NGI FORWARD

BREAKING THE TWO-YEAR CYCLE

EXTENDING THE USEFUL LIFE OF SMARTPHONES

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NEXT GENERATION INTERNET

INTERNET OF HUMANS

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ABOUT THIS BRIEFING

This report is part of NGI Forward, the strategy and policy arm of the European Commission's flagship Next Generation Internet (NGI) initiative, which seeks to build a more democratic, inclusive, resilient, sustainable, and trustworthy internet by 2030.

Following our examination of the environmental impact of the internet in our report 'Internet of Waste',[1] this briefing explores the issue of prematurely curtailed smartphone lifetimes. This briefing is timed to inform the European Commission's consultation this year on changes to the Ecodesign Directive through the Sustainable Products Initiative,[2] as well as product-specific 'vertical' Ecodesign regulations for smartphones and tablets,[3] and the Circular Electronics Initiative.[4] It makes three recommendations for policy interventions that we believe should be included in the upcoming smartphone-specific regulation, and in the Directive's overall framework. It focuses on smartphones because the environmental issues they cause are particularly acute, but the recommendations are immediately transferable to many other products.

With appetite for climate action and the right to repair growing across the globe, Europe has an opportunity to blaze a trail and drastically reduce the environmental impact of our digital devices and meet the market need for more sustainable devices. The aim of this report is to provide a clear overview of the problems relating to device lifetimes, describe the legislative context and provide clear recommendations for policy change.

1   https://www.nesta.org.uk/report/internet-waste-how-europe-can-make-internet-green/
2   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12567-Sustainable-products-initiative
3   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12797-Designing-mobile-phones-and-tablets-to-be-sustainable-ecodesign
4   https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-circular-electronics

THE PROBLEM WITH SMARTPHONES

Digital devices account for a significant share of the internet's growing environmental impact and the proliferation of smartphones is a particularly challenging issue in fuelling this. EU citizens replace their smartphones on average every two years,[5] creating 60-80kg of CO2-equivalent emissions for each of the 200 million devices purchased annually. This adds 12-16 million tonnes of CO2-equivalent emissions each year, which is more than the carbon budget of Latvia in 2017.[6] The smartphone market continues to grow rapidly at 11 per cent per year,[7] meaning this problem is likely only to worsen in years to come.

Around 72 per cent of the lifetime emissions of a smartphone are created before the device reaches its owner,[8] much higher than the proportion for other devices such as washing machines (25 per cent) and vacuum cleaners (21 per cent).[9] As a result, interventions aimed at design and how long devices remain in use have the greatest potential to improve their bottom-line environmental impact.

Because smartphones are highly complex products, this impact extends beyond emissions. The average smartphone contains over 60 of the 83 stable elements on the periodic table, and 16 of the 17 rare earth metals.[10] These materials are mined and processed using dangerous chemicals that often pollute natural environments. When a smartphone is recycled, its complexity makes dismantling and retrieving the valuable materials from it incredibly difficult, so only very small amounts are recovered. In addition, the integrated circuits used in smartphones are nearly impossible to recycle. Despite a European ban on exporting electronic waste to developing countries,[11] an estimated 350,000 tonnes of undocumented electronic goods are exported from the EU each year to developing countries in Africa and Asia,[12] where devices such as smartphones are processed in ways that present significant risks to human health and the environment.

5   https://publications.jrc.ec.europa.eu/repository/bitstream/JRC116106/jrc116106_jrc_e4c_task2_smartphones_final_publ_id.pdf
6   https://eeb.org/revealed-the-climate-cost-of-disposable-smartphones/
7   https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf
8   https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2019/09/Coolproducts-briefing.pdf
9   https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2019/09/Coolproducts-briefing.pdf
10 https://publications.jrc.ec.europa.eu/repository/bitstream/JRC116106/jrc116106_jrc_e4c_task2_smartphones_final_publ_id.pdf
11 https://en.wikipedia.org/wiki/Basel_Convention
12 http://wiki.ban.org/images/f/f4/Holes_in_the_Circular_Economy-_WEEE_Leakage_from_Europe.pdf

Electronic and electrical waste. Credit: John Cameron via Unsplash

The short two-year lifetime of smartphones is in stark contrast with the longer average lifetimes of other technology such as laptops (4.5 years) or household appliances such as washing machines (11.4 years) and vacuum cleaners (6.5 years).[13] However, the two-year cycle of smartphone replacement is arbitrary and shaped by market forces. Most people purchase a mobile phone in a bundled contract lasting two years, including 59 per cent of UK mobile customers,[14] so this is likely to have shaped the two-year cycle. The lifetime of smartphones is also unreflective of the expectations of consumers,[15] with more than half expecting them to last more than four years, and one in five expecting a seven-year lifespan.

Smartphones require regular software updates to function properly and protect against security threats. However, most smartphones stop receiving updates after two or three years, which is often far shorter than the usable lifetime of the device's hardware. Poor software performance is a significant driver of unnecessary device replacement, shortening the average lifespan of smartphones overall. A 2020 Eurobarometer survey found that 30 per cent of users replaced a smartphone because the performance of the old device had significantly deteriorated,[16] and 19 per cent replaced it because certain applications or software stopped working on the old device.

Despite consumers expecting their devices to last longer, they are often unable to access repair services that extend the lifetime of their products. Two-thirds of smartphone users would not even try to repair a device because manufacturers have made it difficult and costly to do so.[17] 78 per cent of Europeans have replaced their smartphone for reasons that could have been avoided through better and more durable design.[18] Many smartphones are replaced because the screen cracks during an accidental drop, the battery degrades or consumers experience problems with the camera, all issues exacerbated by manufacturers' deliberate design choices. With reports of manufacturers issuing software updates that deteriorate performance for older devices,[19] it is quickly becoming clear that this is a complex issue

that will require action on many fronts to resolve.

As the smartification of our homes and lives accelerates rapidly, with clear implications for environmental sustainability, regulatory changes will be required across a broad range of appliances and device categories. The number of connected devices is predicted to rise sharply in the coming decade, with estimates ranging from 7 billion[20] to 50 billion[21] devices already in use in 2020. The question for the European Commission and policymakers is where to start. Given its sizable environmental impact, potential for innovation and ability to engage consumers, we have identified the smartphone market as an important priority area for policymakers. However, recommendations made in this briefing are equally applicable to tablets, computers, and Internet of Things (IoT) devices, and lessons learned from regulating this challenging but advanced consumer electronics sector can then be applied to other, often still emerging, device categories. This is particularly important for IoT devices, which are likely to make up a much larger share of the total number of connected devices in years to come.

A smartphone smashes from a fall.
Credit: Ali Abdul Rahman via Unsplash

13   https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2019/09/Coolproducts-briefing.pdf
14   https://data.gov.uk/dataset/eb673e35-1a59-47d3-b5f1-914a67d85baf/technology-tracker
15   https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf
16   https://ec.europa.eu/commission/presscorner/detail/en/IP_20_383
17   https://prompt-project.eu/wp-content/uploads/2020/07/PROMPT_20200430_State-of-the-art-overview-of-the-user-market-and-legal-aspects.pdf
18   https://www.coolproducts.eu/policy/letter-to-the-european-commission-regulate-smartphones-through-ecodesign/
19   https://wccftech.com/samsung-lied-about-not-using-updates-to-slow-down-older-phones/
20   https://transformainsights.com/blog/iot-24-billion-connected-things-15-trillion
21   https://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?action=display&doc_id=8606

THE AIM

According to the European Commission's own assessment, increasing the lifetime of a smartphone to three or four years would reduce the emissions from this device category by 29 and 44 per cent respectively.[22] Since smartphone production is estimated to account for 11 per cent of energy consumption by all internet technologies,[23] moves to extend their lifetimes could halve a significant impact on our overall environmental footprint. This briefing will outline how Europe can gradually increase smartphone lifetimes from two years in 2020, to three years in 2025 and five years in 2030.

There is broad consumer support for devices that last longer. A 2020 Eurobarometer survey found that 64 per cent of consumers in the EU-27 want their smartphones and tablets to last five years or more.[24] Extending smartphone lifetimes would create tangible benefits for consumers, who would be given greater freedom to choose whether and when to replace, repair or upgrade their device. While the retail cost of devices prices has steadily increased over the past 20 years,[25] taking the average lifetime of a smartphone from two to five years would bring the annual cost of owning one down by 60 per cent, putting between €50 and €150 per year back into the pocket of each European smartphone user.[26] Reducing cost could also help reduce the digital divide, which has become even more important during the COVID-19 pandemic, as education and work are pushed online.

This reduction in cost allows us to address issues of social and economic justice, both at home and abroad. As devices last longer, their viability in global second-hand markets increases, making it more affordable for the 10 per cent of European households without internet access to get online,[27] and also open up access to devices in some of the least-developed countries, such as Sierra Leone, where the cheapest smartphone costs over six months' salary.[28]

The European Commission has committed to reaching net-zero by 2050, setting in motion the twin green and digital transition as one of the key levers to reach this target.[29] Digital technology is an instrument for tackling the environmental crisis, but it also comes with its own detrimental impacts, which must not be overlooked. While there has been considerable exploration of reducing the energy consumption of devices and servers in use,[30] the production of internet devices has received less attention, despite contributing almost half of the internet's total energy footprint.[31] If the Commission wants to make digital technology a part of transition plans, it must explore ways to make digital devices last longer and reduce their environmental impact at both the beginning and end of their lifecycle.

Europe also has an opportunity to blaze a trail by creating legislation that does not exist elsewhere. Furthermore, the international impact of European regulation means that any changes are likely to cascade across the world, creating progress in the production of long-lasting and environmentally friendly technology.

22 https://publications.jrc.ec.europa.eu/repository/bitstream/JRC116106/jrc116106_jrc_e4c_task2_smartphones_final_publ_id.pdf
23 https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf
24 https://ec.europa.eu/commission/presscorner/detail/en/IP_20_383
25 https://www.uswitch.com/mobiles/news/2020/07/mobile-phone-prices-soar-over-20-years/
26 https://www.gfk.com/en-us/press/smartphone-unit-sales-rose-6-in-north-america-in-4q17-highest-growth-in-two-years
27 https://ec.europa.eu/eurostat/statistics-explained/index.php/Digital_economy_and_society_statistics_-_households_and_individuals#:~:text=By%202019%2C%20the%20share%20of,in%20 2009%20(55%20%25)
28 https://docs.google.com/document/d/1YFXbUr-W0LTOAXs9QEtlf8oEBsrakQ_lLeHUyb-6oEY/edit#
29 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu_en
30 https://www.datacenterdynamics.com/en/news/eu-wants-data-centers-be-carbon-neutral-2030/
31 https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf

PROGRESS SO FAR

Legislation	EC responsibility	Release date	Main points
Vertical regulations for smartphones and tablets	DG GROW	Q2 2022	Will set product-specific regulations for smartphones and tablets under the Ecodesign Directive.
Sustainable Products Initiative	DG ENV DG GROW DG ENER	Q4 2021	Will review Ecodesign Directive to add measures of durability, reusability, repairability and recyclability. Will also add new product categories: – electronics & ICT equipment – textiles – furniture – steel, cement & chemicals
Circular Electronics Initiative	DG CNECT	Q4 2021	Will implement a right to repair (not yet defined). Will propose regulation for ICT products under the Ecodesign Directive.
Empowering consumers for the green transition	DG JUST	Mid-2021	Will set rules for environmental information for consumers, including minimum information and verifying claims

Environmental and consumer-interest campaigners have long tried to promote the longevity of technology and digital devices, including smartphones. The Right to Repair movement, which has gained momentum in both the EU and the US, has pushed for legislation that supports consumers' ability to access affordable repair services and repair their devices themselves.

In response, the European Union is about to take some important steps in the right direction. In 2019, the European Commission launched the EU Green Deal,[32] under which it aims to reach carbon-neutrality by 2050. As part of the Deal, the Commission announced its Circular Economy Action Plan,[33] designed to reduce the environmental impact of products by encouraging changes to design and waste management. The Sustainable Products Initiative is part of this plan,[34] which will set rules to make electronics and ICT equipment more sustainable through legislation, with proposed legislation planned for announcement in Q4 2021.

The Circular Electronics Initiative[35] is another part of the Circular Economy Action Plan, intended to be unveiled in Q4 2021. It will bring forward regulatory measures for ICT products including smartphones and laptops under the Ecodesign Directive and the work on vertical regulations for smartphones under the Empowering consumers for the green transition[36] proposal planned for mid-2021. It also includes a right to repair, a right to update obsolete software, measures on a common charger, improvements of the collection and management of electronic waste, and a review of rules around hazardous substances in electronic equipment.

The main focus of legislative change in this area will make use of the Ecodesign Directive (EDD).[37] The Directive was introduced in 2005 to reduce the environmental impact created by the products purchased across the EU. The EDD is a framework with horizontal principles on environmental performance that are applied to vertical regulations that refer to specific product types. A regularly

32   https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu_en
33   https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf
34   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12567-Sustainable-products-initiative
35   https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-circular-electronics
36   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12467-Empowering-the-consumer-for-the-green-transition
37   https://ec.europa.eu/growth/industry/sustainability/product-policy-and-ecodesign_en

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updated work plan creates new vertical regulations to add new product types and updates the existing vertical regulations.

So far, the EDD has primarily included products based on their energy consumption and efficiency while in use. However, the framework can set regulations for any aspect of a product's environmental impact, including lifetime carbon footprint, circularity, recyclability, repairability, and material and chemical composition. It can also stipulate specific design changes and features that are required to improve environmental impact.

In April 2020, the European Commission initiated a preparatory study on the environmental impact of smartphones and tablets,[38] and the aspects of their design that could be targeted by the Ecodesign Directive. The process will involve a public consultation followed by the development of vertical regulations for smartphones and tablets that the Commission plans to adopt in Q2 2022.[39]

There remain a number of barriers to lifetime extension, many of which are being addressed by campaigners across Europe. However, there are two issues that, despite their significance for device lifetimes, have received less attention. This roundtable focused on informing proposals to tackle the two issues of software support and public repair information.

38   https://www.ecosmartphones.info/
39   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12797-Designing-mobile-phones-and-tablets-to-be-sustainable-ecodesign

BARRIER 1: SHORT-LIVED SOFTWARE SUPPORT

The software on a smartphone is vital for it to function, ensuring that the device is secure from attack and operates properly. However, there is a disjuncture between the longevity of the hardware of a smartphone and the software that runs on it. Few smartphone manufacturers provide guarantees about the duration of software updates, which leads to devices being abandoned with security holes and missing features. Smartphones running the Android operating system get an average of two-years' worth of updates,[40] and while this fits with the current conception of device lifetimes, updates will need to be provided for longer if we want to achieve a longer lifetime overall. Specific applications can also cease to be compatible with older versions of software as developers stop supporting them, leading to popular apps such as WhatsApp becoming unavailable to users of older devices long before the device reaches the end of its life.[41] While this issue is beyond the scope of this briefing, it warrants future consideration.

Smartphones are responsible for collecting and processing some of the most private data a person can create. They contain records of their owner's behaviour, biometrics, contacts, messages, location, passwords, and financial information. Keeping that information secure in the face of constantly evolving cyber threats requires regular software and security updates. Providing these updates ensures that a smartphone's utility matches the lifespan of their hardware.

Apple maintains a longer software support period for its smartphones, with some devices receiving security updates up to seven years after they go out of production. In December 2020, Apple released a software update for iPhones 5S and 6,[42] to add support for its COVID-19 Bluetooth contact tracing function. The iPhone 5S was launched in 2014 and discontinued in 2016,[43] and this update demonstrates the feasibility of providing software updates for devices that were launched as long as 7 years ago. Even discounting the exceptional nature of this update, Apple has maintained an average of 5 years of software updates for all its now-discontinued iPhone models.[44]
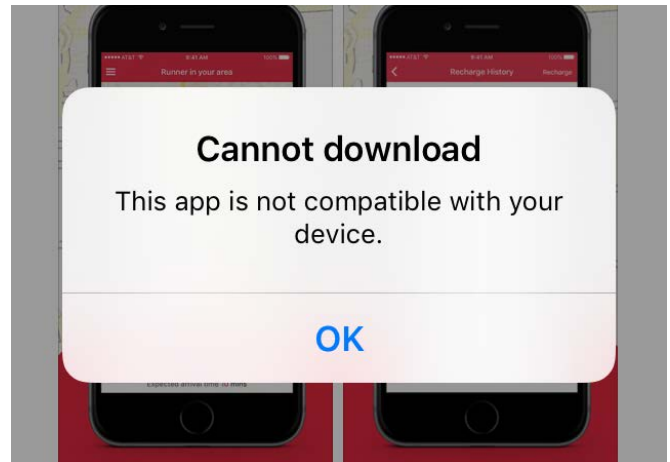
WhatsApp became unavailable to users of older devices. Credit: Nazish Ali via Stack Overflow[45]

A fundamental difference between Apple's iOS software and Google's Android, is that while Apple creates software only for its own devices, Android is deployed across thousands of devices from dozens of manufacturers.[46] The varied configurations of each device and the desire of many manufacturers to add additional features creates an extra layer of complexity for extending support. For policymakers, this creates a tension between diversity and harmonisation. A smaller number of devices and manufacturers would enable the streamlining of designs and the simplification of repair, but suppressing diversity in product design could hamper opportunities for further innovation. Another result of this fragmentation is that security updates must go through two rounds of release: first from Google and then through the manufacturer, and this process can take many months in some cases.[47] Google has expressed a desire to provide Android updates to each device for four years,[48] but this is only half the battle and manufacturers will need to make similar commitments for any change to occur.

A 2020 Eurobarometer survey found that 30 per cent of Europeans replaced a smartphone because the performance of the old device had significantly deteriorated,[49] and 19 per cent replaced it because

40   https://www.androidcentral.com/android-phones-software-updates-longer-two-years-apple
41   https://www.independent.co.uk/life-style/gadgets-and-tech/whatsapp-update-latest-version-android-iphone-2021-b1779479.html
42   https://www.engadget.com/apple-ios-125-adds-covid-19-exposure-notification-older-iphones-213616636.html
43   https://en.wikipedia.org/wiki/List_of_iOS_and_iPadOS_devices
44   https://en.wikipedia.org/wiki/List_of_iOS_and_iPadOS_devices
45   https://stackoverflow.com/questions/37027960/this-app-is-not-compatible-with-this-device-ios
46   https://en.wikipedia.org/wiki/List_of_Android_smartphones
47   https://www.androidpolice.com/2021/01/07/android-phone-security-update-tracker/
48   https://www.slashgear.com/new-android-phones-could-get-4-years-of-os-updates-16651443/
49   https://ec.europa.eu/commission/presscorner/detail/en/IP_20_383

certain applications or software stopped working on the old device. Manufacturers must also balance the addition of new features against the memory and graphics capabilities of older devices that are more likely to struggle with complex tasks. With each new version of smartphone software, it is common for users to complain about slower performance,[50] a factor that inevitably feeds into the decision of whether to replace a device with a newer model.

THINKING BEYOND SMARTPHONES

Time limited software support is not just an issue for smartphones, tablets, and laptops. A more deliberate approach to software updates could have an even bigger impact across other product categories as well. Internet connectivity is being integrated into an increasing number of product types, from security cameras, smart speakers, and autonomous drones to televisions, washing machines and kettles. Connecting a device enables its owner to monitor and control it remotely, but this comes at a cost to the environment. Each Wi-Fi or 5G module requires precious physical resources, complex manufacturing processes and energy, and the addition of connectivity can even impede the lifetime of the product.

Connecting a product to the internet means that software and security updates must be provided by the manufacturer to ensure that security threats are addressed. Software updates should be available for the duration of the product's lifespan, especially if they are essential to its primary function. Research shows that adding a connected element can reduce the typical decade-long lifetime of a household appliance to just two years when the security updates stop and the device is left open to attack.[51] The design of these products often also makes it difficult to replace or upgrade the connected elements. The expected rapid growth in volume of these devices means that it is particularly important for the European Commission to take a proactive approach to setting higher standards.

SOLUTION: EXTENDED SOFTWARE UPDATE DURATION

One approach here could be to make it compulsory for all smartphone manufacturers to provide software and security updates for the expected lifespan of their products and to publish this commitment on packaging and online stores.

Apple's COVID-19 software update for iPhones 5 and 6 demonstrates the feasibility of providing software updates for devices that were launched as many as seven years ago. Seven years is a reasonable target to expect smartphone manufacturers to provide software and security updates. Processing and memory capabilities may limit the ability to add new features, but consumers should be able to expect that their device can continue to function and remain secure for this period. Devices that currently have longer lifetimes, such as household appliances and IoT devices, would be expected to receive software updates for far longer.

A minimum software update duration could be implemented in a vertical regulation for smartphones. This would ensure that products are secure for a longer period and incentivise software developers to consider the impact of new features on those with older and less powerful devices. This approach has already been accepted by Member States in the recent update to Ecodesign regulations for televisions.[52] From early 2021, television manufacturers must provide firmware and security updates for eight years from the last unit of a model being put on the market. Manufacturers will also need to tell consumers how long they will provide updates for. The legislation states:

> E. 1. (a): 'The latest available version of the firmware shall be made available for a minimum period of eight years after the placing on the market of the last unit of a certain product model, free of charge or at a fair, transparent and non-discriminatory cost. The latest available security update to the firmware shall be made available until at least eight years after the placing on the market of the last product of a certain product model, free of charge.'[53]

The decision that larger household appliances such as televisions should have eight years of software updates highlights the double standard when it comes to smartphones and other internet devices. This is particularly apparent for companies such as Samsung, Xiaomi, and Huawei, which produce smartphones, televisions, and many other internet-connected devices. These companies are already proficient in providing software updates for longer periods than they do for smartphones, which would suggest it is an achievable goal. Despite smartphones and televisions being comparable in price range, the two-year life cycle of smartphones has become

50   https://www.nytimes.com/2017/11/15/technology/personaltech/new-iphones-slow-tech-myth.html
51   https://www.which.co.uk/news/2020/06/the-truth-behind-smart-appliance-security-updates/
52   https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=uriserv:OJ.L_.2019.315.01.0241.01.ENG
53   https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=uriserv:OJ.L_.2019.315.01.0241.01.ENG

expected, while consumers instinctively expect that televisions should last longer. Furthermore, the data processed by smartphones is far more likely to be sensitive than the information flowing through a television, so prompt and long-lasting security updates are important from a security perspective as well as an environmental one.

We can also look to the United Kingdom, which is developing legislation to mandate minimum software update provision for the lifespan of IoT devices,[54] as part of a drive to improve security.[55] Legislators propose to adopt the following principles in law:

> 3) Software components in internet-connected devices should be securely updateable. Updates shall be timely and should not impact on the functioning of the device. An end-of-life policy shall be published for end-point devices which explicitly states the minimum length of time for which a device will receive software updates and the reasons for the length of the support period. The need for each update should be made clear to consumers and an update should be easy to implement. For constrained devices that cannot physically be updated, the product should be isolatable and replaceable.[56]

The language here is straightforward and could be adopted for smartphones and other connected devices.

Any legislation must be specific in its reference to the software that is installed on the device at the point of purchase. If this is not specified, a loophole could be taken advantage of where a manufacturer produces a basic version of the software that it supports for seven years, with an option to switch to a feature-rich version that is supported for a shorter time.

LEGISLATIVE IMPLEMENTATION

There are two main mechanisms through which a minimum software update duration could be implemented in EU law, both involving the Ecodesign Directive. The first is the inclusion of a minimum software update duration in the vertical regulations for smartphones and tablets, currently in development by the European Commission.[57] The following wording could be adopted:

> 'For all smartphones, the latest available version of the operating system installed on the device at the point of purchase shall be made available for a minimum period of seven years after the placing on the market of the last unit of a certain product model, free of charge or at a fair, transparent and non-discriminatory cost. The latest available security update to the operating system shall be made available, free of charge, until at least seven years after the placing on the market of the last product of a certain product model.'

This would create a legal requirement for all smartphones purchased within the European Union to make available at least seven years of software and security updates. Setting a minimum standard means that manufacturers would not need to publicise their commitment, in contrast with the UK legislation for IoT devices, which would simplify implementation. Inserting the requirement into vertical regulations would take less time as there is no requirement for changes to primary legislation.

The second approach is to include a minimum software update duration in the Ecodesign framework as a horizontal principle, as part of the process of updates currently being consulted on through the Sustainable Products Initiative.[58] Through the initiative, the Commission will consult in the first quarter of 2021 on how to broaden the scope of the Ecodesign Directive's framework beyond energy-related products, with new regulations coming into force in 2024. The changes will include a much broader range of products, ranging from electronics and ICT equipment, to textiles, furniture, steel, cement, and chemicals. During this review, it will be possible to create a range of new overarching environmental principles that cover all categories of goods. Building the requirement into the framework would enable legislators to set a minimum software update duration for any product currently covered by the Ecodesign Directive's vertical regulations, as well as any that are added in the future. This wider scope would allow legislators to pre-empt problems in the future as connected devices proliferate across different industries and categories. However, implementing this change would take far longer, given that changes to primary legislation must be agreed by the European Commission, the Council of the European Union, and the European Parliament.

54   https://www.natlawreview.com/article/internet-things-how-uk-s-regulatory-plans-could-raise-compliance-standards
55   https://www.gov.uk/government/consultations/consultation-on-regulatory-proposals-on-consumer-iot-security/outcome/government-response-to-the-regulatory-proposals-for-consumer-internet-of-things-iot-security-consultation
56   https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/773867/Code_of_Practice_for_Consumer_IoT_Security_October_2018.pdf
57   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12797-Designing-mobile-phones-and-tablets-to-be-sustainable-ecodesign
58   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12567-Sustainable-products-initiative

SUPPORT AND CHALLENGE

The extension of software updates is supported by many organisations within the Right to Repair movement such as iFixit,[59] which provides repair information and campaigns for repair rights. iFixit argues that continued software support goes hand in hand with extending the ability of consumers to repair and upgrade their devices themselves.

Manufacturers may resist this requirement on the grounds that it will increase the cost of supporting smartphones, which would end up being passed on to the consumer. Finding and fixing security issues is a laborious task, which requires constant monitoring and development work. The European Commission's preparatory study into the environmental impact of smartphones estimates the cost of providing software updates for five years at around €2 per device.[60] More research may be required into these costs, particularly for smaller manufacturers, but any extra cost to consumers in the provision of software updates for a longer period is likely to be outweighed by the reduced overall cost of owning a smartphone that lasts far longer, let alone the potential cost and security implications of large-scale data breaches.

Apple has shown that it can support its iPhone devices for five years as a matter of course, with occasional security and feature updates for devices as old as seven years. However, with the 69 per cent of smartphones connecting to the internet in Europe running Android,[61] it is becoming increasingly clear that legislative intervention is necessary to hold the wider smartphone sector to account for the environmental footprint and cybersecurity implications of their products.

The application of software requirements to televisions creates a precedent that could easily be applied to smartphones and doing so would contribute to the fairness of legislation as it applies to different product categories.

SOLUTION: ALTERNATIVE SOFTWARE AT THE END OF SUPPORT

With care and maintenance, smartphones could last for many years. Exploring alternative options for when official software updates end could help to extend the lifetime of devices further.

One way of doing this is to require manufacturers to make a device's software open-source when it stops providing software support. This could involve the publication of the software's code on a public platform under an Open-Source Initiative approved license.[62] Doing so would allow communities of Free and Open-Source Software (FOSS) developers and security experts to continue to support older devices. This approach would also protect consumers if the maker of their device ceases to trade or exist. The smartphone market is difficult to enter and the last few years have seen several companies fail to reach profitability[63] or exit the market for other reasons.[64] When this happens, consumers can be left with slow and insecure devices.

There is a legal precedent for mandating the opening up of smartphone functionality in the UK, which made changes to enact the European Electronic Communications Code (EECC). Since the advent of mobile phone contracts, carriers have locked the devices they sell so they cannot be used on other networks without their consent. British consumers wishing to switch networks, even after the minimum period of their contract, were faced with a fee between £10 and £30. Ofcom, the UK's telecommunications regulator, found that this practice contravened the requirements on fairness in the EECC[65] by being anti-competitive and limiting consumer choice, and it also increased the likelihood of waste. From December 2021, it will be illegal to lock any smartphone or other cellular device to any particular network,[66] a significant victory for consumers. This approach could be expanded to consider the software inside the phone as well as the network it connects to.

Manufacturers may resist publishing code because it could expose unknown security issues or share protected intellectual property. If a smartphone maker is reluctant, another approach is to require the

59   https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12567-Sustainable-products-initiative/F1177713
60   https://www.ecosmartphones.info/app/download/11461136174/Task_6_ErP_study+24-11-2020.pdf?t=1608136228
61   https://gs.statcounter.com/os-market-share/mobile/europe/2020
62   https://opensource.org/licenses
63   https://www.computing.co.uk/news/3013764/blinged-up-british-smartphone-maker-vertu-goes-bust
64   https://www.gadgetsnow.com/tech-news/this-chinese-smartphone-company-is-bankrupt-after-chairman-lost-144-million-in-gambling/articleshow/67177014.cms
65   https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L1972&from=EN
66   https://www.which.co.uk/news/2020/06/the-truth-behind-smart-appliance-security-updates/

A Fairphone with /e/ installed. Credit: esolutions.shop.[67]

opening of devices to install alternative operating systems. Fairphone is an example of a company that has adopted this approach by allowing users to unlock the software[68] on its devices and install /e/, an alternative operating system created by the e.Foundation.[69] /e/ is based on the principles of open-source software and prioritises the user's privacy,[70] so it also acts as an alternative to the data-hungry Android operating system.

Another example of an alternative operating system is PostmarketOS.[71] It is based on Linux and designed to be lightweight so that older devices with less powerful components can function for up to ten years. PostmarketOS currently runs on around a dozen different devices, many of which are at the low-cost end of the market. Several other options[72] including Plasma,[73] PureOS[74] and Tizen[75] are also available.

Developing alternative operating systems for existing smartphones is a significant challenge because each model must be reverse engineered so that a new version of the operating system can be developed. Beyond the base of the operating system, each device has its own 'drivers' that allow the software to control its hardware, and these are most often proprietary. Components such as the cellular modem also use 'firmware', which sits between the hardware and software and is often maintained by the manufacturer of that specific component. This means that extending software support requires action across the whole supply chain.

Manufacturers could simplify this process by working with open-source software developers to share all the code that helps them to utilise the various parts of the device. This would also be facilitated by a straightforward mechanism for unlocking the

67   https://esolutions.shop/shop/old-e-os-fairphone-3/
68   https://support.fairphone.com/hc/en-us/articles/360048657752
69   https://doc.e.foundation/devices/FP3/
70   https://doc.e.foundation/what-s-e
71   https://postmarketos.org/
72   https://itsfoss.com/open-source-alternatives-android/
73   https://plasma-mobile.org/
74   https://pureos.net/
75   https://www.tizen.org/

'bootloader' of a device, the feature that allows only the original software to be used.

Developing alternative software takes time, so the sooner open-source developers can access a device's code, the sooner alternatives can be developed. Providing the base or 'kernel' of the operating system and all drivers required for basic functionality at the point a device goes onto the market would allow stable and full-featured alternatives to be developed. Device makers could also make the full software available before the end of the mandatory software support period to give time for alternative operating systems to be developed.

If smartphones are at risk of losing software support because of their age or the insolvency of their manufacturer, this issue is only magnified for other connected devices. Household appliances such as washing machines, smart fridges and televisions could last a decade, and in the fast-moving world of digital innovation, they are at significant risk of losing software and security support before the end of their life.

Manufacturers could support efforts to extend device lifetimes by contributing to a fund for providing continuing support and the European Commission could play a role in securing such commitments through a voluntary agreement with the industry. Funding for open-source software can be difficult to secure, with many developers volunteering their time or relying on charitable contributions. However, some technology companies already support open-source development through grants, including Mozilla[76] and Google.[77] More research is required to design a mechanism for this type of funding, but it could be seen as a way for manufacturers to fulfil or outsource some of their commitments to managing electronic waste as well as the long-term security of their products.

LEGISLATIVE IMPLEMENTATION

The Ecodesign Directive is the main avenue through which this software support recommendation could be enacted. First the requirement could be included in the vertical regulations for smartphones, and then in the update to the Directive itself, as a horizontal principle to broaden its applicability to more product types. It will be important to get the practical and technical implications of any such provision right in dialogue with manufacturers, OS providers and the

FOSS developer community. The following text could provide a starting point to lawmakers:

Manufacturers of smartphones and any components that run software or firmware are required to make provision for the ongoing development of the operating system on a device, as far as it is needed to ensure its cyber security and basic functioning. In the absence of continued security and software support from the manufacturer, this can be achieved through:

a) the provision of a straightforward method of unlocking the bootloader of the device for the purposes of open-source software development;

b) the open-source publication of the devices' base operating system or kernel, all drivers required for basic functionality, and any firmware at the point of the product going onto the market;

c) the open-source publication, at least one year before the end of the mandatory software support period, of the full source code of the operating system on a public platform in a manner that enables adjustment and adaptation, and

d) the creation of an accessible process for installing alternative operating systems on the device.

Making alternative software options visible to consumers would be important to make the process straightforward. One mechanism could be a voluntary register of devices with options for aftermarket software. This could be maintained by the European Commission and would enable consumers to easily access software for their device, without having to rely on a manufacturers' website, which could cease to function.

The legislation should account for the software used on embedded components and maintained by manufacturers other than the final device maker. However, the situation is often complex and will require further research to understand how component manufacturers can be included in any minimum software periods.

SUPPORT AND CHALLENGE

Support for open-source software is widespread, with privacy and security experts among its chief advocates. The most popular mobile operating system, Android, is based on open-source software,

76   https://www.mozilla.org/en-US/moss/
77   https://opensource.google/docs/growing/funding/

and Google, its creator, is a firm supporter of open-source,[78] stating: 'Google believes that open source is good for everyone. By being open and freely available, it enables and encourages collaboration and the development of technology, solving real world problems.'

Despite these public commitments to open-source software, issues remain with the governance of the most popular operating systems that prevent their full publication. Apple's iOS is entirely proprietary and is not licensed for use on any other devices. And while Android is nominally open-source, Google controls how it is used and licensed.[79] Google maintains two branches, one for in-house development and one for public access, and contributions to the codebase are rarely accepted. This means that, regardless of the open-source public image of Android, it is almost as closed as Apple's iOS software. Applying an open source approach to Android would require the creation of strong and collaborative governance processes that allow for more interplay between manufacturers, those developing operating systems and applications, and the open source community.

Manufacturers have pointed to security concerns when justifying their decisions to lock the software on smartphones.[80] Unlocking a device's software could allow anyone with access to tamper with the device, retrieve private information or install hidden tracking software. Open-source proponents, however, argue that software can be made more secure when its code can be checked and verified by anyone, or be subjected to regular expert community audits. By exploring alternative approaches to aftermarket software, device makers could contribute significantly to extending the lifetime of their smartphones and reducing the overall environmental impact.

It is vital that the process of switching operating systems be made as smooth and intuitive as possible, since any complexity will push more consumers towards replacing their device. One potential issue is that users will become accustomed to a certain operating system after using it for several years, before having to relearn a whole new user interface on the alternative software. To maximise the opportunity for the original owner to continue using a device, the original software provided by the manufacturer at the point of purchase should last as long as possible to reduce the complexity involved in switching to alternatives. This issue could also be addressed by installing the alternative operating system when a smartphone changes ownership, such as when it is sold or refurbished.

78   https://opensource.google/
79   https://www.w3.org/WoT/IG/wiki/images/a/a5/Webinos-whitepaper-Open-Governance.pdf
80   https://insights.samsung.com/2019/05/29/what-are-the-security-risks-of-rooting-your-smartphone/

BARRIER 2: REPAIR MANUALS, SCHEMATICS, DIAGNOSTIC TOOLS ARE NOT PUBLICLY AVAILABLE

Digital devices are often complex, so accurate manuals are vital for their repair. However, most manufacturers tightly control access to information about how to repair their devices, which makes it more difficult for repair professionals and end-users to extend their device's lifetime. Some device makers have argued that repair manuals and schematics constitute trade secrets, and their publication could enable repairers to infringe on their copyright. However, according to The Repair Association,[81] repair manuals do not need to contain trade secrets,[82] and manufacturers are still protected from imitation by their copyrights and patents.

SOLUTION: PUBLIC REPAIR INFORMATION

In November 2020, Members of the European Parliament voted in favour[83] of a report led by French Green MEP David Cormand on ways to boost sustainability by giving consumers the 'right to repair' and by tackling practices that intentionally shorten the lifetime of products.[84] The vote makes it clear that the European Commission has the full support of the European Parliament in working to extend the lifetime of digital devices.

However, a right to repair can only be effective if consumers are empowered to meaningfully assert this right. Consumers, and even many repair professionals, are currently prevented from understanding and safely conducting the most common repairs because of a lack of reliable public information, even for the most-used devices. Alongside the provision of repair parts and tools necessary within the right to repair, device makers should be required to publish adequate information that will support effective and safe repair.

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81   https://www.repair.org/
82   https://www.latimes.com/business/hiltzik/la-fi-hiltzik-right-repair-20181116-story.html
83   https://repair.eu/news/european-parliament-stands-by-consumers-and-the-environment-in-the-fight-against-obsolescence/
84   https://www.europarl.europa.eu/doceo/document/A-9-2020-0209_EN.html

A smartphone ready for repair. Credit: Joel Rohland via Unsplash.

Several manufacturers have made repair manuals available to repair professionals that they have authorised but it is often necessary to agree to lengthy, invasive and even anti-competitive contractual agreements to gain access.[85] This can be burdensome for repairers, but it also allows manufacturers to exclude anyone they decide should not be permitted. While the Ecodesign Directive enables Member States to implement a national register of repair organisations with the aim of providing a straightforward mechanism to prove eligibility to access repair manuals, this has not yet been implemented by any Member State.[86] Furthermore, being on the register does not grant immediate or automatic access to repair manuals, since manufacturers can apply other conditions, contractual obligations, and delays. Even if a register were to be implemented effectively, this approach still leaves far too much power in the hands of device makers, because it continues to prevent users from conducting repairs themselves.

Publishing repair manuals and electronic schematics for devices would help more people extend the lifetime of their devices at a lower cost and do it more safely and effectively. The growing popularity of repair parties and cafes makes it clear that there is demand for this information from consumers.[87] The public availability of these materials would also enable a wide range of public-interest research activities to be conducted, including detailed analysis of the repairability and environmental impact of devices. This could lead to further gains in device lifetime as insights generated by academics and campaigners can help device makers improve their designs.

77 per cent of Europeans would rather repair their electronic devices than replace them.[88] Making repair manuals and electronic schematics publicly available would make this easier and help to reduce the digital divide by reducing the cost of repairs. Keeping repair manuals and electronic schematics tightly controlled also presents a potential issue for competition as manufacturers restrict users to a limited selection of repairers, stifling the growth of a larger market for repair. The current manufacturer-controlled repair market also tends to concentrate services in repair centres and authorised partners in densely populated urban areas, meaning that users often need to send their device off for repair or travel significant distances. When dealing with an item as relied upon as a smartphone, this inconvenience can tip the balance towards ordering a new device. Both consumers and the environment stand to gain from more and cheaper repair options.

Demand for this information is clear from the rising popularity of repair parties and cafes across Europe but we cannot yet know the full impact of making repair information public, since it has not been an option for consumers.

Investment in local initiatives could also support increased repair and longer device lifetimes. For example, eReuse, a charity focused on the circular economy, creates legal templates to build refurbishment and reuse into large-scale technology procurement. These templates will enable organisations to ensure that the devices they purchase will be refurbished and used by citizens without an internet device.[89] Innovative methods of extending device lifetime are developing all over Europe, which makes it even more important that smartphones are repairable too.

LEGISLATIVE IMPLEMENTATION

The availability of repair manuals, schematics and diagnostic tools could be improved through the Sustainable Products Initiative, which is reviewing the Ecodesign Directive framework. Implementing the necessary changes in this way would enable public repair information to become an Ecodesign principle across all relevant product sectors, but is likely to take several years, with changes taking effect in 2024 at the earliest. In the shorter term, the publication of repair manuals and electronic schematics should be included in the requirements for the vertical regulations being considered to cover smartphones within the Ecodesign framework. Adapting language from the vertical regulations on electronic displays,[90] it could be worded as such:

From the placing on the market of the first unit of a model or of an equivalent model, and for a minimum period of seven years after placing the last unit of the model on the market, the manufacturer, importer, or authorised representative shall publish appliance repair and maintenance information in the following conditions:

85   https://repair.eu/news/our-questions-about-apples-independent-repair-provider-programme/
86   https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.315.01.0285.01.ENG&toc=OJ:L:2019:315:TOC
87   https://repaircafe.org/en/wp-content/uploads/sites/2/2020/05/RepairMonitor_analysis_2019_05052020_ENGLISH.pdf
88   https://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_388_en.pdf
89   https://ereuse.org/
90   https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2019.315.01.0241.01.ENG&toc=OJ%3AL%3A2019%3A315%3ATOC

1. the manufacturer's, importer's or authorised representative's website shall provide unrestricted access to this information, without any person requesting the information being required to identify themselves or agree to any legal obligation;

2. the manufacturers, importers or authorised representatives shall make this information available instantly and without delay or approval process;

3. manufacturers, importers, or authorised representatives may not charge any fees for access to the repair and maintenance information or for receiving regular updates.

Any individual or organisation shall have access to the requested repair and maintenance information instantaneously and without delay. The available repair and maintenance information shall include:

• the unequivocal appliance identification;

• a disassembly map or exploded view;

• list of necessary repair and test equipment;

• component and diagnosis information (such as minimum and maximum theoretical values for measurements);

• wiring and connection diagrams;

• diagnostic fault and error codes (including manufacturer-specific codes, where applicable); and

• data records of reported failure incidents stored on the electronic display (where applicable).

This would represent a strengthening of the wording that has been used in the vertical Ecodesign regulations for electronic displays.[91] These regulations only require manufacturers to provide repair information to repair professionals, who must either be registered on a national database or provide some other verification that satisfies the manufacturers' own criteria. As mentioned, no Member State has implemented a national register, so this leaves repairers at the behest of manufacturers' requirements.

The electronic display regulations also permit manufacturers to charge a fee for access and ongoing updates, which is anathema to the concept of a right to repair and could prevent smaller repair organisations from gaining access. The regulations also allow manufacturers to take up to five days to process a request for verification, and a further working day to process any request for specific pieces of information. Any delay is likely to worsen the chances of a successful repair, as a quick repair turnaround can make the difference between fixing a device and deciding to replace it altogether. A delay is also unnecessary, since the information listed above is already available to manufacturers and their repair technicians; it just needs to be put online.

SUPPORT AND CHALLENGE

As part of a package of measures to implement a comprehensive right to repair, the public provision of repair information has support from repair professionals, academics, and campaigners alike.[92] This information is the cornerstone of a culture of repair and reuse, and its availability for other product categories has had a significant impact in recent years. For example, during the early stages of the COVID-19 pandemic, there was a severe shortage of ventilators and other medical devices, but manufacturer representatives could not keep up with the demand for repairs. A campaign emerged to source and publish repair manuals and other information,[93] enabling hospital biomedical technicians to conduct repairs on the devices and save more lives. Unofficial repositories of service manuals for laptops already exist,[94] demonstrating the existence of comprehensive and well-explained service guidance.

In the past, manufacturers have resisted the public availability of repair manuals and electronic schematics by arguing that they contain intellectual property or trade secrets.[95] However, these materials generally provide no more information than can be gleaned by thoroughly disassembling a product, so it is not clear how the publishing of this information would negatively affect manufacturers.

Device makers have also justified their secrecy by arguing that releasing the materials could cause unskilled end users to injure themselves on sharp parts or by, for example, puncturing a battery.[96]

91 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.315.01.0241.01.ENG&toc=OJ:L:2019:315:TOC
92 http://repair.eu/
93 https://www.ifixit.com/News/41440/introducing-the-worlds-largest-medical-repair-database-free-for-everyone
94 https://tim.id.au/blog/tims-laptop-service-manuals/
95 https://www.latimes.com/business/hiltzik/la-fi-hiltzik-right-repair-20181116-story.html
96 https://www.cnet.com/news/apple-reportedly-warning-of-dangers-associated-with-right-to-repair-bill/

However, there are many other products for which users are expected to replace parts or conduct potentially dangerous procedures - from car maintenance to light bulb replacement - and many manufacturers of complex electronic products already publish such information without safety concerns.

Regulatory reforms have already been successful at incentivising manufacturers to release repair manuals. For example, in response to the recent implementation of a repairability index in France, Samsung has released repair manuals for several of their smartphones in French.[97] This shows that the manuals exist, and that they are a valuable and accessible resource for repair professionals and consumers alike. The more of this information is available, the more demand will be generated for high-quality parts, which are currently often expensive and poor-quality.

The French Repairability Index gives each device a repairability score. Credit: indicereparabilite.fr[98]

A further benefit of the publication of repair manuals is the potential for exploring effective design choices. When approaching most modern smartphones without a public service manual, repairers are reliant on organisations that manually take apart devices to understand their construction and the opportunities for repair. iFixit is one such organisation, which has created an extensive collection of repair manuals for others to use.[99] However, the process is laborious and expensive, requiring the purchase and disassembly of several units of each device to create a guide to repair. The publication of official service manuals would make this process unnecessary. Public repair manuals could also be studied by researchers to

ascertain the repairability of devices and make recommendations for design choices that could be implemented through future amendments to European regulations.

With more information about the specific designs of smartphones and other devices, legislators could also explore ways to increase modularity. This would involve creating standardised connectors for components within the device and would make it much easier for users and repairers to swap out parts and upgrade them. The Fairphone has several swappable modules, including the screen, camera, and battery.[100]

Legislation can also support the 'right to own', the idea that consumers should be able to assert their right to ownership over their own property.[101] This right has been eroded in recent years with the digitalisation of services and even the 'servicisation' of many hardware products,[102] but ownership has broad support across many areas of society.[103]

97   https://downloadcenter.samsung.com/content/EU/202101/20210113161119652/SM-A125F_UserServiceManual_Fre_Rev.1.1_210112.pdf
98   https://www.indicereparabilite.fr/
99   https://ifixit.com/
100   https://www.fairphone.com/en/
101   https://research.ngi.eu/working-paper-a-vision-for-the-future-internet/
102   https://justnetcoalition.org/digital-justice-manifesto.pdf
103   https://justnetcoalition.org/digital-justice-manifesto.pdf

TACKLING THE INTERNET OF THINGS

This briefing has focused on smartphones because they are emblematic of the environmental issues created by digital technologies. The smartphone market is growing by 11 per cent each year[104] and current consumer replacement cycles are much shorter than for other, comparable products. However, the issues explored in this briefing apply to virtually all products that can connect to the internet, especially in the growing space of the 'Internet of Things' (IoT). These include household appliances such as smart washing machines, dishwashers, and televisions, as well as Wi-Fi-controlled light bulbs, smart home assistants and wearable devices such as smart watches. They also include countless examples of electronics procured by governments and the wider public sector, where appropriate standards for lifespans, repairability, transparency and long-term security should be of paramount concern.

Estimates of the total number of IoT devices vary widely from 7 billion[105] to 50 billion[106] in 2020 but the predictions are clear that the number of connected products will increase significantly, if not exponentially, over the next decade. The environmental impact of this proliferation of devices cannot hope to be sustainable if their useful lives are artificially shortened by poor software or barriers to repair.

There is a broader opportunity to set horizontal requirements for all product categories that use software. The Commission should explore what it would mean to require that software updates be made available for the expected lifespan of all connected devices. For example, a fridge with a potential lifespan of over a decade should not have its use limited by the premature curtailment of software updates to keep it secure and protected from hacking.[107]

Beyond their software, smartphones and most other connected devices are reliant on cloud services to conduct even their most basic of functions. Data storage, messaging and security features all connect with servers run by the software creators. The dominance of Apple's iOS and Google's Android creates a small number of points of failure for smartphones, and the potential for IoT devices ceasing to function prematurely should be explored in more detail.

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104   https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf
105   https://transformainsights.com/blog/iot-24-billion-connected-things-15-trillion
106   https://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?action=display&doc_id=8606
107   https://www.which.co.uk/news/2020/06/the-truth-behind-smart-appliance-security-updates/
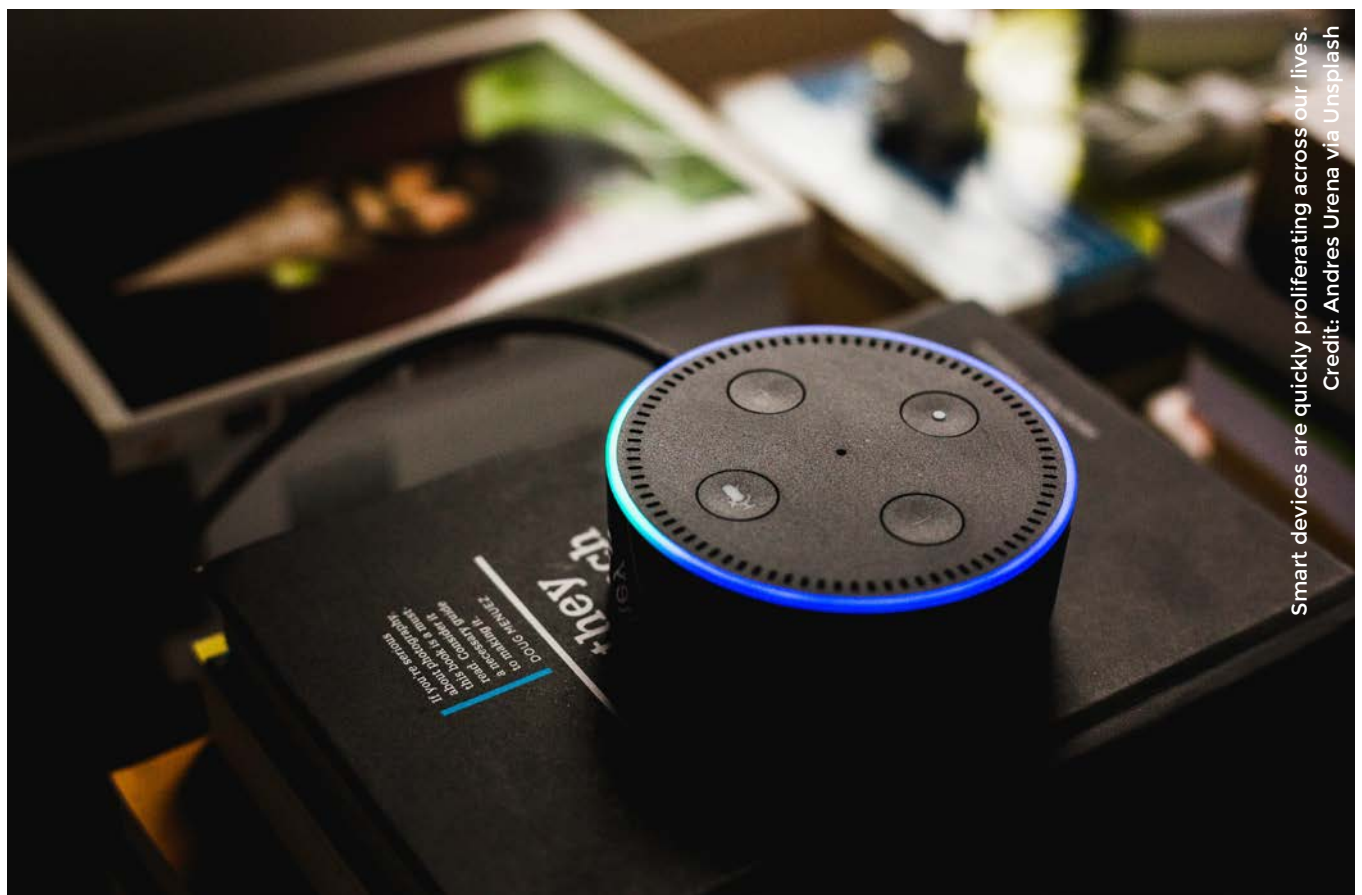
Smart devices are quickly proliferating across our lives.
Credit: Andres Urena via Unsplash

CONCLUSION

If the future lives of Europeans are to be increasingly mediated by connected devices, reducing the environmental impact of our digital lives should be a priority. Smartphones and other IoT devices are proliferating faster than the policy process can keep up with, so efforts to extend their lifetimes should be considered a matter of urgency. Europe does not only have an opportunity to lead through regulation in an area that has seen little oversight in other parts of the world, but to spearhead innovation in the design of high-quality, trustworthy, and sustainable electronics.

By implementing the recommendations in this briefing, legislators can contribute to reductions in waste and irresponsible consumption across the European Union. Changes made here will likely emanate out to other parts of the world as manufacturers begin to extend their commitments and the next billion users connect to the internet. These changes will also benefit consumers, who will be able to save money on less frequent device replacement and choose to spend it on more sustainable and durable technology.

But perhaps above all, these issues are a matter of justice. It should be a fundamental right to own, adapt, upgrade, and extend the life of the products we buy. Our current world of short-lived, locked-down, difficult-to-repair devices is quickly eroding that right. Now is the time to push back against this trend and legislate for smartphones and other internet devices to last longer and to drastically reduce the internet's environmental impact.

Websites:
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