PROMPT

Premature Obsolescence Multi-Stakeholder Product Testing Program

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- DEM = Demonstrator, pilot, prototype, plan designs
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STIWA (Stiftung Warentest)

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ANEC (Association Europeenne pour la Coordination de la Representation des Consommateurs pour la Normalization)

With the collaboration of UFC (Union Federale des Consommateurs) and CB (Consumentenbond)

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Content

1 GLOSSARY

ADEME French Environment and Energy Management Agency

BENELUX Economic union that includes Belgium, the Netherlands and Luxembourg

CEN European Committee for Standardization

CENELEC or CLC European Committee for Electrotechnical Standardization

CEN-CENELEC Joint Technical Committee of both CEN and CENELEC

DEFRA Department for Environment, Food and Rural Affairs, United Kingdom

DG ENV Directorate-General for Environment

DG JUST Directorate-General for Justice and Consumers

eDiM Ease of Disassembly metric

EN European Standard

ErP Energy related products

ESOs European Standardisation Organizations

EU European Union

prEN Draft European Standard (CEN/CENELEC)

Group SEB Multibrand group of manufacturers focused on small domestic appliances

IEC International Electrotechnical Commission

JRC Joint Research Centre

JTC10 Joint Technical Committee 10 of CEN-CLC

ON Österreichisches Normungsinstitut, currently Austrian Standards International

WEEE Waste electrical and electronic equipment

WG Working group

2 INTRODUCTION

2.1 OBJECTIVE

This report collates existing information regarding tests, rating systems and standards in so far as they include relevant aspects concerning premature obsolescence.

This information will help the consortium to identify existing features and issues that dominate product obsolescence (such as bearing failure, high repair cost and commonly used protocols). In addition, it will provide examples, references and background information for future work, reports or dissemination campaigns.

Project partners could update the databases developed after this deliverable is completed to make sure the information displayed remains relevant over the whole project lifetime.

2.2 SCOPE

Data collection focused on white goods and consumer electronics, paying special attention to compiling information for the four main product groups in PROMPT: smartphones, televisions, washing machines and vacuum cleaners.

The report contains information regarding examples of both durability and reparability. For practical reasons, we distinguish between testing and rating methods. Throughout this report, in line with internal definitions:

- A TEST is a punctual exercise to assess durability/reparability in a limited number of devices with similar characteristics according to a specific procedure, and
- A RATING METHOD is a procedure to calculate a durability or reparability indicator.

At the same time, the rating methods gathered were classified using the three categories defined in the *Reparability criteria for energy related products,* a Benelux study to evaluate the options available to extend a product's lifetime, prepared by Ellen Bracquené, Jan Brusselaers, Yoko Dams, Jef Peeters, Karel De Schepper, Joost Duflou and Wim Dewulf *(Final Report June 2018)*[1]:

- Qualitative evaluation methods generally consist of a number of criteria that need to be fulfilled in order to obtain a label, such as Blue Angel, Nordic Label or European Eco-label.
- Semi-quantitative evaluation methods assign a weight to each criterion and sum up these weighted criteria which results in a "repairability score" for the product. Examples for this are the iFIXIT score card and the Austrian Technical Rules ONR 192 102:2014.
- Quantitative methods use measurable data to calculate a reusability index or metric. For example, the Ease of Disassembly method (eDiM) calculates the required disassembly and reassembly time, which can also be used to assess the repairability, since disassembly and reassembly activities are an important part of the repair process.

2.3 PARTNERS INVOLVED AND THEIR ROLES

OCU, Test-Achats, STIWA and ICRT contributed to the data collection using previous experiences and results of durability and reparability tests. UFC and CB also were invited to participate. R.U.S.S. and iFIXIT worked on a state-of-the art review of durability and reparability rating methods.

ANEC, with the help of iFIXIT and R.U.S.Z., summarized the state-of-the art related to standardization in the field of resource efficiency of white goods and consumer electronics.

[1] http://www.benelux.int/files/7915/2896/0920/FINAL_Report_Benelux.pdf

2.4 WORKING PLAN

First, OCU distributed a data matrix to the partners to collect relevant information in a harmonised tool. The partners filled in the matrix with their test experiences and identified rating methods. Subsequently, OCU compiled and structured the information gathered and the partners then validated the structure and completed any missing data. Finally, a joint discussion took place during the first General Assembly meeting of the PROMPT project to identify remaining data gaps and future needs. The final deliverable was compiled in December 2019.

3 REVIEW OF EXISTING TESTS

3.1 INFORMATION GATHERING: DATA MATRIX

An Excel template was elaborated during the project kick-off meeting to harmonise how necessary information on testing and rating was to be collected. This format facilitates consultation and is easy to update.

This data matrix contains the following minimum information regarding existing durability and reparability tests for specific categories of white goods and consumer electronics:

- Product details (product type, parts of the product within the scope of the test, number of product models tested, etc.);
- Methodology used and laboratory/centre performing the test;
- Date of the test;
- Reference organisation and other organisations involved;
- Main results of the test;
- Conclusions, and
- Links and references to paper/online publications providing additional information about the tests.

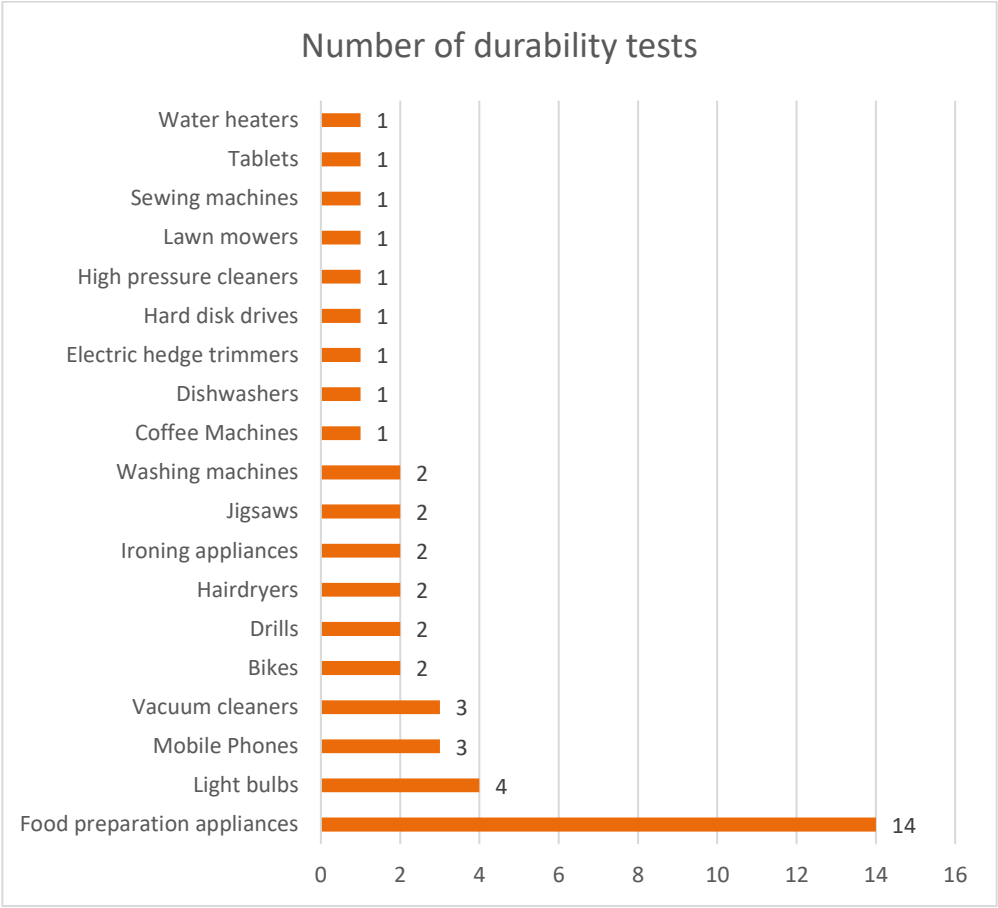
The relevant information contained in the Excel file is summarised in section 2.2 General overview and detailed in the annex of this document.

3.2 GENERAL OVERVIEW

The data matrix contains information on 51 tests (44 durability tests plus 7 reparability tests) performed on a wide variety of products, which were mainly household appliances (washing machines, vacuum cleaners, food preparation appliances, ironing appliances, drills, etc.), but also consumer electronics devices such as mobile phones, laptops, tablets and other battery-driven devices such as e-bikes or lawnmowers.

Most of the tests were performed using proprietary testing methods developed by the various organisations and in only a few cases standards are mentioned. In these cases, the standard methodology is sometimes adapted.

The number of durability tests performed per product category is as follows:



The category of food preparation appliances registers the highest number of durability tests performed. This is because this category includes a wide range of kitchen products, including hand blenders, blenders, pastry makers, food processors, cooking robots and others. The highest percentage of failures was registered in cooking robots (those which include a heating function).

Some of the durability tests were performed as part of a continuous joint test where:

- A test programme was agreed upon by the participating organisations and a common laboratory was used for the test;
- The test programme includes not only durability aspects, but also other product aspects (such as performance, usability, etc.) in order to provide an overall quality score for each tested product, and
- Products are sent to the laboratory in several batches during the year. The test keeps running for several consecutive years.

Each one of these continuous tests may appear as a single durability test in the annex of this document; nevertheless, hundreds of products might have been analysed during the same test programme. This is the case for the following product categories:

- Food preparation appliances: more than 800 products tested;
- Ironing appliances: about 200 products tested per year;
- Mobile phones: about 200 products tested per year;
- Vacuum cleaners: about 200 products tested per year, and
- Light bulbs: more than 100 products tested.

The durability tests performed usually replicate intensive use of the product: use cycles are performed one after another in order to simulate several years of normal use in a shorter period of time (days, weeks or months). Cycles include both on and off periods. As the full use of the product is simulated in a short period of time, some effects, such as the aging of the materials/electronic components, are not covered by these accelerated tests but could be an issue in real-life applications. Several durability tests aim to stress the motor of the product, as this is one of the most important parts and its replacement can be very expensive.

Other durability testing, such as drop tests or scratch tests, are reserved for portable devices like mobile phones or portable hard disk drives. For cordless products/mobile devices, battery lifetime and battery capacity, which decreases over time with use, are also normally tested. Corrosion tests are rare, but the presence of rust could be observed from the outset in a few tests (washing machines and water heaters).

Durability tests related to software/firmware are very rare at the present time. Just one test on the updateability of Android mobile phones was identified. Nevertheless, outdated software/firmware may become more and more of an issue for consumers as the number of connected products (IoT) increases.

Product design plays an important role in both durability and reparability. For instance, when testing the durability of e-bikes, it was discovered that bikes designed for men were more fragile than bikes designed for women due to the frame geometry. Vacuum cleaners are another example where most of the motors fail because the carbon brushes wear out. Such a component was not easily replaceable in most cases. In our products tested, inverter motors could have been used instead of traditional motors to provide a much longer motor lifetime.

Regarding reparability, mobile phones, tablets and thin-form factor laptops (also called ultra-slim laptops) are very hard to repair. Batteries are not easily replaceable in many cases (including e-bikes), limiting the overall product lifetime. Product design, manufacturer documentation (for product assembly/disassembly, error messages, etc.) and spare part availability are key aspects to be considered in terms of reparability.

Reparability tests collated focussed on the product categories of mobile phones, tablets, laptops, washing machines, vacuum cleaners and e-bikes (electric bikes). For mobile phones, tablets and laptops, the tests are still ongoing continuously, which means that more samples will be tested in the coming year.

All the details of the durability and reparability tests collected can be found in the annex.
Results and conclusions arising from the tests performed can be found on each organisation's website. Published content is sometimes available as a magazine article (downloadable in pdf format) but in other cases, especially when there is a continuous test running, results appear as part of an online comparison tool containing all the test results from products tested. Please note that access to the published results is very often restricted to the registered members of each organisation.

4 REVIEW OF EXISTING RATING SYSTEMS

4.1 BACKGROUND

The research process involved assembling the expertise of the partners as well as taking into account work ongoing at the European Commission Joint Research Centre (JRC), the French Environment and Energy Management Agency (ADEME) and other national and international initiatives.

Several published studies contain interesting information about rating systems, such as:

- **DG ENV's "Study on socio-economic impact of increased reparability"**[1]

  This study estimates the impact of potential policy measures aimed at increasing product repair. The bulk of the study is concerned with quantifying such impacts. Nevertheless, chapter 4 offers a useful overview of existing requirements or criteria related to reparability as laid down in regulations and environmental labels, broken down in a thematic table. It also contains a list of potential criteria, partially based on existing requirements and partially devised by the authors to overcome identified barriers to repair, some of which cannot be found in current regulations (i.e. avoiding non- reversible adhesives).

- **ADEME report on an international benchmark of the repair sector (benchmark international du secteur de la réparation[2])**

  This study offers an overview of the repair ecosystem, including actors, barriers and attempts to incentivise repair, such as regulations (chapter 5.3) and ecolabels (chapter 5.4.1) taking into account reparability. However, the report does not offer any proposals for new criteria that are not already considered in other existing documents.

- **DG JUST's "Behavioural Study on Consumers' Engagement in the Circular Economy**"[3]

  The study sought to identify barriers and trade-offs faced by consumers when deciding whether to purchase a more or a less durable good, to opt for repair or to discard the product and to buy a replacement. Furthermore, it aimed to establish the importance of economic, social and psychological factors that govern purchasing durable products and seeking to repair products instead of disposing of them, as well as proposing policy tools to enable and encourage consumers to adopt practices related to durability and reparability. The study focused on some products that are also relevant for PROMPT, such as vacuum cleaners, televisions and smartphones, as well as dishwashers and clothes.

- **DEFRA study on "The Effectiveness of Providing Environmental Sustainability Information on Products in influencing purchasing behaviours"**[4]

  The purpose of the review is to assess how effectively purchasing behaviour is impacted by providing information about the environmental sustainability of a product. This study was conducted in 2018 and concluded that providing information on environmental impact can influence consumers' purchasing decisions for a range of environmental impacts (eco-friendly, lifespan, carbon footprint), audiences and products (from batteries and lightbulbs to washing machines and televisions). The relative importance of environmentally sustainable criteria needs greater exploration as some environmental impacts may have more impact; in the case of lifespan this may be partly due to a combination of personal-public benefit. The influence of environmental information may be product dependent.

4.2 INFORMATION GATHERING: FACTSHEETS

[1] Deloitte (2016) Study on socioeconomic impact of increased reparability – Final Report. Prepared for the European Commission, DG ENV, doi:10.2779/463857. See https://op.europa.eu/en/publication-detail/-/publication/c6865b39-2628-11e6-86d0-01aa75ed71a1/language-en

[2] https://www.ademe.fr/benchmark-international-secteur-reparation

[3] https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf

[4] https://www.researchgate.net/project/The-Effectiveness-of-Providing-Environmental-Sustainability-Information-on-Products-in-influencing-purchasing-behaviours-3

Information on each identified rating system is presented in individual factsheets and all individual sheets are grouped in a specific Excel file that can be consulted in the annex of this document.

Each factsheet contains the following minimum information:

- The name of the method;
- The name of the lead organization;
- Whether it assesses durability, reparability, reusability, upgradability, only disassembly, etc.;
- Type(s) of equipment considered;
- Type of methodology- qualitative (there are several criteria that need to be fulfilled), semi-quantitative (they assign a weight and sump up) or quantitative (a parameter is directly measured);
- Criteria assessed: list of parameters, and
- A link to the method for further details.

Additionally, some further useful but not essential information is provided:

- Area of application: EU Member State / USA/Europe / other;
- How the index is displayed: figure of a scale, percentage, logo …;
- Ponderation/rating method: how the final score is created, and
- A short internal assessment of advantages and limitations.

The following figure provides an example of a factsheet.

Info required	Explanation	Input
NAME	name of the method	Repairably
LEADER ORGANIZATION	name of the organization	Repairably (Slovakian NGO)
SCOPE	reparability, durability, both, reusability	reparability
TERRITORY	Area of application: Europe, Member State, USA	Europe (ideally global if successful, for the moment most active in Slovakia)
TYPES OF EQUIPMENT CONSIDE	printers, electronic devices, all devices,..	Assembled goods (any product that consists of components (electrical appliances, bicycles, furniture, sport equipment, ...)
TYPE OF METHODOLOGY	qualitative evaluation, semi-quantitative, quant	Qualitative (compliance with the 10 requirements mandatory; some of the rules have numerical parameters).
CRITERIA ASSESSED	list of parameters	component price, component availability or open source components, tools availability, software availability, repair guides, ease of reassembly, legal restrictions,
PONDERATION	how the final score is created	pass/fail (a score is created which only refers to parts prices, see https://repairably.com/repairably-score/)
HOW THE INDEX IS DISPLAYED	figure of a scale, percentage, logo, disclaimer..	logo (https://repairably.com/wp-content/uploads/2017/04/logo.png)
LINK FOR FURTHER INFO	www.....	https://repairably.com/manifesto/
COMMENTS	Useful information	reparability is understood in the sense of disassemblability + self repair
MAIN ADVANTAGES		Transparency, simplicity
MAIN LIMITATIONS		The system has a simplicity that is almost naive. The criteria lack precise definitions; no information on verification of requirements; time-related criteria are open-ended so not verifiable at time of certification, but duration of validity is unclear; no specification of target audience of information and parts; lack of product-specific adaptation of criteria, limiting the approach to simple low-tech products (as exemplified by certified products).

Figure 1. Example of factsheet

4.3 GENERAL OVERVIEW

The database contains twelve factsheets with descriptions of the following relevant rating systems:

- JRC Scoring system for reparability
- Austrian standard ONR 192102:2014 Label of excellence for durable, repair-friendly designed electrical and electronic appliances
- Groupe SEB's Product 10Y Repairable label
- iFIXIT 1, scoring system for reparability v1 (published)
- i-Fixit 2, scoring system for reparability v2 (beta version to date)
- Labo FNAC's Indice de réparabilité
- BENELUX study on Reparability criteria for energy related products
- prEN 45554: General methods for the assessment of the ability to repair, reuse and upgrade energy related products
- French reparability index (ADEME)
- Repairably (from a Slovakian NGO)
- Ease of Disassembly Metric (eDiM)
- LONGTIME label

Most of the rating systems focus on reparability. Only several recent methodologies include durability assessments (i.e. LONGTIME® tackles reparability, longevity and robustness) and few of them address upgradability aspects (JRC, iFixit version 1 and PrEN45554). The eDiM methodology is slightly different, as it assesses the time needed to disassemble and reassemble a product or its parts.

Overall, rating systems have a generic, horizontal approach and can be used on a wide range of products. However, some of them have been tailored to specific products, making it easier to apply them to concrete tests.

Existing rating systems	Type	Scope	Applicable to
JRC Scoring system for repairability	Scoring System	Repairability, upgradability	Energy related products
Austrian standard ONR 192102:2014	Standard	Reparability, durability	White and brown goods
Product 10Y Repairable label	Label	Repairability	Small household appliances
i-Fixit 1, scoring system for reparability v1 (published)	Scoring System	Repairability, upgradability	Portable IT products
i-Fixit 2, scoring system for reparability v2 (beta version to date)	Scoring System	Repairability	Portable IT products
Labo Fnac's "indice de réparabilité"	Scoring System	Repairability	Laptops and smartphones
Benelux study on "Reparability criteria for energy related products"	Scoring System	Repairability	Energy related products
prEN 45554: General methods for the assessment of the ability to repair, reuse and upgrade energy related products	Standard	Repairability, upgradability, reusability	Energy related products
French reparability index (ADEME)	Scoring System	Repairability	Electrical appliances
Reparably (from a Slovakian NGO)	Label	Repairability	Assembled goods
Ease of Disassembly Metric (eDiM)	Metric	Disassemblability	Electrical appliances
LONGTIME® label	Label	Durability, reparability	Assembled goods

Figure 2. Overview of existing rating systems

When it comes to the scope of PROMPT, those particularly relevant for washing machines and vacuum cleaners are the JRC scoring system, the Austrian Technical Rules ONR 192 102:2014 and the ADEME methods. For smartphones, the FNAC repair index, work ongoing on the French repair index (ADEME) and the iFIXIT scoring system are very relevant. No specific rating system could be identified for televisions, although the Austrian Technical rules ONR 192 cover brown goods and their results could be useful. FNAC has also developed a reparability index especially for laptops and the Product 10Y repairable label focuses on small household appliances.

The area of application is another topic to be considered. Some schemes were developed and applied in specific countries and transferability to other countries can be challenging. This is the case for the Austrian Technical Rules ONR 192 102:2014, the reparability index of the French Environment and Energy Management Agency

(ADEME) or the French FNAC retailer. Nevertheless, most cases were designed to be used at European or international level.

Usually a weight is assigned to each criterion and the criteria are afterwards summed up to a final score for the product, so they are mainly semi-quantitative methodologies.

The final score can be displayed on a label or a scale. A label is the option chosen in the SEB, Repairably and LONGTIME® schemes. Alternatively, a scale is the choice in the Austrian Technical Rules ONR 192 (0-5 score), iFIXIT rating system (0-10 score), FNAC repair index (0-10 score) and BENELUX study (percentage). There is still no final decision on how to display the assessment in the JRC scoring system although the index is already defined and the ADEME repair index label is under development by behavioural scientists.

Figure 3. Examples of labels

Finally, on each factsheet there is a website link for access to further information as well as a short assessment of the main advantages and any constraints or weaknesses identified by PROMPT partners.

5 STATE-OF-THE ART RELATED TO STANDARDIZATION IN RESOURCE EFFICIENCY OF WHITE GOODS AND CONSUMER ELECTRONICS

5.1 BACKGROUND

According to the Ellen McArthur Foundation one of the principles of the circular economy is to "keep products and materials in use"[1]. In 2015, the European Commission defined it more specifically in the communication 'Closing the loop – An EU action plan for the Circular Economy', with areas of action listed and general measures including product design, production process, consumption, from waste to resource as well as innovation, investment and other crosscutting issues[2].

The Commission specifically highlighted the Ecodesign Directive[3] as one way the European Commission will support improvements in product reparability, durability, and recyclability to ensure their long lasting. The 'Ecodesign Working Plan 2016-2019' explores options in developing product-specific and/or horizontal requirements in areas such as durability, reparability, upgradeability, design for disassembly, information provision, ease of reuse and recycling.

[1] https://www.ellenmacarthurfoundation.org/circular-economy/concept

[2] https://ec.europa.eu/growth/industry/sustainability/circular-economy_en

[3] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (Text with EEA relevance)

5.2 EUROPEAN STANDARDISATION MANDATE

Under the umbrella of the Circular Economy Package Action Plan, the European Commission requested a set of horizontal/generic methodologies that would address material efficiency aspects for Ecodesign (energy-related products) from the European Standardisation Organisations (ESOs). The work will result mainly in the form of harmonized standards, which are to be considered in further regulatory discussions and match any material efficiency requirements in Ecodesign and labelling regulations.

The European Committees for Standardization CEN and CENELEC are currently finalising European horizontal standards related to material efficiency aspects for Ecodesign products under the request M/543[1].

The mandate specifies that those standards should cover the areas of:

- Assessment of the durability, upgradability and ability to repair, re-use and re-manufacture of products;
- The ability to access or remove certain components, consumables or assemblies from products to facilitate repair or remanufacture or reuse or their extraction at the end-of-life for ease of treatment and recycling;
- Reusability/recyclability/recoverability (RRR) indexes or criteria, preferably taking into account the likely evolution of recycling methods and techniques over time;
- Assessment of the proportion of re-used components and/or recycled materials in products;
- Use and recyclability of critical for the European Union raw materials, as listed by the European Commission, and
- Documentation/marking on material efficiency information related to the product.

In order to develop these methodologies CEN-CENELEC created the Joint WG10 ''Material Efficiency aspects of Ecodesign'', which later became Joint TC10. The Committee has been further divided into the following working groups, based on the different areas of coverage:

- WG 1: Terminology;
- WG 2: Durability;
- WG 3: Upgradability, ability to repair, facilitate re-use;
- WG 4: Ability to re-manufacture;
- WG 5: Recyclability, recoverability, RRR index, recycling, use of recycled materials, and
- WG 6: Documentation and/or marking regarding information relating to material efficiency of the product.

The work consists of 10 items across these WGs, with a deadline originally set to March 2019, but there have been several delays. Two standards have been published so far (in February 2019): the EN 45558:2019 'General method to declare the use of critical raw materials in energy-related products' and EN 45559:2019 'Methods for providing information relating to material efficiency aspects of energy-related products'.

The remaining deliverables are at different stages of development, but the whole series should be published by March 2020 if the formal votes have positive outcomes.

In terms of repair, the sub-committee (CEN/CENELEC TC 10 WG3) has been working on standard **prEN 45554 'General methods for the assessment of the ability to repair, reuse and upgrade energy related products'** to assess reparability and reusability in order to extend the product lifetime in the design process. This 'corrective maintenance' defines the term 'repair'.

[1] M/543 COMMISSION IMPLEMENTING DECISION C(2015)9096 of 17.12.2015 on a standardisation request to the European standardisation organisations as regards ecodesign requirements on material efficiency aspects for energy-related products in support of the implementation of Directive 2009/125/EC of the European Parliament and of the Council.

The standard aims to provide a toolbox of parameters and methods to assess the ability to repair, reuse and upgrade energy-related products (ErP). It provides a general approach, which should be tailored to specific products.
The draft EN 45554 was delivered for formal vote in September 2019 and the results were positive (29/10/2019). Publication is planned for the end of February 2020, once final editorial changes are completed by WG3. The draft explains that the assessment method, type and criteria must be chosen by the user. This will prove useful at the product specific level.
The last available draft (September 2019) included:

- Guidance for the identification of parts to be covered in the assessment;
- A list of product-related parameters influencing repair, reuse and upgrade;
- A list of parameters related to manufacturers' support to facilitate repair, reuse or to upgrade, and
- Examples of possible classification and rating criteria for such parameters linked to design-related reparability criteria (disassembly depth, fasteners and connectors, tools; working environment, skill level); service-related reparability criteria (diagnostic support and interface, availability of spare parts, types and availability of information, return models, criteria specifically aimed at re-use (data transfer and deletion, password and factory reset for reuse).

Regarding durability, the standardisation request M/543 has also led to the drafting of the horizontal standard **prEN 45552 'General method for the assessment of the durability of energy-related products'**. The term 'durability', which is introduced in the draft standard, focuses more on the lifetime aspect of the general term 'reliability'. However, it's also important to note that in many cases, maintenance and repair can result in increased reliability and durability.

The standard prEN 45552:2019 discusses the difference between reliability and durability and outlines a general reliability and durability assessment procedure. The standard covers specific targeted validation carried out by tests which can be carried out and validated only under test conditions and not under normal use conditions. It also has an informative Annex C which shows the relationship between functional state, limiting state, repair and durability and the wear out of parts and spare part considerations. It notes that there might be trade-offs between durability and reparability, as a design feature which supports durability and reliability could potentially hinder easy (or easier) repair.

In the draft standard, there is a lack of information regarding how to deal with the rising use of software in energy related products. This is key, as software can greatly impact the durability of a product. Software should be mentioned more than just in the definition of parts, especially so that, where applicable, it is emphasised that products are designed in a way that hardware parts are not fully dependant on software. It is also missing provisions on premature (or potentially planned) obsolescence arising from deliberate use of material which are of inferior quality in crucial parts or connections of the product.

5.3 VERTICAL STANDARDS UNDER DEVELOPMENT

In August 2019, the European Commission consulted the European Standardization organisations on a **draft Standardisation request on ecodesign and energy labelling requirements for household dishwashers, household washing machines and household washer-dryers (Lot 14**) and included some guidance questions related to the need of standardization.

It regards standards for measuring the performance of household washing machines and of household washer dryers and includes a section on resource efficiency with regards to spare parts, repair and maintenance information and information requirements. As of autumn 2019, the standardization request is still under preparation and considers the essential ecodesign and energy labelling requirements set out in the regulation. Specifically, the EU regulations on ecodesign and labelling for washing machines, washer-dryers and dishwashers as well as for refrigerators. The regulations have been adopted by the EU Commission and published in Official Journal of the European Union in December 2019.

Additionally, there are certain related safety and performance standards identified in the test inventory. For example, **standard EN60335 - Part 1 'General Requirements for electrical appliances'** includes clause 18 on endurance. This refers to impulse voltage test apparatus and endurance test apparatus (IEC 60384-14), as well as to endurance test apparatus (61058-1) for switches. Also, listed in the test inventory is **EN 60312-1:2017 'Vacuum cleaners for household use. Dry vacuum cleaners. Methods for measuring the performance'**. This links to the motor lifetime of corded (mains-operated) vacuum cleaners as there are two comparable tests described in both international standards for dry vacuum cleaners for household use (EN 60312-1:2017 and IEC 62885-2:2016 Ed.1, Ed. 2). The two standards will be merged in the future.

5.4 RELEVANCE OF STANDARDS FOR RE-USE

Although re-use is not directly the focus of this document, preparation for re-use also covers necessary repair operations. A method for the deletion of personal data and updating of firmware in reused appliances or repair is key to the successful increase of product reparability.

5.4.1 EN 50614:2019: Requirements for the preparing for re-use of waste electrical and electronic equipment

EN50614 was developed by CLC/TC 111x 'Environment' (WG7) as a response to the M/518 mandate for the treatment, including recovery, recycling and preparing for reuse, of waste electrical and electronic equipment (WEEE). The document mentions that personal data should be stored within data-bearing equipment or components, such as disk drives and memory chips, and these shall be erased in accordance with a documented procedure. It is applicable to preparing only for re-use and doesn't cover activities connected with used or second-hand equipment that have not yet become waste.

The standard received a positive vote on October 2018. All CLC members were in favour except the Finnish National committee who felt that the FprEN 50614 draft was not ready for publication as a standard. Therefore, they lodged an appeal against its ratification. We are aware that the environmental organisation ECOS also had a negative opinion on the standard. In any case, the date of publication was set for December 2019. Technical specifications for the collection and logistics of WEEE are also being developed in CLC/TC 111x.

5.4.2 National Guidelines for the Reuse of Waste Electrical and Electronic Equipment

Guidelines exist In Austria for this purpose, the 'Guidelines for the Reuse of Waste Electrical and Electronic Equipment in Austria, November 2009' ('*Leitfaden für die Wiederverwendung von Elektroaltgeräten in Österreich, November 2009*')
These guidelines specify test steps to be carried out according to the Austrian Standard ÖVE/ÖNORM E 8701-1: visual inspection, functional inspection, and safety test before putting the product back into circulation. The guidelines were taken into account in the European standardization deliverables on material efficiency developed in CEN-CENELEC JTC10.

6 CONCLUSIONS

Most existing tests are focused on durability. Existing exercises were carried out using mainly proprietary test methodologies where several years of use were simulated in a condensed period of time. Effects such as the aging of materials or electrical components are not covered by these accelerated tests. Software and firmware assessments are very rare.
On the contrary, most identified rating systems deal with reparability. They can be used on a wide range of products at European or international level and they commonly assign a weight to several induvial criteria and a final score is shown as a label or scale.

Examples of both existing tests and rating systems have been identified for products under the scope of PROMPT. Regarding tested products, the following remarks should be considered:

- Battery lifetime tests performed on mobile phones were not able to reproduce real situations reported by users, in that many issues with mobile-phone batteries were reported by users right after expiry of the EU two-year warranty period;
- Tests on vacuum cleaners show that some parts suffering wear out are not easily replaceable and spare parts are not always available;
- Spare-part availability over time and the lack of technical information needed to easily repair a product were also an issue in washing machines;
- Outdated firmware/software can cause early obsolescence especially in consumer electronics such as mobile phones and TVs. Some apps may become unusable with old operating system versions. The product itself can become unsecure in case of software vulnerabilities when the operating system is old and technical support is no longer provided by the manufacturer. Further, we note that most current television models are 'smart' televisions. This problem might extend to other products such as washing machines or robot vacuum cleaners where the number of products connected to the internet is rapidly increasing.
- All products (mobile phones, televisions, vacuum cleaners, washing machines) are becoming more and more complex in terms of design due to their rising number of functions. A proper disassembly plan provided by manufacturers is becoming a must: products should be designed to be repaired.

With respect to the identified rating systems, the Austrian Technical rules ONR 192 and the ADEME repair index are particularly relevant for washing machines and vacuum cleaners, while the iFIXIT, FNAC and ADEME methodologies are significant for smartphones. However, the transferability to other countries can be challenging for the time being in cases where the score has often been developed only at national level (i.e. ADEME or ONR exercise).

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8 ANNEX

8.1 SUMMARY OF DATA MATRIX: EXISTING TESTS

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Coffee Machines (Automatic models only)	12	6 cycles a day consisting of 10 cups and a break (in total: minimum 540 cups were brewed).	StiWa	12/2014	No significant results. Durability is not an issue for automatic coffee machines.	test 12/2014 Espressomaschinen: Wie beim Italiener https://www.test.de/Kaffeevollautomaten-im-Test-4635644-0/
Battery-driven lawn mowers	11	300 runs each 500 m² lawn (mowers without wheel drive) or 800 m² lawn (mowers with wheel drive)100 h vibration test; 400 cycles charging and discharging the battery.	StiWa	04/2019	Most of the tested mowers reached a good or very good durability. We measured the real discharging current/rate and used it for an accelerated battery test (charging cyclization) and it worked fine. Simply discharging with a constant rate may produce false results.	test 04/2019 Akkurasenmäher: Zwei Abräumer https://www.test.de/Akku-Rasenmaeher-im-Test-5157148-0/
Bikes	20	20.000 km test under load and artifical bumps.	StiWa	06/2017	Durability very variable. Man's bicycles are less break-proof due to stiff frame geometry.	test 06/2017 Damit alles rund läuft. https://www.test.de/Fahrrad-Test-Trekkingrad-Damenrad-Herrenrad-1772656-0/
Bikes (electrical models - eBikes)	12	20.000 km test under load and artifical bumps. Up to 1300 cycles of charging and discharging of the battery.	StiWa	06/2018	Durability very variable. Man's bicycles are less break-proof due to stiff frame geometry.	test 06/2018 Elektrisch auf Tour. https://www.test.de/E-Bike-Test-4733454-5035318/ Trekking-E-Bikes https://www.test.de/E-Bike-Test-4733454-0/

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Blenders	18	1250 cycles consisting of 5x 1 min "on" and 1 min break per cycle with a paper-water-mixture. After a complete cycle, 20 min cool down break is done.	StiWa	10/2016	Patchy results in terms of durability	test 10/2016 Rührende kraftprotze. https://www.test.de/Mixer-Standmixer-im-Test-5073614-0/
Blenders (Hand held blenders)	318	70 cycles, 1 minute on* and 1 minute off in a 1/3 saw dust + 2/3 water mix. After 5 cycles, 10 minutes off. After each run, the blender foot is disassembled and reassembled.	ICRT, OCU	Continuous test	9 of 318 products were not acceptable. Motor durability is not an issue for most of the Hand Blenders.	OCU - Product comparison tool: https://www.ocu.org/electrodomesticos/pequenos-electrodomesticos/test/comparar-batidoras
Blenders (Different types of Hand held blenders)	20	450 cycles with 2x 3min processing in between 3 min break, finally 40 cool down; 150 cycles with medium stress, 300 cycles with high stress.	StiWa	03/2012	Most products performed good. Weak point: plastic rack-wheel.	test 3/2012 Endstation Hefeteig - Handrührer https://www.test.de/Handruehrer-Bodum-und-Bosch-machen-schlapp-4334781-0/
Blenders (Immersion blender)	22	450 cycles with 5x 1min processing 1min break finally 40 cool down; processing with water (150 cycles), raw (150 cycles) and cooked vegetables (150 cycles); for battery models reduced cycle	StiWa	08/2011	Cheap products failed.	test 8/2011 All zu billig bringt es nicht https://www.test.de/Stabmixer-Allzu-billig-bringt-es-nicht-4260470-0/
Blenders (Super Blenders)	1 sample per model	90 cycles of 1min at full speed.	UFC	11/2017	No problems noted.	(Not stated)

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Drills (Cordless drills only)	22	Drilling in wood and steel with 6 mm diameter; in total 33 operating hours; 4,5 h hammer function; 400 charging cycles for the battery.	StiWa	02/2019	2 models of the same store brand failed. Discharge current in the test must follow the discharge current under use.	test 2/2019 Die Besten haben den Dreh raus. https://www.test.de/Akkuschrauber-im-Test-4228653-0/
Drill bit	47	Maximum 100 drills; constant force; with increasing number of drill cycles the condition of the drill is getting worse and drilling time increases, thus a maximum drill time was defined and used as failure criteria: 40mm wood - exceeding 60 sec = failure; 3mm steel - exceeding 180 sec = failure; 50 mm concrete - exceeding 40 sec (SDS-drills 20 sec) = failure	StiWa	05/2017	Drill sets are not reasonable, some of the included drills did not pass the durability test and the quality was less compared to single drills; Only a few single drills showed bad results, wood drills did not fail, steel drills often failed.	test 5/2017 Gutes Werkzeug hilft https://www.test.de/Bohrer-und-Stichsaegeblaetter-Teure-Markenware-nicht-immer-gut-5171582-5171586/ https://www.test.de/Bohrer-und-Stichsaegeblaetter-Teure-Markenware-nicht-immer-gut-5171582-0/
Dishwashers	19	2800 runs consisting of short program and intense program (ratio 10:1) simulating 10 years; 3 specimens of each model tested.	StiWa	11/2018	Almost every third specimen failed. Random, no systematic failure, hard to assess.	test 11/2018 Geschirrspüler: Billig lohnt nicht https://www.test.de/Geschirrspueler-im-Test-4685888-0/
Electric hedge trimmer	15	7800 cycles consisting of 15 seconds cutting and 15 seconds break, after 60 cycles 30 min break.	StiWa	08/2017	Most products showed good durability	test 08/2017 Heckenscheren: Am besten mit Stihl https://www.test.de/Test-Heckenscheren-4435042-0/

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Food preparation appliances (Cooking machines)	123	*Dishwasher life test: 50 cycles with Eco program with detergent, salt and rinse aid. *Motor life test: Dough kneading function, max bread dough capacity, low speed: 11 min On 1 min OFF after 10 cycles (= 2 hours) 1hour OFF; per day 30 cycles, the bread dough mixture will be changed after every 10 cycles. 2 days testing time (60 cycles) for kneading function Mixing/blending function, mixture used, high speed: 5 min On 1 min OFF after 20 cycles (= 2 hours) 1hour OFF; per day 60 cycles. 2 days testing time (120 cycles) for mixing function. *Heating and jug sealing life test: 90 runs with water and heating function, 10 minutes on and 1 minute off, after 10 cycles 20 minutes off	ICRT, OCU, CB	Continuous test	* 6 models not acceptable in the dishwasher life test (7%) * 34 models not acceptable in the motor life test (27%) * 17 models not acceptable in the heating and jug sealing life test (15%) Motor life time plus heating and jug sealing life time are an issue for several Cooking machines models.	OCU - Product comparison tool: https://www.ocu.org/electrodomesticos/pequenos-electrodomesticos?selector=Robots%20de%20cocina CB: https://www.consumentenbond.nl/keukenmachine/beste?icmp=primarybutton_dossierhome_keukenmachines_bekijk%20de%20beste%20keukenmachines

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Food preparation appliances (Kitchen machines)	220	*Dishwasher life test: 50 cycles with Eco program with detergent, salt and rinse aid. *Motor life test: Dough kneading function, max bread dough capacity, low speed: 11 min On 1 min OFF after 10 cycles (= 2 hours) 1hour OFF; per day 30 cycles, the bread dough mixture will be changed after every 10 cycles. 3 days testing time (90 cycles) for kneading function Mixing/blending function, saw dust 1/3 and water 2/3 mixture, high speed: 5 min On 1 min OFF after 20 cycles (= 2 hours) 1hour OFF; per day 60 cycles . 2 days testing time (120 cycles) for mixing function.	ICRT, OCU	Continuous test	* 8 models not acceptable in the dishwasher life test (6%) * 5 models not acceptable in the motor life test (2%) No relevant Durability issues in Kitchen machines	OCU Products comparison tool: https://www.ocu.org/electrodomesticos/pequenos-electrodomesticos?selector=Robots%20de%20cocina UFC: https://www.quechoisir.org/comparatif-robot-patissier-n823/

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Food preparation appliances (Food processors)	175	*Dishwasher life test: 50 cycles with Eco program with detergent, salt and rinse aid. *Motor life test: Dough kneading function, oat flakes 1/3 and water 2/3 mixture, low speed: 3 min On 1 min OFF after 15 cycles (= 1 hour) 1hour OFF; per day 60 cycles, the oat flakes water mixture will be changed after every 15 cycles. 2 days testing time (120 cycles) for kneading function Mixing/blending function, saw dust 1/3 and water 2/3 mixture, high speed: 5 min On 1 min OFF after 20 cycles (= 2 hours) 1hour OFF; per day 60 cycles. 2 days testing time (120 cycles) for mixing function.	ICRT, OCU	Continuous	* 6 models not acceptable in the dishwasher life test (7%) * 23 models not acceptable in the motor life test (13%) Motor life time can be an issue in some Food processors models	OCU Products comparison tool: https://www.ocu.org/electrodomesticos/pequenos-electrodomesticos/test/comparar-robots-cocina
Food preparation appliances (Food processors)	12	100 cycles with water + 100 cycles with yeast dough+ 300 cycles with cake batter; in total representing 5 years of moderate use	StiWa	12/2018	Except 3 specimen all tested foodprocessors showed a very good durabillity	test 12/2018 Von Aufschneidern und Aufrührern https://www.test.de/Kuechenmaschinen-im-Test-4137971-0/
Food preparation appliances (Baby food preparation models)	10	100 baking and mixing cycles with openings and closures & 50 cycles in dishwashers (Eco prog)	UFC	09/2015	During the heating and mixing cycles, 4 devices showed defects: The mixing part that shows weaknesses (defective gasket, leakage, mixing does not stop, belt noise, etc.). 10 products tested. Mixing part is the weakest.	(not stated by the partner)

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Food preparation appliances (Multifunction robots)	30	(not stated by the partner)	UFC	Continuous	2 engine failures and 1 after washing on 30 devices - 18 devices passed the dishwasher test without alteration	(not stated by the partner)
Food preparation appliances (Pastry makers)	38	(not stated by the partner)	UFC	Continuous	4 faults due to dishwasher washing on 38 devices - 16 devices passed the dishwasher test without alteration	(not stated by the partner)
Food preparation appliances (Robots cookers)	27	(not stated by the partner)	UFC	Continuous	6 cooking failures, 1 diswasher failure and 1 engine failure out of the 27 tested – 17 devices passed the diswasher test without alteration	(not stated by the partner)
Food preparation appliances (Robots cookers, multifunctions and pastry makers)	(not stated)	50 washes in dishwasher, between 180 and 240 engine cycles with load, total between 10 and 12 cumulative hours of operation, 90 cooking cycles (in the case of cooker robots) or 15 hours combined.	UFC	Continuous	(not stated by the partner)	(not stated by the partner)

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Hairdryer	16	400 h testing with alternating 15 min "on" (highest level) and 15 min "off"	StiWa	01/2015	Only 1 specimen with bad durability	test 1/2015 Mähnen zähmen https://www.test.de/Haartrockner-Gute-Foehne-ab-10-Euro-4796779-0/
Hairdryer	17	*Endurance test of 400 hours in total, 200h "on" in full power mode and the rest used to cool down. The test consists of a heating and a cooling phase: the devices run 15 min in full power mode and the next 15 min are used to cool the device down before the cycle of full power mode starts again. * Drop test according DIN EN 61855 - chapter 6.9. During the test the device is switched off. The function is checked after each of the three drops from a 90 cm desk to a wooden covered ground.	OCU	02/2014	* 2 of 17 models failed the durability test * No problems in the drop test	OCU Compra Maestra febrero 2014 nº389. https://www.ocu.org/toda-la-informacion?type=magazine-articles&magazine=ocu%20compra%20maestra&year=2014
High pressure cleaners	52	Samples 300 cycles under load, 1 cycle = 40 minutes (- 15 minutes with highest pressure and maximum water flow, - 3 minutes with closed nozzle jet (do not switch off the machine), - 12 minutes with highest pressure and maximum water flow, - 10 minutes rest). Repeat tests 7.1. and measure force of the jet at the nozzle after 150 and 300 cycles	CB	2019	Only 19 models made the full 300 cycles. One appliance caught on fire (we don't know which one, there where 3 samples at the testing rig at the time). lots of wornout carbonbrushes, defective motor bearings, leakage, defective pumps. One time overheating	(not stated by the partner)

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Ironing appliances (Steam iron, steam generators, steam cleaners)	200 per year	Scaling tests during 250 hours of use	ICRT, UFC	Continuous	Nearly 50% of appliances tested does not reach our target of 252 h of endurance. 19% of failed steam generators	OCU Products comparison tool: https://www.ocu.org/electrodomesticos/planchas
Ironing appliances (Steam irons)	14	Test of calcification for 240 h; abort criterium: steam below 5g/min or failure.	StiWa	12/2016	Wide range in durability results calcification is a problem	test 12/2016 Für faltenfreie Feiertage https://www.test.de/Buegeleisen-im-Test-5098871-0/
Jigsaw	19	Testing for the longest cut in19 mm wood (maximum 600m)	StiWa	03/2016	Big differences between the tested products	test 3/2016 Zweimal top, sechsmal flop https://www.test.de/Stichsaegen-19-Saegen-im-Test-zweimal-top-sechsmal-flop-4980617-4980624/ https://www.test.de/Stichsaegen-19-Saegen-im-Test-zweimal-top-sechsmal-flop-4980617-0
Jigsaw blade	25	Maximum 20 cuts into 40 mm wood or 3 mm steel	StiWa	05/2017	Very good or good performance of all tested blades	test 5/2017 Gutes Werkzeug hilft https://www.test.de/Bohrer-und-Stichsaegeblaetter-Teure-Markenware-nicht-immer-gut-5171582-5171586/ https://www.test.de/Bohrer-und-Stichsaegeblaetter-Teure-Markenware-nicht-immer-gut-5171582-0

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Light bulbs – directional (spotlights); halogen and LED	60	Several durability tests on 2 types of lightbulbs: 1) Continuous run test - for 5 samples of each model 2000 burning hours, in cycles of 2 hours and 45 minutes on and 15 minutes off. 2) Decrease in light output - for 5 samples of each model, after the continuous run test (2000 hours) the light output measurements that were done before the durability tests were repeated. 3) On/off switching test - for 3 samples of each model the lamps were switched in cycles of 1 minute on and 3 minutes off, until 30.000 switching cycles. *in an earlier phase of our project, test was done for 6000 hours based on the Ecodesign requirements.	CB	Batches in 2013-2014	Compared to the 09001 test we decreased test costs and test time by reducing # of burning hours, since we had found that most LED bulbs either failed early or after many thousands of hours. For CFLS this was different but they were no longer relevant (especially not for directional bulbs). Also, we learned that the switching test which was very relevant for CFL bulbs not really distinguished LED bulbs; most had no problems with the switching.	Outdated by now so no longer available
Light bulbs	5	Tests at 3000h at 25°C and 45°C (6 months of testing)	UFC	10/2018	7% failures/ 50% performance decreases	(not stated by the partner)
Light bulbs (Energy saving lamps)	9	3 lamps run 25000 cycles with 1 min "on" and 3 min "off"; 5 lamps are tested similar to DIN EN 60969	StiWa	12/2018	only 2 specimens with bad durability	test 12/2018 Guter Halogen-Ersatz ist selten https://www.test.de/Lampen-im-Test-4436814-5058679/ https://www.test.de/Lampen-im-Test-4436814-0

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Light bulbs (Energy saving light bulbs); CFL's, LED and halogen, all non-directional	More than 100	Several durability tests on 3 types of lightbulbs: 1) Continuous run test - for 5 samples of each model 5000 burning hours* for CFL's and LED's and 2000 hours for halogen lamps (net, including burn-in hours), in cycles of 2 hours and 45 min on and 15 min off. 2) Continuous run test until the claimed lifetime, for those samples still running after the 5000 hours test of selected LED models; some have run for several years until the test was stopped at 25.000 hours! 3) Decrease in light output - for 3 samples of each model, during the continuous run test after 2000 hours, 3500 hours and 5000 hours, the light output measurements that were done before the durability tests were repeated. This was also done after each 5000 hours of extra runtime for the selected LED models of that test. 4) On/off switching test - for 3 samples of each model the lamps were switched in cycles of 1 minute on and 3 minutes off, until 30.000 switching cycles. *in an earlier phase of our project, test was done for 6000 hours based on the Ecodesign requirements.	OCU/CB	Several Batches from 2008 to 2015	(not stated by the partner)	Outdated by now so no longer available

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Mobile Phones	200 per year	*Screen Scratch resistance test: a hardness test pencil (ERICHSEN, Model 318 S) is used. This pencil is equipped with a spiral spring and a carbide ball tip of 1 mm diameter (in accordance to ISO 1518). The test load of the spring can be adjusted in a range from 0 to 20 N. First, an attempt is made to scratch the display of the phones with five different loads. *The durability against mechanical shocks (e. g. falling) is tested with a tumbling barrel with a fall height of 80 cm (surface stone) for 50 rotations (100 drops). *Water resistance (rain test): A raining appliance is used to give an even rain distribution according to IPx1: 7,2 l/h. A measurement according to EN 60529 / 2000-09 is performed. The phones lie horizontally on a rotary table and are irrigated for 5 20. Juni 2017 Page 10 minutes. The correct function is assessed immediately, after one day, after 2 days and after 3 days.	ICRT, OCU	Continuous	All screens, today, are scratch-proof: in standard scenarios they are not damaged. The least resistance parts of the phone are the camera lens, which may suffer from scratches, although the biggest majority of models get good scores also in this test. What is probably more surprising is that today phones are rather robust also to resist falls: most phones pass our severe test (100 falls) with just minor damages. Clearly, this doesn't mean that if they fall down we can guarantee that they don't break off (it is a matter of luck, because it depends a lot on the surface, on the angle the phone impact the surface and on the height), but we can say that despite a higher area covered by glass, the phones are rather robust.	OCU Products comparison tool: https://www.ocu.org/tecnologia/telefono/test/comparar-moviles/results UFC https://www.quechoisir.org/comparatif-smartphone-n431/

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Mobile phones (Smartphone technology analysis)	100s of models	A database of Mobile phones models was created containing the latest OS version running on each model together with the hardware specifications of the mobile phone. It was determined the minimum and average HW required to run the different OS versions. The amount of models that could have been updated to a later OS version but were not updated was reported.	ICRT	03/2017	* 15 mobile phone models originally delivered with Android 4.0 to 4.4 could have been updated to Android 7 but were not. * 177 mobile phone models originally delivered with Android 5 could have been updated to Android 7 (43%). * 53 mobile phone models originally delivered with Android 6 could have been updated to Android 7 (36%). Not all the manufacturers have a policy for updating the OS version whenever supported by the hardware. Sometimes mobile phones cannot be updated because of the motherboard manufacturer, some other because of the manufacturer itself and some other because of the Network provider.	OCU Compra Maestra 423, page 15, March 2017 https://www.ocu.org/-/media/ocu/resources/paper%20publications/ocucompra%20maestra/2017/423/actualizacion-android.pdf?la=es-es&rev=e099885f-76ed-43bf-9440-9a9a59ce2fb5&hash=0835D9E23EBB72094CF7F62970B62FF6B6ECA656

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Mobile phones and Tablets	* 9 Mobile phones * 7 Tablets	Cycle description: Video streaming form Youtube until 20% of battery level is reached. Then Mobile phone is recharged to 100%. Then 30min retsing period for the battery to lower and stabilize its temperature and the cycle is repeated again. The test is planned to last until the device with the worst battery life reaches 365 cycles (smartphones) and 244 (tablets). Each device starts/ends its cycle undependably of one another.	OCU	04/2015	The worst result was a decrease of battery life to about 86% of the initial capacity. It means that the use doesn't influence a lot the decrease of the battery capacity. Some android devices shown to be extremely slow to charge when the screen is at max luminance thus we´ve opt to lower the luminance while charging. Therefore, for Android devices, we opt to dim down the brightness to the lowest level, while charging. This is not aligned with the battery problems reported by the users which leads to the fact that battery aging will be probably more impacting in the battery life. Battery aging is probably impacting batteries lifetime.	OCU Compra Maestra nº 402, page 23. April 2015 https://www.ocu.org/toda-la-informacion?type=magazine-articles&magazine=ocu%20compra%20maestra&year=2015
Sewing machines	17 (3 samples per product)	100h of use with 50h of effective sewing	UFC	07/2016	Only one of the 3 samples of one machine did not withstand the durability test, but the other 2 specimens tested passed the 100h test / 17 products in test	(not stated by the partner)

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Vacuum cleaners	10	Engine test for 600 h (cable), 70 h (battery cleaners); 67500 cycles (upright vacuum cleaner), 75 h (battery cleaners) on a cill testing facillity; 500 cycles (canister vaccum cleaners) on a a cill and pole testing facillity; 6000x cable rewind; 40000 rotations of the pipe connector; 70 kg load on pipes for 10 sec	StiWa	06/2019	Durability very good Cordless vacuum cleaners are very noisy.	test 6/2019 Ein kleiner Schritt nach vorn https://www.test.de/Staubsauger-im-Test-1838262-5081874/ https://www.test.de/Staubsauger-im-Test-1838262-0/
Vacuum cleaners	200/ year	Test carried out in Cylinder Vacuum cleaners based on EN 60312-1. *Motor endurance test for 550 hours. The dust bag or container is filled with DMT 8 dust to obtain a reduction of the initial airflow. *Cable reel test for 1000 runs.	ICRT	Continuous test	Since the project started in 2014, 1268 samples were tested and 28 of them were not considered acceptable in the motor test, 60 were not considered acceptable in the cord test.	OCU Products comparison tool: https://www.ocu.org/electrodomesticos/aspirador/test/comparar-aspiradores/results

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Vacuum cleaners	20	Test carried out on cylinder vacuum cleaners. * Flexible hose endurance test: 40.000 cycles, IEC 60312 standard * Floor brush / Nozzle endurance test: 75 hours test, 90.000 cycles * ON / OFF button endurance test: 10.000 cycles, IEC 60335-1 standard * Overheating test * Motor lifetime test: IEC 60312 standard. No dust used.	OCU	03/2017	* No remarkable issues found in flexible hose, nozzles, on/off button * Overheating: Only 4 of 20 reached temperatures higher than 85^{o}C. 10 of 20 models didn't have a thermal switch to protect the VC against overheating * Motor test: Average life time was 891 hours. In 5 models the 3 tested samples failed before 400 working hours. Motor carbon brushes wear out was the reason of failure for 56 of 60 samples tested > the samples less durable had shorter carbon brushes (less than 2,6 cm long). The 3 Inverter motor samples never failed: inverter motors don't use carbon brushes. Vacuum cleaners motors fail because of the carbon brushes wear out and 70% of the tested VC are not designed to replace the carbon brushes. Sometimes the repair service replaces the full motor.	OCU Compra Maestra nº423. March 2017 https://www.ocu.org/toda-la-informacion?type=magazine-articles&magazine=ocu%20compra%20maestra&year=2017 Consumentenbond magazine Consumentengids February 2017 (nr. 2, p. 62-66)
Washing Machines	24	2500 cycles of (rinsing + spinning) with a 60% load. The door was open and closed at the end of each cycle. As the washing phase was not tested no detergent was used and cold water is used.	ICRT	09/2015	* In 4 of 24 models tested, some parts of the washing machines had rust from origin. * 4 of 24 Washing machines failed the Durability test.	OCU Compra Maestra nº406, page 15. September 2015 https://www.ocu.org/toda-la-informacion?type=magazine-articles&magazine=ocu%20compra%20maestra&year=2015

Product	Product tested	Methodology	Partner	Date	Main results and learnings	Link or publication reference
DURABILITY TESTS						
Washing machines	15	3 specimens of each model conducts 1840 runs with different washing programs and little breaks representing 10 years	StiWa	11/2018	Durability good or very good Cheap models offer less protection in case of accidental water release	test 1/2018 SUV im Badezimmer https://www.test.de/Waschmaschinen-im-Test-4296800-5059142/ https://www.test.de/Waschmaschinen-im-Test-4296800-0
Water heaters	12	(not stated by the partner)	OCU	02/2019	8 of 12 models had defects from origin. 3 of 12 failed the corrosion test.	https://www.ocu.org/vivienda-y-energia/calefaccion/noticias/termos-electricos-oxidacion
Portable hard disk drives	33	The HDD is repeatedly dropped from a 1m height onto a hard surface (such as wooden base). In total, the sample is dropped 3 times in the normal position of usage. Check the state of the HDD after each fall:	OCU	12/2014	3 models didn't pass the test of the 33 models tested.	OCU Compra Maestra nº398 12/2014 https://www.ocu.org/toda-la-informacion?type=magazine-articles&magazine=ocu%20compra%20maestra&year=2014

Product	Products tested	Brief description of the methodology	Partner	Date	Main results and learnings	Link or publication reference
REPAIRABILITY TESTS						
Washing Machines	24 from 12 different brands	1) Washing machine was unpacked and installed. Accessories enclosed were stored 2) Washing machine is turned on and the water supply and drain pump are tested for operation 3) The rear wall or an opening of the rear wall and the cover plate are removed. It was checked whether the appliance could still turn on. 4) The drain hose is blocked. Wait 30 min for a reaction. If the test does not show any reaction the test is repeated. 5) The water tap is turned off and a reaction is waited for 30 minutes. If it shows no reaction the test is repeated. 6) The level switch is disconnected and the reaction of the product is documented 7) The front and control panel are disassembled for testing 8) Accessibility and removal capacities of individual components is tested 9) Spare parts list for the machine has been created 10) Photographs of components are made 11) Washing machine is properly reassembled 12) Functional test of the appliance	R.U.S.Z	2014-2015	None of the washing machines have passed the test against ONR 192102:2014 The majority of contacted manufacturing representatives were not willing to give out information regarding: *) The durability of their products *) Handling of serial errors *) Time duration of the availability of spare parts *) Service documents *) Access to software for diagnosis and deletion of error codes	OCU Compra Maestra nº406, page 15. September 2015 https://www.ocu.org/toda-la-informacion?type=magazine-articles&magazine=ocu%20compra%20maestra&year=2015 Test Achats Septembre 2015, p. 12 (please check back with Test Achats)

Product	Products tested	Brief description of the methodology	Partner	Date	Main results and learnings	Link or publication reference
REPAIRABILITY TESTS						
Vacuum Cleaners	40 from 18 different brands	1.) Vacuum cleaners and accessories are weighed in packaging and then unpacked. Then Vacuum cleaner is weighed and accessories documented 2.) User Manual is read and tested to determine if the maintenance activities as described are possible 3.) Vacuum cleaner is turned on and the function of the cable reel is checked 4.) The vacuum cleaner is dismantled and the different parts documented, photographed and numbered 5.) In the disassembled state the motor is tested to determine if it can still be turned on and functioned. Disassembly occurs following the dismantling plan step by step if available. 6.) Accessibility and removal capabilities of individual components and assembles are tested 7.) A spare parts list for the device is then drawn up, documenting the part numbers and material names 8.) The multiple nozzles are dismantled and separated into its component parts 9.) All parts are separated by materials in coloured boxes All materials are separately weighed 10.) Motor and energy labels are specially numbered and stored for a later Carbon brush Test	R.U.S.Z	2016	None of the tested vacuum cleaners passed the Standard ONR 192102:2014. This is due to the unwillingness of manufacturers to provide (detailed) service documentation for service technicians operating in independent workshops. Regarding longevity only one manufacturer tested his vacuum cleaners for a life span of 20 years. The other manufacturers suppose that life span depends only on the user`s behaviour and is uninfluenced by the manufacturer. From a repair perspective, it is technically possible to repair any of the tested vacuum cleaners. The main requirement for this however, is the availability of spare parts. This is not possible for every vacuum cleaner for a number of reasons. The more complex the design and therefore, the more functions and components installed, the more time consuming the dismantling process and greater the need for a dismantling plan. High quality dismantling plans were provided by only one manufacturer, but also from this manufacturer not for all tested models.	Test Achats 615, Janvier 2017 Consumentenbond magazine Consumentengids February 2017 (nr. 2, p. 62-66)

Product	Products tested	Brief description of the methodology	Partner	Date	Main results and learnings	Link or publication reference
REPAIRABILITY TESTS						
Tablets	59	Full disassembly and evaluation of ease of disassembly, evaluation of after sales service	iFixit	Ongoing	Most tablets are extremely hard to repair due to large glue areas on screen and battery. Still scoring 10/10 remains possible for manufacturers that have this ambition.	https://www.ifixit.com/smartphone-repairability
Notebooks	41	Full disassembly and evaluation of ease of disassembly, evaluation of after sales service	iFixit	Ongoing	Extremely thin form factors are almost never repairable. Still scoring 10/10 remains possible for manufacturers that have this ambition. Microsoft has been making progress recently whereas Apple hasn't.	https://www.ifixit.com/laptop-repairability
Mobile Phones	103	Full disassembly and evaluation of ease of disassembly, evaluation of after sales service	iFixit	Ongoing	Smartphones are getting increasingly hard to repair due to increased use of curved glass, glass at the back, adhesives,... Still scoring 10/10 remains possible for manufacturers that have this ambition.	https://www.ifixit.com/smartphone-repairability
Mobile Phones	Several of 3 different models tested.	We damage the screen, USB connection and start button in several mobile phones and we send them to different repair shops to know: * How much the reparation cost is * The information delivered to the consumer * The quality of the reparation * How long the reparation takes	OCU	12/2015	Reparation was good and quick. Screen reparation was the most expensive. In cheap mobiles it can be even 40% of the price of a new mobile (same brand and model).	OCU Compra Maestra nº409, page 23. December 2015. https://www.ocu.org/toda-la-informacion?type=magazine-articles&magazine=ocu%20compra%20maestra&year=2015

Product	Products tested	Brief description of the methodology	Partner	Date	Main results and learnings	Link or publication reference
REPAIRABILITY TESTS						
E-Bikes	n/a	Not a comparative test. Interviews with three battery repair shops. Two defective e-bike batteries have been repaired by replacing the Li-ion packs by new cells.	TA	05/2019	In many cases, e-bike batteries can be repaired by replacing the flat Li-ion packs by new cells. Sometimes manufacturers try to prevent this by filling the battery pack with liquid silicone or disabling the battery management system as soon as it becomes disconnected from the pack.	Test Aankoop 641 • mei 2019, page 42

8.2 FACTSHEETS: EXISTING RATING SYSTEMS

Explanation of the information displayed

Information required	Explanation
NAME	Name of the method
LEADER ORGANIZATION	Name of the organization
SCOPE	Reparability, durability, reusability, dismantling or upgrading
TERRITORY	Area of application: EU Member State, USA, country…
TYPES OF EQUIPMENT CONSIDERED	Printers, electronic devices, all devices...
TYPE OF METHODOLOGY	Qualitative evaluation, semi-quantitative or quantitative
CRITERIA ASSESSED	List of parameters
PONDERATION	How the final score is created
HOW THE INDEX IS DISPLAYED	Score, percentage, logo, disclaimer...
LINK FOR FURTHER INFO	www…...
COMMENTS	Useful information
MAIN ADVANTAGES	Partners' assessment
MAIN LIMITATIONS	Partners' assessment

JRC Scoring system for reparability

LEAD ORGANIZATION	Joint Research Centre
SCOPE	Reparability and upgradability
TERRITORY	Europe
TYPES OF EQUIPMENT	The generic approach has been preliminary tailored to three product groups: laptops, vacuum cleaners and washing machines. TV exercise will be ready for next future
TYPE OF METHODOLOGY	Semi-quantitative
CRITERIA ASSESSED	12 parameters in two categories: •Design for disassembly: 1. Disassembly depth/sequence. Fasteners 3. Tools 4. Disassembly time) •Repair/upgrade process: 5. Diagnosis support and interfaces 6. Type and availability of information 7. Spare parts 8. Software and firmware 9. Safety, skills and working environment 10. Data transfer and deletion 11. Password reset and restoration of factoring settings 12. Commercial guarantee
PONDERATION	The assessment framework is composed of: a) Pass/fail criteria that products have to fulfil in order to be considered as reparable/upgradable, and thus eligible for being assessed through the scoring criteria; b) Scoring criteria, to rate the extent to which products are reparable or upgradable. Scores can be aggregated and reported in different types of indices, which could be more or less suitable based on the final application of the scoring system
HOW THE INDEX IS DISPLAYED	To be defined
LINK FOR FURTHER INFO	https://susproc.jrc.ec.europa.eu/ScoringSystemOnReparability/documents.html

MAIN ADVANTAGES	It is directly supported by European Commission. Detailed proposal including aggregation of score for laptops, vacuum cleaners and washing machines
MAIN LIMITATIONS	It is only a proposal yet. Disassembly time was considered but not implemented in any of the 3 pilots

Austrian standard ONR 192102:2014

NAME	Austrian standard ONR 192102:2014. Label of excellence for durable, repair-friendly designed electrical and electronic appliances (1.10.2014)
LEADER ORGANIZATION	R.U.S.Z. - Association for the Promotion of the Social Economy
SCOPE	Reparability and durability
TERRITORY	National - Austrian
TYPES OF EQUIPMENT	White goods and brown goods
TYPE OF METHODOLOGY	Semi- quantitative
CRITERIA ASSESSED	40 criteria requirements for white goods and 53 criteria requirements for brown goods
PONDERATION	The system is composed of both mandatory pass/fail criteria, and criteria based on graded classes. The latter ones are used to quantify a score, which is then related to a 5-10 quality level and an overall rating. Positive test result: the fulfilment of all mandatory criteria; the achievement of at least 30 points of the general criteria; and at least 15 points in the service documentation. Conversation table for level of quality and rating in the joined table
HOW THE INDEX IS DISPLAYED	5-10 score for all products which pass the mandatory criteria
LINK FOR FURTHER INFO	https://shop.austrian-standards.at/action/de/public/details/527823/ONR_192102_2014_10_01
COMMENTS	Blueprint for European Standard CEN-CENELEC JTC 10/WG 3/Reparability, Reusability and Upgradability. It has been already applied for the testing of washing machines and vacuum cleaners

MAIN ADVANTAGES	Some good ideas for horizontal requirements, e.g. accessory functions not influencing main functions. Extensive criteria for service support. Some specific requirements are very relevant for washing machines
MAIN LIMITATIONS	Scope limited to white and brown goods. Mixes durability, reparability, service support, quality management, and documentation. Single-scenario approach (independent professional repair). It recommends the use of specific labels to indicate compliance with a minimum period a product can be used—five years in the case of brown goods (home entertainment equipment) and ten years with respect to white goods (household appliances). This affects/links to most criteria given, but the Austrian Standard focuses on durable appliances / longevity only

Product 10Y repairable label

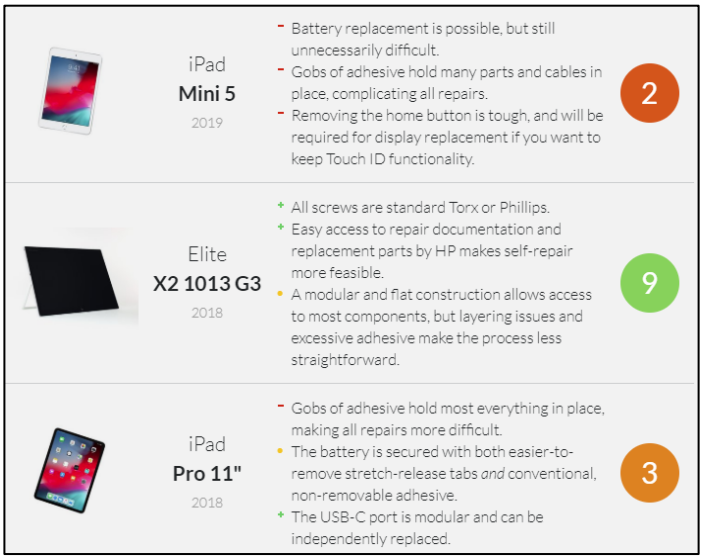
LEADER ORGANIZATION	Group SEB (Krups, Rowenta, Tefal, Moulinex, Calor…)
SCOPE	Reparability
TERRITORY	Global
TYPES OF EQUIPMENT	Small household appliances
TYPE OF METHODOLOGY	Qualitative (pass/fail)
CRITERIA ASSESSED	Possibility to disassemble and reassemble without special tools; availability, delivery time, and price of parts
PONDERATION	3 levels: fully repairable, mainly repairable, limited repairability
HOW THE INDEX IS DISPLAYED	Label for fully repairable and mainly repairable (see below)
LINK FOR FURTHER INFO	https://www.groupeseb.co.uk/repairable.html
COMMENTS	The label aims to indicate to consumers: possibility to fully disassemble and reassemble without risk of damaging the product and fast availability of spare parts. Proximity of repair centre is not product specific but label is applied product by product (95% of portfolio in 2018)

MAIN ADVANTAGES	Takes into account economic factors (spare parts price). Focus group tested for credibility among consumers.
MAIN LIMITATIONS	Binary pass/fail concept, therefore insufficient differentiation for labeling purposes. Single scenario approach (professional repair), no provision for different target groups, skill levels etc. Internal procedure; no provisions for external verification

iFixit reparability score version 1 (published)

LEADER ORGANIZATION	iFixit
SCOPE	Reparability and upgradability
TERRITORY	Global
TYPES OF EQUIPMENT	Portable IT products (laptops, smartphones, tablets)
TYPE OF METHODOLOGY	Semi-quantitative
CRITERIA ASSESSED	Availability of information, ease of disassembly, time for disassembly, tools required, number and types of fasteners, accessibility of priority parts, internal organisation of components, fragility of components, modularity, upgradability
PONDERATION	Sum of 5 criteria x 10 points and 10 criteria x 5 points; total divided by 10 to normalize to score out of 10 points
HOW THE INDEX IS DISPLAYED	0-10 score with colours (see picture below)
LINK FOR FURTHER INFO	https://www.ifixit.com/smartphone_repairability https://www.ifixit.com/tablet_repairability https://www.ifixit.com/laptop_repairability
COMMENTS	Original scoring method, still used for reparability scores displayed online. Criteria sets differ slightly by product group

MAIN ADVANTAGES	Contains experience-based criteria tailored to product group
MAIN LIMITATIONS	Some criteria are not fully objective/well-defined; consistency of results requires familiarity with previous ratings


iPad
Mini 5
2019
- Battery replacement is possible, but still unnecessarily difficult.
- Gobs of adhesive hold many parts and cables in place, complicating all repairs.
- Removing the home button is tough, and will be required for display replacement if you want to keep Touch ID functionality.
2
Elite
X2 1013 G3
2018
+ All screws are standard Torx or Phillips.
+ Easy access to repair documentation and replacement parts by HP makes self-repair more feasible.
• A modular and flat construction allows access to most components, but layering issues and excessive adhesive make the process less straightforward.
9
iPad
Pro 11"
2018
- Gobs of adhesive hold most everything in place, making all repairs more difficult.
• The battery is secured with both easier-to-remove stretch-release tabs *and* conventional, non-removable adhesive.
+ The USB-C port is modular and can be independently replaced.
3

iFixit reparability score version 2 (beta version to date)

LEADER ORGANIZATION	iFixit
SCOPE	Reparability
TERRITORY	Global
TYPES OF EQUIPMENT	Portable IT products (laptops, smartphones, tablets)
TYPE OF METHODOLOGY	Semi-quantitative
CRITERIA ASSESSED	Path of entry, accessibility of critical components, availability of spare parts, availability of information, type of tools needed, endorsed repair options, visual cues, health and safety risk (each with sub-criteria)
PONDERATION	Criteria are weighted in 3 tiers according to importance (very high, high, moderate). subcriteria are also weighted. Final score is normalised to 100 but displayed on 10 point scale; scores are calibrated based on known best and worst performers
HOW THE INDEX IS DISPLAYED	0 to 10 score
LINK FOR FURTHER INFO	Flipsen, Bas; Huisken, Matthias; Opsomer, Thomas; Depypere, Maarten - Smartphone reparability scoring: assessing the self-repair potential of mobile ICT devices (PLATE 2019 Paper)
COMMENTS	Version 2 of the scoring system was developed in the context of the sustainably smart project. It is still in beta version and not used for published scores

MAIN ADVANTAGES	Combines qualitative with quantitative methods documenting number and type of operations and required tools. Allows for weighting of criteria.
MAIN LIMITATIONS	Focused on DIY repair scenario. Doesn't take into account economic factors (price) or software aspects (updates, encryption, paired components,). A three tiers scale could be too small for a good assessment

Labo FNAC's Indice de réparabilité

LEADER ORGANIZATION	FNAC-DARTY
SCOPE	Reparability
TERRITORY	France
TYPES OF EQUIPMENT	Laptops and smartphones
TYPE OF METHODOLOGY	Semi-quantitative
CRITERIA ASSESSED	12 parameters grouped in 4 areas: 1) Documentation (disassembly instructions, diagnosis support, maintenance tips) 2) Modularity and accessibility (ease of disassembly, modularity of main parts, use of tools) 3) Spare parts (availability, price, standardised parts) 4) Software/firmware (reset to original conditions, compatibility with open source software/firmware, updates)
PONDERATION	The maximum score for the index, which represent the best repair scenario, is 100. The contribution from each area is proportional (i.e. 25%). The score is then normalised to a 0-10 scale
HOW THE INDEX IS DISPLAYED	Figure from 0-10 scale
LINK FOR FURTHER INFO	https://labo.fnac.com/guide/indice-labofnac-reparabilite-ordinateurs/ https://labo.fnac.com/guide/indice-labofnac-de-reparabilite-smartphones-disponible-point-criteres-evalues/

MAIN ADVANTAGES	Takes into account economic factors (price) and software aspects
MAIN LIMITATIONS	Precise definition of criteria is unclear. Missing the criteria about the service offering of the producer on repair and maintenance

BENELUX
Reparability criteria for energy related products

LEADER ORGANIZATION	KULeuven / VITO
SCOPE	Reparability
TERRITORY	Undefined (proof of concept only)
TYPES OF EQUIPMENT	Energy related products
TYPE OF METHODOLOGY	Semi-quantitative
CRITERIA ASSESSED	24 parameters in a 15 criteria grid, evaluating information provision, product design, servicing across 5 stages of repair: identification, failure diagnostic, disassembly and reassembly, spare part, resetting to working condition
PONDERATION	A score (0/2/5/10; not all levels possible for all parameters) is assigned to each criterion and aggregated by step, category of criteria and overall score. All 15 criterion/stage combinations are weighted equally
HOW THE INDEX IS DISPLAYED	Percentage
LINK FOR FURTHER INFO	http://www.benelux.int/files/7915/2896/0920/FINAL_Report_Benelux.pdf
COMMENTS	In line with current developments of the draft prEN 45554. Introduce the concept of priority parts and differentiates between who carries out the evaluation. It has been tested in vacuum cleaners and washing machines. This is just a research exercise so far in order to provide input to current processes, no practical application is planned at this stage

MAIN ADVANTAGES	Includes both authorised repair and independent repairer/consumer repair scenario.Takes into account economic factors (price) and technical support. Concrete proposal for aggregation
MAIN LIMITATIONS	Requires reference values for disassembly time or steps; relation between partial and full disassembly may create false incentives. Some criteria not well-defined, for instance the availability of technical support

PrEN 45554

NAME	Standard: PrEN45554 'General methods for the assessment of the ability to repair, reuse and upgrade energy related products'
LEADER ORGANIZATION	CEN-CENELEC JTC10 Material Efficiency Aspects for Ecodesign' WG 3
SCOPE	Reparability, upgradability, reusability
TERRITORY	EU (in principle; might also be used elsewhere) - discussion on use as a starting point for circular economy work at IEC level (related to terminology)
TYPES OF EQUIPMENT	All energy-related products
TYPE OF METHODOLOGY	Qualitative evaluation, semi-quantitative, quantitative
CRITERIA ASSESSED	Time for disassembly, disassembly depth, fasteners and connectors, necessary tools, working environment, skill level, diagnostic support and interfaces, availability of spare parts, types and availability of information, return options, data management, password and factory reset for reuse
PONDERATION	Weighting by criterion and by priority part (also specific section A.4.13 Aggregation of criteria scores)
HOW THE INDEX IS DISPLAYED	Not specified
LINK FOR FURTHER INFO	https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:65685,2240017&cs=15F972631647841DFFF0A1026B720FD49
COMMENTS	Final draft out for vote in September and results shared on 29/10/2019. FV result on FprEN45554 was positive (with a weighted positive vote of 87.66%)

MAIN ADVANTAGES	Most comprehensive method to date. Addresses a comprehensive range of aspects and takes into account a wide range of scenarios and target groups.
MAIN LIMITATIONS	Methodological framework only; criteria and performance levels need to be selected and weighted at product category level. Mainly useful for classification of categories, with little guidance for aggregation. Doesn't take into account economic factors (price). Not very ambitious overall, horizontal nature of the standard limits its aptness in providing a clear path for vertical standards but this was needed in light of the scope defined in the standardisation request

Repair index ADEME (FR COPIL)

LEADER ORGANIZATION	CGDD / ADEME (Commissariat Général au Développement Durable / Agence de l'Environnement et de la Maîtrise de l'Énergie)
SCOPE	Reparability
TERRITORY	France
TYPES OF EQUIPMENT	All electric and electronic devices; pilot stage with 5 product groups: smartphones, computers, washing machines, vacuum cleaners, lawn mowers
TYPE OF METHODOLOGY	Semi-quantitative
CRITERIA ASSESSED	5 criteria (each with a list of sub-criteria): availability of Information, ease of disassembly, availability of spare parts, price of spare parts, product-specific criterion; evaluated for 3 target groups (authorized repairers, independent repairers, consumers)
PONDERATION	Equal weighting for all criteria and target groups
HOW THE INDEX IS DISPLAYED	A label. After initial tests, two visuals are currently under evaluation in experiments at selling points
LINK FOR FURTHER INFO	https://www.ademe.fr/expertises/dechets/passer-a-laction/eviter-production-dechets/reparation
COMMENTS	Working groups ongoing. iFixit is involved in general COPIL (Comité de pilotage) and working groups' on computers and smartphones

MAIN ADVANTAGES	Fairly balanced; takes into account priority parts and considers different repair scenarios (authorized repairers, independent repairers, consumers); also considers economic factors (price)
MAIN LIMITATIONS	Very little granularity in ease of disassembly (only number of steps, no difficulty)

Repairably

LEADER ORGANIZATION	Repairably (Slovakian NGO)
SCOPE	Reparability
TERRITORY	Europe (ideally global if successful, for the moment most active in Slovakia)
TYPES OF EQUIPMENT	Assembled goods (any product that consists of components (electrical appliances, bicycles, furniture, sport equipment, ...)
TYPE OF METHODOLOGY	Qualitative (compliance with the 10 requirements mandatory; some of the rules have numerical parameters)
CRITERIA ASSESSED	Component price, component availability or open source components, tools availability, software availability, repair guides, ease of reassembly, legal restrictions
PONDERATION	Pass/fail (a score is created which only refers to parts prices, see https://repairably.com/repairably-score/)
HOW THE INDEX IS DISPLAYED	Logo https://repairably.com/wp-content/uploads/2017/04/logo.png
LINK FOR FURTHER INFO	https://repairably.com/manifesto/
COMMENTS	Reparability is understood in the sense of disassemblability + self-repair

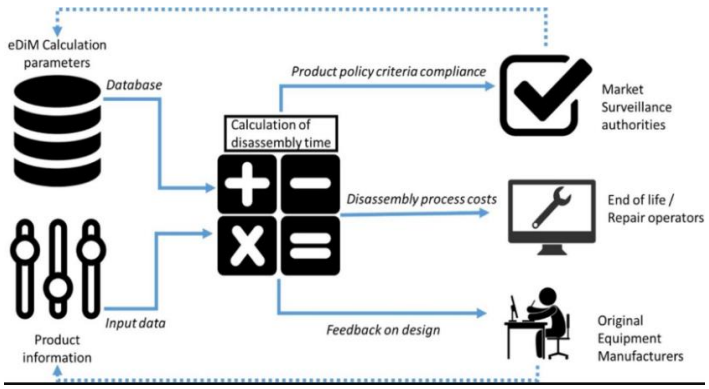
MAIN ADVANTAGES	Transparency, simplicity. The voluntary approach ensures full collaboration by the manufacturer, which allows for assessing certain criteria that would be hard to assess at the point of sale
MAIN LIMITATIONS	The criteria are clarified in a manifesto which is not made public. The major drawback of this method is the lack of product-specific adaptation of criteria, limiting the approach to simple low-tech products (as exemplified by the products certified so far). *Repairably* is aware of this and will hold a series of workshops to evaluate criteria and adapt them to electric and electronic products. The first workshop will take place on 18/12/2019. Further weaknesses are the absence of a procedure to lodge complaints when certified producers don't meet the requirements. The criterion on price of spare parts is too stringent for any complex product, the criterion on tool availability on the other hand is very weak. The 'open source' option for spare parts availability is completely unrealistic in most cases. The criterion of software availability is insufficiently defined and extremely hard to verify. The criterion on legal restrictions has a significant and unnecessary loophole

REPAIRABLY

EDiM (Ease of Disassembly Metric)

LEADER ORGANIZATION	JRC Joint Research Center
SCOPE	Disassemblability (time to disassemble and reassemble a product or its parts)
TERRITORY	Not defined
TYPES OF EQUIPMENT	Electrical and electronic equipment. Case study of an LCD monitor (2016), notebook computer (2018)
TYPE OF METHODOLOGY	Quantitative
CRITERIA ASSESSED	Time needed to disassemble and reassemble parts. Tasks are listed and reference time values are associated to each of them, from a database which can be adapted, extended and/or updated
PONDERATION	N.p.
HOW THE INDEX IS DISPLAYED	Figure
LINK FOR FURTHER INFO	https://www.sciencedirect.com/science/article/pii/S0921344917301763?utm_source=sendinblue&utm_campaign=RCR_updates_May_2019&utm_medium=email
COMMENTS	Based on Maynard Operation Sequence Technique (MOST). It requires information about parts in product, disassembly sequence, gasteners, tools needed

MAIN ADVANTAGES	Offers a theoretically comprehensive metric regarding the disassemblability of a product
MAIN LIMITATIONS	Not represent entirely the repair process. Theoretical framework only, requires defining reference tables for all disassembly actions, which do not exist at this time



LONGTIME® LABEL

LEADER ORGANIZATION	Ethikis ad civis (a Toulouse based cooperative company that is wholly owned by its employees)
SCOPE	Longevity, robustness and repairability
TERRITORY	Not restricted in theory, but in practice limited to France due to language barrier
TYPES OF EQUIPMENT	all assembled products (potentially even including furniture)
TYPE OF METHODOLOGY	Semi-quantitative
CRITERIA ASSESSED	41 criteria (https://longtimelabel.com/specifications/) 1) **The product is designed to last over time** a. Design (9 criteria) b. Documentation (2 criteria) c. Upgradability (1 criteria) 2) **The product meets the conditions of reparability and after-sales service** a. Disassembly (5 criteria) b. Documentation (5 criteria) c. Spare parts (5 criteria) d. After-sales service under warranty (3 criteria) e. After- sales out of warranty (2 criteria) 3) **The product has warranty beyond the legal guarantee of conformity** a. Warranty (6 criteria) b. Use and maintenance tips (3 criteria)
PONDERATION	3 types of criteria: mandatory, major (need to be respected 80%) and minor (need to be respected 50%)
HOW THE INDEX IS DISPLAYED	Logo (see the picture below)
LINK FOR FURTHER INFO	https://longtimelabel.com/longtime-the-label-for-products-designed-to-last/
COMMENTS	Obtained by two manufacturers (three products) in October 19:SEB Rowenta Silence Force R064 (Vacuum Cleaner), Xplorer ORX and Xplorer DEUS WS4/WS5 (metal detectors) https://longtimelabel.com/product-list/

MAIN ADVANTAGES	Audited by independent companies (Ecocert or Apave). Supported by ADEME. Interesting approach
MAIN LIMITATIONS	It costs money. Only 3 products certified to date. No granularity (pass/fail), hence low differentiation potential. Several key criteria require reference values that need to be set per product category, meaning the method as it stands is not mature and hardly objective - questionable how reference values for metal detectors would have been set for instance