



Contents lists available at ScienceDirect

Resources, Conservation & Recycling

journal homepage: www.elsevier.com/locate/resconrec

Full length article

Repairing the circular economy: Public perception and participant profile of the repair economy in Hull, UK

Heather A. Rogers^{a,*}, Pauline Deutz^a, Tomás B. Ramos^b^a Department of Geography, Geology, and Environment, University of Hull, Cottingham Road, Hull, HU6 7RX, UK^b CENSE – Center for Environmental and Sustainability Research, Department of Environmental Sciences and Engineering, NOVA School of Science and Technology, NOVA University Lisbon, Campus da Caparica, 2829-516, Caparica, Portugal

ARTICLE INFO

Keywords:

Circular economy
Repair
Maintenance
Consumer behaviour
Care
Employment

ABSTRACT

Repair is an essential aspect of circular economy (CE) strategies to extend the life of products and materials, and has further been suggested as a key sector to benefit from employment through CE transitions. At the same time, CE narratives around repair have been criticised as highly technocratic, neglecting the body of literature exploring repair as a relational act embedded in daily life. Hull, UK has been characterised as a structurally disadvantaged city, which might benefit from development opportunities offered through an expanded repair economy. However, a better understanding of the demographics of repair users is needed to promote its expansion. Therefore, this research aims to increase understanding of public perceptions, attitudes and behaviours relating to repair as both an option for consumers and as potential employment. The study combines literature in CE, human geography, and consumer behaviour to critically analyse a public survey ($n = 740$) conducted in partnership with Hull City Council. Results explore demographic associations with repair behaviour, identifying a profile of repair economy participants. Furthermore, an interdisciplinary discussion identifies a tension between repair as an act of necessity, which often carries a negative stigma, and that of choice for those privileged with skills and excess leisure time. Gender discrepancies between public perceptions, attitudes, and behaviours are identified, and policy recommendations for the development of an inclusive repair economy are made. While an opportunity for an expanded repair economy in the city is apparent, further research is needed to assess the quality of work in the sector.

1. Introduction

A Circular Economy (CE) can be described as a system where value is retained throughout the lifecycle of materials; goods are designed for value retention, leakage is minimized through slowing, closing, or narrowing material and energy loops, and residues are seen as a resource input for further production (Geissdoerfer et al., 2017; Ghisellini et al., 2016). The concept has largely been promoted in an effort to address the vast environmental externalities associated with the linear ‘take, make, waste’ industrial system (EMF, 2013). However, the focus on recycling and energy recovery in practice has led to a call for higher value-retention options such as refusal (producing and consuming less), repair, and maintenance to be prioritized by policy makers and business (Reike et al., 2018). The British Standard BS8887–2–2009 defines repair as “returning a faulty or broken product or component back to a useable state” (British Standards Institution 2009 cited in Bakker et al., 214:11),

with the nature of repair services being highly varied, serving to either lengthen product life for one user (functionally or otherwise), or facilitate commercial sales activities through resale. Either of these eventualities may be realised either through use of professional repair services (PRS), or through ‘do it yourself’ (DIY) practices.

Environmental benefits of repair may be realised through reducing demand for the manufacture of new products (EMF, 2013), and economic benefits in terms of job growth are widely cited (European Commission, 2018; King et al., 2006; Llorente-González and Vence, 2020; Morgan and Mitchell, 2015) (notwithstanding an implied loss of jobs in manufacturing). There is a call, however, to broaden the current focus in CE of ‘eco-effectiveness’ to include social value generated, such as “provision of care, enjoyment, maintenance of traditions and connections with personal histories” (Mylan et al., 2016: 794), and intentionally build inclusivity into the transition (Lekan and Rogers, 2020). With this in mind, many social benefits have also been associated with

* Corresponding author.

E-mail addresses: Heather.Rogers@hull.ac.uk (H.A. Rogers), P.Deutz@hull.ac.uk (P. Deutz), tabr@fct.unl.pt (T.B. Ramos).<https://doi.org/10.1016/j.resconrec.2021.105447>

Received 16 October 2020; Received in revised form 17 December 2020; Accepted 20 January 2021

Available online 3 February 2021

0921-3449/© 2021 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

repair services, including training and skill development opportunities for those who have been excluded from the labour market (facilitating their re-engagement with society) (Alexander and Smaje, 2008; Bovea et al., 2017; Williams et al., 2012), and increased affordability (Cole et al., 2019). The process of repair is also arguably valuable in itself, as the breakdown and subsequent fixing of objects remains a “means by which societies learn”, invent, and innovate (Graham and Thrift, 2007:5). Recent research further explores repair as a relational rather than technocratic act; one which might take the form of reconstruction, remediation, reconciliation, and reconfiguration, and which may be present in plural circular economies (diverse in terms of justice or sustainability) (McLaren et al., 2020). Considering this multitude of social, economic, and environmental benefit, it is reasonable to consider repair services as a priority for an inclusive CE transition.

The successful development of a CE, including a thriving repair economy, relies on a number of factors relating to consumer behaviour, including willingness to adopt new modes of consumption and ownership, modifying product acquisition and use behaviours, and product end of life management. Research indicates that the major factors driving participation in CE offerings are largely based on the characteristics of consumers (i.e. personality traits, values, and ideologies) (Camacho-Otero et al., 2018), and that targeting certain demographic groups is a key factor in reaching a critical mass for promoting circular economy practices (Kuah and Wang, 2020). Greater understanding of consumer attitudes and the individual characteristics associated with those attitudes is therefore required in order to develop circular economies (CEs) in general and the repair economy specifically. In addition, geographic context is a significant influence on CE-related developments (Deutz et al., 2015). Therefore, the aim of this paper is to increase understanding of public perceptions, attitudes and behaviours relating to repair as both an option for consumers and as potential employment. We undertook an online survey of residents in the City of Hull; a relatively deprived city in NE England representing the type of location expected/hoped to benefit from the development of a repair economy. The results contribute to empirical and conceptual research on user perceptions, attitudes, and behaviours towards repair economy activities in CEs, ultimately developing a demographic and value orientation profile of repair-economy participants in Hull, UK.

2. Influences on the repair economy

The following section develops an interdisciplinary context of the repair economy. Sub-Section 2.1 considers repair from a governance perspective, discussing public policy, regulation, and taxation related to repair. Sub-Section 2.2 explores the role of the ‘consumer’ in CEs and object care practices. Finally, sub-Section 2.3 outlines the limited literature relating to the characterisation of repair economy participants and the need for further research in this area.

2.1. Governance of repair

There has recently been a surge in support for repair activities across Europe and North America manifested through policy, legislation, and tax redistribution. Many of the benefits of repair activities have been outlined in the introduction. However, the feasibility of repair is often dependant on factors outside the control of the individual or PRS provider. In particular, access to spare parts and repair-prohibitive design are frequently cited as major barriers (Bovea et al., 2017; Türkeli et al., 2019). The Right to Repair (R2R) movement (Right to Repair, n.d.; Svensson et al., 2018), which advocates for inclusive access to repair through policy, promotion and awareness, is an example of how community-level initiative has influenced governance change. For example, in October 2019 the European Commission adopted new eco-design measures for a number of household products, addressing barriers to repair such as access to spare parts and repair and maintenance information for PRS (European Commission, 2019). The

establishment of consumer right to repair is also a key forthcoming action for 2021 as stated in the European Green Deal (European Commission, 2019) new Circular Economy Action Plan (European Commission, 2020). Furthermore, action towards ‘empowering consumers for the green transition’ (European Commission, 2020) is already in consultation phases, and has received recommendations such as provision of repair manuals, the use of a repair score index, access to spare parts and tools, and the extension of legal guarantees for certain product groups (European Environmental Bureau, 2020).

In order to address the widely cited labour cost barrier of repair (Bovea et al., 2017; Diddi and Yan, 2019; McCollough, 2009; WRAP, 2011), some national governments are also using tax reductions to incentivise repair activities. For example, in Sweden, 50% of labour costs for repairs are tax deductible, and Austria now reimburses 50% of repair labour costs up to 600 EUR/year (Rreuse, 2017). More inclusive theoretical tax shift scenarios have also been explored, which shift much of the current labour taxation (approximately 51% of tax revenue in the EU) towards consumption and natural resource tax. While models suggest overwhelming potential benefit, implementation of such reforms has been limited (Ekins and Speck, 2000; Freire-González and Ho, 2018; Groothuis, 2016; Hogg et al., 2016). This reform strategy is arguably a correction in the accepted historic interference in the market, which subsidises exploitation of natural capital. The suggested shift instead prioritises and encourages the development and utilisation of human capital – a renewable resource, which has the unique feature of increasing capacity through practice and learning, and whose ‘externalities’ are overwhelmingly positive in terms of wellbeing and sense of purpose and belonging (Stahel, 2013).

While these are significant steps towards enabling a repair economy, policy, legislation and tax redistribution continues to co-exist and interact with business interests. Original equipment manufacturers (OEMs) (lack of) willingness to provide proprietary repair information may continue to prevent effective practice (Svensson et al., 2018), as producers may view repair as a risk to their market share (Gharfalkar et al., 2016; Lechner and Reimann, 2015). However, repair can also be seen as an opportunity to diversify production (Gharfalkar et al., 2016) and aftercare services (Amini et al., 2005; Tecchio et al., 2017; Türkeli et al., 2019). Amini et al. (2005) outlines the competitive advantages of service management activities, which include additional profit streams, increased customer loyalty, and ability to command higher prices for products. In this way, traditional producer business models may be adapted to leverage service-based economic opportunities. Furthermore, services are increasingly being explored as core business strategies in the form of Product Service Systems (PSS) (Annarelli et al., 2016; Mylan, 2015; Wang et al., 2011). This approach can benefit producers by expanding profit streams across the lifetime of a product, and through material reclamation for remanufacture at the end of the product life (Zhu et al., 2012). In addition, OEM aftercare services, distinct from third party or independent PRS, have the potential to address the frequently identified barrier of lack of trust in either PRS, or the quality of the product resulting from a repair (Bovea et al., 2017; McCollough, 2009; Pérez-Belis et al., 2017). While these options have the potential to stimulate employment in the repair service sector, closed access models such as these do little to democratise the repair of products on a user level (Svensson et al., 2018). The direction companies take with regard to integrating repair into various aspects of their business model will undoubtedly be influenced by macro-level regulation and incentive.

Governance factors play an important role in enabling, regulating, and restricting various activities, particularly on the industry or company level, however the transition to a CE requires coordination across multiple scales, including business and public administration, and ultimately requiring consumer/user acceptance to succeed (Kirchherr et al., 2017; Liu et al., 2009). The positioning of government through public policy has been shown to significantly influence consumer behaviour; however, consumer attitude and individual traits such as gender, age, and education are also significant predictors of behaviour, particularly

in the context of CE practices (Camacho-Otero et al., 2018; Hazen et al., 2017). The following section will therefore draw from CE, human geography, and consumer behaviour literature to discuss the conceptual positioning of the individual within a CE, and furthermore, what current research reveals about individual traits associated with repair behaviour.

2.2. From consumer to caretaker: Factors influencing individual repair behaviour

The meaning of consumption in a CE increasingly deviates from traditional understandings of the consumer-producer relationship and challenges aspects such as anonymity of use versus identity of ownership, trust and commitment between consumer/company relationships, value generation, and the politics of consumption in terms of status and rebellion against the status quo (Camacho-Otero et al., 2018). More recent CE work advocates for a departure from placing people only in the context of production-consumption systems, and instead as social beings within the wider social context (Calisto Friant, 2020; Hobson, 2019; Schröder et al., 2020). In the case of repair and maintenance activities, these practices sustain the materiality of objects – arguably in conflict with the traditional role of the consumer as the purchaser of products (Gregson et al., 2009) and adjusting the positionality of the user to that of the *caretaker* of objects. Furthermore, these practices must be understood as “emerging from recursive processes between action in everyday life and broader societal structures” (Mylan et al., 2016). In other words, the individual is not simply a deliberate, rational decision maker, but instead an agent situated within and engaging with complex spatial, temporal, and cultural systems of social life.

This sense of repair and maintenance embedded within routine might, however, suggest that repair is merely a chore, neglecting the aspect of repair that provides opportunity for self-expression and identity imprinting through product and object manipulation. Related to the concept of the craft consumer (Campbell, 2005), prosumer (Kohtala, 2015), and pro-user (Stahel, 2019), who are characterised by their control of both the design and creation of objects, repair may provide a similar opportunity for people to connect with an object. Although the object may be a product of mass-production, the personal repair of it resists the homogeneity of mass consumer culture, creating a narrative for that object which is unique. In this sense, repair could be characterised as a ‘possession ritual’ (McCracken, 1990), enabling owners to ascribe meaning to a formerly vacant or neutral object. Furthermore, repair, similar to crafting activities, often requires skill and an abundance of leisure time, both of which are (usually, although not always) associated with affluence. This could be viewed as a perpetuation of classist superiority-signalling through use of material goods, taking a new form in post-modern society (Campbell, 2005), and lays in juxtaposition to affordability claims. The emergence of a collective of high cultural capital ‘conscious consumers’ has been termed ‘eco-habitus’ and is characterised by natural materialism, preference for local, and a reverence for traditional and ‘unskilled’ manual labour (Carfagna et al., 2014). While this group has been observed as elite and urbanite, there may be scope to imagine such a collective permeating outside the bounds of the affluent and privileged.

Increased affordability through repair, or more significantly, repair necessitated through the inability to afford a replacement, is often cited in the literature (Alexander and Smaje, 2008; King et al., 2006). In this context, rather than a sense of ownership, repair can evoke a sense of shame, either because it signals a lack of care (i.e. the object was not maintained properly), or the lack of financial capacity to replace the object (Gregson et al., 2009). This tension illuminates another possible barrier to repair, whereby the socioeconomic status of the individual may influence their perception of and relationship with repair activities. This dichotomy is further complicated by the materiality of the object itself; for example, a higher quality (generally more expensive) table might be sanded down and refinished, whereas a less-expensive

veneered table might be much more difficult or even impossible to repair when damaged. The initial cost of, and ability of the individual to pay for, an object may then affect their ability and/or desire to repair. Sentimentality or nostalgia may also play a role in lengthening the lifespan of objects (Page, 2014), as cultural propositions of new as superior may encourage premature disassociation. At the same time, repair and maintenance are often “invisible tasks” in the sense that they remain largely unnoticed when maintenance networks are functioning, and are only made visible when objects are broken, or the practice of care is neglected (Graham and Thrift, 2007). This may give some indication as to the failing of maintenance routines, and in fact, visibility and legibility of repair can be argued as essential to bring repair “out of the shadows” of minority or subordinate groups (McLaren, 2018).

2.3. Profile of repair economy participants

The gendered division of labour in the household is a dimension worth examining as it relates to repair behaviours. Traditional gender roles would indicate that household repairs are primarily performed by males in the household, while other ‘care’ tasks such as meal planning, clothing repair, and many household cleaning tasks, which might be regarded as maintenance activities (e.g. mopping, sweeping, dusting, cleaning bathroom fixtures), remain primarily performed by females (Coltrane, 1989). Furthermore, repair in the home undertaken by women tends to be connected with care and embedded within emotionalised contexts, and furthermore such practices do not seem to translate to technical professions (Bix, 2009). Even in environments that are specifically designed to democratise repair, such as Repair Cafes, these gender stereotypes are seen to persist (Dawkins, 2011; Dunbar-Hester, 2008; Rosner and Ames, 2014), delineating men towards mechanical skills, and women towards craft skills such as textile mending. Skill requirements for DIY repair is also an important consideration. Lack of skills required has been identified as a major barrier for the DIY repair of small household Electrical and Electronic Equipment (EEE) (Bovea et al., 2017; Pérez-Belis et al., 2017), and mobile phones (Sabbaghi and Behdad, 2018; Türkeli et al., 2019) through previous questionnaire survey results. In particular, women have been found to specifically underestimate their competence in these areas (Rosner and Ames, 2014) and require additional courage to overcome their doubts (Bix, 2009). While repair may be a traditionally male role, a more recent questionnaire survey of Spanish public consumer practices indicates women are more likely to have small household EEE repaired professionally (Pérez-Belis et al., 2017). The extent to which this is true of other products requires further investigation.

Furthermore, the moral placement of repair activities may vary based on individual value orientation and awareness of environmental impact. In the context of clothing repair, for example, there is an association between clothes mending and a desire to reduce environmental impacts (Diddi and Yan, 2019). While perceived environmental benefits may affect adoption of repair, in the case of remanufactured products, the analysis of student and public questionnaire survey results in the US indicate that users may not be aware of this association, and therefore their willingness to pay (or in the case of DIY repair, to participate) remains unaffected (Hazen et al., 2017). This speaks to the importance of communicating environmental benefits of repair to receptive individuals. Furthermore, a questionnaire survey offering a choice experiment to a sample of Italian households also found that monetary incentive, mediated by convenience, is a driver to participation in CE initiatives related to food waste (Borrello et al., 2017). In the case of second-hand sales, both perceived environmental impact and thrift were found to be motivators, however the thrift aspect tended to lead to increased consumption, negating the environmental benefit associated with buying used goods (Gregson et al., 2013). The Fogg Behavioural Model (Fogg, 2009) also indicates that a high motivation at low ability will still result in the target behaviour, and vice versa, which would imply in the case of repair, that the more expensive the product (i.e. the

higher the motivation), the more likely a repair is to be performed, despite any barriers that might exist.

Additional socio-economic characteristics associated with individual's repair behaviours have also been considered. For the decision to have a mobile phone repaired (items often replaced prior to physical obsolescence), a public questionnaire survey disseminated in Austria found that the age of the user plays a role. Users over age 50 are found to retain their devices for longer before replacement due to a combination of (a) a higher level of care of the phone, (b) the choice to purchase a durable option, and (c) less intensive use (Wieser and Tröger, 2016). Similar findings were discovered for common durable household products, with the addition of higher education levels and larger family sizes being associated with the probability to repair (McCollough, 2010). While these works give some indication of trends in individual characteristics, existing research, particularly from a technocratic CE perspective, largely perceives individuals as rational economic consumers, failing to appreciate the nature of individuals as actors and decision makers entwined within their various contexts, be they cultural, social, political, economic, or spatial. Further research into demographic factors relating to the adoption of circular solutions is needed (Camacho-Otero et al., 2018), as well as the contextualisation of participants in order to strategize effective adoption incentives. This study uses literature from CE, human geography, and consumer behaviour to analyse new empirical findings on the public perception, attitudes and behaviours towards the repair economy in Kingston upon Hull, UK. Furthermore, the study takes initial steps towards developing a profile of participants in the repair economy, thereby contributing to a better understanding of how the repair economy might most effectively be supported.

3. Methods

This paper uses a case study approach based on Kingston upon Hull (hereafter: Hull). By using an intensive case study approach, place-based circumstances can be investigated to a depth where significance and causality may be observed (Sayer, 2010), which may then inform theory for further work in additional contexts. Hull is located on the NE of England on the Humber estuary. The population of the city is 259,778 (Kingston Upon Hull Data Observatory, 2019). The history of Hull as a port is an important dimension of the identity of the place that arguably persists today. Historically, fisheries were the economic driver of the area. In 1976, rising fuel prices and the exclusion from fishing in Icelandic waters (i.e. the Cod Wars) led to the industries' collapse, causing mass unemployment and lack of compensation for work completed amongst the working class (Atkinson et al., 2002). This historic event is thought to contribute to a persistent distrust of institutions and sense of inequality still present today (Atkinson et al., 2002). While this observation of collective identity may be subjective, the Index of Multiple Deprivation (IMD 2015) confirms that relative to other UK cities, Hull is 4th most deprived under the 'Income' domain, 6th under 'Employment', and *most deprived* in the UK under 'Education, Skills and Training' (Kingston Upon Hull Data Observatory, 2015). Furthermore, Hull has been characterised as a 'structurally disadvantaged city', where green economy initiatives such as wind energy and biomass fuel production are identified as an opportunity to replace the fishing industry as the new economic driver of the area (Wurzel et al., 2019); such initiatives are active and in on-going development (Humber LEP, 2019). Structurally disadvantaged cities are found to be relatively willing to endorse pioneering climate policy, stemming both from a higher climate risk position (i.e. flooding), and as an economic opportunity for industry (Wurzel et al., 2019). As a result, Hull may have a particular opportunity to benefit from an expanded repair economy, both from the perspective of affordability (DIY repair) and employment (PRS). It is for this reason that Hull has been chosen as a singular case study, taking into account the specific spatial, social, economic and cultural contexts of the city.

3.1. Questionnaire survey

For this study, a survey was designed as part of a collaboration between the University of Hull and Hull City Council (HCC) Insight team with the purpose of identifying the public perception, attitudes and behaviours associated with DIY and PRS repair of various household objects. Questionnaire surveys are commonly used to collect broad data sets relating to people's behaviour and attitudes (Rowley, 2014). The development of the survey questions was an iterative process, which began with the University of Hull team identifying key themes in the repair literature and creating a first draft of questions. The survey then went through several iterations to ensure that both parties were satisfied with the value of the output, and was pre-tested prior to dissemination in order to limit the variability of participant unreliability due to design (Robson, 2002). Key themes of the survey included: (i) participants understanding of CE, (ii) experience with repair, (iii) product specific choices, (iv) barriers to repair, (v) values in purchasing habits, and (vi) willingness to work in the repair service sector (see supplementary material for the questionnaire).

Snap Surveys software was used to disseminate the survey to members of the HCC 'People's Panel' (an online database of citizens who regularly participate in surveys). The use of this resource facilitated a much a higher response rate than would be expected through dissemination using other channels available, thus enabling the statistical analysis of variable associations that is not possible using smaller sample sizes. While this platform enables effective dissemination and cost-effective response rates, it is not without its limitations. For example, access to online resources can be particularly limited in low socio-economic groups (Humphry, 2014) creating a diversity bias. Questionnaires are also not ideal for capturing nuance in responses. It should also be noted that while the survey covers perceptions, attitudes, and behaviours of participants, these are all self-identified, with no distinction between what a participant says they do and the actions they take in reality, potentially creating a positive-leaning bias (Cerri et al., 2019). This bias is mitigated to some extent through the anonymous and online format (Larson, 2019). The survey remained open from August 1st, 2019 to September 1st, 2019, and targeted the general population of individuals 16 years and over living within the spatial boundaries of the City of Hull.

The survey yielded 966 total responses, 740 of which came from residents with a Hull postcode. Hull has an estimated 207,539 residents aged 16 and over (Kingston Upon Hull Data Observatory, 2019). A sample size of 740 allowed for a 95% confidence level, resulting in a margin of error of 3.6%. Demographics of responses can be seen in Table 1. Due to the random nature of the sampling method, respondent demographics are not necessarily representative of the population (for example, there is a large underrepresentation of respondents aged 16–34, and an over-representation of those 55–64 and 65–74). Any result bias due to this discrepancy has, however, been addressed through attainment of an adequate minimum sample size (minimum = 384) (Laerd Statistics, 2016b), calculated through methodology from Bartlett et al. (2001) for categorical survey data analysis. Hull is not a particularly diverse city, in that only 9.8% of the population fall outside of the majority category of 'White British'. However, it should be noted that minorities are underrepresented in this sample. NVQ levels refer to the National Vocational Qualification standard in the UK. For the purposes of this survey, levels included are: Level 1 (qualifications generally related to routine or predictable activities), Level 2 (e.g. GCSE), Level 3 (e.g. A level) and Level 4 (higher education qualifications from professional certificates to PhD level). See GOV.UK (n.d.) for full list of equivalences.

3.2. Analysis

All analysis was carried out using SPSS software (version 26). Descriptive statistics of the results are used to produce a landscape of the

Table 1
Responses by demographic.

		No. of valid respondents	% of valid responses	% of Hull population	Sample error
Gender	Male	351	47.5%	50.4%	-2.90%
	Female	388	52.5%	49.6%	2.90%
Age Group	16-34	65	9.1%	36.5%	-27.40%
	35-44	87	12.1%	15.0%	-2.90%
	45-54	140	19.5%	15.7%	3.80%
	55-64	205	28.6%	14.0%	14.60%
	65-74	177	24.7%	10.5%	14.20%
	75+	43	6.0%	8.1%	-2.10%
Ethnic Group	White British	682	93.3%	90.2%	3.10%
	Black and Minority	39	5.3%	9.8%	-4.50%
Highest Educational Qualification	No Qualifications	52	7.07%	8.9%	-1.83%
	NVQ Level 1 equivalent	49	6.67%	13.7%	-7.03%
	NVQ Level 2 equivalent	75	10.20%	19.1%	-8.90%
	NVQ Level 3 equivalent	133	18.10%	21.5%	-3.40%
	NVQ Level 4 equivalent	387	52.65%	27.2%	25.45%
	Other	39	5.31%	9.7%	-4.39%

current state of the repair economy by capturing and categorising different behaviours. A further analytic analysis then attempts to discover *why* certain behaviours occur through exploring trends and associations related to gender, age, education, and value orientation.

A Chi-square test of homogeneity was carried out to explore gender differences in (a) general repair behaviours, (b) product specific repair behaviours, and (c) identified barriers to repair (Laerd Statistics, 2016b). A Chi-square test of association has been used to identify whether or not an association exists between different purchasing values and repair behaviours (DIY or use of PRS) (Laerd Statistics, 2016a). In addition, a Mann-Whitney U test was used to determine if there is a

significant difference in highest educational qualification between those who (a) DIY repair or (b) used PRS. In order to determine the significance of age in those who (a) repaired products themselves, or (b) used PRS, an independent samples *t*-test was chosen. The sample failed to meet the normal distribution requirement, and therefore the non-parametric alternative of the Mann-Whitney U test was used to analyse this variable as well. For each test, the following assumptions were met: (i) one dependant continuous or ordinal variable, and one independent dichotomous variable, (ii) independence of observations, (iii) use of single sample methods, (iv) sample size expected frequency of >5 for each category (except where expressly noted), and (v) where

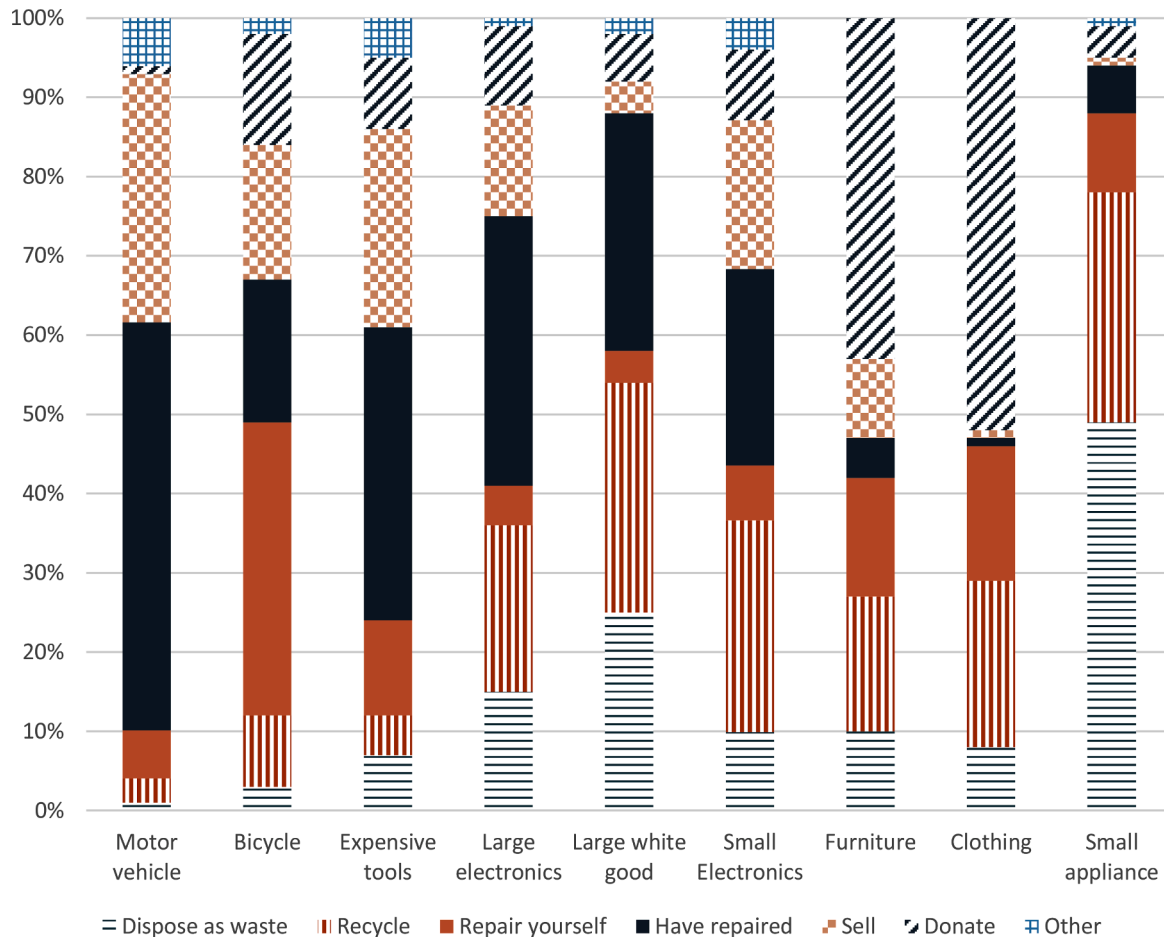


Fig. 1. Most likely action taken when items are damaged, by product category.

relevant, similar shaped distributions between groups (based on visual inspection) (Laerd Statistics, 2015).

4. Results and discussion

4.1. Perception of and willingness to repair

Respondents were asked to place a variety of actions into the categories of either the linear, shared, or circular economy. The vast majority of respondents (82%) identified repair activities as being a part of the circular economy, which may indicate a level of association between repair and environmental impact or eco-friendly behaviour. Furthermore, 79% indicated that they have used PRS in the past, and 76% had repaired items themselves. Respondents were also asked which action they were most likely to take when different household objects were damaged (see Fig. 1).

Different products yielded vastly different responses for the most likely action taken when the object is damaged. Small appliances, for example, were most likely to be disposed of as waste. Previous research has indicated that this is very likely due to a combination of small appliances being designed for replacement rather than repair, unavailability of spare parts, and the perception of the repair costing more than a replacement (Bovea et al., 2017). Fewer or lesser known recycling, repair, or donation alternatives may also play a role in certain product categories' frequency of waste disposal. As an additional general trend, the more expensive the product, the more likely respondents were to either repair the item or have it repaired (confirming previous studies, e. g., Fogg, 2009), with the possible exception of furniture. Respondents were most likely to donate broken furniture over any other activity option (including recycling or disposing as waste), which indicates a perception that the object maintains some level of material value, even when broken. And yet, the willingness to give the object away rather than repair it perhaps indicates a lack of sentimentality towards furniture, which historically has been something that might be passed down and maintained through multiple generations. The tendency towards donation of clothing also relates to findings from Diddi and Yan (2019), where the intention to gift clothing was indicated as a motivator for mending. It may be the case that when clothing requires repair, it is the moral lift of gifting that stimulates the otherwise overlooked option of repairing the article for further personal use. Awareness and capacity (either perceived or actual) of local second-hand organisations to undertake repairs may also play a role in the choice to donate. This frequency of donation also may speak to the specific culture of second-hand and charity shopping in Hull. Frequency of second-hand shopping amongst respondents was high, with only 1.4% saying they never shop second-hand, 23.1% rarely, 44.6% sometimes, 24.7% often, and 2.2% always. Second-hand shopping is more affordable than purchasing new, and may be the motivating factor for this choice in Hull, given its low-income status. On the other hand, particularly in the case of supporting local charity shops, the motivation may additionally be related to an ethic of care.

Respondents were asked to identify the barriers that prevent them from repairing items or having them repaired. Cost (62%), lack of skills or confidence (59%), and low replacement cost (55%) were the most frequent barriers identified (see Fig. 2).

Many major barriers identified confirm and reiterate previous literature findings. For example, the low cost of replacement products and the high cost of PRS, as found by Bovea et al. (2017), remains a major barrier to participation in the repair economy. This supports the potential effectiveness of policies that aim to adjust the cost of repair, either through subsidy or tax incentives (Groothuis, 2016; Reuse, 2017). The barrier of lack of skills and confidence in repair is also confirmed in previous literature (Amini et al., 2005). Seemingly simple, the reason for a lack of skills is more likely to be a complex combination of increased complexity in product design, less need to practice maintenance of objects due to low replacement costs, and perhaps a cultural

perception that new is better. The maintenance and repair of objects is often seen as a necessity for those who cannot afford to buy new and a subject of shame, rather than a trait of care (Gregson et al., 2009), and over generations, if not practiced, that skill is lost. These values may also be reflected in formal education systems, where gender norms may play a role in the types of skills acquired in school. This is further explored in Section 4.2.1. Lack of awareness of PRS is a barrier confirmed by previous literature (Amini et al., 2005). On the other hand, mistrust in the quality of the repair (McCollough, 2009; Bovea et al., 2017; Pérez-Belis et al., 2017) is not confirmed by this study, as only 14% of respondents marked 'repaired items are less reliable', and only 7% cited mistrust in professional repair services, however, men were more likely to mistrust PRS than women (see Section 4.2.1). It should also be noted that this survey does not draw a distinction between OEM repair/aftercare services, and those of third party PRS, which may occupy varying levels of public trust. Additionally, the general nature of this question does not distinguish between barriers for different product categories, or the relationship between the cost of PRS and lack of trust, both of which warrant further investigation.

Participants were also asked whether they would consider working in PRS. This is an important aspect when considering the capacity to expand PRS and provides an, albeit limited, insight into public interest in working in the sector. Results can be seen in Fig. 3. This result was further cross-referenced with gender using a Chi-square test of homogeneity. Results indicate four significant findings, revealing men as more likely to consider working in repair of small appliances ($p < 0.0001$), large appliances ($p = 0.003$), and road maintenance ($p = 0.009$). Women were more likely to consider working in clothing repair ($p < 0.0001$). In general, the participant-stated willingness to work in repair was quite high, which might indicate an opportunity for further development of the sector, provided skills training is available. Coupled with public behaviours towards use of PRS (i.e. demand for PRS, see Fig. 1), large appliance repair may be a particular area of opportunity.

Willingness to work in repair services was also tested for association with education level using the broad categories of educational attainment of (a) below NVQ4 (i.e. without higher education qualification), and (b) NVQ4 and above (i.e. with higher education qualification). Two categories showed significant results, where clothing repair was positively associated with the higher educational attainment group ($p < 0.0001$), and the choice of "none of these" was positively associated with the lower educational attainment group ($p < 0.0001$). The lack of interest in repair service work amongst the lower-qualified group may suggest a lack of available labour force for an expanded repair economy; however, it is also possible that this group does not feel they have the skills necessary to carry out the work. Further examination of the dynamics influencing this result are needed.

4.2. Profiling characteristics associated with repair behaviours

The following section explores various demographics and values associated with repair behaviours (that participants have identified in themselves) in an effort to develop a profile of 'repairers'.

4.2.1. Gender

Of the respondents who participate in (DIY or PRS) repair in each product category, a Chi-square test of homogeneity was used to determine whether a difference exists between males and females with regard to these behaviours. Results are shown in Table 2, where statistically significant p-values are denoted by an asterisk (*).

These results bear a resemblance to common stereotypes of gender roles in the home (e.g. sewing as a female role, mechanical repair as male) (Coltrane, 1989). Gender differences in the identification of barriers to repair (descriptive statistics of barriers can be seen in Fig. 2) was also investigated using the Chi-square test of homogeneity. While most barriers were not identified significantly more by one gender over another, there were a few exceptions. Men were significantly more likely

Table 2
Gender differences in product-specific repair behaviours.

Product type	DIY repair p-value	Gender more likely to participate	Professional repair services p-value	Gender more likely to participate
Small appliance	0.000205*	M*	0.755	F
Large white good	0.459	M	0.140	F
Clothing	<0.0001*	F*	min. expected count not met	
Furniture	0.400	F	0.095	F
Expensive tools	0.004*	M*	0.031*	F*
Small electronics	0.217	M	0.397	F
Large electronics	0.146	M	0.119	F
Bicycles	0.006*	M*	0.015*	F*
Motor vehicles	0.010*	M*	0.244	F

* indicates statistically significant p-value ($p < 0.05$).

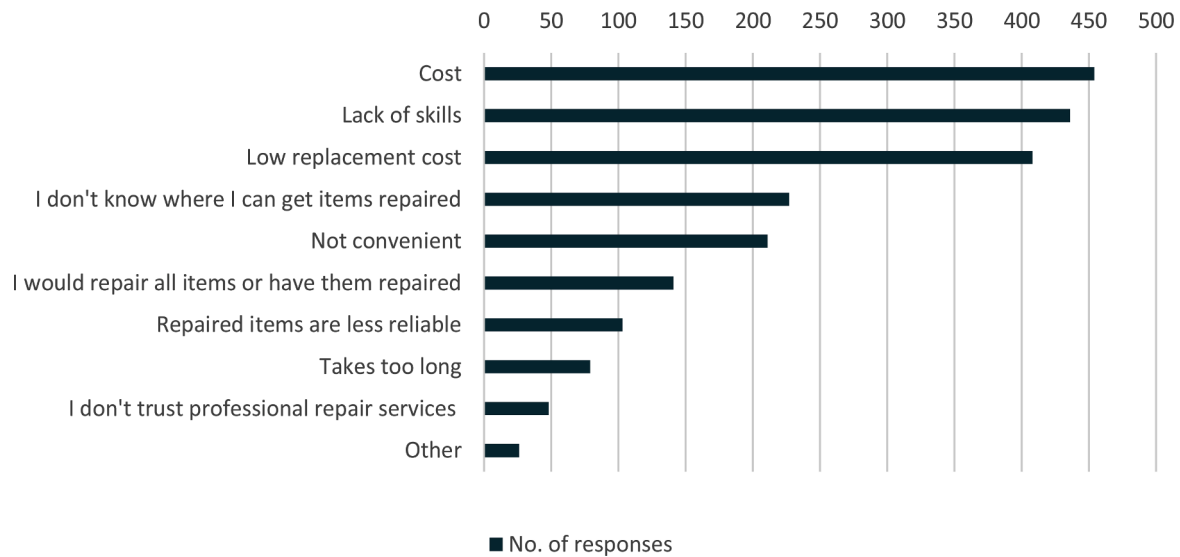


Fig. 2. Barriers to participation in repair economy.

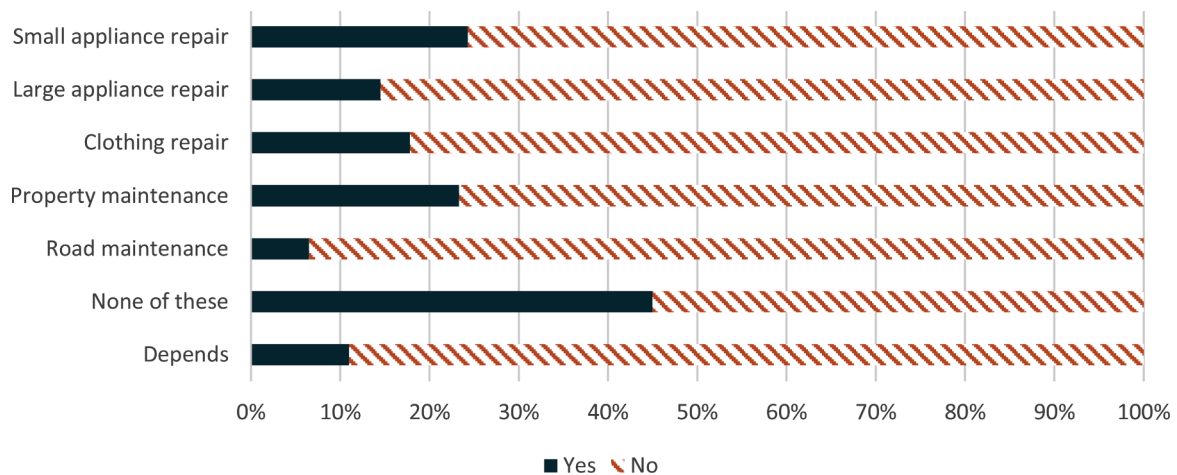


Fig. 3. Willingness to work in professional repair services.

to identify lack of trust in PRS than females ($p = 0.013$), while females were more likely to identify a lack of awareness of local professional service options as a major barrier to repair ($p = 0.000063$). This is also coupled with the evidence that women are more likely to hire out PRS across product types. Perhaps women trust professionals more because they simply have more experience with PRS, and thereby more opportunity to build a trusting relationship. This may indicate an opportunity to promote positive first repair experiences, or perhaps provide a financial incentive for a first repair, normalising the experience for

future use. However, the result could equally indicate a gender discrepancy in skill and expertise required to carry out DIY repair. In this case, a question emerges about the way that gender stereotypes might be propped up through cultural pressure or formal education systems.

4.2.2. Values orientation

A Chi-square test of association was used to determine whether there is an association between the values identified by respondents as most important in their purchasing choices (either for new or used goods) and

respondent willingness to participate in (a) DIY repair behaviour, or (b) use of PRS. Results indicate that valuing environmental impact, ethical sourcing/production, value for money, and durability in new goods are all positively associated with willingness to DIY repair. Willingness to use PRS was negatively associated with valuing price, but positively associated with valuing environmental impact in purchase decisions. Full results can be seen in Table 3.

It seems reasonable that those who participate in DIY repair are more likely to value durability in their purchases, as durable products are also associated with a greater ease of reparability. However, it is equally possible, when viewing repair as a somewhat luxury choice, that those who have the skills and leisure time to repair are the same demographic as those who can afford more durable, or higher quality products to begin with. Value for money associated with DIY repair behaviours might indicate that one of the motivations behind DIY repair is thrift (i.e. to save money on replacing the product or hiring PRS). The association between DIY repair and valuing a low environmental impact of products also reveals another possible motivation, where the maintenance of material value is recognized as an environmentally conscious choice. Understanding these traits is important when targeting different audiences to encourage repair behaviour. A similar finding was identified by Gregson et al. (2013) in relation to car boot/second-hand sales and purchasing where the motivation of thrift is found to collide with those of environmental impact, as the thrift aspect (i.e. inexpensive goods) tends to encourage excess consumption. This rebound effect is also relevant to the repair of objects, particularly DIY, as money saved may in turn enable deferred consumer expenditure. Here a distinction might be made between frugality and thrift. Evans (2011) suggests that while 'thrift' stems from restraint in an effort to preserve household resources (and may result in increased overall consumption as an expression of care of the family), 'frugality' differs in that it stems from a moral restraint orientated towards the wider good and is therefore consistent with reduced overall consumption. While this study is not able to distinguish these opposing motivations, it should be noted that in practice, this dichotomy may be less polarised than the theory might assume. As Podkalicka and Potts (2013) point out, individual's circumstances, perspectives, and skills tend to blur the line between choice and necessity.

The Mann Whitney U test was also run to determine if there is a significant difference in frequency of second-hand shopping amongst those who do or do not participate in repair behaviours. Distributions of frequency of second-hand shopping between individuals who have participated in DIY repair and those who have not were dissimilar based on visual inspection, therefore medians are not able to be compared. However, distributions and mean ranks (DIY repairer mean rank = 376.63 versus 284.03 for those who don't) are statistically significantly

different, indicating that those who DIY repair also shop second-hand more frequently ($p < 0.0001$). On the other hand, frequency of second-hand shopping was not found to be related to use of PRS ($p = 0.704$). This may be a reflection of income and the affordability of both second-hand shopping and DIY repair (and inversely, the cost of PRS), however no certain conclusions may be drawn as to the reasons for this association.

4.2.3. Age & education

In contrast to previous studies of repair (Pérez-Belis et al., 2017; Wieser and Tröger, 2016), this study found no significant difference in age relating to likelihood of undertaking repair either as DIY or professional services. The Mann Whitney U test was run to determine if there were differences in ages between those who DIY repair, and those who do not. Distribution of age was similar between the two groups based on visual inspection. Median age for DIY repairers (58) was not statistically significantly different than those who did not (59) ($p = 0.904$). The same test was run comparing age between those who use PRS (median=59.0) and those who do not (median=57.5), with similarly insignificant age differences between groups ($p = 0.202$). This is in contrast to a previous study from Spain, which found that at least in the case of small household electrical and electronic equipment, older people tended to repair more (Pérez-Belis et al., 2017). Similar results from Wieser and Tröger (2016) indicated age as a factor for mobile phone repair. It may be that age remains a factor in product-specific repair behaviour, however the findings of this study cannot confirm such a hypothesis.

Difference in highest educational qualification amongst those who do or do not participate in repair behaviours was examined using the Mann Whitney U test. Distributions of highest educational attainment between individuals who (a) have, and (b) have not participated in DIY repair were similar based on visual inspection. Median level of highest educational attainment was statistically significantly different between the two groups, where the median DIY participant had attained NVQ Level 4 or higher (the highest category of attainment), while the median of those who do not participate in DIY repair was NVQ 3 or equivalent ($p = 0.016$). Median results for use of PRS versus those who do not were the same as above and significant ($p = 0.034$). This indicates greater willingness to participate in the repair economy amongst those with higher educational attainment, confirming previous research (McCullough, 2010). Furthermore, if education can be taken as a proxy for income, this result may indicate that in fact the stigma of repair as a necessity is not affecting uptake of repair amongst those who can afford to choose, and supports the idea that the 'craft culture' ethic of pro-user behaviour is relevant in the case of Hull.

All results relating to demographics and individual characteristics

Table 3
Association between purchasing values and repair behaviours.

Purchasing Value	In the case of second-hand purchases			In the case of new purchases			PRS		
	DIY repair P-value	Assoc.	PRS P-value	Assoc.	DIY repair P-value	Assoc.	PRS P-value	Assoc.	
Price	<0.0001*	+	0.117	n/a	0.772	n/a	0.016*	-	
Quality	0.196	n/a	0.785	n/a	0.182	n/a	0.203	n/a	
Variety/choice	0.435	n/a	0.686	n/a	0.800	n/a	0.772	n/a	
Brand	0.261	n/a	0.564	n/a	0.093	n/a	0.167	n/a	
Environ. impact	<0.0001*	+	0.014*	+	0.032*	+	0.010*	+	
Ethically produced	0.307	n/a	0.909	n/a	0.046*	+	0.112	n/a	
Local	0.039*	+	0.316	n/a	0.733	n/a	0.183	n/a	
Value for money	<0.0001*	+	0.010*	+	0.034*	+	0.376	n/a	
Durability	0.226	n/a	0.316	n/a	0.039*	+	0.056	n/a	
Aesthetics	0.758	n/a	0.426	n/a	0.151	n/a	0.077	n/a	
Eco-packaging	0.920	n/a	0.625	n/a	0.671	n/a	0.674	n/a	
Convenience	0.034*	+	0.360	n/a	0.486	n/a	0.288	n/a	
Warranty	0.708	n/a	0.839	n/a	0.755	n/a	0.463	n/a	
Supplier gets a fair price	0.331	n/a	0.215	n/a	0.761	n/a	0.593	n/a	

* indicates statistically significant p-value ($p < 0.05$).

Table 4
Summary of repair participant profiles.

Profile of repair economy participants <i>DIY repairers</i>	<i>Users of professional repair services</i>
<ul style="list-style-type: none"> • Educated • Men more likely to repair small appliances, expensive tools, bicycles and motor vehicles • Women more likely to repair clothing • Value environmental impact, ethical production, value for money, and durability when purchasing new products • Value environmental impact, price, supporting local, value for money, and convenience when buying second-hand. • Shop second-hand frequently • Exist in all age groups 	<ul style="list-style-type: none"> • Educated • Women more likely to be users across product categories • Value environmental impact when purchasing new products (negatively related to those who value price) • Value environmental impact and value for money when purchasing second-hand. • Are not frequent second-hand shoppers • Exist in all age groups

have been summarised in [Table 4](#) to develop a profile of repair economy participants in Hull.

5. Conclusions

This study contributes to empirical research on the public perception, attitudes, and behaviours towards repair economy activities, providing insight into the viability of expansion of employment in the repair sector. In addition, the study takes a combined perspective from the often-disparate fields of CE, human geography, and consumer behaviour to analyse results; ultimately generating a demographic profile of repair economy participants (see summary in [Table 4](#)) that might inform the expansion of repair service provision, both professional and DIY. The results show that there are certainly gender discrepancies in the affinity to repair certain products, some of which are quite typical of traditional gender roles, such as clothing mending for women, and tool or motor vehicle repair for men. These stereotypes were further reflected in willingness to work in PRS. This survey does not provide the qualitative data necessary to explore the reasons for the gender differences encountered; further research should explore how traditional gender roles are perpetuated or challenged through education systems, and how culture may influence the perception of masculine and feminine behaviours and roles. Perhaps building these skills from an early age can also act to facilitate a greater gender balance in willingness to work in the sector in future, similar to STEM for girls programs. Community repair cafes also provide an informal skill sharing space that could be supported through additional funding, volunteer procurement, and promotion. In terms of supporting the use of PRS, although women are more likely to hire out repair, due to the limitations of the survey method, the reason for this discrepancy remains unclear and requires further investigation. For example, this result could equally indicate that women are more likely to choose to have an object repaired (versus replacement/disposal), or that they are more likely to be the decision-makers or instigators of the care of the object in the first place.

Furthermore, a question emerges from the results about the choice and motivation to repair. Previous research indicates a tension between a sense of shame associated with repair due to lack of financial capacity to replace an object, versus repair as a choice of affluence based on the time or skill required from a craftsman point of view. Considering the multiple deprivations of the city of Hull, and its structurally disadvantaged status, affordability as the main motivation for repair is a tempting hypothesis. This is somewhat supported by the association between DIY

repair behaviours and purchasing values of price, value for money, and the association with second-hand shopping. On the other hand, higher education associated with repair economy participants might suggest that affordability is less of a concern (if we can take education as a proxy for income, which is certainly not a perfect measure, and does not reflect the great range of variability of income in higher education jobs). Particularly, use of PRS seems less of a financial choice, and more fuelled by environmental responsibility. This may reflect the reality of a high cost of repair, or a perception of the cost being high, substantiated or not. It may be that both sides of this seemingly polarising dichotomy, between affordability and luxuriated choice, exist simultaneously in the city. Acknowledging each as separate can enable sense-making and the development of effective support mechanisms to capitalize on the existing value orientations of participants. At the same time, it is important to acknowledge what might be consistent between these groups in service of reducing, or at the least not exacerbating, the existing inequalities amongst the citizens. The survey results indicate that the value of environmental impact could warrant further investigation as a common-ground motivator to support the repair economy. From an interdisciplinary standpoint based in the literature discussed (see [Section 2.2](#)), the value of 'care' may be a further inspirational motivator, which might include environmental impact, or care of the planet, but extends to include care of owned objects and materials, and acknowledgement of the labour required to sustain them. In this way repair can be observed as a relational rather than technical act. By reframing repair as an act of care, promotion of repair can move towards a more universal value orientation that is more likely to be inclusive and personally relevant to individuals from diverse socioeconomic circumstances.

On a larger scale, some inferences can be made about the effective trajectory of public policy associated with repair. Cost is confirmed to be a significant barrier to participation and threatens the inclusivity of the repair economy in Hull. To address this barrier, there are many examples of policy instruments that have been effectively used to lessen the financial burden of participation and redistribute funds to prioritise and encourage repair (see [Section 2.1](#)). These policies, when promoted, also have the additional benefit of bringing awareness to access to repair (a participation barrier confirmed in this study).

Expanding the repair economy is a multi-faceted endeavour, which requires coordination across multiple levels of government together with manufacturers, designers, educational institutions, community organisations, and, directly and indirectly, with individuals. While individual motivations to repair will differ, and governance contexts are continuously changing, this study proposes the reframing of the individual and collective perception of repair towards one of care of objects and honour of the material and labour value that is embedded in our things. This is an initial step in further understanding the complexity of the repair economy and how it might be supported in order to realise both its environmental and social benefit potential. While this study is limited in its scope, it provides a conceptual contribution particularly to the CE literature by exposing deficiencies in the understanding of repair as a relational rather than technical act, and how the use of this frame of reference might alter the CE discourse on the role of the consumer/user. Further qualitative research is needed to test the theories presented in this study and investigate the viability of policy recommendations within the appropriate national, regional, and local political and regulatory context. Furthermore, while the public demand for and willingness to work in PRS uncovered in this study suggests a scope for employment opportunities in PRS in Hull, further research is needed to investigate other relevant dimensions, such as the quality and diversity of work in the sector.

CRedit authorship contribution statement

Heather A. Rogers: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing.

Pauline Deutz: Conceptualization, Methodology, Writing - review & editing, Supervision, Project administration, Funding acquisition.
Tomás B. Ramos: Conceptualization, Methodology, Writing - review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This work has benefited from a collaboration with Hull City Council. We would especially like to thank to Sarah Tonks and Martin Budd for their contribution. We would also like to thank the many people in Hull who participated in our survey and shared their views on repair. CENSE is financed by the Portuguese Foundation of Science and Technology (FCT) through the strategic project UID/AMB/04085/2019. This project is funded by the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 765198. For more information visit <http://cresting.hull.ac.uk>.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.resconrec.2021.105447](https://doi.org/10.1016/j.resconrec.2021.105447).

References

- Alexander, C., Smaje, C., 2008. Evaluating third sector reuse organisations in the UK: case-studies and analysis of furniture reuse schemes. *Resour. Conservat. Recycl.* 52 (5), 719–730. <https://doi.org/10.1016/j.resconrec.2007.09.005>.
- Amini, M.M., Retzlaff-Roberts, D., Bienstock, C.C., 2005. Designing a reverse logistics operation for short cycle time repair services. *Int. J. Prod. Econ.* 96 (3), 367–380. <https://doi.org/10.1016/j.ijpe.2004.05.010>.
- Annarelli, A., Battistella, C., Nonino, F., 2016. Product service system: a conceptual framework from a systematic review. *J. Clean. Prod.* 139, 1011–1032. <https://doi.org/10.1016/j.jclepro.2016.08.061>.
- Atkinson, D., Cooke, S., Spooner, D., 2002. Tales from the Riverbank: place-marketing and maritime heritages. *Int. J. Heritage Stud.* 8 (1), 25–40. <https://doi.org/10.1080/13527250220119910>.
- Bakker, C., Wang, F., Huisman, J., den Hollander, M., 2014. Products that go round: exploring product life extension through design. *J. Clean. Prod.* 69, 10–16. <https://doi.org/10.1016/j.jclepro.2014.01.028>.
- Bartlett, J.E., Kotrlik, J.W., Higgins, C.C., 2001. Organizational research: determining appropriate sample size in survey research appropriate sample size in survey research. *Inf. Technol. Learn. Perform. J.* 19 (1), 43.
- Bix, A., 2009. Creating “chicks who fix”: women, tool knowledge, and home repair, 1920–2007. *Women's Stud. Quarter.* 37 (1/2), 38–60.
- Borrello, M., Caracciolo, F., Lombardi, A., Pascucci, S., Cembalo, L., 2017. Consumers' perspective on circular economy strategy for reducing food waste. *Sustainability* 9 (1), 18. <https://doi.org/10.3390/su9010141>.
- Bovea, M.D., Pérez-Belis, V., Quemades-Beltrán, P., 2017. Attitude of the stakeholders involved in the repair and second-hand sale of small household electrical and electronic equipment: case study in Spain. *J. Environ. Manage.* 196, 91–99. <https://doi.org/10.1016/j.jenvman.2017.02.069>.
- British Standards Institution, 2009. 8887-2: 2009 Design for manufacture, assembly, Disassembly and End-of-Ufe Processing (MADE). BSI.
- Calisto Friant, M., Vermeulen, W.J., Salomone, R., 2020. A typology of circular economy discourses: navigating the diverse visions of a contested paradigm. *Resour. Conservat. Recycl.* 161, 104917. <https://doi.org/10.1016/j.resconrec.2020.104917>.
- Camacho-Otero, J., Boks, C., Pettersen, I.N., 2018. Consumption in the circular economy: a literature review. *Sustainability* 10 (8), 25. <https://doi.org/10.3390/su10082758>.
- Campbell, C., 2005. The Craft Consumer: culture, craft and consumption in a postmodern society. *J. Consum. Culture* 5 (1), 23–42. <https://doi.org/10.1177/1469540505049843>.
- Carfagna, L.B., Dubois, E.A., Fitzmaurice, C., Ouimette, M.Y., Schor, J.B., Willis, M., Laidley, T., 2014. An emerging eco-habitat: the reconfiguration of high cultural capital practices among ethical consumers. *J. Consum. Culture* 14 (2), 158–178. <https://doi.org/10.1177/1469540514526227>.
- Cerri, J., Testa, F., Rizzi, F., Frey, M., 2019. Factorial surveys reveal social desirability bias over self reported organic fruit consumption. *British Food J.* 121 (4).
- Cole, C., Gnanapragasam, A., Cooper, T., Singh, J., 2019. An assessment of achievements of the WEEE Directive in promoting movement up the waste hierarchy: experiences in the UK. *Waste Manag.* 87, 417–427. <https://doi.org/10.1016/j.wasman.2019.01.046>.
- Coltrane, S.R., 1989. Household labor and the routine production of gender. *Soc. Probl.* 36 (5), 473–490. <https://doi.org/10.2307/3096813>.
- Dawkins, N., 2011. Do-it-yourself: the precarious work and postfeminist politics of handmaking (in) Detroit. *Utop. Stud.* 22 (2), 261–284. <https://doi.org/10.1353/utp.2011.0037>.
- Deutz, P., Lyons, D.L., Bi, J., 2015. International Perspectives On Industrial Ecology. Edward Elgar Publishing. <https://doi.org/10.4337/9781781003572>.
- Diddi, S., Yan, R.N., 2019. Consumer perceptions related to clothing repair and community mending events: a circular economy perspective. *Sustainability* 11 (19), 17. <https://doi.org/10.3390/su11195306>.
- Dunbar-Hester, C., 2008. Geeks, meta-geeks, and gender trouble: activism, identity, and low-power FM radio. *Soc. Stud. Sci.* 38 (2), 201–232. <https://doi.org/10.1177/0306312707082954>.
- Ekins, P., Speck, S., 2000. Proposals of environmental fiscal reforms and the obstacles to their implementation. *J. Environ. Policy Plann.* 2 (2), 93–114. <https://doi.org/10.1080/714038548>.
- EMF, 2013. Towards the circular economy: economic and business rationale for an accelerated transition.
- European Commission, 2018. Impacts of Circular Economy Policies on the Labour Market – Final Report. European Commission, Brussels. <https://doi.org/10.2779/574719>.
- European Commission, 2019. Annexes to the Commission Regulation (EU) Laying Down Ecodesign Requirements For Refrigerating Appliances Pursuant to Directive 2009/125/EC of the European Parliament European Commission, Brussels.
- European Commission, 2019b. Communication: The European Green Deal. COMM(2019) 640 Final. European Commission, Brussels.
- European Commission, 2020. Annex to Communication: A New Circular Economy Action Plan for a Cleaner and More Competitive Europe. COM(2020) 98 Final. European Commission, Brussels. https://ec.europa.eu/environment/circular_economy/pdf/new_circular_economy_action_plan_annex.pdf [Accessed 07/12/2020].
- European Environmental Bureau, 2020. EEB Draft Feedback: Empowering the Consumer for the Green Transition. European Environmental Bureau. <https://mk0eeborgicuyupctuf7e.kinstacdn.com/wp-content/uploads/2020/10/EEB-feedbackto-consultation-on-empowering-the-consumer-for-the-green-transition.pdf> [Accessed 07/12/2020].
- Evans, D., 2011. Thrifty, green or frugal: reflections on sustainable consumption in a changing economic climate. *Geoforum.* 42 (5), 550–557. <https://doi.org/10.1016/j.geoforum.2011.03.008>.
- Freire-González, J., Ho, M.S., 2018. Environmental fiscal reform and the double dividend: evidence from a dynamic general equilibrium model. *Sustainability* 10 (2), 501. <https://doi.org/10.3390/su10020501>.
- Fogg, B.J., 2009. A behavior model for persuasive design. *Proceedings of the 4th International Conference on Persuasive Technology.* pp. 1–7. 10.1145/1541948.1541999.
- Geissdoerfer, M., Savaget, P., Bocken, N.M.P., Hultink, E.J., 2017. The circular economy – a new sustainability paradigm? *J. Clean. Prod.* 143, 757–768. <https://doi.org/10.1016/j.jclepro.2016.12.048>.
- Gharfalkar, M., Ali, Z., Hillier, G., 2016. Clarifying the disagreements on various reuse options: repair, recondition, refurbish and remanufacture. *Waste Manag. Res.* 34 (10), 995–1005. <https://doi.org/10.1177/0734242X16628981>.
- Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *J. Clean. Prod.* 114, 11–32. <https://doi.org/10.1016/j.jclepro.2015.09.007>.
- GOV.UK, n.d. What qualification levels mean. <https://www.gov.uk/what-different-qualification-levels-mean/list-of-qualification-levels> [Accessed 29/07/2020].
- Graham, S., Thrift, N., 2007. Out of Order: understanding Repair and Maintenance. *Theory Cult. Soc.* 24 (3), 1–25. <https://doi.org/10.1177/0263276407075954>.
- Gregson, N., Crang, M., Laws, J., Fleetwood, T., Holmes, H., 2013. Moving up the waste hierarchy: car boot sales, reuse exchange and the challenges of consumer culture to waste prevention. *Resour. Conservat. Recycl.* 77, 97–107. <https://doi.org/10.1016/j.resconrec.2013.06.005>.
- Gregson, N., Metcalfe, A., Crewe, L., 2009. Practices of object maintenance and repair: how consumers attend to consumer objects within the home. *J. Consum. Culture* 9 (2), 248–272. <https://doi.org/10.1177/1469540509104376>.
- Groothuis, F., 2016. New era. New plan. Europe. A fiscal strategy for an inclusive, circular economy. In: Gersen, P. (Ed.), *The Ex'tax Project*. Utrecht.
- Hazen, B.T., Mollenkopf, D.A., Wang, Y.C., 2017. Remanufacturing for the circular economy: an examination of consumer switching behavior. *Bus. Strategy Environ.* 26 (4), 451–464. <https://doi.org/10.1002/bse.1929>.
- Hobson, K., 2019. Small stories of closing loops': social circularity and the everyday circular economy. *Climatic Change* 1–18. <https://doi.org/10.1007/s10584-019-02480-z>.
- Hogg, D., Elliott, T., Elliott, L., Ettliger, S., Chowdhury, T., Bapasola, A., Emery, L., Andersen, M.S., ten Brink, P., Withana, S., 2016. Study on Assessing the Environmental Fiscal Reform Potential For the EU28. European Commission, Luxembourg.
- Humber, L.E.P., 2019. Humber Clean Growth Local White Paper. Humber Local Enterprise Partnership, Hull. <https://www.humberlep.org/wp-content/uploads/2019/11/Humber-Clean-Growth-White-Paper.pdf> [Accessed 07/12/2020].
- Humphry, J., 2014. The importance of circumstance: digital access and affordability for people experiencing homelessness. *J. Telecommun. Digital Econ.* 2 (3), 55. <https://doi.org/10.7790/ajtde.v2n3.55>.
- King, A.M., Burgess, S.C., Ijomah, W., McMahon, C.A., 2006. Reducing waste: repair, recondition, remanufacture or recycle? *Sustain. Dev.* 14 (4), 257–267. <https://doi.org/10.1002/sd.271>.

- Kingston Upon Hull Data Observatory, 2015. Deprivation overview. http://109.228.11.121/IAS_Live/profiles/profile?profileid=7. [Accessed 04/03/2019].
- Kingston Upon Hull Data Observatory, 2019. Hull summary profile. http://109.228.11.121/IAS_Live/profiles/profile?profileid=22. [Accessed 09/06/2020].
- Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: an analysis of 114 definitions. *Resour. Conservat. Recycl.* 127, 221–232. <https://doi.org/10.1016/j.resconrec.2017.09.005>.
- Kohtala, C., 2015. Addressing sustainability in research on distributed production: an integrated literature review. *J. Clean. Prod.* 106, 654–668. <https://doi.org/10.1016/j.jclepro.2014.09.039>.
- Kuah, A.T.H., Wang, P.J., 2020. Circular economy and consumer acceptance: an exploratory study in East and Southeast Asia. *J. Clean. Prod.* 247, 13. <https://doi.org/10.1016/j.jclepro.2019.119097>.
- Laerd Statistics, 2015. Mann-Whitney U test using SPSS Statistics. Statistical Tutorials and Software Guides. <https://statistics.laerd.com/>. [Accessed 06/04/2020].
- Laerd Statistics, 2016a. Chi-square test for association using SPSS Statistics. Statistical Tutorials and Software Guides. Laerd Statistics. <https://statistics.laerd.com/> [Accessed 06/04/2020].
- Laerd Statistics, 2016b. Test of Two Proportions Using SPSS Statistics, Statistical tutorials and Software Guides. Laerd Statistics. <https://statistics.laerd.com/> [Accessed 06/04/2020].
- Larson, R.B., 2019. Controlling social desirability bias. *Int. J. Market Res.* 61 (5), 534–547. <https://doi.org/10.1177/1470785318805305>.
- Lechner, G., Reimann, M., 2015. Reprocessing and repairing white and brown goods - the R.U.S.Z case: an independent and non-profit business. *J. Remanuf.* 5 (1) <https://doi.org/10.1186/s13243-015-0012-9>.
- Lekan, M., Rogers, H.A., 2020. Digitally enabled diverse economies: exploring socially inclusive access to the circular economy in the city. *Urban Geogr.* 1–4. <https://doi.org/10.1080/02723638.2020.1796097>.
- Liu, Q., Li, H.-m., Zuo, X.-l., Zhang, F.-f., Wang, L., 2009. A survey and analysis on public awareness and performance for promoting circular economy in China: a case study from Tianjin. *J. Clean. Prod.* 17 (2), 265–270. <https://doi.org/10.1016/j.jclepro.2008.06.003>.
- Llorente-González, L.J., Vence, X., 2020. How labour-intensive is the circular economy? A policy orientated structural analysis of the repair, reuse and recycling activities in the European Union. *Resour. Conservat. Recycl.* 162 <https://doi.org/10.1016/j.resconrec.2020.105033>.
- McCollough, J., 2009. Factors impacting the demand for repair services of household products: the disappearing repair trades and the throwaway society. *Int. J. Consum. Stud.* 33 (6), 619–626. <https://doi.org/10.1111/j.1470-6431.2009.00793.x>.
- McCollough, J., 2010. Consumer discount rates and the decision to repair or replace a durable product: a sustainable consumption issue. *J. Econ. Issues.* 44 (1), 183–204. <https://doi.org/10.2753/JEI0021-3624440109>.
- McLaren, D., Niskanen, J., Anshelm, J., 2020. Reconfiguring repair: contested politics and values of repair challenge instrumental discourses found in circular economies literature. *Resour. Conservat. Recycl.* X 8. <https://doi.org/10.1016/j.rcrx.2020.100046>.
- McLaren, D.P., 2018. In a broken world: towards an ethics of repair in the Anthropocene. *Anthropocene Rev.* 5 (2), 136–154. <https://doi.org/10.1177/2053019618767211>.
- McCracken, G., 1990. *Culture and Consumption: New Approaches to the Symbolic Character of Consumer Goods and Activities*. Indiana University Press, Bloomington.
- Morgan, J., Mitchell, P., 2015. Opportunities to Tackle Britain's Labour Market Challenges Through Growth in the Circular Economy. Green Alliance & WRAP, London. <https://doi.org/10.13140/RG.2.1.5171.6566>.
- Mylan, J., 2015. Understanding the diffusion of Sustainable Product-Service Systems: insights from the sociology of consumption and practice theory. *J. Clean. Prod.* 97, 13–20. <https://doi.org/10.1016/j.jclepro.2014.01.065>.
- Mylan, J., Holmes, H., Paddock, J., 2016. Re-Introducing Consumption to the 'Circular Economy': a sociotechnical analysis of domestic food provisioning. *Sustainability* 8 (8), 14. <https://doi.org/10.3390/su8080794>.
- Page, T., 2014. Product attachment and replacement: implications for sustainable design. *Int. J. Sustain. Design* 2 (3), 265–282. <https://doi.org/10.1504/IJSDS.2014.065057>.
- Pérez-Belis, V., Braulio-Gonzalo, M., Juan, P., Bovea, M.D., 2017. Consumer attitude towards the repair and the second-hand purchase of small household electrical and electronic equipment. A Spanish case study. *J. Clean. Prod.* 158, 261–275. <https://doi.org/10.1016/j.jclepro.2017.04.143>.
- Podkalicka, A., Potts, J., 2013. Towards a general theory of thrift. *Int. J. Cultural Stud.* 17 (3), 227–241. <https://doi.org/10.1177/1367877913496198>.
- Reike, D., Vermeulen, W.J.V., Witjes, S., 2018. The circular economy: new or Refurbished as CE 3.0? — Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options. *Resour. Conservat. Recycl.* 135, 246–264. <https://doi.org/10.1016/j.resconrec.2017.08.027>.
- Right to Repair, n.d. Right to Repair. <https://repair.eu/>. [Accessed 09/04/2020].
- Robson, C., 2002. *Real World Research: A Resource for Social Scientists and Practitioner - Researchers, 2nd Edition*. Blackwell Publishing, Oxford, UK.
- Rosner, D.K., Ames, M., 2014. Designing for repair? Infrastructures and materialities of breakdown, Proceedings of the 17th ACM Conference On Computer supported Cooperative Work & Social Computing. pp. 319–331. 10.1145/2531602.2531692.
- Rowley, J., 2014. Designing and using research questionnaires. *Manag. Res. Rev.* 37 (3), 308–330. <https://doi.org/10.1108/MRR-02-2013-0027>.
- Reuse, 2017. *Reduced Taxation to Support Re-Use and Repair. Recycling EU Social Enterprises network*.
- Sabbaghi, M., Behdad, S., 2018. Consumer decisions to repair mobile phones and manufacturer pricing policies: the concept of value leakage. *Resour. Conservat. Recycl.* 133, 101–111. <https://doi.org/10.1016/j.resconrec.2018.01.015>.
- Sayer, A., 2010. *Method in Social science: Revised 2nd Edition*. Routledge. <https://doi.org/10.4324/9780203850374>.
- Schröder, P., Lemille, A., Desmond, P., 2020. Making the circular economy work for human development. *Resour. Conservat. Recycl.* 156, 104686 <https://doi.org/10.1016/j.resconrec.2020.104686>.
- Stahel, W.R., 2013. Policy for material efficiency—Sustainable taxation as a departure from the throwaway society. *Philos. Trans. R. Soc. A* 371 (1986), 20110567. <https://doi.org/10.1098/rsta.2011.0567>.
- Stahel, W.R., 2019. *The Circular Economy: A user's Guide*. Routledge, New York.
- Svensson, S., Richter, J.L., Maitre-Ekern, E., Pihlajarinne, T., Maigret, A., Dalhammar, C., 2018. The emerging 'Right to repair' legislation in the EU and the US. Proceedings from Going Green—Care Innovation, Vienna, Austria.
- Tecchio, P., McAlister, C., Mathieux, F., Ardente, F., 2017. In search of standards to support circularity in product policies: a systematic approach. *J. Clean. Prod.* 168, 1533–1546. <https://doi.org/10.1016/j.jclepro.2017.05.198>.
- Türkel, S., Huang, B., Stasik, A., Kemp, R., 2019. Circular economy as a global business activity: mobile phone repair in the Netherlands. *Poland China. Energies* 12 (3). <https://doi.org/10.3390/en12030498>.
- Wang, P., Ming, X., Li, D., Kong, F., Wang, L., Wu, Z., 2011. Status review and research strategies on product-service systems. *Int. J. Prod. Res.* 49 (22), 6863–6883. <https://doi.org/10.1080/00207543.2010.535862>.
- Wieser, H., Tröger, N., 2016. Exploring the inner loops of the circular economy: replacement, repair, and reuse of mobile phones in Austria. *J. Clean. Prod.* 172, 3042–3055. <https://doi.org/10.1016/j.jclepro.2017.11.106>.
- Williams, I.D., Curran, T., Schneider, F., 2012. The role and contribution of the third sector in terms of waste management and resource recovery. *Waste Manag.* 32 (10), 1739–1741. <https://doi.org/10.1016/j.wasman.2012.06.019>.
- WRAP, 2011. *A Methodology for Quantifying the Environmental and Economic Impacts of Reuse*. Banbury.
- Wurzel, R.K., Moulton, J.F., Osthorst, W., Mederake, L., Deutz, P., Jonas, A.E., 2019. Climate pioneership and leadership in structurally disadvantaged maritime port cities. *Env. Polit.* 28 (1), 146–166. <https://doi.org/10.1080/09644016.2019.1522039>.
- Zhu, H., Gao, J., Li, D., Tang, D., 2012. A Web-based product service system for aerospace maintenance, repair and overhaul services. *Comput. Ind.* 63 (4), 338–348. <https://doi.org/10.1016/j.compind.2012.02.016>.