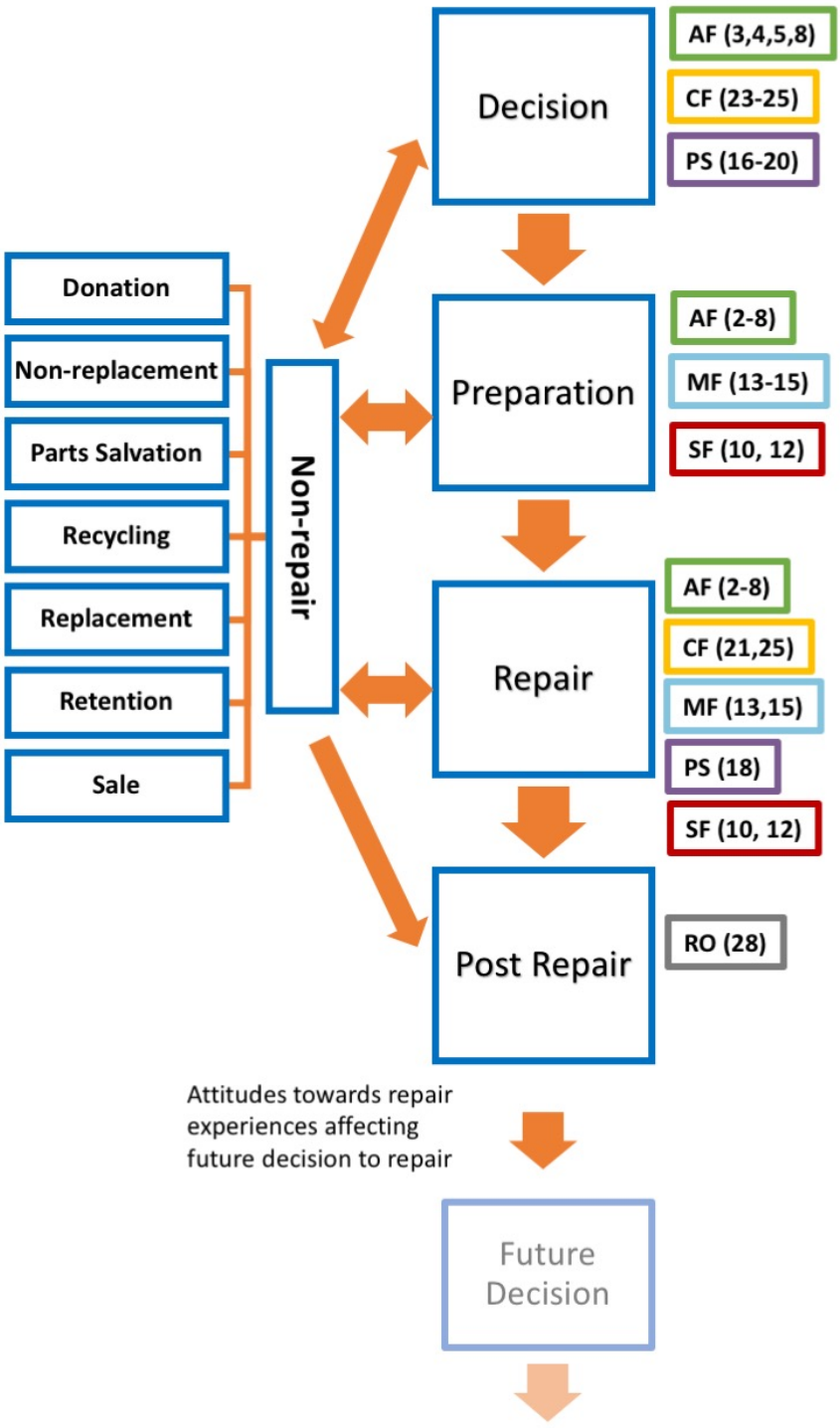


Figure 4-5 - Repair Process with factors influencing PRP and attitudes towards trying to repair

CHAPTER 5: PROSUMER STUDY FINDINGS

This chapter presents the results from the analysis of the contemplation ladders, the in-depth interviews and the video elicitation exercises with 10 prosumers with pro-environmental inclinations. The Prosumer study, as described in the Methodology (see Chapter 2), was designed to addressed the research questions outlined in Table 3-2.

The chapter begins by presenting the results on the factors influencing PRP. It continues with the findings on the attitudes towards trying to repair. The chapter presents a repair process model with consideration of the influence of the factors and attitudes at different stages of the repair process.

5.1 Factors influencing PRP

The findings on the factors provided further insights on each category of factors outlined in Chapter 4. The report on the results begins with an understanding of the influence of the Social Factors on the prosumer repair behaviour. It then expands on some of the significant Asset factors. The report continues with the Market factors and introduces Community repair as an additional factor supporting the prosumer. The findings on the Products & Services and Consumer Factors follow. Through the results, there are, in bracket, examples of items that participants tried to repair and for which a repair process was drawn (see Appendix O – Sample of Coded Repair Processes for sample).

5.2 Social Factors

The following sections provide insights into the significance of Social factors in supporting the prosumer to engage with a repair. First, it examined the role of the family; then of peers.

5.2.1 The role of the family in influencing the repair of items

The following sections present the results from the analysis of the role of the family in influencing the repair of items. It shows how the family's organisation and the way it instructs and socialises their members to participate in the running of the household (i.e. children and parents) support the take-up of repair. It also presents some of the generational differences that exist between members of the same family.

5.2.1.1 *Nuclear Family nurturing repair in male partners and children*

Most participants were or had lived in a nuclear type of family arrangement with children. Some participants had grown children who left the nuclear household (RB05A, JB09A). One participant ran at first a patrifocal home with no mother nurturing the children and was now living within a shared house with one of his grown-up child (TB01E). FW03C lived with her extended family when she was a child. She then moved out and was raised by her mother exclusively.

The most common characteristics in participants' nuclear families were the division of tasks between male and female members and the process by which children and male counterparts were nurtured to engage with the repair. For the division of tasks, they were divided by gender role. Men repaired electrical and mechanical items while women mended and sewed clothes:

> *''If it has to do with the bike, it is my husband* […]. *If it is anything to do with the mending of clothes. Then I would do that. If it is the rabbit hutch need to be put back together, my husband will do. If it has to do with hammer and nails my husband will do it. If it has to do with needles and cotton I will do it.''* [SW04A]

''I do the clothes mending and my husband does electrical things and it is quite gender stereotyped.'' [RB05A]

The gendered division of tasks meant that male counterparts were often encouraged by female family members to repair around the home. By asking their husband, father or male partners to repair, the female participants nurtured them to develop their skills and abilities further and make them accept their role as the repairer of the family unit. As such, the male participants with high PRP repeatedly described through the interviews how their wife and children turn to them when an item is broken to find a solution:

''My wife said to me this is not working, can you look at it and I'll go down, have a look at it and see what is wrong.'' [JB09A] (JB09A - Disclights)

''The kids often break things. My wife too and they are given to me because I suppose that something I do. If something broke and Sam looks at me to fix them''. [WK07A]

All female interviewees had low PRP and turned to their male family members because they knew they had neither the education or the experience in dealing with electrical items. The main consequence for relying on their male counterparts is that they did not develop the skills to repair. HW01D always relied on her father for the repair of items and did not as a result develop the skills to repair items by herself (HW01D – Mobile Phone):

''I have never tried to do the electrical stuff because I will always give that to my Dad.'' [HW01D]

RB05A relied on her husband because he was an engineer by trade and had more skills and abilities as well as ingenuity to find a solution to a problem. He helped her in repairing her liquidiser and headphones (RB05A – Liquidiser, RB05A - Headphones). DMT06A explained that she asked her husband for help when she is unable to repair an item because he has greater skills and experience. She asked for his support in trying to repair her e-reader and headlamp (DMT06A – E-reader, DMT06A - Headlamp):

''if I can't, I'll take it straight to M and see if he can fix it. […] because M is quite practical, experienced in electronics, circuit board. It was his job for a while, so he is good at those sorts of things.'' [DMT06A]

The division of tasks between male and female in the household might have an impact on the socialisation of children in participating in day-to-day activities. The witnessed exchange and delegation of repair tasks between members may inform children about the gender role they shall embrace. Apart from seeing the family dynamic, children are told by their parents the ways of being and behaving in the household. SW04A defined trying to repair as a guiding principle within her home and that her children are aware of it:

''Because of our ethos we know that things if they're broken, they are not automatically being thrown away. Everything that can be fixed is fixed. The children know that.'' [SW04A]

Children are also invited to participate and learn to repair. Parents chose to delegate repair tasks to children so that it will contribute to their development. JC06A explained how she gave to her children, her son and daughter, the responsibility to fix the cable for the television for it to work.

SW04A explained that her children are learning to repair a bicycle. Her husband is the primary person responsible for maintaining the bikes, so he is most probably the one instructing her sons to repair:

> *''They were getting at an age, where we thought you can do it yourself. I think it is good to give them, to find activity when they are getting bored or if they really wanted something enough that they will find a way to do it and if you help them too much''.* [JC06A]

> *"The boys are learning that things like to fix their bike with help. They know if something is broken, it will be mended if possible gluing whatever way.''* [SW04A]

As children acquire more and more skills to repair items, parents may give more responsibilities in maintaining the home. One participant with high PRP explained how his mother asked him, when he was a teenager, for advice on safety risks related to a cable extension because he was more used to repairing items:

> *''I remember coming home when I was 14 or 15 years old and my mother she has been trying to extend the cable on an electric table lamp and when I got home, she asked me is there a problem if the cable is touching the red and the black one. I wondered that because I tried to extend the cable and I heard a big bang and all the fuses went out in the house. I said Mum you are lucky you did not electrocute yourself. I knew there was a problem with that.''* [TB01E]

Parents can nurture interests in the activity of repair by supplying their children with tools or items so that they can develop their repair skills. WK07A narrated how his father provided him with broken objects to dismantle:

> *''I used to deconstruct things. My Dad used to ask for bits of broken things so I could just take them apart.''* [WK07A]

Finally, parents act as role model. JB09A, one of the participants with higher PRP has two sons who are now engineers. He explained that they used to watch him repair for people in his community. RB05A who has sewing skills used to watch her mother mending clothes as she grew up. Her mother acted as a role model for her to acquire mending skills:

> *''my mother was repairing things I'll watch her and see what to do. I've learnt to darn even though I was not taught how to do it. I watched her doing it''* [RB05A]

Most of the examples provided concerning the repair of items highlighted the role of women in asking and delegating repair tasks to their children and to men to participate in the instruction of children for electrical and mechanical items. The examples appear to portray a traditional nuclear family where the members align with the demand of the different figures of authority within the household. However, differences of values placed on repair exist between the members of the same family because children do not always agree with the ethos of preserving and maintaining items as presented in more details in the following section.

5.2.1.2 *Generational differences*

The family is the principal institution for the socialisation of children (Freeman & Showel, 1953). Through the family institution, knowledge, know-how and values are being passed on from generation to generation on how to best deal with the challenges that emerge in a particular

context. The tales and experiences of their ancestors help the children to define their social identity and the behaviours that are deemed appropriate to support their survival in the context in which they live.

Repair and the reuse of items were significant behaviours to embrace in a time of conflict and war. The Make and Mend movement during the Second World War (WW2) forced families to become resourceful and skilled. Even though most participants did not experience the War, they reflected upon the same memories of their ancestors or parents suffering trauma and dealing with the difficulties of day-to-day life by being ingenious and creative with their resources during war times. The memories inspired them to repair and reuse items. WK07A mentioned his grandmother who lived during WW2 to explain his inclination to repair. TB01E highlighted how he was raised to not dispose of items unnecessarily because it was his family's ethos who grew up during warfare:

> *''Some of it may have come from almost passed down from wartime where resources were really scarce. The classic phrases from Grandma 'where there is muck there is brass' or 'one-man trash is another man gold'. …People wore old jumpers and mended them. They were that reuse of resources.''* [WK07A]

> *''My parents grew up during the WW2 at a time of rationing at a time of shortage I grew up in a family where you do not throw anything away unless you absolutely have to. You reuse stuff.''* [TB01E]

Holding onto repair and reuse behaviour to ensure one's survival appears illogical in a context where there is no immediate threat to the participants. Differences between generations about their beliefs, values, and opinions exist in part because the context in which each generation lives is different. WK07A who embrace repair was inspired by his grandmother to preserve and maintain items. He recognises that his parents did not adopt the same values as his grandparents because they were born after the WW2 in an environment that promotes consumerism:

> *''Grandparents are the ones who repaired. My parents are quite wasteful and my grandparents quite practical. My grandparents were more focused on repair and reuse than my parents are. They were exposed to the war and they did not have a lot of stuff. Perhaps it is just in my head. The growth of consumerist society and it is recent. My grandparents did not have all that, they had basic things, not many electricals''.* [WK07A]

FW03C lived at her grandfather's home. A place where fixing was the household's central practice. She highlighted how the value placed upon repair shifted when she moved out with her mother. When a plate broke in her new home, her mother rejected the idea of repairing it like her father and felt relieved not to have to deal with fixing the broken item She threw the plate away:

> *''When my mother got the time to be living on her own. I remember we were around there and she dropped a kitchen plate and I said ''Oh dear, we better get the bits and try to put it back together again''. She said ''No! We are going to put it in the dustbin''. We took it outside and put it in the dustbin and said ''We are not going to repair it'' and laughing and clapping it was so liberating to do that.''* [FW03C]

The traditional division of tasks between men and women can also be rejected by children who may feel that through work and consumption they can free themselves from maintaining and preserving their environment. DMT06A, as such highlighted how her mother tried to encourage her to garden,

cook and do activities within the home. Her mother ultimately gave up convincing her to participate as her daughter did not express any interests in the activities:

> *''my Mum did not force me to do this thing which is fair because I would have rebelled more if she forced me and I did not show an interest in it.''* [DMT06A]

The idea to engage with a sustainable lifestyle to combat the risks of climate change may also be rejected by members of the family who may disagree with what the lifestyle entails such as reducing consumption. Some participants experienced difficulties with some of their children who dislike the idea of their family embracing a sustainable lifestyle:

> *''Anything outside the mainstream people kind of think it is a bit weird particularly having teenagers, they have a very narrow way of thinking what is normal, and they tolerate, and nobody else's parents do […]. My daughter is more like ''I'll just buy what I want/ She said that now she is 14 that because she perceives that we have less neat things, she like the idea of the new shiny things''* [JC06A]

> *'' My middle child he is a bit of a monkey, he actually if he was given his own way, he actually had everything brand new for him and it would be the latest fashion and you know if money was no object, but he knows it is not what we do. He does not like it. He does not like the fact that he has second hand uniform''* [SW04A]

In summary, the family's organisation and history impact on children socialisation and their introduction to the repair activity. Differences exist between generation as conflicting ideas on the way one should lead his life is influenced by the context in which they live.

5.2.2 The role of peers in supporting or hindering repair behaviours

The following sections present the findings of the role of peers in influencing the take-up of repair activities. It begins by introducing the results on the support and normative influence of environmentally inclined groups. It also presents the perception of interviewees of non-supportive group. Finally, it presents how individuals with high PRP support their direct community to repair.

5.2.2.1 *Support and normative influence from environmentally inclined peer groups*

Most participants highlighted peer groups with an inclination to preserve and protect the environment as supportive of repair. The shared environmental concerns may aid the participants to identify who in their community may be more likely to help them repair a broken item. SW04A identified Footpaths Leicester, the carbon reduction programme which organised the Green Festival of Making and Mending as a supportive community. She was more likely to ask them for help if her items broke. HW01D highlighted that people who shared environmental values were supportive and she will be more inclined to talk to them if she needed help:

> *''Footpaths was the thing for repair that was very supportive as well as for thinking about society* […] *If it comes that things need to be fixed, I'll ask some of the footpaths people''.* [SW04A]

> *''Greenie friends are always very supportive* […] *The greenie people will be the people I would talk to about repair and that kind of things. If I was telling (friend's name) that I was trying to repair something. He will probably know exactly how to go about it.''* [HW01D]

Environmental inclined peer groups may have a normative influence on the behaviour of its members. Since repair is a pro-environmental behaviour, it is more likely that members of the same environmentally inclined peer group are expected to try to repair. HW01D highlighted how individuals with shared environmental values were more likely to suppose that she would engage in sustainable consumption behaviour:

> *''They are people who are greenie like me and they'll expect me to repair or try to repair it. Buy a second hand one that kind of things.''* [HW01D]

5.2.2.2 *Perception of non-supportive groups*

Most participants with environmental concerns placed themselves in opposition to people who may engage in what was termed the 'throwaway society'. They expressed some contempt towards individuals who participate in conspicuous consumption and who throw away items:

> *''Both my husband and I, the whole family really, we hate it that it is a throwaway society really […] My husband always jokes ''that what people do in this country, they spend their weekend shopping'' we don't spend our weekend shopping or window shopping, we hate shopping, we have a whole family who cannot bear it.''* [SW04A]

> *''I loathe people that say ''I don't want it no more then we'll put it in the skip [...]" People should know about these things and the tip should make people feel guilty about throwing things away. It should be a law make it illegal to throw, crush things, it is disgraceful''* [WK07A]

They also expressed some incomprehension as to why people will behave in a way that goes against some of their values for the care of others and their needs for security and protection. RB05A described how her colleagues from work who used to teach children with special needs are on one side caring for others' needs and inclined by aspects of social justice. On the other hand, they are led by an illusion of progress through consumption. Reflecting on their behaviours, she noted apparent incongruence between the values they display in work setting and their practice at home influenced by the media. She described it as irrational. She explained how she lost hope and felt down from meeting with this group of individuals considering that their behaviours are an illusion of success through acquisition:

> *''So sometimes I used to be depressed about our meeting. If even those people who are caring so warm, so lovely and interested has been deceived in this way. It is not surprising that most people are''.* [RB05A]

JC06A witnessed her neighbour throwing away all her items one Christmas. She used the example as a means to reinforce the fact that most people around her do not try to mend and purchase an item instead:

> *''Most of the people I know would not try to mend, we had a neighbour at one point who replaced most thing in her house every year or two. She got a skip one Christmas just filled. It was unbelievable. It does make me feel sad''* [JC06A]

Most participants also felt that most people did not have the skills to repair:

> *''I do not think necessarily that in the way people grow and are educated now, is that high on practical skills''* [DMT06A]

In recognising that they cannot get support from the society at large, it may wear their motivation to repair. SW04A expressed the difficulty in trying to fix items when no one around engages with the practice:

> *''If everyone was fixing things and you knew where to go, you will become like them and you will do it automatically but when everyone else around you don't, it is more difficult''* [SW04A]

HW01D felt reluctant to ask for help from her peers who appear not to share the same value as her from fear that she may lose them:

> *''my school friends I do not usually speak to them about things like that.*[…] *I think it is harder to speak to your friends about things like that that it is to speak to your family or strangers actually because you do not want to lose your friends, do you? You do not want to bore them with why you are not doing that?''*

Some participants tried to influence their peer group to embrace repair. It may be in part because they have not been able to identify someone who may be able to help them with their repair issues and so by creating a new norm within a social setting, the group may be more likely to help them with trying to repair their items. RB05A who used to be depressed in meeting work colleagues who engage in conspicuous behaviour chose to share with them her repair activities as a mean to try to change their perspective:

> *''Anyway, when I am with this group of friends who are all lovely people. I always try to say one thing that will make them think a bit differently.* […]*. I said I am not as creative as you two are, but I have started to mend things* […] *it is about throwing it in the conversation. This is what I do, and it is a different perspective for them''* [RB05A]

5.2.2.3 *Support from individuals with high PRP*

Participants with high PRP helped their family, their community and friends with repairs. The main reason is that they had the skills and abilities to repair items and were willing to help. WK07A repaired items for his family, friends and participants of community repair events (WK07A - Laptop, WK07A - Coffee Machine). HW01D described how family and friends asked his father constantly for help with their broken items. JB09A and TB01E also expressed how busy they were even though they were retired in helping their direct circle to repair items. WK07A used ''some expert group on the internet'' to obtain help. The internet offers an open space for people with higher PRP to share information on how to solve problems.

5.3 Assets Factors

The following sections present the various assets (and lack thereof) which may encourage or discourage the prosumer from repairing. The assets include the skills, the knowledge and experience, the education, the available time, the conducive environment, the tools, the access to spare time and the financial resources.

5.3.1 Skills to repair

All participants were aware of what skills are necessary for repair. Most of the identified skills were transferable and accessible to both individuals with high and low PRP. The table below present the transferable skills identified through the analysis along with quotes.

Table 5-1 - Recognised Transferable skills

Transferable skills	***Used for***	***Quote***
Interpersonal skills	Requesting tools and parts Asking questions on how to repair an item, Delegating the repair attempt and collaborating	*''the skills would be to be able to communicate in the store and understand what it is and being able to describe what it is to be to get the part that matches''.* [JC06A]
Ability to follow instructions	Following instructions from people and written proxies such as manual and instructions from the internet	*''If you have a manual you can look at a manual that describe and give the faults and tell you what you need to do to repair.''* [JB09A]
Organisational and methodical skills	Disassembling items Reassembling items Sorting out parts	*''you have to be quite methodical when you take things apart to know where all the different parts are, to have good memory or to be very organised. Labelling part and knowing where they come from. So, some type of organisation required there and''* [JC06A]
Problem solving skills	Thinking laterally and creatively about an issue in order to find a solution	*''They are sort of general skills, lateral thinking skills and creativity. You've got some stuff what you can do with it and it is quite open ended I find''.* [WK07A]
Other abilities	Recognising the components in an item Dismantling an item	having *''good eyesight''* [D08] and *''some manual dexterity to deal with small parts''* [JC06A].

5.3.2 Knowledge and repeated experience

Most participants with low PRP lacked knowledge and experience in understanding how items work. They could not gauge when looking at a broken object whether they had the skills or resources to attempt a fix.

Participants with higher PRP had developed their knowledge and experience through education, paid and voluntary work. Their expertise contributes to greater self-efficacy beliefs.

Participants with higher PRP were able to specify and categorise where their skill-set lay and differentiate the type of electrical items including electrical, mechanical, electronic and software issues they could deal with or not. They had greater self-awareness on their level of skills:

> *''there is the mechanics, the simple wiring, those are two things I can deal with but when it comes to computer chip and that kind of stuff I cannot do it. I don't know where to go with those things.''* [TB01E]

> *''I am happy to go in most electrical things, power circuit. I am comfortable with, if you can see a popped component, then you can often replace that. I have repaired a computer for the first time in 15 years; I soldered a component on that. The component has been physically damaged when closing in the computer and it just bruised the capacitor, squashed it. I replaced the capacitor and I was quite chuffed about that. […] I do understand logic, digitally, I even understand the basic of microprocessor, my analogue electronics is amateur at best.''* [WK07A]

It illustrated how knowledge and experience contribute to higher self-efficacy beliefs. All participants had transferable skills and physical attributes for repairing. Only individuals with higher PRP acquired the knowledge and confidence to restore an item. JB09A was able to develop a hypothesis as to why

an object may not be working without the help of instructions from the item (JB09A - Microwave, JB09A - Disc lights, JB09A - Fairy lights).

Participants used their past experiences to assess whether or not the repair is worth doing. One participant with lower skill and PRP highlighted having failed in the past to repair items. The experience held her back to try again. The negative experience is likely to lower self-efficacy beliefs.:

> *''I have done some repair and I have been sort of... things are failed basically, it did not work very well, and I spent quite a bit of time on it and I kind of… so thinking about, it is about the success rate and the time I have spent on it, that kind of hold me back''* [JC06A]

On the other hand, positive experience in trying to repair can encourage prosumers to try to repair again. One participant with low PRP learnt to identify an issue with her hoover and subsequently changed the belt, on the advice of her father. When the hoover smelled of burn again, she was able to repair the item back (HW01D – Hoover).

Another repeated experience that may encourage participant with low PRP to try to repair an item is to succeed to fix items despite manufacturers and retailers advising that the item needs to be replaced. One participant with little repair skills and knowledge repaired her oven twice and her TV despite the indication by the retailer that the item should be replaced (SW04A – Oven, SW04A – TV). The experience made the participant more self-reliant and increased self-efficacy beliefs in her ability to solve a problem using her ingenuity or requesting the help of others.

5.3.3 Education

The education received by the prosumer is an asset factor that contributes to the appropriate level of knowledge and experience to be confident to try to repair. Education is also a significant process of socialisation for children after the family unit. Educational institutions help the child to determine what are appropriate behaviours when engaging in society. Differences were found between participants on their PRP because of their received education.

Some participants, because of their age combined with their gender, had a formal education where they acquired the skills to make, design and repair. Amongst the participants, the five 60+years old interviewees benefitted from an education system where they engaged in practical activities. The male participants engaged with mechanical, electrical and woodwork tasks at school, enabling them to repair items in the home. The women participated in homemaking activities at school such as sewing and cooking. Female 60+ participants shared what they learnt at school:

> *"I was always in the class with the girls doing the domestic science: sewing and cooking and the boys did wood work, metal work, things like that. It was all quite segregated so may be in regard to mending that probably why I do not do anything electricals.''* [RB05A]

> *''In school we had home economy in those days now if you ask […] They used to allow boys to do woodwork, metal work. The girls used to do sewing, housework. This was the job in school. ''* [D08]

It impacted on their willingness to try to repair electrical items. They were reluctant of trying.

The two 60+ male participants did not engage in mending clothes activities in the last five years, perhaps due to their lack of skills and abilities in homemaking activities when at school. The three 60+ women knew how to use a sewing machine. They also relied on male counterparts to help to repair electrical items because of their low PRP. Gendered education has an impact on the way

individuals construct their social identity and embrace roles as much as nurture inequalities. It may also impact on the way males and females manage their emotion when dealing with a difficult or risky task.

Younger participants chose between vocational and academic courses to determine their future career as well as the skills they would acquire. WK07A had a great interest in electronics, and he decided to enter a vocational course:

> *''I always like practical things and still like doing something with your hands and I always enjoy electronics. I did electronics for FCS a year early in my lunchtime at school. So, I always had an interest in electronics. I am quite passionate about the reuse and materials. And I don't like waste''* [WK07A]

Younger female respondents chose academic courses or engaged in vocational courses in the medical and healthcare sector. DMT06A reflected upon her secondary education. She highlighted the extent to which theoretical subjects tend to be promoted over other skills that could support her in her day-to-day life:

> *''We got into thinking that academic subjects trump everything. For me a lot of what I have learnt in high school at least I have never used. For example, it is quite useful to learn math. But a lot of math is completely unnecessary for my life now''* [DMT06A]

Most respondents perceived that education, today, do not teach repair skills:

> *''I do not think necessarily that in the way people grow and are educated now, is that high on practical skills […] it is not part of the school curriculum''* [DMT06A]

One participant perceived the current education system to over-emphasise on the acquisition of computer skills such as coding and programming which respond to industry current imperatives (i.e. robotisation, automation, sensors) as opposed to skills that would aid the repair of items within the household:

> *''These days, I don't think for a start that many people are taught [basic repair skills] at school. They are taught computing skills, and this is great but at the school I went to, everyone learnt carpentry.* […] *I think most young people these days, I do not think they have those opportunities within the schooling system to learn basic electrical skills. So where are they going to learn them from.''* [TB01E]

5.3.4 Time

Time can be defined as an indefinite series of events in the past, present, and future which as a whole defines the progress of an existence (Oxford Dictionary, 2017)). Within the existence of human beings, priorities chosen by the prosumer influence how much time is available to pursue activities such as the repair of an item. Through the analysis, it was found that the prosumer constantly trades their time between different activities that may discourage them to repair and engage with repair communities because of work, child-rearing, and other commitments. The following sections presents some of the trade-offs the participants engaged in.

5.3.4.1 *Time trade-offs between work, child-rearing and repair*

Participants considered how they have to continually assess the available time they have concerning the roles they have to fulfil at home, within the workplace and elsewhere. JC06A has a full-time job

and two children to take care of at home, she shares how she assesses whether she can try repairing or not. SW04A indicated that she would like to learn to fix but felt that she did not have the time to do so. She has three children and is a homeowner in Leicester who works part-time in London:

> *''So, it would prioritise the time. It is in a way between yes how long I think it might take, how much time have got available, how much a pressure it is on me. For something to be done versus other things that urgent about time, I guess, the more I think about it''.* [JC06A]

> *''I don't have the knowledge but if I had more time I could go and get the knowledge.''* [SW04A]

Retirement could be an opportunity to regain time to engage with repair. RB05A, who is retired, considered that work reduces the amount of time one has available to learn to repair. She experienced it herself when she was working. At the time, she was not able to pay attention to the repairs her husband did in and around the house. She could not learn from him during that period. She reflected on the situation of her grown-up daughters who are now busy with work and child-rearing. To help them in their inability to engage with repair and maintenance, she now mends her daughters' family clothes because she is retired and has time:

> *''Time is also a problem for people who work* […] *My daughters would like to repair things but again they haven't got time so that's why I will sew, I have got time''* [RB05A]

The example highlights the invisible economic value of retirement in supporting working individuals.

Other examples concerned how the choice of career takes precedence over the possible available time to learn repair. D08 chose an art teaching career which determined how she would spend her time and subsequently did not expand energy to acquire, apply and transfer knowledge about repair:

> *''I have been an art teacher for 11 years. I haven't learnt how to do anything else. I haven't got time. If you are a teacher, you haven't got time. So, I wasn't teaching electrical stuff I was teaching art in Third World country as they call it. I have learnt to do natural things natural arts.'' [D08]*

5.3.4.2 *Time trade-offs to get involved with repair community*

Four participants could not engage with the repair community because of lack of time. For two participants, it was mainly because of work and child-rearing (SW04A, JC06A). SW04A prioritised looking after her children over going to repair communities. JC06A would like to engage with repair communities, yet she had other priorities:

> *''I have never managed to come, and I do know about those and I want to come to these but whenever I look the dates. I am either on holidays or at work or something is happening. There are usually on Saturday do I work a lot of weekend.''* [SW04A]

> *''I have been interested in the restart party, I haven't been to one. I think when I had things; it has not been the right timing.''* [JC06A]

For two participants, it was because of their involvement with communities through voluntary work that they were not able to engage with repair (HW01D, RB05A). HW01D worked full-time during the week and used most of her weekend for volunteering and family. She found the weekend to be too

busy for her to engage with repair communities. RB05A also volunteered and indicated to be unable to engage with repair communities because she was supporting prisoners in America:

> *''The hackspace it sounds very good because it is during the weekend and often I am busy, but it is a very good resource to go to see people to talk to.''* [HW01D]

> *''I should have said that I am quite busy supporting various people who are on death row in America so even though I am retired. I seem to be quite busy you see and that impacts on things.''* [RB05A]

For individuals with higher PRP, they redirected their paid, voluntary work, and free time towards repair. JC06A volunteers at a local church as a maintenance manager and helps his community with repairs. TB01E indicated that since he retired, he is busier than when was working because he does a lot of informal work fixing items. WK07A helps his peers with their items, repairs items in his home and volunteered to create a repair space in his hometown. RB05A indicated that her home was more of a workshop than a home because her husband prioritised repair and making things over other activities. HW01D mentioned her father as busy in his community because he repairs items for everyone.

5.3.4.3 *Time trade-offs encouraging replacement over repair*

The temporal pressure to accomplish a particular task within the household can also force an individual to replace an item as opposed to repair. Most participants indicated to prioritise replacement over repair because of the urge to fulfil a particular want. SW04A shares how her work colleague would not be able to wait for a week or two if they had an item broken. She also shared how her husband chose to replace a bread maker without her agreement because he wanted to be able to make bread. She described the behaviour as a feature of an instant society that wants the fulfilment of their needs now:

> *''The new one was there. He wanted the bread maker and that the other thing we are an instant society we are now. If he wants something, you wanted yesterday, you do not want it in three-month time and that's how people are and when years ago.''* [SW04A]

> *"They might say my hair dryer broke this morning, I will have to buy a new one. They haven't got the time to have a week or two with not having the item that is broken they wanted now.''* [SW04A]

The internet contribute to the instant society by making the instant fulfilment of wants possible since it allows the search and purchase of new items easily and instantly:

> *''People want the thing now and the internet contribute to that too: click got delivered.''* [WK07A]

5.3.5 Conducive environment

A conducive environment is an asset to repair items. Within an industrial environment or a community repair setting, the prosumer can have access to tools and workbenches that allow them to fix. Within a home, it depends on the investments made by the prosumer. FW03C invited a friend to repair her computer. Unfortunately, her house was inadequate to fulfil such tasks. It does not mirror what a workshop would have, and as a result, they were unable to repair the computer:

''But here in your front room, I do not really know, what to do. There is somebody with all the skills, but they are not in the workshop, so they cannot do it.'' [FW03C]

JC09A also indicated how his home is not conducive to restore a heat-welded chair. The manufacture of the chair makes difficult any attempt to repair within the house. He suggested that a factory environment could deal with the damage and the repair of the chair. Manufacturers fail to account for the limitation of the home as an environment in which the item's life cannot be elongated or deliberately strive to protect their business interests by preventing unofficial repair. The design focus is limited to the prosumer's need of 'sitting onto a chair comfortably' without adding the consideration that the prosumer wants to 'sit comfortably on the chair after their own repair'.

5.3.6 Tools

Tools to dismantle and to put the item back together were identified to support the prosumer to repair the item. The participants also mentioned informational tools such as the internet and instructions manuals. Most participants used resources on the internet to find instructions and identify why an item was not working (DMT06A – Laptop, HW01D – Mobile Phone). WK07A used a Gaggia instruction manual which had breakdown exploded parts for a coffee machine. It allowed him to see where the problem may be and identified the parts that may be faulty (WK07A – Coffee Machine). HW01D used a video shared on YouTube to dismantle her Fairphone (HW01D – Mobile Phone). The role of manufacturers and retailers in sharing information on how to repair an item through printed manuals and information on the internet is valuable for the prosumer to self-learn. On the other hand, the contribution of a prosumer in providing information on YouTube for dismantling the Fairphone highlights the collaborative nature of repair between prosumers.

Through the analysis, tools for diagnosing the issue were identified. The ability to diagnose an item problem may be inaccessible for a prosumer with low skills and knowledge on repair. However, digital technology can help diagnose the issue without much input from the prosumer. HW01D downloaded, for example, an application to check whether a particular issue was affecting her phone (HW01D, Mobile Phone). Otherwise, the prosumer needs to be familiar on how to use some diagnosis tools, such as a multimeter. JB09A used the multimeter to identify which lightbulb was not working on his fairy lights (JB09A – Fairy lights)

The prosumer can also use tools to record progress. WK07A used a camera and his computer to record his progress and know exactly the steps he went through to repair an item. By recording the information, WK07A also had the opportunity to share with others how to repair a specific item.

Finally, the internet was used to source spare parts to repair items, as noted below (Section 6.4.8).

5.3.7 Transportation

For participants with lower PRP, access to transportation may be necessary if they live far from repair shops or the item is bulky. SW04A used her car to go to repair shops in order to repair a laptop and highlights within the repair process the many back and forth's she had to complete to get the item fixed (SW04A - Laptop).

5.3.8 Access to Spare parts

Spare parts are essential for the repair of small electrical items. To successfully repair items, the majority of participants ordered a spare part from a specialised retail shop or the manufacturer website (HW01D – Hoover, JB09A - Disc lights, JB09A - Microwave, WK07A - Coffee Machine, TB01E -

Caravan lights, DMT06A – Blender 2). The role of manufacturers in providing through the market the necessary parts is essential to enable the prosumer to access them. In one instance, RB05A's husband upcycled a rubber ring that he had in his home to repair a liquidiser (RB05A – Liquidiser). The retention of broken items and parts as well as the experience in trying to fix may support the prosumer to find an ingenious way to solve repair issues. In another instance, WK07A ordered some materials to make a screen bracket for a laptop. He used his design skills to make the spare parts (WK07A – Laptop).

The lack of spare parts meant that most participants failed to repair items. In some instances, the repair shops were unable to get a spare part to help the participants, and they were forced to give up the repair for disposal:

> *''I had to throw an item away recently because I took it to a specialist and the specialist said to me ''I am sorry you cannot get the part'' the special component, I am sorry but it has to be thrown away, that is terrible but this is the way it is with a lot of modern products. You get this built in planned obsolescence.''* [TB01E]

> *''The engineer could not get into the part that need it to be repaired because of the way it was built and this is what they do today make things to be thrown away and not repaired''.* [D08]

In some instances, participants turned to eBay (an online marketplace) with the hope that other households and companies may sell spare parts but were left disappointed when no spare parts were available (SW04A - Bread maker, DMT06A – E-reader). Prosumers may not be accustomed to trying to sell second hand and broken items online to be used for parts. It makes access to spare parts even more difficult.

Participants expressed frustration regarding their inability to access spare parts during the repair process. DMT06A was frustrated with Amazon which sold her an e-reader because they did not have an extra screen. JC06A also highlighted frustration and boredom in trying to source materials for repair particularly when unable to find what she wants:

> *''Definitely the last one, the sticky point is getting the replacement item and act. I am frustrated with Amazon about that because they could provide the screen.''* [DMT06A]

> *''Probably, sourcing materials* […]*, I can find it a bit frustrating, a bit boring... If you cannot find what you want, then you can get the temptation of just getting a new one.''* [JC06A]

5.3.9 Financial resources

Financial resources are a significant asset towards purchasing the service of a third party for the repair of an item. In the UK, National living Wage is approximately £7.50 per hour or £15,269 per year as of 2017 (ONS, 2018). For the prosumers under national living wage, they might not be able to afford the the service of a repair technician who charge between £25-£50 per hour. For the two participants who earn less than £10,000 per year in the sample, they chose to go to repair community events for repair. The favouritism for informal networks of exchange may signal that the current rate for repair is too high for the largest proportion of prosumers.

The financial situation of participants can also discourage them to purchase repairable items. Most participants mentioned the Fairphone as a repairable item to purchase because of its repairable feature. The premium placed on those items discouraged their purchase. Only HW01D chose to

purchase it. WK07A indicated that he was interested in getting a Fairphone, but he was not able to because he did not have the means to purchase one:

> *''I promise myself that my next phone will be a Fairphone and haven't bought one for price reasons because I could get a phone for a third of the price and I was a bit skint at the time.''* [WK07A]

5.4 Market Factors

The identified market factors include manufacturers and retailers support, trust in repair efficacy of repair shops and repair community. Repair community is an additional factor where the prosumer engages with people who have repair skill in their community.

5.4.1 Manufacturers and retailers support

The following sections present how the prosumer perceives and experiences the support (or lack) of manufacturers and retailers in their attempt to repair an item.

5.4.1.1 *Perception of manufacturers and retailers support*

All participants perceived an overall lack of support from manufacturers and retailers for repair. They believe that the primary goal for many manufacturers and retailers is for the consumer to make repeat purchases, and for that reason, they do not produce easily repairable items which the prosumer can learn to repair:

> *''My point is that consumer they cannot acquire the skill very easily because the manufacturer is manufacturing in such a way as to ensure that the consumer can't because the manufacturer do not want the consumer to repair. The manufacturer wants the consumer to buy new''* [FW03C]

WK07A recognised that the lack of support for repair was prevalent throughout the value chain as companies do not communicate the value of repairing items; do not promote repairable item; do not develop item with reparability components; and finally, do not employ people that could repair or develop repairable items:

> *''Not enough companies are promoting repairable item. There are not many companies with reparability components, it is lagging behind the ethical supply chain and employment.''* [WK07A]

Their perception was supported by the media and documentaries they encountered which highlighted that most companies embrace planned obsolescence:

> *''I watched a film a while ago called the light bulb conspiracy and it is about how things are designed to fall apart after a period of time''* [HW01D]

Warranty rules of service also discourage the prosumer from attempting to repair because it may invalidate the warranty:

> *''You are blinded with the fact that manufacturers of goods don't encourage repair. They usually say that if you open this, it will invalidate the warranty, basically, they say do not touch it.''* [TB01E]

Most respondents criticised companies for their advertisement and promotion of new items that target vulnerable individuals who may not have the means to repair or lack the understanding of the impacts of waste on the broader environment. FW03C considered that advertisements target vulnerable groups such as children, younger generations, and immigrant communities who aspire to achieve a certain status through consumption in the society they are joining in and ultimately reject repair as old-fashioned and non-modern:

> *''The advertising industry worked out that the best way to get parents to open their pockets was to get the children to pressurise them. The children got targeted.*
>
> *For the younger generation, it is the ''keeping up with the Joneses'' as we used to call it in my generation, it is the ''my friend has got so I must have'' and then ''my friend kids have got so my kids are disadvantaged if they don't have''*
>
> *''also, amongst immigrant's communities, part of what it meant to become part of a developed country […] not needing to repair cos that you did in the past.* […] *the idea that development is about buying new or having access to consuming goods is something that has been pushed very hard around the Third World and you see this in the immigrant community in this country the fact that they have to do automatically this to establish their status in this country. ''* [FW03C]

The communication choices made by retailers and manufacturers to encourage prosumers to consume as opposed to repair aggravate the participants' perception that they are not supportive of repair.

5.4.1.2 *Prosumer experiences in trying to repair an item with manufacturers and retailers support*

Participants reached out to companies by either calling them or going physically to their store. In many instances, the retailers invited the participants to replace the item (SW04A – Oven, DMT06A – E-reader, D08 – Laptop; SW04A - TV). A reason for encouraging replacement as opposed to repair was the fast turnover of products which affect retailers and manufacturers to respond to prosumer desiring to fix the item; the manufacturer may not have the product in production anymore and therefore can't service or provide spare parts. For SW04A and her broken oven (SW04A – Oven), the company did not produce the appliance anymore and could not help:

> *''I tried to ring Bosch and they said ''oh that haven't been made for years* […] *you need a new oven''* [SW04A]

JC06A had a broken microwave. She indicated that the product range changed quickly and that created difficulties in trying to find the part for the item:

> *''The microwave, it was more of a pain to get the part, my husband tried to buy part from microwave and none of the one we tested were available. They changed the line within one year or two and there are so many different items.''* [JC06A]

The evolution of technology may be another identified reason for the retailer to advise the prosumer to replace the item. SW04A had a non-digital television. When the network went digital, she went to a shop to get some advice. The retailer told her to replace the TV (SW04A – TV)

> *I went to the shop and I went ''we got that old TV'' they said ''no you have to buy a new one there is, no way you'd be able to use that when it goes digital*' [SW04A]

There were instances where the manufacturers and retailers supported the prosumers. Most participants who succeeded to repair an item successfully were able to access spare parts through manufacturers online website or retail shops.

Some companies made repair a central component of their business model. HW01D chose to purchase a Fairphone. Through her purchase, she had access to a number of guides and resources online that helped her and taught her to repair her mobile phone. JB09A chose to purchase refillable printer cartridges to reduce impact onto the environment. When the refillable cartridges stopped working, he had access to customer services which advised him to replace the battery to make it work again. By obtaining the information, JB09A was able to move forward and look for a replacement part to put the item back into function (JB09A – Refillable cartridges).

5.4.2 Trust in repair shops

The variability in service and cost from shops to shops may discourage the prosumer from repairing the item with the help of a professional as the prosumer may believe that the repair shops are untrustworthy. SW04A went to a first repair shop where she learnt that the item was too expensive to repair and parts for it were unavailable. She went to a second repair shop where they were able to fix the issue at a fair price and source the component (SW04A – Laptop).

A negative experience with repairers may discourage the prosumer from repairing items with them. Repeated positive experiences can, on the other hand, create positive relationships between a prosumer and repairer. SW04A had developed a relationship over the years with an electrician who did some work in her house, and she asked him to help with repairing a stereo HiFi radio and an oven on her behalf (SW04A – Oven, SW04A – Stereo Hifi Radio). The electrician was at first reluctant but gave it a go. JB09E explained he had a relationship with the locksmith and was able, after purchasing a lock, to go back to the shop and ask him how to solve a problem with his door. The repair person gave him instruction on how to solve his problem:

> *''I got back to the person who sells it and say this is the symptoms, what do I do. He said do this this and this''* [JB09A]

5.4.3 Repair community support

Some participants engaged with a repair community to repair items that they owned. Repair communities act as an alternative to repair shops, manufacturers and retailers. They provide skills, knowledge, tools, and a conducive environment to restore items from the prosumer at a minimal cost.

For participants with low skills, access to a repair community enabled them to repair their broken item in instances where retailers failed to. In two cases, the participants approached the repair communities when retailers and manufacturers were unable to support them. When D08 had her computer hacked into, she went first to a retail shop for help and was advised to replace the item. Following this advice, she instead went to a repair event and was able to get help to repair her laptop (D08 – Laptop). DM06A was advised by Amazon to replace her E-reader, she went to a repair event and was encouraged to get a spare part to repair the item (DMT06A – E-reader).

Repair communities can help to repair items that were broken for a long time and retained by the owner. Two participants with low PRP retained items after they were broken for some time and when they became aware of the repair events, they took the items for repairing (FW03C – DAB Radio; DMT06A - Headlamp).

Repair communities can also provide a second opinion on whether an item is safe to repair or not. SW04A had a broken toaster that she did not feel safe to repair. The item failed portable appliance testing [PAT testing] at the event (SW04A – Toaster). She learnt at the community event how to upcycle the item instead.

Through the process of repairing an item in a repair community, participants gained an understanding of what repair is involved, how long it takes, and how easy or complicated it is (D08 – Laptop, FW03C – Dab Radio, DMT06A – E-reader, Headlamp, Lamp). Learning through the repair event is one of the added values from interacting with repair communities. Manufacturers provide the opportunity to learn to repair mainly if the prosumer can follow instructions supplied through the repair guides.

5.4.3.1 *Access and visibility of repair support*

There was no mention through the analysis of the difficulty to access repair shops to repair items. However, the participants mentioned the lack of proximity to repair communities. RB05A indicated that she would prefer having repair events closer to her home. DMT06A highlighted the situation where an older person potentially cannot go to a repair event because it is out of reach:

> *''It will be nice to have things in more local areas. The restart parties are in town isn't it? But it is up to us to think how we are going to do that, sometimes in the evening I do not feel like going out but if it was with neighbours says. That would be nice''* [RB05A]

> *''So, if you are lonely little old lady that is a bit complicated. What are you going to do? You cannot even go to a restart party living in an area where there is not one.''* [DMT06A]

5.5 Product & Service Factors

The following sections present the findings in relation to the products and services that may affect the prosumer to repair. They include perceived cost of repair and replacement, relationships between attachment and the item and the perceived repairability of the item.

5.5.1 Perceived cost of repair and replacement

The perceived high cost of repair remained influential for most participants to give up trying to repair. Most participants considered that items within the marketplace are becoming cheaper, therefore accepting that replacing an item costs less than trying to repair it, and that spare parts can be expensive compared to replacement. Most participants recognised that the price does not reflect the cost of the negative externalities from disposing and replacing the item which includes the pollution, depletion of natural resources, and the social and economic impacts on a community which use natural resources to support their livelihood. DMT06A considered that the lack of awareness in environmental implications of consumption may hinder individuals' decisions to repair as they used a narrow range of criteria to make their decision to replace and were more influenced by the cost to value ratio:

> *''Now that product is cheap, things changed. If you do not have that understanding that the price you pay for the product it is not the price of the product to the world as a whole, it is greater because you really not paying the real price of the product. If you are not aware of that I guess I take it they are not going to take it seriously on one side [...] So it is easier, quicker and cheaper to buy the cheapest item they can from Argos/Primark just to quickly deal with it because it is something I just do not want to think about.''* [DMT06A]

However, an understanding of the environmental implications does not appear from the analysis to deter prosumer from replacement of the item. DMT06A had a broken e-reader. She looked for a new screen and realised that the price of the part was as expensive as a new one and chose finally to not repair the item because she could not find an affordable part (DMT06A – E-reader):

> *''The new screen was very expensive. It was not then much less than a new e-reader.''* [DMT06A]

Significantly, the price set by manufacturers and the level of access to financial resources are significant barriers to repair as discussed in section 6.4.9.

5.5.2 Relationships between attachment and the item

Different forms of attachment were identified triggered by the initial value of the item, the prosumer's financial circumstances, affiliation, hedonic reasons and ownership.

5.5.2.1 *Item's initial value triggering attachment*

The initial cost of an item may trigger or hinder attachment. The less expensive an item is, the more likely one is going to replace it as opposed to repair if it breaks. Purchasing something more expensive can make one more likely to take care of the item:

> *''The cheap costs of cheap electrical items make you value them less. If you get something more expensive, you know if you go to buy a kettle, £5 or you can spend £150 and all that dilemma you've got of where to come in what is.''* [JC09A]

5.5.2.2 *Attachment triggered by financial circumstances*

The prosumer can be attached to an item because of its functionality and ability to respond to a particular need. D08, for example, indicated that she relied on her computer because it supported her autonomy to apply for jobs and obtain benefits. She earned less than £10,000 a year. The attachment to the item was linked to her personal circumstances.

5.5.2.3 *Attachment through affiliation*

JC06A was reminded by a toaster of her affiliation with her mother in law. She recognised that it is just an item, yet felt compelled to try to repair it because of its history and good service:

> *''My step mother-in-law bought that* […] *20 years ago for my husband and I.*[…]*There is an attachment to it because of that and more willingness to invest time in it because we had it in a long time.''* [JC06A]

5.5.2.4 *Hedonic attachment*

TB01E introduced himself as being passionate about music to the extent where he was going to music concerts almost every week. He shared how much he liked a speaker for the sound quality and how he tried to get it repaired. Enjoyment may be one element driving the attachment to the item and encouraging the repair:

> *''It was a little speaker that you attached to a laptop to improve the quality of the music. You can get normal speaker but this one is very good. Great sound and then something went wrong* […] *and I thought it will be fairly easy to repair and I thought I had to push the recharging. Just like you do for a phone charger. But I could not work out how to get inside that thing.* […] *So, I took it along to a repair shop. And he said these things are not designed to be repaired.''* [TB01E]

5.5.2.5 *Attachment due to ownership*

Ownership is the act, state or right of possessing an item. With this right comes responsibility for which the individual bears the charge. Some participants highlighted their duty to try to fix an item if they own it. DMT06A indicated that who owns the item will be the one who would repair it::

> *''It depends on who own the item. If it is ours, if it is quite basic and I broke it, I will have a go.''* [DMT06A]

Homeownership gave responsibility to the homeowner to maintain the home and its content regardless of their abilities. The majority of participants were homeowners. Three participants were homeowners renting accommodation within their home. They indicated that the people living with them do not make any particular effort to repair because they don't see it as their responsibility:

> *''I don't even think that it will cross their mind. There is different part to it, One, it is having the knowledge and the skills. I am not sure that anyone else in the house have the knowledge and the skills in any case and I think that it would not occur to them if something goes wrong then they see it as my role to sort it out. It is my house''.* [TB01E]

> *''The lodger does nothing. I do all the repair. All the repair that needs to be done it is all done by me. ''* [FW03C]

Homeownership aids to set the roles of the occupants. D08 who rented accommodation indicated that she did not have to repair much in her home because a lot of the items was the responsibility of the homeowner to deal with it:

> *''Here the water is electric, the landlord will send the engineer to repair it really. It was done once a year ago. The cooker belongs to the landlord that's fine.''* [D08]

5.5.3 Perceived reparability

Through the thematic analysis, different elements were identified to influence perception of reparability. They included the relationship between the prosumer repair competencies and the item, perception that items in the past were more repairable, the age of the item as well as design features.

5.5.3.1 *Relationship between prosumer's repair competencies and the type of items and issues*

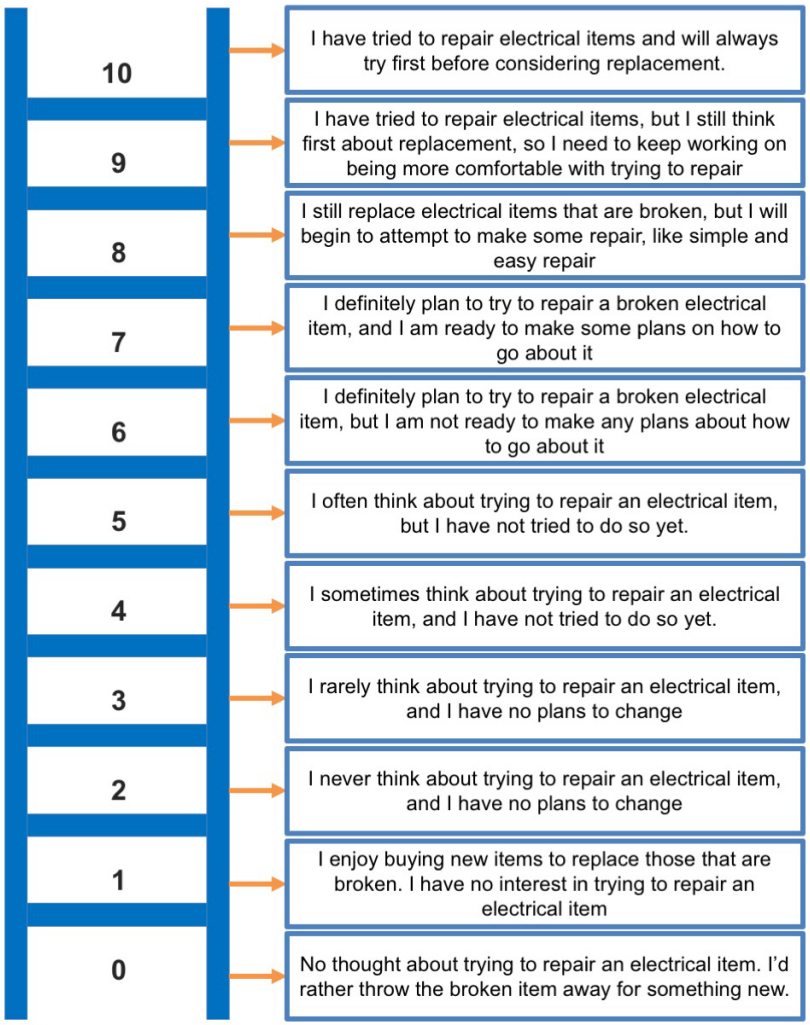
A discussion on the contemplation ladders completed by the participants happened to uncover the elements that influence their decision to repair (See Figure 5-1). Most participants explained that the relationship between their level of skills and knowledge and the type of items they were trying to repair influenced their intention to repair. TB01E was unable to complete the contemplation ladder because he considered that the type of item and his abilities would determine whether or not he would think first about repair or replacement:

> *''whether I will try to repair something or whether I will immediately think I give it to someone else to repair depends upon the item, how complicated technologically the repair whether I think that it is within my capabilities to repair it or not.''* [TB01E]

Most participants differentiated the type of technical faults and items. From the differentiation of items and issues, they were able to determine whether the repair was easy or complicated and if they had the competencies to try to repair the item. Between mechanical, electrical, software and electronic issues, electronic issues were considered the most complicated by participants regardless of their level of skills. TB01E, who is experienced in trying to repair, illustrated the differences between the items and defined their level of difficulty:

> *''The electrical light in there in the kitchen, it is very simple electrical wiring, you compared that with the washing machine, if something goes wrong with it often it will be the mechanical part and not the electronic part of it. But sometimes when the electrical goes*

wrong, sometimes it is simple wiring, but some part of electrics are complicated electronics.'' [TB01E]



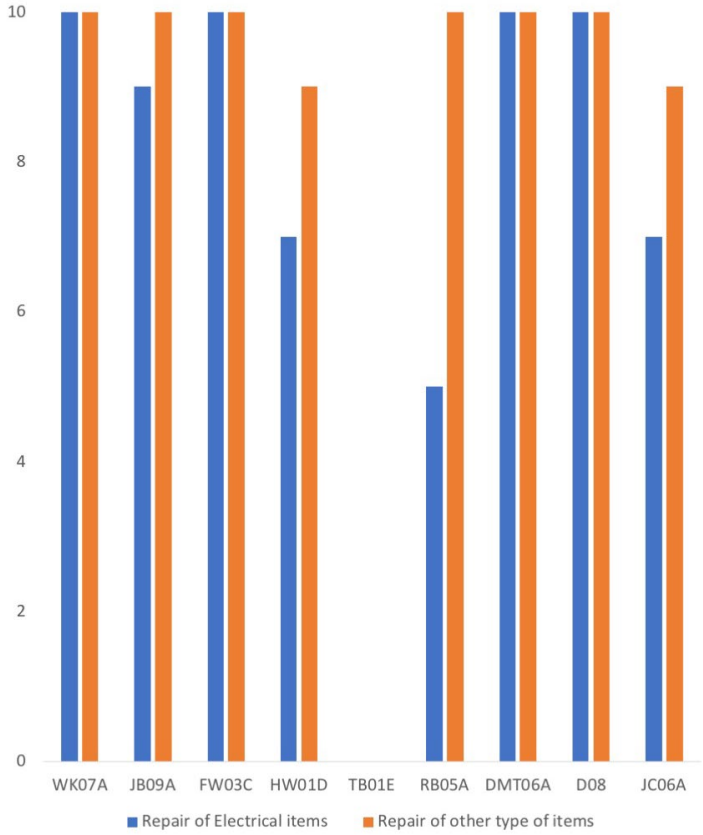


Figure 5-1 - Results from Contemplation ladder

FW03C, who does not have a lot of experience in trying to repair, suggested that it was easier for her to understand how an electrical item worked as opposed to an electronic item:

> *''There is a difference between repairing the electrical fan that keeping me cool at night than repairing my computer. One is simple and relatively simple to understand. And some are very complicated''* [FW03C]

5.5.3.2 *Perception or experience that items produced at present are not repairable compared to the past*

Another major element that influenced perceived reparability of the item is the extent to which the prosumer viewed or had the experience that items produced in recent years are more difficult to repair. Most participants considered that companies do not nowadays produce repairable items:

> *''The stuff that we buy is not easily repairable.''* [HW01D]

> *''Everything now has gone into built in obsolescence made irreparable''* [JB09A]

Apart from the way the participants relate to manufacturers and retailers, participants with a higher level of skills used their knowledge and experience to support their beliefs that items are more difficult to repair. TB01E considered that in the past it was easier to fix cars than nowadays. Cars are computer-connected and, the participant supposed the repair requires specific equipment and knowledge:

> *''So, for example you take a car that is 40 or 50 years old and it is all mechanics and electrical system is very simple, you take a modern car and a lot of it is computer controlled and without specialist knowledge.''* [TB01E]

WK07A tried to repair a Sigma camera lens and gave up when he realised that the parts were too small to repair (WK07A- Camera). His experience taught him that electronics were easier to understand in the past prior to the miniaturization of items:

> *''It was easy to understand electronics at the time. There were not too complicated. Miniaturisation is making things a lot harder. It got a big part to play''* [WK07A]

Most participants with lower PRP had the conviction that items in the past were more accessible to repair than today even though they have not tried to fix any items by themselves. The participant's community influenced perceptions. RB05A, for example, did not have experience in trying to repair, nevertheless her husband who is an engineer told her that electronic items evolve over the years making the task to learn to fix challenging to engage with:

> *''He was saying that things progressed over the years so the way that they were put together, the things that they used the components seems to change so if you learnt to do one thing, it may not be relevant later''* [RB05A]

HW01D believed that a fridge in the past was easier to repair than modern one and this explained why people used to repair more:

> *''They say that if you bought a fridge 15 years ago, you could still be using it because you could repair it. Those modern fridges are a lot more difficult to repair. So, I think we used to repair a lot more.''* [HW01D]

It could be argued that the reason why people found that items were easier to repair in the past is that they engaged with the activity more often and through this engagement, they accumulated knowledge shared with their community. For newer technology, it can be argued that the know-how on how to repair those items has not yet become common knowledge for most individuals to try to repair. It cannot be dismissed on the other hand the influence of product design on the perception of item's repairability.

5.5.3.3 *Product design influencing the prosumer's perception of an item's repairability*

Some design elements can enable or hinder the repairability of the item.

Product serial number and parts' specification helped most participants to find information online and to look for spare parts (HW01D – Hoover, JB09A - Microwave, JB09A - Disc lights, WK07A - Coffee Machine). The serial number on a part also helped FW03C to communicate with a calling computer technician to diagnose her computer's fault remotely. Without the serial number on the part, she was not going to be able to identify the component (FW03C – Desktop Computer).

In other instances, the repair task is difficult because the item cannot be opened to diagnose and repair the issue. It stops the participants with higher PRP to try to fix the item by themselves, and they have to turn to a third party to try to repair the item. TB01E, for example, had a speaker that was not working anymore, and he was not able to restore it because it was sealed:

> *''I could not work out how to get inside that thing. If I could have got inside, then I would have a go to repair it myself…''* [TB01E]

It can also be a significant source of discouragement for prosumers with low PRP to try to repair. FW03C had two items that she gave up trying to fix herself because there was no indication that those items could be open (FW03C - Charger, FW03C – DAB Radio). The design of the object as a closed unit prevent carrying out a diagnosis:

> *''Because like as I have been saying before these things are closed system it does not easily unscrew […] the plug is being sealed together so you cannot find out if the wire has come loose, you cannot guess what happen with it because for one minute it works, to the other it does not.''* [FW03C]

5.5.3.4 *Age of the item*

The manufacturer and retailer reinforce the concept that items have a date after which a repair attempt cannot occur. SW04A contacted Bosch to get help to repair her oven and learnt that her oven was too old to find spare parts for it (SW04A – Oven). SW04A also went to a retailer to find out if her TV could be used when all TV becomes digital. The retailer advised her to replace it (SW04A – TV). SW04A chose to pursue the repair regardless of the influence of the retailers and manufacturers however it may not be the case of other prosumers which indicate some differences in consumer traits and experience of the prosumers.

5.6 Consumer Factors

The following sections present the findings in relation to the consumer factors that may affect the prosumer to repair. They include innovativeness, self-efficacy beliefs, safety concerns, environmental concerns, product retention tendency, and concern for humanity.

5.6.1 Innovativeness

Innovativeness traits influence the adoption of new ideas and practices. Through the analysis, participants expressed their innovativeness by wanting to find a solution to a problem by themselves. HW01D who usually relies on her father for help, chose to try to repair her hoover by herself (HW01D – Hoover). Some participants also collaborated with others. SW04A engaged with individuals who had greater skills, so they could find a solution to a problem. They engaged in self-learning behaviour by searching for information on the internet to raise their awareness and knowledge on how to fix an item. JC09A, for example, indicated that she watched YouTube videos to find out how to repair her washing machine. HW01D used the online platform provided by Fairphone to obtain information on how to repair her phone. The participants also engaged in self-making behaviour. SW04A developed a solution to repair her oven seal using a paper clip (SW04A – Oven). WK07A advocated learning through making, choosing to make his own spare part as a way of learning more about the materials, the tools he uses, and to get a further grasp on the potential of repairing an item. He promoted learning through making as opposed to purchasing the parts:

> *''Making the component. This is the fun bit you learn about materials, understand about it. When you work with materials, you learn about it. When you make a part, test it, you learn about it.''* [WK07A]

All participants engaged with activities and behaviours that would support their development of skills and confidence, so they can learn to repair. However, there are differences between individuals with higher PRP and lower PRP on the extent to which they applied their attention and energy to adopt further skills and abilities. Many factors may influence innovative prosumer traits. One element that was put forward by participants is 'interest'. TB01E indicated that interest was one of the reasons why he would commit more time to repair as opposed to trying to learn how to sew:

> *''I am tempted to say that I do not have time to learn how to sew. But this is not a satisfactory answer. Because when it comes to something going wrong with computer a friend of mine brought … I stayed up the freaking night to find out how to solve the problem. I started to work on it at 1am in the morning and I finished to work on it at 5am in the morning, I spent 4 hours on it and I was prepared to research and find out on the internet. Would it have been a piece of sewing I would not have been able to do that. It is partly about what interest you. Computer does, sewing does not.''* [TB01E]

'Interest' in repair appeared to increase through the participants' childhood and education. Those with higher PRP went to school at a time where boys learnt practical skills or chose a vocational course teaching electronics. This experience might foster their innovativeness traits. TB01E and WK07A shared the experiences that shaped their interest:

> *''But also, I am interested in science. I did physics up to the age of 18 and so some of my understanding of electronics and electricals comes from the physics that I did at school and I am interested in how things work.''* [TB01E]

''I always like practical things and still like doing something with your hands and I always enjoy electronics. I did electronics for FCS a year early in my lunchtime at school. So, I always had an interest in electronics. I am quite passionate about the reuse and materials. And I don't like waste […] *I think I am fairly aware of the potential of fixing things, I like fixing first. If something is broken, I'll try to repair it.* [WK07A]

The other elements that support innovativeness traits are self-efficacy beliefs. Self-efficacy beliefs are the beliefs in one's ability to succeed or accomplish a task in a specific situation. Participants with higher PRP displayed stronger self-efficacy beliefs. They were prone to take risks. TB01E thought that replacing the lights in a caravan was an easy task because of his experience in trying to repair electrical fittings. However, it was not as easy as he thought it might be when he began the repair process (TB01E - Caravan lights). The beliefs in the ability to succeed also influence the prosumer to have greater locus control. In other words, the prosumer believes that they have more control over the outcomes and pay less attention to external forces beyond their control. DMT06A highlighted that the ability to repair enhances the belief that she has the power and control to solve problems. TB01E explained that one of the reasons he gets upset when unable to fix an item is that he does not like when a situation dictates how he should behave; he prefers having control of the situation:

''It is quite a nice feeling if I can do it myself. It is quite an empowering feeling and I'll give it a quick go''. [DMT06A]

''And so, I do not like it if the environment is controlling me then if there are things that I cannot repair, and I cannot understand them, that annoys me, and I feel frustrated'' [TB01E]

The ability to take control over ones' life is an essential element for an individual's wellbeing. Self-efficacy beliefs are essential to feelings of happiness and sense of wellbeing (Maddux, 2002). Participants from lower PRP went through the process of speculating who they would be if they were able to repair items successfully. The process of imagining one's better self contributes positively to self-efficacy beliefs (Maddux, 2002). They highlighted that they would *''be happier, prouder and more innovative''* [RB05A] and more likely to volunteer to help others in trying to repair their items [DMT06A]. The purpose of the research was not to measure wellbeing in the participants and whether the display of innovativeness traits and self-efficacy beliefs support wellbeing. Participants with higher repair propensity might have a stronger sense of wellbeing compared to other participants partly because they had fewer worries concerning safety and the process of repair.

5.6.2 Frugality traits

The participants expressed different logic of frugality. Some, such D08 and DMT06A were motivated to repair so they can save money. D08 was in a financial situation that did not permit her not to try to repair. DMT06A highlights that her husband and herself made a commitment not to dispose of items and to save financial resources. She described her incomprehension of people not choosing to repair as she believed most people were concerned by financial security:

''we are committed to the fact of not throwing things away unnecessarily and saving money, it makes perfectly sense to try repairing it. I do not understand people who will throw it away because you think most people will save money even if they don't care about the environment.''

On the other hand, FW03C indicated that her concern for humanity influenced her to reduce her acquisition of goods and to try to repair items instead:

> *''I have the concept of a lifestyle experience which requires that it is added to or subtracted to by the acquisition of goods. And the moral motivation behind the acquisition is motivated by a concern for humanity. So, I will tend not to acquire so I will tend to attempt to repair''*. [FW03C]

The motivation to be frugal in that particular case is, therefore moral.

5.6.3 Safety concerns

Safety was one of the main factors discouraging repair. Perceived safety risks induced feelings of nervousness and anxiety amongst participants. JC06A emphasised a fear for safety triggered by the thought of trying to deal with an electrical item:

> *''I suppose a bit nervous, anxious about it particularly electrical because it is about safety.''* [JC06A]

> *''One of the main things that stop me for repairing electrical is the safety things. […] yeah, I perhaps... yes that kind of worry.''* [JC06A]

The following sections introduce the elements that trigger safety concerns. They include the lack of knowledge and experience, prosumer's predictions of worst-case scenario, the external influence from parents and media, self-identification as risk-averse and the type of item.

5.6.3.1 *The lack of knowledge and experience trigger safety concerns*

The lack of knowledge and experience contributed to the fear because the prosumer is unable to determine whether an item has lost its safety features or is unable to test the item for leakages. JC06A, who was the most concerned participant for safety, highlighted her lack of skills and awareness on how to keep an item safe when trying to repair it:

> *''I think safety keep coming up to my mind and it is one of the main area I kind of feel I do not have the skills in terms of I know obviously the safety testing that electrician do with items.''* [JC06A]

> *''I think the awareness of safety and if an item need repair, how would you know if the major safety features has been lost.''* [JC06A]

For participants with higher PRP, their knowledge and experience supported them to follow appropriate safety procedures. JB09A is aware, for example, of the risks associated with repairing an electrical item and knows what to do to keep himself safe:

> *''Dealing with electrical things it could be quite dangerous. If they don't realise that you have to unplug it before taking it apart you have to connect the wire in the right order otherwise you can have an accident''* [JB09A].

The lack of knowledge and experience of prosumers with low PRP may discourage them from attempting the repair because of safety concerns. Nevertheless, if they asked a prosumer with greater PRP, they may be able to verify whether the item is safe or not. The safety of a broken toaster concerned SW04A. She chose to go to a repair community to check if the item can pass a PAT

testing (SW04A – Toaster). In this case, the lack of knowledge and experience is not a barrier to repair if the prosumer has access to expertise from a perceived-to-be more qualified third-party.

5.6.3.2 *Imagining the worst-case scenario triggering safety concerns*

Apart from the lack of skills and knowledge contributing to the fear, some participants predicted the worst-case scenario in their mind of their family, peers or themselves being harmed by the item. The fear of being held responsible for harm may contribute to greater safety concerns and being discouraged to try to repair. JC06A and SW04A who are both caring for children were particularly concerned for the safety of others and were less likely to try to repair items themselves:

> *''Am I going to kill myself or somebody else concerns about electrical repair kind of things'' [JC06A]*

> *''I would not know how to take the inside of a radio apart and put it back together and I'd be wary of electricity, making something unsafe for someone and get electrocuted''.* [SW04A]

The safety of his family members concerned JB09A who has more experience repairing. He wanted people with less experience to come to him for help as he did not believe they had the experience and knowledge to deal with EEE. His sister's health and safety concerned him greatly:

> *''When she came to repair electrical things then it is not good because she will put the wire in the wrong way and not make sure that the right amount of insulation is ripped off or things like that. So, I am very conscious about her being able to repair electrical things. If you got something electrical that need repairing so ask me before trying to do it yourself.''* [JB09A]

Ensuring the constant safety of family members may hinder the possibility for the less experienced members of the family unit to learn through trying and failing.

5.6.3.3 *External influence of parents and companies on the level of safety concerns*

JC06A highlighted that the constant communication by the media and companies around safety amplified her concerns. As a result, she is reluctant to try to repair and needs help from someone with more expertise:

> *"I think also when thinking of the electricals behind them there is the safety aspects. The safety worries have probably gone up as well. We got a lot of warning, don't open the cover, don't know what to do, only let experience people qualified people do things.* […] *These things kind of put you off. Those big warnings signs, safety culture. It has been off putting to me..."* [JC06A]

Her safety concerns also stem from her childhood experiences as she recalled her parents preventing her to engage with items:

> *''I can hear my parents saying that it could be dangerous.''* [JC06A]

5.6.3.4 *Identifying oneself as risk averse*

Some participants with low PRP identified themselves as risk-averse or cautious by nature which reinforced their attitudes, beliefs, and behaviour that they are unlikely to try to repair because of the safety risks:

''Generally speaking I am risk-averse, so I would not pull it out and pull it back in again. I would say do not mess with it.'' [FW03CA]

''I am a bit more cautious by nature. [JC06A]

5.6.3.5 *The type of items and issues trigger safety concerns*

Participants with lower repair propensity considered repairing items that present fewer safety risks to lower their concern. RB05A indicated that she prefers objects that offer low risk of electrocution. SW04A avoided mains electric for safety reasons, and JC06A chose to avoid most item that may present safety risks:

''I'd be much happier to repair something that did not involve electricity say a battery-operated thing then you know no one is going to get electrocuted that badly'' [RB05A]

''Something you could get electrocuted from I'll be wary off and I would not mess with it apart from that transformer, I would not mess with main electric for safety'' [SW04A]

''There are times when I have avoided, I negated it in the sense of just thinking […] *it is too dangerous. it is a bit of a cop out avoidance''* [JC06A]

The type of damage can also discourage participants from trying to repair because of the safety implications. DMT06A had a blender that exploded. The content of the mixer went into the mechanisms. She decided to not clean the item because of the safety implications (DMT06A - Blender):

''I put it on and it exploded everywhere. It went into the mechanisms, we opened it up, but we could see it was destroyed it was not even completely mixed at this point. They coated all the inside. We realised there is no way of cleaning, it will not be safe to do it.'' [DMT06A]

5.6.4 Environmental concerns

Environmental concerns were a factor influencing participants to consider what were the appropriate behaviours to embrace for the protection of the environment and what was not. JC06A considered that caring for an item is the reflection of the care one has for the planet. On the other hand, HW01D pointed out that the disposal of objects is an act harming nature by creating pollution. She thought that the prosumer should take responsibility for their actions:

'' we have a duty of care for things, I suppose. We have to use items with care, you know […] *It is perhaps an intuitive care for the whole planet but in kind of broad term. Is what we do for life, does it reflect in our wider care for the environment so in the same ways you are going to care for the living you are going to care for the non-living* […] *they are helping us to live our lives in a positive manner. So, we should perhaps have more considerations over their care''* [JC06A]

''So I think when you are throwing something out without thinking about it you bear part of the responsibility for the pollution that comes out of that.'' [HW01D]

The prosumer's environmental concerns is likely to encourage more product care and possibly greater product retention.

Participants, who embrace a sustainable lifestyle, experienced feelings of guilt from failing to repair small electrical items and being forced to dispose of them. HW01D had high awareness of the impact of her consumption on the environment. She expressed frustration and guilt towards herself for having to throw away and not living up to her personal goals:

> *''The frustration will be with myself because I'd be conflicted* […] *because I do not like to throw things away I suppose''.* [HW01D]

> *''The guilt is with myself* […] *because I was not managing to live up to my own standards on how I wanted to live''.* [HW01D]

Most participants expressed both sadness and anger from thinking that items may end up in landfills and contribute to the pollution of the environment. DMT06A highlighted how sad it is to know that an item will end up in a landfill after being disposed of. JC06A considered how depressing the landfill is and how repair may reduce the number of items going there:

> *''Something in which a lot of resources and effort having put in to and if we have to throw it away, this thing has to be disposed of and just be dumped in a landfill site and that is something that is very sad.''* [DMT06]

> *''I have been to the tip a while* [ago]*…. It is depressing. So, this is part of the solution to carry out simple repair''* [JC06A]

5.6.5 Product retention tendency

Product retention tendencies enable repair behaviour. For example, participants with high PRP retained parts to repair other items. RB05A who is married to an engineer described her home be more like a workshop than an actual home because her husband liked to retain items for future repair projects. WK07A also dismantled objects to keep the parts:

> *''If I fail which obviously happens. I don't throw it away, I think about the components. Can anybody else fix it. Can I reuse any of the components? I don't know. Call it hoarding!* [laugh] *I don't know how I become like that. I like to retain things that are of use.''* [WK07A]

Through the repair processes, participants with low PRP kept objects until the opportunity arose for repairing them. They went for example to community repair events when they learnt about it happening (FW03C – DAB Radio, DMT06A – Headlamp). DMT06A who was unable to find a spare part for an e-reader kept it in the eventuality that she found a spare part (DMT06A – E-reader).

5.6.6 Concern for humanity

Concern for humanity was a factor that emerged through the analysis of the interview data. Most participants were conscious of the resources required through the supply chain to manufacture items such as energy, water, natural materials, and human capital. They were aware of the pollution associated with the disposal of an object. They were also aware of how pollution impacts on human's wellbeing. Participants considered the effects of their behaviour on others and the environment. Some participants were alerted by the welfare of individuals involved in the production of goods, such as FW03A:

> *''I know that […] they are humans who are making the plastic, chopping down the trees, they are sailors on the boats, and the human exploitation all the way through the supply chain''* [FW03C]

HW01D considered the impacts of electrical waste pollution on the population living in developing countries and felt that this was in part the fault of the consumer:

> *''Apple were dumping all their electronic products in a river bank somewhere in Kenya where there are less restrictions. And it was just polluting everybody water in this area. So, I think when you are throwing something out without thinking about it you bear part of the responsibility for the pollution that comes out of that.''* [HW01D]

The concern for humanity can influence PRP. It can also discourage the acquisition of items.

5.7 Attitudes towards trying to repair

Attitudes towards trying to repair include attitudes towards succeeding, failing, and the process of striving to repair. From the thematic analysis, there were differences of attitudes between participants with higher PRP compared to prosumers with lower PRP. Participants with higher PRP did not feel as upset from failing than individuals with lower PRP. It might relate to their repeated experiences of trying to repair which shift attitudes towards failing. Participants with higher PRP considered the repair activity as an opportunity to further their knowledge and experience as well as fulfil their interest in the subject rather than a process limited to the reestablishment of the item function. WK07A experienced failure in such ways that his focus shifted from the end outcomes (i.e. repairing the item) towards the other benefits he gained through the repair:

> *'' If you do not fix something you learn about the materials about the physical properties of that item and you learn not to buy them again. Even in failure you still gain bit of information, so it is not negative''* [WK07A]

In regard to the participants' attitudes towards the process, low self-efficacy beliefs were identified to foster negative attitudes. JC06A, for example, became troubled by the thoughts of trying to repair her broken carpet sweeper. FW03C displayed signs of worry and anticipated that she would have more problems if she tried to repair an item:

> *''*[The carpet sweeper] *has just broken. It kind of scared me, in terms of where to start in terms of trying to how to do it about that.''* [JC06A]

> *''I am worried that I'll break it and make it worse than in the first place''* [FW03C]

5.8 The processes of change

The analysis allowed the identification of the pros and cons of repair as described in the TTMC model of change. To avoid repetition of the previous sections, the tables (Table 5-3 and Table 5-4) present what hinder and support repair behaviour in one sentence description. In brackets, there are indications of whether the description concerns a social (SF), asset (AF), market (MF), product and services (PS) or consumer factor (CF) and cross-references to sections within the chapter. Figure 5-2 is a visual representation of the results on how the processes of change related to the categories of factors influencing repair propensity.

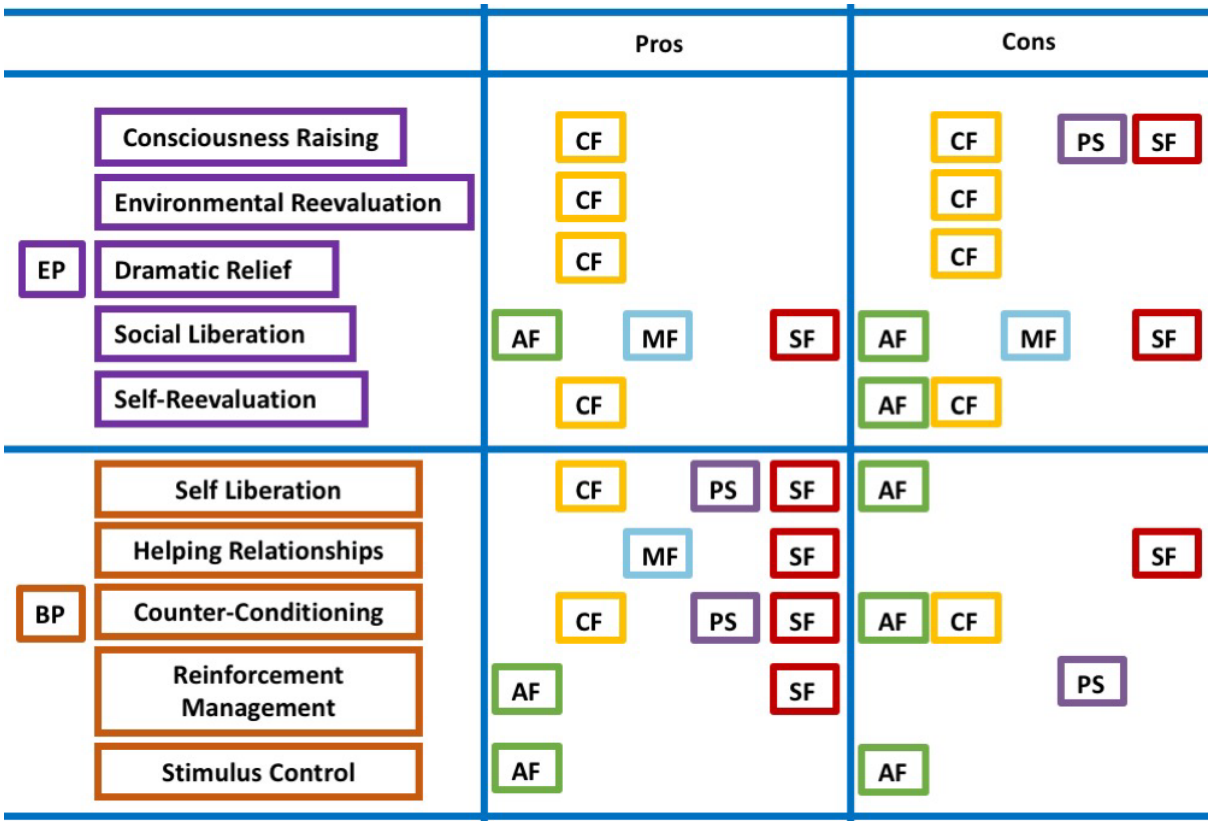


Figure 5-2 - Pros and Cons to Repair and associated categories of factors in relation to the processes of change

To summarise the pros of change, the experiential processes supporting change include consumer factors predominantly. The innovativeness traits, environmental concerns and concerns for humanity support the prosumer to decide to commit to repairing. For the environmental opportunities that exist to show society is supportive of repair, the participants considered the influence and support of their family and peers, repair communities and companies that support repair. They recalled their childhood experiences at home and through education.

The behavioural processes of change supporting repair include amongst others, social factors. The participants performed repairs for their community, ask for help from people around them or created a shared expectation in their family or peer group that repair is a behaviour to adopt. They also owned assets that support them to repair such as the skills, tools and a conducive environment. They turned to manufacturers and retailers and went to repair events for further support.

To summarise the cons of change, the experiential processes hindering repair include the lack of assets factor predominantly. The participants do not have the skills, knowledge, time to make repair behaviour a part of who they want to be. They also have safety concerns and worry of harming others through the repair process. They are also anxious about how to proceed with the repair because they lack the knowledge and experience. Product and service factors also influence their perception as the item is expensive and complicated to repair. For the environmental opportunities that exist to show society is unsupportive of repair, they had cues from their family, especially their children that repair is unsupported. Most people around them including friends were also not supporting repair. They regarded school education to be unsupportive of repair. They perceived manufacturers and retailers as the primary entities that do not support repair.

The behavioural processes hindering repair include the lack of assets to repair such as the tools, spare parts, an adequate environment to repair or the lack of financial resources to buy repairable items or parts to fix. They may not ask for support from their friends because they do not share the same environmental values, or they find inconvenient to go to repair community event because they are too far. They may try to commit to the repair but found that the item was not repairable, spare parts were not available or too expensive to purchase.

Table 5-2 - Pros to repair

Process of change		*Description of processes of change*	*Sentence description (Factor and Cross-referenced section)*
Experiential	Consciousness-raising	Increasing awareness about the repair behaviour	They have strong awareness of environmental issues (CF - 5.6.4)
	Dramatic relief	Emotional arousal about the repair behaviour, whether positive or negative arousal.	They feel frustrated when they have no control over their environment (CF- 5.6.1) They feel negative emotions thinking about items going into landfill (CF - 5.6.4) They feel guilty when they do not live up to who they want to be (CF - 5.6.4)
	Self-re-evaluation	Self-reappraisal to realise the repair behaviour is part of who they want to be.	They are happier, innovative and ingenious if they try to repair (CF -5.6.1) They need power and control over their environment (CF - 5.6.1) They bear the responsibility for the harm they cause (CF - 5.6.4)
	Environmental re-evaluation	Social reappraisal to realise how non-repair behaviour affects others.	They have concern for humanity (CF - 5.6.6)
	Social-liberation	Environmental opportunities that exist to show society is supportive of the repair behaviour.	Their parents and grandparents used to repair (SF - 5.2.1.1) They have shared expectation in the family to repair (SF - 5.2.1.1) Environmental and High PRP peers are supportive of repair (SF - 5.2.2.1, 5.2.2.3) Education supported the acquisition of repair skills (AF – 5.3.3) Repair community are supportive of repair (MF -5.4.1) Some companies have repairable products and resources (MF - 5.4.1.1)
Behavioural	Counter-Conditioning	Substituting repair behaviours and thoughts for non-repair behaviours and thoughts.	They encourage people to repair (SF – 5.2.) They buy items that are repairable (PS - 5.5.3.3) They keep items for future projects (CF - 5.6.5)
	Stimulus Control	Re-engineering the environment to have reminders and cues that support and encourage the repair behaviour and remove those that encourage the non-repair behaviour.	They have a workshop space to engage with repair (AF – 5.3.5) They have tools to repair. (AF – 5.3.6) They have the skills to manage safety risks and repair (AF- 5.3.1, CF – 5.6.2)
	Reinforcement management	Rewarding the positive repair behaviour and reducing the rewards that comes from negative non-repair behaviour.	They get satisfaction and financial rewards from helping people (SF – 5.2.2.3) They gain spare parts when failing to repair (AF – 5.3.8) They gain satisfaction from learning to repair (Attitudes – 5.7)
	Helping relationship	Finding supportive relationships that encourage the desired change.	Family and peers asked for repairs and they help them (SF – 5.2.2) They receive help from family and peers (SF – 5.2.2) They contacted manufacturers and retailers for help (MF – 5.4.1) They went to a community repair workshop (MF – 5.4.3)
	Self-liberation	Making a commitment to change	They have shared expectation in the family to repair (SF – 5.2.2.) They commit to not act like other who shop and dispose of items (SF – 5.2.2.2) They commit and promote greater consumer responsibility (SF – 5.2.2.2) They committed to repair because of their attachment to the item (PS – 5.5.2) They committed because of environmental concerns and concern for humanity (CF – 5.7.3, 5.7.5)

Table 5-3 - Cons of repair

Process of change		*Description*	*Cons*
Experiential	Consciousness-raising	Increasing awareness of the repair behaviour	It is cheaper to buy new than to repair (PS – 5.5.1) Items are becoming more complicated to repair (PS – 5.5.3.2) Repair is dangerous (CF – 5.6.2) Some items are not designed to be reparable (PS – 5.5.3.)
	Dramatic relief	Emotional arousal about the repair behaviour, negative arousal.	They are anxious around the repair process (CF – 5.6.1) They are nervous and anxious to repair because of safety (CF – 5.6.2)
	Self-re-evaluation	Self-reappraisal to realize the repair behaviour is not part of who they want to be or who they are	Their experiences of repair have not been successful (AF – 5.3.2) Their education did not support the acquisition of repair skills (AF - 5.3.3) Their current roles do not give them time to repair (AF – 5.3.4) They are risk averse (CF – 6.6.2)
	Environmental re-evaluation	Social reappraisal to realize how the repair behaviour (may) affects others.	They are scared of harming their family (CF – 5.6.2)
	Social-liberation	Environmental opportunities that exist to show society is not supportive of the repair behaviour behaviour.	Family members are unsupportive of repair (SF – 5.2.1.2) Most people around them do not repair, they want things now. (SF – 5.2.2.2) School education do not support repair (AF – 5.3.3) The internet makes it easier to buy new (AF -5.3.6) Advertisement supports consumption as opposed to repair (MF – 5.4.1) They are not many companies that makes reparable items (MF -5.4.1) Communication by companies that repair is dangerous (CF/MF – 5.6.2)
Behavioural	Counter-Conditioning	Substituting non-repair behaviours and thoughts for repair behaviours and thoughts.	They have a second-hand item to use instead of trying to repair (CF/AF – 5.6.4) They retain items instead of trying to repair them (CF – 5.6.4)
	Stimulus Control	Re-engineering the environment to have reminders and cues that hinder and discourage repair behaviour behaviour and support those that encourage the non-repair behaviour.	Their home is not adequate to repair (AF -5.3.5) They do not have the tools or required equipment to repair (AF – 5.3.6) They do not have the financial resources to get items repaired or buy repairable items (AF – 5.3.9) They do not have the skills and knowledge to repair (AF – 5.3.1)
	Reinforcement management	Rewarding the non-repair behaviour and reducing the rewards that comes from repair behaviour.	They used a second-hand item instead of trying to repair because the spare parts is expensive. (PS – 5.5.1)
	Helping relationship	Not finding supportive relationships that encourage the desired change.	They do not ask for support from their friends (SF – 5.2.2.2) They live far from town, so they cannot engage with repair community (MF – 5.4.3.1)
	Self-liberation	Making a commitment to not change	They did not get the parts to repair so they gave up (AF – 5.3.8) The cost of a spare part was too high, so they gave up trying to repair (PS – 5.5.1)

5.9 The Repair Process

The analysis of the factors, attitudes, process of change as well as thirty-four repair processes drawn out from the interviews and video-elicitation exercises supported the identification of combination of factors that significantly support or hinder the prosumer from repairing. It also contributed to the improvement of the repair process developed in Chapter 4 to include an additional stage:

- **Stage 0 – Pre-decision.** It includes the predispositions of the prosumer to engage with repair.

The following figure presents the updated repair process:

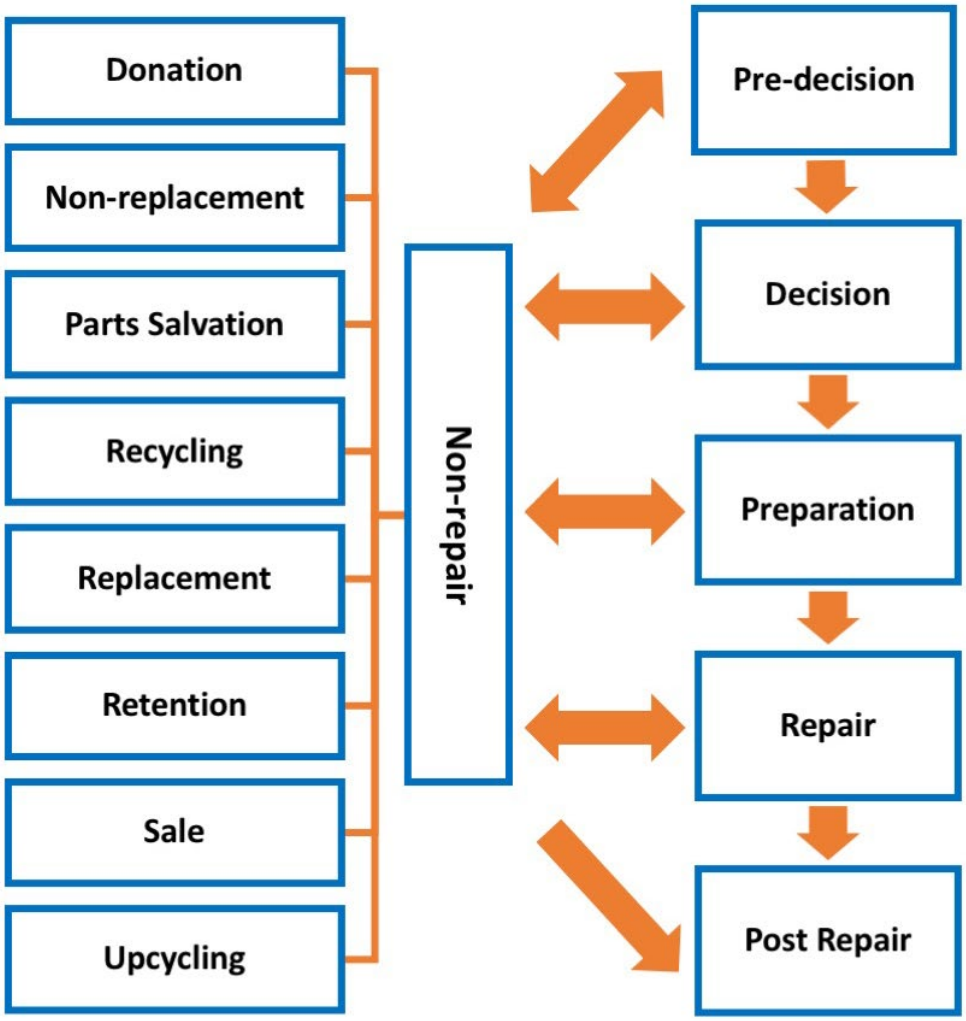


Figure 5-3 - Updated Repair process

The following sections only present significant and new information which enrich the understanding of the stages. It then introduces the combination of factors that are favourable or unfavourable to complete a repair.

5.9.1 Stage 0 – Pre-decision

The pre-decision stage includes the predispositions of the prosumer to engage in the repair activities prior to the breakage of an item. As identified through the processes of change (Section 5.8),

experiential processes of change can support or hinder the prosumer to engage with the repair activity. Their consumer traits including their innovativeness traits, environmental concerns, their concern for humanity, product retention tendency, safety concerns are influential in determining whether or not they will engage with repair in the future. Those traits are nurtured through their past experiences during childhood at home and schools and through their adulthood. Their perception on how their peers and family, manufacturers and retailers, repair shops support repair also influence their future decision to repair. Their beliefs surrounding repair, the cost as well as the perceived reparability of the item may also influence whether they will decide to repair in the future.

5.9.2 Stage 1 – Decision

The decision stage concerns the decision to repair as the prosumer assesses the item against their circumstances and level of skills while being influenced by their pre-dispositions to repair. The prosumer is concerned with the item's repairability considering its design as well as the cost of repair. They also assess whether they have the skills, knowledge and other resources to repair. They consider the support of others in carrying the repair through. The prosumer also uses past experiences, initial predisposition and attitudes towards repair to help them in their decision to pursue the restoration. The acquisition of an item that is repairable, such as HW01D's Fairphone, can support the prosumer in their decision to repair the item:

> *'' I bought a Fairphone earlier this year. Because, it supposed to be fairly easy to repair, and they'd got a lot of tutorials is online. I have got quite an in-depth website with a lot of instructions in how to repair it. I need to. So, I am hoping that if I break that. I would be able to use the tutorials to repair it myself''.* [HW01D]

The experiential processes still influence the prosumer to repair as they still reflect on the pros and cons of repair.

5.9.3 Stage 2 - Preparation

The preparation stage includes the gathering of assets and relationships necessary to repair. The prosumer draws on their assets, including their skills and expertise as well as the resources they can gather (tools, parts, documentation, financial resources, time, and conducive environment) to repair the object.

Through the analysis, a significant activity was the engagement of the participants with peer or family members, or market stakeholders (e.g. a repair technician). The interaction was significant for participants to get the appropriate advice to pursue the repair of the item. They were receiving instructions to follow so they can complete the repair of the item. The peer and family and market actors acted as unintentional mentor facilitating the interaction of the prosumer with the item. FW03C received instructions to diagnose her computer by calling a computer technician (FW03C – Desktop computer). DMT06A and D08 were advised to go to a repair community to get their item repaired (DMT06A – headlamp, D08 - Laptop). JB09A, HW01D and DMT06A were advised to buy specific parts so they can pursue the repair (JB09A – Cartridges, HW01D – Hoover, DMT06A - E-reader).

Another essential activity through the preparation phase was the possibility to diagnose the item. It supported the participants to figure out what were the required assets for repairing the item. Although some diagnostics do not need much skill, such as checking a wire for short connections (FW03C – Charger), the analysis of the processes showed that the diagnosis of the item involved

some reverse engineering skills. The prosumer deconstructs the item to learn how it works so they can develop hypotheses as to why the object may not be working. Participants with higher PRP appeared to have greater ease in developing hypotheses because of their experiences and their greater innovativeness traits.

The diagnosis of the item can:

- Help the prosumer to develop a solution to solve the problem inhibiting the function of the item. SW04A, who had lower repair skills, developed a solution to make her television work by observing how it was made (SW04A – TV). She also identified that her oven clock was responsible for stopping her oven working (SW04A – Oven).
- Provide information on which the individual can reflect whether they have the capabilities to repair the item.
- Indicate whether the item is safe or not to attempt repair. SW04A enquired the help of a repair community to check if the item was safe or not to repair (SW04A – Toaster).

Access to online information allowed people to self-learn how an object works and how to fix it. The autonomous self-taught process enabled by online resources supports the prosumer to develop skills and to gain confidence. Companies became education providers by creating platforms with information to repair. Fairphone is a good example where the prosumer can acquire knowledge and skills as well as tools to diagnose what is wrong with the item (HW01D – Mobile Phone). YouTube, for access to manuals and guides, is another crucial tool for enabling repair education. Access to spare parts online also supports the prosumer. The contrary hinders it. DM06A had great difficulty finding a spare screen for her e-reader on the second-hand market (eBay), which may be partly due to prosumers not seeing any value in selling their broken items (DMT06A – E-reader).

5.9.4 Stage 3 - Repair Stage

The Repair stage incorporates all the activities necessary to re-establish the item's functionality; it is where the gathered assets are applied. For small electrical items, the participants participated in the same activities identified in Chapter 4:

- Disassembly of the item to help assess whether the item can be repaired, to access specific parts and/or to figure how the item works
- Removal and replacement of parts
- Reassembly

They also engaged in other activities such as:

- Testing and resetting system
- Travelling to a third party to get the item repaired
- Paying for third party services
- Learning how the item works and is being repaired
- Collaboration with a third party
- Recording of information

Through the analysis of the repair process, dismantling and reassembling were the most mentioned activities.

Many of the repair processes involved the engagement with a third party to repair the item. Through the engagement, most participants gathered new knowledge on how an object works and how to fix it. DMT06A engaged with a repair community and learnt for example that a piece of cardboard had been used to repair a lamp (DMT06A - Lamp). She also learnt from a volunteer at a repair event that she did not put the battery properly into a headlamp which explained why the item did not work (DMT06A – Headlamp). In other cases, participants did not obtain any new information on how an object is repaired (FW03C – DAB Radio) or that the item is repaired by a professional repairer who did not engage with the participant when fixing the item. When involved with a professional

repairer, the repair may add additional cost overheads, such as the cost of the repair itself (including parts and labour) as well as the cost of travelling to the place of repair (SW04A – Laptop). Innovativeness traits are important to have during the repair phase to manage safety concerns that may arise.

5.9.5 Stage 4 - Post-repair

Post-repair stage is the assessment of the repair attempt outcome. From failing to repair an item, participants gained knowledge on how an item works, information on how to upcycle an item (SW04A – Toaster), parts to be reused (WK07A – Magnifier from Camera), and understanding how difficult it is to find parts (DMT06A – E-reader). Product care was another outcome from failing to repair a previous broken item. For example, DMT06A took particular care of her replacement e-reader to ensure that it would not break.

The success of repair generated a positive economic outcome for the participants. It saved, for some participants, the purchasing of a new replacement item. WK07A who repaired items for his acquaintances received a down payment for his effort; recognition of his productiveness by his acquaintances. The success of repair also has social significance. It does not only help the owner of the item or the one who repaired it, but it can support a whole community in its functioning. JB09A, for example, repaired a screen at his local church for the community to be able to use. The ongoing engagement with a repairer and the beneficiary can strengthen the bond between them to the extent to which they can together tackle more significant repair issues. SW04A is a prime example of a prosumer who took the opportunity to get the help of an electrician who was not qualified to repair. Other outcomes of repair include the recognition of the perceived repairability of the item. It also provides cues on how much it costs to fix. Another tangible outcome of repair is the gathering of information on the process of repair, as such, WK07A recorded the repair process through pictures and writing on his computer.

5.9.6 Non-repair alternatives

When the item broke, most participants with low repair propensity retained the item especially if they did not have the skill to repair until they found someone to help them. Participants with higher repair propensity kept the item for spare parts.

5.9.7 Critical combination of factors hindering or supporting repair

The highest combination of factors for success was when prosumers engaged with family members, peers, repair shops, manufacturers and retailers to try to repair their items. Success occurred when at least one of them have the skills and experience to repair and when market actors give access to the information and parts to try to fix the item. Failure occurs when the prosumer does not engage with people who have the skills to repair and do not attempt to find out whether people have the resources to help them. They tend to retain the item at this point hoping eventually that an opportunity may arise to engage with repairers. Failure also occurred when one of the actors was not able to access parts, dismantle the item and simply when the item was not reparable.

5.10 Integration and Conclusions

The Prosumer study provided valuable insights on the factors influencing PRP, attitudes towards trying to repair, the processes of change and the process by which prosumer engage with the repair activity. The conceptual framework on the factors influencing repair propensity (Figure 5-4) and the

Repair process Model (Figure 5-5) were further developed through the integration of the findings from the Prosumer Study with the results of Survey Study.

Regarding the results, the most critical factors related to the access to assets and the engagement of the prosumers with actors who have either the resource or the knowledge to help with the repair. Design features of the item are also significant for the prosumer to disassemble the item. The results made apparent the exchange of assets and resources that occurs between the prosumer and other actors (inc. peers and family, manufacturers, retailers, repair shops, and repair community).

The findings resulted in an additional stage to the repair process to reflect the significant role of consumer traits (inc. innovativeness, frugality, product retention tendency, environmental concerns, safety concerns) and the prosumer's perception of support in influencing the prosumer's predisposition to engage with the repair activities after analysing the processes of change. The prosumer past experiences through childhood at school and at home, as well as in adulthood nurture those consumer traits and the inclination to repair. The perceived (or lack of) support of the various actors also influences prosumer predisposition to repair. When the prosumer observed that their peers are not inclined to engage with repair, they were less likely to share with them their attempt or desire to change. They were more likely to turn to people they perceived shared similar values as them. During the preparation phase, the prosumer tried to engage with market actors for support but did not always find support and had to turn to repair communities in order to pursue the repair further. The latter might foster a lack of trust in the ability of market actors to support the prosumer in pursuing the repair of an item.

The findings further refined the decision phase reflecting how the prosumer assesses the item's repairability in relation to their skills and knowledge as well as their initial predisposition.

The preparation phase remains critical for the prosumer to gather all the resources to engage with the repair of the items. The availability of spare parts is essential for the prosumer to pursue the repair. Market actors play an important role in providing spare parts as well as the prosumer who resell spare parts on online trading second-hand websites (eBay). The findings reconfirmed the importance of designing items that easily disassemble so that the prosumer can repair the item. The labelling of parts also supports the prosumer in trying to repair the item.

The findings highlighted, in the post-repair phase, many repair outcomes as the prosumer gain both additional assets as well as social connection to support him to repair in the future. They also obtain knowledge about the items that if leveraged could benefit market actors in remanufacturing and designing more repairable items

Regarding the findings related to the attitudes towards trying to repair, participants with higher PRP appeared to be better able to deal with negative emotions such as fear, anxiety because of safety issues, and annoyance towards others not being supportive of repair. They directed their attention instead to the repair process and what they would gain through their success such as learning more about how items work. It highlights how negative emotions and feelings may distract the prosumer from using their reasoning to find a solution to repair an item. The attitudes towards trying showed the extent to which prosumers with lower PRP grapple with anxiety by thinking about the repair process and the safety risks. Other differences highlighted that participants with higher PRP displayed stronger self-efficacy beliefs that supported them to repair. They also acquired over time the assets that would help them to repair an item. Participants with higher PRP had more experience and knowledge in trying to repair, having engaged with manufacturing and repair processes through their childhood, at school, and at home with their family. They were particularly productive in trying

to repair items for themselves as well as for their community and had a strong self-interest in understanding how items works and were confident in their abilities. Gaining pride from positive repair outcomes may also foster a greater sense of wellbeing. While the evolving government and industry agenda may constrain the role of schools to educate the prosumer to repair, some participants self-educated by using resources online provided on peer-to-peer sharing platforms or by companies (e.g. Fairphone) and by engaging with people who have more experience in trying to repair (e.g. repair community).

The limitations of the research study relate to the small sample approached for the research. The majority of the participants were either retired or self-employed. As a result, the findings may not reflect the constraints the prosumer experiences when working full-time as well as the ingenuity they may display in trying to get their item repaired. Further research needs to engage a larger group of individuals with various work status to allow comparison.

The following chapter discusses the findings in light of the literature and provides recommendations as to how the prosumer can be further supported to repair.

*****: Factors identified in both QUAL/ QUAN**

****: Critical factors for successful repair (QUAL)**

***: Most significant factors (QUAN)**

: Significant factors (QUAN)

*: Important factors (QUAL)**

Figure 5-4 - Factors influencing PRP identified through the in-depth prosumer study

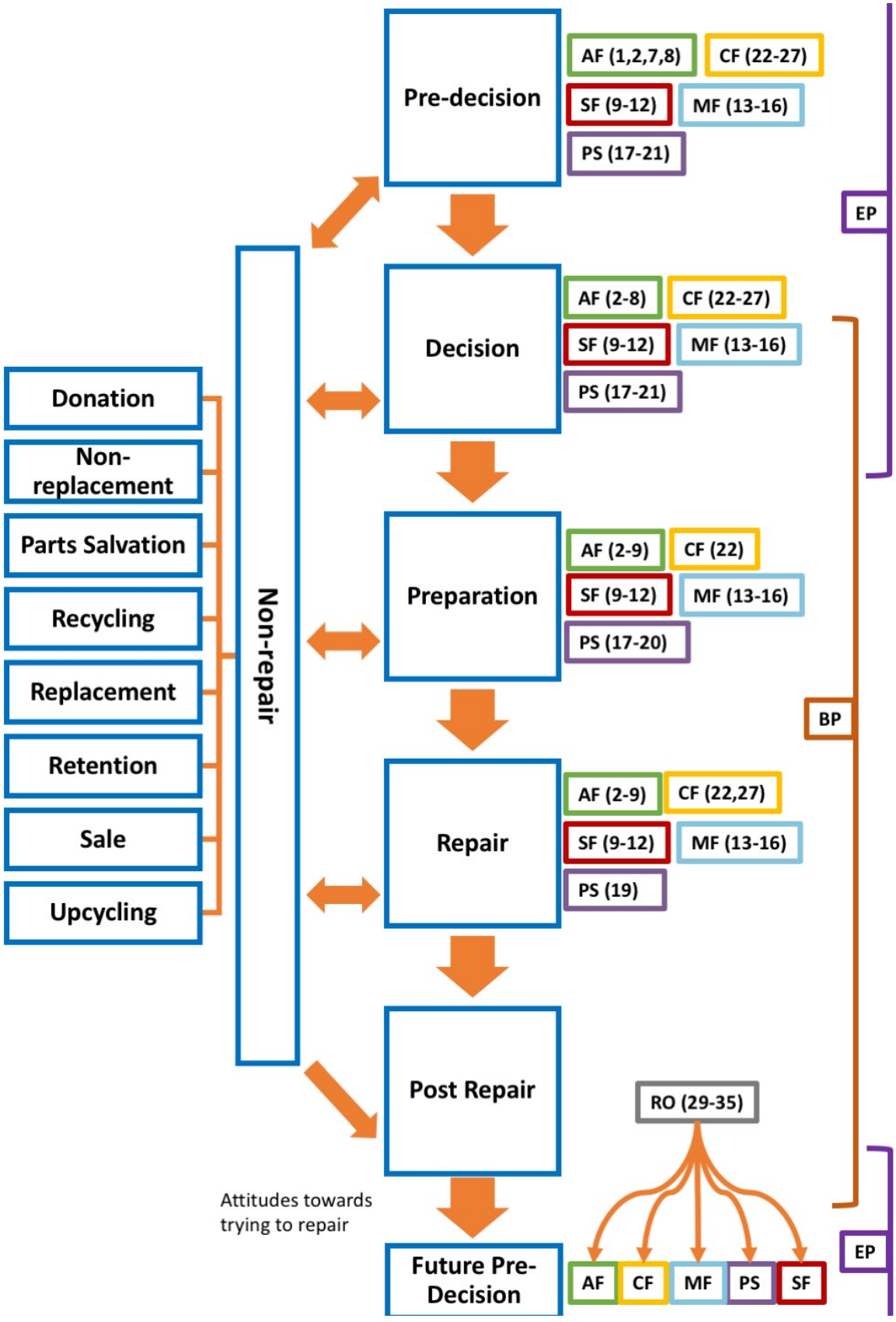


Figure 5-5 - Repair process with associated factors influencing PRP

CHAPTER 6: DISCUSSION

This chapter reflects on the research project and discusses its outcomes. The chapter begins by reviewing whether the research addressed the research questions. It then draws on and discusses some topics, based on the findings, their implications in practice and this, in light of previous literature. The discussion closes with a reflection on the pragmatic approach taken in this research using behavioural frameworks and additional thoughts.

6.1 Introduction

The research explored Repair as an activity the prosumer can adopt to support the transition towards the CE, a regenerative system that intends to blur the line between production and consumption. The thesis supports the importance of understanding the prosumer further inviting designers not only to design interventions for behaviour change but to be as Lockton (2013) suggests to become the counsellor supporting the prosumer in their evolution. The investigation of PRP used behavioural frameworks and existing research on PRP to create a multi-dimensional object. As an outcome, the thesis developed original frameworks (See Figure 6-1) illustrating the process by which prosumers repair and how a myriad of complex and inter-related elements influence and affect their behaviours. The framework is not intended to support designers in developing one size fit all solutions so that the prosumer can engage further with repairs. The findings confirmed that Repair is singular and idiosyncratic because the individual's circumstances, level of skills and the object state are themselves singular (Graham & Thrift, 2007). For that reason, it imposes the production of a specific solution by the prosumer using their agency and self-efficacy. Instead, the framework is an invitation for the designer to develop some sensibilities when engaging with the prosumer. So, they can support the prosumer to identify through their past experiences and current circumstances what supports or hinders them from participating further with the repair process. The intent is to help the prosumer to define their role as a citizen by identifying the behaviours they need to embrace through their everyday lives that would facilitate the transition towards a CE.

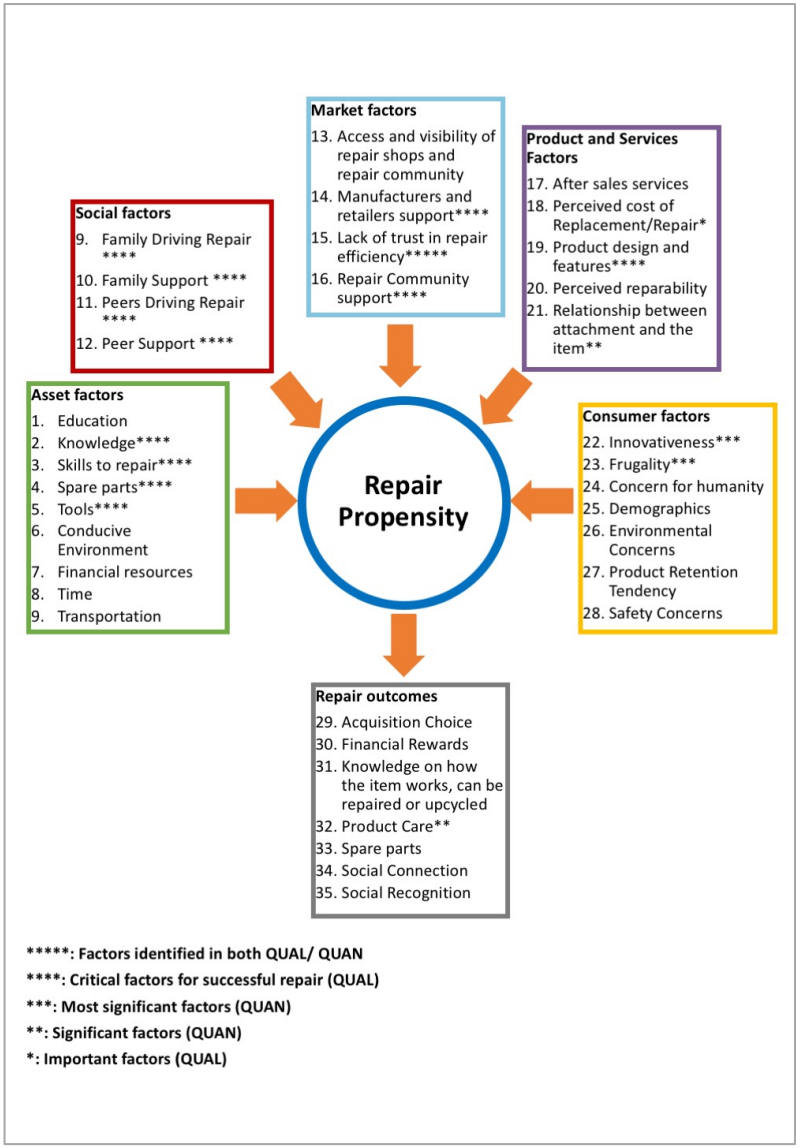
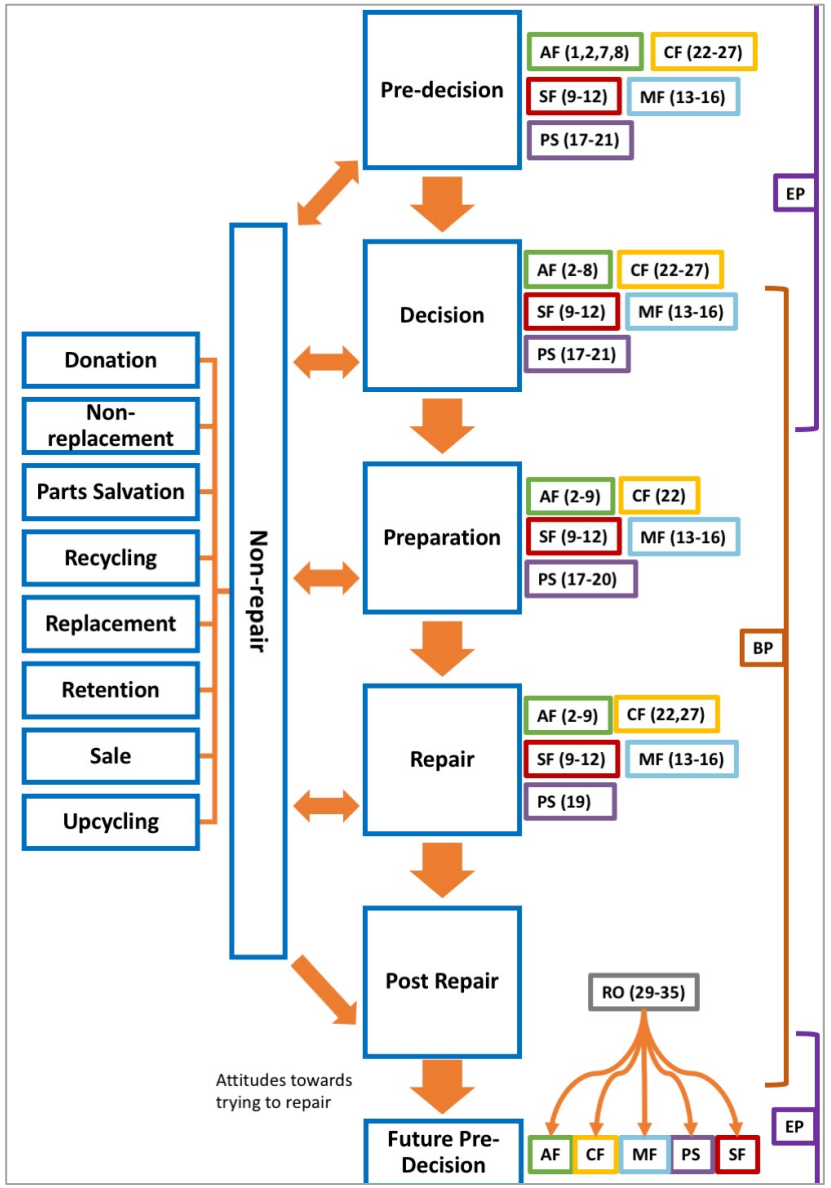


Figure 6-1 - Outcome from the Research - Factors influencing PRP & Repair Process Model



6.2 Addressing the Research Questions

The following sections address the research questions for the investigation.

6.2.1 What are the factors influencing PRP?

The Survey study identified frugality and innovativeness as the most significant factors influencing repair propensity through the quantitative analysis. It aligns with the findings of Scott & Weaver (2014), although in their research, stewardship as a latent construct of repair was more significant than thriftiness in the Survey Study. Similar to Scott & Weaver (2014), environmental concerns was not a significant factor influencing repair propensity. The qualitative analysis in the Survey study identified the cost of repair as a significant deterrent from trying to repair small electrical items which align with previous research in the area (Scott & Weaver, 2014; Lilley et al. 2013; McCollough, 2009). The qualitative analysis allowed to identify the role of peers and family in supporting the repair of small electrical items as well as many assets the prosumer needs for repairing the items. The Prosumer study allowed to identify the most significant role of the prosumer's relationships, access to assets including having the skills and knowledge to repair and the object state. It aligns with the notion that repair involves the development of a specific solution according to the prosumer's circumstances, skills and the object state (Graham & Thrift, 2007). The circumstances of the prosumer in this instance concerns their access to resources and the level of support they can receive from the other prosumers they have access to, and it includes their peer and family, manufacturer and retailers, repair shops and repair community. The Prosumer study also helped in identifying the role of past experiences in nurturing further some significant traits of the prosumer in trying to repair.

6.2.2 What are the attitudes towards trying to repair?

The research question emerged through the review of the literature and the choice of the TT to aid the research investigation. The TT was deemed a suitable theory to understand the prosumption process compared to traditional attitudinal theories (Xie et al, 2007). The prosumption process was identified as being difficult to engage with, vulnerable to failure and required effort at goal striving. The TT would help in understanding how the attitudes towards trying to repair would support or hinder the intention to repair.

When starting the research, the author aligned their perspective with the research by Bagozzi and Warshaw (1990,1992) and Bagozzi, Davis and Warshaw (1992) indicating that both attitudes to success and failure are essential in determining intentions. However, as the research progressed, elements such as habits and past experiences as well as the perception of risks were identified to influence greatly the intention to engage with repair as well as to complete the repair process. As such, the analysis of the attitudes towards trying to repair highlighted some differences between prosumers with low and high PRP, in the way they perceived repair. It was predominantly affected by the frequency of past experiences they had in trying to repair which is likely to affect their innovativeness traits and their self-efficacy beliefs. Prosumers with higher PRP had more experiences in trying to repair and were more used to the challenges that may arise through the repair process. The attitudes towards the process of striving were identified to be significant in supporting the prosumer to complete the repair. The reasons were that the prosumer must go through a process of striving to complete several activities, which require willpower and self-efficacy with no control over the outcomes, and each activity has different impacts on the emotional state of the prosumer, which can influence whether they will carry out the repair or not. Prosumer with higher repair propensity

were more neutral in their attitudes towards the process of striving and identified both negative and positive attitudes during the process of repair. Futhermore, when failing to repair, prosumers with higher PRP shifted their attention on their gains as opposed to their loss. On the other hand, prosumers with low PRP anticipated failure in trying to repair and had strong safety concerns which deterred them from attempting to fix. In accordance with Dehart & Birkirmer (1997), the perception of risk can in some circumstances be more significant in influencing prosumers to act than their attitudes towards trying, especially because safety risks are associated with the repair of electrical items. They also made predictions on the repair outcomes that did not relate to their personal experiences in trying to repair. They were more likely to predict that the repair would fail or be dangerous than successful. The Prosumer Study helped in recognising the role of past experiences in influencing and affecting the attitudes towards the process of repair and self-efficacy beliefs or the beliefs that one can achieve a goal.

Prosumers with higher PRP were more likely to anticipate success from trying to repair than a prosumer with lower PRP. TB01E, for example, believed that caravan lights were easy to repair, and he gave it go. His past experiences in trying to repair lights had a significant impact on his beliefs that he had the abilities to restore the caravan lights. He realised upon trying that the caravan lights were harder to repair than he expected. The findings are consistent with previous research showing the role of past behaviours in supporting self-efficacy beliefs as well as attitude formation (e.g. Bagozzi and Warshaw, 1990; Ouellette and Wood,1998, Sheppard, Hartwick, & Warshaw, 1988).

The participants with higher PRP had accumulated valuable tools within their home to be able to repair. The situational differences between prosumers from higher PRP and those of lower PRP impacted significantly the extent to which repair could become a habit. The TT is limited because it does not consider the context in which the prosumer engages with an activity. Bagozzi and Warshaw (1990) insert, however, that the situational differences may influence the prosumer to form an intention to act more reactively. It could be interpreted in the context of this research as ‘’if an item breaks and the prosumer do not have the tools to repair, he is more likely to react impulsively and choose to replace as opposed to repair’’ and the opposite applies. Fortunately, by combining different lenses to understand PRP, it was possible to understand further the context in which the prosumer is forming their attitudes towards trying to repair and what may impact on their behaviour.

Reflecting upon the choice of the TT versus other model, it was considered that Stern’s Attitude-Behaviour Context (ABC) model could have potentially be more appropriate to understand PRP. In the perspective of Stern (2000) behaviour is a function of the organism and its environment where both the attitudes of the prosumer and the contextual factors influence the behaviour. In the ABC model, the attitudinal variables are broader than in the TT. They consider personal beliefs, norms and values as well as general pre-disposition to act in a certain way. Future research could make use of the ABC model to understand prosumer’s repair propensity and integrate elements of the TT to understand how external conditions and attitudes towards trying correlate.

6.2.3 *What are the processes of change?*

The findings on the processes of change are given on an indicative basis as they are the expression of the compounded voices of the participants. However, it is still possible to glean some learning from their experiences and thoughts about trying to repair and how they relate to the processes of change. The analysis of the processes of change helped in identifying the significant role of relationships in supporting the prosumer to repair. During the pre-decision stage, the prosumer reflected upon the support by society for repair. It reflects the environmental re-evaluation process. The reflection impacted on their behaviour when trying to repair as they decided to engage predominantly with people who appeared to be supportive of repair, while silencing their motivation for participating in a frugal lifestyle with those who did not seem to be supportive of the behaviour. Research interested in supporting prosumers to reduce their weight, smoking addiction and manage better their mental illness used the TTMC to identify the influence of different relationships (family, friends, professional) and recognise their significance in supporting or hindering the implementation of health programme supporting the prosumer's propensity to change (e.g. Sherman & Carothers, 2005; Sorensen et al., 1998; Wagner et al., 2004).

The literature supports the notion that relationships are significant in helping the prosumer to evolve and in turn affect the environment around them as they gathered the tools over time to pursue further repair. The quality of relationships appears significant for prosumers to fulfil their role as 'resource integrators' as they can through helping relationships gather the necessary assets to extend product lifespan.

The review and selection of the TTMC model supported the formulation of the research question: what are the processes of change influencing PRP and the research investigation? Reflecting upon the choice of the TTMC, the TTMC provided order and direction through the research investigation by first encouraging the delineation of the repair process and the of mapping how the factors affect the prosumer at different stages of the process, and in supporting the identification of the processes of change. Tools such as the contemplation ladder to identify the stage of change and existing questionnaire to identify the processes of change, were adapted for the purpose of the research and provided support in further understanding what influence an individual to change and adopt a new activity. The primary assumption on individual behaviour change through the TTMC is that it is a long, continuous, cyclical and non-decisive process. (Callaghan & Herzog, 2006; Velicer et al., 1995. The findings of the research reinforced the assumption as it was identified how social and societal support affect how the individual acquire and share further the necessary assets to repair.

6.2.4 *What is the process of Repair?*

The Repair process involved five stages as presented in Figure 6-1.

- Stage 0 – Pre-Decision: It concerns the prosumer's reflection on their predispositions to engage in the repair activities before the breakage of an item.
- Stage 1 – Decision: it concerns the decision to repair as the prosumer assesses the item against their circumstances and level of skills while being influenced by their pre-dispositions to repair.
- Stage 2 – Preparation: it concerns the gathering of assets and relationships to support the repair of the item.
- Stage 3 – Repair: it concerns the repair of the item's functionality where the prosumer applies their gathered assets and relationships.

- Stage 4 - Post-Repair: it concerns the assessment of the repair attempt and possible dissemination of assets to the surrounding circle

The Repair Model stages reflect the TTMC stages of change. At any stage of the process, the prosumer can choose to pause or end the repair of the item and choose a non-repair alternative. Product retention was a predominant alternative behaviour to repair. In the Prosumer study, it was opted for when the participants anticipated that they could eventually find the support or gather the resources to try to fix the item. In the Survey study, it was the most mentioned course of action, yet recycling and replacement were the main course of actions taken for items respondents had in the last five years. Some respondents from the Survey study would eventually get rid of the item because their motivation to repair wore off. While attachment was found to be an essential factor influencing repair propensity in the Survey study, the literature on attachment (Mugge, Schoormans, & Schifferstein, 2005) highlights that the prosumer may be attached to the item and chose to retain it. However, the lack of interaction with the item overtime may wear off the motivation to deal with it.

6.2.5 How do the factors, attitudes towards trying to repair and processes of change affect the prosumer at different stages of the repair process?

Figure 6-1 presents how the factors, attitudes and processes of change affect the prosumer at different stage of the repair process.

For the factors influencing repair propensity, all categories of factors were present for each stage of the repair process. However, each stage of the repair process defines the way the prosumer relates to the factors influencing repair propensity. For example, during the pre-disposition stage, the prosumer's past experiences nurture or hinder the development of specific consumer factors such as innovativeness, frugality, environmental concerns and safety concerns. During the decision stage, the aspects linked to the item including the cost of repair, the prosumer's attachment and the design feature, for example, influence their assessment of their circumstances and level of skills while in the preparation stage the prosumer is concerned with gathering the assets and relationships that would support the repair. In the repair stage, the design feature of the item affects the capacity of the prosumer to complete the repair of the item applying their assets or getting the help of relationships. The post-repair phase reflects the outcomes of the repair where the prosumer obtained as the result of the repair some assets including knowledge, spare parts and financial rewards, new relationships and a new perspective on the extent to which they can complete the repair of the item. The reflections will impact their future decision to repair.

The prosumer's attitudes towards trying to repair affect the prosumer pre-decision and decision to repair as the prosumer reflects on their past experiences trying to repair during the post-repair phase.

Experiential processes of change affect the pre-decision and decision stage of the repair process while behavioural processes of change affect the prosumer between the decision and post-repair phase. It aligns with the TTMC model of change.

6.3 Reflecting upon the repair prosumption process within the context of the CE

The following section reflects further on how some of the identified elements during the research affect the prosumer repair process by considering the literature and provide some suggestions on the behaviour the prosumer can engage in to support the repair of small electrical items.

6.3.1 Pre-decision Stage

The pre-decision stage includes the predispositions of the prosumer to engage in the repair activities before the breakage of an item as defined in section 5.9.1. During the pre-decision stage, the prosumer's past experiences through their childhood that nurture or hinder attitudes towards trying to repair and the development of significant traits for repair. A feature of those past experiences is the nature of relationships the prosumer has with their circle of influence. The following section reflects specifically on frugality and innovativeness traits.

6.3.1.1 *Frugality*

Frugality was found to be a significant factor influencing repair behaviour in the Survey study, especially thriftiness as an aspect of frugality. The findings differed from Scott and Weaver (2014) which highlighted stewardship as a more significant dimension of frugality supporting repair intention. The results from the Prosumer Study identified different types of frugality supporting the prosumer to repair. FW03C emphasised wanting to reduce her acquisition of goods by repairing items because of her concern for humanity. The prosumer is, in this case, motivated to engage by what is morally right (Boucher, 2017). In the TTMC, it reflects the environmental reevaluation experiential process of change when the user recognises the effect of negative behaviours on others. DMT06A emphasised the importance of saving money through the repair. The prosumer is motivated to engage in frugal behaviour because they want to avoid the pain of paying (Rick, Cryder, & Loewenstein, 2008). In the TTMC, it relates to the increased awareness that repair has benefits when the prosumer considers the pros and cons of a behaviour (Consciousness Raising).

From the Prosumer study, it was possible to identify the past experiences that support the emergence of frugality traits in an individual. The participants' memory of their parents and grandparents trying to preserve resources and the experiences they had over their lives from childhood to adulthood nurtured their inclination to repair and preserve resources. The findings align with the results by Boucher (2017) on their research about frugality amongst affluent environmentalists. Frugal behaviours are rationalized and explained by what the individuals wanted to reproduce from their parents, childhood and the experiences over their lives as opposed to their strong environmental inclination. The prosumer with pro-environmental inclination links their attitudes towards the environment and pre-existing attitudes towards the preservation of resources (Boucher, 2017). It explains why frugality was a significant factor related to PRP within the Survey study as opposed to environmental concern. Haws et al. (2012) also highlighted that frugal traits of prosumers with pro-environmental inclination relate to greater product retention tendency and innovativeness as the prosumer strives to find a solution to retain the item longer.

While frugal traits support the inclination to repair, it was not a trait accepted by the peers and family's members in the circle of the participants. The promotion of consumer restraint in tackling the challenges of climate change appears to suffer some social silencing (Zerubavel, 2006). This was also noted by Boucher (2017) in his discussion on the logic of frugality amongst affluent environmentalists. Participants in the Prosumer study were disinclined to speak about their attempt to preserve resources with people they believed did not share the same values as them. HW04A chose to speak only about repair with people who shared the same environmental values as her. RB05A felt uncomfortable with her friends talking about the new purchases they have made and had to make the conscious decision to share her perspectives on mending with them. Within the family,

SW04A had conflicts with her husband who replaced items without consulting her. Social liberation concerns the environmental opportunities that exist to show society is supportive of the healthy behaviour (Prochaska & Diclemente, 1983), it is an experiential process which affects the pre-contemplation and the contemplation stage. The perception of the lack of support from people surrounding the prosumer can affect their engagement with the repair process. It also reinforces the idea that reducing consumption within the household is an individual project supporting one's identity and affiliation to a specific social group (Cherrier, 2009). Shared environmental concerns within a peer group can be supportive in the repair process because it allows the prosumer to identify individuals whom they can ask for support to complete their project. SW04A highlighted that she would turn to people from Footpaths if she wanted help with a repair. The challenge with making the preservation of resources an individual project is that if the prosumer does not have the peer and family support, the innovativeness traits and the resources to pursue the repair; the lack of support and resources makes the intent to preserve and to make repair a habit more difficult. The prosumer needs to nurture and support those in society who are already frugal, so the behaviour is legitimised and not silent by social peer pressure to make frugality a collective project as opposed to an individual one. The goal is to make frugality more accepted and acknowledged by using cultural mechanisms and to identify what are frugal behaviours and what methods can be used to encourage them (Boucher, 2017; Pepper, Jackson, & Uzzell, 2009).

6.3.1.2 *Innovativeness*

The findings from the Study identified innovativeness as a significant factor influencing PRP. It aligns with Scott and Weaver (2014) conclusions. Lilley et al. (2013) also identified being creative and practical as identifiers amongst the fixers. The question that arises is what influences the emergence of innovativeness traits in individuals? The findings from the Prosumer Study identified that experiences within the home and at school impacted on prosumers' acquisition of skills for repair and potentially their innovativeness traits.

Prosumers with high PRP in the Prosumer Study were men whereas prosumers with low PRP were women (see Table 4 7 - Prosumer Study Participants' Profile). WK07A was introduced to broken items by his father. RB05A was introduced to darning and mending clothes by her mother. The adoption of repair by men reflected the most common gendered division of domestic labour within a family setting. Within this study group, DIY and repair activity is still an important preserve of men whereas women typically engaged in cooking, housework and child-rearing. Research by Cunningham (2001) interested in the parental influences on the gendered division of housework highlights the extent to which parents transmit gender-role attitudes to their children and to which the characteristics of the division of labour in the household influence the children's housework allocation. For example, in the case where both man and woman have a balanced shared of housework in the house, sons would more likely participate in routine housekeeping such as cleaning and cooking. A more recent study on the transmission of gendered role attitudes amongst children highlights that mothers play an important role in imparting knowledge about feminine behaviour for girls and masculine behaviour for boys (Halpern & Perry-Jenkins, 2016). Although it was not the remit of the research to look at the transmission of values from parents to children, the findings from the Prosumer Study highlighted how both SW04A and JC06A strive to give tasks to their children so that they have exposure to the concept of repair. SW04A encouraged her sons to spend time with their father, so they would learn to repair their bicycle.

The lack of exposure of children to activities such as repair and DIY within the home is likely not to ignite the desire for children to model behaviour which would nurture their innovativeness traits for

repair. DMT06A and TB09E were both concerned by whether schools currently provide the skills that would support future adults to repair their items. SW04A and JC06A both highlighted the challenges they experience in trying to transmit values of preservation to their children who were not interested. The implication of the findings reinforces the idea that the adoption of repair cannot be left to the devices of individual prosumers' interest but needs to be instead an endeavour shared and supported within the family setting.

The other significant setting that may influence innovativeness traits in the prosumer is school. Education was recognised by both Scott & Weaver (2014) and Lilley et al. (2013) to affect innovativeness traits in prosumers with higher repair propensity. After reflection of the findings from the Prosumer study, the role of schools in creating an outside-of-home environment in which the prosumers as children are together defining, assimilating and transmitting values needs to be acknowledged. Research by Harris (1995) interested in the development of children's personality highlighted that the long-term effects of childhood and adolescence peer groups on children's personality are more significant than the influence of their parents. The research emphasises the role of outside-the-home socialisation in being responsible for the transmission of culture and in influencing personalities. The Prosumer study highlighted the school experience of the participants and the role of schools in supporting them to acquire repair skills. JB09A and TB09E were both born at a time where schools taught boys mechanical and electrical skills while RB05A, FW03C and D08 learnt in the same period home economics where they acquired cooking and sewing skills. The availability of practical skills for boys at school was part of a collective project to ensure that they had the manufacturing and design skills when entering the workforce. JB09A was also part of the scouts where he developed practical skills. WK07A chose to do a vocational course in electronics which allowed him to pursue his interests in electronics. The research findings did not determine the extent to which their relationships with their childhood and adolescence peer-groups at school and through the scouts may have impacted on their willingness to take risks, to solve problems, to retain items for repair when they became adults. More research is needed to look at how the in-school culture may support and hinder future preservation behaviours. The implication of the findings also emphasises the critical role of schools in introducing the idea of repair to children. The Restart Project (2017) has developed a 10-week course programme to be run in secondary schools to transmit the notion of repair to high school students.

The findings on the attitudes towards trying to repair highlighted the importance of repeated attempts to repair as a mean to maintain and expand prosumer innovativeness traits and self-efficacy beliefs. The repeated experiences were found to be what differentiate prosumers with high PRP in the Prosumer study from prosumers with low PRP. The question that arises is whether individuals with low PRP can increase their innovativeness traits when they may not have had the opportunity through school education and family instruction to be exposed to repair. The repeated exposure to people who can or try to repair may be a significant element to support prosumers with low PRP in the acquisition of repair skills. Modelling behaviour is a substantial way for children as well as adults to pick up on behaviour. A recent experiment has shown that even in the absence of social interaction and pressure to copy, children and adults will over-imitate people who are completing a task they want to achieve (Whiten et al., 2016). They will even try to reproduce irrelevant actions. The study by Whiten et al. (2016) suggested that ''humans are opportunistic learners through their lifetime''.

Reflecting upon the literature and the findings, the implication in practice are for the prosumers to create opportunities for exposure to repair practices in social settings. Examples include repair

community initiatives such as Repair Café and Restart Party. Repair community initiatives provide an enabling space to allow individuals with low PRP to emulate people who have more experience in trying to repair. While there have not been any studies on the role of repair community initiatives in supporting behaviour change in prosumer with low PRP, research interested in the position of environmental initiatives to reduce their carbon footprint have shown a net reduction of individual's impact through their continuous involvement and even after being involved with a group (Olli, Grendstad, & Wollebaek, 2001; Middlemiss & Parrish, 2010; Fisher, 2013; Büchs, 2014). Research interested in pro-environmental intention and self-efficacy beliefs found that manipulating the collective efficacy of a group can influence self-beliefs that one is capable of change (Jugert et al., 2016). The prosumers can take the opportunities to run repair community events on school sites and workplaces to expose their community to the idea of repair. There are great opportunities for prosumers to use schools and as a site for running repair community events for families after school hours. At school, children can receive exposure to the idea of Repair in the school environment, and the parents would benefit from the opportunity to meet people in their local community who have the skills to repair. In workplaces, it is an opportunity to promote frugal behaviour as a desirable behaviour. It can also support repair community initiatives in identifying skilled prosumers for support.

6.3.2 Decision Stage

For the decision phase, the broken item provides cues for the prosumer to contemplate whether the repair is worth pursuing, especially if the item has been designed not to be repairable or appeared too old or too costly to repair. The second set of cues come from the prosumer themselves as they contemplate whether their circumstances and level of skills can support the item. The following section reflect on the elements identified to influence the prosumer's perceived repairability as well as their skills and knowledge and the cost of repair emphasizing that regardless of their level of skills or financial resources, they can access resources and relationships that will support them to repair.

6.3.2.1 *Perceived Repairability*

The literature highlighted that the unforced replacement situation (Bayus, 2001) is where the complexity of the motivations to repair appears as various factors may encourage the prosumer to replace as opposed to extend the product lifespan through a repair. In relation to the item, absolute obsolescence was the primary reason why the prosumer failed to repair. DMT06A disposed of a blender after it exploded and was diagnosed as irreparable. In the Survey study, absolute obsolescence was combined with aesthetic obsolescence. As such, the age of the item influenced respondents in the Survey study to dispose of the item and devalued it by naming the item a *''hunk of junk''*. The item appears to be aesthetically obsolete for the prosumer as considered in the literature (van Nes et al. 1999; Burns, 2010; Manley, 2015) (Appendix B). The item also presented design features that made it irreparable such as the item being sealed as designers support strategies for planned obsolescence (Guiltinan, 2009). The level of skills and their past experiences affected how the prosumer perceived the item's repairability. The prosumer engagement with people who had the skills to repair shifted their perception on the item's perceived repairability as they obtained information from the repairer's on how to repair it.

6.3.2.2 *Skills and Knowledge*

The findings from the Prosumer Study showed that the skills to repair are transferable. The main differences between participants with low and high PRP are in their repeated experiences of

applying their skills to repair broken items and their knowledge about the intricacies of electrical items. A core skill for the prosumer is the ability to follow instructions in order to take the appropriate action for the repair.

The prosumer can contribute their knowledge about their repair experiences on platforms such as Ifixit, currently the world is first free repair manual for consumer electronics and household appliances (Wiens, 2015). They provide knowledge and guidance through tutorial videos, repair guides and product teardowns (Getto, 2016). They rely predominantly on a global community of prosumers to gather repair manuals, take the product apart and write repair guides (Deloitte, 2016b). Ifixit also collaborates with companies such as the Fairphone to develop their step-by-step video tutorial and Dell to make their items more repairable (Ifixit, 2018).

Manufacturers and retailers can play a detrimental role by hindering prosumers to repair. As seen in the literature, companies can choose to not provide repair guide to the prosumer (Deloitte, 2016). Prosumers have an essential role in pushing policymakers in ensuring that manufacturers are required to provide open access guides to accredited repairers and prosumers so that they can try to learn how to repair their broken item.

6.3.2.3 *Cost of Repair*

A significant element that hinders the prosumer to engage with repair is the cost as seen in the Survey study. Cost is also a factor identified by Lilley et al. (2013) amongst non-fixers and extreme fixers. However, the Prosumer Study highlighted how the circumstances of the prosumer and their access to a repair community and skilled social relationships alleviated their need for financial resources. As discussed in the literature review, the role of the informal and unpaid economy is significant for the prosumer to fulfil their needs if they cannot afford or they recognize the failed reliability of formal services. The Survey study recognized the role of peers and family in supporting the prosumer to repair and how the lack of trust in repair efficiency supported the prosumer to try to repair. Through the Prosumer study, participants with a low level of income highlighted that they did not receive support from manufacturers and retailers to try to repair the item and upon learning of the existence of repair community, they were able to repair their items. Prosumers with higher repair propensity also played the important role of the repairer within their family and direct community. Research by William and Martinez-Perez (2013) support the idea that the reason why participants of the research on PRP favour informal routes to repair is for cost reason as well as the failed reliability, speed and quality of formal services such as repair shops and manufacturer and retailer support. The lack of trust combined with the high cost of services may contribute to the appeal for relying upon the benevolence and care of family members or the direct sphere of influence. The repeated practice of engaging with the informal and unpaid sector for repair may significantly contribute to the perception that the cost of repair is high when prosumers can fulfil their needs at a cheaper rate.

The contribution of informal work and unpaid work to the economy is an ongoing discussion as to how to acknowledge it economically and whether informal routes are damaging the potential for growth of formal entities (William & Martinez-Perez, 2013). However, if the goal is to encourage repair to reduce the throughput of resources, the question needs to concern how prosumers can take the necessary steps to engage further with family and peers to support them with the repair of their broken items. The fixometer tool developed by the Restart Project (2017) can support in gathering information about the repaired item as mentioned in the literature to account for the economic and environmental impact of informal routes of repair.

6.3.3 *Preparation stage*

The Preparation stage of the repair process includes the gathering of assets and relationships to support the repair. The prosumer draws on his assets including his skills and knowledge as well as the resources they have and can gather to repair the broken item (Inc. tools, parts, documentation, financial resources, time, conducive environment). It is the most critical phase of the repair process. The following sections consider what can ease the gathering of spare parts, tools and time for the prosumer.

6.3.3.1 *Spare Parts*

To repair an item, the access to spare parts was recognised in both studies as necessary. Participants in the Prosumer Study mentioned that the lack of spare parts and their costs were barriers to repair. The lack of spare parts for repair is a well-recognised barrier in the literature (Lilley et al. 2013; Scott & Weaver, 2014; Mashaadi et al., 2016). Lilley et al. (2013) proposed as a conceptual design a kettle sold with a repair kit that contains instructions, tools and spare parts. The conceptual design strives to encompass all stages of consumption including repair. The main difficulty is in determining a priori to any potential breakage, the type of repair that an item would require. The literature recognised the idiosyncratic singularity of repair practices; hence it will be difficult, maybe not impossible to bring together all the spares parts and tools that may be necessary to repair. The conceptual design may work for small electrical items but may not for more obscure items such as laptops or large computer.

Furthermore, the question that needs answering is whether trying to repair broken items needs to involve an increased production and consumption of unrequired spare parts by the prosumer. A just-in-time strategy may be more appropriate; in other words, when the prosumer needs a spare part, they need access to it. To deal with the lack of spare parts within the current system, Mashaadi et al. (2016) suggest the development of a network system of parts considering the significant role of manufacturers in feeding the network with parts and making them available to both prosumers and repair shops. 3D printing is also another system for supporting a just-in-time network of parts. The prosumer can also participate in the development of a network of spare parts by listing their broken and unused items onto an online trading website. After analysing the journey of SW04A in trying to gather spare part for her bread maker, she highlighted the impossibility to find parts at the point of purchase, on trading websites such as eBay and other social network platforms such as Freecycle. In the case where a prosumer would have listed their broken item or scavenged spare parts on the online trading website, she may have been able to repair her bread maker.

The emerging question is how to encourage prosumers to contribute to a network of spare parts by listing their items on a trading website. Research by Clausen et al. (2010) reviewed the motivation of the prosumers to contribute to sites such as eBay. One of the hypotheses put forward by Clausen et al. (2010) was that prosumers with environmental concerns might be more likely to sell items on those sites, however it was found that this was not the case, prosumers with innovativeness traits were identified to resell items for economic gain as well as a sense of fun and fulfilment. Some recommendations for the prosumers to engage others in contributing to trading website by Clausen et al. (2010) include raising awareness on the effect of used goods in helping the environment and creating jobs and to developing local sales platforms to reduce the transactions cost of selling items.

6.3.3.2 *Tools*

Tools are central for diagnosing the issue and repairing the item. As previously suggested one solution could be for the manufacturers to provide tools at the point of purchase, in case the prosumer needs to perform a repair themselves. However, there is a need to discuss the implication of shifting conspicuous consumption from new items to new tools to repair. Atkinson (2006) in its review of DIY behaviour literature recognised the prosumers' reactive behaviour to purchase tools to repair items, and they described the drive to be tied up with issues of wanting to emulate others' behaviour and wanting to enhance one's prestige as a hobbyist or crafter in a specific social circle. Encouraging the consumption of tools as a means to support more repair of items may not be the most appropriate route to ease the transition towards the CE. Reflecting upon the literature on the motivation to consume (Røpke, 1999), it is emphasized that one of the drivers of consumption is a culture of self-service also described as ''Do It Yourself'' attitude whereby prosumers acquire materials in order to fulfil their needs as opposed to engaging with more labour-intensive services to achieve the same outcome. Prosumers need to engage further with sharing resources with people in their community. Hackspaces, maker spaces, fab lab and tool libraries are all co-production spaces who require more people for them to function, yet there are places where the prosumers can access tools to try to repair the items. They appear to foster a ''Do it Together'' attitude where the prosumer can access shared materials. The recommendations for the prosumer is to promote and integrate their resources with citizens in their local setting while minimising the need for the production of more tools and services that consume resources.

6.3.3.3 *Time*

Both studies recognised a lack of time as a barrier to repair. Between child-rearing and work, participants such as SW04A and JC06A, for example, found it was challenging to try to repair items and engage with a repair community in their leisure time. Being retired and having the skills to repair, in the case of TB01E and JB09A, seems to provide those prosumers with more available time to pursue their interest in repair. The same applies for participants who were self-employed such as D08, DMT06A and WK07A who could engage with repair communities. However, as TB01E notes in the Prosumer Study, interest in learning to repair is central to decide whether or not he would allocate his leisure time to try to fix an item. Hence, in light of the literature on the transfer of professional activities to the amateur economy, there is a need to increase leisure time for professional workers. There is also a need for nurturing interest in the preservation of resources.

It is important to note that the available leisure time in the UK across the 20th century has mostly increased (Gershuny & Fisher, 1999). The increase in leisure time in Europe and North America is also a well-documented trend (Aguiar & Hurst, 2006; Haller, Hadler, & Kaup, 2013). Analysis of the allocation of leisure time in the UK highlighted that most people used their free time to consume mass media, followed by socialising. Deloitte (2016) highlighted the high street as a central hub for leisure where people socialise by shopping and eating out together. SW04A in the research highlighted her disgust for prosumers who chose to spend their weekend shopping as opposed to trying to repair as she does. The comment by SW04A highlights the allocation of leisure time for consumption of new goods which may not be supportive of a transition towards a circular system of consumption and production as opposed to prosumption. As Kaskarelis (2009) pointed out leisure time can be used to create items as much as providing satisfaction. TB01E highlighted the satisfaction he gathered from trying to repair broken items and from helping people around him. WK07A emphasised the pleasure of learning new skills and abilities. They chose to allocate their free time to the pursuit of repair. The allocation of time to prosumption activities may lead to an

enhancement of their wellbeing of the prosumer. Scott & Weaver (2014) also suggest that that increase in creativity may contribute to enhanced wellbeing.

One question is how the prosumers can allocate more of their leisure time to activities that may support the transition towards the CE and reduced consumption. Kaskarelis (2009) refers to the work of Mare (2002) who suggests two design criteria for creating a sustainable economy of leisure. They include Design for Frugality whereby frugal behaviour is encouraged and promoted to reduce ''needs'' for new items and Design for Community where the abilities of each serve their community. The other, as seen in the literature, is to promote personal and people-centred development in contrast to economic development driven by the production of new items (Robertson, 2005; Wann, 2007; Nørgård, 2013). For the prosumers involved in the development and production of new products and services, it is an invitation to consider how their skills and abilities can be transferred from the production of new items to supporting people-centred development.

6.3.4 Repair Stage

The 'Repair phase' incorporates all the activities necessary to re-establish the item's functionality; it is where the gathered assets are applied. For small electrical items, the activities mentioned through the research included:

- Disassembly of the item to diagnose and assess whether the item can be repaired, to access problem parts and to figure how the item works
- Removal and replacement of parts
- Reassembly

The prosumer also engaged in other activities such as:

- Testing and resetting systems
- Collaboration with a third party
- Travelling to a third party to get the item repaired
- Paying for third-party services
- Learning how the item works and its repair
- Recording of information

The findings are limited to a small selection of electrical items which do not encompass all the various existing electrical items in the market. Nevertheless, the results reflect what van Nes and Cramer (2005) point out for the repair of small electrical items, the repair activities include more reconditioning, upgrading and replacing of parts than repair (van Nes & Cramer, 2005). The repair of small electrical items is a more natural skill to acquire by the prosumer.

Gregson et al. (2009) and Terzioglu et al. (2015) recognised a spectrum of repair whereby the prosumer either restores the item to its full functionality by using his skills and abilities or performing a quick fix instead of making the repair visible. In the Prosumer study, WK07A made, for example, a spare part for his item by himself whereas SW04A used a pin to hold in place the seal of her oven.

The prosumer can support the repair of items by acquiring reparable items. Previous studies recognised that prosumers with higher repair propensity were more likely to purchase repairable items (Lilley et al., 2013; Scott & Weaver, 2014). The Survey study and Prosumer Study did not identify the acquisition of repairable items as a feature of prosumer with higher PRP. One participant with low PRP purchased a repairable mobile phone (Fairphone) anticipating that she would try to

repair in the future. The premium placed on repairable items was found to be a deterrent for purchase for a participant with higher PRP.

The design of the object can be a barrier to repair, especially if disassembly is challenging and the parts or components to replace are not accessible. FW03C gave up on trying to deal with a charger because it was a sealed unit. It must be acknowledged some of the precautions taken by manufacturers to ensure that their item remains sealed for safety reasons. However, when the item cannot be even open by a professional repairer, it is questioned the motivation of the manufacturers. For example, TB01E brought his speakers to a repairer who told him that the device is unrepairable.

Lilley et al. (2013) and Mashaadi et al. (2016) put forward to use transparent product architecture which eases the disassembly and reassembly process.

Through the Prosumer Study, FW03C was able to communicate with a specialist on the phone to try to diagnose the issue with her desktop computer. The labelling of the parts eased the communication between the specialist and the prosumer. It aligns with the suggestions put forward by Lilley et al. (2013) and Mashaddi et al. (2016) to create a comprehensive labelling system of parts and components to support non-specialists.

The findings also highlighted the usefulness of self-diagnosing tools for the prosumer. For example, HW01D was able to diagnose the fault with her Fairphone on her own by downloading an application onto her phone. There are opportunities for the manufacturer to develop similar tools which do not require the opening of the device so that the prosumer can make an informed decision on how to proceed with the repair.

6.3.5 Post-Repair Stage

The Post-repair phase encompasses the assessment of the repair attempt. The findings from the Prosumer study highlighted that in both failure and success, the users benefitted from the experiences by obtaining information and resources (including spare parts for future repair and financial rewards).

The prosumer by reflecting upon the overall repair experiences and its outcomes can support themselves in directing their learning and self-development. Self-reflection is a recognised tool for personal growth (Mezirow, 2009).Further, the prosumers supporting product and market innovation can benefit from capturing prosumer repair experiences and reflection on the repair outcomes to inform further development. As seen in the literature, designers benefitted from engaging with hobbyist tinkerers for the development of repairable solutions (Salvia, 2013; Charter & Keiller, 2014; Hertz, 2014)

When failing to repair, for example, WK07A indicated that he obtained a valuable understanding of how items work and aspects of failure. His perspective enhanced his attitudes towards trying to repair and failing. It also has a role in reinforcing the idea that repair is a positive behaviour to engage in because of the benefits it yields. If the understanding of how the items works and aspects of its failure is captured, such information could be used to help designers to develop longer-lasting items.

SW04A obtained information from her local repair community on how to upcycle her toaster; such information can support remanufacturing opportunities.

If an item fails to repair, the user obtains parts to be reused which can be resold on online trading websites to support future repair attempts as discussed in section 6.3.3.1.

Reflecting on the failure to repair may encourage users to take greater care of their working item. DMT06A indicated that after failing to repair her E-reader, she treated her replacement item with great care.

In succeeding to repair, WK07A received financial rewards from his repair attempt from friends. He used part of the money to pay for parts and donated the rest to his local hackspace.

The findings from the Survey study showed that some respondents recorded and shared their repair attempts for others to use. As seen in the literature, it highlights the fundamental role of Repair in revealing 'the importance of labour and his ingenuity' in aggregating knowledge and transforming the material realm (Graham & Thrift, 2007) Successful repair appeared to enhance prosumers' wellbeing as they experience pride and satisfaction as recognised in both studies. Section 6.3.3.3 on leisure time also emphasised on supporting users to develop skills and abilities as a means to enhance their life satisfaction while in turn supporting a sustainable system of consumption and production.

In the process of repair, the findings of the Survey and Prosumer study highlighted how significant the social dimension is to support the user to repair and gather the resources necessary for completing the repair. As the user engages purposefully with individuals who have more skills to solve an issue with the item, the togetherness of the practice empowers the user with knowledge on how to re-establish the item function. DMT06A learnt by going to a repair community event what type of spare parts she needed and where to find it to repair her electrical item. It was not clear from the research though whether the users with low PRP obtain more technical skills to repair items through the interaction. A longitudinal study may have been more appropriate to account for such change. Engaging with others was also a means for the prosumer to be recognised by their direct community for their effort. In the Survey study, few respondents were keen to share their achievement with their peers. The literature interested in motivation for prosumption recognised the social motivation of the prosumer who seeks both a community as well as a means for sharing so they can receive recognition and acknowledgement for their accomplishment (Dahl & Moreau, 2007).

The prosumer needs to reflect on and share the knowledge and resources gathered through the post-repair phase to support further the transition towards the CE. Designers need to develop the means to ease the collection, sharing and analysis of those information. There are existing tools supporting the collection of the repair experiences developed by the Open Repair Alliance (Openrepair.org, 2017) and digital social networking tools (i.e. Youtube) on which the prosumer can share their experiences.

6.3.6 Non-repair alternatives

The section discusses some of the findings identifying the reasons for product retention, the influence of marketing communications in influencing consumer decision not to repair and it acknowledge the fact that not all items are repairable.

6.3.6.1 *Reasons for Product Retention*

There are several studies which have been interested in product hibernation where the prosumer chooses to retain an unused item for an indefinite period, even after replacement. Wilson et al.

(2017) reviewed the literature on the motivation for product hibernation for mobile phones and assessed motivations for retention amongst a group of students. Their review of the literature supports some of the findings on the reasons why the prosumers would retain an item including the prosumer's environmental concerns, what the devices embodies, the endowment effect where the prosumer perceives that the broken item still retains value and not knowing where to recycle an item. As such HW01D expressed guilt from the idea of disposing of an item because the behaviour did not align with her idea of a sustainable lifestyle. Self-reevaluation is an experiential process of change whereby the prosumer identifies who they want to be and determines whether the behaviour aligns with their self-image. DMT06A chose to retain a camping lamp in part because of its financial value even though she replaced it. Some respondents in the Survey study did not know where to recycle the item and chose to retain it instead.

The Survey study and Prosumer Study did not set out to explore the motivation to retain items for an indefinite amount of time. The findings of the prosumer study aided in identifying what may encourage the prosumer to pursue the repair after having kept the item for an indefinite amount of time. DMT06A kept three items between 3-5 years for potential repair and was able to re-establish their functionality by going to repair events. D08 believed her laptop could not be repaired and was pleased to find out that it could by going to the Green Festival of Making and Mending. FW03C chose to retain her radio and brought it to the festival for help.

The retention of an item for perceived financial, emotional, functional values or negative environmental value can recede with the prosumer engaging with repair communities who have more insight on how to deal with the broken item.

Hobson (2015) put forward that there is a need to increase the responsibility of the prosumer to deal with their broken item. It may ignite not only the prosumer's motivation to find a solution for their broken items but also the drive of companies to find the means to alleviate potential prosumers' pains.

6.3.6.2 *The role of communication in influencing the choice for non-repair alternatives*

The findings related to prosumer attitudes towards trying to repair in the Survey and Prosumer study highlighted that the prosumer makes predictions on the repair outcome. Those predictions do not always relate to their personal experiences in trying to repair.

In the Survey study, JC06A and SW04A who had low PRP anticipated some risks for their safety and those around them if they tried to repair. The perception of risks is likely to deter prosumers with low PRP to repair. Research interested in the influence of perceived risks on prosumers' decision making has demonstrated that in many cases individuals use their most primal emotions instead of using rational thought processes based on knowledge and experiences to predict an outcome (Slovic, 2000). In the Survey study, JC06A, for example, referred to the current safety culture as deterring her from trying to repair. The literature on product safety highlights that warning labels placed on consumer products influences people greatly to behave cautiously (Otsubo, 1988). Prosumers including 'designers' and 'marketers' can review the message of warnings labels for the prosumer to understand safety risks still and yet simultaneously understand the benefits of engaging in repair such as acquiring skills and abilities and avoiding items going into landfills

For a prosumer with low PRP and little experience, the decision to not repair is also greatly influenced by integrated communications. The role of advertisement is significant in influencing their attitudes, beliefs and behaviour. Studies have demonstrated that hedonic messages in advertising

support the consumer to visualise and anticipate emotions they will experience during the consumption process rather than help them assess the utilitarian functions of the product (Moore & Lee, 2003). Once those emotions are activated, they are overwhelming for the consumer to decide whether to fall for an impulse purchase or self-restraint (Moore and Lee, 2003). This messaging which appeals to the pleasure of consumption can encourage the prosumer to replace items as opposed to try to repair when advertising messages.

6.3.6.3 *Not all the items are reparable.*

In the Prosumer study, WK07A tried to repair a camera and was not able to do so. He chose to dismantle it and retained the lens. SW04A learnt that her toaster was not safe to repair and planned to recycle it. In that context, other product life extension strategies need to be applied. Bakker et al. (2014) point out that it is not clear when and which product life extension strategy needs to be applied for the diversity of items that exist in a context where market dynamics and legislation also constrain businesses. Bakker et al. (2014) advised that the designer shall monitor further product life and trends in resource efficiency to select a more appropriate product life extension strategy. It must be noted that Repair remains the primary product life extension strategy that yields most environmental benefits compared to its alternatives (King et al., 2006). Refurbishing and remanufacturing products may require massive reverse logistics infrastructures as well as newly produced parts, and it is not clear yet what would be the environmental impacts of such system (Bakker et al., 2014). Design for Repair needs to be applied when the item is first designed. Some of the guidelines for constructions of the item such as ''being easy to disassemble'' are also relevant for other product extension strategy such as refurbishment and remanufacturing.

6.4 Implications of the research for Design

The research helped in identifying how the factors influencing PRP affect the prosumer at different stages of the repair process. It offers order and direction for designers to develop design interventions to support the prosumer to repair. A more in-depth study is required to understand how designers respond to the conceptual framework, develop design interventions for each stage of the repair process and for different prosumer level of repair propensity. The critical factors supporting the successful repair of an item includes peer and family support, manufacturers and community repair group support, the product design, the availability of spare parts, having the skills and knowledge. Designers remains required to support the development of items that are easier to dismantle and repair, and the design of PSS that allows the access to spare parts as seen in the literature. They also have a role in supporting peer and family, manufacturers, and community repair group in the design and communication of instructions to repair. Nazli et al. (2016) research focused as such on the development of proxy to repair from a design perspective to support the prosumer to follow repair instructions. Through the prosumer study, the role of education both at home and at school affected the attitudes towards trying to repair. Those with higher repair propensity saw less perceived risks in relation to repair and had develop more positive attitudes towards striving to repair and were less upset by failing to repair. The findings have implication in supporting the development of educational material that teaches how to repair items within schools. Designers have to consider that prosumers differ from one another in the way they approach trying to repair and how they approach an item. Some prosumer with low repair propensity were found to ask for help whilst others were reluctant to do so. Some prosumer with higher repair propensity were likely to document how they repair while others did not. Each prosumer specialises in a given domain. The implication for design is to encourage an optimal level of co-production on the part of the prosumer

in a novel way (Vargo and Lursch 2004, 2006). The question remains and concerns the definition of the optimal level of co-production for the repair of an item the prosumer needs participate in to support the transition towards the CE. The research investigation put an emphasis on the repair prosumption activity as a process. The focus is therefore less on the item to be repaired but more on what is happening in the prosumers' mind, how they form attitudes towards trying to repair, how they react to various factors influencing repair propensity and how they pursue the repair. This has implication for design because the concept of a product is detangibilised as Xie et al. (2007) outlines. The true end product offering moves from the store shelves to the prosumer's experience and the experience of their direct and extended communities. It encourages the designer to take a more whole system design approach in developing their items from the prosumer to the interaction of the prosumer to their direct community.

6.5 Reliance on others is the premise of the development of individual capability

The transition towards the CE relies on the capabilities of citizen-designers, manufacturers, politicians and prosumers to develop and adopt processes that support lifespan extension and retention as opposed to disposal. The literature portrayed how through the LE, corporations strategically choose to weaken the capabilities of the regenerative agents such as repair businesses or even the hobbyist tinkerer in their attempt to repair by not providing tools and designing items that are difficult to repair. Such tactics prevent prosumers from developing and acquiring the capability to repair. It also discourages prosumers from asking for help because they believe the item to be unrepairable. Through the research investigation, prosumers with high repair propensity were unable to repair items when they were not designed to be disassembled. Prosumer with low repair propensity fail to repair when they were unable to find spare parts through manufacturers and suppliers. Prosumers rely on manufacturers, designers and other agents of production to develop items than can support and nurture the development of their capabilities.

The Prosumer study identified women in the household to drive the repair of items by asking their partners and children for help. The women identified their partners as having more skills and abilities, and they also participate in the socialisation of their children to maintain and preserve items in the household. They relied on individual capability and willingness to try to repair the items. Their reliance on others nurture individual capability to develop the skills to repair items in the household.

The analysis of the process of change also reinforces the idea that the development of individual capabilities relies on others to provide skills, knowledge and resources to repair. As the individual develops the capability to repair and shares their new acquired knowledge with others, they provide opportunities for their direct and extended circle to learn from them and to develop in their turn further capability to preserve items. From the reliance on others to solve a problem, the individual develops their capability to solve problem and in turn their direct community's knowledge and skills are actualised.

6.6 Sustainable Production and Consumption, the Circular Economy and Social Sustainability

The definition of Sustainable Consumption and Production emphasises on *''the use of goods and services to meet basic needs and bring a better quality of life''* (Norwegian Ministry for the Environment, 1994)." The literature highlighted the lack of clarity surrounding the definition which

creates an ongoing debate about the appropriate strategy to meet this specific goal (for the current state of debate on SCP, see Vergragt, Akenji, & Dewick, 2014). Jackson and Michaelis (2003) emphasise that one of the reasons for the lack of clarity is because the intermediate consumption of material, energetic and human resources are not apparent. Through the research, the analysis of the repair prosumption process revealed how blurred are the line between consumption and production: prosumers exchange information with other prosumers, use and share their assets to re-establish the item function, and this, regardless of their level of skills and circumstances.

Reflecting upon the findings, the other element that contributes to the lack of clarity is the focus on goods and services as a means to support humans as opposed to their relationship with one another. The focus on economic growth as a good thing in the LE by driving the production of goods in the fastest time at the cheapest rate and with the buy-in of most people conceals some of the illth in personal relationships between prosumers when personal values differ, and inequality sustains.

In the research, the quality of the prosumer relationships with the other prosumers had a significant impact on their propensity to repair. When they identified prosumers, who shared the same value, they were more likely to ask for help than with those who did not value the preservation of resources. They also expressed frustration and anger towards the manufacturer for their inability or refusal to help them to repair their broken item. When the basis of the relationship between prosumers involved the exchange of financial resources, and the prosumer did not have the means to pay for the service, they were more likely to ask for help from those who did not appear to try to monetise their relationships.

The quality of relationships appears significant for prosumers to fulfil their role as 'resource integrators' as they bring together skills, knowledge and other assets to reduce the impact of the broken item on the environment by extending their lifespan. To that notion, an attempt is made to provide a revised definition of Sustainable Consumption and Production Concept:

> *"The enhancement of the quality of human's relationships to respond to their basic needs and bring a better quality of life while integrating their existing assets, minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the lifecycle of a service or product, so as not to jeopardize the needs of future generations"*

The definition is an invitation for citizens across professional practices to reflect upon how best to build a sustainable civilisation and to continue further debates on what the enhancement of the quality of human's relationships means for the transition towards the CE, and more specifically, what social sustainability resembles in a CE.

Social sustainability demands citizen to define society's culture, identity and politics to combat all forms of discrimination by ensuring equality between generation and to tackle all forms of exclusion through social inclusion and cohesion, political participation, social mobility and respect for cultural diversity (Koumparou, 2018).

A challenge for the CE advocates is to bring to the forefront those considerations alongside economic and environmental aspirations. The CE still operates under the prominent neoliberal economic status and is a main tool for businesses and government for achieving a zero-waste world while meeting economic goals. The main process to achieve this goal is by transforming the status of waste into valuable saleable resources and developing new business models that maintain items as well as the monetary relationship between the manufacturer and the citizen.

Repair is not considered as economically appealing for manufacturers as other processes to facilitate the transition such as remanufacturing and reconditioning (King et al., 2006). Repair has nevertheless recognised value to support the social economy through the creation of jobs for marginalised communities. The research to measure the environmental impact of social consumption to facilitate the CE was recognised in the literature not to be as significant as the research made to measure the impact of industries on the environment. Kirchherr, Reike, & Hekkert (2017) remarked that only 13% of 114 definitions of the CE refer to the three dimensions of sustainability. Social sustainability is not at the forefront of the debate on the transition towards the CE (Koumparou, 2018). Hobson (2016) criticised CE advocates for defining the role of citizen in the transition towards the CE using the same assemblages as within the linear economy. Hobson (2016) invites them to engage in more studies to understand how prosumer enact everyday activism to retain their items longer and its effects on their direct community politics, culture and identity. By doing so, Hobson (2016) perspective is that joint value creation between manufacturers and the prosumer can be created. The fairphone is a good example of an item where both the prosumer and the manufacturer contribute to 'creating a fairer economy' as Hobson (2016) points out. The Fairphone company provide resources for repair, and the prosumer contributes to social sustainability goals by purchasing the item and learning to repair the item.

In the research, it was identified how the process of repairing an item is a dynamic, continuous, non-decisive process and has repercussion on a community actualisation of skills and knowledge. In the same way, social sustainability has a dynamic conception and is transformed overtime and place (Dempsey et al., 2011). Through repair, CE advocates may foresee an opportunity for fostering joint value creation between prosumers and agent of production that meet the three pillars of sustainability.

CHAPTER 7: CONCLUSION

The final chapter reflects on the significance, and contribution of the investigation to knowledge. It assesses how the research investigation met its aim and objectives and summarises the main conclusions drawn from the research. The chapter introduces the limitations of the project and discusses suggestions for further work.

7.1 Fulfilling the research aim and objectives

The section describes how the research activities met the research aim and objectives presented in Chapter 1. The overall aim of the research was to provide an understanding of what enables and hinders the prosumer from repairing. Four research objectives were set to meet the aim by gaining some level of knowledge on the factors influencing PRP, the attitudes towards trying to repair, and the process by which the prosumer repair an item.

The first objective centred on understanding one of the central topics of the research: ''Repair''. Repair is a strategy to facilitate the transition towards the CE, and it is a behaviour the prosumer can perform. The role of Design in supporting the transition towards the CE by developing eco-design solutions as well as DfSB interventions to influence prosumer's behaviour was looked upon and aided in deciding that further understanding of the prosumer was required. The investigation of the literature revealed an initial set of factors influencing PRP to build upon and helped in identifying behavioural frameworks including the TT and TTMC that could support the research project further and direct the primary research studies.

The completion of the literature resulted in the refinement of the aim, objectives and research questions. The research questions guided the development of the research methodology for addressing them. The Survey study identified critical and additional factors influencing PRP and attitudes towards trying to repair. The analysis of the repair experiences aided to draw a repair process and to determine the influence of the factors influencing PRP on the different phases of the repair process. The Prosumer study augmented the understanding of the factors influencing PRP, attitudes towards trying to repair and the processes of change and how this relates to different phases of the repair process. The combined findings from the two research studies and the literature were integrated to present the elements that may hinder or enable the prosumer to repair answering the research question and meeting, in turn, the aim of the research project. Some of the identified critical factors affecting prosumers were discussed further within the discussion chapter to provide some suggestions on the prosumer behaviours that are supportive of the transition towards the CE

7.2 Conclusions from the thesis

The two findings chapters and the discussion presented in the thesis contain rich insights and observations regarding repair propensity of prosumers with affiliation to environmental communities in Leicester. The process by which the collection of findings occurred and the suggestions to support PRP can benefit a broader subset of the population which have to decide whether to repair a broken EEE or not while considering their past experiences, circumstances, their level of skills and the object state. The prosumer needs to reflect upon the findings on the chosen sample and their specific situation to decide on their relevance in directing their decision to repair. Repair is a goal-oriented activity which is 'difficult' because many factors influence the prosumer to

repair. The primary challenge during the pre-decision stage is for the prosumer to reflect upon their past experiences to recognise the importance and value of repair for themselves and others as well as the elements that support their beliefs that they can repair. The past prosumer experiences shape and nurture consumer traits such as innovativeness and frugality which were found to be the most significant factors influencing repair propensity.

For the decision phase, the broken item provides cues for the prosumer to contemplate whether the repair is worth pursuing, especially if the item has been designed not to be repairable, appeared too costly to repair, too old or too new. The second set of cues come from the prosumer themselves as they contemplate whether their circumstances and level of skills can support the item. The skills required to go through the repair process were found to be transferable. The circumstances of the prosumer are non-fixated. Again, their past experiences are significant to support the prosumer to recognise the pros of trying to repair the item and how it can benefit themselves and others.

After having decided to repair the item, the preparation phase of the repair process begins, and it is the most critical phase to complete. It is when the prosumer gathers all the necessary knowledge and resources necessary for the repair of the item. Prosumers with higher PRP have an advantage when it comes to completing the preparation phase. The reason being that they have more experiences trying to repair items. Therefore, they are more likely to have acquired tools to repair. They have accumulated knowledge. They may have adapted their home environment to be conducive to repair. Finally, they are likely to have social connections to tap into if they need help. Prosumers with low PRP do not have the same advantage. If they are women of a certain age, they may also have been groomed to engage in sewing and cooking activities which reflect the gendered division of labour found in many households, so they do not have the same level of knowledge when it comes to small electrical items. The prosumer with low PRP may want to give up at this stage, primarily if they cannot identify a source of support from the market, family or friends to pursue the repair further.

Regarding the source of support, manufacturers and retailers were found by the majority of prosumers to be unsupportive of repair. The reasons for the negative perception of manufacturers and retailers include the design of unrepairable items, the lack of services supporting repair, advertisement promoting conspicuous consumption, as opposed to preservation and reuse of items and the evidence in the media that manufacturers are polluting the environment and affecting the livelihood of people in developing countries. Lack of trust in the repair shops discourage repair through a third party. The reasons contributing to the lack of trust in repair shops included the variability and failed reliability of repair services and the cost of repair. The prosumer is likely to turn to family and friends for support. For prosumers with pro-environmental inclination, they were more likely to turn to people who share similar environmental concerns and silence their motivation to preserve resources with people who appears not to share the same frugal values. The findings emphasis the role of environmental reevaluation as an experiential process of change in the TTMC in influencing the way the prosumer is going to approach relationships to support them to repair. The research identified Repair community events as an enabling space for the prosumer to meet with knowledgeable individuals who can help them to fix their items.

The completion of the preparation phase marks the beginning of the repair phase. The repair of small electrical items involves more reconditioning than repair. The main tasks include disassembly, replacement of parts and reassembly of the object.

Once the repair is complete, the post-repair phase presents an opportunity for the prosumer to evaluate the repair experience. When succeeding to repair, the prosumer is likely to feel satisfaction and pride from trying to repair. It is expected to increase their self-efficacy beliefs and in turn their wellbeing. The possibility to enhance the prosumer wellbeing through repair as a creative endeavour could have a positive impact on society as a whole if more prosumers take up repair. The prosumer may receive financial and social rewards from their repair efforts. When failing to repair, the prosumer can be frustrated, redirecting their anger towards the manufacturers. Others, especially those with higher PRP are more likely to recognise that even in failure they have acquired some knowledge, some spare parts for future repair, and new relationships. In the process of trying to repair, prosumers with high PRP had neutral attitudes towards the process of trying to repair, accepting the difficulties that arise from the repair process. Through repeated repair experiences, the prosumer strengthens the thought in their mind that repairing is good for one's personal development, to help friends and family, to save money, to protect the planet.

The prosumer cannot repair all broken items. The prosumer with concern for the environment and humanity may feel guilty for disposing of unrepairable items. Among the non-repair alternatives, retaining the item is the preferred course of action. Prosumers with high PRP are more likely to retain broken items for spare parts within their home for potential future repair. The attachment to the item influences product retention. The prosumer anticipates that they will attempt a repair in the future if support becomes available. Unfortunately, the less interaction with the item occurs, the more likely the attachment wears off, and the prosumer gives up trying to repair the item. Recycling and Replacement become subsequently the default course of actions taken by the prosumer.

7.3 Contribution to Knowledge

The research contributes to knowledge by providing a detailed understanding of PRP, delineated into a conceptual framework that maps out the repair process and how the factors influencing repair propensity, the attitudes and the processes of change affect the prosumer at different stages of the process. The research contributes to knowledge in the field of Design for Repair and DfSB by reflecting upon the implication of the research findings on Design. The importance of developing items that easy to disassemble with a comprehensive labelling system is reiterated while an emphasis is made to consider the whole experience of the prosumer and the interaction with their community when designing items. The research contributes to knowledge by applying and providing reflection upon the application and use of the TT and the TTMC as tools to help investigating the prosumption process prosumption. It also provides an adaptation of the contemplation ladder as a tool to engage with participants. The research contributes to knowledge to support wider debates on sustainability and circular economy with a particular focus on social sustainability as a pillar that need greater attention to support the transition towards the CE.

7.4 Limitations to research

The success of this research lies in its ability to identify and portray what affects and influences the prosumer to repair and the processes by which they engage with trying to repair. The research delivered a wide range of observations, insights and findings in this regard; however, there are limitations which are necessary to acknowledge, relating to both the implementation of the research and also what can be claimed by it. An overarching challenge was to shift the author perspective on the role of marketer, designer as well as environmental activist in trying to influence and develop

solutions on behalf of the ‘user’; so to become a researcher that pays full attention to the multi-faceted qualities of the citizen-prosumer and tells their stories. The recognition of a deficiency in the prosumers to engage with Repair misguided the focus of the author through the PhD process by focusing on the reasons why Repair is devalued through society, identifying what the interventions for supporting the adoption of repair and trying to implement them with the organisation of numerous events in Leicester; while disinvesting her time in nurturing relationships with the design academic community which appeared in the author minds not to share similar values. Reflecting upon the participants' experiences of social silencing when involved with people who do not share the same environmental values, the author recognised how repeated past experiences of failing to convince may have impacted on her self-efficacy in making the best out her circumstances, level of skills while meeting the purpose of the research. The reflection is a token of the contribution of the research has made on the author’s practice and a gift to support existing and future researchers in their dealings with others.

In regard to the limitations, the research would have benefitted from strengthening its review of the literature on defining further the prosumer. It would have been desirable to assess the identified attitudes towards trying to repair on a larger sample of participants. It would have been beneficial to ask further questions to participants of the Prosumer Study once they had completed the video elicitation exercise to assess their experience on using the camera as well as to gain new insight on their repair behaviour. The video elicitation exercise could have been strengthened by encouraging the prosumer to document their repair journey. Through the analysis of the videos, it was identified that one prosumer with high repair propensity had documented on their computer using a camera the repair process for many items he tried to repair. The video elicitation exercise allowed to identify such activities. A longitudinal study would have been ideal for understanding prosumer repair behaviour over time. The use of different behavioural approaches broadened the focus of the doctoral project by approaching the understanding of repair behaviour as a multi-dimensional object. Using different approaches to understand PRP created challenges for the analysis of the research study as well as deciding how best to present and discuss the findings. For greater depth of analysis, it might have been better to use one specific approach to understand PRP.

The main subject group for the investigation were prosumers affiliated to environmental communities in Leicester and who were concerned by the environment. The participants from the Prosumer study were aware of the resources available to them in trying to repair by being exposed to The Green Festival of Making and Mending. A comparative study with prosumers who do not have access to repair communities could have been beneficial to understand how prosumers deal with lack of support. The participants from the Prosumer Study were for the majority self-employed or retired which may provide them with more time to engage with trying to repair.

The author was involved in the organisation of the Green Festival of Making and Mending, the repair community events and she also has strong links with environmental communities in Leicester, striving to support people in reducing their carbon footprint with Footpaths Leicester. The author had as a result greater understanding of certain aspects of the project, especially the role of community repair events in supporting prosumer repair and the enablers and barriers for prosumers to try to reduce their carbon footprint. It benefitted the discussion with the interviewees because of the shared environmental values at play. The interpretation and analysis of the data may be influenced by the researcher experience, although the six steps process taken for the thematic analysis shall supersede any potential bias from the researcher. On the whole, the position of the author was a great asset in engaging the public in discussing repair.

7.5 Recommendation for future work

One area for further development is in refining the factors influencing PRP presented as a result of the research through further investigation and validation with prosumers. The developed framework on the factors could be simplified and made more suited for detailed empirical research with a large sample.

An essential element to consider is the transmission of values from family members to the prosumer as well as how peer groups may foster repair behaviour through the prosumer childhood and adulthood. It was evident from the research that childhood experiences were punctuating the narratives of the prosumer to explain why they repaired. The discussion highlighted the potentially significant role of peer groups in shaping children's personality, and this may have a significance in the extent to which some prosumers are more or less risk-averse or more innovative in trying to repair an item. Longitudinal studies on one group of children and their families being introduced to repair practices and a control group which is not would be ideal to note how the introduction to repair impacts on their attitudes towards trying to repair, their self-efficacy beliefs as well as innovativeness traits.

Further research is needed to analyse the differences between prosumers with low PRP who reach out for help to repair and those who do not. The reason is that the prosumer with low PRP who strive to find support is more successful in fixing a broken item than those who chose to retain it. The research could support in developing campaigns and services to bring together people from different backgrounds and interests.

Further research is needed to develop tools to capture and analyse the prosumer repair outcomes. The reason is that by retrieving the knowledge, it offers opportunities for future innovation for repair supporting the transition towards the CE.

Further research is needed to make greater use of the TTMC to understand how the processes of change outlined in the model evolve as the prosumer makes repeated attempts to repair different items. Through this process, the evolution of the prosumer social network can be measured as the prosumer engages with the repair. The type of rewards the prosumer receives and gives to themselves can be accounted for to measure positive reinforcement. The evolution of the home environment as a conducive space to repair can be further assessed.

Finally, the knowledge gained from the research needs to be disseminated to all citizen who are simultaneously ''prosumer, academic, designer, repairer, activist, consumer'' so they can take the steps necessary to affect the material realm and redefine how they relate to one another, so they can better integrate their resources while minimising the impacts of goods and services on the environment. The findings need to be reformatted to suit a more general audience to inspire actions that support behaviour change.

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APPENDICES

The following documents are supplemental information to support the content of the thesis.

Appendix A - CE Definitions

Table A - Circular economy definition (Taken from Prendeville et al. 2014, p.5)

Source	Definition
Ellen MacArthur Foundation (2013)	"Though still a theoretical construct, the term ' circular economy' denotes an industrial economy that is restorative by intention and design…products are designed for ease of reuse, disassembly and refurbishment, or recycling, with the understanding that it is the reuse of vast amounts of material reclaimed from end-of-life products, rather than the extraction of resources that is the foundation of economic growth.''
Ellen MacArthur foundation (2013)	It replaces the end of life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse and aims for the elimination of waste through the superior design of materials, products, systems and within this, business models.''
McKinsey Global Institute (2011)	''In addition to meeting current demand/consumption needs, a circular economy also actively invests in improving resource systems and increasing their resilience to ensure their continuing availability in the future. In short, it replaces a throughput and efficiency driven view that ultimately degrades capital with one where capital rebuilding and maintenance offers an upward spiral or virtuous cycle, and a continuous flow of materials and products.''
Green Alliance (2011)	''The circular economy represents a development strategy that maximises resource efficiency and minimises waste production, within the context of sustainable economic and social development' 'The circular economy requires careful management of materials flows, which are of two types. These are characterised by McDonough and Braungart in Cradle to Cradle: remaking the way we make things as biological nutrients-materials designed to re-enter the biosphere safely and rebuild natural capital, and technical nutrients designed to circulate at high quality without entering the biosphere.''
Edie (2013)	A circular economy is one in which resources are kept in use for as long as possible by extracting the maximum value from them while in use, then recovering and regenerating products and materials at the end of each service life''

Appendix B – Type of Obsolescence

The table introduces and defines the type of obsolescence and provide examples of items:

Table B - Types of Obsolescence with EEE examples. Mawle and Smalley (2012)

Type of Obsolescence	***Definition***	***Examples of EEE disposal of goods***
Absolute Obsolescence	Wear and tear contribute to physical product failure where the item ceases to function. Technological advances also contribute to absolute obsolescence. Other identified term referring to absolute obsolescence includes Technical or Technological Obsolescence (van Nes et al. 1999).	Absolute obsolescence is the main assumed reason for disposal. For example a mobile phone ceases to work after being dropped on the floor, and the screen is not operational.
Functional Obsolescence	The item does not meet a 'functional need' based on practical circumstances, rather than based on subjective changes such as the prosumer taste.	The need to replace a computer with a more advanced one because the current computer does not fulfil the professional needs of the prosumer as he needs to use advanced applications.
Aesthetic Obsolescence	It concerns the product looks, its cleanliness, wear and tear, newness (Burns, 2010; van Nes et al. 1999) and the way the item communicates a particular lifestyle or prestige (Burns, 2010).	The breakage of a mobile phone screen may encourage the replacement of the item although the latter is still functioning (Manley, 2015).
Economic Obsolescence	It relates to the cost or affordability of an item.	The cost of repair may be higher than replacing an item. It makes the existing item economically obsolete even though the prosumer can attempt to repair.
Technological obsolescence	It is when a product becomes relatively inferior to a newer product.	The introduction of the smartphone to replace a standard cell phone or the move from 3G to 4G network making many mobiles phone obsolete to use. It is when a product becomes relatively inferior to a newer product.
Ecological Obsolescence	It is when the product has a less harmful impact on the environment that the existing one.	The introduction of energy-saving light bulbs to replace existing ones.
Psychological obsolescence	It is when a newer product has a greater emotional value.	The offering of a gift for a new camera which renders the existing one obsolete in the mind of the prosumer.
Societal obsolescence	It concerns changes in societal norms and changes in legislation (Burns, 2010).	The introduction of the ban for smoking cigarettes contributed to the adoption of e-cigarettes.

Appendix C – Type of obsolescence strategies

The table introduces and defines the planned obsolescence strategies and provide examples of items designed for disposal (Guiltinan, 2009):

Table C - Type of obsolescence strategies

Type of Planned Obsolescence Strategies	***Definition***	***Example of EEE designed for disposal***
Limited functional life design	Designed for short-lived life (Slade 2006).	Portable radios designed to last for only three years (Guiltinan 2009).
Design for limited repair	Designed to be non-repairable.	Disposable single-use cameras (Adolphson, 2004).
Design aesthetics that lead to reduced satisfactions	Choice of materials which on everyday use becomes quickly damaged and engender dissatisfaction and premature disposal (Cooper 2005).	Plastic kettles which appear polished when purchased and quickly lose their aesthetic integrity over usage.
Design for fashion	The influence of fashion and trends on the aesthetic features of material goods.	Newly introduced mobile phone or FitBit are an example of fashionable designed items which foster technological and psychological obsolescence.
Design for functional enhancement through adding or upgrading product features	Technological development which expands product benefit or improve the level of performance on existing benefits.	Examples include adding a camera feature on mobile phone or increasing the memory and speed or reducing the weight of a laptop.

Appendix D – Eco-Design Strategies

Table D - Eco-design strategies

Design strategies	***Definition and Example***	***References***
Design for reliability and robustness	This design strategy is characterised by the use of durable materials, construction and production techniques to improve the reliability, durability and wear resistance of a product. Example - Kenwood Chef food mixer	Park (2009), van Hemel (1998)
Design for repair and maintenance	Life extension is to be achieved through prosumer participation in repair and maintenance. Access to different parts is critical (Mugge 2007). Appropriate business models in the form of PSS can facilitate the repair aspects incorporating products and services to fulfil the needs of customers. Example - The Dualit toaster	Schoormans and Schifferstein (2005); Truttmann and Rechberger (2006); Mugge (2007); Chismar (2008); McCollough (2009); Park (2009); Heathcote (2010); ERM (2011); Bakker, Wang, Huisman, and Den Hollander (2014);
Design for reuse	The lifetime extension of products is to be achieved by considering how components or whole devices can be easily reconditioned and reused in new products. The recovery system is an essential element to allow the reuse of parts. Example - Widespread application in the automotive industry. Model embraced in companies such JCB and caterpillar	Charter and Tischner (2001); Gelbmann and Hammerl (2014)
Design for remanufacturing	A combination of design processes whereby an item is designed to facilitate remanufacture including design for core collection, ecodesign, design for disassembly, deign for multiple lifecycles, design for upgrade, and design for evaluation Example – Xerox has a comprehensive process for taking back 'end of life photocopiers, printers, scanners from customers since the early 1990s. Remanufactured output now account for 25% of Xerox output despite double the labour cost compared to new equipment	Charter and Gray (2008); Hatcher et al. (2011); Bakker et al. (2014), Tan et al., (2014)
Design for upgradability	Both aesthetic and technological aspect can benefit from design for upgradability. PSS also facilitate the upgrade of products if consumers cannot do it by themselves. Example - Mobiles phones and computer	van Nes and Cramer (2003); Mugge, Schoormans and Schifferstein (2005b); Park (2009)
Design for variability	Variability or multi functionality offer possibility to reconfigure a product without the need for new part. Example – a mobile phone chip designed for variability may respond differently because of environmental parameters such as temperature, variations in manufacturing processes leading to device and interconnect changes, and reliability causes like ''wear-out'' or ''device aging'' phenomenon.	Charter and Tischner (2001); van Nes and Cramer (2003); Mugge, Schoormans and Schifferstein (2005), (2001); Park (2009)

Design for reconfiguration/reconditioning	These design strategies share aspects with upgradability and variability (Clever 2014). It is about reusing products or components in a way that was not originally intended (BSI 2009; Park 2009). Example - DVD into bird scarier or coaster.	BSI (2009); Park (2009)
Design for extended warranty	A 'long life' guarantee is a product that exists alongside a service or maintenance agreement within a time period. Example - Existing model with electric cookers, refrigerators and washing machine where manufacturers offer warranty	Cooper and Mayers (2000); Mugge, Schoormans and Schifferstein (2015),
Design for emotional durability	Strategies that create a strong emotional attachment between product and prosumers. It is to be achieved through superior utility, appearance, good fit with lifestyle, product personalisation shared memories, and/or associations with pleasure and fun. Example – Repair it Yourself range of canvas footwear created by Eugenia Morpurgo is assemble with reversible mechanical fastening rather than the permanent stitching and comes with a repair kit.	van Hemel (1998); Charter and Tischner (2001); van Nes and Cramer (2003), Mugge, Schoormans and Schifferstein (2005); Park (2009); Chapman (2009); Chapman (2013)

Appendix E - A typology of PRP profiles (Lilley, Bailey, and Charnley, 2013)

The table introduces repair profiles drawn from Lilley et al. (2013) research with the suggested design concepts and associated DfSB.

Table E - PRP profiles (Lilley et al., 2013)

PRP profile	Suggested concepts	Associated DfSB strategy
Fixers: like to understand electrical and mechanical product.	A kettle sold with component parts. Membership of an online community with interactive guide.	Feedback
Sometimers: Main barrier was not understanding the fault within the product.	The hidden message kettle placed messages inside the kettle to help the prosumers think about the repair step. The Tamagotchi kettle provided an inbuilt health indicator and offers instructions to mend. Kettle and fix kit provide a repair kit with instructions. The kettle is colour coded and the instructions link the symptoms to the diagnosis and the part that need replacing.	Behaviour Steering
Non Fixers: Cost of replacement was the most common reasons to not mend.	The Fact of the Day kettle informed the consumer how many times the kettle was set to boil, the equivalent volume of water and a different fact associated with this amount each week. My Kettle is an online service to build fully customised kettles. It reduces the impact of aesthetic obsolescence, with inbuilt fault diagnosis.	Behaviour Steering (based on emotional values, not economic values).
Extreme Non Fixers: Not interested in mending and view replacement costs as low and do not have time to undertake mending.	The Everlasting Kettle is sold as part of a product-system service. The kettle's redundant working parts begin to work as the primary functioning parts break. The kettle sends a signal to the manufacturer when the primary parts have failed. The concept does not encourage self-repair.	Persuasive technology - the consumer is unaware that the product has a fault until the repair is arranged.

Appendix F – Replacement motives

Taking into consideration the work of Engel el al. (1995) on the consumer decision making process and combining the work of Bayus (1991), Creusen (1998) and Mowen (1995) on 'forced' and 'unforced' situations for replacement, van Nes (2003) developed three categories influencing replacement motives (see Table F)

The interaction of the various factors with one another may influence the prosumer to perceive the item as obsolete for single and combined reasons of obsolescence (see **Error! Reference source not found.**) and decide subsequently to replace the item (Mawle & Smalley, 2012) and not to repair it.

Table G - Description of the categories influencing replacement motives by van Nes (2003)

> Product Characteristics. The product characteristics refer to those aspects of the product that provide an added value of one product over another. **> Situational Influences or External Influences.** Factors extrinsic to the product, meaning working from outside and not a part of the essential nature of the thing. **> Consumer Characteristics.** The consumer characteristics refer to those differences between people that explain why, in the same situation, different people make different choices.

These three categories are expanded in Figure F:

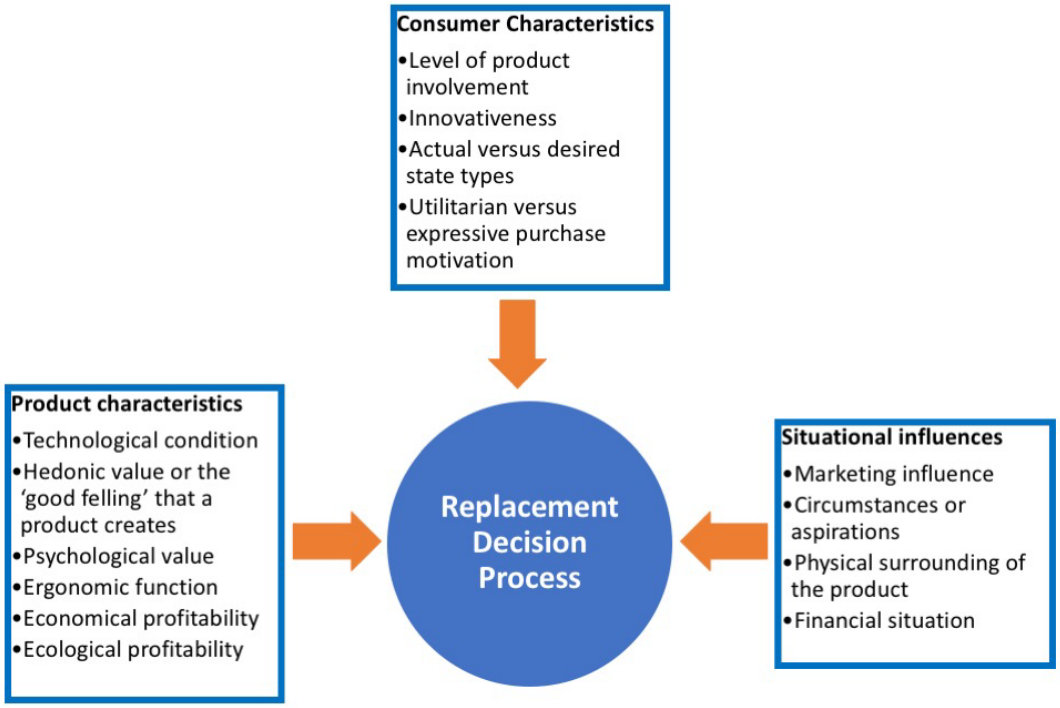


Figure F – Overview of the factors Influencing Product Replacement Decisions (van Nes, 2003)

Appendix G – Factors influencing PRP

Factors influencing URP	***References***
Market Factors	
Perceived Inconvenience of repair The prosumer can perceive repair to be inconvenient because elements outside the prosumer's control can make the repair process difficult to navigate. These elements include the lack of repair outlets, the phasing out of after-sales services by retailer and manufacturer which cannot bear the cost of infrastructure to process the repair; delays in delivering the repair, the discontinuation of replacement part production; the design by manufacturers of items that cannot be easily repaired, the evolution of technology for which the prosumer may not have the skills and abilities to repair the item	Packard (1960); Klausner, Grimm and Horvath (1999); Consumer Reports (2001); van Nes and Cramer (2005); Chismar (2008); Chismar, 2008; Chapman (2009); McCollough (2009); Guitinan (2009); Scelfo (2009); Cooper and Christer (2010) ; Park (2010); Twigg-Flesner (2010); Lilley et al. (2013); Scott & Weaver (2014); Terzioglu et al., (2015); Mashhadi et al. (2016).
Lack of trust in repair shops Customer's lack of confidence in the repairer, their perception of what constitutes a 'fair price' and concerns over being exploited by unscrupulous repairers who overcharge, over-service or charge for fictitious repairs which were never carried out is hypothesised to influence repair behaviour.	Darby and Karni (1973); Consumer Reports (2001); McCollough (2009); Lilley et al. (2013); Scott and Weaver (2014)
Product Factors	
Perceived cost of repairs and replacement The prosumer can consider costs of repair and replacement to decide whether repair or replacement is the most satisfactory option to meet his/her needs. It is indicated that prosumer is on average willing to pay for the repair about 20% of the cost of the item (McCollough, 2009). The cost is not only monetary, there are intangible cost such a travel and waiting times.	Cripps and Meyer (1994); Okada (2001); Cooper (2005); Utaka (2006); Guiltinan (2009); Cooper and Christer (2010); Twigg-Flesner, (2010); Lilley et al. (2013); McCollough (2009); Scelfo, 2009; Scott and Weaver (2014); Terzioglu et al. (2015)
Relationships between attachment to item and repair Emotional attachment brought about by memories and, experience and emotion to an item influencing him/her to handle the item with care, to repair it when it breaks down and to postpone its replacement.	Mugge et al. (2005, 2010); Lilley et al. (2013); Scott and Weaver; 2014; Terzioglu et al. (2015); Ackerman et al. (2018);

Consumer Factors	
Environmental concerns Concerns for the environment and engagement in the sustainability agenda can encourage repair. The negative impact of electrical waste on the environment can influence individuals to be more sustainable and heighten concern for the environment.	Haws, Naylor, Coulter, & Bearden, (2012); Lilley et al. (2013), Scott and Weaver (2014); Terzioglu et al. (2015)
Frugality The prosumer can have frugality traits which influence product retention. It can enhance their stewardship traits by using the item more efficiently and also encourage them to be thriftier in the way they use financial resources (i.e. tightwad).	Bayus, (1991); Okada, 2001; Lilley et al. (2013), Scott and Weaver (2014);
Product Retention Tendency It refers to the tendency of the prosumer to retain possessions through a desire to avoid waste	Haws, Naylor, Coulter, & Bearden, (2012); Lilley et al. (2013); Scott and Weaver (2014); Terzioglu et al. (2015)
Use Innovativeness/Innovativeness The prosumer can be receptive to, and creative with, using and adapting a product in new ways to suit a new purpose. refer to it as a personality trait and call it 'use innovativeness'. It includes the following aspects: creativity-curiosity, risk preferences, voluntary simplicity, creative re-use and multiple use potential.	Price and Ridgway (1983); Graham & Thrift (2007); Guiltinan (2009); Lilley et al. (2013); Scott and Weaver (2014)
Demographics – age, income, education Prosumers with higher incomes have been seen to replace more than to repair whilst lower-income households tend to focus on immediate fiscal need. Age has been correlating positively with repair.Educational attainment has conflicting results on whether the higher educational attainment relates to early or delayed replacement (Bayus, 1991; McCollough, 2010).	Bayus (1991); McGrattan and Schmitz (1999); McCollough (2007, 2010); Lilley et al. (2013); Scott and Weaver (2014)
Repair Outcomes	
Product care Increased product care is a potential outcome exhibited when prosumers with a higher PRP compare the economic cost and benefits of maintenance, against the economic cost and benefits of replacement	Boyd and McConocha (1996); Okada (2001); Scott and Weaver (2014); Ackermann et al. (2018).
Product Acquisition Usage When the prosumer considers the product reparability at the initial purchase, it impacts positively on the likelihood of repair	Giotinan (2009); Lilley et al. (2013); Scott and Weaver (2014)

Appendix H – Review of Behavioural models

Table H - Reviewed behavioural models

Theory	Description	Ref's
Attitude-Behaviour- Context Theory (ABC)	The ABC Theory is based on the notion that behaviour is a function of the organism and its environment. It states that behaviour is an interactive product of personal-sphere attitudinal variables (A) and contextual factors (C) The attitude-behaviour is strongest when contextual factors are neutral and weakens when contextual forces arestrongly enabling or preventative (Stern 2000)	Guagnano, Stern, Dietz (1995); Stern (2000)
Comprehensive Acton Determination Model (CADM)	CADM integrate four theories (TPB, NAM, the theoretical concept of habits and the ipsative theory of behaviour) that have been acknowledge for their strength of explaining behaviour, but also criticicised for not integrating all the factors that may influencebehaviour. CADM depict the intentional, normative, situational and habitual influences affecting environmentally friendly behaviour (Klöckner & Blöbaum, 2010).	Klöckner & Blöbaum (2010)
Model of Pro-Environmental Behaviour	A complex model incorporating factors from prosocial and sociological behaviour models. Environmental knowledge, values and attitudes, together withemotional involvement, make up pro-environmental consciousness' which is embedded in broader personal values that are shaped by personality traits and other internal and external factors. This is the antecedent to pro-environmental behaviour but must overcome barriers such as existing habits or lack of incentives and possibilitieses (Kollmuss & Agyeman, 2002).	Kollmuss & Agyeman (2002)
Motivation-Ability - Opportunity Model (MAOM)	The model suggests that at least three classes of determinants: Motivation, Ability, and Opportunity should be used as a framework to study (consumer) behaviour (with respect to the environment). Motivation leads to behaviour only if a person commands the required abilities to perform, and opportunity to carry out the intentions. (Ölander & Thøgersen, 1995)	Ölander & Thøgersen (1995)
Theory of Interpersonal Behaviour (TIB) / Subjective Culture Model	TIB states that behaviour is a function partly of what I intend; partly of my habitual responses; and partly of the individual's ability to perform the act. Intentions are immediate antecedents of behaviour, but behaviour is mediated by habits, and both of these influences are moderated by 'facilitating conditions' (Triandis, 1976).	Triandis (1976)
Theory of planned behaviour	TPB assumes intention is the immediate antecedent of behaviour. These behavioural intentions are formed from attituudes toward the behaviour, subjective norms and perceived behavioural control (PBC) which are respectively guided by behavioural beliefs, normative beliefs and control beliefs (Ajzen, 2012, p.448)	Ajzen (1991)

Appendix I – Mixed Methods Strategies

Creswell (2003) put forward a systematic framework for approaching mixed methods research that involves 4 decisions and 6 strategies

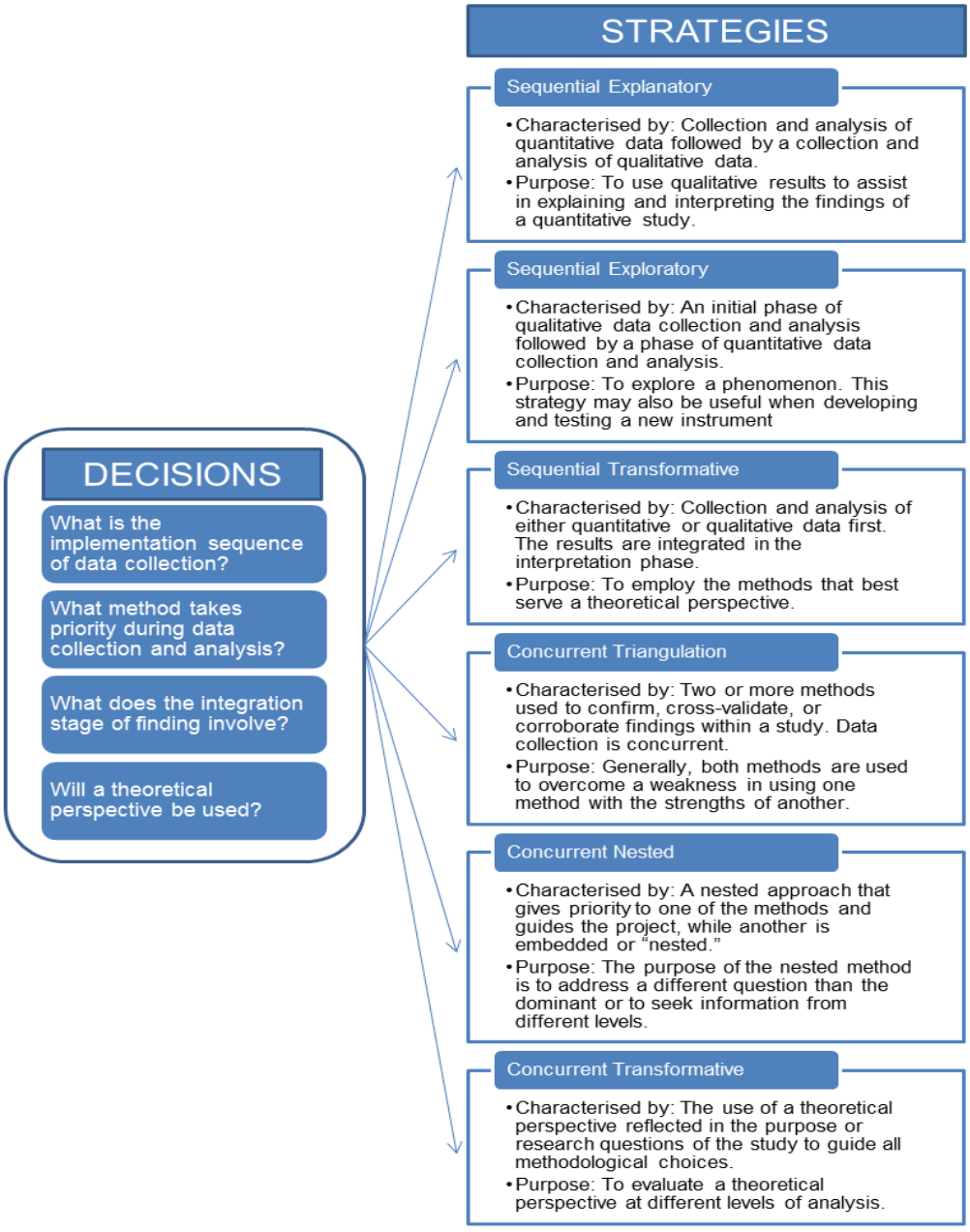


Figure I MixedMethods strategies by Creswell (2003)

Appendix J – Survey Study documentation

The appendix includes the survey and advertisement materials

Loughborough University

Footpaths
Routes to a greener life

Household Electrical Item Repair Survey

An investigation of user's attitudes towards repair and their process of change

Researcher : Marie Lefebvre, Ph.D at Loughborough University,
m.lefebvre@lboro.ac.uk, Loughborough Design School

A Special Thanks to Footpaths for allowing this survey to be conducted at the Green Festival of Making & Mending. More information on Footpaths, check www.leicesterfootpaths.org.uk

Survey Introduction

Thank you for taking the time to complete this survey. It should take no more than 20 minutes of your time. This survey is being undertaken as part of a Ph.D. research at Loughborough University and is looking at attitudes towards trying to repair small electrical household appliances.

All information will be treated completely confidentially, and stored in accordance with the data protection act. Individual responses will not be passed onto any other party. If you are happy to be contacted for future studies, please leave your email address and/or phone number, please be assured that your contact details will not be captured as part of the survey analysis.

Marie Lefebvre (Researcher)

Section 1 – Tell us if you agree or disagree with the following statements

Tell us if you agree or disagree with the following statements (Tick where appropriate)	Strongly disagree				Strongly agree
	1	2	3	4	5
URP					
I always try to fix an electrical item by myself or have someone else fixing it					
I always try to find information online to try to fix an electrical item that I own					
I always ask someone else to fix an electrical item for me					
If an electrical item can be fixed, I feel obliged to repair it instead of replacing it					
I am more likely to have an electrical item repaired than to replace it					
I am more likely to fix an electrical item by myself than to ask someone else to fix it for me					
It is important to try to fix an electrical item before getting rid of it					
Environmental Concerns					
Compared to other things in my life, environmental problems are not that important					
Environmental problems are of great concern to me personally					
Environmental problems are not that serious because in the long run things will balance out					
I can think of many things I'd rather do than work toward improving the environment.					
Economy					
If you take good care of your possessions, you will definitely save money in the long run					
Making better use of my resources makes me feel good					
There are many things that are normally thrown away that are still quite useful					
If you can re-use an item you already have, there's no sense in buying something new					
I am willing to wait for a purchase I want so that I can save money					
I save money for tomorrow by resisting to buy some items today					
I discipline myself to get the most from my money					

Tell us if you agree or disagree with the following statements (Tick where appropriate)	Strongly disagree				Strongly agree
	1	2	3	4	5

Product Retention Tendency					
Getting rid of things is difficult for me					
I tend to hold onto my possessions					
Unless I have a really good reason to throw something away, I keep it					
I do not like to dispose of my possessions					
Innovativeness					
Even if I don't have the right tool for the job, I can usually improvise					
I never throw something away that I might use later					
In general, I would rather alter an old product to work in a new situation than purchase a new product specifically for that purpose					
After the useful life of a product, I can often think of ways to use its parts for other purposes					
I do not enjoy a product unless I can use it to its fullest capacity.					
I use products in more ways than most people					
Product Care					
I work hard to protect my material possessions					
Keeping my material possessions in good working order is very important to me					
Material things should be guarded from harm					
I am very conscious about keeping my material possessions safe					
I always try to return a an electrical item to the shop I bought it from to get it repaired					
More questions about repair					
Repairing products is such a hassle. It is just easier to get a new one					
I don't trust repair businesses to do the job right					
Having a product repaired is too expensive					
It is often cheaper to buy a new product than to have an old one repaired					
The more attached I am to a product, the more likely I am to have it repaired					
When I purchase a product, I look for ones that can be repaired					
I always try to get an extended warranty in case an electrical item breaks for it to be repaired					
I have the practical/technical/manual qualifications to carry out repair					
I am confident if I attempted to repair an item that I would be successful					
I dispose items because the amount of things I own overwhelms me					

Complete the following statements by listing advantages, disadvantages or anything else you associate with each of them
Assuming that I try to repair an electrical item that I own in the next year, I/It would_____ _____
Assuming that I try to repair an electrical item that I own in the next year and that I am successful in repairing it, I/It would _____ _____ _____
Assuming that I try to repair an electrical item that I own in the next year and that I fail to repair it, I/It would_____ _____ _____

Section 2 – Circle <u>any of the following electrical items that broke in the last five years</u>. For the item that broke in the last five years, tick where appropriate.

Circle any of the following electrical items that broke in the last five years and tick where appropriate.	I got someone to repair it for me	I attempted to repair it myself	I did not try to get it repaired, I still have the item at home	I returned it to the shop to get it replaced.	Other (please specify)
Hand-held blender					
Bread-Maker					
Juice Maker					
Kettle					
Coffee Maker					
Electric Scale					
Electric Whisker					
Hair Straighteners					
Electric Razor					
Tablet					
Laptop					
E-Reader (i.e. E-reader)					
Hand-held Gaming devices					
Landline Telephone					
Electric Fan					
Radio					
Sander					
Circular Saw					
Electric Screwdriver					
Saw					
Toaster					
Food Processor					
Steamer					
Hair dryer					
Electric Bathroom Scale					
Electric Toothbrush					
Camera					
Mobile Phone					
Mp3 Player					
Satnav					
Electric Clock					
Electric drill					
Table lamp					
Other					
Other					

Section 3 – Select two items from above that broke in the last 5 years and answer the following questions

Item 1 (indicate the name and brand - if known - of the item of your choice)	Item 2 (indicate the name and brand - if known - of the item of your choice)
Thinking about the product that broke, can you describe what was wrong with it?	
Would you describe the item as partly broken (still functioning in some ways) or completely broken?	
Partly Broken Completely Broken Other_____	Partly Broken Completely Broken Other_____
Approximately, how old was the item?	
When you purchased the item, how many years did you expect it to last?	
What type of item was it (tick where appropriate)	
Premium quality model Middle range model Budget price model Add any other details about the item that may be relevant	Premium quality model Middle range model Budget price model Add any other details about the item that may be relevant
Did you try to get the item repaired?	
Yes No If no, go to section 3A, I did not try to repair it If yes, go to section 3B, I tried to repair it	Yes No If no, go to section 3A, I did not try to repair it If yes, go to section 3B, I tried to repair it
Section 3A - I did not try to repair it	
Item 1	Item 2
What did you do instead of trying to get the item repaired? (e.g. dispose it where? donated where? Returned it where? Plus details)	
What motivated you to (dispose/replaced/return/scavenge) instead of getting it repaired?	
Why did not you take it to a repair shop to get it repaired?	
Why did you not repair it yourself?	
Item 1	Item 2
Section 3B - I tried to repair the item	
How? (tick where appropriate)	
I tried to fix it myself I asked someone to repair it for free I paid someone to repair the item for me I went to a community event (i.e. repair café/restart party) to get it repaired I used the extended warranty I had to get it repaired I returned it to the shop where I bought it to get it repaired I brought it to a repair shop to get it repaired Other (please specify in the box below)	I tried to fix it myself I asked someone to repair it for free I paid someone to repair the item for me I went to a community event (i.e. repair café/restart party) to get it repaired I used the extended warranty I had to get it repaired I returned it to the shop where I bought it to get it repaired I brought it to a repair shop to get it repaired Other (please specify in the box below)

What type of information did you look for to carry out the repair? (tick all that are appropriate)	
I looked at YouTube Video to find out how the item could be repaired I looked for repair guide online (i.e. Ifixit) I looked for the address of a repair shop I asked for advices from friends and acquaintances Any other details that maybe relevant (please specify in the box below)	I looked at YouTube Video to find out how the item could be repaired I looked for repair guide online (i.e. Ifixit) I looked for the address of a repair shop I asked for advices from friends and acquaintances Any other details that maybe relevant (please specify in the box below)
Can you describe the type of repairs that was carried out (i.e. replacement parts, soldering fuse etc.)	
What challenges or problems, if any, did you encounter in trying to repair the item?	
Have you successfully repaired the item? (tick where appropriate)	
Yes No If no, Why? (write you answer in the box)	Yes No If no, Why? (write you answer in the box)

What motivated you to get it repaired instead of disposing it?	
What motivated you to repair it (yourself or with the help of someone) instead of going to a repair shop?	
How did you feel when you tried to repair the item?	
How did you feel about the outcome of the attempt repair (success or failure)	

Section 4 – Tell us few things about you by answering the following questions

Are you male or female?		Male	Female
What is your date of birth (day/month/year)?			
What is your marital status (tick where appropriate)			
Married Civil Partnership Living with Partner	Single Divorced Separated	Widowed Rather not say Other (please specify) _____	
Including you, how many people live in your household (tick where appropriate)			
1 2	3 4	5 6	More (please specify)_____
How many children under 18 currently live in your household (tick where appropriate)			
None 1	2 3	4 5	More (please specify)_____
What is your approximate annual average income (tick where appropriate)			
<£10, 000 £10,000-£20,000	£35,000-£50,000 £20,000-35,000	£50,000-£80,000 £80,000+	I would rather not say
What is your highest academic qualification to date?			
What is your current employment status?			
In full-time paid employment In part-time paid employment self-employed retired from paid work altogether undertaking unpaid (voluntary) work on maternity/paternity leave looking after family at home	full-time student long term sick or disabled on a government training scheme seeking employment Other (please specify in the box below)		
What sector do you work in?			
Accounting and financial management	Investment, banking and investment IT/telecoms		

Banking, Insurance and financial services Charity and not-for-profit Construction, civil engineering and surveying Consulting Consumer goods, manufacturing and marketing Education Energy and utilities Engineering, design and manufacturing Hospitality, leisure and tourism	Law-Solicitors Logistics, transport and supply chain Media and advertising Property Public Sector N/A Other (please specify in the box below)

How would you describe your job role	
Senior Executive Senior Management Middle Management Supervisor Administrator	Technician Manual Labour Other (please specify in the box below)

Which communities are you involved in your spare time and how involved are you on a scale of 0-10 – 0 being no involvement – 10 high involvement -? (write in the box provided)			
Hackspaces/FabLab communities		Crafts/Sewing/Knitting community groups	
Permaculture/Landscaping Gardening community		Zero Waste/Minimalist/Waste Reduction online communities	
Civil rights Campaign groups		Secular/Spiritual/Religious communities	
Footpaths Carbon reduction groups		Other (please specify)_____	
Environmental Campaign groups		Other (please specify) _____	
Transition Towns		Other (please specify) _____	

What is your ethnicity? (please describe in the box below)

Section 5 – Keeping in touch

Would you be happy in participating in further studies to get greater understanding on attitudes towards repair and the process of change?	
Yes No If yes, please insert your contact details and I will contact you in the near future.	Name_____ E-mail_____ Phone number_____

Thank you very much for answering this questionnaire. You can return the questionnaire to the researcher, one of her helpers or in the appropriate box at the Friends Meeting House. We hope very much that you will enjoy the rest of the day with us.

Advertisement/Recruitment material

Blog Post on the www.leicesterfootpaths.org.uk

Marie is doing her doctorate at Loughborough Design School investigating the intention to try to repair an electrical item. She is also working with Footpaths on the organisation of the Green Festival of Making & Mending. Her research intends to provide a greater understanding of the decision-making process and process of change people go through in deciding to repair an item and how a change in attitudes and behaviour towards repair can be enhanced. To support her research, she will invite attendees of the Green Festival of Making & Mending to participate in a short survey on their attitudes towards trying to repair an electrical item. The questionnaire will approximately take 15 minutes. It will aid in developing a future larger Survey study on attitudes and process of change. There will be the opportunity to participate in further studies (i.e. online survey, interviews and observation in trying to repair an item), more details are to come. If you want more information on the research and would like to be involved in future research, please get in touch with Marie Lefebvre, m.lefebvre@lboro.ac.uk

Appendix K – Prosumer Study documentation

The following appendix includes all that was developed to interact with the participant for the main study 1. It includes:

- pre-interview exercise
- interview questions
- Instructions on how to film and send recording
- Mission 1 and 2
- Participants Information Sheet, Informed Consent form and further information on the mobile video ethnography for the participants

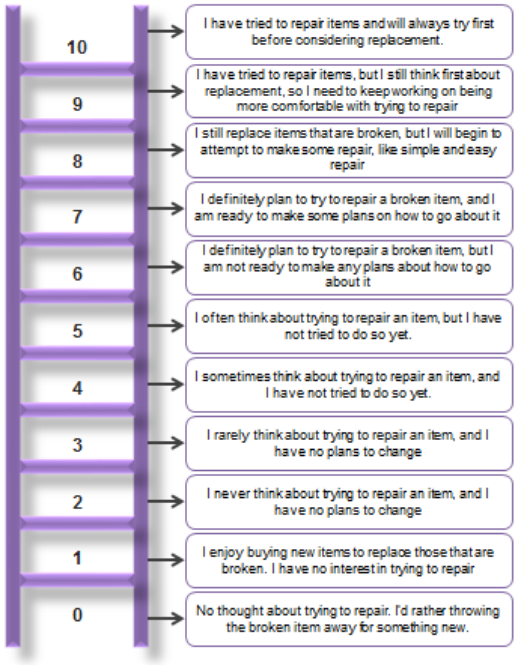
Pre-Interview Exercise - Contemplation Ladder

Please feel the questionnaire below, tick the boxes if you decide to print this form or highlight your answer.

What is your gender:	
☐Male	☐Female
Age:_____	
What is you current employment Status:	
☐in full-time paid employment ☐In part-time paid employment ☐Self-employed ☐Retired from paid work altogether ☐Undertaking unpaid (voluntary) work ☐On maternity/paternity leave	☐Looking after family at home ☐Full-time student ☐Long term sick or disabled ☐On a government training scheme ☐Seeking employment ☐Other_____
Approximate annual average income:	
☐<£10, 000 ☐£10,000-£20,000 ☐£35,000-£50,000	☐£20,000-35,000 ☐£50,000-£80,000 ☐£80,000+ ☐I would rather not say
What is your highest academic qualification to date? _____	
Have you engaged in the following activities in the last 5 years (tick where appropriate or highlightyour answer):	
☐Tried to repair an electrical item ☐Tried to repair a piece of furniture ☐Tried to mend some clothes ☐Tried to look for guides to help me repair an item ☐Tried to go into a repair shop to get an item repaired	☐Tried to go to a repair community events ☐Tried to watch some videos to help me repair an item ☐Tried to ask for help to repair an item ☐Other activities you engaged in to help you repair an item: _____ _____

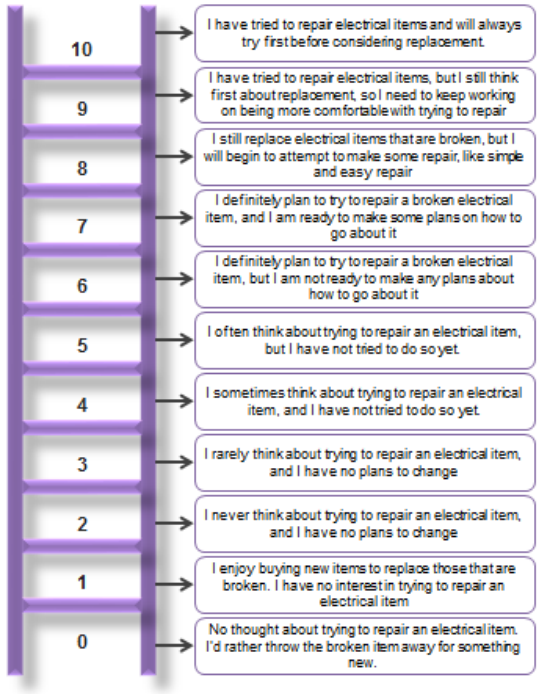
Pre-Interview Exercise - Contemplation Ladder

Each rung of this ladder shows where various users are in thinking about engaging in **repair behaviour**. Select the number that best matches where you are now.



Pre-Interview Exercise - Contemplation Ladder

Each rung of this ladder shows where various users are in thinking about engaging in **the repair of electrical items**. Select the number that best matches where you are now.



Interview

Code:……..	Date: :……
PRP Profile: :……..	Start Time……/End Time……

Current Role – URP

1. Can you introduce yourself?
2. Can you tell me a bit more about the home you live in and the people living in the household and their roles in relation to repair?
3. What statement did you choose for the short exercise?
4. What looking at past experiences made you choose this particular statement
5. What were the elements that help you to come at that stage of consideration? (tailor depending on their choice)
6. What were the elements can help you move on to the next stage? (tailor depending on their choice)
7. What elements hinder you to move on to the next stage
8. On a scale to 1-10, to which extent do you feel you have the skills to repair an item?

High URP	**Low URP**
9. How your acquired skills make you feel? 10. What do you do to forget that you haven't got great ability to repair items? (SC)	How your lack of ability to repair make you feel? (DR) What do you do to forget that you haven't got great ability to repair items? (SC)

Repair Perception - Perceptions of Repair and Repair Movement

11. How do you view repair as a skill to acquire as a prosumer?
12. How do you perceive the lack of repair skills amongst people in general?
13. What changes have you encountered if any that support and encourage repair behaviour across society?
14. How do you perceive those changes?

Repair Process Processes supporting repair practices

Choose an item that you have tried to repair in the past, can you go through the steps you went through in trying to repair the item (I will write them on post it notes).

Now using the colour pen, can you indicate?

a. Which one of the steps do you stumble the most upon with (stumble most)
b. Which one of the steps do you tend to give up to persist to repair with (give him up to persist)
c. Which part of the process do you spend the most time on with (most time)

d. Which part of the process do you enjoy the most (enjoy the most)?

e. Which part of the process do you despise the most (despise the most)?

f. Can you give me more details as to why for each item you've indicated?

15. What do you do to counter the urge of giving up repairing an item? CC
16. What trigger you to give up on repairing an item?
17. What type of information you look for or subscribe to help you to repair items? CR

What places/situations discourage you to repair an item? SC

Social gearing toward repair

18. How does your social circle feel about repair and trying to repair broken items?
19. What people expect from you to do when an item is broke?
20. How supportive is your social circle in your attempt to try to repair an item?

High URP	Low URP
21. What expectations people have of you when you try to repair an item? (ER) 22. How different your relationship with others will be if you did not know how to repair anything 23. Who do you talk to when you feel your lacking some particular repair skills? 24. who do you seek out to help to repair items CR 25. who do you talk to when you have a problem with repairing an item HR	30d. What expectations people would have of you if you tried to repair an item? (ER) 29c how different your relationship with others will be if you know how to repair anything? 29.b Who do you talk to when you feel you lacking some particular repair skills? who do you seek out to help to repair items CR who do you talk to when you have a problem with repairing an item HR

26. How your social circle is rewarding you for the repair effort that you are making? CV

27. If you fail to repair an item, what type of emotions do you experience?
28. To what those emotions are directed to primarily? Why?
29. What is the main course of action you take if you fail to repair an item in your home? Why do you take this particular course of action? Why do you not consider asking for help?
30. If you choose to replace, what do you look for in the replacement you are taking considering your experience in trying to repair the previous item?
31. If you fail, how likely are you to be discouraged to try again to repair in the future? Why?

High URP	Low URP
Future Self/Present Self	Future Self/Present Self

<table>
<tr>
<td>32. How different your life would be if everyone knew how to repair (ER)
33. How different your life would be if you did not know how to repair?
34. What type of person would you become if you stop repairing items that you own?</td>
<td>a. How different your life would be if you knew how to repair items (ER)

How different your life would be if everyone knew how to repair (ER)

b. What type of person would you become if you can repair items (SR)</td>
</tr>
<tr>
<td colspan="2">Ask last question

35. How does all this fit with your idea ‘I can or cannot repair’
36. So we had quite a long conversation about repair, thinking back on this conversation, how does all this fit with the following perceptions: I can or cannot repair’
37. What steps would you take to engage further in the repair journey?</td>
</tr>
</table>

Research on users' repair propensity through Mobile Video Ethnography

Details on the second stage of the research

inc. tips on filming, first mission and instructions on sending video

Research on users' repair propensity through Mobile Video Ethnography

- Thanks for participating in the second stage of the research on understanding users' repair propensity through a mobile video ethnography.
- Over the next 2-3 months, I will invite you to complete 3 missions which will be sent by email as you complete them.
- **What do you need to complete the missions?**
  - To complete the missions, you will need a mobile phone or a video recording camera to do some recording.
- **Length of the video**
  - The videos can be as short as 5 minutes or as long as 30minutes. You are also welcome to shoot more than 1 video for the same mission.
- In the following document, you will find some tips on filming the video, your first mission and instructions on how to send your recordings.
- Do not hesitate to contact me by email on m.lefebvre@lboro.ac.uk or by phone on 0740 265 0534.

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- Do not hesitate to contact me by email on m.lefebvre@lboro.ac.uk or by phone on 0740 265 0534.

Tips on filming the videos

- **Get close to your subject (i.e. the object)**
  - Staying physically closer to your subject/object ensures better image quality and focus in your videos.
- **Stay steady**
  - If you don't want your video footage to come out distorted, try to keep your phone steady while recording. Use both hands to hold your video camera / phone as close as possible to your body as you record the video. This could be fatiguing in long takes, so you may want to support the phone with a tripod, rest it against an object such as a mug or a book, or ask a friend to help.
- **Be prepared for the shoot**
  - Before you begin recording your videos, make sure that you have all of the objects and shooting locations ready to go. Additionally, make sure your phone is charged and that you have enough storage space (available memory) to store the footage

Instructions on sending the recordings to Marie

There are two ways you can send me the videos:

1. You can use the website https://www.wetransfer.com/. It is a free service (up to 2GB). All you have to do is add the file and include my email address. I will receive a link to download the content.
2. We can arrange to meet for me to collect the videos from you once you have completed all the tasks or as you complete them.

If you have any issues on how to send the recording, get in touch with me by telephone 0740 265 0534 or by email m.lefebvre@lboro.ac.uk for us to arrange how the recordings will be collected.

Mission 1 – Trying to repair

- **Prior to filming**
  - Make a list of the small/medium electrical/electronic objects you have tried to repair yourself or with the help of someone else in the last 5 years. It can be a successful or unsuccessful repair
  - Think of the experience you had in trying to repair them
- **Filming**
  - One object at the time, record yourself answering the following questions:
    - What is the item?
    - What are your memories linked to this particular item?
    - What was wrong with the item?
    - What was your experience in trying to get the item repaired?
    - What were the steps you went through in trying to repair the item?
    - If you managed to repair the item,
      - What you love/like about the repaired objects
      - What you hate/dislike about the repaired objects?
    - If you haven't manage to repair the item
      - What have you decided to do with the item? Why?
- **Note**
  - You can record up to five objects or more. It is fine to report on less than five objects.

Mission 2 – Retaining items for repair

- **Prior to filming**
  - Make a list of the broken small/medium electrical/electronic objects that you still have at home.
  - Set up the items you intend to film
- **Filming**
  - One object at the time, record yourself answering the following questions:
    - ❑ What is the item?
    - ❑ Is there any specific memory that you have that is attached to this particular item? If yes, what is it?
    - ❑ What is wrong with the item?
    - ❑ What are the reasons you chose to retain the item? (practical/ethical/human/natural reasons?)
    - ❑ Do you intend to repair the item?
    - ❑ If yes, what is going to be your course of actions?
    - ❑ What is your main motivation in trying to repair the item?
    - ❑ What has stopped you to repair this item up to this point?
    - ❑ What would make it easier for you to repair your product?
- **Note**
  - You can record up to five objects or more. It is fine to report on less than five objects.

Participants Information Sheet, Informed Consent form and further information on the mobile video ethnography for the participants

Mobile Video Ethnography along with Semi-Structured Interviews on repair

Participant Information Sheet

What is the purpose of the study?

The purpose of the study is to explore the factors that influence or hinder the adoption of repair as a practice by the participants.

Who is doing this research and why?

This study is part of a Student PhD research project supported by Loughborough University and the Design Star AHRC consortium. The PhD project is to support the Design School's portfolio of sustainable design research in design for sustainable behaviour.

Exclusion Criteria

You must be currently living in the UK, over the age of 18 and not be identified as vulnerable to take part in the interview.

What will I be asked to do and how long will it take?

You will be asked to complete a short writing exercise in which you will tell two different stories about your experience with repair. The exercise will be sent by email and will take minimum 10min to complete

You will then be invited to a semi-structured interview with the researcher. The semi structured interview will approximately take 1h10min to complete. This will be conducted in a place agreed with you and the researcher. This will be audio-recorded or video-recorded if you agree to it in order to familiarise you with the camera as a tool. Some pictures will be taken as well if you are ok with it.

After the semi-structured interview, some instructions will be given to complete approximately 6 tasks sent by the researcher by email over a span of 2-3 months. You will complete them in your own time using your mobile phone device or a camera provided by the researcher. The recordings for each task can be as short as 5minutes or as long as 30min. After having completed each task, you will drop the content onto a shared folder accessible only by him and the researcher. The researcher will insure to delete the file after having it downloaded onto a more secured location.

After the researcher finishes analysing the video content, the participants will be invited for a last interview to review the videos and provide additional comments. It will happen approximately 3 to 6 months after the tasks have been all completed. The interview will approximately take an hour. This will be conducted in a place agreed with you and the researcher. This will be audio-recorded or video-recorded if you agree to.

Once I take part, can I change my mind?

Yes! After you have read this information and asked any questions you may have we will ask you to complete an Informed Consent Form, however if at any time, before, during or after the sessions you wish to withdraw from the study please just contact the main investigator (Marie). You can withdraw at any time, for any reason and you will not be asked to explain your reasons for withdrawing. However, once the results of the study are submitted, it will not be possible to withdraw your individual data from the research.

Will I be required to attend any sessions and where will these be?

Only if you are willing to participate in further studies at a later date (please see consent form).

I HAVE SOME MORE QUESTIONS; WHO SHOULD I CONTACT?

If you have some more questions, you may contact Marie Lefebvre using the contact details above

WHAT PERSONAL INFORMATION WILL BE REQUIRED FROM ME?

Your name, email address, phone number and home address to drop the exercise booklet. The email address will be used to send you information about the interview

WILL MY TAKING PART IN THIS STUDY BE KEPT CONFIDENTIAL?

Yes. Through the signing of the participant consent form, all recorded information will be kept confidential and anonymous for a period of 6 years in a secure location

WHAT WILL HAPPEN TO THE RESULTS OF THE STUDY?

The results of the study will be used to understand the adoption of repair behaviour by a number of prosumers and to develop different profiles of behaviour. Additionally, data gather from this study (i.e. verbal and visual responses of participants) may be used to demonstrate and/or comment on the research at future conferences or in publications. Your contribution will always be kept anonymous but if you do not wish to be included you must notify the researcher before 31/12/2016.

WHAT IF I AM NOT HAPPY WITH HOW THE RESEARCH WAS CONDUCTED?

If you are not happy with how the research was conducted, please contact Ms Jackie Green, the Secretary for the University's Ethics Approvals (Human Participants) Sub-Committee:

Ms J Green, Research Office, Hazlerigg Building, Loughborough University, Epinal Way, Loughborough, LE11 3TU. Tel: 01509 222423. Email: J.A.Green@lboro.ac.uk

The University also has a policy relating to Research Misconduct and Whistle Blowing which is available online at http://www.lboro.ac.uk/committees/ethics-approvals-human-participants/additionalinformation/codesofpractice/ .

Is there anything I need to do or before the interview session?

You will need to complete the exercise booklet and reflect on past repair experiences and experiences when small kitchen appliances in your home.

WHAT DO I GET FOR PARTICIPATING?

You will become more aware of the factors and processes you engage in or have engaged in when trying to repair an item in your home. You will become more aware also of your preferences in relation to item and type of repair activities. Your involvement will also make a valuable contribution towards design for sustainable behaviour and design for repair. Lastly, you will receive a voucher from a local sustainable shop as a gift of gratitude for your participation

MOBILE VIDEO ETHNOGRAPHY ALONG WITH SEMI-STRUCTURED INTERVIEWS ON REPAIR

INFORMED CONSENT FORM

(TO BE COMPLETED AFTER PARTICIPANT INFORMATION SHEET HAS BEEN READ)

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that all procedures have been approved by the Loughborough University Ethics Approvals (Human Participants) Sub-Committee.	Yes ☐	No ☐
I have read and understood the information sheet and this consent form.	Yes ☐	No ☐
I have had an opportunity to ask questions about my participation.	Yes ☐	No ☐
I understand that I am under no obligation to take part in the study.	Yes ☐	No ☐
I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.	Yes ☐	No ☐
I understand that all the contact details I provide (e-mail address and phone number) will be use only if I decide to be contacted at a further date to participate in an interview.	Yes ☐	No ☐
I understand that all the information I provide will be treated in strict confidence and will be kept anonymous and confidential to the researchers unless (under the statutory obligations of the agencies which the researchers are working with), it is judged that confidentiality will have to be breached for the safety of the participant or others.	Yes ☐	No ☐
I agree to participate in this study.	Yes ☐	No ☐

Your name _____

Your signature _____

Signature of investigator

_____

Date _____

INFORMATION FOR THE MOBILE VIDEO ETHNOGRAPHY MISSIONS

To receive the mission, I will need an email address and/or a mobile phone. I will send you both a text and an email to let you know what the mission is. I will send you a reminder in case you have not yet completed the mission over the following week. There will be approximately 10 missions over the span of 3 months that you can complete in your own time using your mobile devices or a camera that I will provide. The video length can

be as short as 5 minutes or as long as 30min. You are welcome to do more than one video for the same mission. If you have any questions on the mission, do not hesitate to get in touch on 0740 265 0534 or m.lefebvre@lboro.ac.uk

Instruction on where and how to send the recording to the researcher

In order for me to receive your recordings, it will be great if you can upload them onto Dropbox into a shared folder that I will have created for this purpose. It will be called 'Prosumer Repair [your name]. I will check the folder every day and download them onto my computer and delete them from the shared folder to ensure that they remain confidential.

If you are using your mobile phone to record the videos, you can download the Dropbox application on your device and upload the video directly. You can also access Dropbox from your computer.

If you haven't got a Dropbox account, it is possible to create an account using your email address from the application on your mobile phone or on your computer. Please let me know which email you have used to create the account, it will allow me to create a folder for you to upload your videos on it.

If this appears too complicated for you, I am happy to collect all the videos at a later date, you can also transfer them to me through a Wetransfer https://www.wetransfer.com/ on m.lefebvre@lboro.ac.uk

Appendix L – Electrical equipments referred to by participants across the two studies

	Survey Study	Prosumer Study
Assorted Power Tools	x	
Bathroom Electric Light Fixture		x
Bathroom Scale	x	
Bicycle Lights	x	
Bread-Maker	x	x
Camera	x	
Caravan Lights Fittings		x
CD Player	x	
Charger	x	x
Circular Electric Saw	x	x
Clock	x	
Christmas Lights	x	
Coffee Grinder	x	
Coffee Maker	x	x
Cooker	x	
Carpet Sweeper	x	x
Desktop Computer	x	x
Disclights		x
Dishwasher	x	
DVD Video Player	x	
Electric Carving Knife	x	
Electric Drill	x	
Electric Fan	x	
Electric Razor	x	
Electric Scale		
Electric Screwdriver	x	
Electric Toothbrush	x	
Electric Whisker	x	
E- Reader	x	x
Fairy Lights	x	x
Food Processor	x	
Freezer	x	
Guitar Input socket Jack	x	
Hair Dryer	x	
Hair Straighteners		
Hand Free Car Kit	x	
Hand-held blender	x	x
Hand-held Gaming devices	x	
Hard-Drive	x	
Headlamp	x	x
Headset	x	x
Hedge Trimmer	x	x

Hot Hair Fryer	x	
Iron	x	
Juice Maker	x	
Kettle	x	
Lamp	x	x
Landline Telephone	x	
Laptop	x	x
Lawn Mower	X	x
Liquidiser		x
Mobile Phone	x	x
Microwave	x	x
Mp3	x	
Oven		x
Printer		x
Radio	x	x
Refillable cartridges		x
SatNav	x	
Sander	x	
Screen		x
Shredder	x	
Sigma Camera lens		x
Slow Cooker	x	
Steamer	x	
Stereo Hifi Speaker	x	x
Straightener		x
Tablet	x	
Toaster	x	x
Tumble Dryer	x	
TV	x	x
Vacuum Cleaner	X	x
Washing Machine	x	

Appendix M - Sample interview transcript

Can you introduce yourself and tell me a bit more about you and your home

My name is HW01D.

Tell me about what you do?

I work for, an academic publisher for a psychology journal. Outside of work, I am involved in environmental activism with Friends of the Earth and the Green Party.

Can you tell me more about the home you live in?

So I live in a terrace house with two bedrooms and a garden, not quite. I live by myself unless we are counting three fat Guinea pig.

Are you the primary person looking after repair in the house?

That is an interesting question, so my parents and my sister lives just down the road abt two miles away. My dad helps me with DIY things so he might be the main person looking after repair. It depends what the things are I suppose.what needs repair.

For example clothes, I can repair my own clothes. I am alright with that. But anything that sounds more like DIY like appliances or when I needed a new door. Is that repair then that was my dad so yes he will help me.

Contemplation ladder

For general repair. You chose number 9. Why

I found the ladder tricky because it really makes a difference to me as it depends on what is broken. There are things like an electrical item then I do not have a clue on how to repair it so I would ask my dad or I might replace it without having to repair it. The one exception is that I have learnt to replace the belt on my hoover when that break.so that was my achievement. But clothes like example that need redoing, fixing holes and button I do it all. I am fine with fixing this. Furniture I have tried. I had a table with a wobbly leg. I tried to fix that myself. There some things I'll o myself. And something I would not have a clue. I would either ask my dad, or I would probably replace it.

Why I definitely plan?

Because I would like to be a bit more competent at repairing electrical things, I bought a new phone earlier this year, and I bought a Fairphone. Because it supposes to be fairly easy to repair. And they got a lot of tutorials online. I have got quite an in-depth website with a lot of instructions on how to repair it. I need to. So, I am hoping that if I break that. I would be able to use the tutorials to repair it myself. And the hoover I can lightly repair it. I have tried to fix a leg on a chair, and I had a bit of luck with that. Some things I haven't tried to repair. I have a steamer at the moment that is leaking water. It is very annoying; the top counter is full of water every time I use it. And I keep thinking that it must be possible to fix it. But I had not the time to do anything to it yet.

What would help you to make it better?

I suppose knowing where to look for the information.u can probably google it and find out. But haven't tried. But I don't know where to go to find out how to repair things. I suppose I am a bit daunting because I haven't done many repairs. If I find some instructions and it is a bit complicated, it might put me off as I might not be able to follow them.

On a scale to 1-10, to which extent do you feel you have the skills to repair an item?

Maybe two because I can do the hoover. I can fix one problem in a hoover, and this is probably my only repair skills. Why? I think partly that is because my dad is very good at doing it. And so I have always relied on him which is not a good habit to get into. But I do remember at school we did learn how to wire a plug. And I haven't done it myself since so I can't remember how to do it. So I think I am just in the habit of relying on someone else.

What skills are required?

Some knowledge of how they work. I think he Gained that from trying to repair things because he had a long time trying to repair everything.

How your lack if skills make you feel

I suppose I do not think about it because it is just a normal habit that I do not try to repair things, but I guess it is a bit frustrated. It is better to be able to do things yourself rather than relying on somebody else (reliance self-reliance seamless reliance)

(Ur dad is the main support)

There are things that break, and I do not know what to do with it, and This is why I bought the Fairphone, I had several second-hand phones in the row, and they'll break I can't fix them there is no way to fix them so either I gave them to my dad and it has not been able to fix them either because if software or the actual phone itself. I find it very frustrating because you have to either throw away or give it to the recycling people. It is only a phone it should be fixable, and it is not so I would like my things to last longer.

What do u do to forget that you haven't got much skills to repair those items?

This is getting onto deep psychology. I don't know I give stuff to my dad and do not think abt it very much.

I am very lucky.

How do you view repair as a skill to acquire by consumer?

I think we are not encouraged as consumers are we. The stuff that we buy are not easily repairable so I don't think companies want us to repair things and it is why it is difficult. But it is useful. We should not throw away things because they are only a few years old. And because there is something wrong with them. They say that if you bought a fridge 15years ago you could still be using it because you could repair it. Those modern fridges are a lot more difficult to repair. So think we used to repair a lot more.

How do you get out of the trap?

I tried to get out of the phone trap by getting the fairphone. A phone that is more repairable. But often you cannot find things that are, can you? I m still waiting for a Fairphone version of a laptop cos I always found that y laptop lasted a few years and I get something terrible with them and it is not fixable.

What tends not to break in your home?

Some things, I had them for quite a long time, like my kettle, I bought when I went to university when I was 18, and I am now 32. So it is 13 years old, and it is still working. It is fine. I have an old toaster which is fine. It is a phone really. Phones and computers do not last very long. And that has to do with software partly as opposed to the electronic bit.

How do you perceive the lack of repair kills amongst people in general.

I think that people are so used to replaced things so easily and so cheaply. Electronics are getting so cheap nowadays as it used to be in comparison to average income. They don't think about it they don't think about repairing things they just buy new things.

What changes or initiatives have you encountered that encourage repair behaviour.

Well, there is the hackspace in Leicester, so I know abt the hackspace because you are involved in it and my dad helped them out. And a lot of cities have repair cafes repair workshops where people take their broken bits. I must think there is stuff on the I internet that help people to repair, but I haven't looked at it, so I don't know. And then btw they are companies who are trying to make things more repairable like the fairphones.

How effective are they?

I am not sure because it just had it a few months ago. If after ten years, I still got it. Abt the other.

I think it is difficult because they only reach a limited audience of people who worry abt things like this and the majority of people carry on throwing things out. But maybe it is a start, and it is a step in the right direction. What do you think will help to get more people to repair. I think for me it is an awareness of electronics waste and how damaging it is to the environment. So maybe this is a difference if people understand you know if you

throw things in the bin it is not gone it will seat somewhere in a hole and pollute the soil somewhere, so there is that understanding is there. The microbeads have been quite interesting recently it is not electronic waste, but I think it is interesting that lot of people who do not really care Bt the environmental issue are disgusted that plastic is going into the sea. That it is a mean to think more about waste. So sometimes suddenly do get an understanding of the effects of consumerism I suppose.

what is the moral implication of repairing an item. It is pollution from my perspective. If you do not repair an item and you are chucking it out. Then it is just pollution isn't it? This is gone and sit somewhere. I watched a film a while ago called the light bulb conspiracy, and it is about how things are designed to fall apart after a period of time, and it was talking about apple product and how Apple was asking g send us back your apple, and we will recycle them .bit when they looked into it they found out that apple were dumping all their electronic products in a river bank somewhere in Kenya where there are fewer restrictions. And it was just polluting everybody water in this area. So I think when you are throwing something out without thinking about it you bear part of the responsibility for the pollution that comes out of that.

How do you deal with that?

I don't know. Everybody has to watch the light bulb conspiracy.

Choose an item.

The Hoover

It started making a strange smell. And it was not picking up stuff that was on the floor. This standard item needed repair. I asked my dad why it gave a strange smell. He looked, and he said the Hoover belt is gone and he showed me where it was on the hoover, and he told me what sort of hoover belt I need ed to get. It got a serial number on the bottom of the hoover that tells you, and he told me where the shop was. So I went to the shop with my bit of paper. And I said that I need one of this and they say that I was lucky because it was the only one they had and I got home and looked at the hoover again, and I wanted to see whether I could work it out by myself. I could see that we could unscrew the bottom part of it. And I had a screwdriver. So I unscrew it, and I could see how to change the belt. It was quite easy to do it. There was a roller that you take out. And then put the new belt around it. And I put it all back together. And put it back up, and it stopped making the strange smell. So it was excellent. So it was kind of trial and error but with advice and the best place to understand the problem. And I did it again since the first time I had to do it. Because when it started to make a strange smell, I knew what was the matter with it.

Which step stumble the most upon

Normally what I do is I ask my dad, and he just takes it off me, and he just fixes it. So the difference here he left the hoo cd r here and told me to get the gelt myself. And then when I had it, I had to fix it myself. I suppose it was not difficult; it didn't require any technical skills to do. So it was not very daunting. And also I wanted to hoover the floor because my friend was coming and I didn't want to wait for my dad to come and fix it. So this was a good incentive. It is the guinea pig they spread hay everywhere. So the thing I stumble upon is that I don't normally do it myself. I just ask my dad.

Maybe it is here that I stumble.he has told me in the past what was wrong with it and where to get a part. Like if something is wrong with my bike, he tells me where to find the part and buy it, and then I give to him, and he fixes it. For example when I needed a new brake cable or when I needed a new inner tube then I'll buy it and give it to him. I would not look at it myself. Shopping is what I do, give it to him and he fixes it.

If it was not there how would you do it?

If it is my bike, I take it to the bike shop, and they do it which is what people don't they? the hoover, I don't know, what would I do with that? I'd probably do like those ridiculous people who buy a new hoover with a

new belt. Or maybe go to repair shop. Maybe they will be somebody else that I could ask. I could maybe ask somebody.

Tend to give up to persist

Maybe when I ask my dad, and he told me that it is not easy to fix. It is not fixable. THEn it will be at that stage if the person tells me it is not fixable I'd buy a new one. It might be at that stage. Or it could be at that stage if I'd tried to repair it by myself and can't do it.

As it been other instances when you looked at something and thought I cannot do it

I have looked at the steamer, and I thought I cannot do it, but I haven't replaced it yet. I have just looked at it and thought argh I don't know what is wrong. It might be that stage.

What is the step you spent the most time on?

Sometimes it takes some time to get the part, doesn't it? The hoover shop was in a place I do not usually go to so I had to make a special journey so it might be getting the new part.

What is the stop you enjoy the most?

I'd like when I put it on, and it was working.

What is the step Despise the most?

The bit when it breaks. And I think when you tried to look at something, and you cannot work out what it is. It is frustrating, isn't it?

Why did you keep the steamer?

It is still usable. It is just that when I use it, it floods the worktop. I'd got around it by putting it on a plate to catch all the water, and I keep thinking that I need to do something about that and I'd just haven't got round to it.

How long as it been like that now.

About a year now.

What would push you to do something about it

If all the water comes out one day before it finishes steaming all the vegetables, then I'd do it, but at the moment it just comes out gradually. It is still steaming. So if it stops working completely then yes.

The steamer

I got it for free. My Nan got it free from a catalogue order. But I do not know from where the water is leaking out you see. It might be in here, the sealed is gone or something.

My nan got it free from a catalogue order she died about five years ago, so it is quite old. I got it for quite a while but it works fine, so I do not want to throw it away. The timer at the front has been broken for a while, but it works. But this doesn't matter; I just use another timer. But I am not sure if it is fixable. If the sealed is broken in, there may be is not.

How would you get the sealed apart? I should have a go shouldn't it really. This is a bit wonky as well.

Why are you so attached to it

I just do not like chucking stuff away. If you throw that away you would not be able to recycle it are you? It is a nightmare to recycle so. I am not really attached to it. I do not tend to replace things unless I need to.

Is there any other reason?

No, it is the only one. Well, I am not sure about somebody else. And I imagine a new steamer is probably 20 quid. I am not worried about 'the money. Just what happens to that one once I throw it. I suppose the carbon created to make a new one.

My sister gave me this it is an old tape player. So I can still play tape if I want to.

What is experience with shopping?

I hardly ever do it. I don't do much shopping. My DVD player broke a couple of years ago. I did buy a new one. I'd just went to the shop telling them that my DVD was not working, just give me a new one. But most things, I bought that when I was 18. This was my parent's old toaster. The thing does not work very well you have to pop it. Otherwise, it works quite fine.

What drive people to buy all the time?

Well, it is advertising, isn't it? Everybody tells me that when you do, you want everything new old the time.

I don't know why we need new things all the time, well I know why it is to make money, but I don't know why people need new things all the time.

Things had got cheaper since the time of our parents when people wanted a fridge; they had to save up to buy it. It will be a big thing, and then they really had to look after it because they valued it, And now because stuff is cheaper. They don't value things in the same way maybe Because they did not have to put as much time into it in order to buy them. People do not value things if they did not have to save up for it. So, therefore, it is easy to chuck it away. We do not pay the real cost of things at the moment.

What people expect from you when something breaks

Well, I guess it depends. They are people who are greeny like me, and they'll expect me to repair or try to repair it. Buy a second-hand one that kind of things. But I have some friends who are not greeny at all who said why do you worry just go and buy one and they would just expect me to replace things I suppose.

What do you think about the reaction on both side

Well, I think the greeny people will be the people I would talk to about repair and that kind of things. Because I would expect them to share the same attitudes. But my school friends I do not usually speak to them about things like that. Sometimes we are so far apart that it is too hard to bridge the gap and it is difficult to talk about environmental impacts with your friends. I think it is harder to speak to your friends about things like that that it is to speak to your family or strangers actually because you do not want to lose your friends, do you? You do not want to bore them with why are you not doing that why are you not doing it this way? I remember when I was a teenager (talk about a group to protect earth 34.46) revelation: you have to be careful to which extent you push your friends particularly if they do not share the same values.

How supportive people around you are of repair?

Greeney friends are always very supportive. If I was telling woody that I was trying to repair something. He will probably know exactly how to go about it. So some are very supportive others are not because they would not understand why I would bother repairing anything

How relationships will be with others if you knew how to repair anything

Would I befriend people if I knew how to repair things? If I knew somebody who had repairing skills and I was trying to repair something, then I would talk to them about it.

If I knew, well people would come to you aren't they like everyone is asking my dad to repair for them.

What happens if your dad disappear?

So many people rely on my dad; it is terrible. He is attending church sometimes in Thurnby, and there are about three old couples there who ask him all is computer questions and he sits at their computer and solves all their problem

He does all my repair, and he does my sister as well and all sort of people I think. I think that people who do have repairing skills do end up with people who relied on them because most people don't have the skills.

What type of skills do you tend to be more involved in?

I think it is a sexist thing because the main reason I tend to repair clothes is through trial and error. I tried to do it and learn like that, and now I can use a sewing machine, and I can repair things and sew buttons. And this is only because I tried to do it. But I have never tried to do the electrical stuff because I will always give that to my dad. It is a bit of a sexist division. I am aware of that, and it does irritate me. I haven't got around to fixing it.

Do you really think that it is sexist because the same process you applied for sewing, you could have applied it to learn electricals?

It is a lot to do with convenience because it is very easy to ask my dad (this was a leading answer do not take into account) my mom is not that good at sewing so I will just have a go at it myself. So convenience is a lot to do with it as well. Also, electrical items if you do something wrong with it. You can hurt yourself. If you sew at a seam roll, you can't. Nothing is going to happen.

If you fail to repair an item, what type of emotions?

Frustration I suppose because I do not like to throw things away I suppose. But then, I suppose guilt because I will have to think about how to dispose of it. So when my phone has stopped working, and I knew if it was not fixable. I had to work out where to take them, what to do with it. So it is like a burden; it is like a burden on how you dispose of things.

To what those emotions are directed towards?

The frustration will be with myself because I'd be conflicted. Or maybe with the item itself if it is designed in a way that does not make it repairable. The guilt is with myself; I think that it just. I don't think anyone will judge me for replacing things. Especially some of my friends will just think that it is normal. So I would not think that I will worry about that. I think it will just be with myself that I was not managing to live up to my own standards on how I wanted to live.

Why?

Why am I an environmentalist? I do not know. I can't remember a moment before when I cared about the environment. It must have happened before when I was very small. So I am not sure. When we were small, we used to watch a lot of earth documentaries. Some people say that it is the way they became environmentalists. There was these children programme when I was young. It was called the animal of the farming wood. It was quite famous in the UK. And it was about these woodlands that were being chopped down, and all the animals leave, and they had to make a very long journey to find a new place to live. It was very upsetting to leave there home behind, and I was very distorted about that, and I watched all this programmes, and my mum used to buy me all the comics, and I read all the comics, and I think that parts stayed with me. That's the idea that I was very upset because the environment was destroyed.

If you choose to replace, what are you looking for?

I tend to go for things that seem to be good quality in the hope that it will last longer. I actually bought a new bike lock today because the locking mechanism ceased to work and I gave it to my dad, and he took it apart, and he said that the locking mechanism was broken and it was not a good quality one, so I was not surprised that it has broken. So I went to the back the bike shop, and I bought a posher, expensive one, hoping that it will last longer, the last one only lasted six months. And it was very annoying, and it was a bike lock and how do you recycle that. It is metal and rubber. So if I do need to replace and I buy a more expensive one.

Is price an indicator of quality?

Well, you can look at things and partly see whether it is good quality, but often the price is into it.

A bigger item like the phone, I read reviews and did some research. My last laptop, I did some research, this was three years ago. So maybe bigger items, I do some research but smaller items, I will just try to find good quality ones.

If you fail to repair an item, how likely are you going to be discouraged from repairing again in the future#

Maybe, I will think I tried before, and it is not possible to repair. I am not sure I have an example. I think it will probably put me off, but I cannot think of an example when that's happen, and it happened again.

Why would you be discouraged?

Just past experience, it will be. Doing the same thing over and over again and getting hoping a different result is the definition of insanity.

It is humanity as a whole

Are you different your life would be if everyone knew how to repair?

I will have more people to ask around than just my dad. But if I knew how to repair, I will be able to do it myself, and I will do not need to rely on anybody else. Which will be good.

How do you feel about how relying on your dad

I think I do not feel anything because I am so used to it. But sometimes it does irritate me that I cannot repair things myself. So for the bike, I went to an afternoon course, a few years ago to check your bike for maintenance problems. I thought I am cycling all the time; I should be able to deal with things better. But anytime something goes wrong, it is something quite complicated like the new brake cable an stuff, so I have never been able to fix anything myself on it. So yes maybe anytime I feel that I do not need to deal with anything with my dad, but maybe it is a bit frustrating that I have to rely on somebody else.

Long conversation how I cannot repair

It reminds me of how much I told you that I rely on my dad and that I think that I should try to be a bit more independent. But it had reminded me of the hoover when I tried to repair it myself, and it was successful where I suppose normally I just suppose that I cannot repair anything. So I do not try.

Where does assumption come from

I think it is just habit. A habit that I just do not try. I am used to not trying. So I suppose that it reminds me that I have to repair things myself. I have to be adventurous

Why adventurous?

Because it is the meaning of trying things that you have not been doing and I suppose it requires some type of confidence in your skills, trying to do something as opposed to just giving up to do something.

Scout and guide don't you do repair?

I am a brownie, we do craft and things, but we do a bit of sewing but no repair they are too young. You need a one to one ratio for sewing.

What steps would you take to engage more?

I should probably take my steamer to the hackspace and then maybe they will show me how to repair it. That might be a good first step. And maybe next time I tried to fix something, I should try to look into an online guide because they might be instructions there that I will be able to follow. They have pretty much wiki how today aren't they. So I will probably look at that.

How do you feel about all those resources that are available?

In terms of repair, I suppose that there are resources available online, but I haven't done it so it might be too difficult. The hackspace sounds very good because it is during the weekend and often I am busy, but it is a very good resource to go to see people to talk to. It is easier than going online and following written instructions.

Learning a skill – there are so many skills to learn

It will be very good if there were a course on repair, but I am not sure how it will work because there are so many things to repair. From what would you start. You can do bike repair courses, I have seen those. I suppose there are specific one but how do you repair appliances, you will have to do an all course don't you?

Appendix N – Coding Studies

Code	***Description***	***Survey study***	***Prosumer Study***
acc	Access to repair shops	x	x
actEC	I can think of many things I'd rather do than work toward improving the environment.	x	
Act	Action	x	X
actother	Other activities that were not significant	x	X
Adv	Advertisement supporting consumption as opposed to repair		x
age	Elements attached to the age of the items	x	X
agedis	Age of the item discouraged repair	x	X
ageold	The item was old	x	X
agepri	The item was too old for anyone to do it at a reasonable price	x	X
alteroldIN	In general, I would rather alter an old product to work in a new situation than purchase a new product specifically for that purpose	x	x
Ant	Anticipation of outcomes	x	X
AntFeel	Anticipated feelings	x	X
Anxproc	Anxiety related to the process of repair		x
apart	The item was impossible to take apart - not designed to be repaired	x	X
apartseal	The item is a sealed unit	x	X
Ass	Assessment of the item against other variables to decide whether to repair or not	x	X
asscost	Pointless - repair assessment cost would have been more than item cost	x	X
atta	Attachment to product	x	X
Att-Try	Attitudes towards trying	x	X
avoi	Avoidance strategy	x	X
Batt	Batteries issues	x	x
Ben	Benefits gained from repair	x	X
bro	The item is broken	x	X
brorep	I broke it	x	X
can't	I can't repair the item	x	X
capacityIN	I do not enjoy a product unless I can use it to its fullest capacity.	x	
careE	If you take good care of your possessions, you will definitely save money in the long run	x	X
Cel	Celebration	x	X
Cheap	Cheaper	x	X
cheapdis	Disposing it is a cheaper option	x	X
cheaprec	It was free to recycled	x	
touchHrel	Enter in contact with community of learners	x	X
cle	Cleaned	x	X
Comm	Community groups supportive of repair		x
Commit	Commitment to repair for many reasons		x
Com	Competency	x	X
Compl	Items are becoming more complicated to repair		x

Con	Contemplation	x	X
concEC	Environmental problems are of great concern to me personally	x	X
ConcHum	Concern for humanity or the impact of not repairing on others		x
Conf	Confidence	x	X
Cons	Cons to change – decisional balance	x	X
ConsRais	Consciousness raising - Increasing awareness about the healthy behaviour.	x	X
Corroded	The part was corroded	x	X
Cos	Cost/Expense	x	X
Costen	Financial/Cost considerations encourage repair	x	X
Costdis	Financial/Cost discourage repair	x	X
Coun-Conditioning	Counter-Conditioning Substituting healthy behaviours and thoughts for unhealthy behaviours and thoughts.	x	X
CourFail	Course of actions in case of failure	x	X
Corp	Repair harm corporation	x	X
dam	The cost of damage discouraged the repair	x	X
data	The data inside discouraged repair	x	X
Det	Details on the process individuals went through in trying to repair the item	x	X
dev	Devalued to the extent of being glad of getting rid of it	x	X
diagissue	Issues with diagnosis of the problem I could not diagnose why it was not working	x	X
Noeasy	Type of item difficult to repair	x	X
dis	Disassembly	x	X
Disl	Part got disattached or dislodged	x	X
disInsp	Disassembled to inspect	x	X
disc	Discovering issues when trying to repair	x	X
disciplineE	I discipline myself to get the most from my money	x	X
DispoNonRep	Disposable income discouraging people to repair and favouring buying new		x
DramaR	Dramatic Relief	x	X
E	Economic Considerations	x	X
Easy	Elements attached to how easy the repair might be	x	X
EC	Environmental Concerns	x	X
EducIma	Educational choice by the prosumer are determining whether they can or not repair		x
EducRep	Education from school supportive of Repair		x
EducnonRep	Education from school nonsupportive of repair		x
Ecen	Environmental concerns encourage repair	x	X
Echate	I hate waste encouraging retention	x	X
Enj	Enjoyment	x	X
env	Needed appropriate environment to repair	x	X
Env-reevaluation	Environmental re-evaluation - Social reappraisal to realize how their unhealthy behaviour affects others.	x	X
Events	The repair is thought as an event to prepare for	x	X
exp	Repair are too expensive	x	X
Expe	Experience is being used to repair	x	X

expesucc	My experience of repair has not been successful		x
experno	Electrical are not my area of expertise	x	X
expert	Had expertise - Expertise	x	X
Fail	Attitudes towards trying related to Failure	x	X
failshop	The repair shop could not repair item	x	X
Famethic	Shared expectation in family unit to repair		x
Famforce	Family did not force me to repair		x
FamMem	Childhood memory supporting repair		x
FamNonSup	Family non supportive of repair		
FamSup	Family supportive of repair		
feelgoodE	Making better use of my resources makes me feel good	x	X
Feel-ModFixM	Different feelings depending on whether it is repaired by oneself or others	x	X
Feel-neg	Negative emotions encouraged repair	x	X
fidd	Fiddly - Fine handling	x	X
Fix	An attempt will, may, might be made to repair	x	X
FixM	I always try to fix an electrical item by myself	x	X
Freeze	The item froze, crash	x	X
Fru	Frugalism encouraged repair by myself	x	x
func	Elements attached to the functionality of the item	x	X
funcno	I did not think the item had the capacity to function as a computer anymore	x	X
Function	The item did not function as expected	x	X
Good	Repair is a good things	x	X
goodworkingPC	Keeping my material possessions in good working order is very important to me	x	
hadinfo	Had Information already	x	X
harmPC	Material things should be guarded from harm	x	X
haveparts	Got some spare	x	X
Heat	The item did not heat up	x	X
hob	Prioritising other hobbies as opposed to repair	x	X
holdPR	I tend to hold onto my possessions	x	X
HRE	High repair efficacy	x	X
Hrel	Helping relationships	x	X
retail	Place of purchase	x	X
Hrelask	I was asked to carry the repair	x	X
manu	Enter in Contact with manufacturer	x	X
Manuitemot	There are not many companies that manufacture items		x
Memory	Remembering how to repair a specific item		x
ID	Trying to repair does not aligh with current identity	x	
iden	Investigate to identify damage	x	X
iinc	Repair is inconvenient	x	X
impEC	Compared to other things in my life, environmental problems are not that important	x	
Imprep	It is important to try to fix an electrical item before getting rid of it	x	X
IN	Innovativeness	x	X

Inc	Repair is inconvenient	x	X
IN-cha	Looking for a challenge by repairing myself	x	X
inc-rep	Inconvenience of shopping for new encouraged repair	x	X
inc-sca	I did not want to salvage part so I repaired it	x	X
inc-set	Inconvenience of setting up new item encouraged repair	x	X
ine	Inertia/Procrastination	x	X
enj	Enjoyment from repairing things	x	X
inexp	The item was inexpensive discouraging repair	x	
Info	sought Information supporting repair	x	X
Ima	Self-Image		x
ImaCR	Developing consumer responsibility Self Image		x
ImaWell	Feeling of happiness from being more innovative		x
imp-upc	The item was free but needed improvement	x	
init	Used own initiative	x	X
SkiDevlearn	Opportunity to learn more about the item and design through repairing myself	x	X
IN-Pos	Positive experience in repairing item encouraged to repair retained item	x	X
insapart	Challenge with access inside item	x	X
InterRep	Interest in learning to repair		x
Internon	No interest in learning to repair		
Internetrep	The internet make it easier to replace		x
SEB	Self-efficacy	x	X
iSEB	Self efficacy belief decrease	x	X
iSki	Lack of skills, knowledge, knowhow	x	X
iSkil	lack of skills	x	X
noknowl	Lack of knowledge	x	X
nokhow	I don't know how	x	X
iss-data	Issues with losing data discouraging repair	x	X
iss-offs	Issues with offered services by retailers	x	X
issrepairshop	Issues with repair shops	x	X
issue-repairguide	tricky to understand repair guide	x	X
Ite	Item	x	X
itemexp	The item is expensive encouraging repair	x	X
keepitPR	Unless I have a really good reason to throw something away, I keep it	x	X
lackinfo	Lack of information	x	X
trust	Repair shops are untrustworthy	x	X
leaked	The item leaked	x	
likedisposePR	I do not like to dispose of my possessions	x	X
longtodo	The repair took long to do	x	X
LRE	Low repair efficacy	x	X
Main	Maintenance	x	X
Malfunctioning	The item was malfunctioning	x	X
Man	Manufacturer	x	X

md	Moral disengagement justification - The charity can get money for recycling	x	
Melted	The part was melted	x	X
Memory	The memory was the issue	x	
Mod	Feeling moderated by other variables	x	X
modi	Made modification to item to make it work	x	X
morewaysIN	I use products in more ways than most people	x	X
Motor	Issues with the motor	x	X
MR	Miscellaneous aspects of repair	x	X
NC	Not possible to code	x	X
Neg	Negative outcomes	x	X
NegF	Negative feelings associated with failure	x	X
Neg-Gen	General negative feelings	x	X
neuF	Neutral feelings associated with failure	x	X
No one	No one want to repair	x	X
noawa	No awareness of repair shop	x	X
Noeasy	Repair is difficult, no easy, non practical	x	X
noess	The item was not an essential item which did not need to be replaced	x	
noinfoneed	No information needed	x	X
nointski	Lack of interest to gain skills	x	X
nokhow	I did not know how	x	X
nokhowshop	repair man didn't know how to fix it	x	X
noloc	There is no repair shop locally	x	X
noneed	The item was no longer needed	x	X
noone	Beliefs there was no one who could repair the item	x	X
nooption	Repair was not an option	x	X
noown	No ownership of the item	x	X
noparts	Parts not available	x	X
noposs	I do not know if possible	x	X
norep	I did not want to buy a new one	x	X
Norepairmot	What motivated you to (dispose/replace/return/scavenge) instead of getting it repaired?	x	X
Norepairshop	Why did not you take it to a repair shop to get it repaired?	x	X
norepshop	There are none near by	x	X
notech	I like the idea that I don't need technology to live my life	x	X
nothi	I did not think of repairing it	x	X
notools	Limited Access to tools	x	X
-notposs	Repair Not possible	x	X
nrep	The item was judged believed as not being repairable	x	X
NRepl	The item will not be replaced	x	X
Nwork	The item do not work/ The item stopped working	x	X
obligedto	If an electrical item can be fixed, I feel obligated to repair it instead of replace it	x	X
Offs	Offered services by retailers	x	X
off	Want product services offered by retailers	x	X
Other	Other issues with the item	x	X

Over	I dispose of items because the amount of things I own overwhelms me	x	
partcost	The part accounted for most of the cost discouraging repair	x	X
partnorep	The broken parts were not repairable	x	X
PartPR	One of the part might be useful encouraging retention	x	X
Parts	Issues with parts	x	X
Parts-ass	Assessing the type of spare needed	x	X
Parts-buy	Bought Parts	x	X
Parts-cheap	finding cheap alternative for replacement	x	X
Parts-fid	The parts were fiddly	x	X
Parts-ins	Install parts	x	X
Parts-newbro	The new parts wore down, corroded	x	X
Parts-nofit	The bought part did not fit	x	
Parts-noparts	Parts no available	x	X
Partspro	The parts was broken	x	X
Parts-rem	Remove broken parts	x	X
parts-remcant	Cannot remove parts	x	
Parts-rep	Replace parts	x	X
Pas	Pass it to someone else	x	X
PC	Product Care	x	X
Pcd	Perceived cost of repair in relation to replacement	x	X
PcdTime	Perceived cost of repair vs replacement time + money	x	X
PeerSup	Peer group supportive of repair		X
PeernonSup	Peer group that appear non supportive of repair		X
Pers	Persistence/agile mindset to try to repair item		x
PLE	Product life extension	x	X
Pos	Positive Outcomes	x	X
posF	Positive feelings	x	X
PR	Product retention	x	X
Pre	Precontemplation	x	X
Prep	Preparation	x	X
Pri	Price	x	X
pri	The parts were reasonably priced encouraging repair	x	
prim	The item did not complete its primary function	x	X
Pro	Attitudes towards trying related to Process	x	X
Pros	Pros to change – decisional balance	x	X
PUR	Purchase consideration	x	X
quick	Quick Fix	x	X
R5-Draw-Cour	What are the barriers/drawbacks to repair per course of action instead of repair	x	X
Rea	Reasons why the item failed to be repaired	x	X
reass	Re-assembly	x	X
Rec	Recycled Disposed	x	X
Rein-man	Reinforcement management Rewarding the positive behaviour and reducing the rewards that comes from negative behaviour.	x	X

remshop	The repair shop could not get the parts to repair it as Singer's operations have changed. It is no longer a company in its own right but a brand of an larger electrical company that has no interests in repairs but rather in selling a new product.	x	X
Rep	Replaced	x	X
hadrep	Had a replacement item for the broken item	x	X
repairreplace	I am more likely to have an electrical item repaired than to replace it	x	X
repairshop	Went to repair shop	x	X
reparability	Item that can be repaired	x	X
RepChe	the repair was cheap	x	X
RepShop		x	X
Repshop-near	Knowledge of repair shops nearby that could do the repair	x	X
RepCom	Repair Community		x
Res	Research was carried out to understand how to repair the items	x	X
Ret	Return to retailer	x	X
reuseE	If you can re-use an item you already have, there's no sense in buying something new	x	X
ridPR	Getting rid of things is difficult for me	x	X
RP	URP	x	X
RPbest	Try my best to fix it before throwing it away	x	X
RPPref	Preference for repair than buying a new one	x	X
safePC	I am very conscious about keeping my material possessions safe	x	X
Sav	Repair save money	x	X
savingE	I save money for tomorrow by resisting to buy some items today	x	X
SBE-Conf	Lack of confidence	x	X
SC	Safety Concerns	x	X
SCAnx	Anxiety in relation to safety		x
SCaverse	Considering oneself as risk averse		x
SCWarn	Warning message onitems discouraging repair		x
SCA	scavenge	x	X
Screen	Broken Screen Display	x	X
SEB	Self efficacy beliefs increase	x	X
Self	Self	x	X
Self-lib	Self liberation	x	X
Self-reeval	Self-reevaluation - Self-reappraisal to realize the healthy behaviour is part of who they want to be.	x	X
Sell	The item will be sold	x	X
sensinsp	Sensorial inspection (visual smell)	x	X
ser	Ask to be serviced and specifc problem to be fixed	x	X
seriousEC	Environmental problems are not that serious because in the long run things will balance out	x	X
SI	Social influence – by Repairing, I tell other that I repaired	x	X
SKI	Skills, knowledge, Know	x	X
SKIdev	Skills, knowledge, know how develops	x	X
SKIdevlearn	trying to fix in order to learn from mistakes	x	X
Slow	The item was slow	x	X

Soc-lib	Social-liberation Environmental opportunities that exist to show society is supportive of the healthy behaviour.	x	X
SociIso	Social isolation		x
soft	Update software on item	x	X
Software	The item had software issues	x	X
sol	Soldering	x	X
Sound	The item had issues with sound	x	X
Sparks	The item sparks, burnt out, blew	x	X
Spect	spectrum of repair activities prosumers' engage in?	x	x
Steps	The steps of the repair are being detailed	x	X
Stim-con	Stimulus Control Re-engineering the environment to have reminders and cues that support and encourage the healthy behaviour and remove those that encourage the unhealthy behaviour.	x	X
Stopped	A part stopped working	x	X
Succ	Attitudes towards trying related to Success	x	x
throwuseful	There are many things that are normally thrown away that are still quite useful	x	x
Tiloss	Time is lost through repair	x	x
time	Time Constraints	x	x
Timecons	Repair was Time consuming	x	x
toolIN	Even if I don't have the right tool for the job, I can usually improvise	x	x
tools	Used repair tool	x	x
tryfail	I tried and failed	x	x
Type	Type of item	x	x
typedis	The item was a small electrical item discouraging bringing it in a repair shops	x	
Typeofrepair	What are the type of repair you carried out?	x	
une	Repair is uneconomic	x	x
unsa	Repair is Dangerous, unsafe		x
upc	The item was upcycled	x	x
upcIN	After the useful life of a product, I can often think of ways to use its parts for other purposes	x	x
urg	Urgency in getting a new item discouraged repair	x	x
urg	Urgency to use items discourage repair	x	
Usa	Elements attached to the usage of the item	x	x
Use	Continue to use it	x	x
use	The item is still in use	x	x
Useful	Usefulness	x	x
uselaterIN	I never throw something away that I might use later	x	
Value	Product value	x	x
VolSup	Volunteering supportive of repair		x
VolnonSup	Volunteering non supportive of repair		
Wait	Wait unitl if fails again	x	
waitE	I am willing to wait for a purchase I want so that I can save money	x	
Want	Wanting things now discouraging repair		x

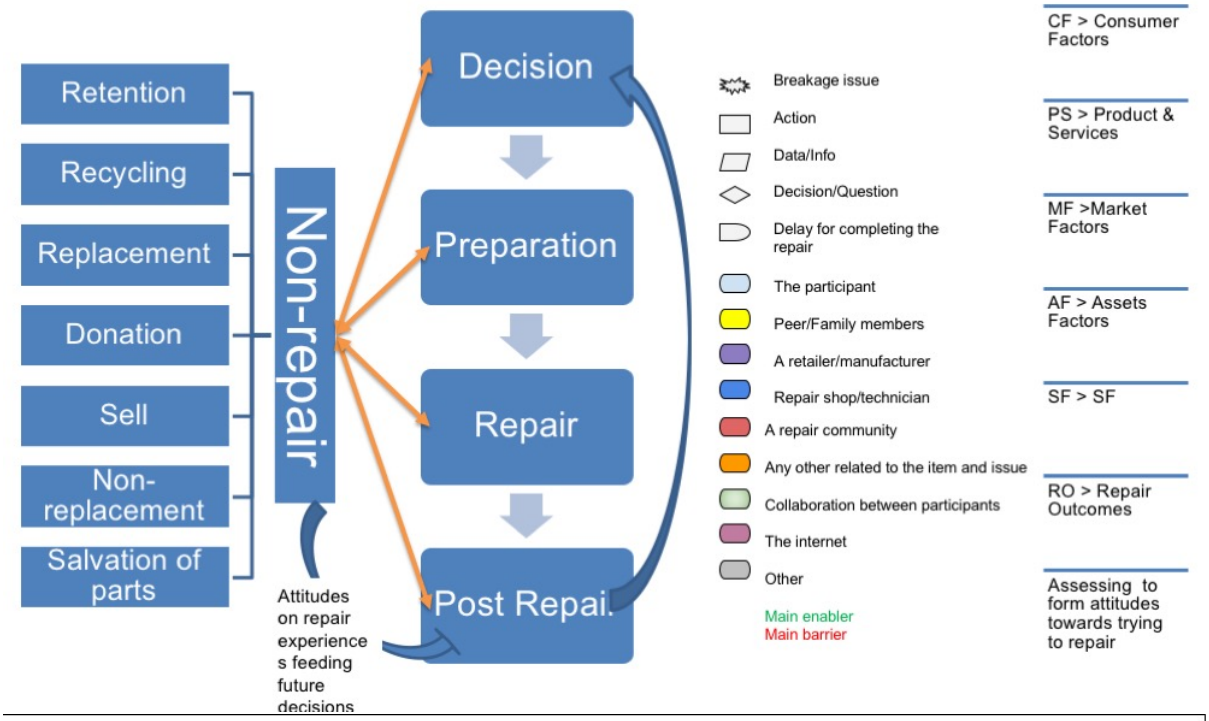
wet	It got wet	x	
Win	i guess for me success is key. i'm not so patient as to be content with trying and failing	x	
wiring	Issues with wiring	x	x
Work	The item will work if repaired successfully	x	x
workhardPC	I work hard to protect my material possessions	x	
Wornout	The part was worn out	x	
worth	Not worth repairing it	x	
wout	Consider whether the item need to be replaced or we can do without it	x	
Wrong	What is wrong with the item	x	

Research Questions Coding -1St level

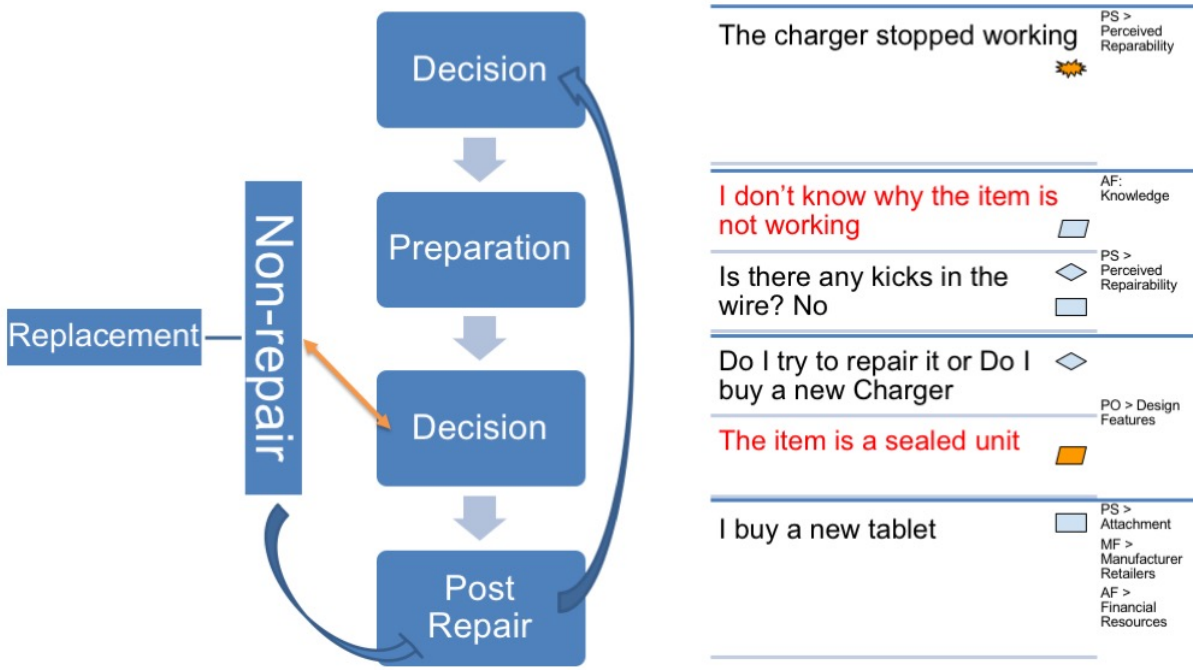
R1-Fact	What are the factors influencing URP
R2-Att	Attitudes towards trying to repair
R3-Process	What is the prosumer repair process?

Appendix O – Sample of Coded Repair Processes

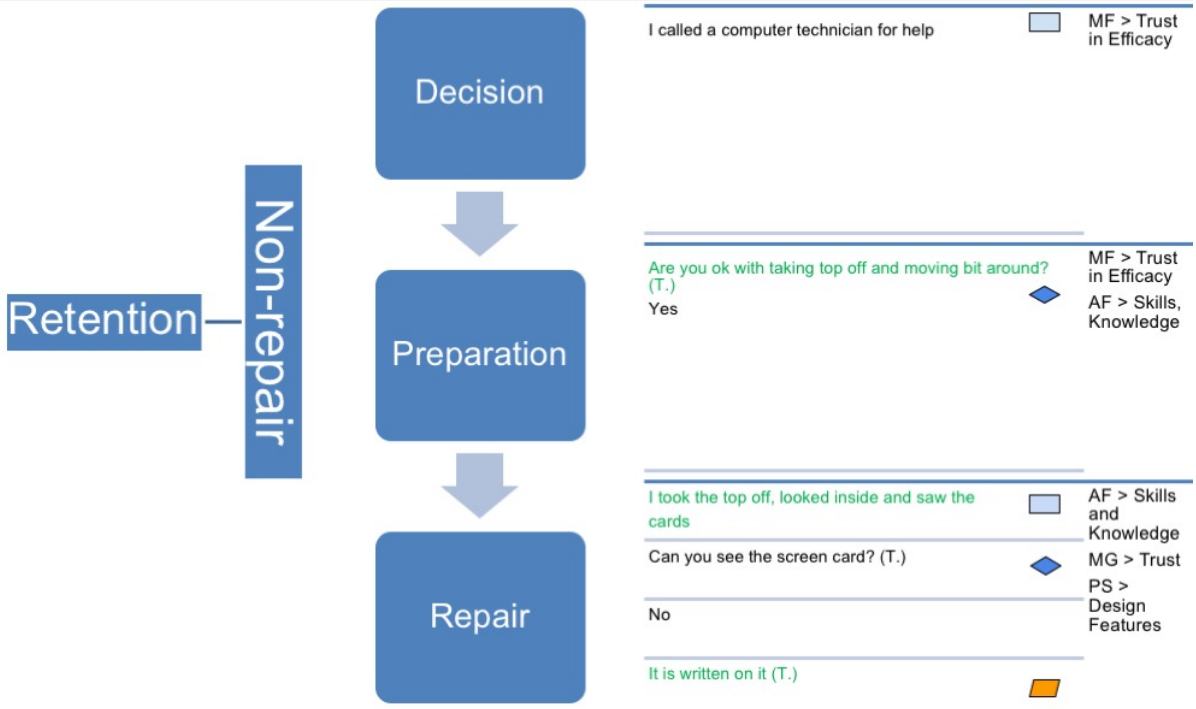
Participant in the repair
Repair Propensity Profile: High/ Low
Item: Name of the item



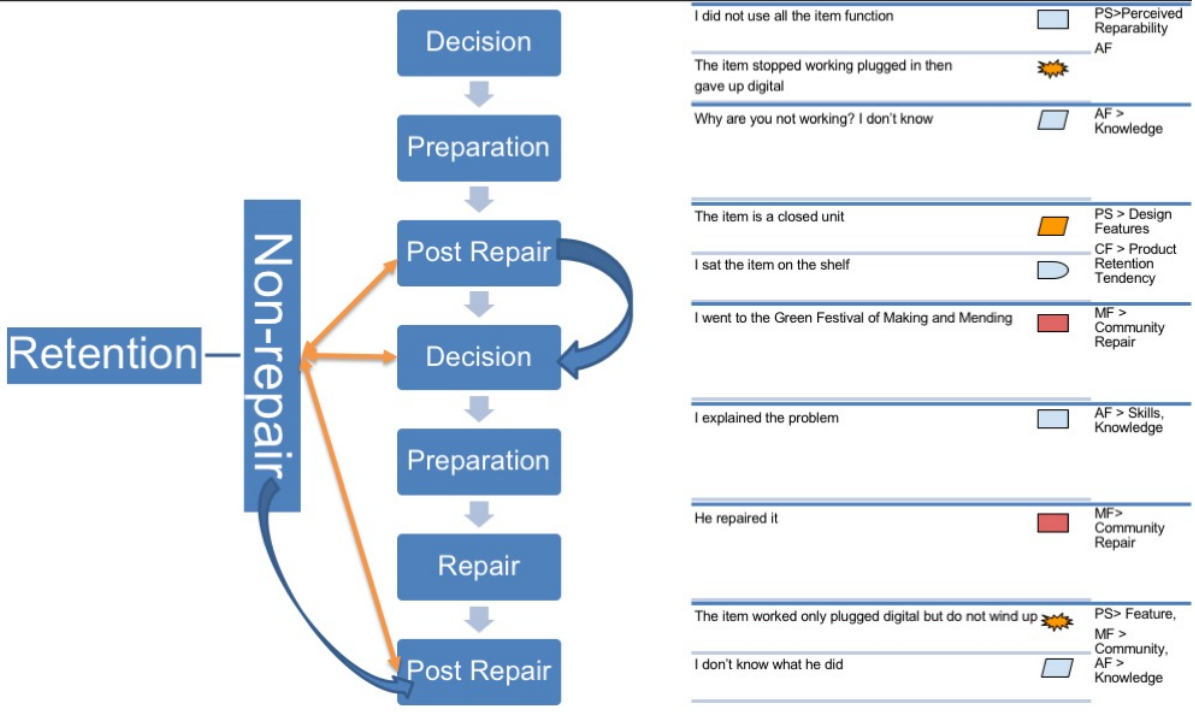
FW03C
Repair Propensity Profile: Low
Item: Charger



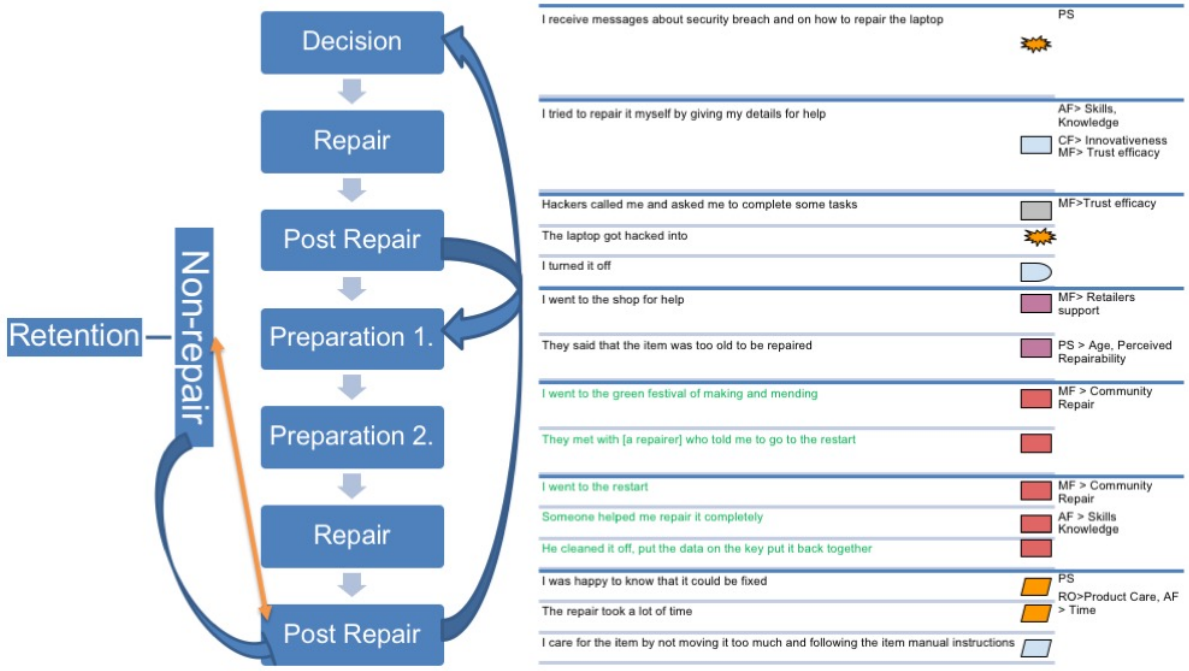
FW03C, Technician (T.)
Repair Propensity Profile: Low
Item: Desktop Computer



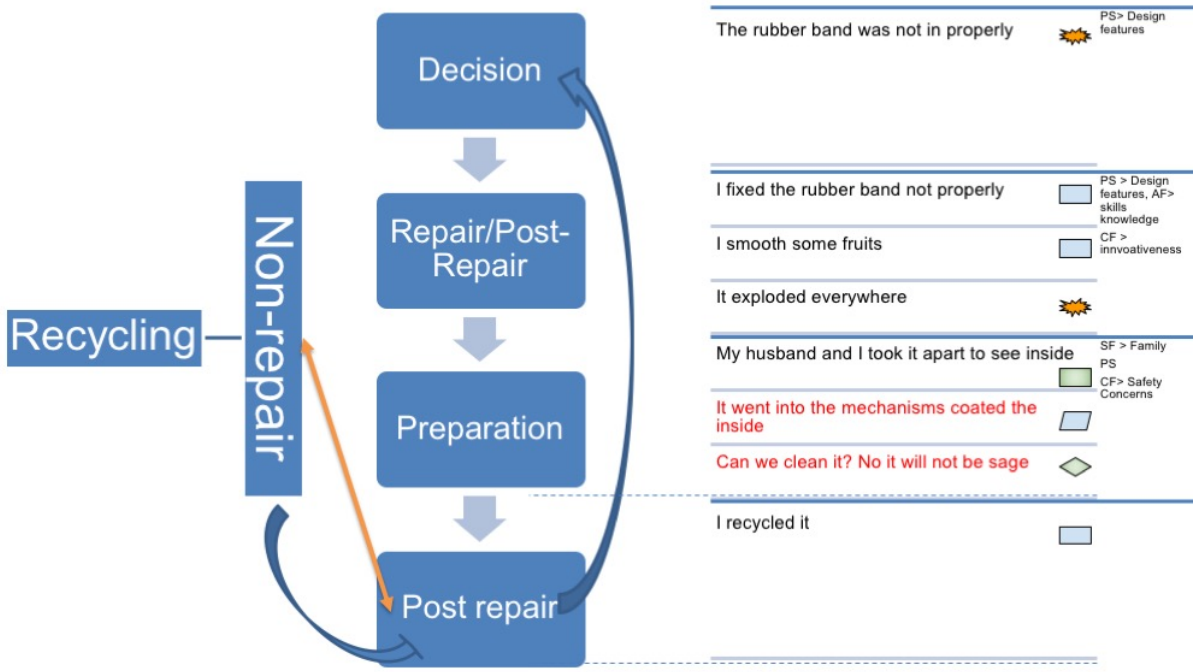
FW03C and Repair Community Technician
Repair Propensity Profile: Low
Item: DAB Radio



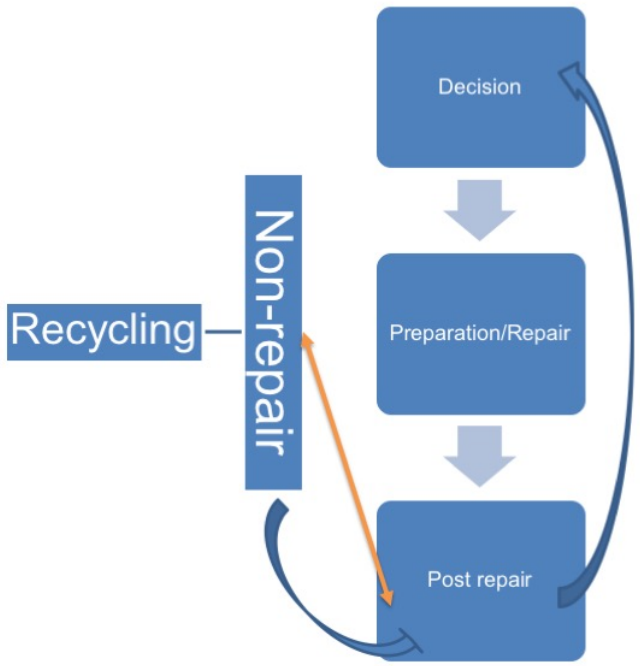
D08, Other, Repair community, Retail Shop
Repair Propensity Profile: Low
Item: Laptop



DMT06A, Family member
Repair Propensity Profile: Low
Item: Blender



DMT06A, Family member
Repair Propensity Profile: Low
Item: Blender 2

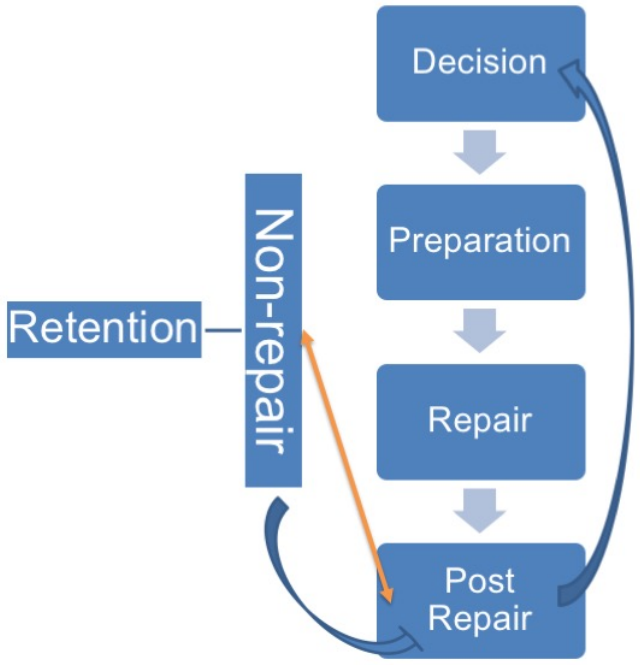


The rubber ring melted — PS

We bought a spare part to replace — MF > retailers and manufacturers support; SF > Family; AF > Financial resources, spare parts

because it is better than buying the whole thing — RO

DMT06A (P)
Repair Propensity Profile: Low
Item: Printer



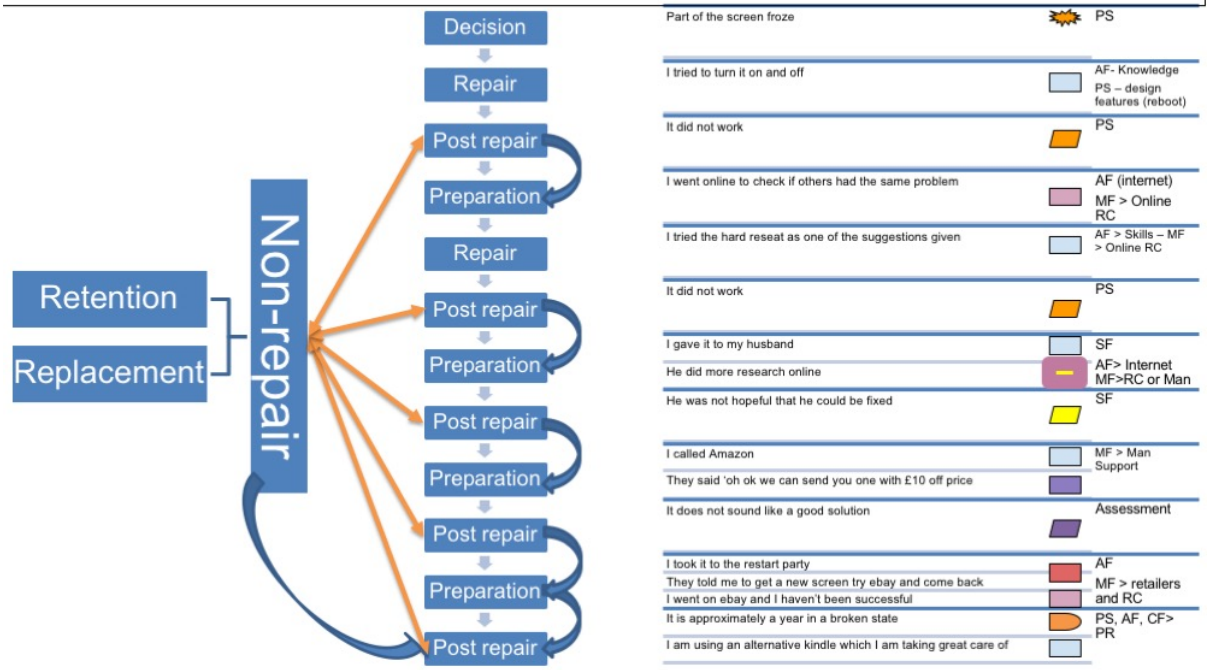
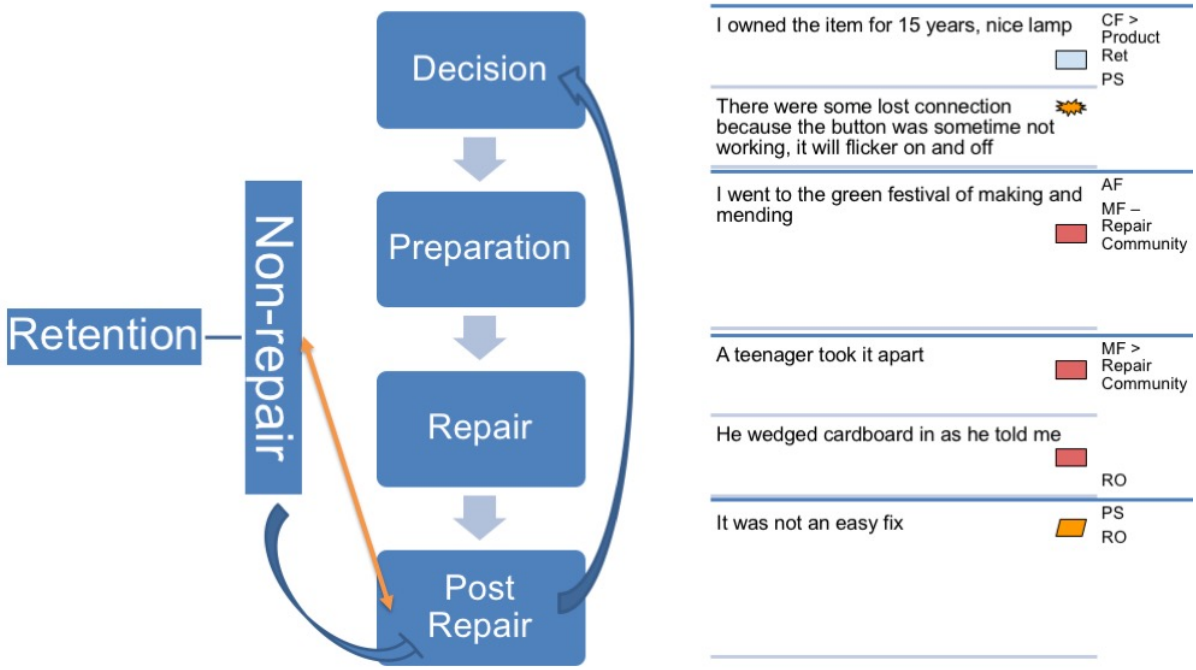
The printer was not working — PS

I looked online for instructions — AF > Tools – internet /documentation; MF > MF and Retailers

I followed instructions — AF> Skills, Tools; MF > Manufacturer and Retailers providing tools

I made it work — PS, AF

DMT06A (P), Husband, Amazon and Repair Community
Repair Propensity Profile: Low
Item: Kindle



DMT06A and Repair Community
Repair Propensity Profile: Low
Item: Lamp