

Design-driven repair: understanding ancient and contemporary product repair practices in Latin America

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Abstract:

Repair is presented as one of the desirable strategies in the framework to develop the Circular Economy (Ellen MacArthur Foundation, 2012). However, not many products which are suitable to be repaired are in fact actually repaired. Products end up in landfills or are incinerated when they still have value to deliver. From a design perspective, technical issues have been addressed and there are actions that can facilitate product repair. Despite these actions, there are other issues related to the desire and emotions involved in the process of repairing that have not been thoroughly studied in a design context. This paper investigates ancient and contemporary repair practices aiming to understand the motivations, obstacles, and conditions that could highlight opportunities to intervene early in the design process to favour product repairability based on social and cultural issues beyond the technical concerns that have already been taken into consideration.

Keywords: design; repair; circular economy; regenerative culture

1. Circular Economy

A Circular Economy is supported by biological and technical cascades in which products circulate to assure all the value is extracted from them before their final disposal, and residual materials return to the earth not causing harm (Ellen MacArthur Foundation, 2012; European Commission, 2020; Kok, Wurpel, & Ten Wolde, 2013). This new production and consumption logic proposes to keep “products, components, and materials at the higher utility and value at all times” (Bjørnset, Skaar, Fet, & Schulte, 2021; Ellen MacArthur Foundation, 2012; Masi, Kumar, Garza-Reyes, & Godsell, 2018). The concept of Circular Economy collects the insights and ideas of previous approaches such as cradle-to-cradle (Braungart & McDonough, 2002), eco-efficiency, sustainable product-service systems (Gottberg, Longhurst, & Cook, 2010; Hernandez, 2019; Hernandez, Bhamra, & Bhamra, 2012; Manzini & Vezzoli, 2002; Mont, 2002), and design for sustainability (Bhamra & Hernandez,

2021; Bhamra, Hernandez, & Mawle, 2013; Bhamra & Lofthouse, 2007), and present them in a comprehensive framework to businesses desiring to make a transition or to initiate themselves a circular business model (Moreno, De los Rios, Rowe, & Charnley, 2016; Nußholz, 2017). Acceptance levels have been very promising, especially among large businesses and policy makers (Bjørnbet et al., 2021; Ellen MacArthur Foundation, 2016; Enkvist & Kleinas, 2018). In general, important environmental and social benefits are recognized in a circular economy and it is currently the most likely concept to help to achieve a more sustainable society (Enkvist & Kleinas, 2018; Moreno et al., 2016).

Focusing on the technical side of this discussion four main strategies are presented as the basis of the continuing circulation of products: reuse, repair, remanufacturing and recycling (Ellen MacArthur Foundation, 2012; Mestre & Cooper, 2017). The fewer resources that are needed to maintain products circulating in the system the better the strategy is (Blomsma et al., 2019; Hernandez, Miranda, & Goñi, 2020). In this sense the preferred option is to reuse products without investing further resources in them other than cleaning and low maintenance supplies (Bakker, Mugge, Boks, & Oguchi, 2021). Repair is the next most desirable option, in which products require small fixes to continue delivering their value and fulfilling their original function (Bakker et al., 2021; Blomsma et al., 2019). Remanufacturing is a strategy that involves major interventions in the products, usually changing parts and even updating functionalities (Bakker et al., 2021; Blomsma et al., 2019). Finally comes recycling, an option frequently selected as the way to deal with a product after its use (Goodship, 2007), however, in reality it should be the last option and then only for products that have already circulated through the system many times, and where there are no other alternatives.

Design plays a major role in developing products that will perform successfully under reuse, repair, remanufacturing, and recycling scenarios (De los Rios & Charnley, 2017; Hernandez, 2019; Lofthouse & Prendeville, 2018; Nogueira, Ashton, & Teixeira, 2019). The Ellen MacArthur Foundation recognizes design as one of the building blocks of the Circular Economy (Ellen MacArthur Foundation, 2012). Its influence is associated with the direct design of products but also with the design of business models that support these new types of products (Nußholz, 2017; Sumter, de Koning, Bakker, & Balkenende, 2020).

2.Design Driven Repair

Between the technical strategies proposed in the Circular Economy, repairability is a very interesting alternative that can encourage consumers to keep their products for longer before they dispose of them (Ackermann, 2018; Lee & Wakefield-Rann, 2021; Nazlı, 2021). Despite the common sense that comes with the idea of repairing before replacing old products that still have value, the reality is that repair has declined significantly in recent years (Jaeger-Erben, Frick, & Hipp, 2021; Nazlı, 2021). Perverse market incentives and technical issues have inhibited consumers to repair their products, such as lack of repair centres, difficulty to find parts and tools, lower prices of new low-quality products, intellectual property, and poor designs for example (Grafström & Aasma, 2021; Hernandez et al., 2020; Laitala, Klepp, Haugrønning, Throne-Holst, & Strandbakken, 2021; Svensson-Hoglund et al., 2021).

Before the Circular Economy was a popular concept within academic research and industry, there were significant advances in repairability in areas of study such as eco-design, ecoefficiency, and design for sustainability (Bhamra & Hernandez, 2021; Bhamra & Lofthouse, 2007; Kim, Cluzel, Leroy, Yannou, & Yannou-Le Bris, 2020). In this context concepts such as design for disassembly, design for repair, design for serviceability, or design for maintainability have contributed to make product

repair more feasible from a technical perspective (Sassanelli, Urbinati, Rosa, Chiaroni, & Terzi, 2020). Not all of these approaches were aimed explicitly to produce positive impacts on the environmental or social performance of products, some emerged to increase efficiency and productivity, but in general all have contributed to make products more repairable.



Figure 1. Example of pottery repaired following the Kintsugi practice. Daderot. (2014)

Despite the technical opportunities that design can embed in a product to make it more repairable (Cordella, Alfieri, Clemm, & Berwald, 2021; Laitala et al., 2021), the fact is that for different reasons nowadays repair is not the first alternative users consider when a product fails (Jaeger-Erben et al., 2021; Laitala et al., 2021; Nazli, 2021; Svensson-Hoglund et al., 2021). Beyond technical obstacles to repair there are other issues related to the desires, emotions, and motivations of consumers that should drive product repair that are not totally understood from a product design perspective (Jaeger-Erben et al., 2021; Laitala et al., 2021; Nazli, 2021). There are historical examples of practices like *Kintsugi* in Japan (Keulemans, 2016; Montesana, De Benedetto, & Fiorentino, 2018), where repairing a product is considered an art. Scars of broken pieces of pottery are fixed and decorated with gold making the repaired product even most valuable than the original one (economically and emotionally) (Bridgens, Lilley, Zeilig, & Searing, 2019; Buetow & Wallis, 2019). But what motivates people to invest and to dedicate time and effort to bring a broken cup back to life in this ceremonial way? What are the motivations that lead users to prefer a repaired product over a new one? How can we avoid the typical view that a repaired product has value less than a new one?

In this paper we address these and other related questions to explore the role that design can play to encourage product repairability beyond the technical aspects. In order to do so, we first explore two case studies to recognise the characteristics that have made repair popular at certain times and in particular geographical locations, and also explore current views on repairability. The aim of this

paper is to illustrate how product repairability can be motivated and facilitated through decisions made early in the design process. Decisions motivated by cultural and social issues that can affect tangible and intangible features of the product.

3.Exploration of Case Studies

In this paper, we will explore and compare two different case studies (Yin, 2012) of repair practices in two very different time periods of Latin American. To construct these case studies, we used publicly available secondary data (Reddy & Agrawal, 2012). Both case studies reflect culturally rich repair experiences originating from Latin America. In this article, we will present the document analysis originating from secondary sources in the expectations that this will be blended with qualitative interviews (Owen, 2014) in a larger publication.

3.1 Case 1: Ancient repair practices in northern South America

Until quite recently, not much was known about the so-called ‘early’ or ‘ancient’ repair practices of Latin-American indigenous communities, as much of the anthropological attention has been focused on Europe, Middle East and Asia (Rodríguez Larrota, 2019). Perhaps one the most substantial efforts to document Latin American traditional repair practices was conducted by the Colombian Museo del Oro (Museum of Gold) that culminated in the 2018 series of expositions, conferences and public engagement activities called “Esto tiene arreglo” (This can be fixed). Throughout the documentation conducted by the Museum, many insights can be drawn about the cultural dimensions of object repair in prehispanic Latinamerica (200BC -1600AD).



Figure 2. Example of pottery repaired in ancient Latin American communities. Banco de la Republica (2018)

The case of the cast filigree earrings from the Zenú archaeological area (Gómez Forero, Valencia Andrade, & Obando Arango, 2019) and the pre-hispanic pottery repairs in Colombia describes the technical proficiency of the materials and techniques used in product repair (Rodríguez Larrota, 2019). These ancient techniques were often used to integrate missing pieces into valuable objects from everyday life or from ceremonial usage. Among the documented repair techniques, the research includes the displacement of strands, selective hammering, addition of inter-weave metal, and dripping of the cast metal. In terms of materials, one of the main findings of the pottery repair case study is the widespread use and efficiency of bee wax in the repair process.

According to the analysis, most repairs used the same tools used for manufacturing and mostly at the same location. This documentation shows the advanced technologies of repair used by the indigenous Latin American people (Gómez Forero et al., 2019) and its social organization as a communal endeavor. These examples of pre-hispanic repair help to map the technical choices used by ancient communities, but also serve as a reminder of the value of imperfection that was inscribed into repaired objects, both in this context and other documented cases (Rodríguez Larrota, 2019).

Two additional findings can be extracted from these case studies. Firstly, that Latin American indigenous communities held a notable but mostly ignored tradition of product repair. Secondly, that despite these initial efforts, more research is needed to illuminate how these ancient repair practices were embedded in cultural value systems, economics and ideology (Rodríguez Larrota, 2019). As Gómez Forero et al. (2019) assert: “If an object suffers deterioration or damage at some point in its history, discarding it or not will depend not only on the decision of its creator or owner, but on its meaning, the affection that it has, its utility or the technical complexity that its elaboration implied” (p.59).

In summary, these ancient repair experiences offer a great learning experience for contemporary repair practices. On the one hand, they illustrate the socio-technical complexity of repair practices, that in this case, reflect a community driven mentality in which the manufacturing of products was directly related to its repair. On the other hand, they offer a set of ancient traditions, including repair techniques and materials, that need to be further explored, but can inspire contemporary ways to reimagine and re-design repair practices in the spirit of reconnecting with the indigenous knowledge that continues to influence Latin-American culture.

3.2 Case 2: Club de Reparadores (Argentina)

There are multiple ways a product can be repaired nowadays. It can happen in repair centres offered directly by producers, it can be done by third parties, a neighbourhood repairman, or directly by users. In all forms of repair, mass consumer products are repaired less now than some decades ago (Jaeger-Erben et al., 2021; Laitala et al., 2021). However, directives such as the “right to repair” promoted in the European Union have grown the interest in product repair for its economic, environmental and social benefits. Another force driving product repair into practice has been the community meetings to repair (Club de Reparadores, 2021; Repair Cafe, 2021). Between these social initiatives to repair, one recognized as a pioneer is the *Repair Cafes Initiative* (Normoyle & Tegtmeyer, 2017). It was born in Amsterdam around 2007 promoted by Martine Postma (Repair Cafe, 2021).

In these repair meetings, people gather together to repair their products, including electric and electronic appliances, clothes, toys, and bicycles, amongst other things. Organisers usually provide materials and tools to repair, and they invite expert volunteers (Repair Cafe, 2021). In South America,

one of these initiatives is the “Club de Reparadores” in Argentina (Galluzzo, 2021), it was founded in 2015 by Mariana Pla and Melina Scioli, inspired by previous experiences like the *Repair Cafes* in Europe (Club de Reparadores, 2021). This “Club” is an itinerant event run at different locations in the country focused on electric and electronic appliances and textiles (Winwins Argentina, 2017).



Figure 3. Gathering at one event of Club de Reparadores. Source: Club de Reparadores

Analysing the strategic interests declared by the founders and their manifesto, it is possible to see the motivations they want to push forward, the obstacles they see in product repair and the benefits it can produce. Between the most straight forward motivations declared by the founders, there is the fact that repair is one way to extend the product life span and reduce waste (Club de Reparadores, 2021). They recognize the value product repair has as a technical strategy part of the circular economy framework. There is a clear vision that positions product repair as a sustainable practice (Club de Reparadores, 2021). Interestingly, their motivation to organise these events goes beyond the environmental impact they can reduce. It is mentioned that these events aim to build community relationships, generate employment for local repairers, promote innovative technologies

like 3D printing, revalue traditional trades (Winwins Argentina, 2017), and fight against planned obsolescence (Club de Reparadores, 2021).

Concerning the perception people who attend these events have of repaired products, the Club of Reparadores declare that one of their objectives is to give value to the relationship people have with their objects. They even mention the idea that objects should pass from one generation to the next one (Club de Reparadores, 2021). There is also the implicit idea that repair empowers people, for example, sharing in an open-source fashion what is learnt during the repair events. Mariana Pla mentions the lack of knowledge as one of the obstacles people face when they want to repair (Winwins Argentina, 2017).



Figure 4. In the events organised by the Club de Reparadores, different actors of the community come to work together: volunteers, repairers, neighbours. Source: Club de Reparadores

In conclusion, social gatherings to repair products, such as the ones organized by the Club de Reparadores, have interesting cultural aspects that go beyond the reduction in waste that results from product repair due to the extension of the product's life. Multiple socio-technical aspects in

these repair events align with having a regenerative culture based on value greater than the resources embedded in the products, building communities, empowering people, and creating sustainable lifestyles. How much of these motivations and efforts can be translated to other spaces of contemporary repair, and what is the real impact these gatherings have in terms of numbers of products repaired are questions that have to be addressed in further investigations.

4. Discussion

The two case studies explored in this paper share parallels and interesting tensions. In both cases, they observe how both ancient and contemporary cultures of repair are often time driven by engaged communities and embedded in socio-technical practices that reflect on a society's technologies, habits and social norms. Whether using bees wax or 3D printing, people repair in their communities because they care about their objects.

The case of "Club de Reparadores" adds clear political connotations in their imagination of repair. To repair is to fight against unsustainable manufacturing processes, a way to re-value traditional jobs, a way to educate consumers and to empower people in a broad sense. The meaning of repair to the pre-Hispanic indigenous communities in Latin America is still understudied. Still, at the very least, we can infer from their material legacy that the products' repairs were visible and noticeable because they reflect on a culture in which imperfection was considered, and repair was an established practice even if we don't know the exact meaning of it.

Some interesting contrasts can also be made when comparing both cases. Table 1 summarizes the preliminary findings of this research project contrasting these two different contexts of Latin-American repair. This table displays what sorts of tenets, processes and symbolisms were embedded in the two cases. "Club de Reparadores" is conceived as a nod to a much larger universal and international experience. In this sense, it is the 'importation' of a repair ideal that has its roots in northern Europe. The leaders of the Club have notably done an interesting job in integrating that format into the aspirations and struggles of their own communities, but from the perspective of design decolonization there may be lessons to extract from indigenous and local knowledge in order to bring about fully culturally-driven repair. Can we re-interpret the way we design repair experiences integrating techniques and materials from our cultural heritage and emergent technologies invented internationally? Can we extract practical wisdom from the social organization of repair in traditional communities (for instance, in the close spatial connection between manufacturing and repair)? Can we manage to even 'export' design-driven repair ideas to the world and thus re-situating Latin America as a knowledge producer rather than just consumer?

Table 1

Comparison of the two case studies regarding main emphasis given

	Ancient repair in Northern Latin America	Club de Reparadores
Reasons to repair	Psychosocial: Extend the lifespan of valuable objects	Ecological reasons: Extend lifespan of products and reduce waste Economical: Save money when buying new products

		Political: Revalorize repair jobs in the country and fight against perverse principles like design for obsolescence
Repair design	Integrated with the manufacturing process Communal endeavour Making damage visible	Driven by emergent technologies Collaborative and horizontal Integrating repair workers Sharing knowledge and skills to empower products' owners
The repaired object	Different than the original Value in imperfection Valued by the resources and time embedded into it	Same as the original Value in recovering the object's functionality Emotionally attached

As table 1 describes, there are many complementing elements and joint lessons to be drawn from both cases. We propose that design may offer a way of addressing, expanding and critically examining this complexity exhibited by the cases. A design-driven repair agenda that is centred on decolonization and democratization can find ways to integrate the old and the new, the local and the external, the technical and the symbolical. Through design, this experimentation can lead to new products, services and systems to engage people with repair and raise awareness of the fact that the way in which we care about our objects speaks about who we are and where we are heading.

In particular, we observed that a Latin-American agenda for design-driven repair should address the challenges of rethinking the way we repair through reconstructing repair as a communal endeavour, as our firsts people did, and a process that highlights the passing of time and transformation of matter instead of hiding it. However, it should not be indifferent to the global challenges, such as sustainability or the new possibilities given by emergent technologies. As emphasized by El Club de Reparadores, this task should also make use of the expertise of our local repair professionals and think about how to excite newer generations not accustomed to product repair. In sum, we see the Latin-American agenda for design-driven repair as one needing design for creating experiences, for re-imagining productive processes, for making cultural critic and re-designing products in a manner that can produce this image and be guided by these cultural values.

Design-driven repair can become a powerful path to achieve technical benefits based on the continuing circulation of products. It also has the potential to change our mindset towards more sustainable lifestyles. Still, to capitalize on that opportunity, it has to consider the traditions and socio-cultural aspects that shape repair practices, motivations and obstacles that differ between territories and communities. A real, more sustainable future cannot be imposed as has been the case with other ideas in the past. There is a great challenge to produce design tools and frameworks that can orient the design of products that facilitates and propitiates repair, integrating technical and non-technical aspects considering local knowledge and cultural identity.

Comparing ancient repair practices with current communitarian efforts aiming to increase the number of people involved in product repair is part of the path we should follow to understand

better the conditions required to establish repair as a common practice. Beyond ecological gains, product repair is a sensible way to manage our relationship with our material environment. It can potentially change the way we satisfy our needs in a manner better aligned with the preferable future we enunciated in the late 80s when the term “sustainable development” was first coined.

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