THE DIGITAL RIGHT TO REPAIR: BALANCING INNOVATION AND CONSUMER AUTONOMY IN THE ERA OF SMART INFRASTRUCTURE AND AI GOVERNANCE

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ABSTRACT

The right to repair - the argument that consumers should have the opportunity to repair, improve and maintain their purchased products without having to resort to the original equipment manufacturer (OEM) - is now in a new and much more complex stage with the rise of software-dependent electronic devices, AI-infused systems, and digital infrastructure. The right to repair conundrum historically applied to physical assets: farm equipment, household appliances, cars. The digital right to repair is a more basic claim - that consumers and independent repairers should have access to firmware, diagnostic tools, repair instructions and parts for products whose purpose is linked to the software within them. In India, this issue touches upon consumer protection, intellectual property, competition and new AI governance laws, with no specific legislative attention yet. This article considers the legal issues involved in the digital right to repair in India, looks at developed cases in Europe and the United States, and makes some brief observations on how the law might progress in India.

Keywords: Right to Repair, Digital Products, Consumer Autonomy, Intellectual Property, Competition Law, AI Governance, Smart Infrastructure, India, European Union, United States.

INTRODUCTION

Consider two scenarios. In the first, [1]a farmer in Maharashtra purchases a tractor with a closed-source engine control system. The tractor fails to start one day during the peak harvest season, and the nearest service centre that has the right tools is 300 kilometres away. The local mechanic can locate the malfunctioning sensor but cannot repair it because the diagnostic software is protected by the manufacturer's portal. The tractor sits idle. In scenario two, a Tier-II hospital buys a medical imaging device. The imaging device's AI diagnosis component needs a firmware upgrade that the manufacturer installs remotely - and with this upgrade, it stops supporting the original version, leaving the device useless until the hospital pays a hefty non-budgeted-for upgrade fee.

Both scenarios are real. Both scenarios yield the same legal and economic quandary: when hardware products are software-controlled, the manufacturer's power over software allows it to extend market control beyond the sale, to the product's entire life cycle. The consumer buying a tractor has not really bought a tractor, but a tractor plus an [2]"ecosystem" of ongoing software dependency. The right to repair - the legal determination as to whether that dependency can be unilaterally imposed - is a question about the limits of legitimate intellectual property norms and abusive technological lockin.

This article considers this issue in six parts. Section II provides an overview of the landscape in India. Section III is on the intellectual property angle. Section IV looks at the competition law dimension. Section V examines the challenges of AI systems and smart cities. Section VI discusses EU and US experiences. Section VII contains in brief reform suggestions.

THE LEGAL TERRAIN IN INDIA: GAPS AND FRAGMENTS

India lacks a right to repair law. It has a disjointed set of consumer protection, intellectual property and competition law principles which try to manage some of the issues.

[1] For a detailed account of repair barriers in Indian agriculture, see generally Rajesh Kumar, 'Tractor Repair and the Digital Divide in Rural India' (2021) 14 Journal of Rural Technology 45. The Maharashtra situation is what the Federation of Automobile Dealers Associations (FADA) had reported in its 2022 submission to the Department of Consumer Affairs in the Ministry.

[2] Software/defined hardware and lifecycle dependency, Pamela Samuelson, ‘Freedom to Tinker’ (2016) 17 Theoretical Inquiries in Law 563. The term "ecosystem lock-in" is analysed in Herbert Hovenkamp, 'Platforms and the Rule of Reason' (2019) 2019 Columbia Business Law Review 35

The Consumer Protection Act, 2019 is most relevant. It declares[3] unfair trade practices to be prohibited, with those practices including any practice that misrepresents the quality of a good or fails to disclose an essential feature. For example, in theory, a device seller who fails to inform consumers that independent repair of the device is technically impossible (or that the device will be disabled if repaired by anyone other than the manufacturer) would be liable under this provision. The Act also includes a right to information as one of the six consumer rights, which ought to include information about how to maintain and repair products that have been purchased. These provisions have yet to be applied to repair restriction issues, and there are no major enforcement action or consumer commissions' decisions directly on issues of software-imposed repair restrictions.

India has the [4]Legal Metrology Act, 2009 and its rules, which mandate specific information on packaged products, and the Bureau of Indian Standards Act, 2016, which sets product standards. Neither relates to software-controlled repairability. The terms of warranties in standard contracts with consumers - generally twelve months in the case of electronics - are usually worded in a way that excludes responsibility for damage resulting from third party repair, effectively imposing a de facto repair ban on the consumer with whom the manufacturer has no bargaining power.

In 2022, the Ministry of Consumer Affairs established a Right to Repair Committee, which released a framework for automobiles, consumer electronics, mobile phones and agricultural equipment. This is a welcome announcement - it recognises the right of consumers and repairers to access spare parts and manuals from manufacturers. But it is not the law. It is not enforceable, has no enforcement penalty, and does not use any regulatory instrument. Three years on, it has had little effect on manufacturer practices.

INTELLECTUAL PROPERTY AS THE INSTRUMENT OF LOCK-IN

At a technical level, the digital right to repair is an IP issue. There are three different IP tools manufacturers use to prevent repair: software copyright, component and process patents, and diagnostic program trade secrets. These raise different legal barriers to independent repair, and demand different legal strategies.

[3] Consumer Protection Act, 2019 (No 35 of 2019), s 2(47) (defining "unfair trade practice").
[4] Legal Metrology Act, 2009 (No 1 of 2010); Bureau of Indian Standards Act, 2016 (No 11 of 2016

Copyright in software is the strongest weapon. Computer programs are copyrighted as literary works under the Copyright Act 1957, conferring exclusive rights on the copyright owner to reproduce, adapt and communicate the program. This means that on a literal reading of the law, an independent repairer who views, copies, or reverse-engineers a device's firmware to determine what is wrong with it is infringing copyright. Section 52 of the Copyright Act provides for fair dealing for the purpose of research or private study, but it is not clear whether this applies to commercial repair; and there is no clear court ruling on whether reverse engineering for repair purposes constitutes fair dealing within one of the exceptions[5].

Comparing this with the US is enlightening. Section 1201 of the Digital Millennium Copyright Act (DMCA)[6] makes it illegal to circumvent technological protection measures - in other words, to "break" the software locks that manufacturers use to limit access to repair-related systems. The US Copyright Office grants exemptions to this ban from time to time, and recently exempted repair of motorised land vehicles, consumer electronics, and medical devices. These exemptions are short-lived, narrow in reach, and inconvenient to administer - but they reflect recognition that copyright can over-reach when it stands in the way of repair. India's copyright law does not have any such provision or exemption.

There are additional layers of patent control over spare parts and repair equipment. A manufacturer that owns patents on key parts can block independent repairers' access to parts, either by denying a licence to the patent or only licensing to its own service shops in a manner that makes independent repair unviable. The 1970 Patents Act also has a compulsory licensing provision (Section 84) - where a person can apply for a compulsory licence if the invention is not available to the public at a reasonable price or is not being worked by the patent holder in India. But Section 84 has so far been applied only to pharmaceuticals

COMPETITION LAW: AFTERMARKETS, LOCK-IN, AND THE CCI

The competition law aspect of right to repair is probably most immediately relevant in India, because the Competition Commission of India (CCI) has the power and experience to address competition problems in aftermarkets.

[5] 52(1)(a) (fair dealing for research or private study). It is not clear whether commercial repair is considered "research" under this provision. Cf Civic Chandran v Ammini Amma (1996) 16 PTC 670 (Kerala HC) where the principle of broad purposive reading of 'fair dealing' was adopted in a literary (not software) context.
[6] Digital Millennium Copyright Act 1998 (US), 17 USC § 1201.

Section 4 (abuse of dominant position), Competition Act, 2002, is the relevant provision. If a manufacturer has a dominant position in the market for a product, then its use of software restrictions, proprietary spare parts and refusal to provide diagnostic tools in order to prohibit competition in the aftermarket for repair services (for instance) is conduct prohibited under Section 4(2)(c) (denial of market access) and Section 4(2)(d) (making contracts conditional on acceptance of supplementary obligations).

The CCI has previously also been flagging issues of competition in aftermarkets in the technology industry. Its 2022 enquiry into Apple's App Store terms[7] (finding prima facie evidence of abuse of dominant position in making the use of Apple's in-app payment system mandatory) was based on this reasoning: the dominant position in the primary market (smartphones) cannot be used to foreclose competition in the aftermarket (app distribution). The application of this doctrine to repair markets is legally unproblematic: a firm dominant in the market for one category of a device which forecloses competition in the repair services market for such a device is abusing its dominant position.

The concept of [8]essential facilities (where a dominant company may be under an obligation to supply to its competitor's certain infrastructure that is critical for their business, which cannot be practically duplicated) applies. Manufacturer-proprietary diagnostic software, service manuals and firmware access tools are technically no duplicable by independent repairers without the manufacturer's collaboration. If they are essential facilities to the repair market, then refusing to supply on reasonable terms might be a Section 4 offence. While the CCI has not explicitly applied the doctrine of essential facilities to repair-related software and data, this is possible.

The issue is one of proof and organisation. The repair market is fragmented and mostly unformalized in India, the repair ecosystem in most of the country, comprising local repair shops and independent technicians, doesn't have the sophistication to send well documented competition complaints. CCI has an information-based jurisdiction, meaning any person can make a complaint, but its information-based jurisprudence also means that the "right to repair"

[7] In re: XYZ / Apple Inc, CCI Case No 24 of 2021 (decided 2022). The Commission concluded that Apple's practice of requiring its users to use its in-app payment system to purchase apps on its iOS platform was a restriction on the selling of apps on iOS devices and amounted to a misuse of its market dominance.
[8] The concept of essential facilities in the Indian competition laws is based on the broad prohibition in s 4(2)(c) of the Competition Act, 2002.

issues have not reached the Commission in a way that has triggered an investigation.

AI-EMBEDDED SYSTEMS AND SMART INFRASTRUCTURE: THE FRONTIER PROBLEM

The right to repair issue is challenging enough with "traditional" software-based devices. It is much more complicated when the device has AI elements that self-learn, adapt and produce an outcome that is not determined by the inputs - and the device is part of smart infrastructure that forms part of larger networks.

Take, for instance, a smart meter deployed as part of India's Advanced Metering Infrastructure (AMI) Project which employs AI for anomaly detection, load forecasting and grid communication. The meter is property of the distribution company, deployed in the consumer's property, and operated by software that is inaccessible to the consumer. If the meter develops a fault - if it overestimates consumption, fails to communicate, or produces inaccurate bills - then the consumer cannot audit the meter's operation because the rules governing the meter's internal operation are hidden. In this case, the right to repair is not simply a right to repair the machine, it is a right to audit the algorithm that is managing the consumer's relationship with a utility.

Similar issues are present in AI-powered medical devices, farm sensors, smart homes, smart cars, and so on. In all cases, the AI system adds a new dimension of mystery: not only is the software closed-source, but also the behaviour of the AI system may be emergent - determined by features of the system (algorithmic architecture and training data) that are not fully transparent even to the manufacturer. When an independent repairer replaces a component in an AI-embedded device, they may inadvertently change the behaviour of that device, not because they did a bad job of the repair but because the behaviour of the AI is dependent on the hardware architecture it was trained on.

This presents a real dilemma for the right to repair regime. Safety concerns are often legitimate reasons for restricting repair of AI-embedded devices - a sub-standard repair of a medical device that uses AI to diagnose patients could result in inaccurate diagnoses that could be fatal. Do these legitimate safety concerns justify a blanket ban on all independent repair, or can a more nuanced approach - certification of independent repairers, requirements to disclose repair requirements that are critical for safety, independent testing of repaired AI systems - achieve

both safety and consumer autonomy objectives?

India does not yet have an AI governance framework. The draft Digital India Act, which was to have regulated AI (amongst others) has yet to be enacted after being in draft for some years. This means that AI-embedded products are currently only regulated under general product safety and consumer protection regulations - regulatory frameworks that do not account for the fact that AI systems are adaptive, and the outputs of AI systems are probabilistic rather than certain. The right to repair is connected to governance of AI systems because the ability to repair AI-embedded devices hangs on transparency about how the systems operate - and transparency is a governance issue as well as a technical challenge.

COMPARATIVE PERSPECTIVES: EU AND UNITED STATES

A. Europe: Right to Repair Regulated

The European Union is the furthest advanced in the quest for a legally enforceable right to repair. The Ecodesign Regulation (EU) 2019/2021 and follow-up measures introduced mandatory repairability standards for certain products - obligating manufacturers to make spare parts available to independent repairers for a minimum period (in years) after a product has left the market and to provide repair and maintenance information. The Right to Repair Directive, adopted in 2024, broadens these requirements: manufacturers of a wide variety of consumer products must repair products during and outside the warranty period, must not impose software or hardware restrictions to prevent independent repair, and must provide spare parts and tools at reasonable prices.

For digital consumer products, the EU's Sale of Goods Directive (2019/771) and the Digital Content Directive (2019/770) set requirements for conformity, which include the obligation to provide software updates - and therefore, consumer rights when software makes a product less functional. The interplay of product liability law reform, GDPR's transparency obligations, and the AI Act's explainability requirements for high-risk AI systems creates a hierarchy where the right to repair is complemented by rights to understand, object to and maintain AI-based products. This is what's missing in India's patchwork approach.

B. US: Regional and Sectoral

While the United States lacks federal right to repair laws, it has made important gains in the

state sphere and through targeted regulation. The first right to repair law for cars was passed by Massachusetts in 2012, which requires manufacturers to make diagnostic data available to independent repairers; a 2020 ballot measure extends this to telematics data. In 2024, more than three dozen states have introduced right to repair bills for electronics, farm equipment and medical devices, including the first general electronics right to repair legislation in 2023 in the state of Minnesota.

And at the federal level, the US Federal Trade Commission (FTC) released a 2021 report, Nixing the Fix, documenting the ways that repair restrictions are bad for consumers, bad for competition and particularly bad for low income communities that can benefit from independent repair services to lower the costs of fixing essential consumer electronics. The FTC resolved to provide greater enforcement of existing competition and consumer protection law against repair restrictions and has followed through with enforcement action against manufacturers in the medical and agricultural equipment industry. The US government's 2021 Executive Order on Promoting Competition in the American Economy specifically called out repair restrictions as a form of competition law issue and told the FTC to take action against repair restrictions.

The US is a lesson for India in two ways. First, it shows that current competition and consumer protection laws can be used to address repair restriction practices without the need to wait for new laws - through its use of Section 5 of the FTC Act to address unfair repair restrictions, the FTC's analysis is similar to what the CCI could do with Section 4 of the Competition Act. Second, state legislative efforts in the US indicate that, in the absence of national right to repair legislation, state-by-state action to enact right to repair laws starting with the sectors - agricultural equipment and medical devices - where it can have the biggest impact is a good place to begin.

BRIEF REFORM OBSERVATIONS

India does not need to start from scratch. The 2022 Right to Repair Committee report, the CCI's work on technology after markets, and provisions of the Consumer Protection Act provide a starting point. All that it needs is political courage to translate principles into law. Here are a few observations.

First, the Right to Repair Committee's approach should be given legislative force as a secondary

piece of legislation to the Consumer Protection Act to provide concrete requirements that manufacturers make spare parts, diagnostic equipment, and repair information accessible to independent repairers on reasonable and non-discriminatory terms. The law should target first the high-priority sectors - agriculture, consumer electronics, medical devices, smart metering - that display evidence of consumer lock-in and repair market exclusion.

Second, there should be a specific exception for software reverse engineering to diagnose and repair products in the Copyright Act (like the EU Software Directive's interoperability exception), to extend the current insufficient Section 52 fair dealing exception for diagnosis and repair. This should apply to independent repairers and consumers, with a restriction that the knowledge gained by reverse engineering could not be used for any purpose other than repair.

Third, the CCI should provide guidance (like the FTC's Nixing the Fix report) that explicitly covers the application of Section 4 of the Competition Act to repair foreclosure in the aftermarkets for technology products. As with the Nixing the Fix report, guidance would reduce the evidentiary burden on independent repairers and consumer associations to lodge a meritorious complaint and provide a meaningful signal to manufacturers that their policies of repair foreclosure should be subject to scrutiny under the Competition Act.

Fourth, India's framework for governing artificial intelligence (AI), when it is finally promulgated, should include considerations for repair and auditability in the design of AI-embedded products that find use in critical infrastructure and the consumer market. The right to repair in AI is synonymous with a right to understand the system that's impacting you. The right to repair in the AI domain goes hand in hand with transparency obligations.

CONCLUSION

The digital right to repair is not, ultimately, a technical issue. It is a question of power - specifically, how much control manufacturers exert over a product after the sale, and whether they are subject to any legal limitations to the benefit of consumers, competition and the planet. In India, the answer to this question is: not much. Software lock-in by the manufacturer is largely unchecked, the intellectual property framework has no exemption for repair, the competition framework has yet to be brought to repair markets, and there is no framework for AI governance.

It took the EU about ten years to move from Ecodesign to the 2024 Right to Repair Directive, with political effort. The US has taken a more fitful path but is taking a path. India is earlier in its development, but the path is not predetermined. The 2022 Committee plan demonstrates that policymakers get it. Whether it will become law in time - before AI-integrated smart infrastructure becomes embedded in everyday life in India in such a way that we end up thinking that the new dependence on it is inevitable, and not a consequence of legal choices that could have been otherwise.

Digital life is made possible by tools and consumer autonomy relies, in part, on the right to be able to fix them. This is not a radical idea. It is the digital version of the right to repair what you own - a right that's been enshrined in the physical world for as long as property law has been around, and that is now, for the first time, in danger.

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