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Productivity Commission
Right to Repair Inquiry
4 National Circuit
Barton ACT 2600
Australia

Re: Productivity Commission's Draft Report on the Right to Repair Inquiry June 2021

iFixit is an international, open-source, online repair manual for everything. Our mission is to provide people with the knowledge they need to make their things work for as long as possible. We represent a global community of makers, tinkerers, fixers, and repair professionals. In 2020, the iFixit community taught repair to over 100 million people from almost every country in the world, including over 6 million Australians. Our strongly collaborative group has published over 75,000 repair guides on everything from home appliances to automobiles to smartphones.

iFixit is grateful for the opportunity to respond to the Productivity Commission's Draft Report on the Right to Repair, and commends the Productivity Commission for its thorough and comprehensive report. We are providing the following comments to assist the Productivity Commission in finalizing its recommendations and offer our continuing assistance.

I. Repair Restrictions are a Systemic Problem

iFixit's initial submission highlighted several examples of smartphone, tablet, game console, laptop, agricultural equipment, and medical device manufacturers using repair restrictions that hinder independent repair and lead to consumer harm.[1] But, these devices only serve as examples of a far more systemic problem. iFixit disputes the Productivity Commission's Draft Finding 4.2 that "available evidence does not point to a systemic competition problem in repair markets" outside of agricultural, mobile phone, and tablet markets and, as in our first submission, we discourage the Productivity Commission from focusing on narrow categories of products and repair markets, as these problems persist in all categories of software enabled devices. In response to the Productivity Commission's request for further evidence of consumer harm in markets other than agricultural equipment, mobile phones, and tablets, we are including several additional examples that illustrate the breadth of the problem posed by repair restrictions.

[1] *See generally* iFixit initial submission.

A. Medical Equipment

The Productivity Commission specifically requested further evidence of consumer harm in the market for medical equipment. In July 2020, The United States Public Research Group (US PIRG) surveyed 222 biomedical repair technicians about the impact of manufacturer-imposed repair restrictions on medical equipment. According to US PIRG's report on the study, "nearly half reported they had been denied access to "critical repair information, parts or service keys", "30.4% claimed to have equipment in their facilities which could not be used due to restrictions on spare parts and service information", and "91.8% claimed they had been denied service information for "critical equipment (defibrillators, ventilators, anesthesia machines, imaging equipment, etc.)." Further, "88.7% of respondents reported that manufacturers had refused to sell spare parts."[2]

Waiting for manufacturer-authorized technicians to service medical equipment can result in unnecessary delays[3] that jeopardize patient care. A positive obligation on manufacturers to provide access to replacement parts, tools, and repair information would enable independent repair technicians, medical providers, and owners of take home medical equipment to avoid harmful delays and reduce costs.[4]

1) Ventilators

PIRG's survey of biomedical repair technicians also revealed that, "of those [biomedical technicians] that work with ventilators, 29.2% report that they currently have ventilators that they cannot use because they lack access to parts and service information. 24.2% of technicians reported that they had been denied access to ventilator repair information since March, and 51.9% report that they have ventilators they could not service on-site if they broke."[5] Some ventilator manufacturers, like Maquet, use Technological Protections Measures (TPMs), including manufacturer-set service passwords, to restrict access to the device's software, access that's

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[2] Proctor, N. and O'Reilly, K., (July 2020), *Hospital Repair Restrictions: Manufacturer-Imposed Barriers to Fixing Medical Equipment Cause Inefficiencies and Delays,* https://uspirgedfund.org/sites/pirg/files/reports/Hospital_Repair_Restrictions_USPEF_7.8.20b.pdf (Accessed Aug. 18, 2021)

[3] See Wyden R. and Kullolli, I.,(Oct. 12, 2020), "Hospitals Need to Be Able to Repair Their Own Medical Equipment", https://slate.com/technology/2020/10/critical-medical-infrastructure-right-to-repair-act-ventilators.html ("As an example, at the facility where Ilir works, electrosurgical units were recalled in April due to major cybersecurity concerns, but the manufacturer couldn't send its repair technician. It took more than eight weeks of back-and-forth, but eventually the manufacturer gave his team permission to address the recall—which simply required installing new software")(Accessed Aug. 21, 2021)

[4] Initial Comment of Transtate Equipment Company Regarding a Proposed Exemption under 17 U.S.C. § 1201, https://www.copyright.gov/1201/2021/comments/Class%2012_InitialComments_Transtate%20Equipment.pdf ("OEMs typically charge 30% to 50% more for service calls than ISOs. Without the competition of ISOs, OEMs will see no reason to lower their prices or provide prompter service. Further, without sufficient access by owner in-house service departments, troubleshooting or diagnosis of machine faults can take days or weeks instead of hours, preventing more rapid service.")

[5] See Supra note 2

needed for repair, and limit distribution of those passwords only to their authorized repair providers.[6] Others require the use of specialized "dongles." Vice's Jason Koebler reported in July 2020 that Medtronic, a manufacturer of medical devices including ventilators, refuses to provide independent service technicians with the necessary dongles and software:

> "In the case of the PB840, a ventilator popularized about 20 years ago and in use ever since, a functional monitor swapped from a machine with a broken breathing unit to one with a broken monitor but a functioning breathing unit won't work if the software isn't synced. And so William uses the homemade dongle and Medtronic software shared with him by the Polish hacker to sync everything and repair the ventilator. Medtronic makes a similar dongle, but doesn't sell it to the general public or independent repair professionals. It's only available to people authorized by the company to do repairs."[7]

Koebler also notes that, while these dongles may work for older model ventilators, "newer medical devices have more advanced anti-repair technologies built into them. Newer ventilators connect to proprietary servers owned by manufacturers to verify that the person accessing it is authorized by the company to do so" and technicians must pay substantial fees to the manufacturer for access.[8]

2) Surgical Robots

In July 2021, a group of Hospitals in the United States sued Intuitive Surgical, maker of the Da Vinci Surgical Robot. The hospitals allege that the company uses its monopoly position in the market for minimally invasive surgical robots to strong arm hospitals into expensive, multi-year service contracts with the manufacturer.[9]

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[6] See Ebme Forums, Maquet Servo I Change Password (Sept. 15, 2015). https://www.ebme.co.uk/forums/ubbthreads.php/topics/69767/Maquet_Servo_I_change_Password (reporting that contact with the manufacturer is needed to change the password); see also, Maquet, Servo-I Ventilator System Service Manual 5, https://www.ifixit.com/Document/jpuqR1CDDumFeves/Maquet-Servo-i-Service-Manual.pdf ("Only personnel trained and authorized by Maquet shall be permitted to perform installation, service or maintenance of the Servo-i.").

[7] See Jason Koebler, "Why Repair Techs Are Hacking Ventilators with DIY Dongles from Poland", MotherBoard (July 9, 2020), https://www.vice.com/en/article/3azv9b/why-repair-techs-are-hacking-ventilators-with-diy-dongles-from-poland (Accessed Aug 21, 2021)

[8] See id, ("You pay between $10,000 and $15,000 to gain access for one year," the hacker said. "They're called 'smart' machines, but it's not smart for me, it's smart for the manufacturer because you spend this enormous amount of money [to repair them]."

[9] Herman, B. (July 13, 2021), "Hospitals are Taking on a Surgical Robot "Monopoly", Axios https://www.axios.com/hospitals-are-taking-on-a-surgical-robot-monopoly-57b3d230-eff3-49a6-8300-4340bd8cee1f.html (Accessed Aug. 21, 2021)

3) Infant Incubators

Like other software-enabled devices, newer infant incubators often use manufacturer passwords to control access to the device software needed for repair—restricting access only to the manufacturers' authorized repair professionals which can lead to high costs and delays.[10]

4) Medical Imaging Devices:

Many CT Scanners, MRI scanners, and other medical imaging devices also use access codes, passwords, or keys to restrict access to diagnostic software and error logs that are necessary for repair.[11] Phillips, a manufacturer of medical imaging devices, has sued several independent service organizations for allegedly circumventing these access controls.[12]

5) Wheelchairs

Repair restrictions on medical equipment don't just impact hospitals and medical centers—they also impact those who rely on take home medical equipment—like power wheelchairs. In an April, 2021 hearing on the US state of Colorado's proposed Right to Repair law, wheelchair user Kenney Maestas testified to his personal experience with repair restrictions imposed by the manufacturer of his wheelchair. Maestas testified that his chair needed simple fixes that could have been done by anyone—the right arm of the chair had broken and it needed a battery replacement.

> "Both my son and brothers were capable and ready to do whatever needed to get done... I called on the 14th of December... I was told the next time a tech would be in my area would be the 18th of January. As a rural resident of Colorado I'm used to a regional delay, but 35 days seemed excessive." While the company apparently had necessary replacement parts, it required that a technician inspect the chair before making the repair. Maestas waited another 28 days after the technician arrived for the chair to function again and spent more than 60 days immobilized.[13]

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[10] Schwartz, L. and Lockwood, D., (Mar. 10, 2021) "Why it's so hard for a hospital in Tanzania to fix broken incubators" https://restofworld.org/2021/why-its-so-hard-for-a-hospital-in-tanzania-to-fix-broken-baby-incubators/ (accessed Aug. 18, 2021).

[11] See *Initial Comment of Transtate Equipment Company Regarding a Proposed Exemption under 17 U.S.C. § 1201*, at 2, https://www.copyright.gov/1201/2021/comments/Class%2012_InitialComments_Summit%20Imaging.pdf (accessed Aug 18, 2021)

[12] See Id.

[13] Gault, M. (Apr. 5, 2021), "Colorado Denied Its Citizens the Right-to-Repair After Riveting Testimony" https://www.vice.com/en/article/wx8w7b/colorado-denied-its-citizens-the-right-to-repair-after-riveting-testimony (accessed Aug. 21, 2021).

Julie Reiskin, Executive Director of the Colorado Cross-Disability Coalition also testified:

> "This company left a friend and colleague for two weeks with a broken tilt, which is necessary to preserve skin integrity, with full knowledge that he has life threatening medical issues caused by pressure sores. When they finally bothered to show up two weeks later, they failed to fix the problem." When Reskin's friend had a handyman fix it, the manufacturer voided his warranty.[14]

Like other software enabled-devices, manufacturers of power wheelchairs also use TPMs like passwords and hardware dongles to restrict access to configuration parameters. The user manual for wheelchairs powered by Dynamic DX control systems states, "WARNING! A Quantum Rehab Provider or a qualified technician must perform the initial setup of this power chair and must perform all of the procedures in this manual." A user may need to change the speed damping setting to offset a failing wheel or motor, or to accommodate an aftermarket part. Or they might use a different tire for navigating inclement weather and need to adjust the wheel grip software parameters. Unfortunately, users cannot make these changes without bypassing the security dongle. "The Wizard requires a hardware security key (dongle) to write parameters to a controller. Without the dongle the Wizard can still display parameter values and diagnostic messages, but nothing can be edited or written to a controller." (iFixit & RA Copyright Office comments 2021)

[14] Id.

B. Consumer and Industrial Equipment

Manufacturer-imposed TPMs that restrict independent repair have also been reported in a wide range of industrial and consumer equipment, including microscopes[15], robot vacuum cleaners[16], electronic cat litter boxes[17], cameras[18], garage door openers[19], boats[20], appliances and home systems[21], and industrial scada systems[22], to name but a few.

For further examples, iFixit encourages the Productivity Commission to review iFixit and other petitioners' comments in the United States Copyright Office's 2021[23], 2018[24], and 2015[25] triennial rulemaking proceedings regarding exemptions to 17 U.S.C. § 1201.

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[15] iFixit has received at least one email from a device user reporting that the diagnosis of microscopes is only possible with a password.

[16] Batteries for Roomba robot vacuums have been reported as not interchangeable. See Robot Reviews, iRobot Roomba and Scooba Chat (Sept. 3 2020) http://www.robotreviews.com/chat/viewtopic.php?f=1&t=22674 ("Unfortunately, iRobot's battery DRM prevents the robot from fully booting and charging. It simply states 'Please insert an iRobot battery.'")

[17] See Brian Benchoff, Cracking Litter Box DRM, (Jan. 19, 2015), https://hackaday.com/2015/01/19/cracking-litter-box-drm/.

[18] See David Coleman, Updated Third-Party Batteries for the GoPro HERO5 Black, (Last Updated Nov. 6 2020) https://havecamerawilltravel.com/gopro/wasabi-power-batteries-gopro-hero5-black.

[19] See Nate Anderson, What Is DRM Doing in my Garage? (Dec. 16 2009), https://arstechnica.com/tech-policy/2009/12/what-is-drm-doing-in-my-garage.

[20] See RiverdalePlace Forum, What is the Software a Mercruiser Tech would Use to Diagnose Problems/Change Parameters (Apr. 7, 2018), https://www.riverdavesplace.com/forums/threads/what-is-the-software-a-mercruiser-tech-would-use-to-diagnose-problems-change-parameters.182089/ (users describing how dealer software may be required for some settings); see also Mercury, CDS G3 Users Manual: Version 1.7 Software (2016), https://service.mercurymarine.com/media/1010/cdsg3usermanual17.pdf; Mercury CDS G3 Home Page, https://service.mercurymarine.com/g3/home/ ("CDS G3 is delivered via a download. A license key is required to unlock the software and only contracted Mercury Marine dealers are authorized to use the software."); See RiverdalePlace Forum supra n. 42 ("Since it's a long way from where I keep the boat to a dealer, I'd like to get the diagnostic tools for my own use.")

[21] See *2018 Recommendation of the Acting Registrar of Copyrights: Seventh Triennial Proceeding to Determine Exemptions on the Prohibition on Circumvention* (Oct. 2018) at 222, ("After weighing the statutory factors, the Acting Register concludes that the prohibition on circumvention of TPMs is causing, or is likely to cause, an adverse impact on the noninfringing diagnosis, maintenance, and repair of home appliances and smartphones.")

[22] When malware impacted Siemens SCADA systems using the manufacturer's hard-coded default, systems operators were forced to either disconnect the hardware from the internet and wait for a Siemens patch, or bypass the Siemens security model and develop a patch for these systems themselves. Wired's investigation found that "hard-coded passwords aren't a problem just for Siemens."When hackers utilized the system's master passwords to install malware, factory owners were unable to repair their own systems and were forced to disconnect the hardware from the internet, effectively restoring all the programs to their factory settings. See Kim Zetter, SCADA System's Hard-Coded Password Circulated Online for Years, Wired (July 19, 2010) https://www.wired.com/2010/07/siemens-scada/ [https://perma.cc/2RD6-EBDQ].

[23] https://www.copyright.gov/1201/2021/comments/

[24] https://www.copyright.gov/1201/2018/comments-121817/

[25] https://www.copyright.gov/1201/2015/comments-020615/

II. Repair Restrictions Lead To Higher Repair Prices and Reduced Options, and Deprive Consumers of Full Ownership of Their Devices

Where manufacturers restrict access to replacement parts, tools, and repair information, independent repair providers struggle to compete in the market[26], and device owners face reduced choice. When manufacturer-authorized repair services are available at all (many manufacturers don't provide any repair services), they often require owners to travel long distances, pay higher prices, wait out delays in shipping and repair, or limit the types of repairs available. The solution is to ensure that owners and independent repair providers have access to the information, parts, and tools needed to keep their devices operational by imposing a positive obligation on manufacturers of electronic devices.

Empirical studies show that manufacturers' authorized repair services often charge higher prices than independent repairers for the same repairs. During the United States Federal Trade Commission's "Nixing the Fix" workshop[27], the International Association of Medical Equipment Remarketers and Services, Inc., (IAMERS) submitted evidence that independent service providers often charge significantly lower prices for repair services than the manufacturers' repairers, stating "some independent servicers maintain diagnostic imaging equipment for $150-$250 per hour. When compared to manufacturer servicing at rates reportedly ranging from $500-$600 per hour (with a four hour minimum), independent servicing may offer a cost-effective alternative to hospitals and healthcare organizations in need of reducing costs."[28] In their comment, the Automotive Body Parts Association stated "[f]or more than 60 years, the alternative collision parts industry has been offering quality alternative parts to consumers, typically 15-50% less expensive than car company non patented repair parts."[29] Anecdotal reports also support these findings.[30]

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[26] See Anderson, M. "Without 'Right to Repair,' Businesses Lose Time and Money" , AP News Aug. 10, 2021) https://apnews.com/article/technology-business-9f84a8b72bb6dd408cb642414cd28f5d (Accessed Aug. 18, 2021)

[27] https://www.ftc.gov/news-events/events-calendar/nixing-fix-workshop-repair-restrictions

[28] Federal Trade Commission (May 2021), *Nixing the Fix: An FTC Report to Congress on Repair Restrictions* ("*Nixing the Fix")* at 40

[29] Id. at 40 n. 219

[30]See Stumpf, R., "Tesla's $16,000 Quote for a $700 Fix Is Why Right to Repair Matters, " The Drive (July 12, 2021) https://www.thedrive.com/news/41493/teslas-16000-quote-for-a-700-fix-is-why-right-to-repair-matters (accessed August 18, 2021); Chen, B. "Why You SHould Care About Your Right to Repair Gadgets," NY Times (Jul. 14, 2021) https://www.nytimes.com/2021/07/14/technology/personaltech/right-to-repair-iphones-android.html ("When I took my wife's iPhone to an Apple Store this year, I was quoted $280 to replace a broken touch-screen, about 40% of the price of a brand new iPhone." When he took the same phone to an independent repair provider, they quoted him only $180 for the same repair.); Han, N. and Grubola, H. "A

Consumers and businesses in rural areas are particularly impacted by the lack of independent repair options where authorized repair providers lack a local presence. As the Productivity Commission itself notes, "Repair services can be limited or non-existent in regional areas. Smaller products, such as mobile phones, often need to be shipped to major cities, which increases the time and cost of repair. As larger products such as white goods cannot be easily shipped to a repairer at a low cost, the distance the repairer travels to reach a consumer may be reflected in the repair price. This means that people in remote areas can expect to pay much higher prices for repairs."[31] If local repair businesses could access the same parts, tools, and information as manufacturers' authorized repairers, they could serve their communities more rapidly and enhance economic development in rural and remote areas.

When limited to manufacturer-authorized repair providers, some consumers will find they can't get their devices fixed at all. Some manufacturers, like Apple, restrict the type of repairs their authorized service providers can perform, encouraging those customers to buy a replacement device even if the repair could be done by an independent technician.[32] In March 2020, iFixit and US PIRG surveyed over 300 phone repair technicians about the types of repairs their businesses perform and how that compares to manufacturer-authorized repair services. The survey found that "78% of repair technicians offer additional repairs over the four repairs Apple offers, and overall, 41% of repairs done by independent technicians are types of repair Apple will not do in-store. Additionally, 89% of independent repair technicians said their businesses would be more successful if they had access to repair software from Apple and Samsung."[33] But without access to that repair software, independent repair providers have to turn customers away.[34]

With regard to the costs of repair relative to replacement, US PIRG also investigated how much american households could save by repairing their smartphones, laptops, refrigerators, and washing machines, instead of replacing them. US PIRG's report found that the average US household would save approximately $330 per year by repairing their devices, for a national aggregate of approximately $40 billion per year. As the US Federal Trade Commission observed in its report on repair restrictions, "Apple's experience with its battery replacement program also suggests that, given a choice between a low-cost repair and buying a new mobile phone, many consumers will opt for the low cost repair. In early 2018, after Apple was found to be slowing down certain models of iPhones in order to compensate for degrading batteries, the company reduced the price of out-of-warranty battery replacements for iPhone 6 and later models. Under the program, Apple reduced the price for a battery replacement from $79 to $29. Subsequently, in a January 2, 2019 letter to investors, Apple's CEO explained that iPhone sales were lower than

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New Push to Make Phone Repairs Cheaper, More Accessible," abc7ny (Nov. 12, 2019) https://abc7ny.com/right-to-repair-laws-cell-phone-near-me/5693220/ (citing a difference of $550 dollars between the Apple store and an independent repairer).

[31] *Productivity Commission, Right to Repair, Draft Report* at 56.

[32] See iFixit Initial Submission at 10

[33] Proctor, N., *The Fix is in: How our smartphones get fixed, why it's harder than it should be, and why that matters* at (Mar. 2020)

[34] See Anderson, supra note 23.

anticipated due to, among other things, 'some customers taking advantage of significantly reduced pricing for iPhone battery replacements.'"[35]

Finally, repair restrictions deprive consumers of their ability to lawfully use the property they own—a deprivation which is itself harmful.[36]

III. Manufacturers' Justifications for Repair Restrictions Lack Merit

The Productivity Commission requests further information regarding whether there is any evidence of systematic differences in quality, safety or security between authorised and third-party repairers. As the US Federal Trade Commission (FTC) addressed this question in its 2021 report, "Nixing the Fix: A Report to Congress on Repair Restrictions;" we have summarized the FTC's findings below.[37] Significantly, after nearly two years of investigation, the FTC found that the majority of manufacturers' justifications for repair restrictions "are not supported by the record."[38]

A. Safety: independent repair is no less safe than manufacturer branded repair.

The FTC's report concludes that "with appropriate parts, repair information, and training", consumers and independent repair providers are fully capable of safely repairing electronic devices.[39] The FTC found no evidence to support claims that repairs performed by consumers or independent repair shops are any less safe than branded repair and significantly noted that manufacturers' restrictions on repair information, parts, and tools themselves cause safety risks: "By not making parts and manuals available to individuals and independent repair shops, and not including information in these manuals about the dangers of particular repairs, manufacturers may be exacerbating the very safety concerns they have raised."[40]

With regard to medical devices, in 2018 the US Food and Drug Administration investigated independent repair of medical devices and found that independent repair providers "provide high quality, safe, and effective servicing of medical devices"[41] and are "critical to the functioning of the US healthcare system."[42]

B. Cybersecurity: Independent repair is no less secure than manufacturer branded repair.

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[35] See *Nixing the Fix* supra note 25 at 36
[36] *See generally* Aaron Perzanowski & Jason Schultz, *The End of Ownership: Personal Property in the Digital Economy*, MIT Press (2016).
[37] In preparation for their *Nixing the Fix* report, the FTC collected comments and empirical evidence, and held hearings on repair restrictions. The record that the FTC examined contains illuminating data that the Productivity Commission may find helpful. https://www.regulations.gov/docket/FTC-2019-0013/document
[38] See *Nixing the Fix* supra note 25 at 54
[39] Id. at 29.
[40] Id. at 28 n. 145
[41] Food & Drug Administration, *FDA Report on the Quality, Safety, and Effectiveness of Servicing of Medical Devices* at i (May 2018). https://www.fda.gov/media/113431/download
[42] Id. at 23

The FTC's report states: "The record contains no empirical evidence to suggest that independent repair shops are more or less likely than authorized repair shops to compromise or misuse customer data,"[43] and that "[w]ith appropriate parts and repair information, the record supports arguments that consumers and independent repair shops would be equally capable of minimizing cybersecurity risks, as are authorized repairers."[44]

C. Liability and Reputational Harm: Independent repair does not increase manufacturers' risk of reputational harm or liability for injury.

Despite repeated requests from FTC staff to provide evidence for claims that Right to Repair would increase manufacturers' risk of reputational harm or liability, "manufacturers provided no empirical evidence to support their concerns about reputational harm or potential liability resulting from faulty third party repairs."[45]

D. Quality: With access to the right parts, tools, and information, independent repair can be as good as—or better than—branded repair.

After evaluating the available evidence, the FTC determined "the record does not establish that repairs conducted by independent repair shops would be inferior to those conducted by authorized repair shops if independent repair shops were provided with greater access to service manuals, diagnostic software and tools, and replacement parts as appropriate."[46] This is consistent with survey results submitted to the FTC by Consumer Reports, which found that "consumers who used independent repair shops were more satisfied with the repairs than those who used factory service"[47] as well as data submitted by the Auto Care Association "that 70-75% of consumers use independent repair shops due mostly to trust, convenience, and price."[48]

IV. Product Labelling

With the introduction of France's new Repairability Index at the beginning of this year, we're already seeing positive results. In May, Samsung reported the results of a survey the manufacturer commissioned on how the French repairability index was impacting consumer behavior. Key results include that 83% of those surveyed would prefer to repair rather than replace a broken product, 90% said they thought the index was useful and would encourage them to choose a more repairable product with 86% reporting that the index impacts their

[43] *Nixing the Fix* at 31
[44] *Nixing the Fix* at 32
[45] *Nixing the Fix* at 33
[46] *Id.* at 38
[47] *Id.*
[48] *Id.*

purchasing behavior.[49] The index appears to be changing manufacturers' behavior as well[50], with some making repair information newly available online.[51]

iFixit has been analyzing products and scoring repairability[52] for over a decade[53] and we would be happy to work with the Productivity Commission or other entity on a repairability labelling system as we have assisted France and the EU Joint Research Center on their scoring research. Appendix A: Assessing Repairability provides an outline of iFixit's scoring system.

V. Recommendations

A. iFixit recommends implementing a positive obligation on manufacturers to provide fair access to parts, tools, and information needed for repair to independent repair professionals and device owners themselves.

B. iFixit recommends amending the copyright law to clarify that circumvention of tpms for non-infringing purposes (including repair) are permissible, and that provision of circumvention tools and services is also permissible.

Consumers and repair professionals who want to fix their software-enabled devices have no intent to pirate content—they simply want to return their cars, tractors, appliances, and smart devices to working order. Often, they require the help from repair professionals to do that. And those repair professionals require access to third-party diagnostic and repair tools. The increasing complexity of modern software-enabled devices means that any statute that bars third-party tools or services in effect bars consumers from fixing their devices at all.

iFixit believes the most effective solution, and one that would provide the most clarity for consumers, repair professionals, tinkerers, and many others, is to cabin the copyright law's prohibition of circumvention only to those activities intended to facilitate copyright infringement, and to explicitly state that the use or distribution of third-party tools and services for circumvention is not unlawful unless that use or distribution is intended to facilitate copyright infringement. And, to clarify that diagnosis, maintenance, or repair of software enabled devices is not infringement.

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[49] Samsung Newsroom France, *Les Français et l'indice de réparabilité : un sondage OpinionWay pour Samsung* (May 18, 2021) https://news.samsung.com/fr/sondage-indice-reparabilite (accessed Aug 18, 2021)

[50] See Purdy, K. "Apple Is Using France's New Repairability Scoring—Here's How It Works," iFixit.com (Mar. 1, 2021), https://www.ifixit.com/News/49158/france-gave-apple-some-repairability-homework-lets-grade-it (accessed Aug. 18, 2021)

[51] See Purdy, K ., "Why iFixit's Repair Scores Are Different than the French Repair Index" (Mar. 5, 2021) https://www.ifixit.com/News/49319/why-ifixits-repair-scores-are-different-than-the-french-repair-index (Accessed Aug. 18 2021)

[52] https://www.ifixit.com/Right-to-Repair/Repairable-Products

[53] See Purdy supra note 46.

Short of these solutions, we recommend amending the copyright law to ensure a permanent exemption for diagnosis, maintenance, and repair of software enabled devices, inclusive of third-party assistance and circumvention tools. We support the Productivity Commission's Recommendation in Draft Finding 5.2 to 'amend the Copyright Act 1968 to allow repairers to legally procure tools required to access repair information protected by technological protection measures (TPMs), such as digital locks' and that the Australian Government should 'clarify the scope and intent of the existing (related) exception for circumventing TPMs for the purpose of repair."

C. iFixit supports the recommendation of the Productivity Commission in Draft Finding 5.2 that 'to reduce the risk of manufacturers using contractual arrangements (such as confidentiality agreements) to 'override' the operation of any such reforms, it may also be beneficial to amend the Copyright Act 1968 to prohibit the use of contract terms that restrict repair-related activities otherwise permitted under copyright law.'

D. iFixit supports the recommendation of the Productivity Commission in Draft Finding 5.2 to 'amend the Copyright Act 1968 to allow for the reproduction and sharing of repair information, through the introduction of a fair use exception or a repair-specific fair dealing exception.'

E. iFixit also supports the recommendations of the Productivity Commission in Draft Findings 4.2 and 3.1.

Appendix A – Assessing Repairability

A repairable product is one that can be readily disassembled and whose key components can be individually replaced.

The scoring system used by iFixit is nuanced—we assess repairability using a set of criteria that evolves in response to new product designs, and even new product categories. So before delving into specifics, which can change over time, here are some underlying principles which do not.

In order to complete any repair, you need access to instructions, tools, and replacement parts. But you also need a device design that accommodates repairs in the first place, and this is primarily what iFixit's scoring system attempts to assess. Our working definition of "repairability" broadly encompasses the following:

- **Repairability** = **modularity**. Ideally, the cost of any repair should be limited to replacing the faulty component and little else. If the tires are glued to the wheels, and the wheels are welded to the axles, and the entire car has to be towed all the way back to Detroit every time you get a flat, in our book, that's not sufficiently repairable.
- **Repairability** = **longevity**. We love our gadgets as much as anyone, and we want them to become a more sustainable part of our lives. Sustainable products are those designed for a *long life*, to responsibly amortize the human and environmental costs of their manufacture and eventual disposal. For this reason, our scores favor devices with some measure of *upgradability*, which can critically extend their useful lifespan.
- **Repairability** = **recyclability**. Recyclers struggle with many of the same challenges we face in the repair community. Take glued-in batteries—not only do they limit the device's lifespan, they also make recycling dangerous, labor-intensive, and expensive. Safe and efficient recycling requires easy access to hazardous components—like backlights that contain mercury, or highly flammable batteries. Products that are difficult to recycle often prove unprofitable for recyclers to process, and are therefore more likely to end up in landfills instead of being reused in any meaningful way. In short, if a device is hard to repair, it's usually also hard to recycle, and vice versa.
- **Repairability** = **affordability**. While OEMs can (and should!) make a fair profit on replacement parts, iFixit's scoring methodology favors devices that can be repaired without investing in expensive equipment, exotic tools, and specialized skills. If it requires a BGA rework station or an industrial clean room, that's technically *repairable*, but prohibitive for a typical end user or independent repair shop. The more locally and economically a repair can be sourced, the more likely it will happen. Note that iFixit's audience includes many DIYers and end users as well as professional technicians.

- **Repairability = practicality.** When scoring any device, we strive to promote high standards that are nonetheless realistic. We constantly look to competing, similar devices in the marketplace to gauge what can be achieved within the constraints of a given device category and form factor. We've happily awarded very high (and even "perfect 10") repairability scores to devices that still have room for improvement, but that nevertheless accommodate the most common repairs well enough to make any tinkerer happy.

The gold standard for repairable electronics is the tower PC—easy to disassemble with a common screwdriver, and every major component can be replaced or upgraded using standard parts that you can buy almost anywhere. A good tower PC is practically immortal.

But tower PCs are also bulky, and no one expects PC levels of modularity in, say, a smartwatch. So what does it take for a device in another product category to earn a high score?

The First and Easiest Point (That Almost Nobody Gets)—Publishing the Service Manual

We believe repair information should be freely available to anyone who needs it. (All guides on iFixit are free to use and licensed for free non-commercial redistribution.)

The highest possible score for any device without a free public service manual is a 9. We're happy to retroactively add a full point for any device when the official manual is later posted for public use.

What if the service manual wasn't written with the public in mind? What if it uses custom tools or processes that the public won't have? That's okay—simply putting the information out there can kick-start the process of making repairs possible. (For examples of companies that have opened up access to their service manuals, check out Dell and HP.)

Major Factors Affecting Repairability

When assessing any new device, iFixit specifically looks for the following:

- **Disassembly is nondestructive and reversible.** In general, the easier it is to take apart and reassemble the device in like-new condition, the higher the score. Our scores favor reusable fasteners like magnets, screws, and clips—and tend to penalize use of rivets, glue, welds, etc. "Booby trapped" designs that require blind prying or use of force in sensitive areas, risking accidental damage during a repair, can lower the score significantly.
- Relatedly, **limited use of adhesives**—particularly strong adhesives used as fasteners. The more destructive and/or time-consuming it is to separate, clean, prep, replace, and cure adhesive, the more it hurts the score. Adhesives that are resistant to heat and/or manual prying make for particularly frustrating repair hurdles.

- **Modularity of critical components**—meaning they should be individually replaceable without painstaking desoldering or ungluing from larger assemblies. For example, a laptop with a removable blade-style SSD and SODIMM RAM scores better than one with its storage and memory chips SMT-soldered directly to the main board. Note that the scope of critical components varies with the device category (in other words, we're not expecting to find socketed RAM in a smartphone). The critical components with the greatest impact on repairability include:
    - *Laptops:* battery, storage, memory, display, keyboard, trackpad, I/O ports, fans, antennas
    - *Phones / tablets:* screen, battery, I/O ports, camera(s), enclosure, speakers
    - *Game consoles:* storage, fan, power supply, optical drive, wireless hardware, main board, expansion boards
- **Use of standard tools.** Proprietary and tamper-resistant screw heads impose unnecessary hurdles for many repairs. Minimizing the number of tool changes required also speeds up repair for professionals. Where security screws are used, they should have a clear safety-related purpose (for example, protecting a high-voltage circuit). More advanced skills like soldering can hurt the score if they are required for basic repairs or troubleshooting, especially if not required in competing devices. It's usually okay if custom tools are *recommended*, so long as there's a viable workaround that isn't prohibitively time-consuming or expensive.
- **Prioritization of key components**. Mission-critical components—those likely to take damage, wear out, or require an upgrade to keep the device in service—should be among the easiest to access, preferably without a complete teardown of the rest of the device. (For one interesting example, see the RAM hatch on the 27" iMac.)
- **Battery is straightforward to disconnect.** In the interest of personal and device safety during any repair, we prefer to disconnect all power sources first, and reconnect last. If it's not possible to do that, or if the disconnection method is a mystery, this can hurt the score.

Quite often, a device can still score well despite breaking one or two of these "rules." But breaking most or all of them typically results in a very low score.

Minor Factors Affecting Repairability

Secondary considerations that may influence the score include:

- **Critical components independently accessible**—a highly linear sequence of repair is usually not ideal. If accessing a display or battery requires first removing all other

components one by one, this tends to complicate troubleshooting, and the odds of accidental damage or reassembly error can increase dramatically.

- **Internal labeling of components for ease of disassembly and/or reassembly**. This shouldn't require any major design changes or tradeoffs, but it tells us that a device's designers considered repairability and decided to make that process easier. It's a "goodwill" measure that can make the difference between a point lower or higher. It's like publishing a bit of the service manual right on the device itself. Examples of labeled-for-repair items include:
    - Where / how to disconnect the battery
    - Proper orientation of components that might conceivably be reassembled incorrectly
    - Screw types, locations, or sizes (especially where different screws are adjacent)
    - Order of operations (such as the correct sequence for tightening heat sink screws)
    - Anything else that might help a technician avoid simple errors in disassembly or reassembly
- **Deterrent messaging**—or, the opposite of friendly labeling. This includes unenforceable "warranty void if removed" stickers that have a chilling effect on repairs. (Many end users will throw away a device that is long since *out of warranty* rather than attempt a repair on a device that includes these warnings.)

Final Step: Sanity Check Against Competing Products

No two devices are the same, and we can't always figure out what trade-offs were made that affected the repairability of a product's final design. So to keep our scores grounded, we compare against competing devices with similar functionality and form factor—and may adjust one point up *or* down accordingly. (Effectively, we grade on a curve.)

At times, the question of whether an expectation of repairability is reasonable or even *possible* is answered by products like Samsung's Galaxy Buds—which managed to include standardized, replaceable batteries in a competitive and extremely space-constrained device category.

Some Shining Examples

A few devices have scored a "perfect" 10 out of 10, including:

- HP Elite x2 1012 G1 (tablet)
- Fairphone 3 (smartphone)
- HP Z1 (all-in-one workstation)

Note that even these devices have room for improvement, so repairability is not an impossibly lofty standard. There are many different ways to make a “repairable” device. We’re looking for a thoughtful, good-faith effort to accommodate repair in the design.

A Sticky Subject: Adhesives

At iFixit we have a strong affinity for threaded fasteners (in case you couldn’t tell from our company logo). That said, we’ve encountered a few adhesives that are arguably advantageous for repair. Examples include:

- **iMac display adhesive** — These pre-cut, two-sided adhesive strips have a foam core that’s easy to cut through, separating the entire strip down the middle. After separation, each strip peels out easily by hand in one long piece—no tools, minimal force, no mess. Replacing it is still tedious compared to the slick magnets and screws used in prior iMacs—but as adhesive goes, this is not the worst. We still think gluing together a desktop computer is pretty lame, but maybe this style of adhesive could have a future in space-constrained devices like tablets.
- **iPhone display adhesive** — A standout amongst smartphone adhesives. It’s pretty easy to separate with mild heat and a cutting tool—but more importantly, due to the phone’s design, the adhesive can be completely ignored during reassembly, if needed. (Good practice dictates replacing it of course, but the screen itself is secured primarily with clips and screws—meaning the device can be quickly and repeatedly reassembled for testing or troubleshooting regardless of the state of the adhesive.) The adhesive itself also has relatively high internal cohesion, making it easier than average to peel out and remove.
- **Stretch-release adhesives** — Also known as “command strips,” these are commonly used to secure iPhone and some Android batteries. Some of the thinner variants don’t always perform reliably, but they provide at least one chance for a clean battery removal without messy solvents and/or use of force.

Unrepresented Factors

iFixit’s current scoring system focuses on hardware, but successful repairs are increasingly dependent on (or threatened by) a handful of intangibles. We anticipate including these in future scoring assessments.

Availability of replacement parts. We’re often forced to overlook parts availability because it’s difficult to assess—the supply of replacement parts usually hasn’t materialized yet on day one of a device’s release (the day we’re doing our teardown and assigning a score). So this usually doesn’t hurt the score, but it could help if we knew the manufacturer had committed to making parts available at fair prices.

That said, use of off-the-shelf components (like the laptop SATA drives in the Xbox One and PS4) can help boost the score, because we know those parts will *always* be available regardless of the choices of the manufacturer. The more customized or proprietary the components get, the more important that they are offered publicly for sale by the OEM.

Cryptographic pairing of components. We understand the critical need to keep devices secure and customer information private. At the same time, far too many devices end up as e-waste because of crippled functionality after a legitimate repair. We think device makers should put tools in place for authentication of legitimate repairs performed by end users and independent shops. As privacy concerns and hardware pairings progress, this may be a major factor in future device scores.

OS updates and software support are huge factors in device longevity. Some companies do a great job here and go unrewarded by our current scoring methodology. We haven't figured out how to integrate it yet, but this will likely factor into future scoring decisions.

Availability of specialty repair software. Where diagnostic or calibration software is required to complete repairs, that software should be readily available.

Additional Suggestions

We've seen many clever, incremental moves toward repairability that aren't typically factored into iFixit's scores in any significant way—but collectively, they can have a real impact. We think many devices have only scratched the surface of what can be achieved if they include repairability among their design goals. Ideas include:

- Use ferromagnetic materials to enable sorting and disassembly.
- Avoid requiring *any* tools for the most common repairs.
- Minimize the number and variety of fasteners.
- Anticipate and allow for technician error—for example, by using identical screws throughout the device to prevent damage resulting from mix-ups during reassembly.
- Use intuitive snap-fits, clips, or sliding connections.
- Design connections that are visually and physically accessible.
- Design for access to fasteners from the same axis to speed repairs.
- Ensure fasteners have adequate structural integrity, so that they hold up after repeated disassembly and reassembly.
- Standardize components between product lines and across generations.
- Include parts lists, exploded diagrams, and part numbers in service documentation.
- Follow sound design-for-recycling practices such as minimizing the number of plastics used, and avoid combinations of materials that are difficult to separate.
- Clearly identify the existence of components that need to be removed prior to mechanical shredding during recycling.

Further Reading / Resources

- Smartphone Repairability
- Tablet Repairability
- Laptop Repairability
- Greenpeace Guide to Greener Electronics
- Right to Repair