"We Not Only Repair Our Devices, But Also Our Relationship With Them": Repair-led designing at the Restart Parties Barcelona

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E-waste is the fastest growing type of waste. In parallel, waste management and growth oriented narratives towards circular economies are increasing. However, informal responses resisting these dominating logics working to avoid e-waste are also proliferating. An example of the latter is The Restart Parties (RP), free public events where volunteers and participants repair their own appliances. To achieve large-scale validation, repair initiatives like the RP are pushed into demonstrating quantitative outcomes (e.g. no. of repaired appliances, Kg of avoided e-waste and Co2), often overlooking broader cultural values and achievements. Here we draw from design ethnographic fieldwork (2021) with the RP Barcelona, and share six analytical spheres (ecological, economic, design, epistemic, socio-communal, and wellbeing) to unpack qualitative expressions of *repair-led designing* and *design-led repairing*. In doing so we contribute to the generative intersection between brokenness, repair and design in advancing counter narratives with practical, political, theoretical and affective implications.

Key words: Repair, sustainable design, e-waste, revaluing, reuse, care, co-design, design ethnography

INTRODUCTION

Electronic waste is the world's fastest-growing domestic waste stream and considering the low rate of collection and recycling (only 17.4% of 2019's e-waste, which was 53.6 million metric tonnes (Mt), predicted to reach 74 Mt by 2030 by Forti et al. (2020)) it supposes a significant environmental problem. Due to the toxicity of materials that pollutes lands, water, air and informal recyclers' bodies, especially of those receptor territories of -mostly illegally exported- e-waste. Despite the uneven distribution of damages that extend beyond the EU, here we focus on the EU territory as it is the context where the case study is allocated and where preventive repairing actions need to take place to face its own e-waste responsibilities.

In order to monitor and measure the impact of every EU country on e-waste collection and treatment systems, the EU dictated a Directive that has been transposed into State Law by which the Index of collection of WEEE (Waste from Electrical and Electronic Equipment) volume is expressed on Kg, Kg/habitant and the % of average weight of electronics introduced in the markets during the last three previous years. In coherence, civil society initiatives that work on e-waste prevention and repair, follow these same or very similar 'official' parameters for validation and legitimation by administrations and institutions.

One of these initiatives is The Restart Project, “a people-powered social enterprise” born in London, UK in 2013, and operating now in over 20 countries by hosting “Restart Parties”, “where people teach each other how to repair their broken and slow devices” (see https://therestartproject.org). In this paper we focus on the local group of Restarters BCN, who have been launching Restart Parties (RP) and supporting the creation of neighbourhood repair communities in Barcelona since 2015 (https://restartersbcn.info/en/mainpage-english/). Generally hosted on weekends with a combination of people involved who in this paper we refer to with pseudonyms and based on their roles as: volunteers (for host organisers) and participants (for attendees). At times we diffuse this distinction and refer to both as repair practitioners or “restarters”.

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Despite recognizing the need and utility of comparative measures, environmental metrics can overlook broader cultural values and achievements. As The Restart Project states: “We Not Only Repair Our Devices, But Also Our Relationship With Them". However, what other impacts does repair foster that cannot be perceived by such quantitative measures? Are there other kinds of “repairs” beyond devices’ functionality during the acts of repair? In this article we seek to explore these inquiries and offer insights from our practice-led, interdisciplinary and participatory case. By exploring the multiple effects, benefits and tensions that community repair actions entail, we identify the opportunity to advance *repair-led designing* and *design-led repairing.* A conceptual and practical proposition that brings together brokenness, repair and design.

This proposal entails a shift in which qualitative relational care acts contribute as much as quantitative metric counts. And where the effects of repair initiatives from an ecological angle are valuable for more than the tons of waste reduced, or the material efficiency narratives that frame environments as resources for human projects. An eco-ontological shift that sees people in relation with materials from a lively perspective (Bennet 2010; Ingold 2013; Tsing 2015), systemically composed by a diversity of elements sharing worlds and affecting each other from multiple directions - continually making, breaking and mending each other. Moreover, this conceptual questioning of for example the ‘environmental’ and ‘ecological’ meanings of sustainability that repair practices are involved in (among other concepts), are a manifestation of “repair in a broader sense, as a theory-making practice” (Martinez 2019, 6), "with which to “fix” and extend received bodies of social scientific thought" (Jackson 2018, 339). This matters because it reveals some of the practical implications that narratives and languages of design (Ehn 1988) have in materialising and articulating world organising agendas (e.g. UN Sustainable Development Goals), thus demonstrating the political implications of design more generally.

Repairing design while repairing electronics

The brokenness of design products mirrors broken aspects of design's onto-epistemologies. What is known of the products functionality and their reason of being is challenged as these things fail to work, as their material fragility gives them a rebel agency to quit performing their intended services. Brokenness emerges unexpectedly, altering routines and reminding humans involved, of their roles beyond users, as maintainers. This shift also brings attention to the socio-material power dynamics at play with our things, which reclaim their positions as more-than-human participants in everyday life. The repair of electronics facing failures, wears and brokenness of potential e-waste highlights the role of design as an accomplice discipline of eco-social damage (Papanek 1972). At these instances of brokenness when people engage in tasks of maintenance to assess the material, technical and functional interruptions, repair "refers to embodied acts of completing things that stand in a stage of in-betweenness, engaging with signs of use and giving to disassembled pieces the opportunity for recovered meaning." (Martinez 2019, 10).

Repairing, as Giulia Costa states, "is an individual choice as well as a political one" (2020, 33). As Schmid further says, to repair is to "critically intervene in and attempt to solve societal crises but in ways that foreground equality, openness and social justice" (2019, 230). The politics of repair bring into dialogue "different paradigms such as green economy, sustainable development, post-growth or postcapitalism." (Schmid 2019, 243). The extent of these political implications of repair as Henke argues (see also Ureta 2014), can be either for "maintenance" or "transformative" purposes,

> Typically, those invested in and benefiting through the existing structure of a system will prefer a repair as maintenance approach. Repair as transformation is more often proposed by those critical of established infrastructures, or in times of repair crises, where the very existence of a structure is called into question. (Henke 2019, 272).

In turning our attention to the relationship between design and repair we build on Crosby and Stein's proposition of "repair as design and designing for repair" (2020, 180-181), designing for repair they argue "includes considerations of durability, longevity and material affordances", for designs to "change over time: designing to allow objects, codes and systems to be opened, disassembled, or altered." (2020, 182). From the former perspective of repair as design, design scholars have explored multiple ways in which people use, appropriate and modify things 'after' and besides these have left the hands of designers and manufacturers. Such visions have been conceptualised and analysed in terms of "design-after-design" (Redström 2008; Ehn 2008); "design-in-use" (Wakkary and Maestri 2008; Maestri and Wakkary 2011); "designs with other names" (Calderón Salazar and Gutiérrez Borrero 2017); "designing-after-use and designing-before-reuse" (Duque 2018); and as design strategies to deal with the "aftermath of design" (Lindström and Ståhl 2020).

These propositions challenge some of the conventional design's "aspirations for sleek, seamless, and human-centered forms. It means embracing bricolage and remix as we design for uncertainty and complexity in more-than-human systems" (Crosby and Stein 2020, 182). Open and "support a more plural, democratic and equitable process" of making. (Udall 2019, 277). The "repair-making" and a "craft of repair" that as Harvey proposes "is both a craft of its own, and part of the craft of creating" (2019, 430) that "is more than simply material, it is social and political too" (2019, 438). Then, the processes and outcomes of repair as political design crafts stand independently from the designers, manufactures and ethics that initially made these. Broken materialities hold traces of its design origins, and become overlapped with the repair interventions that challenge them and detach "repair not only from restoration but also from the very idea of the original" (Callahan 2019, 371). These propositions however are continually involved in disciplinary and practical tensions, as Rosner states "within public sites of repair, engineering and craft are intertwined yet always in tension: they do not sit comfortably side by side but are woven into the same networks of cultural production." (2014, 73).

These political tensions and actions at the heart of repairing as remaking, redesigning and transforming practices, evidence the importance of exploring the spectrum between *design-led repairing* and *repair-led designing* that we wish to contribute with here. Two lenses (not as polarities but as range of possibilities) that allow us to unpack different political entry points of design disciplines and of designing acts. As connected visions helpful to investigate some of design's material, systemic, cultural and disciplinary (often closed) boundaries. Through this spectrum, we also aim to explore how repair can be design's ally, as it takes care of the messes derived from the unconsidered blind spots or from some strategically hidden faults (in service of obsolescence). To examine this we build on a relationship between brokenness, design and repair - that is generative, transformative, negotiated and collaborative (Philip and Botero 2021; Martinez 2019; Henke 2019; Udall 2019; Rosner and Ames 2014). Which beyond focusing on fixing the already broken, could also draw from these learnings to anticipate and prevent similar future failures.

Restarters Barcelona: a design ethnographic approach

This article draws from design and ethnographic insights from fieldwork (July-August 2021) undertaken with 13 people (nine participants and four volunteers - 7 women and 6 men) at the "Restart Parties" hosted in Barcelona. All participants consented for these conversations to be audio recorded, transcribed and for photos of their devices to be taken.

Two semi-structured interviews were designed for two different groups of repair practitioners. One interview aimed for nine people joining the parties as participants bringing their devices for repair, who joined [Anon] for a conversation that asked them about their reasons for joining the RP, the devices they brought, the repair outcomes, feelings of participating and broader reflections about value. These interviews were done individually onsite and lasted from 10 to 15 minutes and were done at the end of the event.

The second interview was tailored to volunteers working as repairers and event facilitators. This conversation involved a group of three volunteers that [Anon] invited (as co-founder of Restarters BCN and also current volunteer organiser for more than six years) for a group discussion aimed at covering four main areas: their motivations to volunteer at the RP; as well as their views on the personal and collective impacts of these gatherings, in relation with sustainability practical, economical and political agendas. This group session lasted over two hours and instead of responding to one RP event, it invited overall reflection of their time as a collective for the past six years hosting almost 70 parties.

The analysis of the transcribed interviews in dialogue with the literature review phase brought [Anon] and [Anon] together. The different locations where both are based, [Anon] in Barcelona and [Anon] in Melbourne, as well as their shared languages - Spanish for their spoken and practical dialogues, in addition to their theoretical understandings from mostly English references - allowed them to explore approaches to their analysis informed by their plurilingual positionalities (Botero, del Gaudio and Gutiérrez Borrero 2018). Besides the interviews, both are reuse and repair practitioners, a personal experience that enriched their conversations, analysis and auto-ethnographic reflections.

The methodological approaches and research insights shared and reported on this paper draw from, build on and are aimed at advancing interdisciplinary design ethnographic collaborations (Pink et al. 2022; Henke 2019), in this case between: Science and Technology Studies (STS), Participatory Design (PD), Design Anthropology (DA) and Everyday Design (ED). By bringing these distinct fields, this interdisciplinary approach contributes towards augmenting repair languages composed of (Southern and Northern) Spanish and English takes, as well as technical, political, theoretical, practical and metaphorical terms.

The next analysis section presents six thematic areas focused on qualitative implications of repair in a dialogue with the literature review and fieldworks accounts. These six themes are connected with: economy; ecology; designs; learning episteme; socialites; and wellbeing values - following this same order, each section is titled as follows:

- Post-growing economies of sufficiency
- Caring practices for traumatised ecologies
- Repair-led design: opening the black-boxes
- “Commoning” knowledge for collective response-abilities
- Togetherness: a hopeful techno-political resistance
- Embodied values and reciprocated wellbeing

ANALYSIS: Multi-scale repairing impacts of Restart Parties

Post-growing economies of sufficiency

Despite the modest but fundamental role of repair as a sustaining and caring practice of everyday life since old ages, it still remains quite invisible for those who emphasise circular economies on "close loops" or "zero waste" policies (Isenhour and Reno 2019, 1-2). More radical visions of economy situate repair as a post-growth, degrowth (Kallis et al. 2020; D'Alisa et al. 2015) or post-consume practices engaged "in politics of sufficiency, subsistence economies and regionalized value chains as vehicles towards deceleration and detachment from formalized growth-economies" (Paech 2013 in Schmid 2019, 234). In fact, the economic impact of repair was the most outstanding together with the ecological one, noted by RP participants. The thrifty value of repairing, caring for the household economy by extending devices' lifespan, especially in times of crises and scarcity, were key virtues of repair "not only to save money but also to reduce consumption" said Luz, a participant.

In a collective dimension of economy, repair is also connected with the defence of commons. As it is a way of using common natural resources in more efficient, careful and responsible ways, as José one participant explained: "After all, the true economy is the one that we can use our resources in an efficient way". Also because repair alters and pushes for the redefinition of "property" by defending repair as a common in itself (Graziano and Trogal 2019, 12), as 'Rights to Repair' initiatives reclaim (Perzanowski, 2022). This sense of commonality in relation with economy was also expressed by participant Luz when defining the RP as a collective way of "taking care of the economy of the neighbours". Schmid (2019, 246) supports this idea by saying that "In providing a counter-experience, repair can shift subjectivities (including capabilities) towards preservative forms of (economic) being-in-common." Hence, a continuity between the personal/local and collective/global scales appears, as repairing a personal belonging extends to taking care of the common (natural) resources more efficiently, no longer as properties derived from "cheap nature" (Moore 2015) but as everyone's and no one's entities.

The potential to re-signifying economies through post- or anti-consumption models and to disrupt trajectories of waste by fomenting durability needs a certain grade of disobedience to actively ignore appealing fashions of consumerism and strive for sufficiency. Repair appears counter-hegemonic: "It is a bit punk", said Clara, a volunteer. She continues: "'A two-year-old mobile phone has to be replaced'…What do you mean I have to change it!? That 'have to'… depends, doesn't it?". Hence, the act of repair helps to empower participants as more critical, conscious, responsible, caring, and re-skilled consumers (Graziano and Trogal 2017; Costa Domingo 2020; Drazin 2019) with capacity to play with the sociocultural and socioeconomic forces that undergird the "negotiated endurance" (Rosner and Ames 2014, 330) of technology. Moreover, as evidence suggests participants are more likely to attempt repair after attending RP or similar repair events (Costa Domingo 2020). "I'm making a mental list of all the devices I have that are half comatose" said Luz at the end of a RP.

Nevertheless, as Schmid notes "repair does not challenge or disrupt capitalist economies per se" (2019, 231) as it can be easily "co-opted and instrumentalized" (246) as a controlled secondary niche market for electronics companies (Harvey 2019). In fact, as Schmid further argues, repair as vital, preserving and reproductive work that sustains and makes life possible to continue, is part of capitalism's "constitutive outside" (2019, 246 - citing Gibson-Graham, 1996: xxiii) that helps patching its own damages and ruins. Then, any analysis of repair demands to be clearly situated to account for the different political and economic conditions and effects that define it. Despite the possible 'patching' role of repair absorbing the deliberately derived damages of capitalism, we cannot make equivalent community initiatives that impulse repair as an act of resistance (in the middle of the digital divides and those other businesses that promote repair) as a secondary niche market under circular economy narratives. No matter the similarity in embodied gestures and some common immediate effects on personal economic saving and ecological prevention, situated analysis is needed to identify unequal ethico-political effects. In making these effects visible raising awareness can be facilitated in pointing people collectively towards responsible mechanisms and to critically examine the logics of ecosocial damage.

Caring practices for traumatised ecologies

The environmental sphere of sustainability appears strongly as motivation in repair practices and narratives, often in tension or at the expense of economic agendas. Repair scholars consistently highlight the interrelated beneficial potential that repair can have for environmental restoration in reciprocity with social and material dimensions (Rosner 2014; Graziano and Trogal 2017; Wilson 2019; Martinez 2019; Drazin 2019; Henke 2019). For the RP practitioners, meeting at these community spaces was a way of contributing to preventing and alleviating some of the impacts of their consumption towards the environment. As Carlos one participant shared,

> I'd say that if we want to reduce the waste we generate, one of the solutions is to repair. Moreover, I think that this [RP] project creates a lot of awareness, in that not everything is throwaway, things have second lives and we can embrace that. In the end that empowers you because you no longer are a consumer who disposes but also repairs. For me the ecological theme is the most important one.

An environmental motivation can turn into ethico-political awareness that fosters broader forms of cultural activism. However, what we note from the literature and fieldwork accounts is that repair analysis and acts tend to come 'after' to mend and make sense of already existing damages - to 'pair' again broken links. Broken links that have creative potential to become openings to pair things otherwise. As Tironi says, beyond restoring "the original status quo; repair is in fact an operation that permanently re-interrogates the scheme's materiality and its multiple interactions with its environment, producing new knowledge and hypotheses in relation to the service's socio-technical ecology." (2018, 212-213). Similarly, Crosby and Stein complicate the environmental category of repair and its contribution in ecological terms, arguing that "repair is the expression of care, and

therefore a way of making ethical decisions about design within complex and traumatised ecological systems." (2020, 180-181). Trauma, that is inflicted at all the stages of products' life cycles, and is in continual tensions, negotiations and unequal relations. Within shifting value frameworks throughout the socio-material infrastructures it is embedded into (Reno 2017; Martinez 2017). Repair cares for affected natural and cultural systems while also challenging and transforming broken value systems. This eco-ontological positioning of repair relates with Ann Light's recent proposition that "climate care is not separate from care of ourselves" (2022, 38).

These empirical and academic accounts demonstrate how the environmental sphere of sustainability is conceptually outdated. In that it still maintains an analytical separation (from its origins - Brundtland Report 1987) between the human and more-than-human worlds. An ecological framing instead can help bridge that separation to still account for specific environmental related challenges (e.g. climate change metrics), alongside the social, ethical, political and cultural complexities that these changes are inextricably related with. In doing so, the recurrent tensions with economic interests and unequal hierarchies (e.g. with other categories of sustainability) can, as Crosby and Stein optimistically propose, facilitate continual inclusive leeps for an "intergenerational equity and the multispecies "earth-repair" that might reframe the relationship between ecology and economy." (2020, 182).

We see the interrelated aspects of repair practices at both individual and collective scales, as eco-political expressions of care. Researchers of similar community repair initiatives also found from their participants that environmental concerns drove their participation in these events (Rosner and Ames 2014; Costa Domingo 2020). At the RP, participants responses ranged from wanting to "save" their devices from becoming waste to considering with hope that, in the long-term, they could perhaps contribute "bit by bit to avoid CO2 tons from multiplying" as David a volunteer said, followed by the realisation that "planet Earth will continue to go round as it has been doing for millions of years". David further summarised that personal concerns about global North-South inequalities (Graziano and Trogal 2017; Light 2022) motivated his sustained commitment to join these community events:

> I think it was mostly for ecological awareness [that he first joined RP], when you start to learn about the tons of waste we generate, and how this waste is managed, how it affects people who are very far from where these are created… from the [Global] North and sent illegally to China or Africa… Well then that's when you say 'we could try to do things otherwise'.

Repair-led designs: opening the black-boxes

The limits evidenced by failure and brokenness of objects shed light on the ways in which things are strategically marketed as "anti-repair" (Crosby and Stain 2020, 181) and understood as interactive objects, cultural devices, and temporal tools. These limitations connect different temporalities as they entail an openness into technological and design

past decisions and also into alternative futures in which these could better deal with such failures (Gill and Mellick Lopez 2011; Argyropoulou and Vourloumis 2019; Drazin 2019; Harvey 2019). This way, the product's brokenness brings their position back into prototypes and testing stages, despite the position given by their commercial lifecycles. Becoming a humbling reminder of design's blurry closures and the stimulating chances to engage with its unfinishedness (Tonkinwise 2005) and ongoing openness (Gill and Mellick Lopes 2011). An openness in which repair comes in to unpack, investigate, reconnect, alter, and remake designs. Such "repair-oriented perspective on design", as Philip and Botero argue, "is valuable insofar as it aids in steering away from a productionist bias and instead asking 'why did it break, and how can it be made to last?'" (2021, 13). Repair, undertaken as a practice of inquiry (Tironi 2018) and imagination that 'problem-solves' and projects things into possible futures, becomes a practice of bridging functionalities and temporalities. The sum of facing creative, material and relational challenges makes repair a process of designing.

A creative inquiry that starts from an existing broken object of design is what we understand as *repair-led designing*. That in its distant position in relation with its original design, manifests a collective material responsibility of design as a caring everyday practice that can push closed epistemic and disciplinary privileges. Repairing then can offer a democratization of designing practices that, for many practitioners, can be related with systemic sustainability agendas. This practice-led capacity to interrogate and alter the objects of design cultural systems can, we believe, provoke broader disciplinary and technological design transformations - that we understand, on the other side of the spectrum as *design-led repairing*. "Understanding repair and design as interlinked helps share knowledge between the environmental humanities and design studies, pushing to transform the way design is conceived, managed and practiced." (Crosby and Stein 2020, 183).

Existing literature in STS, anthropology and design has also examined the role of repair in challenging innovation paradigms by way of everyday creative acts of improvisation (Rosner and Ames 2014; Martinez 2019; Pink et al. 2019; Udall 2019; Houston 2018; Schubert 2018; Tironi 2018; Crosby and Stein 2020). However, while repair can extend the durability of intended obsolescence in preventing ruptures, it can also contribute towards the maintenance of such design innovation paradigms and infrastructures (Martinez 2017; Crosby and Stein 2020; Henke and Sims 2020). Repairing, either to resist or comply with the cultural paradigms of things, works by entering through vulnerabilities, to open up the 'black boxes' of products and systems that these products are designed from. And, as we will see at the next section dedicated to knowledge, this opening, disassembling, and learning about the inner workings of broken things gave RP practitioners a sense of "satisfaction" and "empowerment", as they had to operate and think, momentarily, as designers did. "First I like to open the devices and see how these are built, their materials, how they work, I look at everything [and try to understand] what philosophy was applied by the design team who made it", said David, a volunteer. By repairing one single object you are faced with interpreting the work that "has gone

through 10 engineers, and technicians" before its production, he continued. That "reverse engineering" also creates possibilities for materials to become resources for repurposing repair projects - "between two Braun chargers we made a new charger" shared José, a participant. Other times the wonder was in the historical opening that repair offered, "I loved how the russian used to design" said David, "for me there is also a historical curiosity" agreed Andrés, a participant.

Approaches to taking existing designs as resources for alternative creative projects has been recognised in the literature as part of the DIY openness that repair fosters (Graziano and Trogal 2017; Cangiano and Romano 2019; Udall 2019; Philip and Botero 2021). Characterised by a rebelliousness to transform designs into something else, it is common for "some repairers refer to their activities as hacking" (Schmid 2019, 238), that is as "repairhacks" (Maestri and Wakkary 2011). Volunteers highlighted a "punki" motivation for them when committing to repair. Feeling that there were limitations for repair initiatives to have impacts on corporate levels "I don't think we have much influence on designers or producers", said David, but trusting that their impact at a local level could still have long-term potential. With for example the "Fixometer", a database created by The Restart Project to record and share all the RP's fixes statistics and impact. Which as Clara pointed out could work as a tool for sharing knowledge with local designers and design studios "to make them aware of the barriers we find when repairing", so that designers could in turn consider these learnings from earlier stages of their designing processes, towards a *design-led repairing*.

Repair has been often differentiated from design, even as an "unfashionable antithesis to design: repair is seen as making do rather than innovating; repair happens in the face of austerity" (Crosby and Stein 2020, 180-181). However, as the above academic and empirical accounts demonstrate, *repair-led designing* can indeed generate novel outcomes: in the sites and processes of opening devices; in diagnosing and learning about its technologies; in testing and returning things to positions of value; and in pushing design's boundaries from the edges of its brokenness.

"Commoning" knowledge for collective response-abilities

A crucial effect of RP derives from its pedagogical dimension. As the learning process - of diagnosing and discovering the reasons behind the devices' 'death'- can become even more important than an eventual successful repair. This leads to an epistemic agency and knowledge empowerment in/by participants (Schmid 2019; Costa i Domingo 2020). As "collective repair can thus be seen as a site for re-skilling subjects who have been stripped of the opportunity to learn how to intervene in the materiality of everyday lives" (Graziano and Trogal 2017, 24). As Luz, a participant said, "understanding how the technological universe that surrounds you at home works… is material but also ideological… [which makes RP initiative a form of] political and technological sovereignty, right?", because as Claudia, another participant noted, "I think we lack training and information". So, even in the case of irreparability, there is a valuable process of learning that as Javier, a volunteer pointed: "Ultimately, to know why the heck that

died". In other cases, the diagnosis helped to continue repairing autonomously outside the RP, as it happened for participant Claudia with a mini hi-fi: "we already know what is missing, which are some small pieces of straps, so they can be bought online and [then it] can be fixed".

This comprehension facilitates a loosening of technological fears as closed black-boxes, and enable feelings of autonomy and self-confidence (Schmid 2019; Costa Domingo 2020). "The feeling that I can do it myself at home…. but I really don't have a clue and if these people teach you a bit, that's cool too" said Carlos after attending a RP. Such powerful acts of opening and appropriating knowledge were perceived as a means for freedom. "If you comprehend and know, then you are more free to decide, right?" said Clara. A freedom that in the case of RP and its pedagogical work, turns into a collective response-ability (Barad 2012, 2014; Haraway 2016): a community practice that responds and makes damage and breakdown accountable, visible and knowable (Puig de la Bellacasa 2011).

RP's aim is not really to train others nor to transfer skills as in a schooling individualistic vision, but to acknowledge and take responsibility for one's expertise to share it and hope for the improvement of our relationships with technology. Repairers expressed how they try to demystify the image of repairers as having superpowers and to help others by sharing and "commoning" skills and knowledge in a manner of "practical solidarity" (Graziano and Trogal 2019, 23). And, although RP volunteers reckon that ego and public recognition slightly operate, their aim is to create a "learning community" based on kinship ties (Sousa Santos 1995) to make collectively possible something that couldn't happen individually. "We all learn a lot…it's very rewarding" said Clara. Otherwise, "repairing risks to become a form of acquiescence with the present neoliberal discourse that promotes self-reliance and resilience as a form of self-sufficiency" (Graziano and Trogal 2019, 24).

At the core of this epistemic process, there is a dose of curiosity, joy, perseverance and passion for challenges that repairers want to transmit to participants through communications and pedagogical skills. "I'm going to explain this that I like so much, to see if you also like it so much and we can share something" explained Clara. Volunteers also acknowledged their need to study continually to update their repair skills and knowledge. At the moment of RP, practitioners operate by experimental trial-and-error method, tinkering, asking each other (Batterbury and Dant 2019), using reverse engineering thinking and very immediate hacks for fixes. Other times, autonomous participants are only looking for supervision or to borrow tools.

Repair can be so engaging in terms of drawing volunteers' concentration, that even though participants are intended to be actively involved, volunteers risk being absorbed and forgetting "to build a bridge with others", reflected Clara. If this happens, "the essence of the Restart Party is lost" she warned. In this sense, some authors (Rosner and Ames 2014; Houston 2018) have pointed out -as the Restart Project also recognises-, that these epistemic communal spaces reflect contradictions and ambivalences as they can

reproduce existing hierarchies such as gender divides. By the higher number of men repairers and women organisers, or reinforcing hierarchical divisions of labour and expert's authority and dependence based on uneven distributions of technical knowledge.

Togetherness: a hopeful techno-political resistance

As we saw already for the epistemic dimension of RP, the act of repair helps to fix not only the materials but also the affective and emotional bonds between users and objects, contributing this way to bind, reconnect and strengthen more-than-human communities of participants, things and repairers: "relationships are born" said Gloria a participant, hence socio-technicalities are fixed. Several authors (Martínez 2019; Graziano and Trogal 2019) recognize the benefits of repair for sociality and the proliferation of intimate and public affections. In a fractal manner, interviewees refer to a multiple scale of belongings, interdependence and togetherness: with objects, between participants, inside their community, locally, as neighbourhood - more generally, as social fabric. In fact, many participants highlighted getting to know people and creating a sense of community as one of the most notable effects of the RP: "[I leave with the feeling of] having repaired something in a family, as a big family that can accompany you on searching solutions to daily problems", Gloria noted. Repair volunteers also mentioned their sense of belonging to a Restarters community as a major contribution for feeling better. As David detailed, the RP had also contributed to multiple job opportunities for him. Employment outcomes that have been similarly found of value by other researchers working with local e-waste repair initiatives in Australia (Vyas and Vines 2019, 13).

In a continuity from the material and intimate towards sociological dimensions, Wilson (2019) citing Martínez argues that repair makes "modern societies more balanced, kind and stronger". Which connects with Haraway's idea of the "restoration and care of corridors of connection" (2016, 140) for humans and non-humans. As we'll see later, this form of care and socio-material healing also has effects on individual wellbeing. Some authors (Sleigh, Stewart, and Stokes 2015; cited in Graziano and Trogal 2019, 19) even consider that many participants engage in repair only because for shared interests in technology or crafts, but because of a desire for pleasant and reciprocal social encounters. For socialization, "to have a short dialogue, a personal moment" said Gloria. You can even go with children and family "to spend the morning", noted Claudia, in a "cool, funny, good environment" , felt Andrés.

In political terms, the appropriation of knowledge at community spaces also contributes towards more critical and empowered citizens. As Clara explained,

> If you decide to make things happen, what is around you -be it people, devices, or whatever- you make it more your own. And this makes you a more conscious and powerful citizen. In other words, it's not that those things happen far away from me, but I am part of what is happening, right?

This kind of encounters contribute to create a more politicised and participatory society, similar to what Sousa Santos (1995) defines as a welfare-society:

> The networks of relationships of mutual knowledge, recognition and help based on kinship and neighbourhood ties, through which small social groups exchange goods and services in a non-commoditized manner and with a logic of reciprocity similar to the gift relations studied by Marcel Mauss. (As quoted in Sánchez-Criado 2020, 216).

Hence, the merit of RP is not only to move a caring and "reproductive labour away from the household to make it into a sociable practice" (Graziano and Trogal 2019, 23), but to do something together: a collective, public and encouraging response that confronts individual resignation and fatalism in times of ecological collapse. Such movement from private, individual, and isolating responses towards collective and collaborative ones reinforces the notion of a hopeful co-response-ability. Because as Clara expressed:

> Instead of staying at home and saying 'shit, shit, let's see when we become extinct', we decide to meet and do something TOGETHER, together, and that's super powerful, and to do something about it. (...) We don't like the way things are, we think we can do something, we decide to get together and try to share it or make it known beyond us. We don't just stay at home licking our wounds.

A togetherness and collective decision that makes repair a political tool of disruption and interpellation about "who has the right to mould and control the material culture" (Graziano and Trogal 2017, 14) or "what is wrong, who is at fault and what should be done. This is where relational repair becomes a truly negotiated order, with actors deploying potentially competing accounts of trouble and what to do about it." (Henke 2019, 263). Restart Parties, then, could be considered as "public spaces for politics and disagreement" (Schimd 2019, 244) in the area of electronics' production, consumption and its derived impacts.

Restart Parties, as a collective and self-organised Do-It-Together or Do-It-With-Others (DIT, DIWO) resistance to breakdowns - in the shape of personal devices affected by planned obsolescence and other dodges closely connected with the capitalist economic system - bring to the fore that the strongly claimed "right to repair" (Perzanowski 2022) cannot be "just the entitlement of an individual to be taken care of, but our common right [and responsibility] to care for each other" (Perez and Salvini Ramas 2019, 397). A caring gesture of collective emancipation that shows how socio-technical matters matter, and how things could be otherwise.

Embodied values and reciprocated wellbeing

At the RP we learnt that a key to participants' continued engagement was the significant value they gained in terms of the personal and community feelings of wellbeing. Wellbeing has been and can be defined in many ways, however here in relation with repair, our understanding combines empirical and scholarly accounts from repair practitioners. From these sources we propose that the wellbeing values of repair overlap emotional, sensory, embodied, biographical, creative, political and socio-technical agencies. While these aspects became explicit in the situated encounters at the RP events,

it was common for participants to express that these feelings stretched well beyond the event. As a motivating factor, a lifestyle choice, awareness and personal disposition to repairing gave volunteers and participants the impulse to join the community 'party' in the first place and ongoingly, guiding them along the technical and creative curiosity processes of "diagnosing" when opening up the devices and looking for "solutions".

Wellbeing factors from repair are circumstantial, changing and while these are experienced personally differently, these can also be shared with others. For instance, it was common for participants to say that they were driven to repair by a combination of feelings from "anger" with the technological obsolescence forced into the products, which catalyzed in them a "daring" determination and "tenacity" to resist a brokenness impositions and thus look for repair alternatives. Engaged in attentive tasks of deep inquiry with the things at hand, dedicating "concentration", they often surprised themselves with tense muscles and "biting the tongue" in moments of "nerve racking" diagnoses, said Javier, a volunteer. This "bodily ontology" and "ontology of repair" as Henke discusses, is central to the socio-material relationality of repairing practices in which experiential affordances guide the process. As he says (2019, 262), "the relationship between bodily senses and material settings provides a key indicator when things need to be fixed—something looks wrong, smells bad, feels too hot or cold, or does not sound right".

These embodied registers are combined with emotional responses that further inform and constitute repair experiences. Schmid describes, "failure, frustration, and estrangement accompany and spread through repair practices just as achievement, self-efficacy and belonging do" (2019, 246). At the latter end of the spectrum, RP participants described that when repair was possible, it felt "like an achievement. Super" said Gloria. But even when it was not achieved during the time of the event, they could still leave with a "little frustration, but that's motivating", shared Andrés. Leaving with guidance Carlos pointed, as "They [the volunteers] explain things very well and tell you if and how you can continue on your own, or come back if you want". The openness to sharing knowledge and leaving the 'doors' open - of the products, the technical repair pathways, and of the Restart Parties - is what volunteers noted maintains the community going in the long-term.

Volunteers hand in parts of the process to participants with "empathy" and "patience", to share the knowledge but also the joys and pleasures commonly felt from repairing processes and outcomes (Batterbury and Dant 2019, 263). In effect, visiting participants acknowledged this technical and social service, saying that they were leaving "grateful" with the volunteer team for their "generosity of spirit towards the community and the planet", said Claudia, while also being impressed by their "refined sense of humour", noted Andrés. Humour that, as Martinez argues as well as "irony, and even sarcasm where necessary, provide such critical mechanisms for reflection and, let's not forget, [operate] as an incentive for taking action." (2019, 321). To lighten the mood and to facilitate "intimate entanglements" between participants and devices (Callén and Lopéz 2019),

evidencing an “immediacy or intimacy in the relationship of people and things, where repair occurs” (Drazin 2019, 305). Contributing to creating a friendly atmosphere that volunteers reflect as being one of their best ways of advocating for repair. As Clara said, through the Restart Parties, repair “sells itself”. These lived experiences relate with Martinez proposition that:

> To repair is an act on the world: to engage in mending and fixing entails a relational world-building that materialises affective formations. It also settles endurance, material sensitivity and empathy, as well as more altruistic values oriented towards the sustainability of life. (2019, 2)

Besides the personal and collective affective experiences, volunteers expressed wellbeing from sharing a sense of belonging to the group of volunteer colleagues. As Harvey (drawing from Pickett and Wilkinson 2010) found, “the act of volunteering can create both personal and group wellness” (2019, 437) in which practitioners develop skills and social-technical connections that can even end in new job opportunities. These instances of employment opportunities further fed a sense of wellness, as being jobs related to repair, aligned with their ethical beliefs and their collective purpose to activate change. Change, as we mentioned earlier, can shift motivating anger into more hopeful emotions, but also towards activating a larger movement with political intent - “an important kick of endorphins… while doing a form of politics”, David said. “Energising reactions of creative action” as Martinez proposes (2019, 10) reveals important aspects of repair “as an affective generator of haptic learning, symbolic meaning and socio-psychological behaviours".

The RP demonstrates then how cultivating spaces for repair locally can contribute towards activating ripple effects and affects of wellbeing in reciprocal and relational ways - “with your knowledge you are making someone feel good, which makes you feel good in return”, David continued. Which moreover as volunteers discuss, creates boosts in participants’ sense of “self steam”, “rebelliousness” and “freedom” that strengthen a sense of agency and “will” to continue repairing.

DISCUSSION: Transversal matters between repair-led designing and design-led repairing

As we mentioned at the introduction, this paper’s aim is to go beyond the quantitative metrics of repair impact of e-waste and explore and learn about complementary qualitative values. This analysis is situated at the intersection of brokenness, repair and design, and braides empirical experiences from practitioners with scholarship voices from repair. The result is composed by diverse threads of qualitative counter narratives that reveal practical, political and affective implications of repair that could trace opportunities for future participatory design interventions. By exploring the spectrum between *design-led repairing* and *repair-led designing* for the case of RP, we propose to

examine and challenge some of design's material, systemic, cultural and disciplinary boundaries.

For analytical purposes we worked with six interrelated dimensions, however, during this analysis we identified some transversal matters across all six themes that we highlight next.

Repair is an act of eco-political care that does not only fix, remake and return to design products their lost functionality, but also contribute to mending socio-material bonds and relationships that intimately and globally interconnect more-than-human ecosystems, composed of all vital organic and inorganic elements. This caring quality of repair Martinez argues, "entails a relational world-building that materialises affective formations" (2019, 2) beyond and after the novelty and creative acts of design. Repair then weaves caring bonds and prints continuity and endurance into a radically vulnerable and continuously breaking and wearing world through the cultivation of "material sensitivity and empathy, as well as more altruistic values oriented towards the sustainability of life" (2).

Repair as care also reveals hidden mechanisms and overlooked side-effects of design (on ecology but also digital divide and knowledge closures) as a material practice at the service of consumption and capitalist economic paradigms. Apart from recognising the need of -mostly feminised or racialized- caring and reproductive labours of repair and maintenance for the sustainability and continuity of life, RP as caring activities serve to highlight "an ontological requirement of relational worlds" (Puig de la Bellacasa 2012, 199). Care also has limits and "we cannot reconcile every contradictory need" (Light 2022, 37). Nevertheless, following repair-led designing approaches could trace "direction[s] toward supportive infrastructures and new eco-socio-economic systems, where profit is second to well-being" (37).

Repair as an act that remakes and reorders the existing socio-material fabric and 'relational worlds', operates as a negotiation process by which all the elements involved (including: people, organizations, institutions, materiality), are re-mediated and re-connected for the aim of reaching what Rosner and Ames (2014) call a "negotiated endurance". In this field of tensions and struggles for re-creating relational and material orders, design force is not the only nor the definitive one for avoiding breakdown or facilitating repair. As we have shown, use, maintenance and repair daily practices have an enormous and humble power to resist, produce and reconfigure matters.

However, despite the best intentions of volunteers and the enthusiastic expressions of gratitude by participants, the generative potential of repair to bring about new relational orders is not exempt of inequalities and power relationships concerning class, race, gender (Rosner and Ames 2014; Young and Rosner 2018), knowledge and expertise (Houston 2018) and other lingering power stratifications (Martinez 2017; Jackson 2018; Henke 2019). Without a committed pedagogy and open share - of knowledge, tools, time, power,

- repair risks becoming a privileged practice that reproduces versions of the same epistemic dependencies, closures and boundaries that affect design as a discipline.

For instance, even when repair's role in interrogating systemic design paradigms has been identified as having a disobedient agency (Oroza 2009) this agency can be at risk. When "Repair's compatibility with neoliberal discourses around self-reliance and voluntary performance is particularly visible when the collective efforts of fixing avoid confronting broader systemic forces." (Graziano and Trogal 2017, 24). Which "may, of course, not prove as reliable, revolutionary or self-reliant as its confident promotion and first impression suggest." (Sormani, Bovet and Strebel 2019, 2). Repair's bottom-up operations, "acts as a kind of invisible hand behind the stability of infrastructures." (Henke 2019, 258). A kind of compliant disobedience that has fueled scholars "recent calls to bring back to the fore the hacker, repair, recycle and ecological orientation of makerspaces" to resist these becoming increasingly dominated by entrepreneurial agendas (Vyas and Vines 2019, 18).

Despite these tensions, repair has been widely considered as an act of hope (Rosner and Ames 2014; Jackson 2018; Crosby and Stein 2020; Sanchez Criado 2020) with the capacity to connect and transform the inherited ruined past into encouraging repairable (presents and) futures. As RP's volunteers expressed before, repair is an act of collective resistance and "subversion" (Light 2022), a co-response-ability, in front of the tempting resignation and the dangerous paralysis that accompanies these times of ecosocial damage and climate crises. As Jackson (2018, 346) proposes "taking repair seriously can help us towards more timely, materialized, and hopeful ways of thinking, making and fixing the worlds around us".

CONCLUSIONS

We started this paper asking about the 'wider' impacts of repair, beyond the more acknowledged and measured ecological and economic metrics. Building on the more conventional "triple bottom line" assessments used in sustainability narratives, we worked with six analitical lenses (economic, ecologic, design, epistemic, communal, and wellbeing) to unpack subtle qualities that tend to remain unseen in quantitative indicators, which bring tension to the value of repair practices at local level and smaller scale. The Restart Parties enabled us to bring these conceptual categories into dialogue with participants' experiences, to evidence the contribution of repair as a form of everyday resistance. In doing so we have identified some positive and other problematic ambivalent impacts at different levels within a generative *design-led repairing* and *repair-led designing* spectrum of possibilities. The Restart Parties demonstrate a capacity of moving reproductive labour away from the household towards the public and collective sphere. In this way, through the apparent 'minor' and material gestures of repairing personal electronic devices, we have seen how different scales and realms, from intimate to structural ones, are jointly, transversally, and simultaneously affected in a continuum that can have major cultural contributions in the long-term. This encourages us to rethink the

notion of scales in an ecosystemic and transversal way, and to defy disciplinary closures, to instead explore forms of interdisciplinary collaboration - offering sites of encounter to develop together more holistic perspectives of the same phenomenon, repair. Hence, this drives us to recognize the relationality we live with and within, that when meeting with common agendas of mending the broken, we can strengthen skills and create 'bridges' to intimately and materially connect people, devices, tools, and shared values. In doing so, repair can foster everyday political interventions, acts of collective caring and co-response-ability in times of crises.

References

Argyropoulou, Gigi, and Hypatia Vourloumis. 2019. "Repeating Brokenness: Repair as Nonreproductive Occupation, Improvisation and Speculation." *Ephemera* 19 (2): 401-14. Retrieved from https://www.proquest.com/scholarly-journals/repeating-brokenness-repair-as-nonreproductive/docview/2258087363/se-2

Barad, Karen. 2012. "On Touching—the Inhuman That Therefore I Am." *Differences* 23 (3): 206-23. DOI: 10.1215/10407391-1892943

Barad, Karen. 2014. "Diffracting Diffraction: Cutting Together-Apart." *Parallax* 20 (3): 168-87. DOI: 10.1080/13534645.2014.927623

Batterbury, Simon, and Tim Dant. 2019. "The Imperative of Repair." In *Repair, Brokenness, Breakthrough* , edited by Francisco Martínez and Patrick Laviolette, 249-66. 1st ed., Vol. 1, p. 1. New York: Berghahn Books. https://doi.org/10.2307/j.ctv1850hkq.24

Bennett, Jane. 2010. *Vibrant matter: a political ecology of things*. Durham: Duke University Press.

Botero, Andrea, Claudia Del Gaudio, and Alfredo Gutiérrez Borrero. 2018. "Towards a polylocal polylogue on designs and autonomías – an intro." *Strategic Design Research Journal*, 11(2): 136-38. DOI: 10.4013/sdrj.2018.112.09

Calderón Salazar, Pablo, and Alfredo Gutiérrez Borrero. 2017. "Letters South of (Nordic) Design." *Nordes. Nordic Design Research* 7. Available at: http://www.nordes.org/nordes2017/assets/short_papers/nordes17b-sub1001-cam-i26_SALAZAR_v2.pdf. Accessed on August 17th, 2018.

Callahan, Manuel. 2019. "Repairing the community: UT Califas and convivial tools of the commons." *Ephemera*, 19 (2): 369-87. Retrieved from https://www.proquest.com/scholarly-journals/repairing-community-ut-califas-convivial-tools/docview/2258087708/se-2

Callén Moreu, Blanca and Daniel López Gómez. 2019 "Intimate with Your Junk! A Waste Management Experiment for a Material World." *The Sociological Review* 67 (2): 318-39. DOI: 10.1177/0038026119830318

Cangiano, Serena and Zoe Romano. 2019. “Ease of repair as a design ideal: A reflection on how open source models can support longer lasting ownership of, and care for, technology.” *Ephemera* 19 (2): 441-49. Retrieved from https://www.proquest.com/scholarly-journals/ease-repair-as-design-ideal-reflection-on-how/docview/2258087745/se-2

Crosby, Alexandra, and Jesse Adams Stein. 2020. “Repair”. *Environmental Humanities*, 12 (1): 179–85. DOI: 10.1215/22011919-8142275

Costa Domingo, Giulia. 2020. *Should community repair initiatives be better supported to achieve circular economy goals in the EU within the electronics sector post COVID-19? A case-study of Barcelona.* MSc diss., Imperial College London.

D'Alisa, Giacomo & Demaria, Federico & Kallis, Giorgos & Perez, Mario & autores, otros & Rincón Ruiz, Alexander. 2015. *Decrecimiento: Vocabulario para una nueva era.* Barcelona: Icaria Editorial

De La Bellacasa, Maria Puig. 2011. "Matters of Care in Technoscience: Assembling Neglected Things." *Social Studies of Science* 41(1): 85-106. DOI: 10.1177/0306312710380301

De la Bellacasa, María Puig. 2012. “'Nothing comes without its world': thinking with care”. *The Sociological Review* 60 (2): 197–216. DOI: 10.1111/j.1467-954X.2012.02070.x

Duque, Melisa. 2018. *Everyday Designing for Revaluing*. PhD diss., RMIT University.

Drazin, Adam. 2019. "Brokenness and Normality in Design Culture." In *Repair, Brokenness, Breakthrough* , edited by Fracisco Martínez and Patrick Laviolette, 297-312. 1st ed.. New York: Berghahn Books. https://doi.org/10.2307/j.ctv1850hkq.28

Ehn, Pelle. 1988. “Playing the language-games of design and use-on skill and participation.” *ACM SIGOIS Bulletin* 9 (2-3):142-157. DOI: 10.1145/966861.45426

Ehn, Pelle. 2008. “Participation in design things.” Paper presented at the Proceedings of the Tenth Conference on Participatory Design, PDC 2008, Bloomington, Indiana, USA, October 1-4, 2008. DOI: 10.1145/1795234.1795248

Forti, Vanessa, Baldé, Cornelis Peter, Kuehr, Ruediger and Bel, Garam. 2020. *The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential.* Bonn/Geneva/Rotterdam: United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR).

Gill Alison, and Abby Mellick Lopes. 2011. “On Wearing: A Critical Framework for Valuing Design's Already Made.” *Design and Culture* 3 (3): 307-27. DOI: 10.2752/175470811X13071166525234

Graziano, Valeria, and Kim Trogal. 2019. “Repair Matters.” *Ephemera* 19 (2): 203–27. Retrieved from https://www.proquest.com/scholarly-journals/repair-matters/docview/2258087303/se-2

Haraway, Donna J. 2016. *Staying with the Trouble. Making Kin in the Chthulucene.* North Carolina: Duke University Press. DOI: 10.1215/9780822373780

Harvey, Bridget. 2019. “Spelman cups: Attitudes to the past.” *Ephemera* 19 (2): 427–40. Retrieved from https://www.proquest.com/scholarly-journals/spelman-cups-attitudes-past/docview/2258087505/se-2

Henke, Christopher. 2018. "Negotiating Repair: The Infrastructural Contexts of Practice and Power." In *Repair Work Ethnographies*, edited by Ignaz Strebel, Alain Bovet, and Philippe Sormani, 255-82. Singapore: Springer Singapore. https://doi.org/10.1007/978-981-13-2110-8_9

Henke, Christopher, and Benjamin Sims. 2020. “Introduction: A Tool Kit for Understanding Infrastructure and Repair.” In *Repairing Infrastructures: The maintenance of materiality and power*, edited by Christopher Henke and Benjamin Sims, 1-28. Cambridge: The MIT Press. https://doi.org/10.7551/mitpress/11771.003.0002

Houston, Lara. 2018. “Mobile Phone Repair Knowledge in Downtown Kampala: Local and Trans-Local Circulations.” In *Repair Work Ethnographies*, edited by Ignaz Strebel, Alain Bovet, and Philippe Sormani, 129–60. Singapore: Springer Singapore. DOI: 10.1007/978-981-13-2110-8_5

Ingold, Tim. 2013. *Making: Anthropology, Archaeology, Art and Architecture*. Oxford: Routledge.

Jackson, Steven. 2018. “Repair as Transition: Time, Materiality, and Hope.” In *Repair Work Ethnographies,* edited by Ignaz Strebel, Alain Bovet, and Philippe Sormani, 337–47. Singapore: Springer Singapore. DOI: 10.1007/978-981-13-2110-8_12

Kallis, Giorgos, Paulson, Susan & D'Alisa, Giacomo & Demaria, Federico. 2020. *The case for degrowth*. Cambridge: Polity Press

Lindström, Kristina, and Ståhl Åsa. 2020. “Un/Making in the Aftermath of Design.” *PDC '20: Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise*, Vol 1: 12–21. DOI: 10.1145/3385010.3385012

Light, Ann. 2022. “Ecologies of subversion: troubling interaction design for climate care.” *Interactions* 29 (1): 34–38. DOI: 10.1145/3501301

Maestri, Leah and Ron Wakkary. 2011. “Understanding repair as a creative process of everyday design.” *C&C '11: Proceedings of the 8th ACM conference on Creativity and cognition*. Nov 2011: 81–90. DOI: 10.1145/2069618.2069633

Martinez, Francisco. 2017. "Waste Is Not the End. For an Anthropology of Care, Maintenance and Repair." *Social Anthropology* 25 (3): 346-50. DOI: 10.1111/1469-8676.12436

Martínez, Francisco. 2019. "INTRODUCTION." In *Repair, Brokenness, Breakthrough* , edited by Francisco Martínez and Patrick Laviolette, 1-16. 1st ed., Vol. 1, p. 1. New York: Berghahn Books.

Oroza, Ernesto. 2009. *RIKIMBILI: Une étude sur la désobéissance technologique et quelques formes de reinvention*. Saint-Étienne: PU Saint-Etienne.

Papanek, Victor. J. 1972. *Design for the real world : human ecology and social change*. 1st ed. New York: Pantheon Books.

Pérez, Marta and Francesco Salvini Ramas. 2019. "The Right to Care: Entering outside in the Southern European Crisis of Welfare." *Ephemera* 19 (2): 389-400. Retrieved from https://www.proquest.com/scholarly-journals/right-care-entering-outside-southern-european/docview/2258087640/se-2

Perzanowski, Aaron. 2022. *The Right to Repair: Reclaiming Control over the Things We Own*. Cambridge: Cambridge University Press.

Pink, Sarah, Juan Francisco Salazar and Melisa Duque. 2019. “Everyday Mundane Repair: Banknotes and the Material Entanglements of Improvisation and Innovation.” *Tapuya: Latin American Science, Technology and Society* 2 (1): 458–77. DOI: 10.1080/25729861.2019.1636619

Pink, Sarah, Vaike Fors, Debora Lanzeni, Melisa Duque, Shanti Sumartojo, and Yolande Strangers. 2022. *Design Ethnography: research, responsibility and futures.* London: Routledge.

Philip, Hector and Andrea Botero. 2021. “Generative repair: everyday infrastructuring between DIY citizen initiatives and institutional arrangements.” *CoDesign.* DOI: 10.1080/15710882.2021.1912778

Redström, Johan. 2008. “RE: Definitions of use.” *Design Studies* 29 (4): 410–23. https://doi.org/10.1016/j.destud.2008.05.001

Reno, Joshua. 2017. “Waste and Values.” In Archaeologies of Waste: Encounters with the Unwanted, edited by Daniel Sosna and Lenka Brunclíková, 17-22. Oxford: Oxbow Books.

Rosner, Daniela. 2014. "Making Citizens, Reassembling Devices: On Gender and the Development of Contemporary Public Sites of Repair in Northern California." *Public Culture* 26 (1): 51–77. DOI: 10.1215/08992363-2346250

Rosner, Daniela, and Morgan Ames. 2014. “Designing for repair?.” *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing:* 319–31. DOI: 10.1145/2531602.2531692

Schmid, Benedikt. 2019. “Repair's diverse transformative geographies: Lessons from a repair community in Stuttgart.” *Ephemera 19* (2): 229–51. Retrieved from https://www.proquest.com/scholarly-journals/repairs-diverse-transformative-geographies/docview/2258087376/se-2

Sánchez Criado, Tomás. 2020. “Repair as repopulating the devastated desert of our political and social imaginations.” In *Politics of Recuperation: Repair and Recovery in Post-Crisis Portugal*, edited by Francisco Martínez, 207-20. London: Routledge. DOI: 10.4324/9781003086383

Schubert, Cornelius. 2018. “Repair Work as Inquiry and Improvisation: The Curious Case of Medical Practice.” In *Repair Work Ethnographies,* edited by Ignaz Strebel, Alain Bovet, and Philippe Sormani, 31–60. Singapore: Springer Singapore. DOI: 10.1007/978-981-13-2110-8_2

Strebel, Ignaz, Alain Bovet, and Philippe Sormani. 2019. *Repair Work Ethnographies Revisiting Breakdown, Relocating Materiality.* 1st ed. Singapore: Springer Singapore.

Tironi, Martin. 2018. "Inquiring and Experimenting with Urban Ecology: Pragmatist Lessons from Public Bicycle Repair." In *Repair Work Ethnographies*, edited by Ignaz Strebel, Alain Bovet, and Philippe Sormani, 187-219. Singapore: Springer Singapore. DOI: 10.1007/978-981-13-2110-8_7

Tonkinwise, Cameron. 2005. “Is Design Finished?: Dematerialisation and Changing Things.” *Design Philosophy Papers 3* (2): 99–117. DOI: 10.2752/144871305X13966254124437

Tsing, Anna. L. 2015. *The mushroom at the end of the world : on the possibility of life in capitalist ruins*. Princeton: Princeton University Press.

Udall, Julia. 2019. "Mending the Commons with the 'Little Mesters'." *Ephemera* 19 (2): 253-81. Retrieved from https://www.proquest.com/scholarly-journals/mending-commons-with-little-mesters/docview/2258087318/se-2

Ureta, Sebastián. 2014. “Normalizing Transantiago: On the challenges (and limits) of repairing infrastructures.” *Social Studies of Science* 44 (3): 368–92. DOI: 10.1177/0306312714523855

Vyas, Dhaval, and John Vines. 2019. “Making at the Margins.” *Proceedings of the ACM on Human-Computer Interaction* 3(188): 1–23.DOI: 10.1145/3359290

Wakkary, Ron, and Leah Maestri. 2008. "Aspects of Everyday Design: Resourcefulness, Adaptation, and Emergence." *International Journal of Human-computer Interaction* 24 (5): 478-91. DOI: 10.1080/10447310802142276

Young, Meg, and Daniela K. Rosner. 2018. "Repair for the Masses? Gender and Care Work in the Fixers’ Collective." In *Repair Work Ethnographies*, edited by Ignaz Strebel, Alain Bovet, and Philippe Sormani, 313-34. Singapore: Springer Singapore. DOI: 10.1007/978-981-13-2110-8_11

Figures

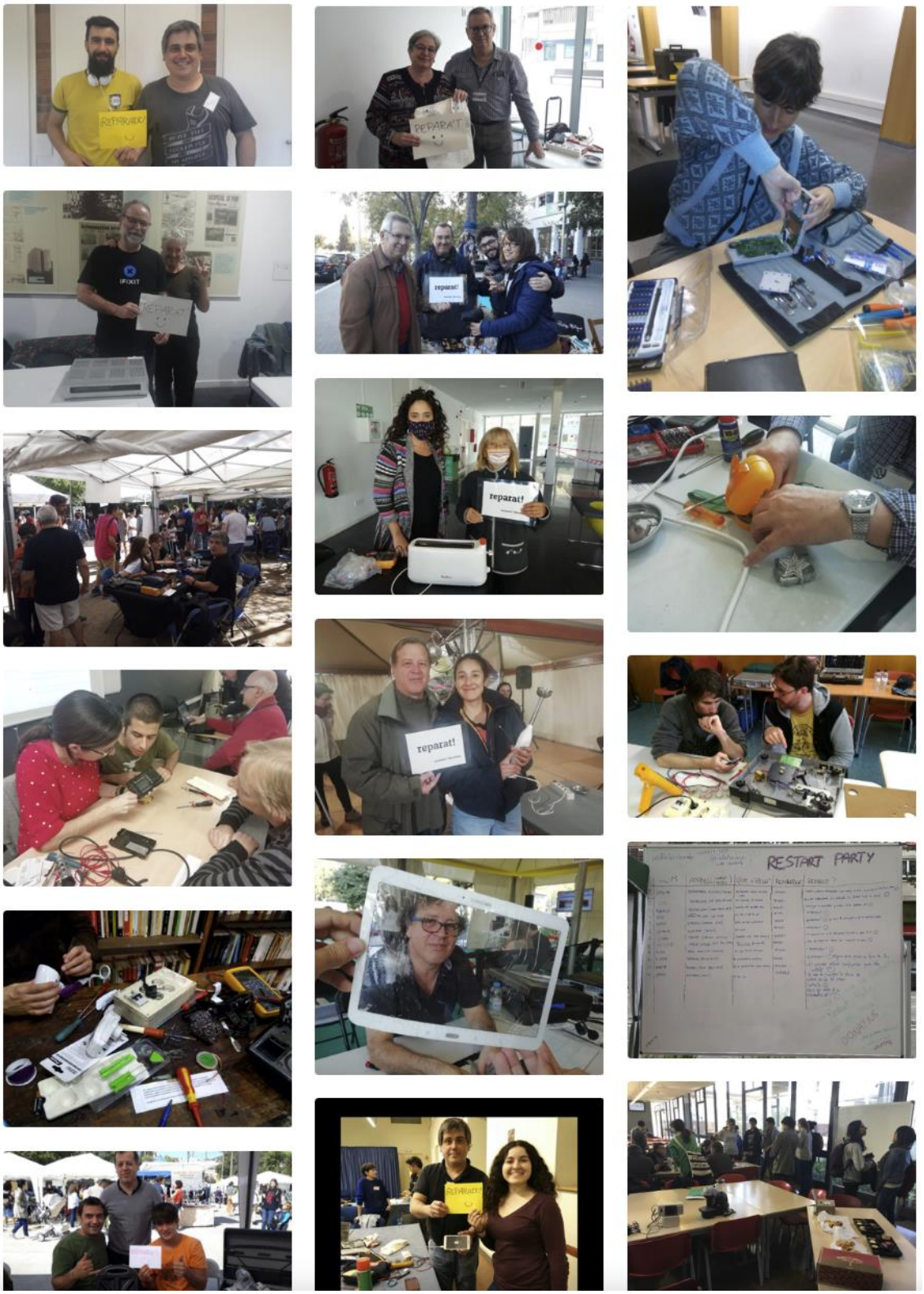

Figure 1: Collection of RP BCN moments (see: https://restartersbcn.info/galeria/)