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THE EMERGING 'RIGHT TO REPAIR' LEGISLATION IN THE EU AND THE U.S.

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Abstract: The transition to a Circular Economy (CE) aims for more efficient use of resources and reconsideration of how products are designed and used, including promoting longer lifetimes through design and repair. However, several factors influence whether it is an option for the consumer to repair the product. These range from legal and market impediments to factors of cost, convenience, and consumer preference. In this paper, we examine the current state of right to repair and different stakeholder perspectives. We outline the fundamental barriers to accessing repair services for consumer electronics as well as current and proposed policies in both the EU and U.S. promoting access to repair. Following a comparison of initiatives, we conclude by discussing the need to balance stakeholder interests in defining the desired scope of Right to Repair (R2R) - distinguished from a fully open access to repair - within the context of CE goals.

1. INTRODUCTION

Waste of electrical and electronic equipment (WEEE), or e-waste, is one of the fastest growing waste streams globally. With an annual growth rate of 3 to 4%, the amount of e-waste is expected to grow to 52.2 Mt in 2021 [1]. In both the U.S. and the EU, there has been recognition of the need for life cycle management of electronic products and the need to ensure sound end-of-life management [2], [3]. At the same time, it has been acknowledged that making products more durable and easier to repair will empower consumers in contributing to a more circular economy. Particularly in the EU, the concept of a Circular Economy (CE), where the value of materials and products is maintained and recovered through narrowing, closing, and slowing loops, has been gaining much traction in recent years [4].

CE is seen as a remedy for more than waste - as a strategy for addressing larger resource and sustainability issues. Waste management and CE strategies have the potential to address e-waste, critical materials, and larger resource efficiency issues by not only narrowing and closing material loops through eco-design and recycling, but also slowing material loops through longer lasting products and repair [5]. However, the upscaling of repair to become more effective in addressing e-waste problems and maintaining value for the CE still faces significant barriers. This paper primarily considers the contexts of the EU and U.S. and aims to provide an overview of barriers and possible policy drivers for increasing repair of electronics.

2. BARRIERS, ACCESS TO REPAIR AND STAKEHOLDER INTERESTS

2.1. Barriers to repair

Academic literature of barriers for independent repairers or consumers often refer to legal barriers, such as IPR infringements, or to products designed for obsolescence rather than longevity or repair. Lack of awareness, knowledge, tools, manuals or spare parts can also impede repair. Total costs of repair, time and convenience, lack of trust, risk of poor quality and availability of cheap new products makes repair a less competitive option. Others note cultural aspects that make repair less desirable independent of costs and other barriers. [6]–[14]

Amongst these barriers, we identify three levels of obstacles to repair: 1) fundamental legal and non-legal barriers preventing accessible repair; 2) the total price of repair and other competitive

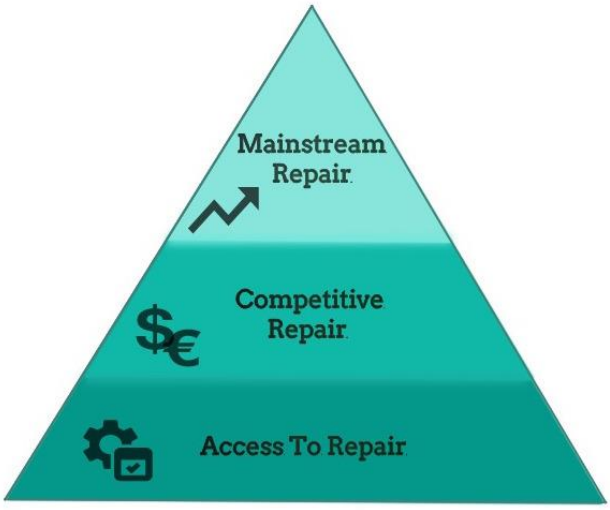

Figure 1. The three levels to achieving the repair goals of the CE

factors deterring consumers from choosing repair as an economic and convenient option, and lastly; 3) consumer preferences and attitudes not favoring repair (see Figure 1 above).

To systematically and effectively enable and incentivize repair services, we argue that the first step is to identify and address the most fundamental barriers, hindering access to repair (base level). Once these barriers are eliminated, or diminished, a similar evaluation should be conducted for the other two levels. By taking this systematic approach, policy measures can be recommended for each level, with the ultimate goal of leading consumers to choose to repair their broken devices - i.e. repair becoming mainstream as part of realising the CE.

In this paper, we focus on the first level, "Access to Repair".

2.2. Open vs. closed access to repair services

The choice to repair a broken device, or not, is primarily a consumer decision, based on a number of factors, such as the possibilities to repair, the price and functionality comparison between the repair and a new purchase, the convenience and time, consumer needs, and fashions [15]. Consumers are faced with four options: 1) contact the seller,[1] the OEM's repair division or authorized repair service provider; 2) approach a local, independent repairer; 3) perform the repair themselves (DIY); or 4) discard and replace [16]. Whether they choose one or another option will notably depend on their access to repair services. The barriers to repair, outlined above, show how the level of "access" is dictated by two activities; the selling and purchasing of the repair services, and the conducting of the repair. The latter implies access to spare parts, tools, repair manuals and the like, as well as the permissibility of the repair activities required to fix the device. We refer to *open access to repair services* when consumers are free to choose who will be conducting the repair. On the other hand, *closed access to repair services* means that consumers are restricted to the repair services provided by the OEM.

2.2.1. Closed access to repair services

Repair services are currently, by the use of different means, kept almost exclusively to the OEMs and their authorized network, depending on the brand. Independent repairers can choose to become authorized to work with one or several OEM. For this to happen, they must get an "Authorization" from each OEM. For example, repair companies have to pay Apple a fee, and agree to only buy parts from Apple at a fixed rate. Despite being authorized, the repairers are restricted from performing certain types of repairs, some of which are regarded as common, such as a fixing a broken charge port or camera. In these cases, the repairer receives compensation, called a 'finder's fee', for sending the product to Apple. Not all repair companies agree to abide by these limitations, some even consider the authorization hurtful to their profitability [17]. There are a number of reasons why OEMs want to control, or close, access to repair of their products, such as data privacy, consumer safety, branding and profitability. We present these concerns and discuss their legitimacy in section 5.

[1] If the product has a default that falls under a warranty (legal or commercial). Warranties and access to repair services are discussed later in this paper.

Figure 2. The Span of R2R

2.2.2. Open Access to Repair Services

At the other end of the spectrum, open access to repair is advocated by independent repairers as the way for local and social companies[2] to take part in the aftermarket, and compete on an equal and fair basis with OEMs. Liberalising the market for spare parts, for instance, would considerably augment the opportunities for repair. Currently, OEMs do not offer to repair all of their product's defaults [17] and some consumers cannot access the OEM repair services because they are not available within reasonable distance or time [18].[3] Moreover, the repair services currently provided by OEMs do not appear developed enough to increase repair activities [19].

The absence of competition on upgrades and updates has led 'closed' devices to have a shorter effective lifetimes and become obsolete quicker than if such a competition had existed [20]. By restricting access to price competitive and convenient repair services, and in some cases even designing products to be difficult to repair or with shorter lifetimes, some argue that this leaves consumers with no other choice than to purchase a new device, ensuring revenues to the manufacturer [21]. However, increased competition may also, under certain circumstances[4], result in lower quality repair due to shorter time spent on repair to ensure profit or the use of cheaper, low quality spare parts. It should also be noted that completely open access may, in certain cases, not necessarily be beneficial for consumers and the environment.

2.2.3. Right to Repair

The current market is seemingly structured against any real incentives for OEMs to enable more repairs, especially outside of their own network, so it is difficult to see how repairs will become more accessible, and contribute to waste and CE goals, without some intervention. According to the U.S. Repair Association, 'Right to Repair [...] is for the consumer's right to choose who, what, where, why, when, how, and for how much their equipment is to be repaired'[22]. In 2014, a nationwide agreement was signed in the US between automobile OEMs and independent car repairers granting access to parts, tools and diagnostics on "fair and reasonable terms" [23], [24], followed by legislative proposals regarding electronics, so called "Fair Repair" bills or "Right to Repair" acts, in many states [25].

In the EU, the European Parliament passed two resolutions in 2017 and 2018 calling for the Commission to promote product durability and reparability as well as better rights and information for consumers [26], [27]. Although some argue that "Right to Repair" (R2R) is equated with open access to repair services, our view is that it is a more complex concept involving many stakeholder views and interests, demonstrated by Figure 2. A crucial question will therefore be to determine where R2R - i.e. a balance between open and controlled access - should be on this spectrum of access (see Figure 2).

We argue that establishing what R2R of electronics should entail requires the recognition and balancing of the various stakeholder interests. In section 5, we attempt to clarify the concept following a discussion and balancing of stakeholder interests.

2.3. Aim and Structure of the Paper

Having concluded that the current access to repair services is fairly "closed", we identify what the barriers for a more "open" consumers access consist of in the EU and the US. Subsequently, we present various policy tools as potential alternatives for how to obtain a more open access. To understand better what the scope of R2R should be, we discuss the interests and concerns of key stakeholders that need to be negotiated moving forward if repair is to become competitive and eventually mainstream. The broad framing for the analysis is the CE and, in considering barriers to increased repair, we are taking the perspective of the consumers as the owners of a broken device. For simplicity, we use the terms OEM broadly to include both seller and IPR holder.

[2] Social enterprises have both business and social goals, and apply commercial strategies to maximize financial, social and environmental improvements.

[3] E.g. there is no Apple store in the State of Vermont so people have to drive out of state to get repair services.

[4] Bad quality can occur e.g. if there are no standards in place or they are not respected (considering both the training of staff and the material) and if there is no transparency for the consumer.

3. FUNDAMENTAL BARRIERS TO OPEN ACCESS

Here we outline legal and non-legal (e.g. market) barriers for consumers and the repair sector to buy, sell and carry out repairs. Table 1 below shows how access to repair is limited by the law or by OEMs.

Repair Aspect	Barrier	Examples
Purchasing /Accessing of Repair Services		
Use of non-OEM authorized repairers (incl. DIY)	End-user license agreement (EULA) and conditioned sales contracts	Terms forbidding unauthorized repair or modification of software-enabled products, their disassembly, and/or the use of non-OEM parts, enforceable under contract law [28]. **US**: Violation of terms constitutes breach of contract.[5] **EU**: Assessment as breach of contract depends on national contract and IP laws[6]; circumvention of exhaustion doctrine might, however, be unlawful [31][7], particularly for more thorough refurbishments.
	Lack of awareness	Low awareness of consumer rights can effectively prevent exercise of R2R [32]. Confusion can arise between terms in the commercial guarantee (from manufacturer) and the legal guarantee (from consumer law).[8]
	Misleading information	There are examples of OEM misleading consumers that a legal/implied warranty will be voided if they: engage in unauthorized repair; try to disassemble the device (e.g. removes stickers on devices); use non-OEM spare parts.[9]
Feasibility of repair	Premature obsolescence	Premature disposal of products, because of designed short lifetimes (i.e. planned obsolescence), or the use of low quality materials or other forms of premature obsolescence (notably psychological and functional), can prompt discard and replacement, and impede repair.
Conducting Repair Services		
Conducting a non-OEM authorized repair or DIY (general)	EULA and conditioned sales contracts	Terms forbidding unauthorized repair, disassembly and/or use of non-OEM parts, enforced under patent law. **US**: Pre 2017, enforceable as patent infringement [35], but not anymore [36]. **EU**: The issue is dependent mostly on national law[10]. Circumvention of the exhaustion doctrine by contracts is most likely unlawful [38].
		Terms in EULA forbidding unauthorized repair, disassembly, and/or use of non-OEM parts enforced under copyright law. **US**: Presumably still enforceable, making a repairer violating the terms a copyright infringer.[11]

[5] It is argued that the Supreme Court "normalizes" the use of contract to restrict use in Impression Products, Inc. (see [29])

[6] The EU Consumer Protection Directive (2011/83) sets an obligation to inform the consumer on functionality of digital content (article 5.1 g and 6.1 r). In general regarding EULAs in the EU, there is in practice little space for application of rules on unfair contractual terms. This is due to a lack of case law on correcting contractual imbalances by applying general rules on good faith and fairness, for instance [30, p. 420].

[7] In the case UsedSoft v. Oracle International C-128/11, the CJEU stated that exhaustion doctrine can not be overridden by the freedom of contract to prevent the secondary market actors to sell used software. Exhaustion itself could be excluded only to the extent necessary to safeguard the specific subject matter of copyright. This case contributed to drawing a line between a genuine license and a sale, as well as the issue of freedom of contract when considering exhaustion.

[8] Only legal warranties give remedy for pre-existing defects; see study by European Consumer Centre Network (ECC-Net) [33].

[9] The U.S Federal Trade Commission (FTC) has found examples of misinformation being conveyed to customers [34].

[10] There are great variety in national law approaches on privity of contract and how the acts of non-party are perceived in relation to contracts. See [37].

[11] See [29] for arguments on why user restrictions can still be enforced under copyright law after Impression Products, Inc in 2017; [39]

		EU: Depends partially on national law [36], but circumvention of exhaustion doctrine does not seem to be possible (see footnote 7 on CJEU´s UsedSoft-case).
		Terms forbidding unauthorized repair, disassembly, and use of non-OEM parts enforced under contract law. **US**: Repairers could face a tortious interference lawsuit for violating the terms, especially considering sellers reluctance to pursue their customers [29], [39], [40]. **EU:** Contract law is not harmonised and the issue is dependent on national law [36]. However, this type of clauses could be questioned under the fairness test of the Unfair Contract Terms Directive.
Disassembly	EULA and conditioned sales contracts	Terms prohibiting disassembly enforced under copyright law. **US**: See above. **EU**: See above
		Terms prohibiting disassembly, enforced under contract law. **US**: See above. **EU**: See above.
	Design Measures	The use of proprietary screws, non-removable batteries and similar techniques can impede repair. Trends such as slim, compact and sleek (i.e. non-visible screws) make products more difficult to disassemble and repair is more likely to damage them [41]. There can be trade-offs between reparability and other ecodesign strategies [42].
Finished repaired product	Patent Law	Repair amounting to a 'construction or 'modification' of the patented article constitute *direct infringement* in the **US** [43]–[45] and **EU** [46], [47] alike.
Technical lock on software incl. Digital Rights Management (DRM) and Technical Protection Measures (TPM)	No obligation	Currently no obligations for OEMs to provide passwords, etc. Without the password, repair attempts can be blocked [18].
	Copyright Law	Unauthorized circumvention of DRM on copyrighted software constitutes a violation. **US**: Applies even to non-infringing use [48]–[50]. **EU:** The relationship between the regulation of TPMs and copyright restrictions & limitations is not clear [30]. While TMPs are allowed and protected, they should not impair the exercise of an exceptions or limitation under copyright law. However, bypassing a TPM (even if it overrides an exceptions or limitation) would be illegal.
Software repair	Copyright Law	**US**: E.g., repair activity such as copying of the codes can constitute infringement (case-by-case). Most repair activities are permissible [28], [51]. **EU:** The software directive contains exception on lawful user´s possibility to correct errors, but it can be set aside or limited by a contract.
	Design measures	Lack of updates for embedded software can mean that the repaired device may be less, or non, functional, pose security risks, or loses the ability to retrieve data (or the data itself) [52].
Spare parts		
Access	No obligation/ guarantee of supply	As a main rule, manufacturers can refuse to sell spare parts to independent repairers [53] or to consumers themselves. They do not have to produce or store spare parts, nor provide software support for the lifetime of the

		hardware [54]. Supply chain disruptions can impede supply even if manufacturers intend to supply.[12]
Manufacture, sell and import	Patent Law	Unauthorized replication of a patented spare part constitute *direct patent infringement* in the **US** [44] and the **EU.**
		Supply of non-patented spares to a combination patented article can constitute *indirect infringement* in both the **US**[44], [45] and **EU**[13], constraining the aftermarket.
	Design Law	Partial design patents on spare parts hinder repair efforts since the use of non-identical parts would alter the appearance of the entire product. **US:** "Must-match" parts are protected without exceptions and can therefore not be lawfully replicated [51], [56]. **EU**: Certain spare parts are protected, provided that the 'repair clause' does not apply (see section 3 below).[14]
	Trademark Law	Prohibition to sell or import refurbished spare parts bearing trademark in a way that causes confusion (for instance, without a disclaimer) or in the case that the condition of the spare parts have changed [57]–[62]. Refurbished aftermarket parts are seized by customs as "counterfeit" [63].
Compatibility	Design Measures	"Software doping" can prevent products from functioning with third party parts or equipment (e.g. printers ink cartridges; or electronics battery chargers) [64].
Manuals & Schematics		
Access	No obligation	OEMs are not obligated to provide original manuals and schematics
Distribution	Copyright Law	Unauthorized spreading of copyrighted repair information is infringing without exemptions in the **US**[65], [66] and **EU** alike.
Tools		
Access	No obligation to sell	Use of proprietary tools, which can be unfamiliar to consumers and/or repairers.
Import, sell, distribute or manufacture	Copyright Law	Unauthorized distribution of software tools, e.g., restoration disks needed to complete the repair and make the device operational again, is unlawful [50], [66].
		US: Tools for the breaking of technical locks on software (DRM) is prohibited, regardless that the tool is used for permissible repairs [49], [56]. **EU**: The same situation, but the relationship between DRM regulation and copyright exceptions and limitation is not clear.
	Patent Law	Creating a replica of patented tool constitute *direct patent infringement.*

Table 1. Barriers to Open Access to Repair Services

[12] E.g. Fairphone had to stop supporting the provision of spare parts for the Fairphone 1 because of such disruptions.

[13] The interpretation appears, however, more liberal in the US compared to some European approaches. For instance, in Germany, a broad interpretation for indirect infringement and for an essential element of an invention might impede secondary market actors. See, e.g. [55].

[14] See EU Design Directive 98/71/EC (Article 3(3)) and Community Design Regulation (CDR) No 6/2002 (Article 4(2)).

4. POLICY SOLUTIONS

In this section, we present policy tools with the potential to remove, or mitigate, the barriers presented earlier in order to move towards more open access to repair services.

4.1. Repair under IP Laws

4.1.1. Exhaustion doctrine

Under Intellectual Property Laws, the exhaustion doctrine provides the right for the consumer as product owner to repair the protected product, as long as the repair or modification is not too extensive [67, p. 452-456]. This stated limitation to what constitute permissible repair[15] arguably leads to wasteful behaviours. Benjamin Pi-wei Liu proposes several interesting alternatives to the current exhaustion doctrine that takes into consideration sustainability goals [68].

Limitations to repair under IP Rights are often interpreted narrowly and courts tend to abide by traditional interpretations, as well as un-harmonised and vague concepts (such as "normal lifespan of the product"). This is causing the distinction between permissible repair and impermissible reconstruction to impede some repair activities. Therefore, one option would be to embed the CE arguments into the doctrine of exhaustion by, for instance, developing international soft law mechanisms in this area.

4.1.2. Anti-circumvention

The U.S. anti-circumvention provision was intended to prevent infringers from overcoming anti-piracy protections added to copyrighted works. However, as expressed by the US Copyright Office (USOC) in the first comprehensive public study of the legislation: "section 1201 was not intended to facilitate manufacturers' use of TPMs to facilitate product tying or to achieve a lock-in effect under which consumers are effectively limited to repair services offered by the manufacturer" [49, p. 92]. There seem to be a general understanding that *bona fide* repair and maintenance activities are typically non-infringing [49, p. 90]. A decision whether product owner can be permitted to undertake repair themselves or with the assistance of third-party repair is expected around October 2018 [69]. The USOC recommended that any exemption should require that the circumvention constitute a necessity for the diagnosis, repair, or maintenance to be conducted, as is required under the exemption for motor vehicles [49]. Also in the EU, concerns have been raised on the possibilities that the formulation of TPM regulation offers for copyright misuse, especially regarding EULAs. For instance, adoption of a general copyright misuse clause to EU copyright has been proposed as a solution to this and some other equivalent problems [30, p. 431-432].[16]

4.1.3. Copyrighted Repair Manuals

For maintenance and repair information of motor vehicles, the Congress granted a 'wholesale exception to copyright' under the Clean Air Act of 1990. In the case of electronics, some argue this may not be necessary and propose that copyright protections are maintained to safeguard the information until the release of the next generation model or the end-of-life of the device [70]. However, in the case of new devices breaking soon after that particular model is released, repair opportunities will not increase following this suggestion. Furthermore, such approach does not provide equal opportunities to independent repairers who would not have as much time to assimilate the information and train their staff, and hence would not be as competitive.

4.1.4. Design and Trademarks

In the U.S., the Promoting Automotive Repair, Trade, and Sales (PARTS) Act, proposes either an exemption for parts used for repair, or alternatively shorten the design patent duration for parts used in repair from around 15 years to 30 months [71]. However, insurance companies who have previously supported this bill regarding car spares have been less interested in backing legislative efforts regarding electronics because components of electronics are mostly internal [72].

In the EU, design legislation protects complex products as well as parts of such products so long as these parts remain visible during *normal use* of the complex.[17] There is much heated debate around whether spare parts should indeed fall out of

[15] E.g., the German Supreme Court has developed a test to draw the line between repair and reconstruction: if the components are expected to be replaced during the working life of the device, and the technical effect of the invention is reflected in replaced components, then the use constitutes reconstruction and is counted as a patent infringement.

[16] Sgagna and Scalzini state that it is problematic that the 6 article of the Infosoc directive not only leaves the relationship between TPMs and copyright exceptions and limitations unclear but additionally it fails in taking into account, for instance, when considering EULAs, potential differences in the parties´ bargaining power [70, p. 415].

[17] Article 3(3) of the Design Directive and Article 4(2) of the CDR. "Normal use" is defined as the "use by the end user, excluding maintenance, servicing or repair work", see Article 3(4) of the Design Directive and Article 4(3) of the CDR.

the design rights led to a hybrid system [73]. Article 14 of the Design Directive introduced a repair clause that exempts from protection component parts that are used to repair or restore the product to its original appearance. This provision, however, is not absolute and EU Member States are allowed to 'maintain in force their existing legal provisions', but any change to national legislation should pursue the aim of liberalising the market for spare parts. It is known as the 'freeze-plus' solution and its effect is that the majority of member states have not introduced the repair clause.

Regarding trademark, a District Court in Norway recently gave a ruling that could change the game of independent repair in the Scandinavian countries. The Court relaxed an independent repairer, who had imported refurbished screens from China bearing the Apple logo, a logo that would not be visible once installed on a repaired phone [74]. Relying on EU and national jurisprudence [75, p. 102], [76], [77], the District Court discussed the risk of damage to the essential function of the Apple trademark – guarantee of origin and quality - and questioned the function of logos embedded on the many hidden components served, especially since Apple do not sell separate parts and have other means of distinguishing counterfeits from originals. The verdict, which appears to aim at facilitating competition in the market for spare parts, has been criticized as dismissing the purpose of the trademark in anticipation of the installation (e.g. when the screen parts are sold to repairers or shown to customers prior to the repair) [78]. Apple has appealed the decision.

4.2. Competition & Antitrust Laws

Claims of dominant position abuse may be used to challenge the effective monopolization of aftermarkets and exclusion of independent repair companies from competing in such markets.[18] This could potentially mitigate the barriers in the form of lack of obligations for OEMs to provide spare parts, tools and repair manuals. However, the EU does not show much eagerness to challenge existing barriers and liberalise the aftermarkets of products other than cars [79, p. 52]. In a recent judgment, the General Court of the EU dismissed the claim brought by independent repairers that the refusal of Swiss watch manufacturers to supply them spare parts constituted abusive conduct [53]. The General Court found that, although the manufacturers likely held a dominant position, it had been proven that not all effective competition would be eliminated by their conduct. Competition between authorised repairers and the possibility for new repairers to enter the repair system would remain. In other words, the elimination of independent repairers from the aftermarket does not in itself infringe competition law. The case is under appeal to the CJEU [75].

With regards to 'lock-in' situations in the EU, the likelihood of OEMs being found guilty of infringement to Article 102 TFEU is slim. Indeed, the Treaty provision applies very high thresholds: it requires that the undertaking has a dominant position and that it refuses to supply an indispensable input (e.g. spare parts). Moreover, OEMs can provide justification to their conduct, which would need to be verified on a case-by-case basis. Similarly, for tying and bundling practices to be prohibited under Art. 102 TFEU, the European Commission has laid down tough conditions: 1) the company concerned is dominant in the tying market; 2) the tying and tied products are two distinct products; 3) the tying practice is likely to lead to anti-competitive foreclosure [80, p. 7]To establish dominance, the EU requires market shares of 50% or more [81]–[83]. Above that threshold, dominance cannot be presumed, but may be proven.[19] It is for the applicant to prove dominance in both primary and secondary markets (Kodak principles).[20]

In the US, a situation of dominance also requires a market share of above 50 % at the very least [84]. In a recent case, General Electric was found to have engaged in anticompetitive conduct when restricting access to the servicing of their anaesthesia machines. Among other measures, they forced independent repairers to purchase spare parts at inflated prices from an authorized firm and restricted access to training. GE alleged concerns for consumer safety [85], but the jury found intent on the part of the company to obtain monopolistic power [86].[21]

"Tying" contractual agreements – such as requirements to buy repair services and spare parts only from a market dominant OEM are considered anticompetitive and are unlawful.[22] However, due to the lengthy litigation process, Antitrust laws are not

[18] See Article 101(1) and 102 TFEU; U.S. Antitrust Sherman Act Sections 1 and 2.

[19] Commission Regulation 330/2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices; Article 3(1).

[20] EU embraced the conclusions from US Supreme Court judgment, Eastman Kodak Co. v Image Technical Services, Inc. 504 U.S. 451 (1992).

[21] Also see Sections 1 and 2 of the Sherman Act and Sections 3 and 7 of the Clayton Act

[22] U.S. Antitrust Sherman Act Section 1 and 2; TFEU Article 101 and 102.

properly enforced (i.e. OEMs are rarely being challenged in court and therefore consumers are "tied up") [72]. In one of those rare cases, Avaya, one of the world's largest suppliers of enterprise voice equipment, was held liable of unlawful tying and attempted monopolization by a New Jersey District Court. The company tried to stop an independent service company from providing post-warranty support, based notably on contractual obligations signed by their customers [87]. However, the District ruling was reversed by the appellate court [88].

4.3. Repair restrictive contractual clauses

4.3.1. Contract Law

The concerns of EULAs is the enforcements of contractual terms against weaker parties, and that the contractual terms will contradict public policies, such as resource efficiency goals [89]. The question is if a private agreement, such as a license, can nullify a right already granted under Copyright, Patent, or other law [90]; Derclaye finds that where exceptions in proprietary laws allow for repair, the use of TPMs and EULAs are not lawful. Contract law in the U.S. pertains to the states, and therefore the principle of pre-emption prevents states, and private parties, from departing from federal law. Hence, such clauses should not be enforceable. Derclaye also finds that "[t]his is particularly clear in respect of American copyright law for the use of both EULAs and TPMs"[56]. The Electronic Frontier Foundation is urging Congress to reform the copyright laws by restricting the ability of manufacturers to force customers to waive their property rights, pointing at several such existing restrictions [39].

However, the USCO found no problem in enforcing contractual terms under state law, "regardless of the resolution of those copyright issues" [28], an attitude reflected in a decade of majority court upholdings of EULAs, despite heavy criticism of their enforceability [29], [40]. To prevent the use of overly restrictive terms, USCO suggested alternations to state contract law principles, pointing at case law where the enforceability of EULAs have been questioned, both regarding contract formation requirements and unconscionability [28].

4.3.2. Patent and Copyright Misuse

In summarizing the case law on copyright misuse, USCO find it to: "... pave a path for a misuse defence to prevent anti-competitive behaviour regarding copyright in embedded software" [28]. However, USCO found it to be premature to add a misuse defence to the Copyright Act. In Europe, a problem is that there is not any consistent base for applying a doctrine of patent copyright misuse since such approaches are fragmented in member states and in EU copyright. One solution could be to adopt an explicit clause on copyright misuse into EU copyright [30].

4.4. Consumer law

4.4.1. Planned obsolescence

France is the first country to have introduced a prohibition of activities of planned obsolescence in a revision of the consumer code in 2015. Engaging in such conduct exposes the offender to criminal charges.[23] Many have questioned the enforceability of this legislation due to the use of the word 'deliberately', which requires to prove the intention of the manufacturer to 'reduce the lifespan of a product to increase the substitution rate' [91] Two investigations are underway in France following complaints against Epson in 2017 and Apple in 2018. Apple is accused of having deliberately slowed older iPhone models as part of a global strategy to increase the sale of new products [92]. Recent suits have also been brought against Apple for the slowing of the phones in at least four U.S. states. The cases in New York [93] and California [94], argue under consumer law (e.g. U.S. Code § 45) that Apple should have informed customers that their devices were being slowed. Moreover, the California case argues that customers were not informed of an available remedy.

Another way to combat planned obsolescence is to increase legal clarity through minimum lifetime requirements and more transparent information about product's durability and feasibility of repair [95]. A 2014 modification of the French consumer code introduced an interesting approach in this direction. Article L 111-3 requires French sellers to indicate to consumers, for each product sold, the period during which the manufacturer or importer commit to provide the spare parts needed for its repair. Manufacturers or importers are then obliged to provide, within 2 months and for the period they have advertised, spare parts upon request from any seller or repairer (including unauthorised repairers). However, consumer organisations have argued, this law should be strengthened by making information mandatory

[23] Up to two years in prison and a fine of €300,000, which can be increased by up to 5% of the average annual revenue calculated on the basis of the three previous known annual turnovers, see Article L. 213-4-1 French Consumer Code, FR490.

to consumers whenever the parts are unavailable [96].

4.4.2. Warranties

Most of the barriers regarding warranties stem from lack of information, misinformation or lack of enforcement about existing consumer rights under warranties - both in the U.S. and the EU. Beyond better information and enforcement of warranties and guarantees, it has been suggested that the liability period (during which the consumer has access to repair as a remedy for product defects) in the EU be extended well beyond 2 years. For some eco-labels this is a requirement, and in some member states, it already is, e.g. 3 years in Sweden and in Finland guarantee periods are tied to expected product lifetimes. The burden of proof for the fault with the product falling on the consumer after 6 months has also been suggested to be extended as (as is the case in Portugal and France, where it is 2 years and Finland, where the burden of proof is also tied to the expected lifetime) [95], [97]. In practice, this six-month period often means that the product is presumed to be faulty only within the first 6 months after purchase; after this, the consumer must prove the pre-existing defect, which is often complicated and requiring expert advice.

4.5. Design Requirements

Both the 2015 EU Circular Economy Action Plan and the Ecodesign Working Plan 2016-2019 have stressed the role of product design to make products more durable or easier to repair, upgrade or remanufacture. Ecodesign requirements for vacuum cleaners and lighting products already have rules related to durability, though not repair specifically.

However, the recently proposed new ecodesign requirements for washing machines and dishwashers have several proposed rules relating to repair in different ways. These include: 1) information requirements for refrigeration gases; 2) design for easier dismantling for recycling, material recovery and depollution purposes, 3) declaration on spare parts availability, 4) access to repair and maintenance information for independent repairers with reasonable and proportionate fees. It is proposed that manufacturers should also declare how long spare parts are available - for a minimum of 7 years - and should deliver them within 3 weeks. Furthermore, the European Commission also proposed requirements on the reparability of refrigerating appliance gaskets (as those are prone to early failure), requiring them to be replaceable without special tools and that manufacturers should supply end-users with fitting door gaskets for at least 10 years after the production of the model has ceased. The different measures should be adopted by early 2019.

Repair and durability requirements in the Ecodesign Directive have been supported by consumer organizations, which propose even stricter rules, for instance regarding spare parts. The consumer movement also stresses the importance of ensuring that software updates of these appliances are easily available for consumers, especially as all appliances are becoming connected [98].

The EU Commission has announced that it will consider developing requirements on durability and the availability of repair information and spare parts in its work on Ecodesign and in future Energy Labelling measures. In this context, the EU is currently discussing the possibility of displaying a label for repair, through a scoring system, for consumers to rate the ability to repair and update their products [99]. There has also been discussion on how lifetime and durability information should be communicated through labelling as they often have different dimensions that are not easily measured, let alone communicated in a simple method. At the same time, the idea of a mandatory commercial guarantee for the lifespan of a product is also being discussed, but there also remain challenges to determining and communicating lifetimes in practice [100].

In the U.S. some states have designed requirements for electronics, including minimum lifetimes for specific products at the state level (e.g. for LED products in California) [101] and design criteria in some of the fair repair bills. For example, Washington (WA)'s proposed bill includes a provision that:

Original manufacturers of digital electronic products sold on 4 or after January 1, 2019, in WA state are prohibited from designing or manufacturing digital electronic products in such a way as to prevent reasonable diagnostic or repair functions by an independent repair provider. Preventing reasonable diagnostic or repair functions includes permanently affixing a battery in a manner that makes it difficult or impossible to remove.[24]

The WA bill goes beyond other U.S. fair repair bills with this mandatory provision specifically addressing design.

While mandatory design measures are proposed in the EU and in some U.S. states, most current design measures in the U.S. are voluntary. Examples of voluntary design guidelines with some

[24] SHB 2279, Section 3 (6)

reparability criteria include the EPEAT eco-label criteria in the U.S. and in the EU they are included in the EU Ecolabel, and regional/national labels like the Nordic Swan label and German Blue Angel, as well as the criteria for Green Public Procurement (GPP) criteria. For some products, GPP criteria rewards products that can be disassembled with simple tools, as well as specify the availability of spare parts for a time after expiration of warranty (how long depends on the expected lifetime of the product) [102]. However, these standards and criteria have historically not been oriented towards repair, with the exception of computers, for which earlier standards did have modularity requirements because it was expected for computers at the time [103]).

Schaffer writes that in the case of EPEAT standards in the U.S., it was only after "prolonged and contentious negotiations, members were able to include some repair/reuse related criteria in the UL 110 standard for cell phones" [103]. The criteria related to disassembly with tools, provided lists of tools and manuals, information of repair services, etc.; however, disassembly without tools (e.g. removal of the battery) is currently only optional, though this would increase the ease of the replacement and repairing processes. Moreover, the reparability and upgradability criteria are written and interpreted in such a way that most OEM current practices could meet them.[25] Ensuring that standards meant to designate best environmental performers actually reflect this aim in terms of reparability is another way to remove obstacles to repair.

4.6. Fair Repair-bills

In the US, Fair Repair-bills, or Right to Repair Acts, have been introduced in 18 states during 2018 alone, and that number is expected to increase to around 25 states in 2019. Under these bills, States can require OEMs that already provide some kind of repair service, including under warranty, to make service documentation, diagnostics, tools, firmware and service parts available, on fair and reasonable terms, to their customers and to independent repair technicians, see e.g. [104], [105]. In other words, these bills do not require more from OEMs than to offer independent repairers and consumers what they are already providing to their authorized network.[26]

The question of state law pre-emption has been raised, although Massachusetts' Right to Repair-bill for automobiles shows that state law requiring access to parts, tools and information is not pre-empted by any federal law. A federal "Right to Repair"- bill has been discussed, but has not moved forward, partly due to the fact that the issue is primarily a state matter, not within the federal competence. The strategy behind the multiplication of these bills at the state-level is to imitate the success of the automobile Right to Repair-bill passed in Massachusetts in 2012; the introduction of one bill prompted OEMs to apply those conditions to the entire U.S. market [72], [106].

5. DISCUSSION: BALANCING STAKEHOLDER INTERESTS IN 'RIGHT TO REPAIR'

In this section, we present and discuss the various stakeholders' interests to keep access to repair closed or, on the contrary, to open it. As a result of a balance of the interests at stake, we argue that the desirable state of R2R is neither complete control nor full access.

5.1. Concerns with Open Access

OEMs have been, traditionally, reluctant to opening access to repair. Their main arguments pertain to guaranteeing the quality of repair activities, ensuring consumer safety and data security, and avoiding damaging their OEM brand [16]. The fear is that independent repairers' lack of training, fast-paced operations and disregard for safety standards will cause serious problems for consumers [107], e.g., OEMs of security equipment are particularly concerned about the capabilities of independent repairers to fix their "highly specialized products" [108]. Some OEMs have suggested exemptions to the Right to Repair-bills for medical equipment, for safety reasons [109]. With open access to sensitive diagnostics and hardware, hacking is foreseen to increase and thereby threaten consumers' privacy and data security [107]. However, that "security through obscurity" will keep consumers' information safe is rejected by a Harvard computer scientist as less effective, instead advocating openness to increase security [110].

Other concerns are potential misuse of IPR exemptions for repair and the exposure of intellectual property and trade secrets. Through reverse engineering on a device, trade secrets can be discovered, and therefore manufacturers oppose a general right to dissect their products. Further, OEMs find that intellectual property thefts would ensue the adoption of fair repair bills [16]. However,

[25] For example, Samsung's Galaxy S8 - a phone heavily glued - meets the requirements as a gold-level device according to the EPEAT registry [103].

[26] E.g. repair information is already in circulation for use by the OEM technicians and subcontractors [72].

the Repair Association points at how the U.S. Right to Repair-bills were already drafted to protect IP rights [22]. Some bills contain an explicit statement liberating OEMs from any obligation to release confidential information.[27] Further, the kind of repair manuals that OEMs would be required to share under the Bills do not contain any trade secrets. To prevent misuse of repair IP rights exemptions outlined in section 4, possible precautions have notably been suggested, for instance that permissible anti-circumvention must constitute a necessity for the repair (see section 4.1.2 above).

Policymakers' processes will necessarily have to evaluate the potential negative impacts of more open repair and work with OEMs as stakeholders.[28]

5.2. Balancing of rights

Fundamentally, consumers' R2R and to maintain their device collides with the OEM's right to make profit from the sale of a new product after the original device is worn. Since 'every refurbished product represent a lost sale', repair reduces the profitability of any intellectual property embedded in the product [68], along with investments in product development. Intellectual property rights is awarded by the policymaker to encourage investments in innovation benefiting societal progress [40]. However, open markets have also been found to favour innovation, and allow for important contributions from the grass-root communities' "tinkering" [20]. More importantly, some argue that IP Laws are used in a way that was not intended by the legislator, for example to keep cost-competitive aftermarket part manufacturers out [112]. Illustrative is the Norwegian Court's remark on the excessive use of Apple trademark on inside components (see section 4.1.4). With guaranteed sales of aftermarket parts and products, OEMs can produce more units and thereby benefit from economies of scale. In addition, for some manufacturers, the aftermarket sale of spare parts and repair services constitutes a significant source of revenue [20].

The repair right awarded to consumers as product owner, granted by the policymakers through exhaustion (see section 4.1.1), is successfully circumvented by OEMs through practices such the use of EULA terms and technical locks on software (see Table 1). The OEM practices are upheld by various sets of laws, such as contract and copyright law, intended to stimulate innovation and thereby promote public welfare. This indicates a disproportionate consideration in favour of OEM interests, altering the intended balance between the need to stimulate innovation on the one hand with protection of property rights on the other [113] Interestingly, civil rights organisations are challenging U.S. anti-circumvention legislation as a violation of the First Amendment (right to free speech) [114].

Balancing the interest of OEMs to profit from their investments, in particular those arising from innovation that advance sustainability, with the interest of consumers to maintain their product in use rather than purchasing a new one - and the public interest to preserve natural resources and minimize waste - is delicate. As is the balancing of the need to ensure quality and safe repairs with that of allowing local and independent businesses to compete on fair terms on the aftermarket to allow for more repair options - especially since low-quality repairs would lead to resource inefficiencies. There are no right or wrong interests, though some can arguably be granted more weight than others. Hence, policymakers who develop solutions to opening access to repair must keep opposing concerns in mind. Faced with two potential solutions, they should consider their trade-offs. For instance, opening up IP right protection can be done through exempting or shortening the duration of the protection, or by requiring OEMs to sell without discrimination. Only the latter solution ensures a continued profitability for OEMs, albeit limited to "fair and reasonable terms."

Similarly, several laws and policy proposals regarding design requirements on durability and reparability, along with measures to combat "planned obsolescence" have been identified (see section 4.4 and 4.5). Although these measures may seem to go against the interest of OEMs, whose business models are still largely based on a short product lifetime, and the sale of new products, we would argue that they are justified by the benefits they bring in terms of both enhanced consumer rights and environmental preservation. This is particularly the case since OEMs themselves can profit from adapting their business models, albeit relatively high upfront costs.

[27] see e.g., section 4 in Washington State's Right to Repair Bill [111]

[28] The EU process includes stakeholder consultation. Similarly, states like Vermont has formed a committee for the evaluation of the impact of a potential introduction of the Fair Repair bill, and Massachusetts have proposed the same, which will contribute to the further outlining and addressing concerns and potential solutions.

5.3. OEM Incentives to Open for Repair

Recent studies show that missed consumer opportunities to repair their broken devices give rise to "value leakage" for both consumers and OEMs, as well as loss of consumer purchasing loyalty and recommendations. These finding show that OEMs could profit from increasing the reparability of their products by, for example making repair manuals available and integrate reparability in their product design [12], [115]. Rather than losing revenue to Chinese counterfeiter, OEMs could benefit from selling their spare parts, such as screens, to their consumers [72].

There is a growing consumer interest for repair [116], as shown in the rapid development of, and increasing participation in, Repair Cafes and online platforms, like iFixit. OEMs could capitalise on this interest by introducing products specifically designed for repair or upgrade. Such an example is Fairphone, and recent crowdfunding campaign [117] demonstrated support for this type of development. Since an open product could constitute a differentiator [20], OEMs could use reparability as a comparative advantage to attract consumers.

5.4. Right to Repair

Ideally, R2R should maximise benefits to consumers and the environment. As such, we argue that it should move towards more open access to repair. Opening access would also enable independent and local repair businesses to develop and be competitive on the aftermarket, and increasing repair options for consumers. However, there are legitimate stakeholder arguments in favour of maintaining some of the control of access, inter alia consumer safety, security, resource efficiency and incentives for innovation, which need to be fully acknowledged and taken into account in defining this right. E.g., repair of certain product categories might not be suited for free competition, such as medical equipment.

Although we recommend a significant transition of R2R towards "Open" access, ultimately R2R should be inclusive, balancing the interests of different stakeholders (their estimated positions are shown in Figure 3). Hence, R2R is not, we argue, synonymous to open access. Further, we acknowledge that the 'closeness' of OEMs varies greatly from one company to another (e.g. Apple versus Fairphone), and emphasise the advantages for OEMs to adapt their business models towards becoming more open.

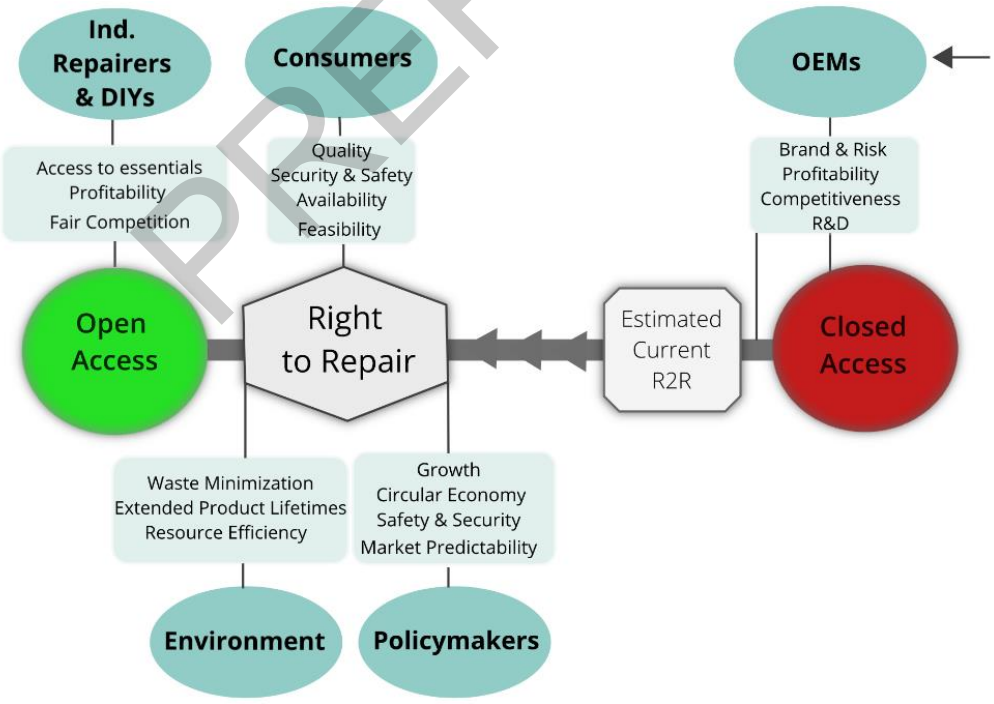

Figure 3. The desired location of R2R in light of stakeholder interests

6. CONCLUDING REMARKS

6.1. Comparative assessment

The comparative angle adopted for this paper has exposed a number of interesting aspects. In particular, it showed that, although both in the US and EU movements are taking place to opening access to repair and moving towards establishing a R2R, they come from quite different perspectives. Recognizing consumer rights to repair their products has been a strong driver to liberalising the aftermarket in the U.S. At the same time, the rapid increase in e-waste prompted American policymakers to address the issue at the source. In the EU, on the other hand, repair came to the forefront of the political agenda with the rise of the CE. Reducing environmental impacts by closing the products loop was a core motivation for beginning to open access to repair. However, the empowering of consumers to choose repair has recently emerged as another crucial strategy. It is not a surprise then that the main discussions take place, respectively, around the development of a consumer R2R in the US, and the adoption of design requirement in the EU. In this light, it is also interesting to note how the U.S. seems much less prone to protect its consumers from having their IP law-related repair rights waived under contract.

Another interesting finding in this paper it that neither the US nor the EU have adopted a completely harmonized approach to R2R. Although some aspects are addressed at the federal/European level, a lot of legal experimentation is taking place at state/national level. Right-to-repair acts are flourishing across the US states, and several EU Member States are adopting legal measures to combat planned obsolescence. However, there remain important discrepancies within the US and EU respectively. Whereas some US and EU states are pioneering in developing innovative ways of fostering more open repair activities, others are lagging far behind. Much is to be gained from creating uniform repair rules, reduce uncertainties and strengthen market predictability.

6.2. Outlook

In the U.S. the R2R movement for electronics hopes to follow the progress made for R2R for cars. However, in some respects this will be more difficult for electronics as they represent a more heterogeneous product groups. In both the U.S. and the EU there are still complex issues to be resolved, for example increased transparency and information about lifetimes is dependent on first determining and measuring product lifetimes, which can be complex and specific to the electronic product being considered [95].

The R2R movement for cars also demonstrated that negotiation between OEMs and other stakeholders will be necessary and requiring compromise. Better understanding of both the legal aspects and the different stakeholder interests is important for understanding R2R. This paper has given an overview, but each issue can be explored more deeply. In addition, repair on the scale needed for a truly circular economy requires addressing competitive and mainstream repair as well (see Figure 1).

Current barriers can also prevent repair activities to move to the next step, i.e. to become more competitive and mainstream. Similar to the approach taken in this paper, it would be useful to further explore competitive and mainstream repair issues (as shown in Figure 1 above), including how liability for both the repair and the repaired products can be a deterrent; the potential for standardisation to improve quality of repair; price of labour and parts for repair versus price of new products and materials or versus recycling; as well as factors that influence consumer convenience, trust, awareness, and demand for repair. Understanding the barriers to repair as well as possible remedies is important to better understanding the barriers and drivers towards the CE.

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