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An overview of Europe's repair sector

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Summary

The main objective of this report is to consolidate and advance the existing knowledge and provide an evidence-based update on the status of the repair sector in Europe. The study focuses on three key product groups, electrical and electrical equipment (EEE), clothing and furniture and provides an estimate of the value and size of the current repair activities in these sectors. Furthermore, an overview of the current repair behaviour in Europe is presented, along with the underlying factors impacting these behaviours. More specifically, this work identifies and categorizes the key challenges and barriers to repair and introduces potential solutions and opportunities for increased uptake of the repair activities by European consumers.

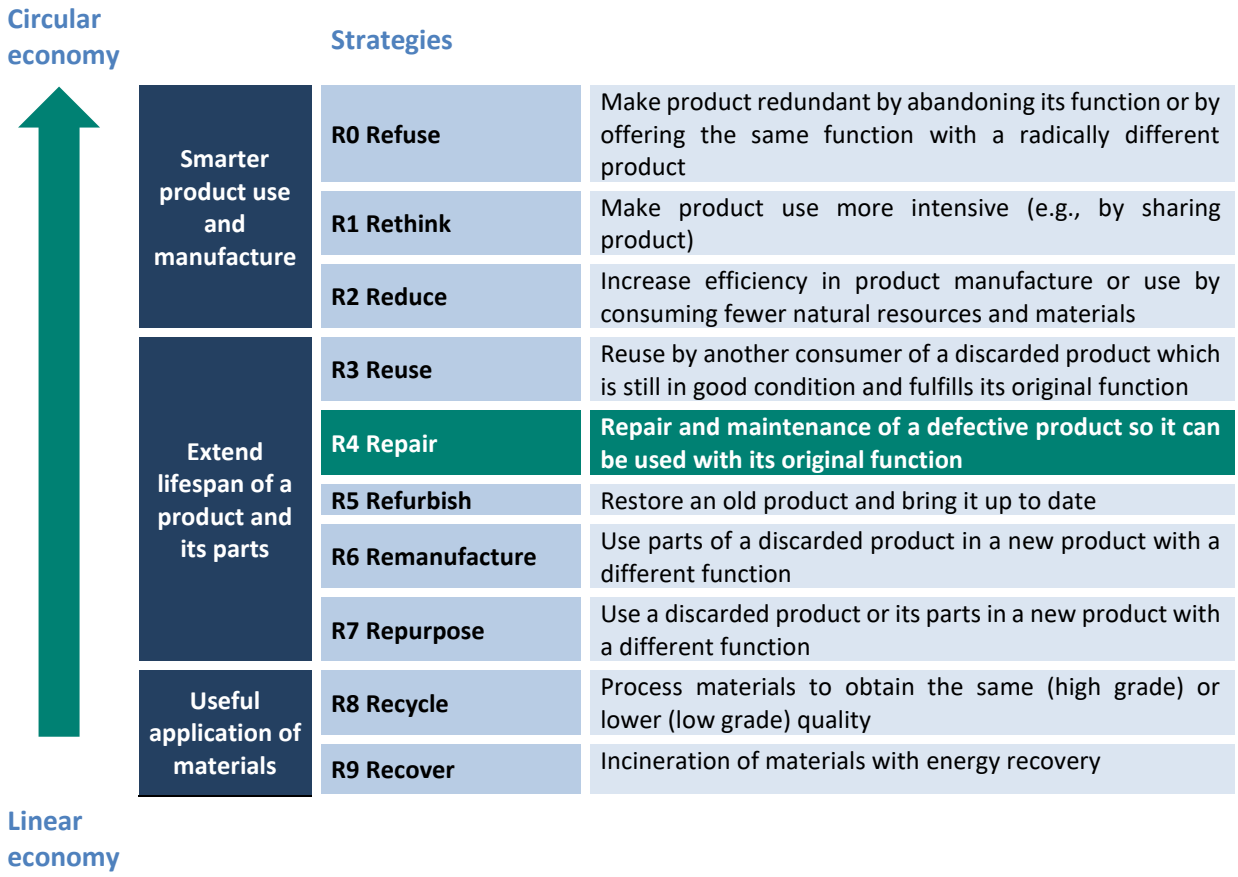
Looking at the recent market data and the existing confidence indicators, the future prospects for businesses operating in the repair sector do not look that attractive. Along with the policies to encourage a circular economy in Europe, targeted initiatives and legislation as well as harmonized economic instruments are needed to improve the operating context for the repair sector at the EU level. These should be underpinned by technical enabling conditions such as encouraging design for repair, improved quality of products, and availability of frequent and structured data on repair operations. Increasing awareness among the public about the benefits of repair and its role in achieving a circular economy is a key step, which can be supported by organising dedicated awareness campaigns taking local, regional and national contexts and needs into consideration.

1 Context

1.1 Role of the repair sector in transition to circular economy

Repair is one of the important parts and driving forces of the transition to a circular economy (Lechner et al., 2021). It is a key circularity strategy in the R-framework ([1]) (Figure 1.1), which can lead to extended product use and efficiency, reduced consumption of natural resources and materials, and minimising production of waste (Potting et al., 2017). Repair is recognised as having a high potential to maintain value within the economy since repaired products have a higher value than the materials that are extracted from them through recycling at end-of-life (European Commission, 2016). By 'slowing down' the resource loops, repair can lead to reduced resource use and a more circular economy (Bocken et al., 2016).

Figure 1.1 Repair as one of the key circularity strategies in Rs-framework



Source: Potting et al. (2017) and (Kirchherr et al., 2017)

To define the position of repair as a strategy for achieving circularity, it is important to understand how it relates to the other strategies and in particular how it fits with product usage strategies and the legal definitions of 'reuse' and 'preparing for reuse'. Although there are similarities between repair and preparation for reuse, there are conceptual differences between them. The precondition for 'preparing for reuse' is that the item, which might be functioning or non-functioning, is categorised or collected as waste. If the item is non-functioning, repair or cleaning may be needed to prepare it for reuse. Repair, as a treatment strategy, however, is done to extend the useful lifetime of a product and avoid discarding it as waste (European Commission, 2016). Furthermore, even though repair and maintenance are considered as one strategy for extending the lifespans of products (R4 in Figure 1.1), maintenance, (including preventive, corrective and predictive maintenance), is typically economically more beneficial and is therefore hierarchically a preferred circularity strategy.

[1] Also known as R-Strategies

1.2 Existing policies and legislation

The importance of the repair sector in achieving a circular economy and creating a sustainable product policy framework has been acknowledged in several of the European Commission's high-level strategic documents and policies, such as the European Green Deal and the Circular Economy Action Plan (CEAP). One of the strategies highlighted in the CEAP is the need for legislative action to improve transparency and availability of repair services and to set minimum requirements for sustainability labels. This led to the development of the **Right to Repair** initiative (EPRS, 2022) by the European Commission, with the overarching objective of empowering consumers.

Based on the current EU contract laws, consumers have the right to have a faulty product repaired at no costs during the period of its legal warranty. With the aim of promoting reparability and increasing the lifespans of products, the new generation of ecodesign rules require spare parts to be available for a specified time, at least for a specific group of products (EPRS, 2022). In March 2021, the European Commission put forward a legislative proposal on the right to repair for situations which are not covered by the current legal warranty period. The Commission's proposals are as follows ([2]).

- *"Creating a new right to repair for defects caused by wear and tear or mishandling of the product, if this arises within a defined period of time – potentially two years. This may only be applicable to certain categories – the EU has suggested that consumer products and electronics could be among these.*
- *Amending the Sale of Goods Directive to ensure that repair, rather than replacement, is the primary remedy available to consumers.*
- *Restarting the legal warranty period for products that have been repaired, which means the consumer would have an additional warranty period of a minimum of two years after the product is repaired.*
- *Providing a longer legal warranty period to allow consumers to claim from sellers for repair or replacement of a defective product.*
- *Extending the legal warranty period for secondhand and refurbished products to equal that of new products. Currently, the parties can agree to a shorter liability period of not less than one year for second-hand products."*

In April 2022, the European Parliament adopted a resolution on the right-to-repair proposals. The resolution calls for the right to repair to address the whole lifecycle of products taking product design into account. The resolution also addresses the aspects related to the key ethical principles of production, standardisation, information labelling on reparability and on the expected lifespan of a product, consumer warranties and public procurement. The key objective of the resolution is for the Commission to ensure that products have a longer service-lives and can be repaired, that consumers are empowered to choose repairable products; and that consumer rights and warranties are strengthened to enable longer use of goods ([3]).

One of the most relevant directives related to the repair sector is the Directive (EU) 2019/771 on certain aspects concerning **contracts for the Sale of Goods** ([4]). This Directive replaced the **Consumer Sales and Guarantees Directive** (1999/44/EC) ([5]) and considers the seller to be liable to the consumer for any lack of conformity of the goods at the time they were delivered, and which becomes apparent within two years of that time. According to this Directive, repair or replacement shall be carried out free of charge within a

[2] https://www.lexology.com/library/detail.aspx?g=5d70ff98-ad70-4aa6-a714-20a624b088b8 (accessed 5 June 2022)
[3] https://www.europarl.europa.eu/news/de/press-room/20220309IPR25157/right-to-repair-meps-set-out-their-demands-ahead-of-commission-s-proposal (accessed 5 June 2022)
[4] Sales of Goods Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0771&from=EN (accessed 6 September 2022)
[5] Consumer Sales and Guarantees Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01999L0044-20111212&from=EN (accessed 3 October 2022)

reasonable period of time from the moment the seller has been informed by the consumer about the lack of conformity and without any significant inconvenience to the consumer.

In March 2022, the Commission proposed amendments to two existing directives, the **EU Consumer Rights Directive** (2011/83/EU) ([6]) and the **Unfair Commercial Practices Directive** (2005) ([7]), to oblige traders to provide consumers with information on products' reparability and durability. More specifically, the proposals require the seller to provide information, such as a reparability score (if applicable), the availability of spare parts, repair manuals or software updates in case of smart and digital devices. Based on these proposals, "*producers and sellers will decide on the most appropriate way to provide this information to the consumers, be it on the packaging or in the product description on a website"* ([8]).

While the main focus of the **Ecodesign Directive** (2009/125/EC) has been in setting targets for improving the energy efficiency of energy-related products, it has identified reparability, a minimum time for the availability of spare parts, and modularity and upgradeability as key parameters that should be taken into account when assessing a product's potential for improvement (European Commission, 2016). In October 2019, new rules regarding ecodesign for certain products ([9]) were accepted by the European Commission. These include regulations regarding the availability of spare parts, stating that they should remain available from the producer up to ten years after a product is being purchased by a consumer. Within the 2022 **Sustainable Product Initiative**, the Commission proposed additional legislative measures to improve the Ecodesign Directive through encouraging the production of more durable, reusable, repairable, recyclable and energy-efficient products ([10]).

Another instrument that promotes more durable and reparable products is the **EU Ecolabel**, which is a voluntary scheme developed for a limited set of products and services. The scheme defines requirements and the producers can choose to apply for the label if their products and services meet the specified criteria (EPRS, 2019).

In line with the EU's policies, several Member States have taken individual steps to strengthen the repair sector at national and local levels and to encourage consumers to choose repair. These strategies are defined and implemented with different levels of details and have had direct or indirect impacts on the sector (Dalhammar et al., 2020). Some examples are provided in Box 1.1.

Box 1.1 Examples of strategies implemented by Member States to support repair

In line with its waste management targets, the **Belgian** government has considered reducing value-added tax (VAT) on small repairs and supporting repair activities by local governments as strategies to improve the repair sector. The Belgian-based organization, RReuse (Reuse and Recycling European Union Social Enterprises), with 25 active members in European countries, is a non-governmental network of social enterprises that focus on repair operations. Furthermore, Flanders, the Belgian region, has been considered to be a frontrunner by implementing policies that simplify the repair process and support repair centres, encourage collaboration between municipalities' waste management organisations and reuse centres, and promoted the adoption of a quality label on repaired electronic products.

[6] EU Consumer Rights Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011L0083&from=EN (accessed 6 September 2022)
[7] Unfair Commercial Practices Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02005L0029-20220528&from=EN (accessed 6 September 2022)
[8] https://ec.europa.eu/commission/presscorner/detail/en/ip_22_2098 (accessed 6 September 2022)
[9] The measures apply to washing machines, dishwashers, fridges and screens, including TVs. But similar rules for servers and welds came into force somewhat earlier in 2021.
[10] https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/about-sustainable-products_en (accessed 6 September 2022)

The Ministry of Environment in **Finland** has adopted a national waste plan, "From recycling to a circular economy", in which strategies to study different economic instruments for boosting repair and maintenance services are proposed. Reduction of VAT for repairs and support of municipalities to enable repair through providing low-cost premises and publicity for small repair services are some of these strategies. Including repair in extended producer responsibility (EPR) systems, increasing consumer information and increasing warranty periods are other strategies being implemented in Finland.

The **French** government has included specific strategies and measures in its Circular Economy Roadmap to boost repair activities, such as the creation jobs related to repair and reuse, making simple information on reparability available, and supporting communication campaigns and awareness raising programmes to inform the general public about the opportunities for repair. Furthermore, the French government adopted two amendments to its Consumer Code to criminalise planned obsolescence and improve product reparability.

The **Swedish** government has also implemented a VAT deduction on repair activities and, as part of its strategies for sustainable consumption, has introduced requirements to include information on repair options available on products, similar to information labels on recycling options.

One of the goals of the **Dutch** National Roadmap Towards a Circular Economy is to achieve a 50 % reduction in use of primary raw materials by 2030. This would involve more efforts to repair, as one of the key strategies for waste prevention and reducing consumption. Similar to some other Member States, the Dutch government has also reduced VAT on minor repair services.

Source: (Dalhammar et al., 2020)

Reparability and the role of durability on lifecycle impacts of products have not received much attention in EU policies. Reparability measures taken by some Member States, such as national labelling initiatives, voluntary agreements or awareness campaigns, are uncoordinated and unevenly applied across the EU. Since January 2021, as the first country in Europe, the French government has implemented a reparability index for five categories of electronic devices (Box 1.2). Reparability requirements affect the competitiveness of businesses, and uneven application could cause a distortion of the Internal Market. In addition, a fragmented adoption of initiatives can hinder the full exploitation of potential environmental benefits (European Commission, 2016).

Box 1.2 The French Repair Index

Since 1 January 2021, France is the first country in Europe to have implemented a Reparability Index on five categories of electronic devices. Its objectives are to encourage consumers to choose more repairable products and for manufacturers to improve the reparability of their products. The Index applies to:

- smartphones;
- laptops;
- televisions
- washing machines;
- lawnmowers.

The Index assesses five criteria – documentation, disassembly, availability of spare parts, price of spare parts and product specific aspects. For smartphones, laptops and televisions, this includes software. Each criterion is scored on 20 points and each number is then compiled into an aggregate score out of 100, which is then divided by 10 and rounded to 1 decimal digit to produce the final grade.

The manufacturer computes the Index score by entering all the parameters in a spreadsheet provided by the Ministry of Environment which includes the different categories and possible answers. Sellers are obliged to display the Index score near the point of sale and should ask the manufacturer for the score

so that they can make it available to the consumer. The manufacturer is obliged to make the Index score available to anyone who requests it. There are standardised reporting templates for providing the score of products on different sub-criteria.

The Index has to be displayed near the product in shops and online next to the price of the product using the logo (below), with the colour corresponding to the level of reparability.

French market surveillance authorities (MSAs) are responsible for checking whether products comply with the necessary regulations.

Source: https://repair.eu/de/news/the-french-repair-index-challenges-and-opportunities/ (accessed 3 October 2022)

Regarding specific sectors, the **Waste Electrical and Electronic Equipment (WEEE) Directive** (2012/19/EU) sets targets and criteria for the collection, treatment and recovery of all types of WEEE and proposes options to promote the re-use of products. This Directive, however, does not exclusively recommend targets for preparation for reuse and does not apply criteria to prioritise repair as a circular strategy.

The European Commission is developing a legislative proposal for a regulation on batteries and waste batteries, which would replace the **2006 Battery Directive** (2006/66/EC), that would govern the entire battery lifecycle. It would establish mandatory requirements for sustainability, such as carbon footprint rules, minimum recycled content, and performance and durability criteria, safety and labelling for the marketing, removability and replaceability of batteries, and requirements for end-of-life management.

The **EU Strategy for Sustainable and Circular Textiles** aims to create a coherent framework for increasing the circularity of the textile sector by 2030 by ensuring "*textile products placed on the EU market are durable and recyclable, to a great extent made of recycled fibres, free of hazardous substances, and produced with respect of social rights and the environment*" ([11]). Consumers will benefit longer from high quality, affordable textiles, fast fashion will go out of fashion, and economically profitable re-use and repair services will become widely available.

An overview of the related EU policies, regulations and initiatives are summarised in Table 1.1.

Table 1.1 Overview of EU policies, regulations and initiatives relevant to the repair sector

Code	Name
2011/83/EU	Consumer Rights Directive
2019/771	Sales of Goods Directive, 2022
2011/83/EU	Consumer Rights Directive
2005/29/EC	Unfair Commercial Practices Directive
2009/125/EC	Ecodesign Directive
2018/851/EU	Waste Framework Directive, 2018
2012/19/EU	WEEE Directive
2006/66/EC	Battery Directive, 2006
-	Sustainable Product Initiative, 2022
-	European Ecolabel
-	Right-to-Repair Initiative
-	EU Strategy for Sustainable and Circular Textiles, 2022

[11] https://environment.ec.europa.eu/strategy/textiles-strategy_en (accessed 10 September 2022)

2 Objectives and scope of this study

2.1 Objectives

This study aims to consolidate and advance knowledge of the repair sector in the EU by providing an evidence-based update on current activity levels along with an assessment of the challenges and opportunities for the increased uptake of repair services by European consumers. To achieve this overarching objective, and on the basis of existing literature, methodologies and data/surveys, the study has looked into the current value of the repair sector in the EU and highlighted the challenges and opportunities of repair for key target products and selected emerging technologies according to their environmental and social impacts. Furthermore, the report aims to assess citizens' attitudes and behaviour, as demand-side drivers of the evolution of the repair sector in the EU.

2.2 Scope

This study covers the business-to-consumer (B2C) repair sector in its scope and excludes the business-to-business (B2B) sector as well as reuse and maintenance of products. In some cases where there is an overlap between repair and maintenance, the latter may be addressed.

To have a deeper understanding of the challenges and opportunities, the report includes analysis of three key product groups:

- **Electrical and electronic equipment**
  Recent studies show that globally WEEE waste is one of the fastest growing waste streams. According to the Global E-waste Monitor 2020 (Forti et al., 2020), around 53 million tonnes (Mt) of WEEE was generated globally in 2019, and this is projected to grow to around 75 Mt by 2030. The growing amount of WEEE is mainly caused by higher consumption rates, short lifecycles and lack of proper repair options (Forti et al., 2020).
- **Clothing (Textiles)**
  The 2020 CEAP identified textiles as a key product value chain and accordingly in 2022 the European Commission developed a comprehensive strategy to strengthen the industrial competitiveness of and innovation in the sector, boosting the EU market for sustainable and circular textiles. Among various product categories that use textiles, the focus of this study is on clothing used by private sector, as the production and consumption of clothes are associated with negative environmental impacts and they represent the biggest contribution to textile waste. Looking at various strategies at different stages of the values chain, repair plays a key role in increasing longevity and durability of clothing and delivering environmental and social benefits (Duhoux et al., 2022).
- **Furniture**
  The European furniture industry is associated with a variety of trends and associated challenges, such as manufacturing growth in emerging markets, increased demand for low-cost, multi-material items leading to greater consumption of raw materials and energy. Improving repair practices in Europe is one of the key circular-economy interventions that could discourage linear trends (Forrest et al., 2017).

As the repair sector is strongly affected by consumer behaviour, this topic is addressed in a separate chapter in this report, highlighting the current European consumer repair behaviour and main factors that influence them.

To study the current volumes of the repair sector in Europe, the study has mainly looked into the existing statistical data in a B2C context and classified as services – NACE 95 covering "Repair of computers and personal and household goods". The two main sub-groups under this category are "95.1 - Repair of computers and communication equipment" and "95.2 – Repair of personal and household goods" as listed in Table 2.1.

Table 2.1 NACE codes used for statistical analysis in this study

Group 95	Sector
95.1 - Repair of computers and communication equipment	Aggregated amount
95.11 - Repair of computers and peripheral equipment*	EEE
95.12 - Repair of communication equipment**	EEE
95.2 - Repair of personal and household goods	Aggregated amount
95.21 - Repair of consumer electronics***	EEE
95.22 - Repair of household appliances and home and garden equipment	EEE
95.23 - Repair of footwear and leather goods	Included in the general overview of the sector (Chapter 3) but excluded from the scope of textiles (Chapter 5)
95.24 - Repair of furniture and home furnishings	Furniture
95.25 - Repair of watches, clocks and jewellery	In parts EEE
95.29 - Repair of other personal and household goods****	Broad scope/mix of products

Note:

*Computers and peripherals include equipment such as desktops, laptops, computer terminals, storage devices or printers.

**Communication equipment includes devices such as cordless telephones, cellular phones, fax machines, two-way radios, commercial TV and video cameras.

***Consumer electronics includes equipment such as televisions, radio receivers, video cassette recorders, CD players or household-type video cameras.

****Repair of personal and household goods includes repair of bicycles; repair and alteration of clothing; repair of sporting goods (except sporting guns) and camping equipment; repair of books; repair of musical instruments (except organs and historical musical instruments); repair of toys and similar articles; repair of other personal and household goods; piano-tuning. The class excludes: industrial engraving of metals, 25.61; repair of sporting and recreational guns, 33.11; repair of hand-held power tools, 33.12; restoration of organs and other historical musical instruments, 33.19

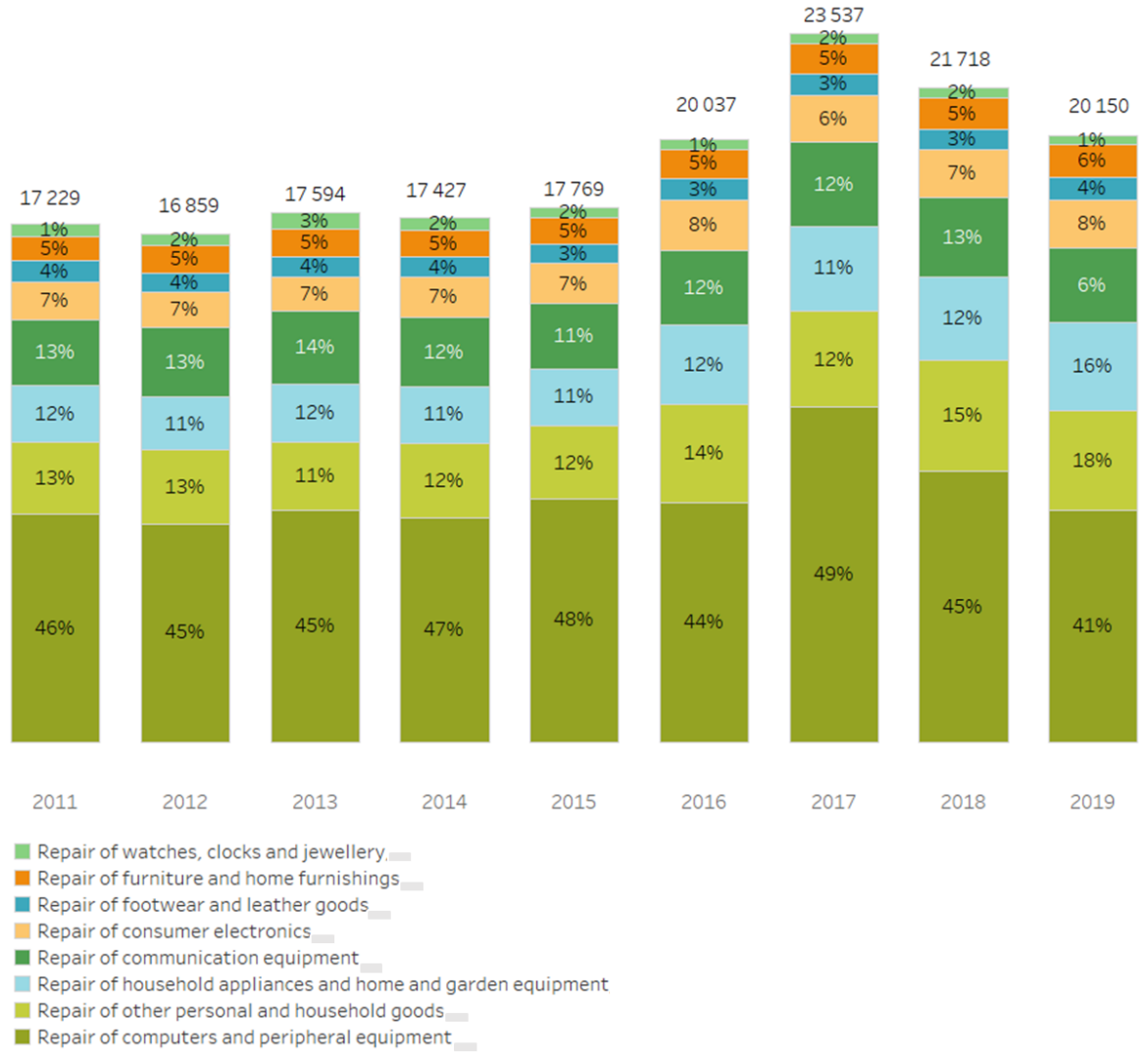
3 Current status of the repair sector

3.1 Volume of the repair sector in Europe

Based on the Eurostat data (Figure 3.1), turnover of the EU's B2C repair sector was more than EUR 20 billion in 2019. After remaining relatively stable between 2011 and 2015, its turnover peaked in 2017 at more than EUR 23.5 billion but has since declined.

Among various product categories, the repair of computers and peripheral appliances together with other personal and household goods made up more than 50 % of the EU repair sector's turnover between 2011 and 2019. These product categories are followed by the repair of household appliances and home and garden equipment; communication equipment; and consumer electronics, which cumulatively accounted for 30–33 % of the sector's total turnover in 2011–2019. This data reveals that repair of electronics is more common than the other repair product categories in the EU.

Figure 3.1 Turnover of the business-to-consumer repair sector by product category, EU27, 2011–2019, EUR million and percent

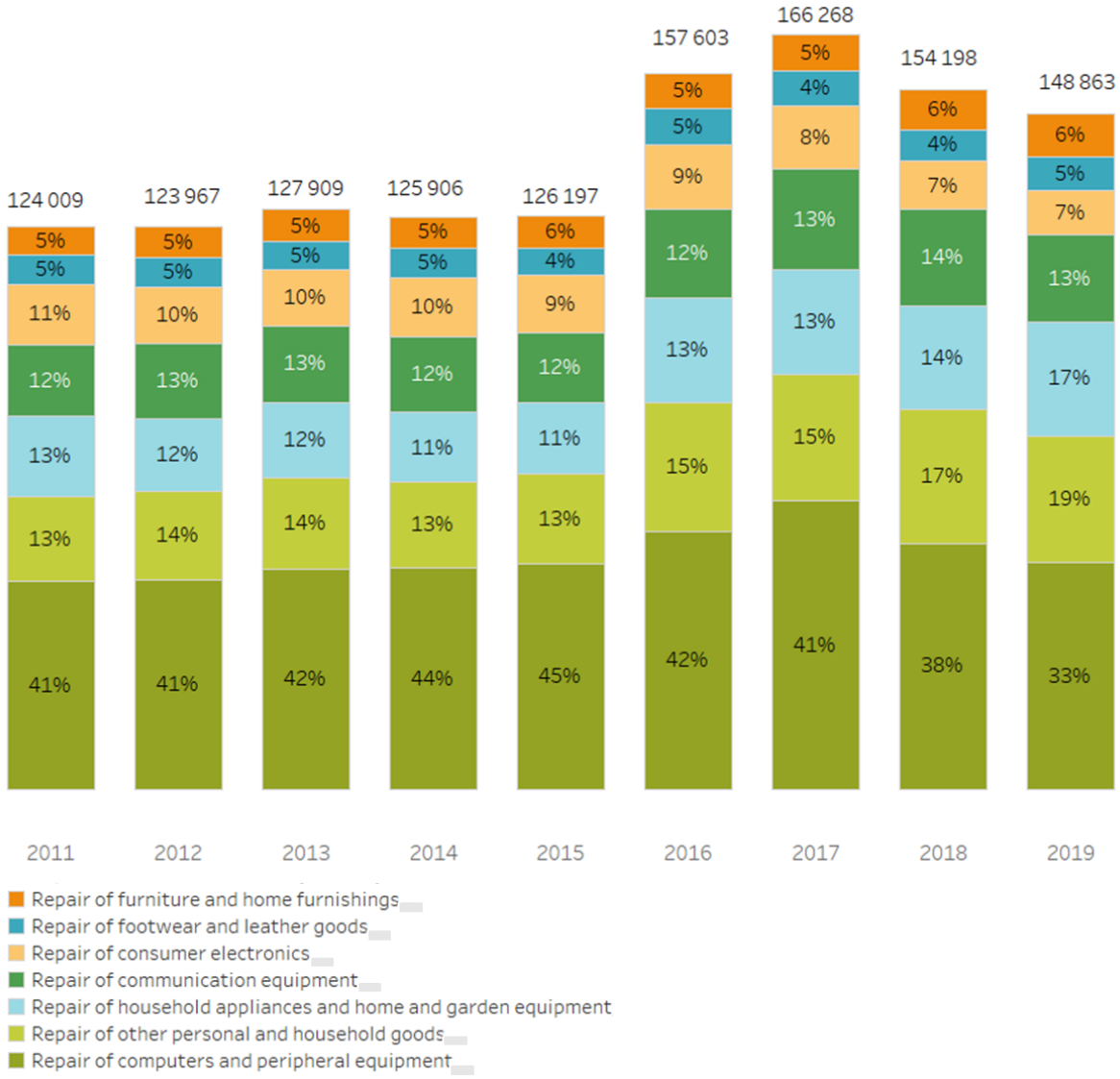


Note: percentages may not sum to 100 due to rounding

Source: Eurostat Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95) [SBS_NA_1A_SE_R2__custom_2610449], Last update of data: 18 May 2022

The total number of full-time equivalent (FTE) jobs in the European B2C repair sector between 2011 and 2019 and the percentage in each sub-sector are shown in Figure 3.2. More than 50 % of the employees working in this sector were engaged in repair of various type of electronic products – including computers and peripheral equipment and consumer electronics. In 2019, around 149,000 people were engaged in repair services in EU27, around 0.3 % of all employees in Europe (Lechner et al., 2021).

Figure 3.2 Number of full-time equivalent jobs in the business-to-consumer repair sector by product category, EU27, 2011–2019, total jobs and per cent

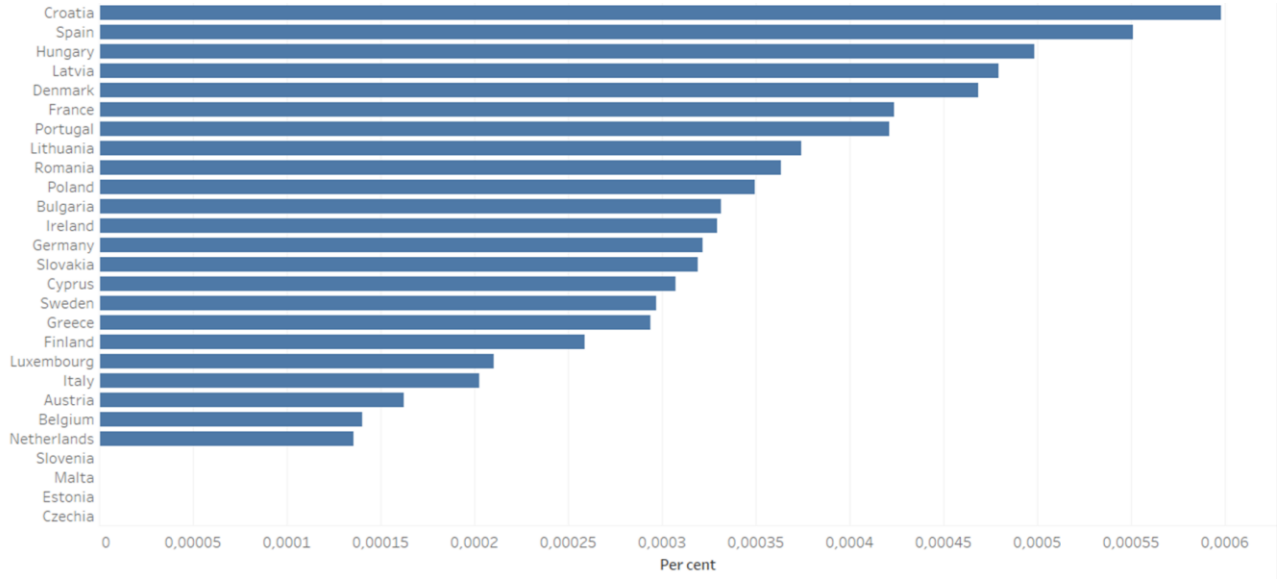


Note: Full data are missing fully for Czechia, Malta and Slovenia, largely for Ireland and partly for Estonia and Spain. Percentages may not sum to 100 due to rounding

Source: Eurostat Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95) [SBS_NA_1A_SE_R2__custom_2610449], Last update of data: 18 May 2022

In 2019 Croatia had the highest number of employees working in the repair sector in the EU, followed by Spain, Hungary, Latvia, Denmark and France. Figure 3.3 shows the percentage of employees active in the repair sector relative to the population of EU27 Member States. In line with turnover data, sector employment levels have recently declined.

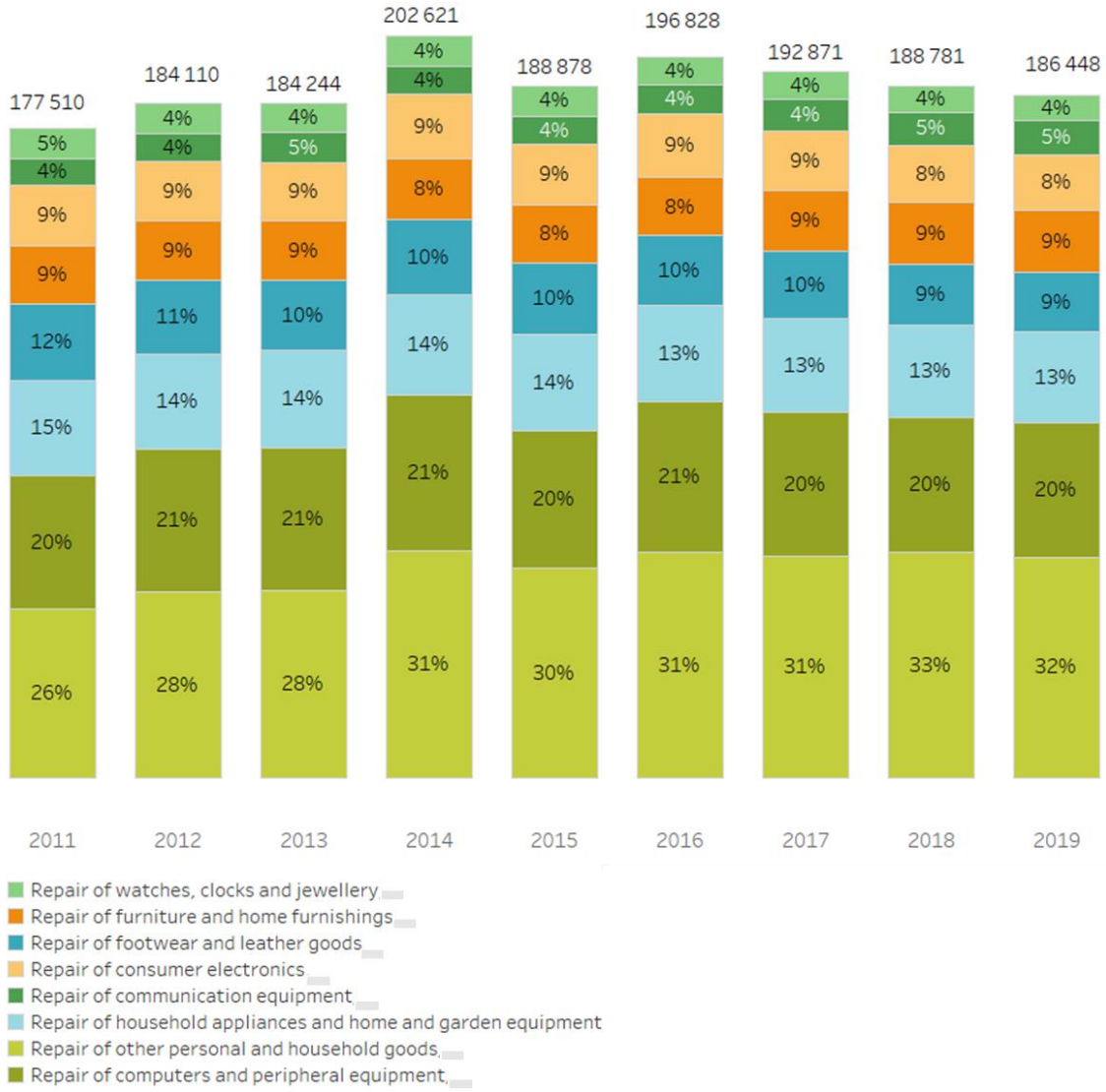
Figure 3.3 The business-to-consumer repair sector in the EU27, 2019, number of full-time equivalent employees as a percentage of the total population



Source: Eurostat, Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95) [SBS_NA_1A_SE_R2__custom_2610449], Last update of data: 18 May 2022

As shown in Figure 3.4, following a peak in 2016, the overall number of enterprises in the EU27 B2C repair sector decreased between 2016 and 2019, from about 186 420 to 178 321. Among the product categories, 33 % of all enterprises belong to repair of other personal and household goods sub-sector, and since this sub-sector has neither the largest turnover nor number of employees (Figures 3.1 and 3.2), it can be concluded that this sub-sector is made up of relatively smaller enterprises.

Figure 3.4 Business-to-consumer repair sector enterprises by product category, EU27, 2011–2019, total number and per cent



Note: Percentages may not sum to 100 due to rounding

Source: Eurostat Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95) [SBS_NA_1A_SE_R2__custom_2610449], Last update of data: 18 May 2022

3.2. Sector Sentiment

The Directorate General for Economic and Financial Affairs of the European Commission conducts regular harmonised surveys for different sectors of the economies in the EU and in appellant countries. They are addressed to representatives of manufacturing industry, services, the retail and construction sectors, as well as consumers. These surveys allow comparisons between different business cycles and have become an indispensable tool for monitoring the evolution of the EU and Euro-area economies, as well as monitoring developments in appellant countries ([12]).

Zooming in on the services sector, the organizations are asked to share their sentiment with respect to the business situation, demand, perceived economic uncertainty, employment and selling prices for the

[12] https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys_en (accessed 3 October 2022) and the metadata sheet: https://ec.europa.eu/eurostat/cache/metadata/en/ei_bcs_esms.htm (accessed 11 October 2022)

month to come. Each quarter, they receive questions on factors limiting business and capacity utilization. And finally, questions on investment activity, as well as structure of and factors stimulating investment are distributed biannually.

The data is used to calculate a "confidence indicator" on a monthly basis reflecting overall perceptions and expectations. More specifically, the confidence indicator is calculated by taking the average of the responses to three questions:

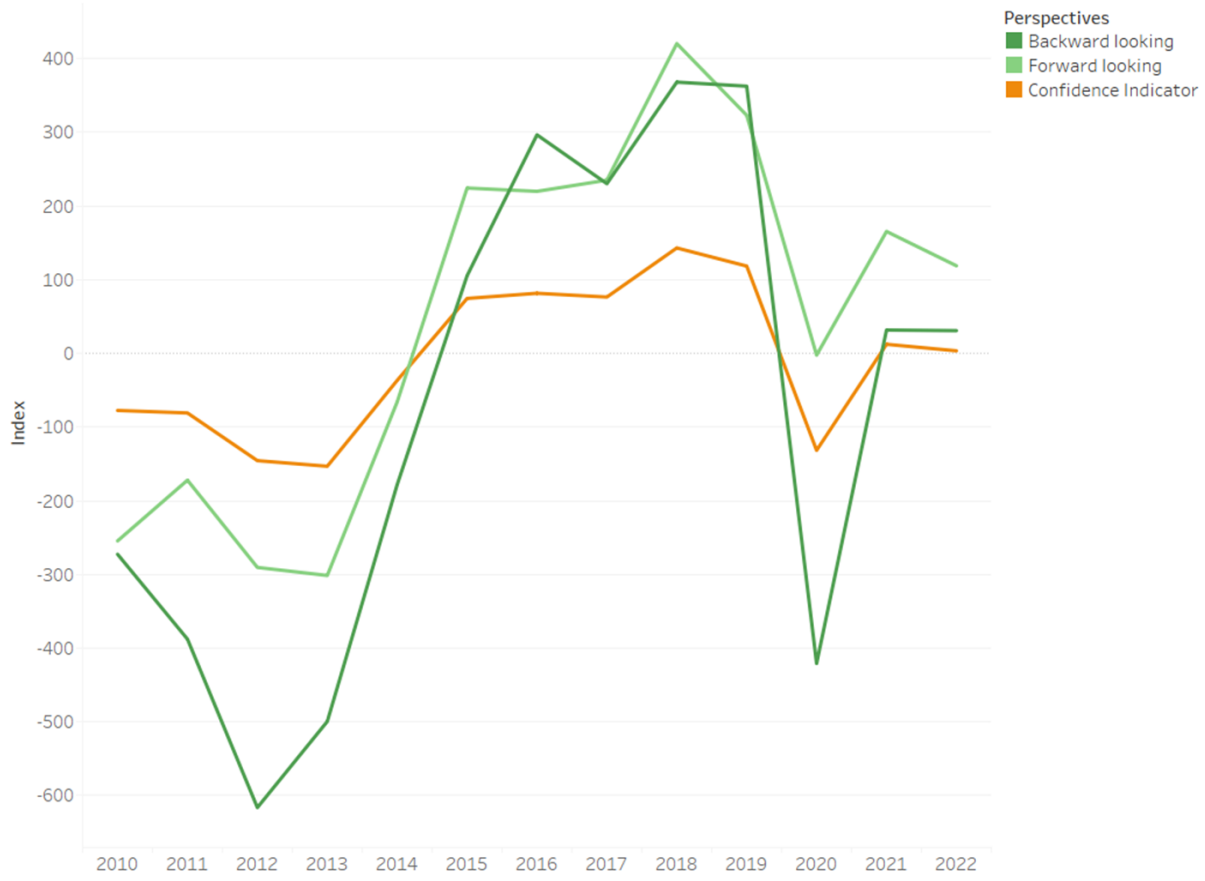
- business situation development over the past three months (backward looking);
- evolution of demand over the past three months (backward looking);
- expectation of demand over the next three months (forward looking).

But the survey covers a few more questions:

- evolution of employment over the past three months (backward looking);
- expectations of employment over the next three months (forward looking);
- expectations of the prices over the next three months (forward looking).

To get an idea of the economic sentiment within the B2C repair sector, data for the sector were downloaded and extracted from NACE 95 for the EU27. Figure 3.5 shows the confidence indicator as well as an average of all backward- and forward-looking parameters.

Figure 3.5 Time series of the confidence indicator of repair services and the average of the backward- and forward-looking variables, EU27, 2011–2022, index



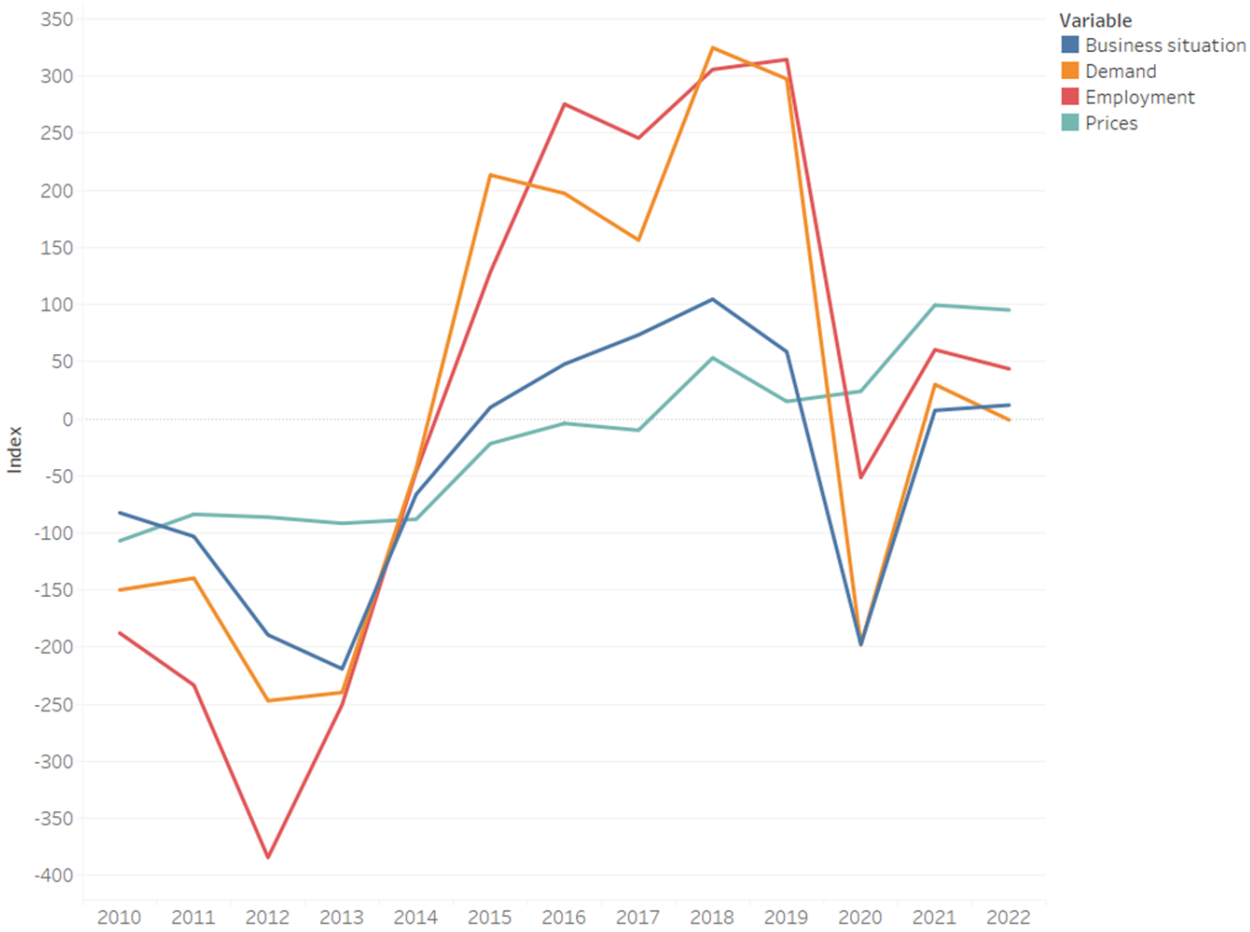
Note: Numbers above 100 suggest an increased confidence in near future business performance, and numbers below 100 indicate pessimism towards future performance.

Source: DG ECFIN, Business and consumer surveys, Services sector, seasonally adjusted data (accessed June 2022)

The sector's economic situation and short-term expectations have been quite positive over the years 2014–2019. The economy had recovered from the 2008 financial crisis and repairers also felt more confident. When the COVID pandemic started, the sector was impacted again but by 2021, entrepreneurs had become hopeful again. Recently, however, due to a changing economic reality with, for example, logistic companies increasingly setting up take-back schemes, forcing roles to be redefined, the future for the companies operating within repair of computer and communication equipment does not look that attractive.

Looking at different market aspects, the same picture arises (Figure 3.6) meaning that, after experiencing a rather challenging period, the sector is now recovering from the COVID pandemic. While finding good employees is a challenge across all sectors, the sector also sees a decreasing demand for repairs.

Figure 3.6. Time series of indicators reflecting on the business situation, demand, employment and price of repair services, EU27, 2011–2022, index



Note: Numbers above 100 suggest an increased confidence in near future business performance, and numbers below 100 indicate pessimism towards future performance.

Source: DG EFA, Business and consumer surveys, Services sector, seasonally adjusted data (accessed June 2022)

3.3. Environmental and social impacts of the repair sector

Environmental impacts

According to a European Commission study on the repair sector (European Commission, 2016), the environmental impacts of the increased reparability of products can lead to an overall decrease in the use of primary resources, greenhouse gas (GHG) emissions, energy consumption and waste production leading to neutral-to-positive environmental impacts. When assessing the environmental impacts of repairing products, there have been studies that illustrate that an older, less energy-efficient product can have a

higher environmental impact during its use phase compared to its production or end-of-life phases, it may be more desirable to replace it with a newer, more efficient one (European Commission, 2016). On the other hand, a study conducted by the German Environment Agency (UBA) (Prakash et al., 2016), has concluded that in all product groups it examined – large and small household appliances, information and communication technology and consumer electronics – products with long lives did better than short-life variants in all environmental categories. The cumulative energy demand of a short-life washing machine with a lifespan of five years, for example, was about 40 % higher than a washing machine with a lifespan of 20 years.

Social impacts

The study conducted by the European Commission (European Commission, 2016) also provided a quantitative assessment of the impacts of the repair sector on employment. Based on an impact assessment and scenario analysis for the four product groups – washing machines, dishwashers, vacuum cleaners and coffee machines – the study found that repair has a positive net effect on employment opportunities. This estimate is largely based on the evolution of turnover between 2015 and 2050 and the sectoral impacts follow similar trends.

In 2019 more than 87 % of the repair activities for computers and personal and household goods in the European Union were performed by small and medium-sized enterprises (SMEs) (Eurostat, 2019). As such, the increase of repair activities can lead to the creation of local added value and an increase in local jobs (Lechner et al., 2021).

The increase of repair activities is also expected to have a positive effect on the quality of jobs and the people employed in the repair sector. The increase in repair activities will particularly promote the development of vocational training and qualification systems. As a result, the distribution of skills and access to technical information for professionals will be increased, leading to inclusive growth.

The other key social impact is that repair activities will increase access to affordable products for people with lower income. This benefit can be questioned, however, as it might be counterbalanced by the higher energy consumption of older products leading to higher electricity and water bills, as well as higher costs of repair compared to buying new products.

A study on community repair (van der Velden, 2021), citizen-driven, locally organised public events, in which volunteer repairers are matched with people who need to repair an object, such as repair cafés, revealed that these types of repair lead to an increased awareness and can consequently encourage citizens to contribute to action towards achieving a circular economy. Furthermore, the study showed that the engagement of a repairer with the object and their interaction with customers can, on one hand, lead to increased knowledge and understanding about the product and its reparability and, on the other hand, strengthen product attachment among citizens.

3.4 Current challenges and barriers to repair

Barriers to repair can be categorised into four groups as shown in Figure 3.7 and explained below.

Systemic or fundamental barriers

These include legal and non-legal barriers that hinder access to repair at a more general level. The lack of criteria to prioritise repair in current EU waste frameworks, such as the EU's Waste Framework Directive (WFD) and the WEEE Directive); shortcomings in consumer laws on, for example, warranty and guarantee conditions; barriers in laws on chemical substances; and intellectual property (IP) rights are considered as the main challenges in this category. Under the IP laws, further issues related to patent rules, licenses and copyright laws, usually applicable to software-enabled products, and trademarks can be highlighted. At a non-legal level, planned obsolescence in products and a lack of clear legislative measures at an EU level to oppose it are considered as a barrier to promoting repair (Svensson et al., 2018).

Technical barriers

The main challenges in this category are related to design for repair, the type of materials and technical specifications that can hinder reparability. For independent repairers, a lack of access to spare parts and issues related to spare-part monopolies, technical information, diagnostic software, hardware and tools are considered to be the key challenges. In many cases, manufacturers limit information and tools to their after-sale services providers or recognised repairers of specific brands (EPRS, 2019). Furthermore, there is a decreasing number of experts with technical skills and knowledge for performing repair services due to a lack of vocational training. Other factors such as short innovation cycles and large ranges of products and brands make it difficult for repairers to stay up to date.

Economic barriers

One of the key challenges is the high cost of repair compared with the costs of purchasing new products. As a tailor-made service which in many cases requires costly spare parts, repair has higher costs than mass production and this has led to limited profitability of the repair businesses and consequently low wages. The growing share of online trade and increased complexity of the value chain has also made it more difficult for the repairers to manage their customers.

Social and behavioural barriers

Lack of knowledge among consumers, lack of trust in the quality and transparency of repair services, the length of time needed for repairs to be carried out, low consumer expectations of the durability and reparability of products and increased acceptance of a throw-away culture are among the main barriers leading to a decreasing demand for repair services. For specific products, the stigma associated with using repaired products and the wish to acquire the most up-to-date innovation are the main barriers to repair.

Figure 3.7 The four categories of barriers to achieving the repair goals of a circular economy

Key types of barriers to repair			
Systemic/legal	Technical	Economic	Social and behavioral
• Lack of overarching legal requirements at the EU level • Shortcomings in consumer laws (warranty and guarantee conditions) • Lack of criteria to prioritize repair in waste frameworks • Intellectual property rights • Lack of avaialbilty of or access to repair	• Complex or non-modular design of products makes it difficult or impossible to repair • Lack of standard technical specifications • Type of materials used • Lack of or limited access to spare parts • Decreasing number of experts with technical knowledge and skills • Short innovation cycles • Limited access to repair information, hardware or tools • Difficulty in providing repair services to a large range of products and brands	• High costs of repair compared with the cost of purchasing new products • Higher costs of tailor-made repair services compared with mass production • Limited profitabilty of repair businesses and low wages • High price of spare parts	• Lack of knowledge among consumers about repair services and their rights • Decreasing demand for repair services • Low customer expectations of durabiltiy and repairability of products • Lack of trust about the quality of or gurantee of repair services • Lack of interest in gaining professional or occupational skills on repair • Lack of time to search for repair services

Source: ETC CE

Barriers to repair may vary depending on the sector and type of product. An overview of the key and explicit barriers to the repair of electronics, clothing and furniture are provided in Chapters 4_6.

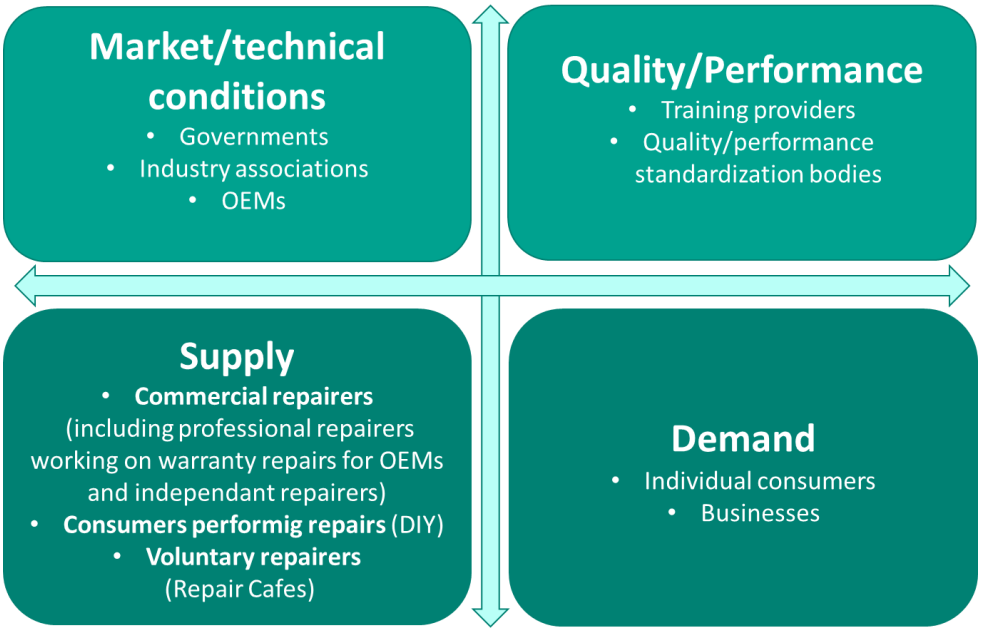
3.5 Key repair sector stakeholders

As shown in Figure 3.8, the main repair sector stakeholders can be categorised in three key groups (Svensson-Hoglund et al., 2021):

- commercial repairers: including professional repairers working on warranty repairs for original equipment manufacturers (OEMs) and independent repairers (IRs),
- consumers carrying out repairs themselves (do it yourself (DIY))
- Voluntary repairers (repair cafés).

Individual consumers and business are the stakeholders on the demand side. Governments, policy makers and industry associations are considered as the stakeholders that have the power to set the market conditions. Furthermore, OEMs are key stakeholders influencing technical conditions for reparability of products, such as through the provision of spare parts, as well as the treatment of repairs and warranties. Training providers and standards setting authorities are responsible for quality and performance of repair activities.

Figure 3.8 Key repair sector stakeholder groups



Source: Svensson-Hoglund et al. (2021)

The relationship between different stakeholder groups is complex and dependent on various factors. On the supply side, reparability of products, i.e., design for repair, access to required tools, infrastructure, guidelines and spare parts are the key enabling conditions. In many cases, these factors are provided or controlled by the product OEM, who can limit or dictate how the other stakeholders from the supply side can participate in repair activities. The relationship between independent repairers, DIYers and voluntary repairers and OEMs can, however, be altered to take account for the need for competitiveness and profitability for independent repairers. By influencing the framework conditions and providing financial incentives, governments and policy makers can play a key role in influencing competitiveness and facilitating the growth of the repair sector (Svensson-Hoglund et al., 2021).

4 Electrical and electronic equipment

Electrical and electronic equipment waste is one of the fastest growing waste streams at global and European levels and despite the roll out of many policy frameworks stimulating the circular economy in Europe and the Member States, the reduction of WEEE volumes and the uptake of substantive repair and reuse of EEE has been limited so far (Forti et al., 2020). When products break, options for repair are increasingly limited, whether because of high cost, lack of spare parts or a decline in the number of repair shops (Sajn, 2019).

This section initially focuses on the current values of repair activities for EEE across Europe and illustrates how they have evolved over time. Next, it describes what the short-term future looks like taking account of new policies and looking at various challenges and barriers. Lastly, it describes the drivers that may impact the sector on the longer term and hence set the scene for future development.

4.1 Current size (value) in Europe

Repairs of EEE are conducted in different settings:

- by commercial repairers
- on a voluntary basis, e.g., in repair cafés and at events;
- by consumers performing, DIY repairs.

For each of the repair settings an indication of the magnitude is provided.

Commercial repair

As discussed in Section 3.1, among the overall repair sector, repair of electronics is most prominent. Despite differences between sub-sectors and highly volatile numbers over the years, the repair of computers and peripheral equipment shrank strongly in the last few years in Europe. The number of enterprises active within the repair of household appliances and home and garden equipment kept stable, but the turnover and number of employees has grown steadily since 2017 (Figures 3.1, 3.2 and 3.4).

Currently, EU contract laws give consumers the right to have faulty electronic products repaired, replaced or, if neither is possible, to receive a refund during the term of legal guarantee. Hence, EEE manufacturers and importers often cooperate with professional repairers. The manufacturers give independent repairers, who are authorised to undertake repairs safely, access to documentation, software and spare parts. In this way they secure the quality of the repair and future safe operation of the appliances for the customer. For the home appliances industry in Europe, this has led to 29 000 direct or indirect cooperation models with business partners in repair and after-sales services. According to data collected from APPLiA's members [13], 91 % of the requests to manufacturers for a repair of a product resulted in an actual repair in 2018 (APPLiA, 2021).

The global EEE repair sector has been suffering from restrictive containment measures involving social distancing, remote working and the closure of commercial activities due to the COVID pandemic. Currently, companies are recovering from this intense period but face operational challenges. Nonetheless, although being hindered by the supply chain disruption causing difficulties in finding spare components for mobile phones and other electronic appliances, the sector is expected to (slightly) recover in 2022. This is, however, highly uncertain as even before the pandemic the sector was shrinking.

Voluntary repair

The logging of repairs carried out in repair cafés is being promoted by the Open Repair Alliance ([14]). The

[13] APPLiA is the European trade association of home appliance manufacturers

[14] https://openrepair.org/ (accessed 3 October 2022). The Open Repair Alliance includes the Germany-based Anstiftung Foundation, the US-based Fixit Clinic, IFixit, the repair café foundation and the Restart project.

Alliance has developed a data standard for repairs and actively promotes their logging. The data set reports the product category, the repair status and the problem. Some product characteristics such as age and brand and the repair barrier, if any, can be reported too (optional fields). This allows year-on-year assessments of success rates, the number of visitors and the number of broken devices brought to repair events over time (Table 4.1 and Figure 4.2). Other aspects, such as the age of incoming products and common failures, can also be monitored.

Table 4.1 Average number of incoming products per event and average success rates, Open Repair Alliance members, data from non-EU organizations removed by filtering, 2017–2021, accessed 12 October 2022

	2017	2018	2019	2020	2021
Number of incoming products	5 752	10 754	17 985	7 858	7 308
Number of repair events organised in European countries	284	368	538	322	458
Average number of incoming products per event	**20**	**29**	**33**	**24**	**16**
Number of successful repairs	2 994	5 611	9 212	4 126	4 029
Average repair success rate (%)	**52**	**52**	**51**	**53**	**55**

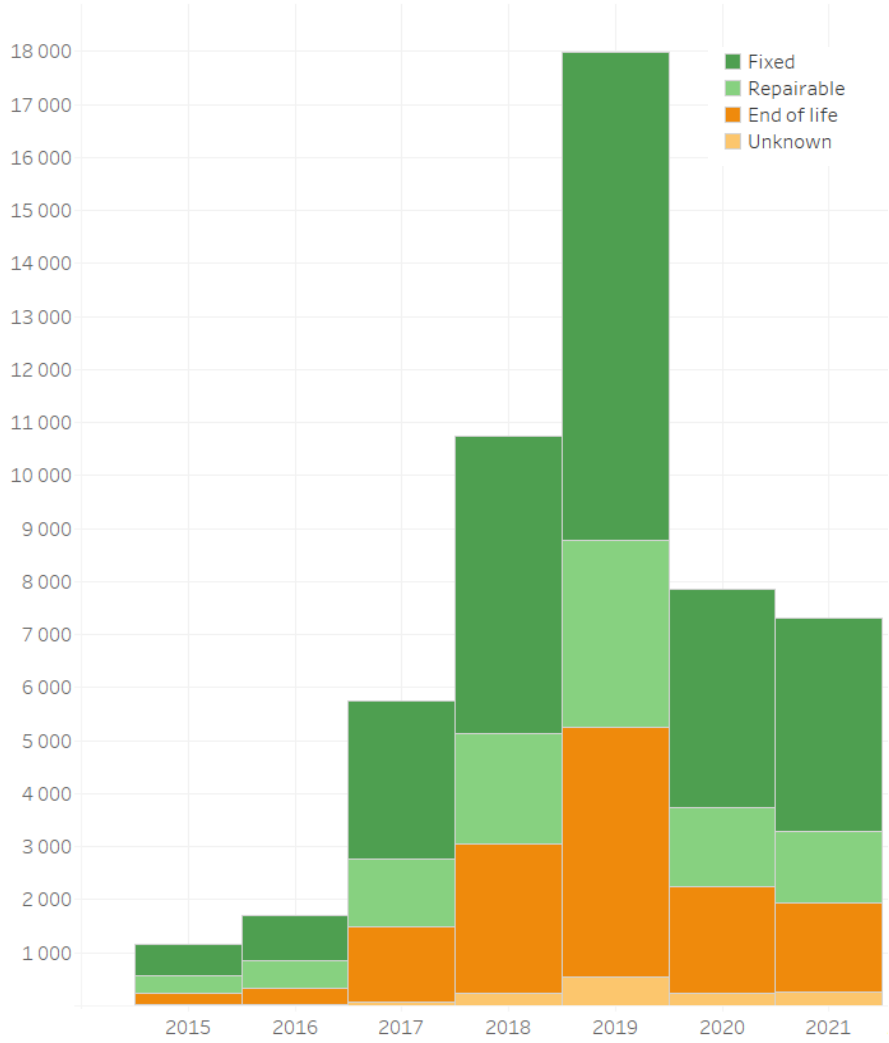
Source: Open Repair Alliance

Due to the pandemic, the number of repair events organised dropped drastically as social distancing measures often did not allow for people to meet. Knowing that the social aspect of repair events is the strongest motive for volunteers to offer their expertise, repair events have mostly been postponed and/or not organised. Despite a counter-initiative from the SHAREPAIR ([15]), a digital facility that supports self-repair, and RepairConnects ([16]), a digital platform facilitating the matching citizens looking for somebody to help them with the repair of a broken device and the repairers/volunteers, the tide could not be turned.

[15] https://www.nweurope.eu/projects/project-search/sharepair-digital-support-infrastructure-for-citizens-in-the-repair-economy/ (accessed 3 October 2022)

[16] https://www.repairconnects.org/en (accessed 3 October 2022)

Figure 4.2 The number of incoming products and their corresponding repair status, Open Repair Alliance, data from non-EU organizations removed by filtering, 2015–2021



Note: Interpretation of the repair status categories:

"Fixed" - if the repairer and owner were satisfied that the item can continue to be used

"Repairable" - if the repairer and owner didn't complete a repair, but identified what reasonable additional steps or professional help is needed

"End of life" - if the repairer and the owner decided that it is not cost-effective or realistic to repair the device

An empty or zero value is recorded as "Unknown"

Source: Open Repair Alliance (accessed 12 October, 2022)

Do-it-yourself repair

Given the relatively high technological complexity of EEE, it is less likely that DIY repair is considered by consumers. Furthermore, for repairs which are not complex, such as replacing a battery, and could be carried out using with common-place tools, DIY repair still is not considered as often the process of finding instructions requires considerable time and effort, discouraging product owners. Recently, this barrier has been tackled by a few digital platforms that aim to help product owners identify faults, offer help on finding the best repair option, and sometimes even offer the possibility of ordering spare parts and instructions for to fixing it yourself through a website. Examples of such digital platforms offering repair services for EEE are provided in Table 4.2.

Table 4.2. Examples of digital platforms offering repair services for electrical and electronic equipment

Country	Company Name	Founded	Type
Worldwide	iFixit ([17])	2003	Peer-to-peer repair guides, B2C spare parts, tools
The Netherlands	Jafix ([18])	n/a	Sharing manuals, support matchmaking
France	Murfy[19]	n/a	B2C repair guidance
Belgium, France, Germany, Italy, Spain, United Kingdom	Direct Repair ([20])	n/a	B2C spare parts
EU27+United Kingdom	FixPart ([21])	nb	B2C spare parts
United Kingkom	Espares ([22])	2004	B2C spare parts
United Kingkom	Restarters Wiki ([23])	nb	Peer-to-peer repair guidance
Belgium, France, Germany, Netherlands, United Kingdom	RepairConnects ([24])	2020	Repair map, matchmaking

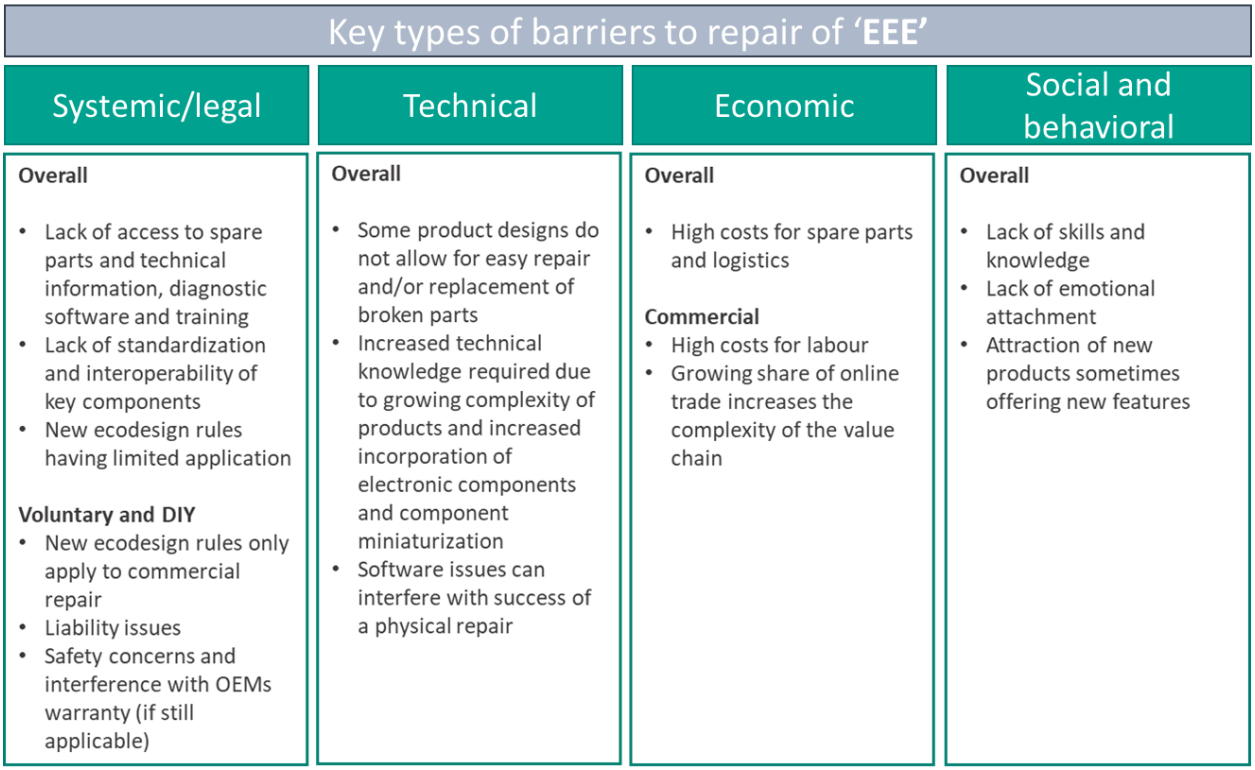
4.2 Barriers

According to a European Commission study on the socioeconomic impacts of the increased reparability of products (European Commission, 2016), repairers mainly complain about a lack of access to original spare parts, technical information, diagnostic software and training, as manufacturers sometimes limit these exclusively to their own after-sales services or to recognised repairers of a specific brand. Many more barriers, however, exist.

In line with the categorisation made in Section 3.4, Figure 4.3 highlights the key barriers with which the EEE repair sector is confronted and distinguishes between barriers having a systemic and legal origins, and barriers caused by technical, economic or social limitations. Each is considered from two different perspectives, commercial repair services and voluntary repair and DIY repair.

[17] https://www.ifixit.com/ (accessed 6 September 2022)
[18] https://jafix.com/en (accessed 6 September 2022)
[19] https://murfy.fr/ (accessed 6 September 2022)
[20] https://www.directrepair.eu/ (accessed 6 September 2022)
[21] https://fixpart.co.uk/en (accessed 6 September 2022)
[22] https://www.espares.co.uk/ (accessed 6 September 2022)
[23] https://wiki.restarters.net/Main_Page (accessed 6 September 2022)
[24] https://www.repairconnects.org/nl (accessed 6 September 2022)

Figure 4.3 Overview of barriers to repair of electrical and electronic equipment



Source: ETC CE

4.2.1 Policy, regulation and standards

Efforts to ensure access to repair can be found in EU environmental and product legislation. The Ecodesign Directive (2009/125/EC) encourages the improvement of environmental performance of electronic products. Although the Directive is mainly focussed on energy efficiency, its scope has been extended so that it regulates other aspects of EEE's lifecycles, such as to motivate consumers to choose product repairs. The new rules regarding ecodesign for certain products ([25]), accepted by the European Commission in 2019, are important for the electrical and electronic equipment. These include regulations regarding the availability of spare parts, stating that they should remain available from the producer for up to a decade after the purchase a product.

The recently proposed Ecodesign for Sustainable Product Regulation (ESPR) defines electronics and information and communications technology (ICT) equipment as priority product groups, which means that they will be the first group required to fulfill the requirements. For the EEE, and almost all categories of physical goods placed on the EU market, performance and information requirements have been set, among others, on:

- product durability, reusability, upgradability and reparability;
- presence of substances that inhibit circularity;
- energy and resource efficiency;
- recycled content;
- remanufacturing and recycling;
- carbon and environmental footprints.

In order to meet the information requirement, the manufacturer needs to equip the product with a digital product passport. These, on one hand, should help all **consumers** and **businesses** when purchasing products, repairing broken/failed products, recycling and evaluating products' lifecycle impacts on the

[25] The measures apply to washing machines, dishwashers, fridges and screens, including TVs. But similar rules for servers and welds came into force somewhat earlier in 2021.

environment. On the other hand, they also offer the ideal instrument for **public authorities** to better perform checks and controls and carry out monitoring. However, full implementation of this approach requires significant investment by private companies and public bodies, and progress to date has been slow.

Commercial repair
According to the new Ecodesign Regulation, producers should make spare parts and repair and professional maintenance information available to professional repairers only for seven to 10 years after retiring the product from the market. According to the Regulation, professional repairers are defined as any self-employed professional or legally established organisation providing repair services, including reuse centres. These needs to meet the following conditions.

- Professional repairers must have the technical competence to repair the product and comply with applicable regulations for repairers of EEE in Member State in which they operate. Registration as a professional repairer on an official system, if one exists in the Member State concerned, is required as proof of compliance with this point.
- Professional repairers must have insurance covering liabilities resulting from their activities regardless of whether this is required by the Member State.

Voluntary and DIY repair
As only few Member States have a registration system in place, voluntary repairers are excluded from the Ecodesign Regulation. There is no regulatory requirement for manufacturers to supply spare parts and repair and maintenance information to anyone asking for it.

4.2.2 Economics

Commercial repair
According to a modelling exercise carried out by Trinomics, Cambridge Econometrics and ICF, a global consulting and technology services company, in 2018, the commercial EEE repair sector has great potential to grow as the EU moves from a linear to a circular economy. According to the authors, this growth will be driven by:

- producers organising better reverse logistics processes, stimulating the reuse of electronics – in many cases, however, products may need to be repaired or modified before they can be reused;
- if the lifetime of devices is extended, the probability that products will need repair increases as older products require more repair services;
- finally, if modular electronics, devices in which parts can be easily replaced or repaired, become more important, it will become easier and cheaper to replace or repair broken components rather than replacing the entire device, thereby increasing the demand for repair services ((Cambridge Econometrics, Trinomics, ICF, 2018).

All developed scenarios show growth in the electronics repair sector employment, driven by the transition to a circular economy. But despite strong potential and in line with the repair activities in other sectors, the EEE repair sector is confronted with economic challenges such as the high cost of spare parts, putting pressure on its business case. Too often, the repair cost is too high in comparison with the price of a new device, which demotivates customers from opting for repair.

The home-appliances industry provides more insights on repair costs (Table 4.3). The extent to which the cost of spare parts and labour are determinants of repair costs varies between large and small appliances. Larger appliances are, on average, more complex, and hence the labour cost of repairs will be more significant, while for smaller appliances the cost of spare parts is likely to the higher (APPLiA Home Appliances Europe, 2021). The fact that the cost of spare parts is likely to account for a considerable part of the total repair costs is confirmed by the literature (Eelen Jens, 2021).

Table 4.3 Contributions towards the repair costs of home appliances, EU, per cent

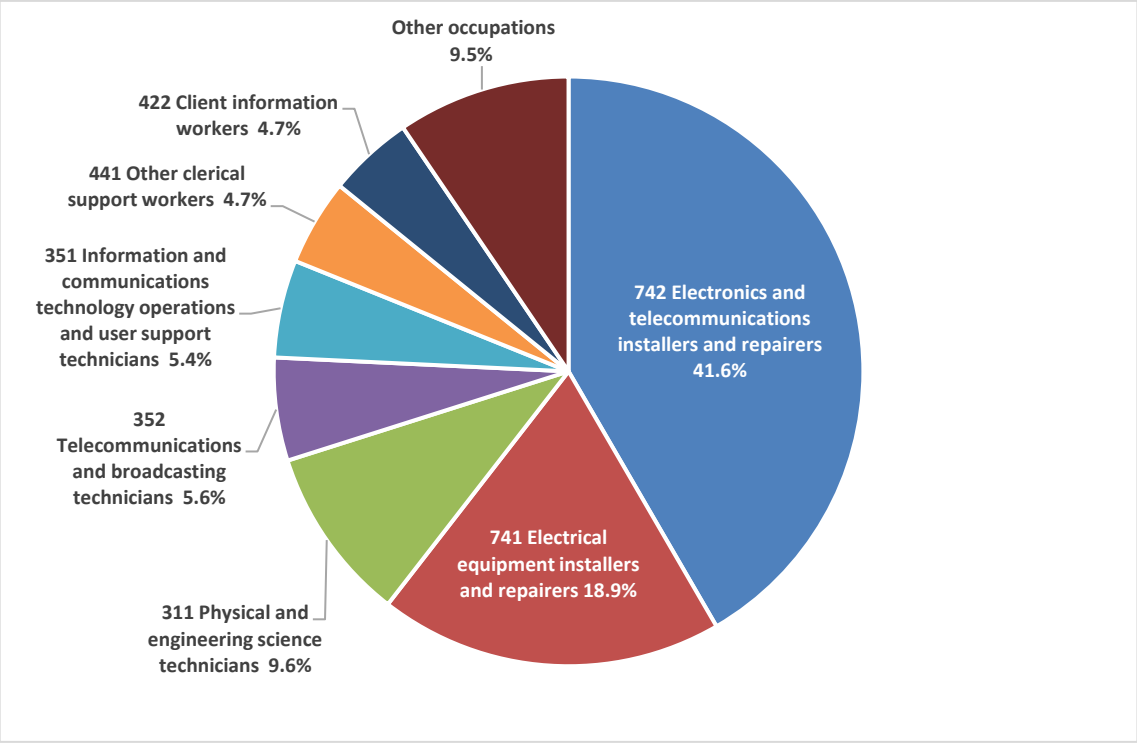
TYPE	*Small appliances*	*Large appliances*	*Cooling and freezing*	*Various*
Spare part	44	39	29	41
Labour	33	44	30	20
Transport	15	16	16	29
Other	8	1	25	10

Source: Small, large, cooling and freezing appliances: APPLIA Home Appliances Europe, Statistical report 2021; Various: Eelen Jens, 2021

In 2020, Repair&Share ([26]) undertook a survey of professional repairers of small household electric and electronic appliances ([27])to map out what barriers and levers professional repairers currently experience in Flanders, Belgium. The high price for repairs driven by wages, logistics and spare parts as well as the increased complexity of products are seen as the main barriers. At the same time, it is difficult for repairers to obtain spare parts and access repair information from manufacturers. Repair&Share concludes that repair no longer seems to be an economically viable profession (Repair&Share, 2021).

In terms of skills and occupational composition, the repair of EEE mostly relies on electronics and telecommunications installers and repairers. The more complex products become, the more electronic components they consist of and the more the trend to product miniaturisation evolves, the more electrical and engineering technicians will be needed to carry out high quality and safe repairs. Occupational composition of the repair of electronics sector for Italy in year 2018 is shown in Figure 4.4.

Figure 4.4 Occupational composition (ISCO-08 3-digit occupations) of the electrical and electronic equipment sector (NACE rev. 2 95.1, 95.21, 95.22), Italy, 2018, per cent



Source: Italian Labour Force Survey, 2018

[26] https://repairshare.be/ (accessed 3 October 2022)
[27] Survey carried out by Möbius, 2020-2021 Commissioned by Repair&Share and DeTransformisten; "Survey of the repair sector for small household electrical appliances"

Voluntary and DIY repair
Taking care of the repair oneself or asking a friend or a voluntary repairer for help can avoid labour costs. Nonetheless, identifying the problem, searching for the correct spare part and the repair process itself can be time consuming.

A final option for the owner of the broken device is to sell it to a hobby repairer. The seller will receive a price both parties agree upon, roughly covering the value of the components given their age and status.

4.2.3 Product design

In the CEAP the European Commission states, *"the circular economy will provide high-quality, functional and safe products, which are efficient and affordable, last longer and are designed for reuse, repair, and high-quality recycling"*.

Maintenance of products is preferred and action to prevent failures and breakdowns. Although a durable design does not inherently imply modularity or reparability, these aspects need to be seen as design requirements alongside durability. For instance, the materials used could be very durable but if different components are glued together, and hence impossible to disassemble, the product is not truly reparable.

While addressing reparability, designers need to make it easy to:

- replace parts that are intended to wear out during long-term use but are necessary for sustaining performance, for example, moving or rotating parts; for these, it would be good to provide an early warning system or instructions for timely replacements;
- repair products and/or replace broken parts.

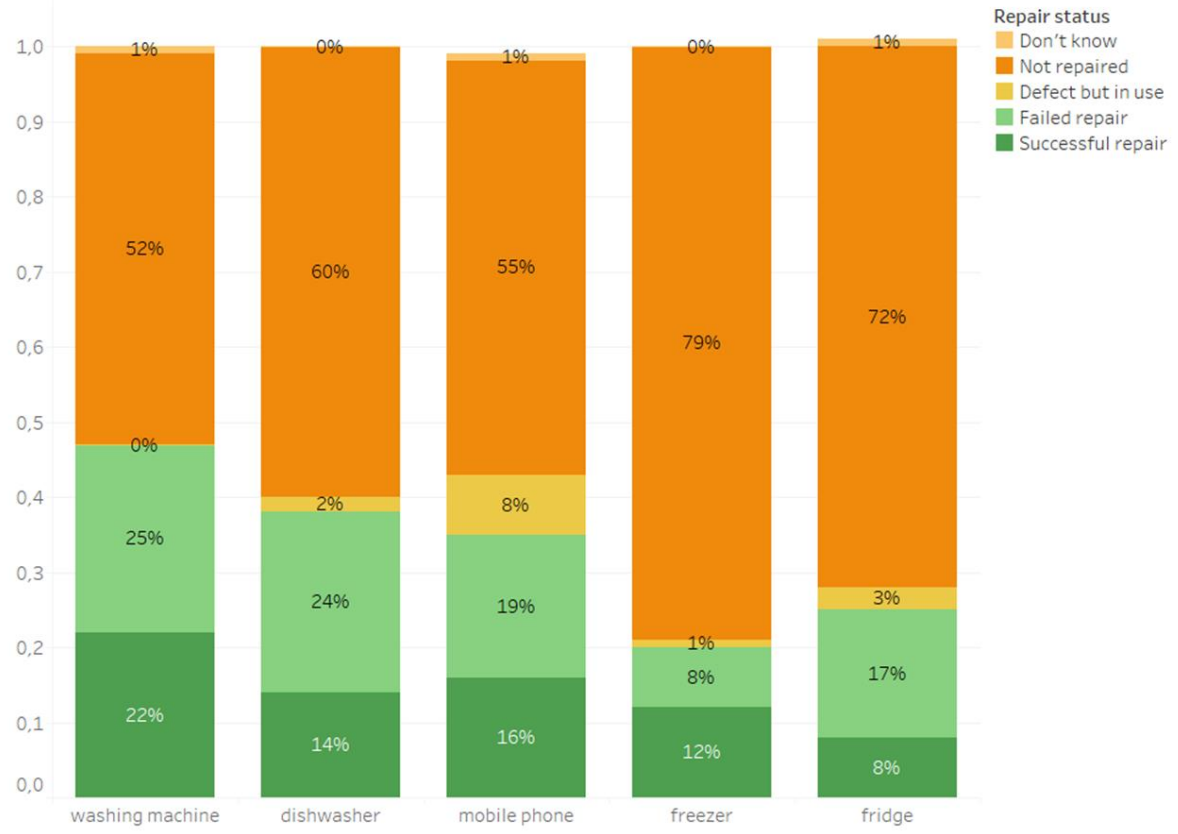
(Selvefors et al., 2019)

To make repair and maintenance the norm, product design for circularity needs to be mirrored by similar efforts in relation to corporate business models and other market-based mechanisms that make circular business cases more obvious. The demand for long lasting, repairable and reusable products, could be triggered through public procurement or by making all repair actor and end-user spare parts available during a product's lifetime, providing technical documentation on all products, and limiting repair costs through reduced levels of taxation or fiscal incentives (ECOS, 2019).

Are EEE currently in use designed for repair? There are examples of products that have modular designs and/or score very high for reparability. While evaluating smartphones, tablets and notebook computers, IFIXIT looks at easiness to open the device and to swap modular parts. Availability of spare sparts, free and public service manuals and upgradability are considered too: for example, Fairphone models 2 and 3 received the maximum score.

Some products appear to be more suitable for repair, as evidenced through a higher success rate for attempted repairs which can be derived from consumer surveys mapping household repair activities. For example, results from a survey of 1,196 respondents conducted in Norway between December 2018 and January 2019 are shown in Figure 4.5 ((Laitala et al., 2021). According to the survey, among respondents who have experienced a failed washing machine, fridge, freezer, dishwasher and/or mobile phone over the past two years, less than half of them attempted to repair these products. In cases where the product owner opted for repair, roughly half of the attempted repairs appeared to be successful. Among different products investigated in this survey, it was most likely to successfully repair a freezer (60%) and less likely for a fridge (32%).

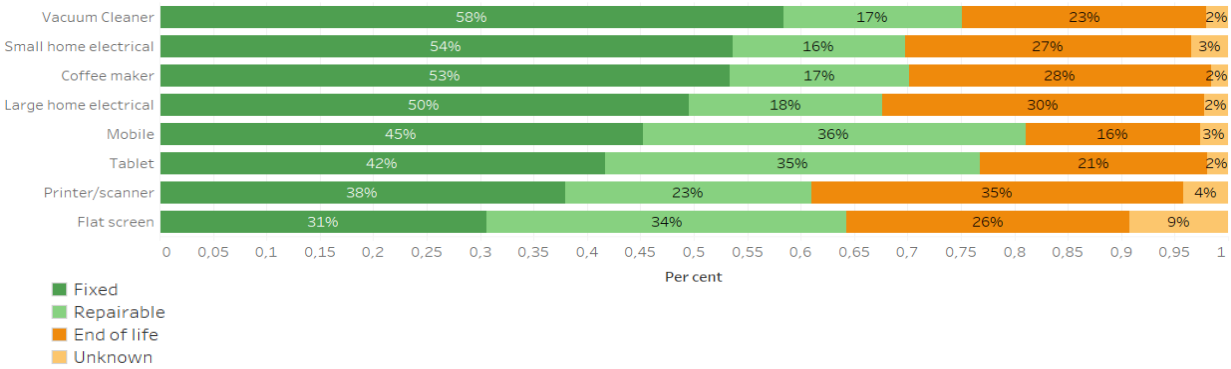
Figure 4.5 Repair rates of washing machines, dishwashers, mobile phones, fridges and freezes derived from a consumer survey conducted between 2018 and 2019



Note: Percentages may not sum to 100 due to rounding
Source: (Laitala et al., 2021)

Looking at the success rate for repairs in repair cafés, there are differences between various product categories. As illustrated in Figure 4.6, a mobile phone has an 84 % chance of being repaired successfully or is considered repairable, but the repair could be done there and then. For flat screens, however, success rates drop to 64 %.

Figure 4.6 Repair status for electrical and electronic product categories as reported by the Open Repair Alliance, data from non-EU organizations removed by filtering, accessed 12 October 2022, per cent



Note: Percentages may not sum to 100 due to rounding
Source: Open Repair Alliance

4.3 Future developments

4.3.1 New business models and trends

Professional repairers of small household electrical appliances currently mainly focus on the repair of products for which the warranty period still applies. According to a survey commissioned by Repair&Share in 2020, it is almost impossible to create a sustainable business model for repairing products for which the warranty period has expired. The following reasons are put forward:

- high wage costs;
- high logistics and transport costs;
- high price of spare parts;
- investment in information technology (IT) systems aligned with those of manufacturers;
- high overhead costs – telephone costs, administration, etc.

These factors result in high repair costs compared to very low prices for new small household electrical appliances (Möbius, 2020).

In an attempt to reduce costs, the sector is exploring ([28]) whether the use of built-in sensors in large appliances, such as washing machines, could help to reduce transport costs by continuously monitoring the machines' activities and hence help in identifying the need for maintenance or the cause of a breakdown, for example, excess vibrations could mean worn shocks. This increases the likelihood that one site-visit would be sufficient or, if the problem could be solved remotely, a visit may not be necessary. Table 4.4 summaries the advantages and disadvantages of remote diagnoses, when no visit takes place but the customer is given assistance over telephone, and data-based diagnoses, through which the repairer has a better understanding of the appliance's use built-in sensors sending information almost in real time.

Table 4.4 Advantages and disadvantages of in-person diagnosis and two alternative business models, remote diagnoses and data-based diagnoses

Type of diagnoses	Advantages	Disadvantages
In-person diagnoses	• Repairer hands-on with device • Can access and test entire device • Most thorough diagnositic method	• Most expensive option • Requires repairer to travel to the product • Time wastage of limited number of repair experts
Remote diagnoses	• Customer gets involved in diagnosis • No hardware requirement, can be used on old devices • Quick diagnosis	• Customer needs basic knowledge • Cannot diagnose all issues
Data-based diagnoses	• Full access to history of machine • Possible issues could be identified automatically • Quick diagnosis	• Diagnosis limited to sensors' availability • Requires data sharing between partners and this might cause environmental burdens (e.g., when data transfer and storge on clouds is needed)

Source: Eelen Jens (2021)

As a new trend, DIY repairs are not only being encouraged by commercial repairers, but many other organisations are also trying to capitalise on this. Digital platforms providing assistance in identifying the

[28] The Internet of washing machines research project, 2021–2023, led by Maakbaar Leuven and funded by the province of Vlaams Brabant, Flanders, Belgium

problem and selling spare parts are gaining momentum. Websites to support peer-to-peer repair, such as Ifixit.com, on which users with experience of repairing EEE can post repair guides, are also growing in importance. Even video channels and social media, such as YouTube and TikTok, are contributing by allowing people to create their own channel on which they can show how repairs can be done.

Finally, driven by circular economy roadmaps and action plans, cities are increasingly supporting local repair activities. Within the Interreg SHAREPAIR project ([29]), led by the City of Leuven, Belgium, a series of digital tools have been developed to support professional and voluntary repairers by allow them share insights and gather data. It has also set up a city portal providing, amongst other things, citizens with maps showing the location of all local repair initiatives together with details of their specialties. Other cities or municipalities can join and get them access to the SHAREPAIR digital tools, which they can then customise to their local needs.

4.3.2 Emerging technologies

Emerging technologies such as big data analytics, machine learning/image recognition, the internet of things (IoT) and additive manufacturing will impact EEE repair activities in the future and by extension entire WEEE management systems. The introduction of these technologies brings plenty of potential benefits in improving the current system, expanding business model and increasing overall efficiency (Fu et al., 2017). Although often adopted and of proven relevance in capital equipment and more sophisticated categories of EEE, it is expected that these technologies will also be incorporated more in smaller electric and electronic appliances. The more people interact with technology, the more data will be generated daily. These new information streams are often of great value for business and research institutes. Obviously, technologies that assist in monitoring the use of appliances, such as the IoT, or that can predict, identify or even prevent failures, have great potential.

While repairing a device, a few challenges arise. For each phase, emerging technologies and data science could mitigate existing limitations by:

- first, identifying the product (type, brand, series number, spare parts) through image recognition, digital infrastructure and digital product passports;
- secondly, by diagnosing the issue and finding the failure through image recognition, IoT (sensors monitoring the appliance's use) and digital product passports;
- thirdly, formulating the ideal repair option through big data analytics, artificial intelligence (AI)/machine learning (ML), and additive manufacturing.

For the EEE repair sector, a **digital infrastructure** offers great potential by pooling (big) data on failures and solutions from all repairers whether professional, voluntary or tech-savvy citizens. Sharing data will allow for the better identification of failures and searches for information on repair problems, then for faster formulation of solutions with the highest success rates based on past or third parties' experience. In a more advanced stadium, artificial intelligence such as deep learning could be applied so as to learn from past repairs, their costs and working time involved, etc. An additional advantage of sharing experiences and expertise is that new companies could step into repair businesses more easily, for example also organisations affiliated to social economy.

The Sustainable Products Initiative foreseen in the new CEAP will establish a **digital product passport** (DPP) that gathers data on a product and its value chain. The objective of the DPP is to support sustainable production, to enable the transition to a circular economy, to provide new business opportunities to economic actors, to support consumers in making sustainable choices and to allow authorities to verify compliance with legal obligations. The electronics value chain is, next to batteries, given priority. Such a DPP will contain the basic information related to a product, such as an overview of its components and their identifiers, its material composition, data on when it is put on the market, and its production origin.

[29] https://www.nweurope.eu/projects/project-search/sharepair-digital-support-infrastructure-for-citizens-in-the-repair-economy/ (accessed 3 October 2022)

Having this information will strongly help the repairer, for example, in identifying the product and the correct spare parts. Further improvement steps could be made by extending the DPP so that it is updatable and could therefore provide information on the product's status, including details of any previous repairs, at any point in time.

In a full digital system, the use phase is continuously monitored by built-in **sensors**. By monitoring the temperature, operation times, vibration, humidity, air pressure and water and electricity consumption, these values can be compared to default ones. If there is any deviation from normal patterns, the user can be notified and encouraged to service or deep clean their device, potentially enhancing the lifetime of the product. Repairers could also benefit as the better they understand the way the product is used, the more likely they find the failure and identify an optimal solution within a reasonable time. This model is still under investigation, for example, by the IoWashing machine project in Leuven, Belgium.

Another emerging technology that enhances repair activities is **image recognition**. Algorithms that have been trained to visually detect products (RECUPEL, accessed 10 October 2022) and maybe even the failure if there is visible damage. This could help to improve and standardise the classification of products and support a quicker and more uniform method for diagnosis. Some platforms already use image recognition technology to categorise items more easily, such as the Flemish website for secondhand items, 2dehands.be. When users upload a picture of the product they want to sell, it is automatically assigned to a suggested product (sub)category.

A 3D printer is a device that creates three-dimensional objects from digital files, usually through additive processes using various materials such as plastics and metals. If a part needs to be repaired or replaced but is no longer available, **additive manufacturing,** also known as 3D printing, can help either by printing the broken element of a component, such as a new surface layer, or by reproducing broken parts if they are shapes and hence, printable, for example, handles. Although good initiatives exist such as TUDelft's guide to 3D printing for repair, which offers guidance and videos to help repairers design and produce spare parts, and My Minifactory, a file-distribution platform for sharing 3D representations, the technology still needs further development if it is to be used for manufacturing parts that are as strong, or even stronger than original ones.

5 Clothing

Clothes serve both practical and aesthetic needs, such as keeping us warm and conveying an identity. In Europe the consumption of clothing has been steadily increasing over the last decades, and in 2020, Europeans consumed an average of 6 kg of clothing (EEA, 2022)[30]. Clothes are primarily made from textiles, which are woven, non-woven or knitted from fibres. These fibres are either natural plant fibre, such as cotton, or animal fibre, such as wool, or man-made fibres such as polyester made from petroleum (synthetics), or natural ones, such as lyocell made from cellulose (semi-man made) (Textile School, 2018). Textiles enable products' functionalities and performance but are also chosen for their aesthetics or comfort. In short, as a society there is a diverse and complex need for textiles.

The production and consumption of clothes are associated with negative environmental impacts. The fashion industry is the second-largest consumer of water and is responsible for 2–8 % of global carbon emissions (UNEP, 2019). In addition, approximately 15 kilograms (kg) of textile waste (including other forms of textiles than clothing, such as home textiles) is generated per person per year in EU 27 and Switzerland, and of this, discarded clothes and home textiles from consumers account for around 85 % (McKinsey & Company, 2022). Extending the lifetime of such textiles, for instance through repair, could deliver environmental and social benefits through reducing the need for new products and reduce the amount of textile waste (Duhoux et al., 2022) (McKinsey & Company, 2022).

The focus of this report is repair of clothing used by private consumers, as this product category represents the biggest contribution to textile waste, and because several of the other product categories using textiles overlap with other industries covered by this report, such as furniture and vehicles ([31]). Lastly, other types of repairs, such as commercial cleaning and repair of clothes returned after sale, are excluded due to lack of data and information.

Repairing textiles is defined as the act of restoring an item by replacing a part or putting together what is torn or broken (Merriam-Webster, n.d.), and includes both repairs of a garment's fabric that the garment is made of, and its construction, meaning how it is sewn or otherwise put together.

This chapter is based on desktop research on the current situation and development of repairs of clothing in the EU, as well as data on comparable countries. Norway is included due to its similarities with other Scandinavian countries, and the United Kingdom (UK) is included as its exit from the EU happened in recent times, and several relevant datasets included UK data.

5.1 Current size (value) in Europe

Repair of clothing amongst private consumers can be done in two ways:

- Professional repair: commercial repair of clothing by specialised tailors' shops ([32]);
- DIY repair: non-commercial repair in private households, either by the consumer or others.

Commercial repair of clothing by specialized tailors' shops

The repair business of clothes appears dominated by independent repairers represented by small business with the owner and a few employees, if any. More detail about the characteristics of the business sector

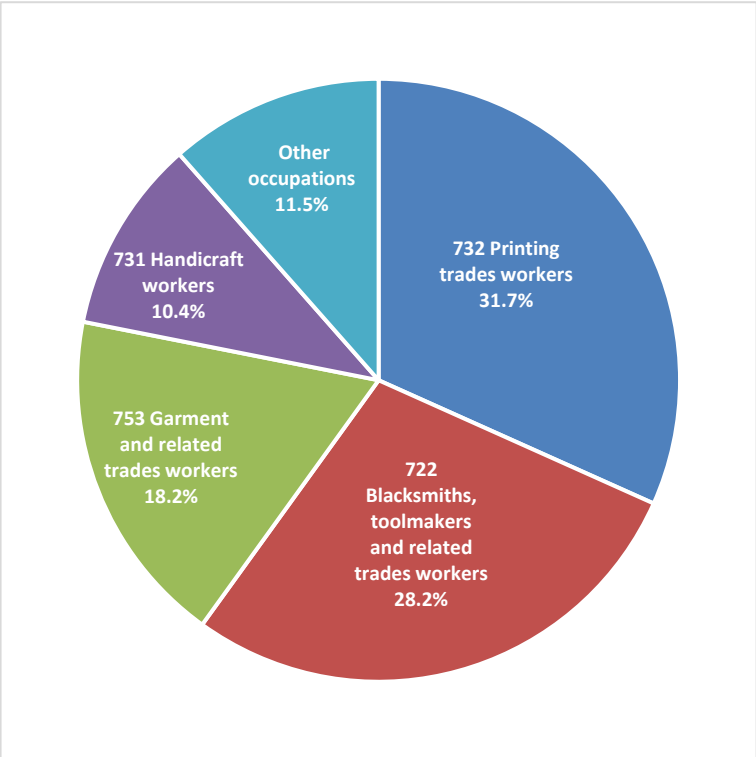
[30] The number excludes leather and fur, as well as other textiles such as home textiles.

[31] This does not mean that there is not an important potential for a reduction in waste in other sectors. The home textiles used, for instance, by the hotel sector have a largely untapped potential for both reuse, repair and recycling. Hotel textiles are already managed through leasing, meaning that reverse logistics are already in place. Further, the items are mostly homogenous in shape, fibre type and colour, making them comparably easier to repair at scale. See more at https://research.cbs.dk/en/studentProjects/we-havent-come-to-hotels-yet-a-qualitative-study-on-circular-text.

[32] Tailors' shops both create and repair all types of clothes, including men's, women's and children's clothing. Thus, the term is, in this study, inclusive of the repair or women's and children's clothing.

is, however, lacking, as European statistical data (Eurostat) on professional repair of textiles is not separately available. Instead, repair and alteration of clothing is covered by NACE ([33]) code 95.29 Repair of other personal and household goods, which also covers other sectors and therefore does not give a clear representation of textile repairs ([34]). Occupational composition of repair for this category for Italy in year 2018 is shown in Figure 5.1. According to this figure, out of the category as a whole, 18,2 % are garment and related trades workers, which includes tailors, dressmakers, furriers, and hatters.

Figure 5.1 Occupational composition (ISCO-08 3-digit occupations) of the repair of other personal and household goods sector (NACE rev. 2 95.29), Italy, 2018, per cent



Source: Italian Labour Force Survey, 2018, Istat

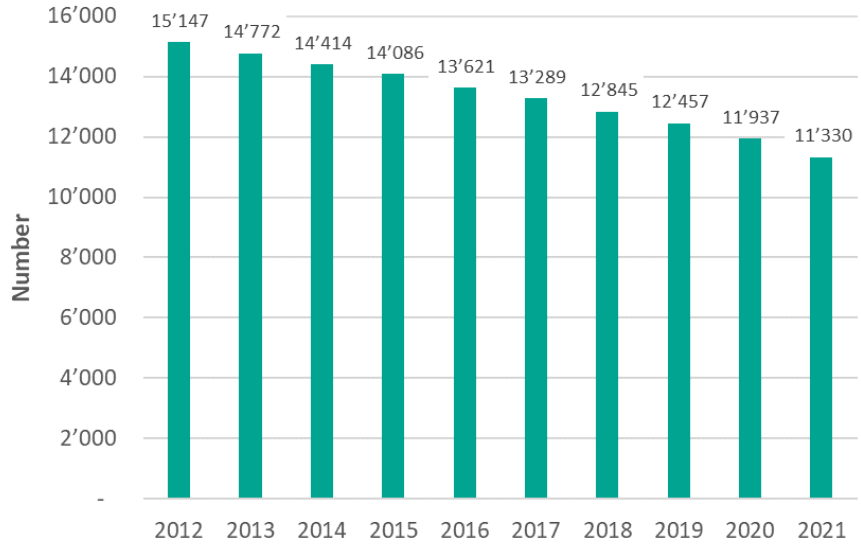
To gauge the current size of the textiles repair sector in Europe as a whole is therefore challenging, but national statistics provide an impression. There were, for example, around 11 300 repair and alteration tailors in Germany in 2021, a number which has been reduced by almost a third since 2012 ([35]) (Figure 5.2).

[33] Eurostat: NACE Rev. 2 - Statistical classification of economic activities in the European Community; https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF (14/09/2022)

[34] This class includes repair of personal and household goods: the repair of bicycles, the repair and alteration of clothing, the repair of sporting goods (except sporting guns) and camping equipment, the repair of books, musical instruments (except organs and historical ones), toys and similar articles, other personal and household goods and piano-tuning. It excludes industrial engraving of metals (25.61), the repair of sporting and recreational guns (33.11), hand-held power tools (33.12), and the restorations of organs and other historical musical instruments (33.19).

[35] The German Yellow Pages (*Gelbe Seiten*) directory contained details of 2 903 repair and alteration tailors, a quater of the number published by the Central Association of German Crafts (ZDH). Thus, such directories are not a valid source from which to derive the number of repair and alteration tailors.

Figure 5.2 Number of repair and alteration tailors in Germany, 2012–2021



Source: https://www.zdh-statistik.de/admin/dyn_stat2.php (accessed 1 June 2022)

The German data represents 1.3 repair and alteration tailors per 10 000 inhabitants. Taking inspiration from this number, a conservative estimate of 1.0 repair and alteration tailor per 10 000 inhabitants combined with an assumed turnover of EUR 10 000 per year from repair work, would give the sector a total turnover of EUR 447 million per year for the entire EU27, or EUR 1 per inhabitant per year. This suggests that the clothing repair sector in the EU is neither large nor valuable. This is supported by data on the structure of consumption expenditure from 2015 which indicates that only 0.1 % of individual consumption is used for cleaning, repair and hire of clothing (CP0314) ([36]).

The contrast with the sale of new clothing is striking: in 2019, there were about 275 000 clothing-retail enterprises in the EU27 ([37]), and their turnover was about EUR 177 billion ([38]), almost EUR 400 per person per year. Thus, the repair sector is assumed to represent a marginal 0.25 % of retail clothing sales.

Nonetheless, a 2015 study from Norway showed that many people claim to have repaired their clothes. In the study, 43 % of respondents reported to have repaired or attempted to repair clothing over the past two years, of which 18 % had used professional services (Laitala and Klepp, 2015).

DIY repair

Repair for own use in private households is included in Eurostat statistics under NACE code 98.10 Undifferentiated goods-producing activities of private households for own use. This category includes hunting and gathering, farming, the production of shelter and clothing ([39]), and the data are therefore assessed to be too general to give a valuable indication of private repairs.

[36]Eurostat: Structure of consumption expenditure by COICOP consumption purpose [hbs_str_t211]; Cleaning, repair and hire of clothing [CP0314]; Last update: 23/08/202; bookmark: https://ec.europa.eu/eurostat/databrowser/bookmark/54f8c5f6-97c1-4828-a696-4cfe5e64ffb7?lang=en;

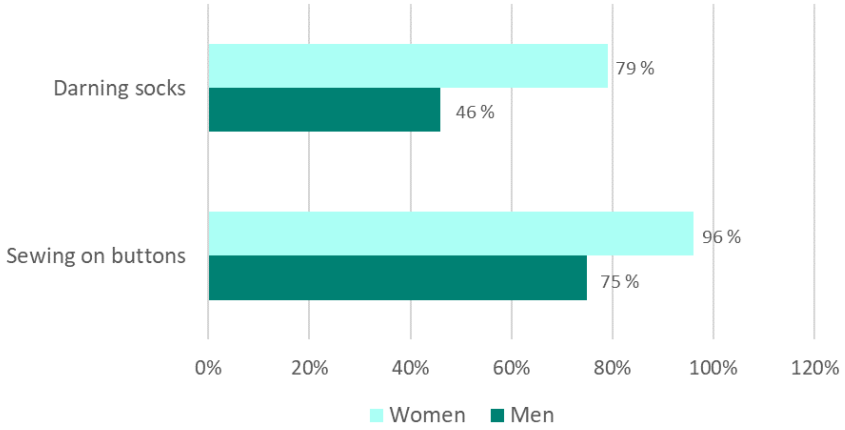
[37] Eurostat: Annual detailed enterprise statistics for trade (NACE Rev. 2 G) [sbs_na_dt_r2]; NACE code G4771; Last update: 18/05/2022; bookmark: https://ec.europa.eu/eurostat/databrowser/bookmark/ae0b6af1-7cfa-4df9-ab6f-5db7f9c26369?lang=en;

[38] Throughout this report billion = 10^9

[39] Eurostat: NACE Rev. 2 - Statistical classification of economic activities in the European Community; https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF (accessed 14 September 2022)

There are, however, indicative numbers from Germany. As shown in Figure 5.3, in 2014, 1 002 participants over 10 years were interviewed on their ability to repair clothing – most were able to darn a sock or sew on a button.

Figure 5.3 Replies to the question: which handicrafts can you do yourself?, Germany, 2004–2014, per cent



Source: Statista ([40]) (accessed 01 June 2022)

A 2021 study from Norway showed that 43 % of respondents had repaired or attempted to repair clothing over the past two years, and of these, 72 % had done this themselves or with someone they know. This shows that private clothing repair is at least three times more common than using professional help in Norway (Laitala et al., 2021).

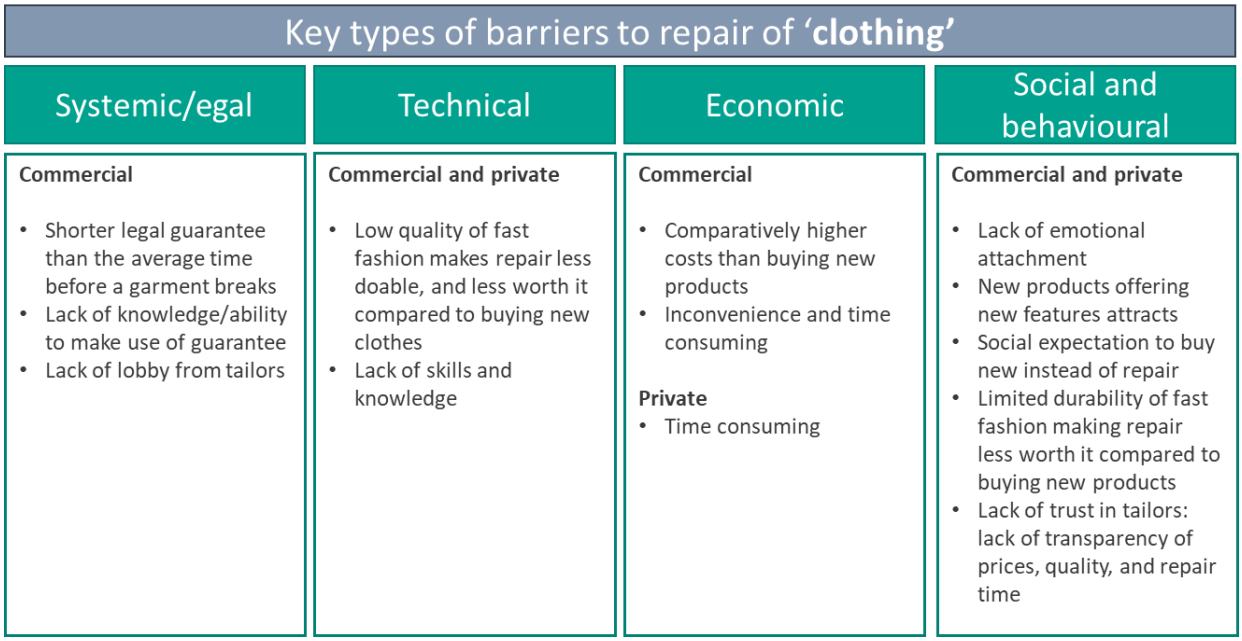
5.2 Barriers

For the repair of clothes, all the general barriers to repair are relevant (Section 3.4), although to different degrees. The specific barriers are summarized in Figure 5.4.

The most important barriers are social and behavioural, which affect whether the consumer wishes or makes the effort to repair something. A part of this barrier is also the lack of time and skills (Laitala et al., 2021). The economic aspect of clothing repair is also a relevant barrier, particularly for commercial repair, which often cannot compete with the low price of new apparel. Nonetheless, DIY repair is not particularly costly, unless a sewing machine is needed. Systemically, short legal guarantees and unawareness amongst consumers of their rights hamper the use of commercial repair. Lastly, the often-low quality of apparel can be a technical barrier to repair, but more than a question of feasibility, low quality makes consumers not see the value of investing time and money on repairs.

[40] https://de.statista.com/statistik/daten/studie/315986/umfrage/umfrage-zu-handarbeiten-die-man-selber-machen-kann-nach-geschlecht/

Figure 5.4 Overview of barriers to repair of clothing



Source: ETC CE

5.2.1 Policy, regulations, and standards

Policy, regulations, and standards influence the systemic and practical access to repair.

Commercial repair

Clothing is covered by the EU Directive on Consumer Rights ([41]) last updated in 2022, which establishes that consumers are covered by a "*legal guarantee of conformity for goods*" for a minimum of two years. This means that the consumer has the right to have the item repaired or replaced, or get their money back if the problem existed at the time of purchase, for instance if the fault is due to the poor quality of the materials used (Your Europe, 2022). Statistics have not been found on the use of this legal guarantee for clothing in Europe, but there are signs that the law does not effectively ensure access to repair. In Norway, more than a third of consumers have experienced clothing being damaged during normal use within the two years from acquisition. However only 44 % of them used their right to complain as defined by Norwegian law (Bøyum et al., 2017), which similar to the EU Directive, secures two years of warranty.

Another potential explanation is that consumers keep their clothes for longer than two years, and/or that the damage happens after the expiry of the guarantee. A study from Norway in 2015 found that clothes that are discarded because of functional defects are thrown out after, on average, five years (Laitala and Klepp, 2015). If this finding is also representative for EU countries, this means that functional defects appear well after the legal guarantee of two years as stated in the EU Directive on Consumer rights. This might be an argument for a longer legal warranty period.

In many industries, developments such as a prolonging the guarantee might be pushed for by industry organisations. In the repair sector, however, enterprises are mostly small, with few employees, and are therefore not likely to be able to engage in lobbying for strengthened incentives for repair. A desktop search for 'tailors' union/association' does not yield any significant results. The pages found seem to be outdated or inactive, such as the European Association of Traditional Tailoring Professionals' website which does not exist, and the World Federation of Master Tailors which has empty pages and outdated

[41] Consumer Rights Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011L0083&from=EN

events. As a result, it is assumed that these businesses have a small lobby at best, or non-existent at worst, constituting a systemic barrier to the sector improving its position.

There are nonetheless upcoming developments in the field, specific to the reparability of clothing. As outlined in the EU Strategy for Sustainable and Circular Textiles (European Commission, 2022) the EC aims for the following:

> "*Under the Ecodesign for Sustainable Products Regulation, subject to its approval by the co-legislators and a dedicated impact assessment, developing binding product-specific ecodesign requirements to increase textiles' performance in terms of durability, reusability,* ***reparability****, fibre-to-fibre recyclability and mandatory recycled fibre content, to minimise and track the presence of substances of concern and to reduce the adverse impacts on climate and the environment. In doing so, specific attention will be paid to the cost-effectiveness and proportionality of measures, as well as the affordability of textiles. As part of the requirements and subject to the impact assessment to define their scope, the Commission will introduce mandatory criteria for green public procurement, the scope of which will be defined following an impact assessment, as well as requirements regarding Member States' incentives concerning textile products.*"

The European Commission will prioritise products with the highest potential and impacts in terms of environmental sustainability. The initial assessment of the Commission shows that this should include, for example, personal and household textiles, carpets and mattresses. The final list will be defined on the basis of a consultation for adopting the first work programme under the Regulation, to be launched by the end of 2022.

This does not necessarily directly impact the access to repair, but places importance on repair at the design phase, which might have indirect consequences on measures EU countries put in place to increase repair. As outlined in the report of the Austrian Environmental Agency (*Umweltbundesamt*) for the European Commission (Karigl et al., 2022), 10 Member States used the opportunity of Directive 2006/112/EC to reduce VAT for repair services for bicycles, shoes and leather goods, and clothing and household linen, including mending and alteration.

Box 5.1 Improving repair services through value-added tax reduction

Based on the scoping study conducted by the EU, the most popular measure on waste prevention has been a reduction of VAT on repair services. VAT rates are regulated by Council Directive 2006/112/EC on the common system of value-added tax (EUR-LEX, 2021), which provides in Article 98 that, for certain goods or services (listed in Annex III), Member States may apply a rate which is lower than their respective standard rates. This list includes minor repairs to bicycles, shoes and leather goods, and clothing and household linen (including mending and alteration). Ten Member States (Austria, Belgium, Czechia, Ireland, Luxembourg, Malta, Netherlands, Poland, Slovenia and Sweden) have applied a lower rate for the repair of all three categories, ranging from 5 % to 13.5 %, while Portugal has lowered its VAT rate to 6 % for the repair of bicycles only. Additionally, France has exempted the collection and sale of used goods carried out by social enterprises, as these activities are linked to the employment of disadvantaged and disabled people, so they can be exempted from VAT under Article 132 of Council Directive 2006/112/EC. Similarly, Belgium has reduced the VAT rate for the sales of goods and services by social enterprises to 6 %. To incentivise and reduce the cost of repairs, Sweden has implemented an additional tax incentive. Half of the labour costs of repair and maintenance work on white goods, consumer electronics and IT equipment are tax deductible, provided that they are performed at the owner's home (Skatteverket, n.d.)

Information on the costs and effects of the measures

The reduced VAT rates lead to tax revenue losses, in addition to higher administrative and enforcement costs. The impact of a reduced VAT rate depends on the extent to which the tax reduction is passed on

to consumers and the impact of a price reduction on demand. Studies on the effects of VAT reduction on the consumption of merit goods, i.e., goods and services for which a reduced rate is allowed because of the associated social and environmental benefits, are, however, scarce (Binder, 2021). One factor in favour of a VAT reduction on repair services is the fact that repair services are labour intensive, given that in EU countries, labour is generally taxed more heavily than commodities, making repair services comparatively more expensive than buying new products (Dalhammar et al., 2020). According to a Eurobarometer survey (TNS Political & Social, 2014), three-quarters of respondents would like to have broken appliances repaired before buying new ones but cite the difficulty and expense of a repair as a major reason for nevertheless choosing new products. The price of a repair does seem to be a major barrier and therefore a reduction through reduced VAT rates could help reduce the price difference between repairing products and buying new ones.

Assessment of transferability to other sectors/types of waste and/or potential transferability to other Member States/for scaling up the approach
Reduced VAT rates are already applied across Member States, which shows that this measure is easily transferable geographically. The scope of products for which repair services can be offered using a reduced VAT rate is, however, limited, which leaves a potential for broadening the scope of this measure to more waste categories.

Source: Karigl et al. (2022)

DIY repair
For DIY repairs, there are no legal elements that hinder access to repair for clothing, as all necessary equipment can be easily found in many stores. The skill of repairing and mending which throughout history has been common especially amongst women, is, however, no longer as widespread in the population (McLaren A. and McLauchlan S., 2015). For private repairs, as many as 74 % of women said they had repaired clothing themselves, compared to only 32 % of men. A Swedish study from 2012 found that older people were more likely to repair clothing (Ekström et al., 2012).

In Denmark, the local chapter for the volunteer organisation Global Shapers, which was born out of the World Economic Forum in 2011 (Global Shapers, n.d.), made an informal study of consumer behaviour around clothing repair in 2019. Their survey of more than 800 young people found that, although most were able to do basic repairs, many would have liked to repair more but lacked the skills to do more complex repairs, such as patching a hole. In addition, they were doubtful of what would be required to do it, which discouraged trying. Most, therefore, asked older family members for help ([42]), which supports the previously stated age difference. This is a sign of a systemic and practical barrier to repair.

5.2.2 Economics

The economics of both commercial and private repair contributes to the practical and socio-economic competitiveness of repair.

Commercial Repair
The economics of commercial repair is dependent on not only the cost for the customer, but the overall competitiveness of the industry.

Cost:
No academic data have been found on the economics of the repair of textiles, or the comparison between repair and buying new clothing. General business dynamics are, however, likely to cause commercial repairs done in Europe to be more expensive than buying a new item, particularly fast fashion clothing.

[42] Personal communication with Justina Bekier, from Global Shapers Denmark.

As most repairs are carried out close the consumer to reduce shipping costs and time (Trading Economics, n.d.), this means that repair for European customers are mostly done in Europe. Repair is a type of production, of which the total cost is dependent on the cost of the necessary equipment, materials and labour, the last of which are high in Europe relative to the rest of the world (Hayes, 2022). For the repair of textiles, the cost of equipment and materials is comparably lower than, for instance, the repair of technical devices, as it can mostly be done with thread, a sewing machine and small spare parts, such as buttons and zips. The labour cost can, however, be high as each item needs to be diagnosed and individually repaired, which involves time spent on each garment.

Compared to buying a new item, the economics of repair are disadvantageous. As fast fashion is mass produced in countries with lower labour costs, the price per garment can be reduced to a minimum making it hard for repair done in Europe to compete.

Lack of information about-, trust in- and satisfaction with repair services
According to the informal study by the Global Shapers in Denmark, many of the respondents did not make use of professional tailors partly because they did not know where to go, and partly due to an *impression* that it would be too costly. They expressed a lack of information about the quality, price and repair time. This was due to a rather analogue service of the repair shops, where the customer only get a price and estimate of repair time once the item is brought to the shop (within opening hours), and then have to come back when the item has been repaired. These aspects were also seen in a 2018 study by the EC, which found that 20 % of consumers who had used repair services reported the quality of repair to be below expectations, and 28 % thought the speed of repair was not up to expectations (European Commission, 2018). More academic research on this field is however needed to verify these observations.

The price, lack of information, and dissatisfaction with quality and level of work, in and the fact that most tailors are analogue, makes commercial repairs appear rather inconvenient for the consumer, particularly compared to the accessibility and low price of new clothes.

DIY repair
Non-commercial repair – consumers doing it themselves – is, however, not affected by labour costs and is therefore cheaper. There is, however, a divide between repairs that can be done by hand, and those that require a sewing machine, for instance for bigger holes in thicker fabrics such as jeans. To purchase a sewing machine can be a high up-front cost for private consumers, and only pay off when used often. This leads to the second part of the economics of DIY repair: time. Repair can be time consuming, if it needs to be done a lot to weigh up for the cost of the machine. In addition, the general skill level is low in the population, and repairing would therefore require a time for learning and getting good at it. In an era of relatively cheap clothing, it is likely that many consumers choose to replace damaged items rather than investing the time required to do a repair.

For garments that are harder to repair, the consumer might find themselves in a dilemma between buying a sewing machine, which is only an investment if the consumer repairs a lot, paying a professional tailor, or discarding the garment and buying a new one for potentially less money. Such an economic balancing act might lead the customer to choose the last, especially since the level of skill is not necessarily there and due to the general unfamiliarity and scepticism about tailors. Combined, the easiest option might be to buy something new.

5.2.3 Product design

The product design of clothing contributes to the technical, economic, social, and behavioural barriers to repair.

Technical
The design of clothing has an impact on whether an item breaks easily and can be repaired. It is, however, challenging to establish how rapidly clothes will wear out or break. Firstly, because no data has been found on the topic, and secondly because clothes are known to be discarded for various reasons, not only when they are broken or worn out, calculating actual lifespans is difficult.

Comparing several studies, Fletcher (Fletcher, 2017) found that the lifetime of clothing is on average 5.4 years, but that this number varies greatly depending on the type of garment, and on its technical and social robustness. Tights, for instance, break rapidly due to the material, and they are cheap and mass-market items, and therefore have a low emotional connection, whereas jackets break more slowly, are mostly more of an investment and thus are socially more robust. Further, the lifetime does not say anything about the intensity of the use, meaning how many times it is worn over the years. Clothing that is thrown out because it is *washed out* (understood as worn out), has, however, on an average a lifespan of 10.9 years (Laitala and Klepp, 2015), showing that clothing that is actively used, can potentially last more than 10 years. Clothing disposed of due to functional defects, on the other hand, has a life span of approximately five years, which suggests that more serious breakages occur within the first five years of usage.

With the rapid rise of fast fashion, it can be assumed that the average lifetime identified by Fletcher (2017) is affected by the physical and emotional durability of fast fashion garments. Physical durability refers to how long the garment can last in technical terms, assuming that there are no holes or breakages. Emotional durability refers to how long the owner feels attached to the garment. Fast-fashion garments are accused of being of poor quality, due to a business model of making cheap clothing rapidly, which results in the use of cheaper materials of lower quality fibres that do not last, and poor construction (the way the garments are sewn together). For instance, to reduce cost, the material is often thinner, making it wear out more rapidly and tear more easily (3D Insider, 2018). Combined, this reduces both the physical and the emotional durability, as the garments are likely to break faster and in general feels replaceable by the owner as a new and fresh garment is easy and cheap to obtain.

Although no academic research has been found, several business and fashion blogs point out that the durability of the material and the product can be improved through, amongst others, the following (LaBianca, 2022; Mitrokostas, 2019; Wong, n.d.):

- durable materials – high fibre counts and not see-through;
- longevity of seams – tight, with a high number of stitches per centimetre with no loose ends;
- reinforcement of key parts – using particularly durable materials on hardworking areas, such as cuffs, hems and knees; interfacing to strengthen. for instance, a shirt collar;
- no raw hems – all hems are finished, meaning they will not unravel.

Economic
Moving to the second point, reparability, this is in theory possible on every garment, as in practice holes can always be patched and buttons replaced ([43]). Whether it is economically worth repairing a garment, however, is strongly connected with its durability, as repair requires that the general state of the garment is good (Les Réparables, n.d.). For instance, a garment the fabric of which is thinning would require major changes, which are more costly. To reduce the need for repair and make the garment worth repairing if its breaks, durability is crucial.

[43] There are garments with reduced reparability, such as tights, which are made of such thin fabric that a hole is difficult to repair seamlessly.

Social and behavioural factors

The overall quality of the garment, and thereby its worth, has an impact on whether the consumer deems it relevant to invest time and money in repairing it (Laitala and Klepp, 2015). For instance, as discussed in Section 5.2.3, the poor quality of fast-fashion garments is likely to reduce both the monetary and perceived worth of the garment. That said, the vast majority of garments do endure physically for longer than the average lifespan (Fletcher, 2012). This shows that the obsolescence of clothing is rather due to the aesthetic change and changing social preferences, and therefore a consequence of consumer behaviour, not because the item itself is objectively worn out (European Commission, 2016; Fletcher, 2012. Consequently, the lack of repair is not necessarily because it is not possible, but because there is a lack of willingness to repair from the consumer's side.

5.3 Future developments

The previous section shows that the main barriers to repair are a lack of skills, poor social acceptance of repairing and weak phycological attachment to garments. In addition, the cost and characteristics of commercial repair do not allow it to compete effectively with new clothes. There is, however, movement in the industry, with new business models and technologies developing.

In summary, to increase repair, the quality of new products needs to be improved to make it possible to repair, but the emotional investment in the garments also needs to be strengthened for consumers to want to repair them, and the cost needs to be reduced to make consumers act on their wish to repair.

5.3.1 New business models and trends

Like the recent digitalisation of the second-hand market, with digital marketplaces appearing across Europe (Statista and Text, 2022), recent years has seen the establishment of many online services which offer to repair of clothing that circumvent physical stores. And investment is following (Deeley, 2022). In general, the companies brand themselves as being sustainable and circular and emphasise that they offer a transparent service through which quality, price and repair time is known at the time of purchase, and in an accessible manner for the increasingly digitalised consumer. Differentiating themselves from the traditional tailors' service on these parameters can be seen as a sign of validation of the fact that traditional tailors' service is not known for being equally transparent, as discussed in Section 5.2.2.

These digital marketplaces operate both as B2C and as an intermediary between a business and the consumer, or a combination (Box 5.2). The current trend of intermediaries follows the established industry pattern of professional services used for clothing being mostly companies independent of the production and sales of the clothes (Laitala et al., 2021). Examples of these two types of businesses are provided in Table 5.1 and Box 5.3.

Box 5.2 Description of the two types of online repair services for clothing

Business to consumer

The company serves private customers regardless of the brand of the garment. The damage is described at the time of purchase, and based on this, the price and repair time is defined. Most companies offer both drop-off and shipment of the clothes. The repaired items are sent back to the customer.

Intermediary

The company is responsible for organising and executing the repairs for the customer of the brands for which they work. Often, the customer contacts the brand requesting a repair, and from here the repair service takes over, receiving, repairing and returning the item. As an intermediary, the repair service might handle both claims and customer paid returns.

Table 5.1 Examples of new businesses offering repair services for clothing

Country	Company Name	Founded	Type
The Netherlands	United Repair Centre ([44])	n/a	Intermediary
The Netherlands	Mended ([45])	2022	B2C and Intermediary
France	Les Réparables ([46])	2020	B2C
Sweden	Repamera ([47])	2017	B2C
Denmark	Strauss ([48])	2021	B2C and Intermediary
Norway	Repairable ([49])	2017	B2C and Intermediary
Ireland	The Zip Yard ([50])	2005	B2C
Finland	Menddie ([51])	n/a.	B2C

Source: ETC CE

An addition to existing tailors and the new repair businesses, there are *repair cafés*. The movement started in Amsterdam in 2011, and as of 2022, there are 2 200 cafés worldwide (Repair Café, 2021). Here, volunteers help with repairs for free, and clothing is one the items most frequently brought in. According to the Repair Café Foundation, cafés do not compete with professional tailors as the users do not pay for a repair, and hence would otherwise throw the item out if the Repair Café cannot help (Ibid).

Box 5.3 United Repair Centre: an example of a cross-industry collaboration

The United Repair Centre is a cross-industry collaboration between apparel brands, consultancy groups, government agencies, non-governmental organisations (NGOs) and educational institutions that aims to support the clothing repair sector in Europe. By offering high-quality repair services at scale and to find recycling outlets for any garment that cannot be repaired, this initiative aims to make it easy for leading apparel brands in north-western Europe to achieve their circularity goals. At the same time this repair centre strives to create a positive social impact by providing training and employment opportunities to newcomers with refugee backgrounds, young adults, and other job seekers. Connected with this initiative and supported by the Patagonia clothing brand and the Amsterdam Economic Board, a network organisation, a new repair centre was recently established in Amsterdam.

The process of repair by this initiative is summarised in six key steps:

- Step 1 the customer buys a clothing item from a trusted brand/company, i.e., one connected to the United Repair Centre;
- Step 2 the product is used and needs repair;
- Step 3 the customer contacts the brand/company;
- Step 4 the customer sends the clothing item to the United Repair Centre;
- Step 5 the United Repair Centre receives clothing item and makes the repair;
- Step 6 the United Repair Center returns the clothing item to the customer.

[44] https://unitedrepaircentre.com/ (accessed 18 July 2022)
[45] https://www.mendedwear.com/about (accessed 18 July 2022)
[46] https://www.lesreparables.fr/ (accessed 18 July 2022) (in French)
[47] https://repamera.se/ ((accessed 18 July 2022) (in Swedish)
[48] https://www.strauss.dk/skraeddersyet-jakkesaet/ (accessed 18 July 2022) (in Danish)
[49] http://repairable.no/ (accessed 18 July 2022) (in Norwegian)
[50] https://www.thezipyard.ie/ (accessed 18 July 2022)
[51] https://menddie.com/ (accessed 18 July 2022) (in Finnish)

In addition to Patagonia ([52]) and the Dutch Scotch & Soda ([53]) brands, 20 more apparel brands are planning to be added to this initiative in the coming years. The Dutch government encourages companies to join these types of initiatives. Starting in 2023, clothing producers will have to ensure that clothes discarded by customers are reused or recycled and will pay a levy per garment or kilogram of clothing put on the market to finance this system.

Source: https://fd.nl/bedrijfsleven/1443723/ouderwets-repareren-moet-shirtjes-van-vijf-euro-overbodig-maken (in Dutch)

5.3.2 Emerging technologies

The main emerging technology in the repair sector is the digitalisation of the service (Section 5.3.1). This is making it easier for brands and customers to make use of repair services by increasing the transparency of price and repair-time and organising the delivery and return of the garments without the customer having to physically go to a tailor and only then be informed about the probable price and repair time.

In relation to the digitalisation of the repair service for private customers, the digitalisation of the logistics for B2B is also happening. The Norwegian repair service Repairable, for example, is introducing a so-called maintenance order management system (MOMS) ([54]). This is an example of a management system for reverse logistics (Box 5.4). The introduction of the circular economy requires adjustments and adaptations in the connection between actors in the supply chain, as well as new connections. This is called reverse logistics, which involves the collection of goods, transport to a given location and sorting prior to remanufacturing, refurbishing, reusing, or recycling or, failing that, disposal. Such new reverse flows can be challenging due to a wide geographic dispersion of returns; inefficiencies due to a lack of scale and that sorting is labour intensive and requires space (The Supply Chain Consulting Group, n.d.). New supply chain management systems are, therefore, appearing.

Box 5.4: Maintenance order management system

This system connects clothing brands with local repairers through a platform that is co-branded between Repairable and the brand. Through an application programming interface (API), it has the potential to be integrated with e-commerce business and the brand's digital platforms or apps. This way, the brand can obtain digital tracking, automatic notifications to the customers, and thereby reduced follow up and better time management. In addition, the platform offers improved cost control with fixed prices and monthly invoicing.

Source: Repairable Community (https://repairable.community/#home)

[52] https://eu.patagonia.com/gb/en/home/ (accessed 4 October 2022)
[53] https://www.scotch-soda.com/ch/de/a-bit-about-us.html (accessed 4 October 2022)
[54] https://repairable.community/#home (accessed 4 October 2022)

6 Furniture

Furniture is a set of durable products that require large amounts of material per unit of monetary value. While in the past furniture was mostly made of wood that could be easily repaired and recycled/reused, modern furniture combines many different materials, including wood, plastics, natural and synthetic fibres, metals, paint and glues (Ollar et al., 2020). These changes aimed to improving the performance of furniture, making it, for example, lighter or with harder surfaces, and reducing prices for the final consumers. At the same time, however, modern furniture is likely to be more difficult to repair than traditional wooden furniture, thus leading to reduced product lifetimes. Moreover, the assembly of heterogeneous materials also makes it more difficult to implement other circular practices such as material and energy recovery.

By consolidating the available data and knowledge, the current situation and size of repair services for furniture, as well as the main challenges and opportunities associated with this sector, are discussed in this chapter.

6.1 Current size (value) in Europe

Repairs of furniture is conducted in different settings:

- by professional repairers and carpenters;
- by operators in the secondhand furniture market;
- by the owner of the product – DIY repair.

The assessment of the market value of furniture repair in Europe only considers the first option (professional repairing), which corresponds to the NACE (rev. 2) Industry 95.24 Repair of furniture and home furnishing.

A brief overview of the sector is shown in Table 6.1. As a benchmark, the size and trends of the furniture manufacturing industry (i.e., Manufacturing of furniture, NACE 31) are considered. In 2019, the furniture repair sector relied on about 17 000 in EU27, producing EUR 1.2 billion of added value. Interestingly, the sector employed about 27 000 people, but just 11 582 of them were employees, showing that most of these businesses are individual entrepreneurs. This is also reflected in the very small average size of the enterprises, about 1.6 persons per enterprise. If compared with the corresponding manufacturing sector (manufacture of furniture), the repair sector is, however, very small in all respects.

In terms of trends, the sector experienced rapid growth over the period 2011–2019 for all variables. The growth rate was particularly high in terms of investment, employees and value added. Overall, these trends led to an increase in the average size of firms and in labour productivity. Interestingly, the repair, i.e., circular, sector grew much faster than the corresponding manufacturing, i.e., linear, sector, which suggests a shift towards more circular patterns when it comes to furniture.

Table 6.1 Overview of furniture repair and manufacturing industry, EU27, 2011–2019

Variable	Repair of furniture and home furnishings (NACE 95.24)			Manufacture of furniture (NACE 31)		
	2011	2019	Growth 2011–2019 (%)	2011	2019	Growth 2011–2019 (%)
Number of enterprises	15 980	16 936	6.0	120 757	124 117	2.8
Production value (EUR million)	970	1 236	27.4	83 510	97 494	16.7
Value added (EUR million)	451	612	35.9	25 943	32 407	24.9
Personnel cost (EUR million)	225	299	33.3	19 724	22 798	15.6

Variable	Repair of furniture and home furnishings (NACE 95.24)			Manufacture of furniture (NACE 31)		
	2011	2019	Growth 2011–2019 (%)	2011	2019	Growth 2011–2019 (%)
Gross investment in tangible goods (EUR million)	28	45	63.6	3 208	3 827	19.3
People employed	23 074	26 708	15.7	955 314	954 644	-0.1
Employees	8 446	11 582	37.1	847 248	851 124	0.5
Average persons employed per enterprise	1.44	1.58	9.20	7.91	7.69	-2.8
Labour productivity (EUR '000 per person)	19.53	22.92	17.4	27.16	33.95	25.0
Labour share of value added (%)	49.8	48.9	-1.9	76.0	70.3	-7.5
Investment intensity of production (%)	2.8	3.6	28.5	3.8	3.9	2.2

Source: NACE Rev. 2 [SBS_NA_SCA_R2]

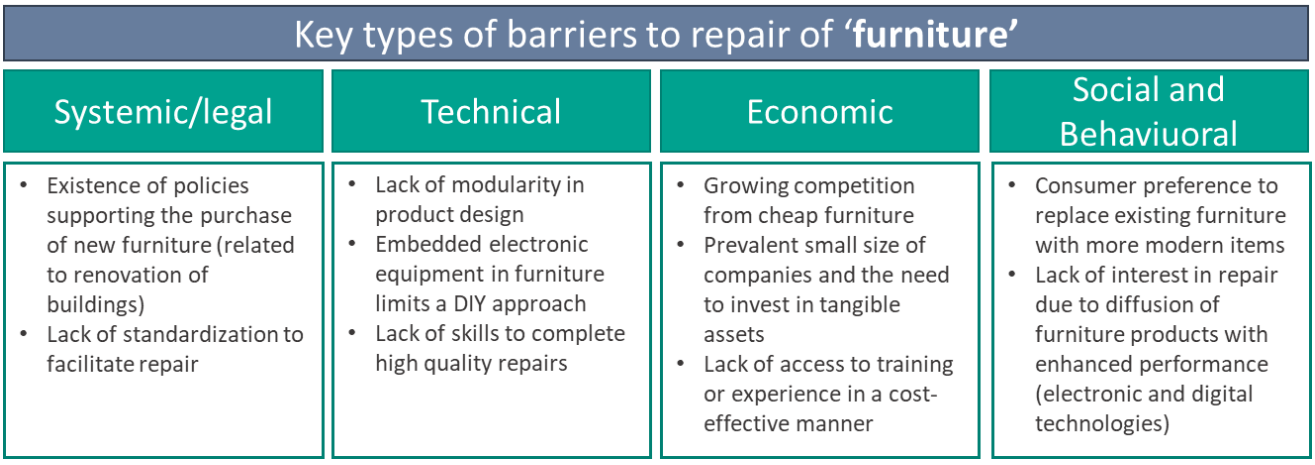
A relevant part of repair activities for furniture is carried out by **secondhand** dealers of furniture. These actors buy or collect used furniture and prepare it for resale, combining repair and refurbishment activities. It is hard to measure the value of repairs by this set of actors for two reasons. First, markets for secondhand furniture are often part of the informal economy, which does not facilitate the collection of detailed statistics. Secondly, it is hard to single out the contribution of repairs to the overall value of the sector.

Given the relative lack of technological complexity of furniture, at least if compared to EEE, makes DIY repair quite attractive. Moreover, given the volume and weight of furniture, DIY is often the preferred option by consumers to avoid the cost of transporting furniture to a repair shop. Members of the public may, however, lack the skills to complete high-quality repairs and so do not attempt to mend damaged/faulty furniture items.

6.2 Barriers

An overview of key barriers to the repair of furniture is provided in Figure 6.1. These challenges and the opportunities for addressing them are explained below.

Figure 6.1 Key barriers to the repair of furniture



Source: ETC CE

6.2.1 Policy, regulation and standards

Reparability criteria for furniture are part of the general regulatory framework on product design, for example in the Ecodesign Directives, which will be revised in the current legislative process of establishing a **right to repair** for products in the EU.

Specific protocols and criteria for the repair of furniture are also being considered for the granting of the **EU EcoLabel**. In this respect, the latest criteria, adopted in 2016 by a Decision of the European Commission (C(2016) 4778), state, "*(t)he revised ecological criteria aim at [...] promoting a durable and high-quality product that is easy to repair and disassemble*". More specifically, Criterion 9.4 states, "*for furniture consisting of multiple component parts/materials, the product shall be designed for disassembly with a view to facilitating repair, reuse and recycling. Simple and illustrated instructions regarding the disassembly and replacement of damaged component parts/materials shall be provided. Disassembly and replacement operations shall be capable of being carried out using common and basic manual tools and unskilled labour"*.

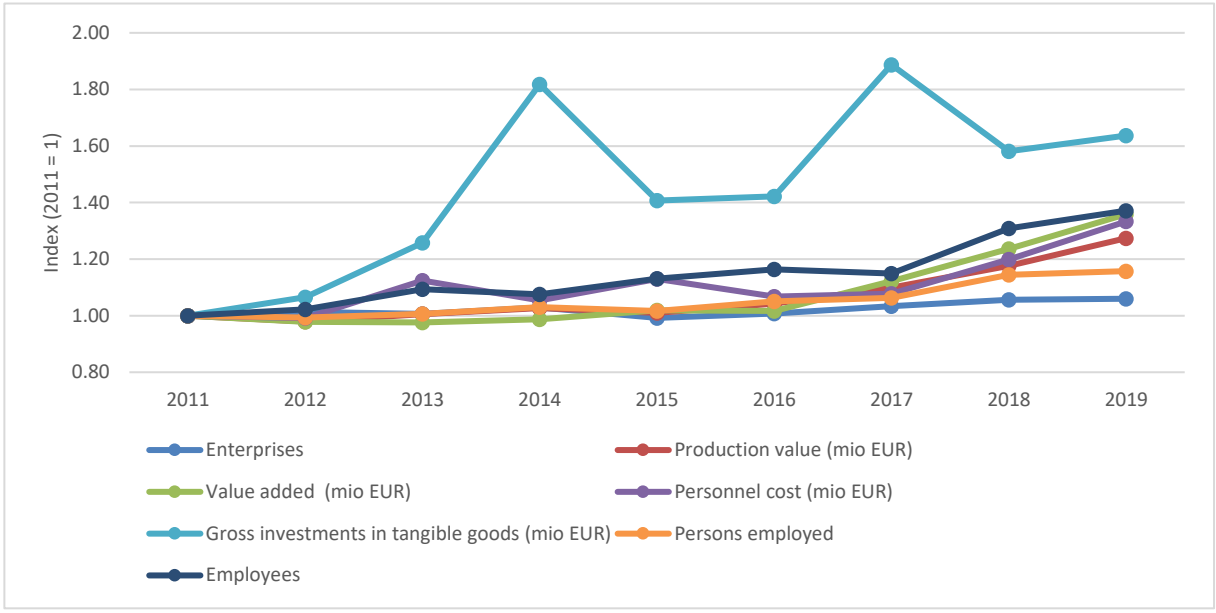
Economic opportunities in the sector also depend on policies that alter the price of new furniture products. In many EU countries, policies in support of renovation of buildings, either for energy efficiency improvement or introduced to boost the post-Covid recovery, were accompanied by **subsidies for the purchase of new furniture**. In Italy, the so-called 2020 *Bonus mobili* allows households that renovate their houses to purchase furniture and equipment at a 50 % discount, that is deduced from income taxes over 10 years, with a cap of EUR 10 000 household. This measure basically represents a 50 % subsidy on the price of new furniture.

More generally, country-specific support mechanisms for the **renovation of buildings,** as well as the Renovation Wave Initiative proposed by the European Commission within the European Green Deal, also influence the likelihood of repairing of furniture. The renovation of buildings is sometimes a once-in-a-lifetime event for households which often requires the (temporary) removal of existing furniture. This once-in-a-lifetime event is often accompanied by consumers choosing to replace existing furniture with more modern items, thus reducing the repair market.

6.2.2 Economics

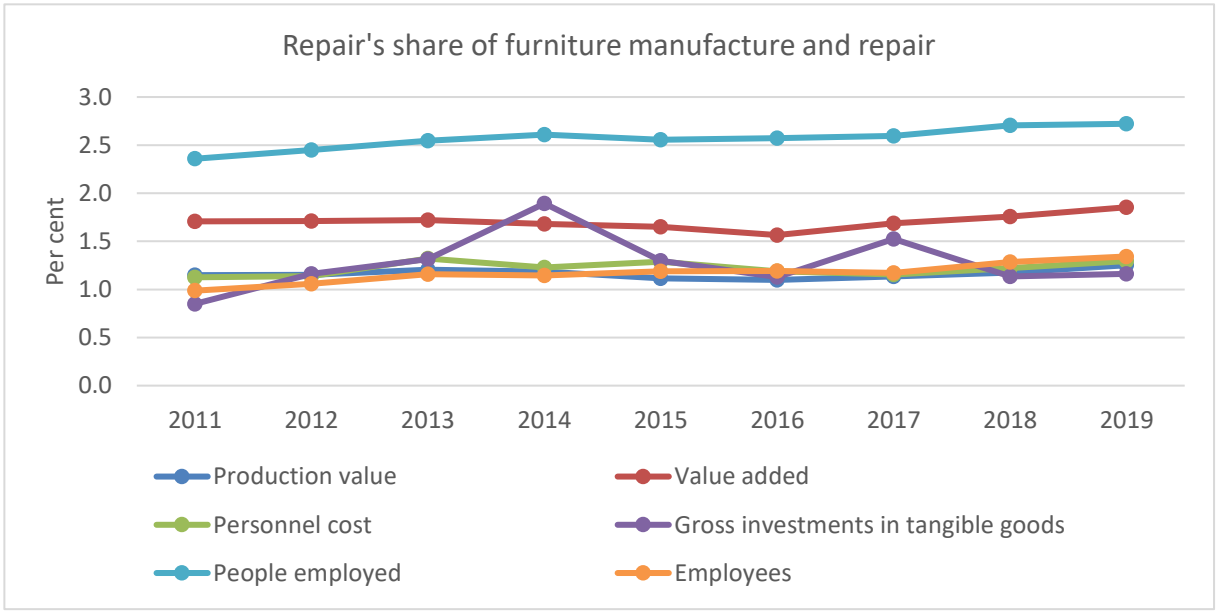
The sector has grown in terms of output, added value and employment in the last decade. Interestingly, its growth rate for basically all variables considered was larger than the corresponding growth rate in the furniture manufacturing sector (Figure 6.2). Nonetheless, the sector remains very small if compared with the sector producing new furniture (Figure 6.3).

Figure 6.2. Main trends of the repair of furniture and home furnishing, EU27, 2011–2019, index (2011=1)



Source: NACE Rev. 2 [SBS_NA_SCA_R2]

Figure 6.3. Share of repair over manufacture + repair of furniture, EU27, 2011–2019, per cent



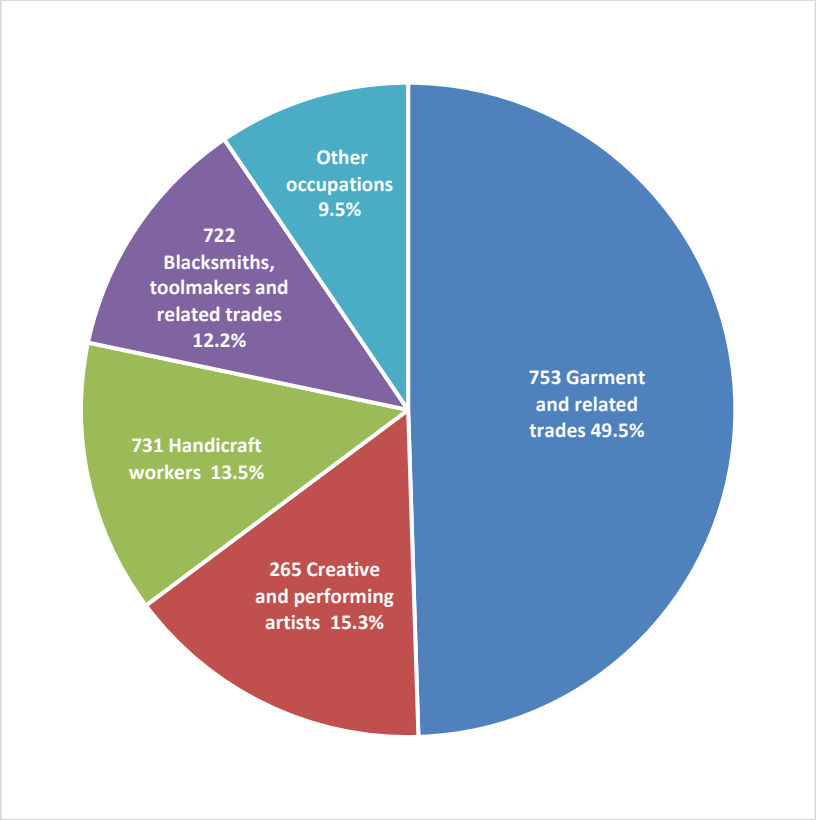
Source: NACE Rev. 2 [SBS_NA_SCA_R2]

The growth prospects of the sector, however, are threatened by the increasing competition from cheap furniture produced both in Europe and in emerging markets, which makes the repair option too expensive. In addition, the diffusion of furniture products with enhanced performance thanks to the integration with electronic and digital technologies is encouraging consumers to replace rather than repair older items.

At the same time, the interruption and disruption of global value chains, due to the Covid pandemic and the growing geopolitical tensions due to the war in Ukraine, has led to an increase in the price of inputs for producing new furniture as well as to longer delays and uncertainties about the delivery of new furniture. Both outcomes make repair more attractive to consumers.

In terms of skills and occupational composition, the repair of furniture mostly relies on crafts skills, which do not require high levels of formal educational attainment but call for manual dexterity and on-the-job training and experience. Detailed data from the Italian Labour Force Survey ([55]) (Istat, 2018), with information on employment by NACE 4-digit sectors and ISCO-08 3-digit occupations – Figure 6.4 reports on sector 95.24. The figure offers a snapshot of the occupational composition of the sector: most of the employment refers to low-skilled manual jobs, but also some creative occupations (creative and performing artists). The need for on-the-job training and experience represents a barrier to the growth of the sector, as single-person and micro firms struggle to provide either training or experience in a cost-effective manner.

Figure 6.4. Occupational composition (ISCO-08 3-digit occupations) of the repair of furniture and home furnishing sector (NACE rev. 2 95.24), Italy, 2018, per cent



Source: Italian Labour Force Survey, 2018, Istat

The repair of furniture requires manual skills but, at the same time, capital investment in tangible assets (plant and equipment) is needed. As shown in Table 6.1, investment represents, on average, 3.2 % of gross output and 6.8 % of value added in the sector. The combination of the prevalent small size of companies in the sector and the need to invest in tangible assets represents an additional barrier to the growth of the sector.

6.2.3 Product design

As highlighted by Criterion 9.4 of the EU Ecolabel for furniture, reparability relies on specific characteristics of its design. More specifically, producers are asked to design products that are easy to disassemble. In this respect, product design should be modular and standardised to enable and facilitate repair. Moreover, producers should provide replacement of parts and components, and develop simple instructions to enable a DIY approach to maintenance and repair.

[55] https://www.ilo.org/surveyLib/index.php/catalog/7022 5

The integration of furniture with domotics (home automation), however, poses serious threats to the reparability of furniture. Electronic equipment embedded in furniture substantially limits a DIY approach to repair and requires the joint intervention of professional repairers of furniture and electronic devices to obtain a successful and safe repair.

6.3 Future developments

6.3.1 New business models and trends

In absence of established big players at the regional, national or EU level in the furniture repair market and given the prevalence of micro enterprises in the sector, new business models were mostly aimed at improving the matching between the demand and supply of repair services. At the international level, TaskRabbit, recently acquired by IKEA, provides the opportunity of searching for a variety of tasks, including furniture repair, to identify an appropriate repairer and also gives information about the price of the service and other features. Similar approaches have also been adopted by national players, such as ProntoPro in Italy.

In support for DIY repair, pieces of furniture are also included in services such as Ifixit.com, which make DIY repair easier for consumers.

6.3.2 Emerging technologies

The furniture sector is usually considered a low-technology sector in standard sectoral taxonomies ([56]), in which, according to scholars in innovation studies (Castellacci, 2008; Pavitt, 1984), innovation is mostly aimed at reducing costs to compete on price. Innovation aimed at reducing the price of new products makes repair less attractive to consumers, especially because the repair of furniture is often a craft activity, with very limited opportunities for improvement in efficiency. At the same time, however, innovations on the manufacturing side of the furniture sector could result in improving the reparability of products. Business models such as the ready-to-assemble approach favour reparability in two ways. First, the architecture of ready-to-assemble furniture should be, by definition, modular, which also makes repair easy as each module can be easily replaced. In this respect, manufacturers of furniture could also earn profits from producing and selling spare parts and replacements for modules, with some room for price discrimination, i.e., by selling replacement parts at a price that is higher than if they were sold as part of the original piece of furniture. Second, ready-to-assemble furniture also contributes to training consumers in assembling and, indirectly, repairing furniture. Consumers learn how to assemble and disassemble furniture and own the necessary basic tools.

As already mentioned in Section 6.2.3, recent technological developments in furniture, that is the integration with domotics (e.g., smart wardrobes, sofas with electric motion), will likely require a substantial upgrade in the skills required to repair furniture by professional repairers.

[56] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-tech_classification_of_manufacturing_industries (accessed 4 October 2022)

7 Consumer behaviour in the repair sector

Changes in consumption behaviour and are increasingly recognised as one of the key levers for enabling the transition to a circular economy, as the success of new circular business models and policy measures largely depend on a social engagement component (EEA, 2019).

When it comes to advancing the repair sector in particular, addressing consumer behaviour is also urgent. There is evidence that at least one-third of European consumers have not repaired their most recent broken products (European Commission, 2018). According to a Eurobarometer survey, the situation is even more critical, with only 31 % of EU consumers having repaired a product, instead of replacing it, in the six months prior to the study (Kantar Belgium, 2020). Products are often replaced for other reasons than being broken beyond repair, including situations in which products could be repaired or even when products are still fully functional, demonstrating that the challenge is not only a technical one (Magnier and Mugge, 2022; van den Berge et al., 2021).

In this context, this chapter aims to provide an understanding of the factors that influence repair behaviour, what current European consumer repair behaviour looks like, and what barriers and opportunities can already be identified for design strategies that effectively increase such behaviour in Europe.

7.1 Why there is a need to look into consumer behaviour in the European repair sector

The majority of studies on the repair sector, and on the circular economy overall, are framed from the perspective of production and business models, while the role of people and their relationship with products and their environment have been largely overlooked (van den Berge et al., 2021; Selvefors et al., 2019). Users, however, play a key role in advancing circular solutions to close material loops, as ultimately the decision lies with consumers on whether or not they repair their items (van den Berge et al., 2021).

While there are already options available in the market to adopt repair behaviour, these options are often considered “impractical and challenging” by consumers due to, for example, time, money or planning requirements (van den Berge et al., 2021), or are even unknown to consumers (Fachbach et al., 2022). If linear instead of circular consumption processes are still preferred, the transition to a circular economy will hardly gain momentum (Selvefors et al., 2019).

In order to make repair the norm among people, it is essential to increase the understanding of what repairing entails for people in their everyday life, rather than assuming how such situations look like and quickly jump into solutions. This requires a realistic view on how people make decisions and a reasonable understanding of the key pillars of repair behaviour, which will be the focus of this subsection.

7.1.1 The importance of understanding and addressing repair behaviour

There is a general tendency among sustainable behaviour projects, including those focused on fostering circular behaviour, to focus on getting people to “care more” about things such as sustainability or circular economy. For that end, usually a communications toolkit is put forward. This might increase awareness and help create intent, but is unlikely to change people’s actual habits, due to the the intention-action gap which describes how people’s **intentions are different from actions** and the first do not necessarily translate into pro-environmental behaviour (Kollmuss and Agyeman, 2002).

Alternatively, there are various behavioural models that map the specific context in which a behaviour takes place, aimed at helping understand what are the main components of a certain behaviour and where best to intervene when trying to change it. A more realistic view on people’s behaviour is proposed by the COM-B model (Michie et al., 2011), which was originally designed for developing policies in the public health domain. Its use, however, has evolved towards its application in the promotion of sustainability strategies and policies in various sectors (Terlet et al., 2022). According to the model, behaviour is shaped

by three main determinants: capability, opportunity and motivation. The absence of any one of these factors is likely to put the desired behaviour change at risk. When thinking of interventions to promote repair behaviour, triggering or changing any of these factors, separately or in combination, may yield better results.

These **three determinants – capability, opportunity and motivation** – will support the assessment of the actual barriers to and opportunities for repair in Europe in this chapter. Before focussing on them, it is important to dispel a few misconceptions and look into actual facts and figures about repair behaviour in Europe.

7.1.2 Key misconceptions about consumer behaviour

There are a few misconceptions about how to approach consumer behaviour that, if identified and dispelled, will increase the chances of developing a more realistic view on people's actual behaviour and bring the solutions closer with the potential of making a difference in fostering repair behaviour on a daily basis. Some are listed below.

Misconception 1: Rationality guides most of our decision-making processes
It is often assumed that people employ rational decision making, as a so-called *homo economicus*, in most of their decisions. This is not always true, however, as human behaviour is frequently not reflected on and influenced by multiple external factors, such as emotions and situational contexts (Kahneman, 2011). Understanding this helps the development of a more critical view on interventions for behavioural change that appeal to rational arguments or benefits to convince consumers to change. The research of Brusselaers et al. (2020) illustrates this point eloquently. According to them, repairing a washing machine or vacuum cleaner, regardless of repair costs, is financially advantageous, in most cases, except when the device is near the end of its lifetime. Yet, repair of these devices is not common – 39.8 % of western Europeans who bought a new washing machine and 69.7 % of those who bought a new vacuum cleaner did not even consider repairing their old device (Magnier and Mugge, 2022). And, even if repairs are considered, they are usually only done when the repair costs are less than 18–31 % of the original device's price, depending on the product category (Fachbach et al., 2022).

Misconception 2: By changing values we change behaviour
Changing values does not necessarily lead to changing behaviour. Firstly, value priorities are very stable, so they are hard to change (de Groot and Thøgersen, 2012). Secondly, it is often underestimated how many people already hold strong pro-environmental values (Bouman et al., 2021). Thirdly, and most importantly, practitioner experience shows that addressing values only is not sufficient to engender behaviour change.

It Is rather more promising to change the circumstances in which decisions are made and thus make it easier for people to **act** on their – likely existing – good intentions and sustainable values (Young and Pelenur, 2022; Bouman et al., 2021). In this context, in the Special Eurobarometer 501, only 6 % of Europeans stated that protecting the environment was not very or not at all important to them personally (Kantar Belgium, 2020). On the other hand, there is evidence that, nevertheless, only a minority of Europeans repair broken products rather than replacing then (Kantar Belgium, 2020). This shows there is a large discrepancy between values and actual behaviour.

Misconception 3: Focus primarily on what people say about their own behaviour
Surveys based on how consumers report on their own behaviour are important to understand the actual behaviour - but only to a limited extent. For example, 72 % of European consumers say they want to buy more sustainable products, yet only 17 % actually do so (European Commission, 2011). This shows that survey results of people's intention and past behaviour should be taken with a pinch of salt, as actual behaviour is usually not what participants plan to do or say they have done in the past (Hassan et al., 2016). While intention is a strong predictors of behaviour (Lanzini and Khan, 2017), there is also potential

to increase the use of ethnographic approaches to understand repair behaviour, by, for example, observing people in action.

Misconception 4: Repairing is expensive
Generally, repair is perceived to be expensive by consumers and price is a major barrier to engaging in repairing (Fachbach et al., 2022; Rudolf et al., 2022; European Commission, 2018). Lifecycle analyses, however, show that, in reality, this depends on the type of product and sector, and repairing is often the most cost-effective option.

In contrast to professional repairs, private repairs are inherently less expensive. As will be elaborated in the following sections, however, self-repairs are often either not considered from the outset (McLaren and Mclauchlan, 2015) or people lack the time, skills or confidence to engage in them (Fachbach et al., 2022; Jaeger-Erben et al., 2021). Nonetheless, self-repairing EEE is possible and thus worth a try: with the right instruction manual, available from, for example, iFixit, spare parts and tools, one can, for instance, replace a broken smartphone screen, thus saving the cost of a professional repair or even a new phone. When considering clothing and furniture, there is often even a larger potential for self-repair as fewer specialised skills are required, and tools or spare parts, such as fabric or screws, are often either readily available in a household or easier to acquire than those for EEE.

7.2 Current repair behaviour and trends in Europe

The trend over the last decades shows regular repair behaviour or product maintenance to be in decline, for example in the textiles sector, particularly when it comes to clothing, as observed by Laitala and Klepp (2018) in their research in Norway: in the last three decades, the number of people who engage in mending on a regular basis decreased from 5 % to 1 %, and those who do engage in it also spent less time mending. In addition, evidence shows that the lifetime of products is getting shorter and people generally engage less in repairing activities, such as mending clothes, than in earlier decades (Laitala and Klepp, 2018).

Nevertheless, with the increasing turnover of clothes, EEE and furniture, as well as efforts to move to a circular economy, particularly from grassroot movements, there seems to be a growing interest in citizens learning and applying repair skills, as can be seen in repair cafés, more repair business strategies and the right to repair movement (Charter and Keiller, 2014). In this context, the purpose of this section is to have a clearer understanding of the actual behaviour of Europeans with regards to repair – both in terms of what such behaviour actually is and how often it occurs.

7.2.1 Breaking repairing into a set of concrete behaviour

To address consumer behaviour efficiently, it is important to single out the actual behaviour to be investigated and addressed, in order to focus solutions for that specific case (McKensie-Mohr, 2010).

Repair behaviour can be characterized by main categories: professional and private repair. Professional repair is provided by the original manufacturer, either as part of their service or for free under the legal obligation of the warranty period. Alternatively, consumers can use an independent repair specialist. Customers do not seem to have a preference for either option (European Commission, 2018), although, in a Norwegian consumer survey, Laitala et al. (2021) found that their success rate differed widely: the repair of household appliances by stores and producers was successful 70 % and 73 % of the time, respectively, while independent repair specialists only succeeded in 30 % of cases. Nonetheless, citizens are generally happy with the repair service provided to them, as "*more than 70 % had their expectations in terms of convenience, speed, quality and friendliness of the repair met, or even exceeded*" (European Commission, 2018).

Looking specifically into private repair, this can be done by the consumer, or by getting support from, for example, an acquaintance or in a repair café. The important difference here is that no money is exchanged for the repair. Thus, private repairs are often considerably cheaper than professional ones, as only the price of the tools, if not already owned, and the spare parts need to be paid for. The knowledge and

experience of private repairers isoften lower, which is reflected in success rates: there is evidence that 39 % of household appliances were successfully repaired privately, while professionals succeeded 48 % of the time (Laitala et al., 2021). In contrast to EEE, clothes seem to be easier to repair: although the majority, 56 %, had not attempted to do so: of those did, 44 %, only 6.8 % failed to repair their item of clothing themselves (Laitala et al., 2021).

Additionally, repair can be broken into actual behaviour, from realising a product has failed through to deciding to repair it and then doing so, in order to decide when it is most effective to intervene in order to foster repair decisions among consumers. When surveying western Europeans with a newly purchased EEE product, Magnier and Mugge (2022) found that 60 % of the participants had not even considered repairing rather than of a replacing their appliance, and, interestingly, more people consider repairing a product when it is completely broken, 58.6 %, as opposed to partly malfunctioning, 30 %. However, even if repairs are considered, that does not necessarily mean it is acted on, as the 40 % of those who had considered repair, ultimately decided to replace the item – or perhaps the repair did not work.

7.2.2 Existing facts and figures about people's repairing behaviour

Consumer behaviour for repair in general

There is evidence that around 60 % of European consumers repair their broken items regularly, while one-third of consumers have not repaired their most recently broken products (European Commission, 2018). Nevertheless, the study concluded that there is not overwhelming evidence of a throwaway economy in Europe. Across all products investigated, many repairs were done by professionals, 26 % by repair services and 17 % by manufacturers but to some extent also by friends/family, 8 %. Self-repair was less frequent, 12 %. Interestingly, respondents in this research found that durability was associated with product quality and was considered more important than reparability (European Commission, 2018). According to a special Eurobarometer survey by Kantar Belgium (2020), however, the situation is less encouraging when looking into a more recent timeframe, with only 31 % of EU consumers having repaired a product instead of replacing it in the six months prior to the study.

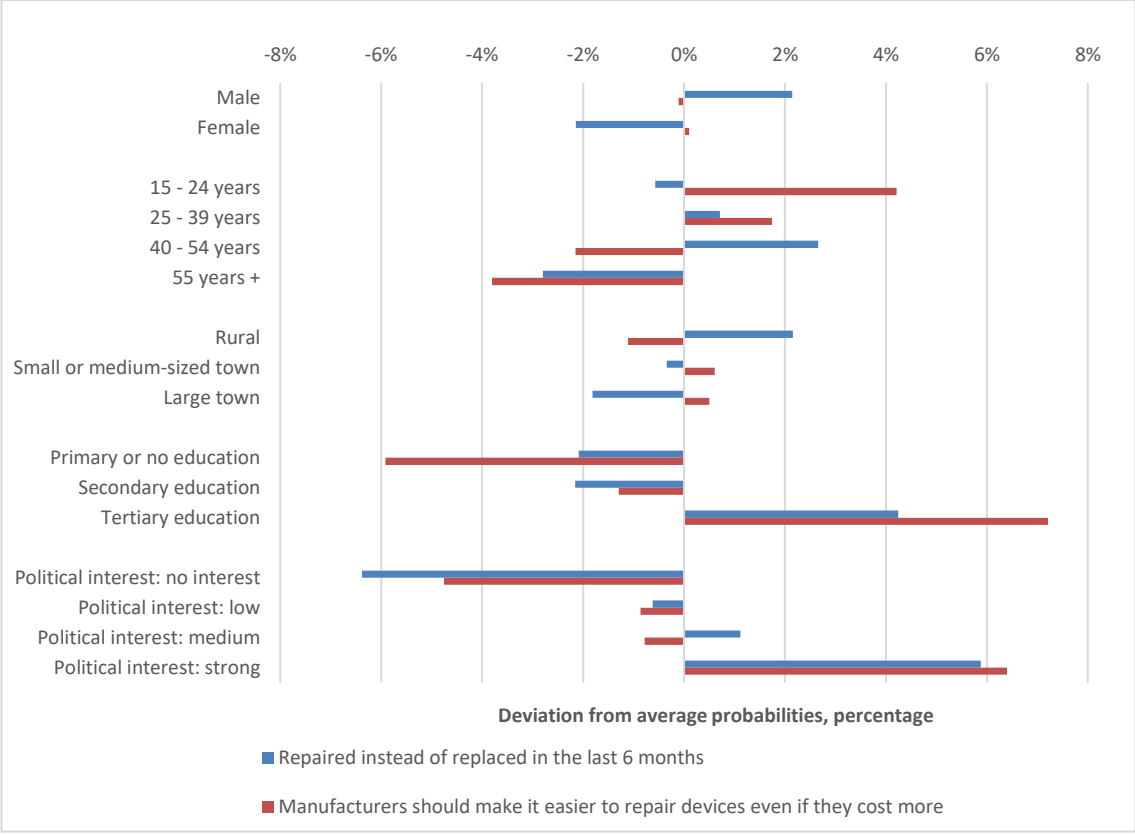
Moreover, just 24 % of Europeans are willing to pay a price premium to manufacturers to purchase easier-to-repair products. According to the Eurobarometer 92.4 survey, there are substantial differences across different categories of EU consumers. Figure 7.1, which is based on a simple probit regression model ([57]), reports the deviations from the average probability of having repaired a product in the past six months (blue bar) or of being willing to pay a price premium to manufacturers to purchase easier-to-repair products. Overall, repairing behaviour is more likely among men, for young adults, 25–39, and adults aged 40–54, people in rural communities, people with tertiary education and people with strong(er) political interest. When it comes to the willingness to pay for more repairable products, however, no gender bias is found, while a higher willingness to pay is found among young people, people in urban areas, people with tertiary education and people with strong(er) political interest.

When looking specifically into national research:

- Rogers et al. (2021) found that repair behaviour in the UK, even in the special case of repair cafés, tends to reflect gender differences, with women more likely to engage in mending clothes and use professional repair services, while men are more likely to repair equipment and motor vehicles;
- Fachbach et al. (2022) looked into repair evidence in Austria and found out that those who know about repair services are more urban and have higher environmental concerns, although three quarters of them have not used such services. In line with the research done in the UK, women were found to be more likely to use a professional repair service than men (Fachbach et al., 2022).

[57] A probit model is a type of regression in which the dependent variable can take only two values.

Figure 7.1 Deviation from average probabilities in repairing behaviour and willingness to pay a price premium for reparability, EU consumers, DATE, per cent



Note: Deviation from average marginal effects based on probit model. The probit model also includes country dummies to account for systematic cross-country differences in attitudes and behaviour. Own elaboration on microdata from Eurobarometer 92.4

Source: Special Eurobarometer 501 (Kantar Belgium, 2020) & (Eurobarometer 94.2 (2020), 2021)

Consumer behaviour in the textile sector

Looking particularly into national research:

- Laitala & Klepp (2018) reviewed national diary studies in Norway and found that over three decades, from 1980 to 2010, the number of people who regularly engaged in mending clothes decreased from 5 % to just 1 %, and those that did mend, spent less time doing it. The downward trend of mending clothes seems to continue, as a comparison between 2017 and 2010 showed that all mending was performed less often in 2017 (Laitala and Klepp, 2018). Their research also shows that those that do engage in mending, more often perform simple repairs, such as sewing on a button or fixing an unraveled seam, while more complex repairs, such as changing a zip or adjusting the size of a garment, is performed much less.
- A recent survey of Swedish IKEA consumers revealed that only 35.3 % had repaired a home textile in the last 12 months, while 76.9 % had donated and 55.5 % had discarded at least one textile (Lehner et al., 2020).

Consumer behaviour in the electrical and electronic equipment sector

Within EEE, research evidence makes a distinction between products that are constantly being updated, such as smartphones and televisions, and less rapidly developing products, such as washing machine and fridges. In this context, according to Jaeger-Erben et al. (2021), "*the personal meaning of novelty is higher for smartphones than for washing machines, (…) as purchase practices for smartphones were more driven*

by the wish for novelty and by opportunities like attractive deals and offers," while "*in the case of washing machines, decreasing functionality initiated replacement more often*".

There also seems to be a difference in repair behaviour between cheaper EEE, mostly small items such as hand-mixers, and more expensive ones, such as televisions and washing machines. For example, repairing a washing machine or a vacuum cleaner regardless of the repair cost is usually less expensive in the long term than replacing it with a new product (Brusselaers et al., 2020). These, however, are big and expensive EEE. For small EEE items, such as kettles or toasters, replacement options often cost only slightly more than repairing the current EEE. In this sense, expensive products get repaired more often than inexpensive ones (Hennies and Stamminger, 2016).

Mobile phones

In the European Commission survey (2018), 62 % of Europeans reported having repaired their mobile phones (European Commission, 2018). At national level the following trends are reported.

- In Austria, although the main reason for replacing a mobile phone was a defect, this was only the case for 30 % of phones, meaning that 70 % of replaced phones were still functional (Wieser and Tröger, 2018).
- In Germany, just 23 % of people have had their phones repaired in 2016 ([58]); a similar number was found in Austria, where about 20 % of respondents have had their previous phone repaired at least once, and 7 % had it repaired multiple times (Wieser and Tröger, 2018).
- In stark contrast, 83.7 % of younger people in Lithuania stated they repair their mobile phone if it breaks (Dagiliūtė et al., 2018), which points toward a difference between varying economic contexts: the necessity of repair *versus* the luxury of replacing or choosing to repair for sentimental or environmental reasons.
- In Norway, 35 % attempted to repair their phone (Laitala et al., 2021).

Other electrical and electronic equipment

- In western Europe, a survey of people who bought a new EEE item revealed that 60 % did not even consider repairing their broken item. Interestingly, more people considered a repair if their EEE item was completely broken instead of it being only damaged/partly malfunctioning (Magnier and Mugge, 2022).
- In Poland, more people seem to repair their EEE items: only 3 % and 4 % respectively responded that they never repaired their small and large EEE items, while 18 % and 21 % always do so (Szczygiel and Kowalska2, 2021). Overall, the studies are very heterogeneous in the number of respondents and countries surveyed, and the number and type of appliances they asked about – making them hard to compare and draw general conclusions, especially given the significant differences between the EU report (EC, 2018) and other studies, or the differences between eastern and western European countries. There seems to be a tendency towards more repair behaviour in eastern European countries, but the number of studies is too small and different in scope to draw reliable conclusions, and the EU survey did not find significant differences in this regard.

Consumer behaviour in the furniture sector

Generally, few studies look into the consumer behaviour for the repair of furniture, as can be seen in a recent review of the literature on furniture within the circular economy (Cooper et al., 2021). According to a study in the UK, fewer than 1 in 10 people (attempt to) repair their broken furniture ([59]). This is

[58] Greenpeace (2016) – https://www.greenpeace.org/eastasia/blog/1868/which-country-is-most-likely-to-repair-their-electronic-gadgets (accessed 4 October 2022)

[59] North London Waste Authority (2018) https://www.nlwa.gov.uk/news/22-million-damaged-furniture-items-and-11000-bust-bicycles-thrown-away-each-year (accessed 4 October 2022)

supported by the findings of Rogers et al. (2021) who found that broken furniture was most likely to be donated, against the general trend they found for other products, including textiles and EEE, that more expensive items were more likely to be repaired. The authors speculate that this expresses a lack of sentimentality towards furniture in current times, as it is no longer passed down for generations. Nonetheless, consumers still recognise the remaining value of their furniture, donating their broken items rather than throwing it away.

7.3 Barriers to behavioural change towards repairing

Based on the literature review conducted, an analysis of the main behavioural and social barriers to repair was conducted across three main categories: capability – can people do the repair; motivation, do people want to repair; and opportunity, are there external and social factors to support immediate repair?. The main outcomes are shown in Table 7.1.

Table 7.1. A summary of main behavioural and social barriers to repair

CAPABILITY				
Factor	**General**	**Electrical and electronic equipment**	**Clothing**	**Furniture**
Lack of skills and knowledge	• Early repair behaviour was found to play an important role in self-repair due to confidence etc. (Hielscher and Jaeger-Erben, 2019). • Lack of knowledge on where to buy materials for repair is a barrier (Terlet et al., 2022).	• Barriers to self-repairers: lack of knowledge and information, time and motivation (Rudolf et al., 2022). • Competence of self-repair and to involve professional services are perceived as low (Jaeger-Erben et al., 2021).	• Lack of skills is a barrier to repairing (Terzioğlu, 2021; McLaren and Mclauchlan, 2015). • Mending takes practice to be accomplished at it (McLaren and Mclauchlan, 2015). • 30 % of respondents in a survey are more likely to use more of their clothes if they have the skills to repair/alter them (Gracey and Moon, 2012).	• 42 % of participants would like to learn the skills to repair furniture (see footnote ([50])) • Lack of knowledge, tools and times is a barrier (IKEA, study[60])
Previous use of repair service/past behaviour	• 70 % of participants, who had used repair services, found that their expectations about convenience, speed, quality and friendliness of the repair were met or exceeded (European Commission, 2018).	• People who have previous repaired a smartphone have higher repair intentions (Wieser and Tröger, 2018). • Experience with repair is important but less influential than the product's design (Pozo Arcos et al., 2021).	n/a	n/a
Opportunity				
Factor	**General**	**Electrical and electronic equipment**	**Clothing**	**Furniture** n/a
Cost of repair	• For repair services, consumers are willing to only pay a small fraction	• Perceived high repair costs and lack of spare parts availability are barriers	• Cost of repair services plays a role and they are only used for difficult repair tasks (Fisher et al., 2008).	

[60] Unpublished study conducted by IKEA Germany and shared with one of the ETC CE partners in the context of a joint project.

	of the price of a new product (Cooper et al., 2021; European Commission, 2018; McCollough, 2007).	(Rudolf et al., 2022; Jaeger-Erben et al., 2021). • 10–15 % of participants in a survey would pay for repair themselves after a 5-year warranty has expired (Laitala et al., 2021).	• Economic reasons are a significant predictor of repair behaviour (Lehner et al., 2020).
Convenience and repair time	• Repair time significantly correlates with repair intentions (Fachbach et al., 2022). • When replacement takes less effort than repair, consumers are more likely to buy new products (European Commission, 2018). • People living in rural areas were less likely to use professional repair services (Fachbach et al., 2022).	• Lack of attractive repair services is the most common barrier (Rudolf et al., 2022). • A minor barrier was the unavailability of the item while it was being repaired (Rudolf et al., 2022). • Time and motivation also played a role in self-repair (Rudolf et al., 2022). • A distance of up to 40 km to repair services is not considered a barrier (Rudolf et al., 2022).	• Lack of time and convenience are barriers (Lehner et al., 2020; McLaren and Mclauchlan, 2015). • 27 % of participants would wear more of their clothes if they had the spare time to repair them (Gracey and Moon, 2012). • The availability of repair services plays a role – they are only used for difficult repairs (Fisher et al., 2008).
Design of current product	• Products manufactured with low quality materials discourage people from repairing (Terzioğlu, 2021).	• Product design is more important for repair than expertise (Pozo Arcos et al., 2021).	• Design of clothes can be helpful when repairing, for example, bigger seam allowances facilitate size adjustments (Laitala and Klepp, 2018).

Motivation				
Factor	**General**	**Electrical and electronic equipment**	**Clothing**	**Furniture**
Desire for new item and low price of new item	• Approximately 10 % of participants had a strong desire for new trends and technology (European Commission, 2018). • 20-30 % of consumers who did not repair their old products felt they were obsolete or out of fashion and 17–25 % preferred getting a new product (European Commission, 2018).	• Participants kept their phone for a shorter period, if owning the newest technology was important (Jaeger-Erben et al., 2021). • Users perceive the time and money used on repair do not result in enough additional years of use (Wieser and Tröger, 2018). • Smartphones are discarded more quickly if there is an attractive offer (Jaeger-Erben et al., 2021). • Washing machines' decreasing functionality initiates replacement (Jaeger-Erben et al., 2021).	• Since mending of clothes is no longer oa necessity, because fast-fashion items are cheap, mending is only done for expensive items (McLaren and Mclauchlan, 2015; Fisher et al., 2008.	n/a
Cost effective/price-quality ratio	• The more expensive an item is, the more likely people are likely to repair it – except for furniture (Rogers et al., 2021). • Consumers are willing to pay for products with	• Expensive appliances are repaired more often, regardless of quality or brand (Wieser and Tröger, 2018; Hennies and Stamminger, 2016). • Citizens state that they would repair EEE more	• Citizens state that they would repair clothes more often if the quality of products were higher (Laitala and Klepp, 2018).	• For 56 % of customer, saving money is important when repairing

	better durability and reparability (European Commission, 2018). • Consumers can be persuaded by low prices (European Commission, 2018).	often if the quality of products were higher (Laitala et al., 2021). • Minor barrier is the small price difference of repair *versus* buying new item (Rudolf et al., 2022).		(IKEA, study)
Stigma of unrepaired items	• Social norms are significantly correlated with repair intentions (Fachbach et al., 2022).	n/a	• Visibly repaired and mended clothes are associated with stigma of poverty(McLaren and Mclauchlan, 2015; Fisher et al., 2008).	n/a
Perception of repair, emotional attachment and environmental values	• Perceived difficulty of repair decreases its likelihood , both professionally and privately (Fachbach et al., 2022). In contrast to Rogers et al. (2021), Fachbach et al. (2022) found no gender differences in perceived repair difficulties. • 25–50 % of consumers who did not repair products expected repairs to be too expensive (European Commission, 2018). • Men have lower trust in professional repair services (Fachbach et al., 2022) and use professional repair services less often (Rogers et al., 2021). • Environmental concern is the strongest driver of repair behaviour compared to social norms, economic factors such as time, money and expected product usefulness after repair (Fachbach et al., 2022).	• Lack of transparency and trust in both repair services and DIY repairs are barriers (Rudolf et al., 2022)r. • Lack of transparency and trust in repair services are also barriers for mobile phones. Includes expected high costs (Jaeger-Erben et al., 2021; Wieser and Tröger, 2018), perceived lack of spare parts or expected amount of time to repair (Wieser and Tröger, 2018). • 45 % of survey respondents could not name a commercial repair service that they trust (Cole and Gnanapragasm, 2017). • Expected costs discourage participants from repairing their devices (Jaeger-Erben et al., 2021).	• Participants in a survey repair clothes because of emotional attachment (Fisher et al., 2008). • Items are more likely to be mended when they have high emotional value compared to environmental reasons (Laitala and Klepp, 2018; McLaren and Mclauchlan, 2015). • Participants have a lack of knowledge about the environmental impacts of the fashion industry (McLaren and Mclauchlan, 2015). • There is a correlation between repair behaviour for textiles and environmental attitudes (Lehner et al., 2020; Laitala and Klepp, 2018).	• 41 % of customers are interested in repairing, whereas 95.8 % are interested in repurposing, redesigning and upcycling. (IKEA, study[61]) • 57 % of costumers repair to care for the environment (IKEA study)

Source: ETC CE

7.4 Strategies to drive increased repairing behaviour in Europe

Based on the behavioural barriers and challenges highlighted here, strategies with the potential of fostering repairing behaviour have been identified, including the adjustment of price and quality of products and repair services, a review how skills and competences are taught, a shift of responsibility from consumers to manufacturers, and cultural shift aspects. These are discussed in Chapter 8.

[61] Unpublished study conducted by IKEA Germany and shared with one of the ETC CE partners in the context of a joint project.

8 Conclusions and outlook for improved framework conditions

The main objective of this report was to consolidate the existing knowledge and data on the repair sector and understand its value and level of activities in Europe. By focusing on three key product groups, EEE, clothing and furniture, the report has assessed the challenges and identified opportunities for improving the sector. The study revealed that repair is a multidimensional sector affected by various linked and overlapping factors and aspects that can be categorised into four common areas, as explained below.

8.1 Legal and strategic

The current high level European strategies and policies that have a focus on the circular economy, resource efficiency, ecodesign and waste management have not sufficiently addressed the issues and opportunities for improving the repair sector. Further initiatives and legislation are needed to either complement existing relevant legislation or act independently to improving the conditions for the sector. As an example, shifting the focus of waste management directives from material recovery to waste prevention or other end-of life options can have a significant impact on repair services. This can be supported by definition of repair and reuse targets, similar to waste collection and recovery targets, in the waste management legislation. Other relevant strategies such as the implementation of EPR policies, offer of take back systems and promotion of effective collection systems where repairable products can be separated from waste would have a positive impact on the sector (Lechner et al., 2021; European Commission, 2016; Montalvo et al., 2016).

The study showed that several Member States have individually taken steps at national or local levels to improve repair services. The efficacy of this action could be maximised were they are implemented in a coherent and coordinated way at the EU level involving all Member States (Dalhammar et al., 2020; Montalvo et al., 2016). Furthermore, inclusion of repair requirements in green public procurement practices can create a better market for the sector (Montalvo et al., 2016).

Strategies, such as the extension of warranty and guarantee periods, are recommended to increase consumer rights for access to better repair services and create a balance between the power of consumers and producers, (Laitala et al., 2021; Lechner et al., 2021; Cordella et al., 2019; Montalvo et al., 2016). Prolonging warranties could potentially increase the incentive for manufactures and designers to account for repairs through the quality of materials and the reparability of their product, and is suggested by several authors (Rudolf et al., 2022; Cooper et al., 2021; Laitala et al., 2021). In this context, implementation of the Right-to-Repair Initiative would empower consumers for the green transition and make the broader economic conditions more favorable for repair. As of now, the European Commission is proposing a new right to repair, which states, "*replacement of a defective product would only be available if repair is not possible or more costly than replacement*" ([62]). However, as in many cases repairs are perceived as more costly than purchasing new products, this initiative should also consider how to provide incentives to prioritise repair over new products (Lechner et al., 2021).

One of the main barriers to consumers deciding to use repair services is lack of trust in the quality of their operations. Development of standards and the promotion of a certification system under a common label would encourage consumers to access repair services. This could be further supported by the availability of a scoring system and reparability assessments for the sector and the inclusion of reparability information and requirements in the EU Ecolabels (European Commission, 2016; Cordella et al., 2019).

Improvements in IP rights, including patent rules, licenses and copyright issues, can facilitate repair operations by the private or DIY repairers.

[62] https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)698869 (accessed 6 October 2022)

Foresight studies on new and emerging technologies can support the timely development of policies and regulations for their repair and end-of-life management. For instance, there is a growing market and increasing demand for electric micromobility solutions (e-bikes and e-scooters). As proposed by the Right to Repair Network, future problems from these emerging products streams could be avoided by identifying and considering the potential challenges associated with their repair (Box 8.1) in the current right-to-repair" initiative or the revision of battery legislation.

Box 8.1 Electric Micromobility: the growing market and repair challenges

The transformation of the mobility sector is essential if the goals of the Paris Agreement and the European Green Deal are to be achieved. To reach the targets proposed by the EU for reducing emissions from passenger cars by 2030 (European Commission, 2022a), there has been an increasing growth in the e-mobility sector. This has also led to a growing demand for new types of personal mobility such as powered micromobility or e-micromobility options, typically used for short urban trips.

These emerging mobility options, such as e-bikes and e-scooters, can, on one hand, substitute or supplement fossil-fueled vehicles and reduce their drawbacks (Kazemzadeh and Sprei, 2022). On the other hand, they can contribute to urban transport problems by substituting human powered options – walking or cycling. According to the Confederation of the European Bicycle Industry (CONEBI) ([63]) the number of e-bikes sold in 2020 grew at 32.3 percent and the turnover of e-bike sales grew by 52% to around EUR 10.6 billion in this year. As for the e-scooters, their global market is expected to expand at a compound annual growth rate (CAGR) of appx. 8% from 2022 to 2030[64].

Despite the rapid growth of the sector, there is lack of knowledge about the potential challenges associated with their integration into the traditional mobility and urban planning (Kazemzadeh and Sprei, 2022) as well as their repair or end-of-life management. The existing research is mainly focusing on their environmental impacts, usage patterns and users' attitude, trip patterns, policies, sharing systems and infrastructure characteristics (e.g. trip-end facilities or parking spaces) (Kazemzadeh and Sprei, 2022).

As indicated in a recent article by the Right to Repair network ([65]), the battery packs on e-bikes are known to be the most valuable part of these products, comprising up to 50 % of the overall cost, and, depending on their use, might require to be changed every 2–7 years. Battery failure is often the first or one of the most common e-bike or e-scooter faults. There are three key components in a battery pack: battery cells, the casing and the battery management system; and the two latter components create the main challenges for repair and replacement. This is mainly because they are tailored to specific manufacturers and sometimes to individual bike models.

The key challenges associated with repair of e-bike and e-scooter batteries have been identified.

- Lack of access to battery packs provided by manufacturers, therefore the users are forced to replace their entire bicycle instead of repairing or replacing the pack. This is partly due to the fact that the design, technology and capacity of batteries are constantly changing, which leads to the situation that after few years, the manufacturers no longer produce older models.
- Poor product design, such as welded or glued battery casings that make it difficult or impossible to access faulty parts.
- Lack of access to spare parts.
- Safety issues – according to CONEBI, due to a lack of a certification process, the safety of repaired batteries cannot be guaranteed, even by the professional repairers.

[63] https://www.conebi.eu/ (accessed 6 October 2022)
[64] https://www.grandviewresearch.com/industry-analysis/electric-scooters-market (accessed 6 October 2022)
[65] https://repair.eu/de/news/disposable-e-bikes-the-problem-with-unrepairable-batteries/ (accessed 6 October 2022)

- Lack of evidence on the environmental impacts or benefits of repairing batteries

Given the growing market for these emerging e-micromobility options, it is proposed that this group should be included in the scope of the Battery Regulation and with attention on the specific requirements for their repair.

8.2 Economic and business models

One of the main barriers to repair is the perceived cost of this service compared with the cost of purchase of new products. Reducing VAT rates on repair activities and secondhand goods (Lechner et al., 2021), as well as tax reductions on labour, tax exemptions for repairers for payroll taxes or social security taxes combined with increasing tax on new products and consumption of non-renewable energy sources could contribute to overcoming this barrier (Dalhammar et al., 2020; Lechner et al., 2021; Cordella et al., 2019). The tax related interventions would be more effective were there a harmonised tax level at the EU level.

Another economic instrument that could encourage consumers to repair their items would be the introduction of repair vouchers (Dalhammar et al., 2022). In Vienna, Austria customers can use a repair voucher that will cover 50 % of a repair cost up to EUR 100 once a year ([66]). Such vouchers could be funded by the government, or through a repair fund scheme (Dalhammar et al., 2022) .

Supporting and extending product-as-a-service business models, such as leasing and sharing, similar to those that exist for vehicles, for more product categories could lead to reduced quantities of products put on the market, stimulate the need for repair services and achieve longer lifetimes for products. As such, companies would be encouraged to invest more on maintenance and quality rather than selling new products.

8.3 Technical

Products are often identified as being non-repairable due to their design. Encouraging the concept of design for repair is one of the main enabling conditions for improving the sector. Elements such as product simplification, improved modularity, convenient disassembly options and use of repairable materials in products and their components need to be considered in the design phase. For instance, although most clothing items are in theory reparable, their poor quality is found to disincentivize the consumer from repairing them, as the item is not deemed valuable enough. Encouraging better quality of clothing (and other products) could therefore increase consumers' interest in repairs (Laitala and Klepp, 2015).

Further interventions are needed to improve access to spare parts. In this regards, harvesting of spare parts from unwanted and end-of-life products and improvements in 3D printing and additive manufacturing are proposed as potential solutions to this challenge (Richter et al., 2022). In addition to spare parts, availability of repair tools and repair equipment can facilitate repair operations both for independent repairers and DIY.

Availability and dissemination of technical information and instructions, and the provision of more vocational training for professional repairers are needed to improve and disseminate expertise for this profession. This approach could be further elaborated through increasing knowledge/education for younger generations. The establishment of repair networks can facilitate collaboration and technical exchange between repairers and be a driver for more efficient, effective and better quality repair operations (Lechner et al., 2021). Expanding these networks and alliances among different industries and stakeholders, can lead to improved cross-sectoral collaboration in the provision of services and facilitate access to repair services (Hielscher and Jaeger-Erben, 2019).

More frequent and structured data collection methods on repair operations is necessary to gain knowledge on existing hotspots and identify the key gaps (Tecchio et al., 2019). Moreover, it is crucial to

[66] https://repair.eu/de/news/austria-makes-repair-more-affordable/ (accessed 6 October 2022)

develop and use harmonised data-collection methods applicable to different industries, sectors and among Members States, which would, in turn, facilitate more scientific research and enable the systemic comparison and benchmarking of various factors. The rollout of a European Digital Product Passport would offer a first step in this direction.

Other technical advancements, such as 3D printing, the IoT and image recognition, have the potential to impact repairs positively in the near future.

8.4 Consumer behaviour

This study revealed that more expensive items are more frequently repaired than less costly items, and that economic aspects are important to consumers. Furthermore, having high-quality items is a factor that would encourage consumers to maintain and repair their possessions. This indicates that the price and quality of a product conveys a value for the owner, who will go to greater lengths to maintain it and its value. This knowledge could be used for regulating the quality, and therefore the price of items, as suggested by the European Commission (2018) to address the problem of planned obsolesce (Laitala et al., 2021). Providing faster, more convenient and high-quality repair services could, in turn, increase their adoption by consumers.

People want to gain the knowledge and skills to repair more products themselves. Increasing the availability of knowledge and the teaching of repair skills, as well as individuals' ability to access repair manuals, repair services, workshops and repair cafés, materials and spare parts easily may encourage the consumers to decide to repair their products. This could include increased courses on repair in schools, especially in early grades since Hielscher and Jaeger-Erben (2019) found that early experience of repair behaviour played a key role for confidence in individuals' own skills.

Increasing awareness among the public about the benefits of repair and its role in achieving a circular economy is a key step, which can be supported by organising dedicated awareness campaigns taking local, regional and national contexts and needs into consideration. A common barrier to repair, especially for clothing, is the stigma associated with repaired or mended products and this can be addressed through cultural change. In several studies, participants expressed that visibly mended clothes are associated with poverty and lower incomes. Laitala and Klepp (2018) suggest incorporating mending in a way that includes a creative element, so that its visibility is not as important. This approach is also suggested by McLaren and McLauchan (2015), who argue that to change the negative perception of mending to a positive and enjoyable activity, mended clothes need to be made more visible. This includes repair patterns that are of a contemporary, stylish or personalised, which also makes the mended clothes personal, meaningful and socially suitable. This also has a potential of increasing the emotional attachment, which has been shown in the literature to increase the likelihood of repairing.

8.5 Conclusion

Despite a favourable policy environment, activity levels in the repair sector are either stagnant or declining. As noted above, and in common with other socio-economic systems, there is a complex set of factors at play including legal, strategic or technical issues. In addition, societal behaviours and norms strongly influence consumer take-up of repair. These comprise well-established positive intentions tempered by a range of barriers (perceived and real) including costs, trust and stigma. A strong policy action is needed at EU and national levels to boost this sector as an important element of the circular economy.

List of abbreviations

AI	artificial intelligence
API	application programming interface
B2B	business to business
B2C	business to consumer
CEAP	Circular Economy Action Plan
CONEBI	Confederation of the European Bicycle Industry
3D	three dimensional
DIY	do it yourself
DPP	digital product passport
EEA	European Environment Agency
EEE	electrical and electronic equipment
e.g.	for example (*exempli gratia*)
EPR	extended producer responsibility
ESPR	Ecodesign for Sustainable Product Regulation
EU	European Union
FTE	full time equivalent
GHG	greenhouse gas
ICT	information and communications technology
i.e.	that is (*id est*)
IoT	internet of things
IP	intellectual property
IR	independent repairers
IT	information technology
kg	kilogram
ML	machine learning
MOMS	maintenance order management system
Mt	million tonnes
MSA	market surveillance authority
n/a	not available
n.d.	no date
NGO	non-governmental organisation
OEM	original equipment manufacturer
RReuse	Reuse and Recycling European Union Social Enterprises
SME	small and medium-sized enterprise
UBA	German Environment Agency (*Umweltbundesamt*)
UK	United Kingdome (of Great Britain and Northern Ireland)
VAT	value-added tax
WEEE	Waste Electrical and Electronic Equipment
WFD	Waste Framework Directive
ZDH	Central Association of German Crafts (*Zentralverband des Deutschen Handwerks*)

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