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Business Innovation for Product Repairability: Implications for Future Policies

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Abstract: This paper summarises recent legislative initiatives concerning repair and aims to identify the potential implications for future policies with reference to the Right to Repair and the EU's Circular Economy Action Plan. In order to achieve this aim, it offers evidence from 21 interviews with business practitioners. These practitioners comprise experts from companies that manufacture or sell products or provide after-sales services in three product sectors – clothing, furniture, and electrical and electronic equipment. Findings from analysis of the interviews are explored to identify value creation opportunities for and challenges to business innovation through product repairability. The research also addresses the importance of contributions from and collaboration between business stakeholders (e.g. manufacturers, retailers, brands and repair service providers) and customers in achieving successful business innovation. Business support needs from government are then addressed, followed by proposals for future legislation – including a reconsideration of product standards and the introduction of financial incentives.

Introduction

Product repair, the process of maintaining the functionality of items by correcting a defect, in theory improves resource security and material efficiency. Previous studies have addressed the importance of businesses in improving product repairability. Three themes of recommendations for businesses are apparent in the literature: improving product features and design strategies for repair, the provision, availability and accessibility of repair information, and services offered during the use of products (DEFRA, 2011; Parker *et al.*, 2012; RREUSE, 2013; Sabbaghi *et al.*, 2016; Bracquené *et al.*, 2018; European Commission, 2018, 2019).

In particular, a consumer behavioural study on the circular economy which addressed product durability and repairability (European Commission, 2018) suggested businesses consider design for disassembly at the design phase; whilst a study of the Reuse and Recycling EU Social Enterprises (RREUSE, 2013) network focused on the simplification and standardisation of product components.

The BeNeLux countries (Bracquené *et al.*, 2018) and the Joint Research Centre funded by the European Commission (2019) have each developed scoring systems for the repairability of electrical and electronic products, and both concluded that manufacturers should provide manuals for self-repair. They also recommended the provision of repairability information that details necessary repair tools and their availability, information regarding the type, number and location of connections, and an index for spare parts suggesting where to get them and their costs. An earlier study funded by European Commission (2018) also indicated that offering a label about the length of reparability for products as part of a strategy to influence consumers in their purchasing decisions.

Services to support repair practices during the use phase could involve the following: repair under warranty, reuse and repair integration, exchange or temporary replacement, fixed cost or lead-time repair services, localised repair services, and transparent spare parts and tool supply. These are now discussed in turn.

To encourage consumers to purchase repairable products and accept repair as a remedy for warranties (rather than seek a replacement), businesses should make the terms and conditions of warranty agreements clearer and invest in repair facilities and support centres (DEFRA, 2011). Comprehensive

collaboration between manufacturers, collection schemes, recyclers, knowledge providers and sale platforms is necessary to harvest broken items and second-hand components, and facilitate sales (Parker *et al.*, 2012; Ellen MacArthur Foundation, 2016). Exchange or temporary replacement of equivalent products could improve the convenience of, and consumer satisfaction with, repair services (DEFRA, 2011; Parker *et al.*, 2012). Fixed cost and fixed lead-time models would ensure the transparency of repair costs and duration, and improve the convenience and efficiency of repair services (Parker *et al.*, 2012). Localisation of repair services may contribute to improvement of the service network, its responsiveness and quality assurance (Lee Woolf *et al.*, 2012; Parker *et al.*, 2012). A robust spare parts supply chain could contribute to increased consumers' participation in repair (Ellen MacArthur Foundation, 2016; Raihanian Mashhadi *et al.*, 2016; European Commission, 2018), enabling them or their chosen repair service providers to have better access to spare parts.

The existing literature focuses mostly on the consumers' perspective, and recommendations for businesses are sometimes questionable concerning commercial viability and consumer understanding. In the same vein, many manufacturers have raised similar questions in response to the EU's Right to Repair initiative, which proposes that companies make appliances longer lasting and requires them to supply spare parts for up to 10 years. This study aims to fill this gap by identifying opportunities for and challenges to sustainable business model innovation for product repairability, and considering the implications for policies supporting the innovation. This aims also aligns with the agenda of the EU's Circular Economy Action Plan in exploring how to move away from the wasteful linear economy (European Commission, 2020).

Research methods

Business models are seen as 'a system of interconnected and interdependent activities that determine the way the company does business with its customers, partners and vendors' (Amit and Zott, 2012, p.42). Sustainable business innovation should be embedded in an organisation's DNA and integrated through all of its activities (Bocken, Rana and Short, 2015). A literature review was consequently conducted to identify current and potential business activities that might be expected to improve the repairability of products and promote repair services (

Business activities	Authors
Design for repair and codesign	Graham and Thrift (2007); Parker *et al.* (2012); RREUSE (2013); Charter and Keiller (2014); Wieser and Tröger (2016); Dewberry *et al.* (2017); European Commission (2018)
Provision of diagnostic and repair manuals, and instructional support	Lee Woolf et al. (2012); Ellen MacArthur Foundation (2016); Ackermann, Mugge and Schoormans (2018); Bracquené et al. (2018); European Commission (2018, 2019)
Promotion of repair benefits and repairable products	European Commission (2018) and business practices, such as IKEA's circular store, Patagonia's and Nudie Jeans' repair tours
Choosing repair over replacement within warranties	DEFRA (2011); Lee Woolf et al., 2012; Armstrong et al. (2015); Wieser and Tröger (2016)
Integration of repair and reuse	Lee Woolf et al. (2012); Parker et al. (2012); Ellen MacArthur Foundation (2016)
The exchange model and temporary replacement model	DEFRA (2011); Parker et al. (2012)
Fixed-cost model and fixed lead-time return model	Parker et al. (2012)
Localised repair service network and shared data	Lee Woolf et al. (2012); Charter and Keiller (2014); Dewberry et al. (2017)
A transparent spare parts and tools supply chain	RREUSE (2013); Ellen MacArthur Foundation (2016); Raihanian Mashhadi et al. (2016); European Commission, (2018)

Table *1*).

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Design for repair and codesign	Graham and Thrift (2007); Parker *et al.* (2012); RREUSE (2013); Charter and Keiller (2014); Wieser and Tröger (2016); Dewberry *et al.* (2017); European Commission (2018)
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Table 1: Current and potential business activities for improving the repairability of products and promoting repair services

Figure 1, below, shows nine cards of business activities that were identified through this review. They are classified into three groups, following the three themes, noted above, that emerged. The first card addresses product features and design strategies, whilst the next two are related to the provision, availability and accessibility of information. The remaining cards refer to services offered during the use of products. Each card presents a business activity, its description and potential narratives.

BUSINESS ACTIVITY CARDS

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#product repairability
#repair decisions
#repair services
#DIY repair

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Manufacturers **develop repairable products**, gathering ideas and comments from different actors (e.g. suppliers, retailers, service providers, repairers, consumers).

S01
REPAIRABLE PRODUCTS, CO-DESIGN

This activity is aimed at improving the repairability of current products and the future availability of repairable products.

It includes at least one of the following strategies:

- **Standardisation** of components
- **Simplification** of components
- **Safe-to-repair** design
- Design for **disassembly** and **upgrade.**

Manufacturers and retailers develop **post-repair scorecards** and encourage repairers and consumers to use them to evaluate the quality of repair work and their satisfaction with the product's repairability. The scorecards are applied to both DIY and professional repair work. Recorded data are used for continuous improvement of product design.

Manufacturers develop and share **diagnostic** and **repair manuals,** and provide **instructional support**.

Retailers **promote the availability** of these manuals and support. Repairers have access to and utilise the manuals.

S02
DIAGNOSTIC & REPAIR MANUALS, INSTRUCTIONAL SUPPORT

- This activity is aimed at easing fault diagnostics and repair work.
- Diagnostic and repair manuals are designed for both **DIY and professional repair**, whilst considering the **safety implications**. The manuals can be in paper or electronic (written or video-ed) form, and are open access.
- Instructional support, including **responsive call centres, live chats** or **email boxes,** are set up to give instructions and advice on fault diagnostics and repair work.

Manufacturers, retailers, repair companies and repair shops focus on raising **consumers' awareness of the benefits of repair**.

They also **prioritise the promotion** and **sale of repairable products** through 'nudges' and information provision.

S03
PROMOTION OF REPAIR BENEFITS & REPAIRABLE PRODUCTS

- This activity is aimed at promoting the benefits of repair and overcoming perceived barriers for consumers.
- **Marketing campaigns, repair events** and **websites** promote the value of repair to the environment and consumers (e.g. saving costs, saving the environment).
- Product repairability is included on the **product label**, and the manufacturers' and retailers' **websites.**

For **manufacturers' guarantees** and **extended warranties**, manufacturers and retailers **provide repair** for broken products, to satisfy consumers who prefer this, **rather than offer a replacement**.

S04
REPAIR OVER REPLACEMENT WITHIN WARRANTIES

- This activity is aimed at encouraging and attracting businesses' and consumers' preference for repair over replacement as a remedy for faulty products.
- **Repair information** regarding the process, parts, labour, delivery and repair duration is provided to **encourage consumers to purchase repairable products** and **accept repair as a remedy.**
- **Repair facilities** and **support centres** are available to **assist warranty claims**. The repair service can also be outsourced from third-party specialists (e.g. repair companies) to ensure its quality and responsiveness.

Manufacturers, retailers, repair companies and repair shops **integrate reuse with repair**.

S05
REUSE & REPAIR INTEGRATION

- This activity is aimed at extending lifetimes of unwanted parts and/or broken products by giving them a second life. These parts and products may be sourced from manufacturers, retailers, reuse organisations, charity shops, asset management companies, household waste recycling centres or waste transfer stations.
- **Reuse parts in repair services** – businesses use second-hand parts in their repair services or sell them to DIYers.
- **Reuse repaired items** – broken items, after being collected, are then repaired and resold to new users.

Figure 1: Cards showing business activities promoting product repairability and repair services

investigate the complexity of views of different business stakeholders in the three industry sectors. Qualitative methods provide rich data, providing deeper and more detailed insights into business practices than a quantitative approach would have done. In particular, tailoring interview questions with the use of 'business activity cards' was effective in enabling stories to be revealed by the businesses of conducting one or more of the nine proposed activities, as each had its own strategy, constraints and opportunities.

Twenty-one semi-structured interviews were undertaken with different business stakeholders, including manufacturers, brands or retailers, and repair service providers. Convenience sampling methods were employed as the investigator was able to negotiate access to interviewees through existing contacts (Saunders, Lewis and Thornhill, 2012) and the variety of industry sectors, company size and business stakeholders were taken into consideration. The interviews lasted between 40 and 60 minutes and focused on two questions:

i. What are actual and potential benefits of the proposed activities to the focal business and its stakeholders?
ii. What are actual and potential challenges to the adoption or execution of the proposed activities? What are support needs from governments to overcome the challenges?

Key findings and discussion

Business innovation for product repairability: opportunities and challenges

Opportunities for most of the proposed business activities were identified and supported by the evidence gained from interviews of business which addressed their practices and solicited their insights into the value to consumers and society. Many interviewees suggested adopting more than one activity to achieve greater value to consumers and society. For example, some interviewees (e.g. a British manufacturer of cleaning appliances, a Dutch modular phone brand and an American office furniture manufacturer) indicated that adopting activities S01, S02 and S03 could educate consumers on how to do DIY repair correctly and safely. Longer warranties could be offered when products become more repairable through integration of S01 and S04, according to an interviewee from a British manufacturer of cleaning appliances. Consumers could have more access to second-hand products repaired and sold relatively cheaply, if both S01 and S05 were adopted by manufacturers and brands (such as a British brand of electrical appliances and an American office furniture manufacturer). Adopting both S07 and S08, or integrating S01, S08 and S09, could help consumers get faulty items fixed more easily. The added value achieved from the integration of business activities could eliminate or minimise key challenges to the engagement of consumers in repair and satisfy their needs from businesses along their 'repair journeys' (Dao, Cooper and Watkins, 2020).

The data also suggests two key trends in value to businesses: (i) the ease of commercial repair processes, either within or out of warranty and (ii) benefits to brand management – including improved customer satisfaction and brand loyalty, gaining more customers (e.g. through repairable products or repair services), or positioning the brand at a higher end of the market. The proposed activities might thus support the repair activities of both consumers and businesses.

The second trend supports findings from a study by Sabbaghi et al. (2016), in which the majority of participants in a consumer survey indicated that product repairability could influence their loyalty and future purchases. Opportunities for the exchange model and temporary replacement model did not seem to have potential to the businesses interviewed. Many interviewees doubted these two models' economic feasibility and raised concerns about inventory management, logistics and common problems raised by second-hand products. The empirical data also illustrates that concerns about hygiene and emotional attachment (especially for clothes and food processors) may prevent consumers from using the exchange model (which was also reported in WRAP's study). However, the temporary replacement model was previously proposed in a report of DEFRA (2011) on product lifetimes which recommended giving a product to customers for temporary use while awaiting repairs, as a courtesy of the service provider.

There are trends in the data that pose considerable challenges to companies engaging in sustainable business model innovation that goes beyond product repairability. Common challenges were (i) consumers' preference for replacements of fashion and newly updated technology products, (ii) constraints on businesses' resources (e.g. finance, labour and facilities) and (iii) lack of collaboration between business stakeholders.

Concerning the first challenge, doubt was cast in the interviews on consumer interest in repairable products and repair services, which could lead to businesses' concerns over income from innovation that goes beyond product repairability and its potential impact on current revenue streams. Companies might prefer a classic business model from which they generate a profit from repeat sales and selling more units over time. This supports findings from a study of six business cases by Bocken and Short (2016), which also found that constraining sales growth, particularly if also reducing revenue and limiting market penetration, may make innovative business models less attractive to investors. Moreover, it was reported to be difficult to allocate resources to business model innovation and reconfigure resources for new business models, in line with the findings of Evans et al. (2017) and Geissdoerfer, Vladimirova and Evans (2018).

The data suggested that sustainable business model innovation, particularly through the nine proposed activities, required contributions from

various business stakeholders (e.g. material suppliers, manufacturers, retailers and service providers) and customers. These contributions included (i) financial investment, (ii) human resources, (iii) facilities for product development, testing and repair services, and (iv) initial ideas, on-going feedback, or efforts to deliver information promoting repairable products and support repair practices. It was suggested that the absence of these contributions and collaboration between stakeholders might arise from conflict between business objectives based on extending product lifetimes and sales-driven business goals, and uncertainty over the likely return on investment in business innovation. The required investment could be in staffing, R&D in repairable design, repair facilities, logistics and inventories of spare parts, service quality and customer relationship management. Moreover, consistent with findings from previous studies, engaging in extensive interaction with external stakeholders seemed to require focal companies to make extra effort (Boons and Lüdeke-Freund, 2013; Evans *et al.*, 2017). This problem could be associated with encouraging interest from customers and other business stakeholders in repairable products and repair services and their contributions to sustainable business model innovation. Thus, strong and communications with these external stakeholders can help the focal company and its stakeholders to utilise value creation opportunities that are different from their current business model and its logic.

Implications for policies supporting business innovation for product repairability

The literature review indicated that most political discussions and academic studies on repair have focused on consumers. This study presents policy options based on the interests and expectations of business stakeholders. The data collected revealed that businesses require support from government concerning product standards and the introduction of financial incentives to encourage business model innovation.

The majority of interviewees anticipated that government would reconsider product standards, in particular to improve repairability and prevent premature obsolescence. They thought that new products should be designed for repair and supplied with repair information (including repair manuals), spare parts and repair services. Non-compliance with the standards (e.g. products designed for premature obsolescence, not for disassembly and repair) could be penalised, such as through taxation, in line with recommendations made in a recent report for the European Commission (2018). Many interviewees claimed that these standards would extend producer responsibility and enable collaboration between different business stakeholders, including local and overseas manufacturers, brands, retailers and repair service providers. Key challenges to and enablers of sustainable business model innovation, considering value creation for and contributions from different business stakeholders are both associated with collaboration. Moreover, the proposed requirements for product standards might also support consumers' purchase decisions concerning repairable products and repair journeys.

Financial incentives could be in the form of tax breaks or research funding. In particular, interviewees suggested that governments should consider reducing VAT on repair work, as in Sweden and the Czech Republic. Tax reform could also take the form of reduced VAT on repairable products, spare parts and repair services, and tax rebates could be applied to R&D work on improving product design and repair services or creative marketing activities that promote repairability. Such measures should make repair more affordable. Additionally, some interviewees anticipated that governments would fund research involving partnerships between business stakeholders or between business stakeholders and research bodies. Further research was suggested, such as studying management toolkits for business transformation and product or service diversification to meet market demands.

Conclusions

This research highlighted the importance of contributions from and collaboration between business stakeholders and customers in achieving successful business innovation through product repairability. Contributions could include (i) financial investment, (ii) human resources, (iii) facilities for product development, testing and repair services, and (iv) initial ideas, on-going feedback, or efforts to deliver information that promote repairable products and support repair practices.

The research also identified two main value creation opportunities for business innovation through product repairability, which were also key motives for multi-stakeholder contributions and collaboration. These were associated with (i) the ease of commercial repair processes, either within or out of warranty and (ii) benefits to brand management, including improved customer satisfaction and brand loyalty, gaining more customers through repairable products or repair services, or positioning the brand at a higher end of the market.

This research identified two key future policies, a reconsideration of product standards and the introduction of financial incentives. Each could act as a catalyst for sustainable business model innovation, enabling businesses to overcome the challenge of generating income from repairable products and repair services instead of selling items liable to be prematurely obsolete. Businesses would be more able to incorporate the proposed repair activities into their business models, commit to sustainability objectives, and provide strong and consistent communication about these objectives to other business stakeholders and consumers. These would encourage (i) consumers' preference for extending product lifetimes through repair over the replacement of fashionable or newly updated technology products and (ii) collaboration and contributions to overcome business constraints concerning finance, human resources and infrastructure.

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