CE100

# EMPOWERING REPAIR

OCTOBER 2016

A COLLABORATION WITH: ebay hp IFIXIT

## ELLEN MACARTHUR FOUNDATION

The Ellen MacArthur Foundation was created in 2010 to accelerate the transition to a circular economy. The Foundation's work focuses on four areas: insight and analysis, business and government, education and training, and communication. The Foundation collaborates with its Global Partners (Cisco, Google, H&M, Intesa Sanpaolo, Nike, Philips, Renault, Unilever) and its CE100 network (businesses, universities, innovators, governments, cities and affiliate organisations), to develop circular business initiatives and build capacity.

## CE100

The Circular Economy 100 is a pre-competitive innovation programme established to enable organisations to develop new opportunities and realise their circular economy ambitions faster. It brings together corporates, governments and cities, academic institutions, emerging innovators and affiliates in a unique multi-stakeholder platform. Specially developed programme elements help members learn, build capacity, network and collaborate with key organisations around the circular economy.

## CO.PROJECT

Co.Projects are opportunities for formal collaboration between CE100 members. They are driven by members, for members and their focus can range from research initiatives to pilots to toolkits. Co.Projects leverage the CE100 network with the aim of exploring opportunities and overcoming challenges which are commonly and collectively faced by organisations making the transition to a circular economy, and which organisations may not be able to address in isolation.

## EMPOWERING REPAIR

The Empowering Repair Co.Project is a collaboration between eBay, HP, and iFixit. The Co.Project's aim has been twofold. Firstly, to take stock of non-commercial repair activity that is currently taking place and identify barriers and recommendations for increasing these activities. The findings are shared in this report. Secondly, to further populate a portal with product information to enable more efficient disassembly and recycling of IT products and data capture which the Co.Project collaborators will continue to build and develop.

Over twenty years ago, eBay created a marketplace allowing people to connect and trade goods. Today, that model is more relevant than ever. The circular economy – preserving the utility and value of products and materials – keeps items in use longer, driving economic, social, and environmental benefits as well as sparking a new way of thinking about the idea of ownership. eBay enables one product to have many lives. Buyers benefit from this with access to quality items at prices they can afford, sellers benefit by turning things they don't need into cash they can use, and the planet benefits by avoiding the environmental impacts of producing new products. Consuming in a more considered way is a choice that comes naturally to many. We were there first and we're continuing to make it easier than ever.

**Contact:** Lori Duvall, Director, Global Impact
**Email:** lduvall@ebay.com

HP Inc is a leading global personal systems and printing business. At HP we believe that our actions should address some of the greatest challenges we face as a society, including climate change, gender inequality, access to quality education and economic opportunity, quality healthcare, and clean and affordable energy. Sustainability is a powerful force for growth and innovation, in the world and at HP. It guides how we do business and drives the way our products are designed, made, used, and regenerated. And it is a focal point as we reinvent our business models and operations toward a materials- and energy-efficient circular economy. We know we cannot do this alone. Working with our partners, employees and customers, we can keep moving forward responsibly, sustainably, and successfully.

**Contact:** Kirstie McIntyre, Director, Global Environment Operations
**Email:** kirstie.mcintyre@hp.com

iFixit is a global online repair community renowned for open source repair manuals and product teardowns. A wiki-based website that teaches people how to fix almost anything is combined with a sales platform for tools and spare parts, creating a repair solution that helps millions of consumers every month and is relied upon by repair businesses around the world. Repair is iFixit's mission - a way to fix the world, one broken device at a time.

**Contact:** Thomas Opsomer, Repair Policy Engineer
**Email:** thomas.opsomer@ifixit.com

# CONTENTS

**Repair is needed to extend product life spans**

**Current impact of the fixer movement**

**Barriers to the fixer movement**

- Lack of repair information
- Lack of spare parts at a competitive price
- Other barriers

**Recommendations**

- Make repair information more available
- Make spare parts and accessories more available
- Design repairable products

**Summary**

**References**

# The Fixer Movement: A Key Piece of the Circular Economy Revolution

Lori Duvall, eBay

Kirstie McIntyre, HP

Thomas Opsomer, iFixit

## Repair is needed to extend product life spans

Consumer culture, fueled by cheap credit and low cost products, has driven the consumption of raw materials by western economies for decades. As consumer culture continues to spread worldwide, so does the depletion of many essential natural resources.

Most modern industrial operations are based on a linear model, in which we take materials, make products, and eventually dispose of those products at the end of their life spans. As evidenced by growing material scarcity around the globe, this linear 'take, make, dispose' model is inherently unsustainable. Too much waste is built in to the system. Indeed, in Europe alone, of the 16 tonnes of material consumed by each person in a year, 6 tonnes become waste (European Commission, 2014). There is a growing acceptance of the need to move toward a more circular economy, which is focused on 'closing (materials) loops' through the more efficient use of resources—in part through extending product lifespans.

Despite increased emphasis on sustainable resource management, recent research from the Öko-Institut in Germany has shown that product life spans of several types of goods are getting progressively shorter (Prakash S. e.a., 2016). Short product lifetimes are especially problematic, as they shorten a product's journey from the cradle to the grave, ultimately contributing to increased waste.

Efforts to move towards a more circular economy have focused strongly on developing policies and processes targeted at lower value options in the waste hierarchy, such as recycling and disposal. This is not always the most resource efficient solution and often entails a loss of material and downgrading of resources (APSRG, 2014). For instance, the valuable rare elements used for manufacturing electronics are almost entirely lost when those products are broken down for recycling (UNEP, 2011).

A vision of a sustainable electronics industry that does not rely heavily on reuse or other lifetime extensions is difficult to conceive (Fitzpatrick, 2015). Unlike traditional recycling methods, reuse strategies—like repair—conserve embodied energy, materials, and water. Moreover, reusing electronics makes more efficient use of scarce materials, it reduces the transportation required to put a product back into use, and it can provide jobs and opportunities within local communities.

As a complement to the rising *maker movement*, which focuses on the creation of innovative new things, the less publicized *fixer movement* looks beyond the throwaway culture and encourages people to repair and reuse broken items (Purcell, 2015). Consumer electronics is a popular category for such repair. Do-it-yourself fixers often find, curate, and contribute resources on electronics repair on the Internet.

The fixing ecosystem is complex, with many dimensions and role players. Hobbyist car repair, for example, already boasts a mature, robust community — complete with a comprehensive collection of available resources for participants. Other categories of products are starting to catch up. Innovative approaches to fixing, upcycling and product life extension are emerging for electronics, clothing, and other product groups, for example, within fixer-focused organizations, like Repair Cafés.

Companies such as iFixit have developed a business model on making repair information, spare parts and/or tools available to the public, so consumers have the resources they need to fix their consumer electronics. Some manufacturers, such as HP, are committed to helping people extend the useful life span of products, by freely sharing service manuals and providing a wide range of service options and product warranties that enable people to repair their devices and maintain product quality. In addition, marketplaces like eBay provide a global conduit for the buying and selling of key repair components.

While many pieces that make up the fixer movement puzzle are easily identifiable, the image remains fragmented and the role of these informal fixing activities in the circular economy has not been studied so far.

This report sets out to assess the scale of these existing repair activities, as well as their potential for contributing to a circular economy and options for enabling and promoting their further development.

# Current impact of the fixer movement

This short report has collected data to provide a snapshot of the non-commercial repair activities undertaken on electric and electronic equipment and household appliances around the world.

Commercial repair is a well-established part of the global economy. For instance, the market size for professional electronic and computer repair in the USA is estimated at 22 billion dollars (Ibisworld, 2015). A report published by Digital Europe states that 118 000 tonnes of electrical and electronic equipment is shipped each year for repair or remanufacturing (Digital Europe, 2014). If we estimate an average weight of 5kg per unit, that would amount to 23 million units shipped for repair each year in Europe.

This report, however, focuses on the less well-documented ecosystem of non-commercial repair. Indeed, many repair activities taking place throughout the world are informal. Various organizations help to stimulate or facilitate non-commercial repair activities.

In just a few years, the Repair Café movement has grown to an impressive size in Western Europe, with a total of 1128 local organizations. Repair Cafés are free meeting places where expert volunteers help visitors to repair broken objects. The success of the first Repair Café in Amsterdam in 2009 prompted the start of the Repair Café Foundation. Since 2011, this non-profit organization has provided professional support to local groups in the Netherlands and other countries wishing to start their own Repair Café.

Similarly, the London-based Restart Project shares information and teaches skills to interested community members — often at free Restart Parties — with a simple goal: to help extend the lifespan of electronics and electrical equipment, and in doing so, keep these products from becoming waste. Through events and information about repair distributed through a variety of media channels, The Restart Project is actively advancing the principles that form the basis of the *fixer movement*.

Similar organizations exist in other parts of the world. In the USA, 'fixer collectives' have been established in New York and Seattle, and there are countless other more or less formalized initiatives aimed at empowerment and community building through repair.

It is clear than an impressive number of appliances are saved by these repair initiatives. However, due of a lack of formalized data collection, it is hard to assess the precise scale of their combined activities. Whereas all commercial companies keep books from which the volume of their business can be inferred, this is not the case for repair activities undertaken by private individuals or non-profit initiatives.

Both the Restart Project and Repair Café Foundation have initiated projects to keep track of actual repairs performed, but comprehensive data sets are not yet available at this point and reported numbers depend to a large extent on assumptions. By extrapolation of average numbers of objects brought in and average success rates, the 2015 annual report of the Repair Café foundation estimates that around 200 000 successful repairs took place over the course of that year at 943 Repair Cafés around the globe (Repair Café, 2016).

As far as the scope of these repairs is concerned, a survey conducted among 317 Repair Cafés from 10 countries showed that the items most frequently brought in for repair are kitchen and household appliances as well as CD and DVD players. There has, however, been a significant increase in the proportion of higher-end micro-electronic products brought in for repair, including tablets, desktops, or laptop computers (Charter & Keiller, 2016). The Restart Project lists laptops, mobile phones and small kitchen items as the most commonly brought devices.

Some information on the volume of repairs can also be inferred from related Internet activity. iFixit is a wiki-based platform that brings together a worldwide repair community and teaches people how to repair various products. Anyone can create a repair manual for a device, and anyone can also edit the existing set of manuals to improve them. The website empowers individuals to share their technical knowledge with the rest of the world.

If the amount of activity on the website is any sort of indication, the volume of repair activities being performed worldwide is impressive. The website currently hosts over 20 000 repair guides and receives about 115 million visits annually. Most of the content focuses on mobile ICT equipment and other small electronic products. A survey conducted among users of the iFixit platform suggested that most users are 'serial fixers', with an average number of 7 items repaired by each user.

Lastly, information about the volume of global repair activities, both commercial and non-commercial, can also be gathered from sales data of repair parts, especially via online marketplaces such as eBay.

For instance, in 2015 more than eight million computer parts and more than 9.5 million mobile phone parts were sold through eBay's UK and USA websites combined. With about 330 million phones sold annually in Western Europe and the US, this amounts to ca. 1 spare part for every 35 phones sold. It is difficult to determine the exact volume of non-commercial repairs based on these data, as some repairs require more than one spare part and professional repair services may also purchase parts through eBay—just as private individuals may purchase parts elsewhere. But while much of this evidence is circumstantial, these numbers definitely suggest that consumers engage in a considerable volume of non-commercial repair.

# Barriers to the fixer movement

Although the fixer movement seems to be gaining momentum, it is clear that its potential is not fully utilized at this point due to several critical barriers.

Last year, 63% of products brought in for repair where successfully repaired at Repair Cafés, leaving 37% unrepaired for various reasons, which have not been systematically studied so far. Data gathered by the Restart Project show similar results, with 32% of broken devices designated as theoretically repairable but not repaired at Restart events. Over 80% of respondents to a recent survey among iFixit users also indicated they had recently tried to repair something, but did not succeed (iFixit, 2013).

Far and away the most commonly cited reason by participants for an unsuccessful repair was lack of information: not being able to figure it out and/or not finding a suitable guide on the iFixit website was mentioned as a cause for one out of three failed repairs (32%). The next major causes are related to spare parts: either people were unable to find any (17%) or they found them too expensive (18%). The Restart Project's data gathering tool does not track the availability of information as a cause for failed repairs, but it does list whether spare parts are required for repairs. Of the objects listed as repairable but not repaired, 36% would have required a spare part (Restart Project, 2016). Other reasons for non-successful repairs as mentioned by iFixit users included lack of access to the required tools (16%) or the repair being too time-consuming (13%).

It seems clear that addressing the two key issues—repair information and spare parts—could unleash a massive additional potential for product lifetime extension through non-commercial repair.

## Lack of repair information

Access to repair information is of crucial importance for enabling repair, especially for repairs performed by relatively inexperienced participants.

Seventy-seven per cent of Repair Cafés access product manufacturer's websites during the course of their repairs. As most manufacturers do not provide free access to repair guides, repairers frequently seek out information on other platforms. Half of Repair Cafés also access online repair videos and 45% access online repair forums, where the public shares knowledge and tips on product repair. Without such websites and online repair forums, many electronics repairs could not realistically be attempted at Repair Cafés (Keiller & Charter, 2015).

While many respondents to the iFixit survey quoted lack of information as a reason for failing, an overwhelming majority (91%) confirmed, on the other hand, that access to the right information was key to a successful repair, stating that the platform's free repair guides had enabled them to do a repair they wouldn't have done otherwise.

However, in spite of a massive effort on behalf of the repair community, easily accessible repair information is lacking for the vast majority of consumer products. Such is the number of products flooding the market year by year, that the community cannot crowd source enough repair guides to keep up with the onslaught of new products.

Comprehensive repair information covering the majority of products in use at any given time can only be achieved with the collaboration of the product manufacturers. Many manufacturers possess a wealth of repair-relevant information for purposes of manufacturing or commercial after-sales service. It is much more efficient for this information to be shared directly from manufacturers than for the repair community to create the required information by a reverse engineering process.

## Lack of spare parts at a competitive price

For products at the lower end of the market, some manufacturers do not make any spare parts available to the public. Even for high-end products, spare parts can be expensive when compared to the price of a new product. In part, this is due to the logistics of spare parts management: an important number of different items with a proportionally lower value need to be stocked and shipped, while tracking each item to match the right spare part to each product. However, marketing strategy also plays an important role in parts price setting, and the price proportion of spare parts and new products can vary wildly from one brand or product to another. Manufacturers may also control the distribution chain for spare parts in such a way as to make it very hard for consumers to identify and purchase the correct spare part.

One option for making more spare parts available at competitive prices would be to harvest components from discarded devices. Of the spare parts for mobile phones offered on sale last year on eBay.com and eBay.co.uk, only about 5% were marked as used or refurbished parts. For computers, however, 41% of parts offered on eBay.com and eBay.co.uk were marked as used or refurbished parts, indicating that the second-hand market for computer parts is already well established. Hopefully, the mobile phone market will increasingly utilize used and refurbished parts as the market matures.

There is a clear potential for leveraging repair and reuse if a symbiosis could be created between various parties involved, enabling easy identification and sales of used parts and products. Ideally, any owner of discarded or faulty electronics—be it a private customer or company—would have easy access to repair information and information on the cost of the required spare part, be it new or used. With this information, parties engaged in repair could estimate what it might cost to repair the device in-house or have it repaired, or what profit could be made from selling the device as a whole or as individual components. This would require manufacturers, collection schemes, recyclers, knowledge providers and sales platforms to work together in order to share relevant information and facilitate the sales of second-hand or harvested components.

## Other barriers

Other barriers exist that could be studied and addressed to increase the potential for repair. Product design is often a decisive barrier: indeed, the design of a product determines to what extent and how easily it can be repaired, and there is substantial room for improvement in this area for many product categories.

Many manufacturers have also been historically resistant to endorse repair activities that take place outside of their authorized service networks. Often, they cite liability concerns as a reason not to endorse private repair, and clarifying the legal state of affairs might further the debate.

Consumer awareness about repair and repairable products could also be increased through information campaigns and product labels. Such campaigns might incentivise consumers to buy repairable products and have them repaired, which would in turn create an incentive for manufacturers to produce repairable products. Though some research has been conducted on repair propensity and psychological factors affecting the decision to repair or replace a product (e.g. Scott, 2015), this could be further studied in order to develop adequate measures for stimulating repair.

# Recommendations

Efforts to help empower the fixer movement and use its potential for greater resource efficiency through product life extension should focus on the following topics:

- **Make repair information more available**
    - Online platforms for repair information can greatly facilitate repair and increase confidence of fixers to make a successful repair. These include easy-to-search platforms to access repair instructions and/or videos, as well as fixer community websites, forums, and blogs to provide advice and expert help. Initiatives for sharing repair information online should be encouraged and spreading existing repair information should not be penalized.
    - Manufacturers should make repair information available:
        - As soon as a product is launched;
        - To all interested parties, including non-profit repair initiatives;
        - Free of charge.
    - Manufacturers should collaborate with existing platforms for repair information.

- **Make spare parts and accessories more available**
    - Manufacturers should make spare parts available:
        - For a period after manufacturing that reflects the potential product life;
        - To all interested parties, including non-profit repair initiatives;
        - For a price that reasonably reflects the part production cost.
    - Manufacturers, collection schemes, recyclers, knowledge providers and sales platforms should work together to facilitate the sales of second-hand or harvested components.
- **Design repairable products**
    - Products should be entirely assembled by reversible means such as screws instead of glue, rivets or non-reversible snap locks.
    - The use of proprietary fasteners should be avoided.
    - Batteries should be easily replaceable, preferably without the use of any tools, and should not be glued or soldered to a product.
    - Components should not be integrated to such a degree as to make individual replacement of functional components impossible.

## Summary

The current environmental impact of the largely informal fixer movement is difficult to measure. Nevertheless, it is clear that the volume of non-commercial repair is significant and that these activities offer considerable potential for reducing our product footprint, provided that some key barriers are addressed and eventually removed. Improving availability of information and spare parts would greatly encourage and increase repair by non-commercial organisations and individuals. This requires collaboration between product manufacturers and all parts of the value chain.

## Are you ready to empower repair?

"As a private or professional user of products, you can commit to using your products longer by exploring all repair or upgrade options before replacing them. This includes not only professional repair services but also non-commercial options such as the ones described in this report. Whenever possible, take options for repair into account when making purchasing decisions.

If you are a hands-on person, regardless of whether you already have some repairing skills or not, you can find ways to get involved in repair. In some form or other, repair is surely happening close to you. Besides the formal education system, you can often learn by doing. You can engage in repair on a volunteer basis or even make a career out of it.

As a producer, first and foremost you can design your products to be as repairable as possible. Secondly, you can enable repair options by making available spare parts and relevant information to stakeholders, including those involved in non-commercial repair activities.

As a retailer or any other actor in the product value chain, you can also play an important role in this process.

For just about any commercial organisation, fostering repair can be a way to work towards a more circular economy. If you want to explore ways in which your company could engage to empower repair, please get in contact with one of the authors of this report."

**Thomas Opsomer, iFixit**

## References


- APSRG (2014), *Triple Win, the social economic and environmental case for remanufacturing. A report by the All Party Sustainable Resource group of the UK Parliament*.
- Charter (2014), *Makers and Fixers: Circular Economy & Grassroots Innovation*
- Digital Europe (2014), *Trans-Boundary Movements of Waste Vs Used Goods. Input to Basel Convention Technical Guidelines*
- Fitzpatrick, Colin (2013) in *E-waste management: from waste to resource* ed. Klaus Hieronymi, Ramzy Kahhat and Eric Williams.
- Ibisworld (2015), *Electronic & Computer Repair Services Market Research Report* (http://www.ibisworld.com/industry/default.aspx?indid=1702)
- iFixit (2013), survey among iFixit users
- Keiller, S. & Charter, M. (2015) *Repair Cafés: Implications for Product Developers and Designers.* Proceedings of the 20th International Conference on Sustainable Innovation pp 140-147. ISBN 978-0-9543950-8-7).
- Martin Charter & Scott Keiller (2016), *The Second Global Survey of Repair Cafés: A Summary of Findings*
- Prakash S. e.a. (2016), *Einfluss der Nutzungsdauer von Produkten auf ihre Umweltwirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen „Obsoleszenz“* (UBA Texte 11/2016).
- Purcell (2015), *The Rise of the Fixer Movement* (https://www.linkedin.com/pulse/rise-fixer-movement-lee-purcell)
- Repair Café (2016): *Stichting Repair Café Nederland, Repair Café jaarverslag 2016*
- Restart Project (2016), First batch of repair data gathered in fix-o-meter
- Kristin Scott (2015), *To Repair or Not to Repair: What is the Motivation?*
- United Nations Environment Programme (UNEP) (2011), *Recycling of Metals: a Status Report*

www.ellenmacarthurfoundation.org
@circulareconomy

The Circular Economy 100 (CE100) is an Ellen MacArthur Foundation initiative.

Ellen MacArthur Foundation • Charity Registration No: 1130306
OSCR Registration No: SC043120 • Company No: 6897785