The European Commission's science and knowledge service

Joint Research Centre

A Scoring System on Reparability to support Ecodesign in a Circular Economy

Joint Research Centre

Directorate B – Growth and Innovation - Circular Economy & Industrial Leadership
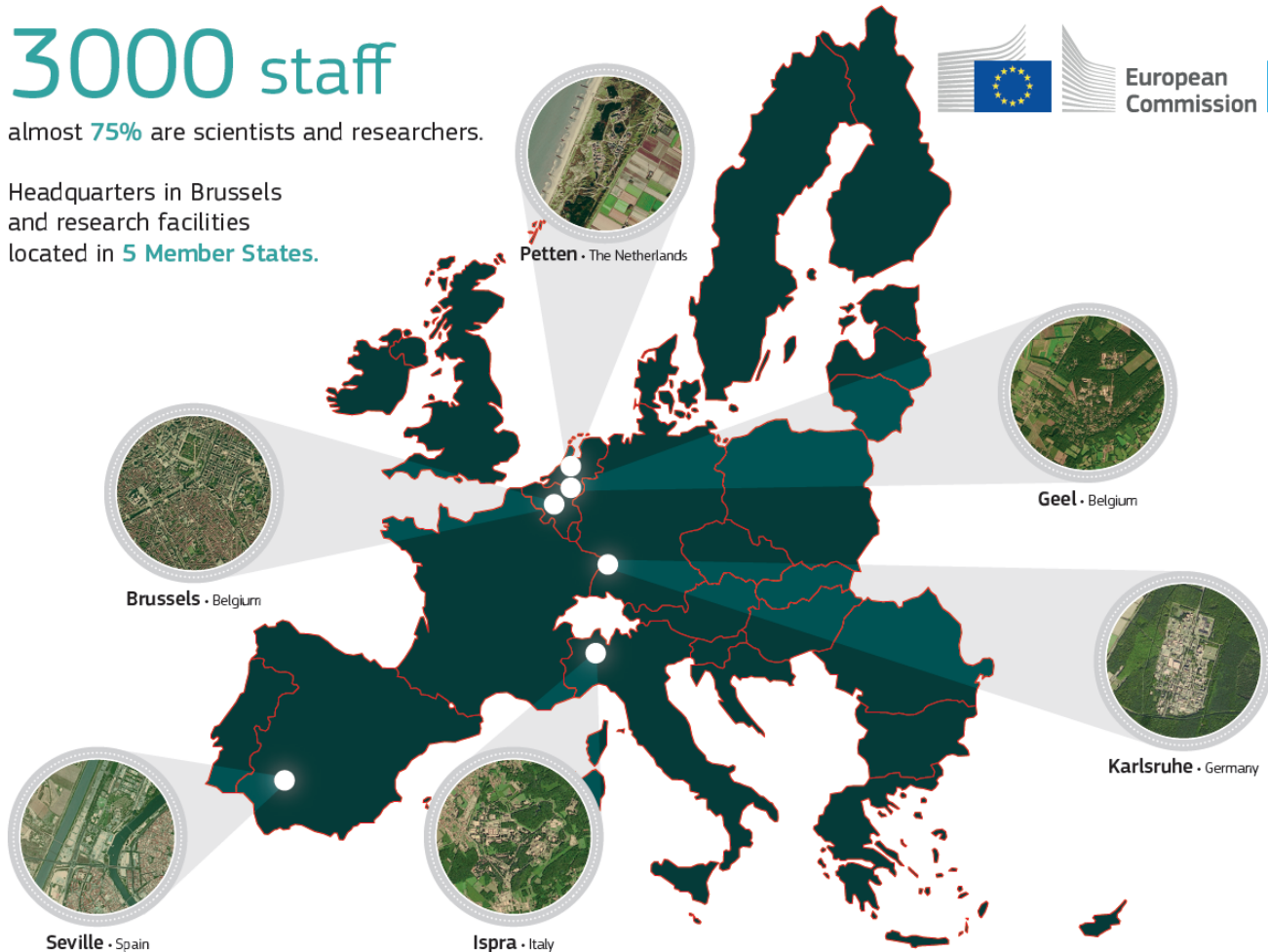
Seville, June 26th, 2018

European Commission

Agenda

Schedule	Topic
09:00 – 09:15	Registration and welcome, round table and objectives of the meeting
09:15 – 10:15	**Part I: Policy context** Repair and Ecodesign for a Circular Economy Presentation of preliminary results of EU behavioural study 'Consumers' engagement in the Circular Economy'
10:15 - 11:15	**Part II: Towards a Scoring System on Reparability: Key aspects for a generic scoring system** Overview of the technical approach, state-of-the-art tools & studies, key parameters
11:15 - 11:30	Coffee break
11:30 - 12:00	Identification of priority parts of products
12:00 - 13:15	Key elements of the scoring framework: classification, rating, assessment and verification of parameters
13:15 – 14:00	**Lunch break**
14:00 – 15:00	Key elements of the scoring framework: : classification, rating, assessment and verification of parameters – cont.
15:00 – 15:45	Key elements of the scoring framework – aggregation and reporting options
15:45 – 16:00	Coffee break
16:00 – 16:45	**Part III: Towards a Scoring System on Reparability: Product-specific aspects** Overview on product-specific issues for laptops, vacuum cleaners, washing machines
16:45 – 17:30	AOB, wrap-up, next steps and conclusion

The JRC: Research in support to policy making

3000 staff
almost 75% are scientists and researchers.

Headquarters in Brussels and research facilities located in 5 Member States.

Petten · The Netherlands
Brussels · Belgium
Geel · Belgium
Karlsruhe · Germany
Seville · Spain
Ispra · Italy

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B. Growth & Innovation

➢ **B.5 Circular Economy & Industrial Leadership (Seville)**

    ➢ **Product Bureau**

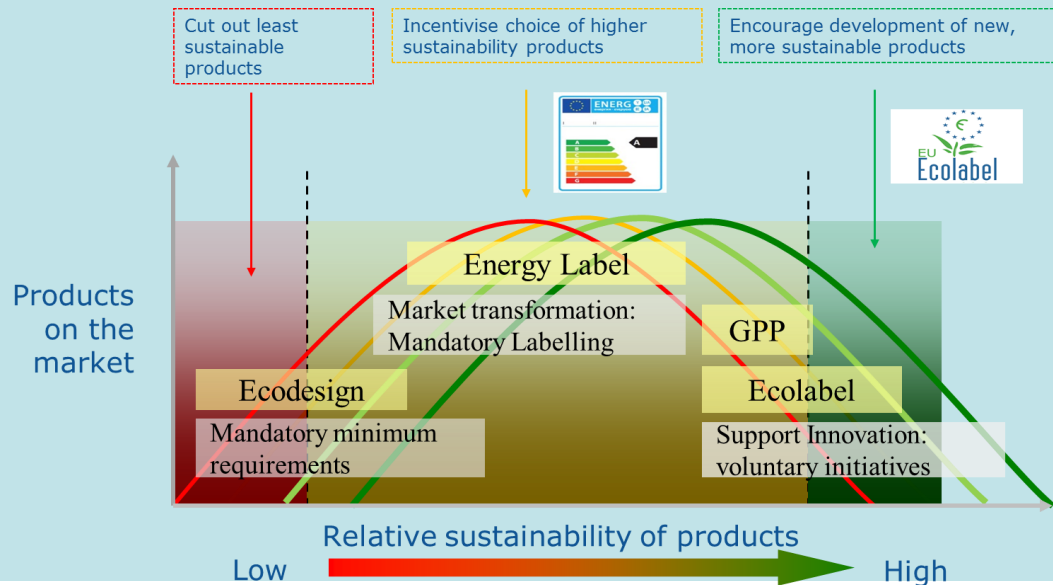C. Energy, Transport & Climate

D. Sustainable Resources

E. Space, Security & Migration

F. Health, Consumers & Reference Materials

G. Nuclear Safety & Security

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The Product Bureau's activities

- Development and implementation of product policies and circular economy strategies at EU level

- Techno-economic and environmental research, as well as operational management of interaction with stakeholders

http://susproc.jrc.ec.europa.eu/product_bureau/index.html

Objectives of the meeting

Development of a scoring system on reparability:

1. Explain the context

2. General aspects

3. Product-specific preliminary guidance

Process

- Apr 2018:
    - Official launch of the study and webpage creation
    - TWG of experts created (above 130 people on June 2018)
- **Apr-May 2018: questionnaire (25+2 replies)**
- **Jun 2018:**
    - **1st report (public consultation until Jul 2018)**
    - **1st meeting in Seville (general approach)**
- Autumn 2018: 2nd draft report
- Nov 2018: 2nd meeting in Brussels (specific PGs)
- End of the year: final report

http://susproc.jrc.ec.europa.eu/ScoringSystemOnReparability/index.html

Outline of the presentation

- **Part I: Policy context**

- Part II: Towards a Scoring System on Reparability: key aspects for a generic scoring system

    - *Approach, tools & studies, key parameters*

    - *Priority parts of products*

    - *Classification, rating, assessment and verification*

    - *Aggregation and reporting options*

- Part III: Towards a Scoring System on Reparability: Product-specific aspects (laptops, vacuum cleaners, washing machines)

Part I: Policy context

Presentations from ENV and JUST

1. Repair and Ecodesign for a Circular Economy (ENV)

2. Presentation of preliminary results of EU behavioural study 'Consumers engagement in the Circular Economy' (JUST)

- Part I: Policy context

- **Part II: Towards a Scoring System on Reparability: key aspects for a generic scoring system**

  - ***- Approach, tools & studies, key parameters***

  - *- Priority parts of products*

  - *- Classification, rating, assessment and verification*

  - *- Aggregation and reporting options*

- Part III: Towards a Scoring System on Reparability: Product-specific aspects (laptops, vacuum cleaners, washing machines)
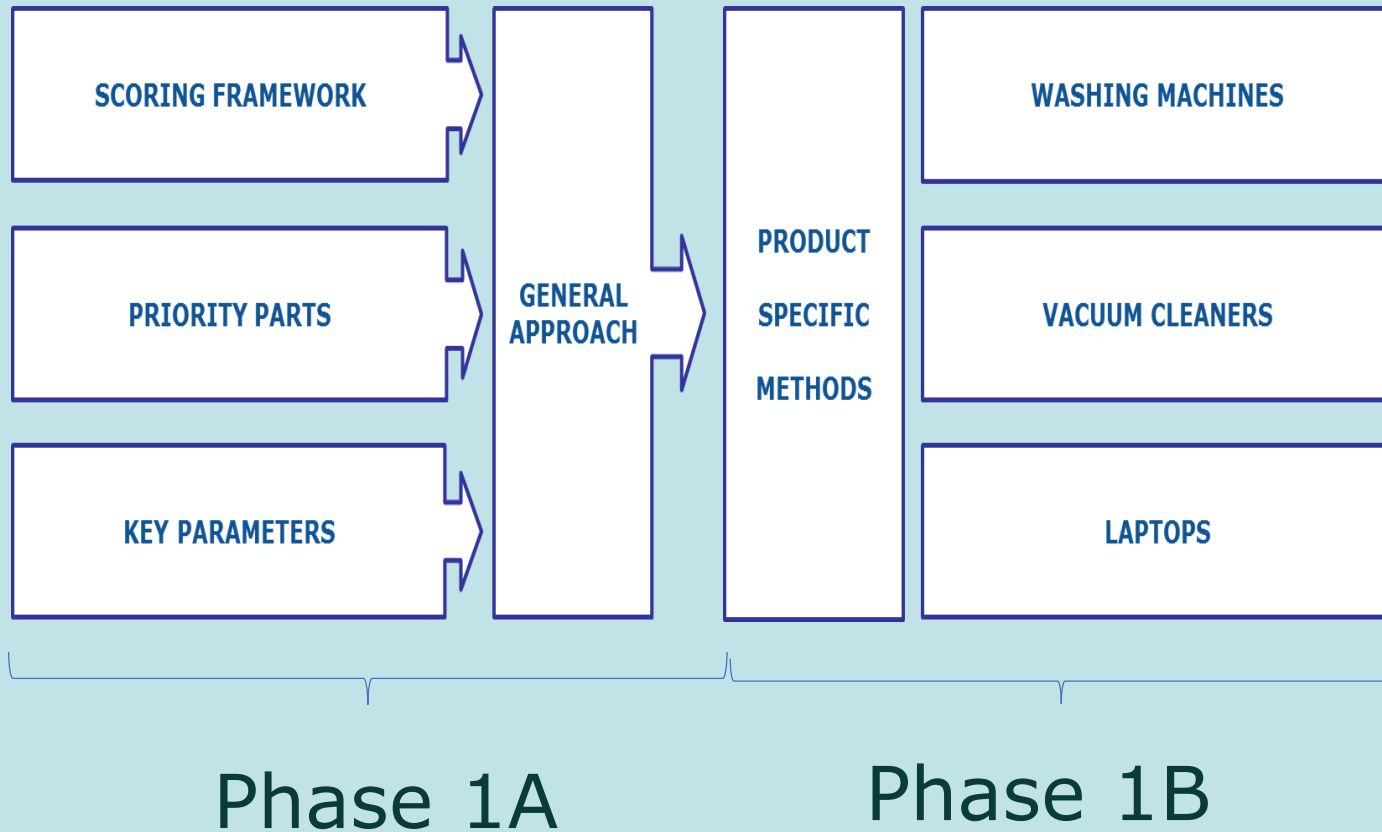
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Approach, tools & studies, key parameters

Approach

Phase 2: ENV's follow-up study to explore development of an information tool

Overview of tools and studies

Overview of tools and studies

PRODUCT 10 YEARS REPAIRABLE

Gütezeichen für langlebige, reparaturfreundlich konstruierte elektrische und elektronische Geräte

ONR 192102: 2014 10 01

Zusammenfassung:

Mit dieser ONR werden Kriterien für ein Gütezeichen für langlebige, reparaturfreundlich kons und Elektronik-Geräte (Weiß- und Braunware) festgelegt.

AUSTRIAN STANDARDS

iFIXIT scoring

Design For Repairability
A Tool for Product Designers

About

A simple way to extend product life is to improve its repairability. How well are consumers able to fix your product themselves?

* this tool is designed to assess Brown Goods.

Grab your product

Improve your product's repairability

Fill in your details

Generate a report

Generate a report

Select fitting repairability statements

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Overview of tools and studies

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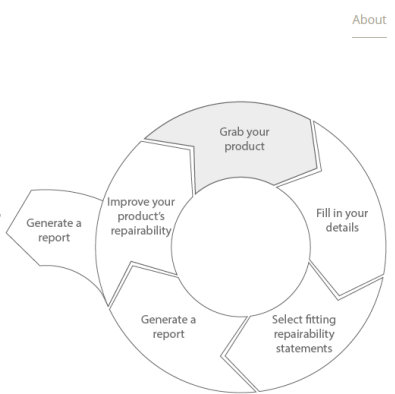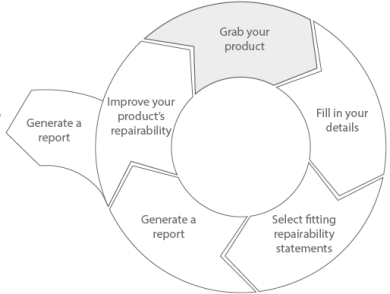
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Reference	prEN 45554
Title	General methods for the assessment of the ability to repair, reuse and upgrade energy related products
Work Item Number	65685
Abstract/Scope	This standard will fulfil requirements in Standardisation request M/543 by defining parameters and methods relevant for assessing the ability to repair and reuse products; the ability to upgrade products, excluding remanufacturing; the ability to access or remove certain components, consumables or assemblies from products to facilitate repair, reuse or upgrade and lastly by defining reusability indexes or criteria.

Study for a method to assess the ease of disassembly of electrical and electronic equipment

Method development and application in a flat panel display case study

Paul Vanegas, Jef R. Peeters, Dirk Cattrysse, Joost R. Duflou (KU Leuven)
Paolo Tecchio, Fabrice Mathieux, Fulvio Ardente (JRC)
2016, May

Overview of tools and studies

And more...

Gütezeichen für langlebige, reparaturfreundlich konstruierte elektrische und elektronische Geräte
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PRODUCT 10 YEARS REPAIRABLE

ADEME
Agence de l'Environnement et de la Maîtrise de l'Energie

iFIXIT scoring
5

KU LEUVEN

vito vision on technology

Benelux

Ellen Bracquené, Jef Peeters, Joost Duflou & Wim Dewulf
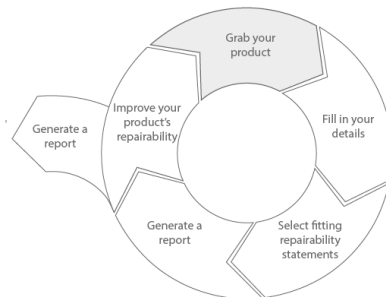KU Leuven

Yoko Dams & Jan Brusselaers
VITO

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2016, May

- Range of scoring approaches, pass/fail labels, and **parameters**
- Background information for developing a scoring system
- **prEN 45554** as reference
- **Key aspects for stakeholders**:

    - Objectivity and reproducibility of A&V methods

    - Ease of understanding of information

    - Representativeness of requirements at EU level

    - Applicability to a broad scope of repairers (DIY, independent professionals, authorised professionals, OEM)

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Key parameters for repair and upgrade

- **First pillar** of the scoring system

- Experienced **selection of general parameters based on existing literature**

- Further evaluated and integrated based on **comments from stakeholders**

- **To be taylored** to specific product group(s) and related priority part(s) and not biased towards particular repair business models

- **Measurable and enforceable**:

  -Limited presence of value choices or judgements

  -Avoid open interpretations and trade-offs

From 10 initial parameters…

Relevance for Reparability
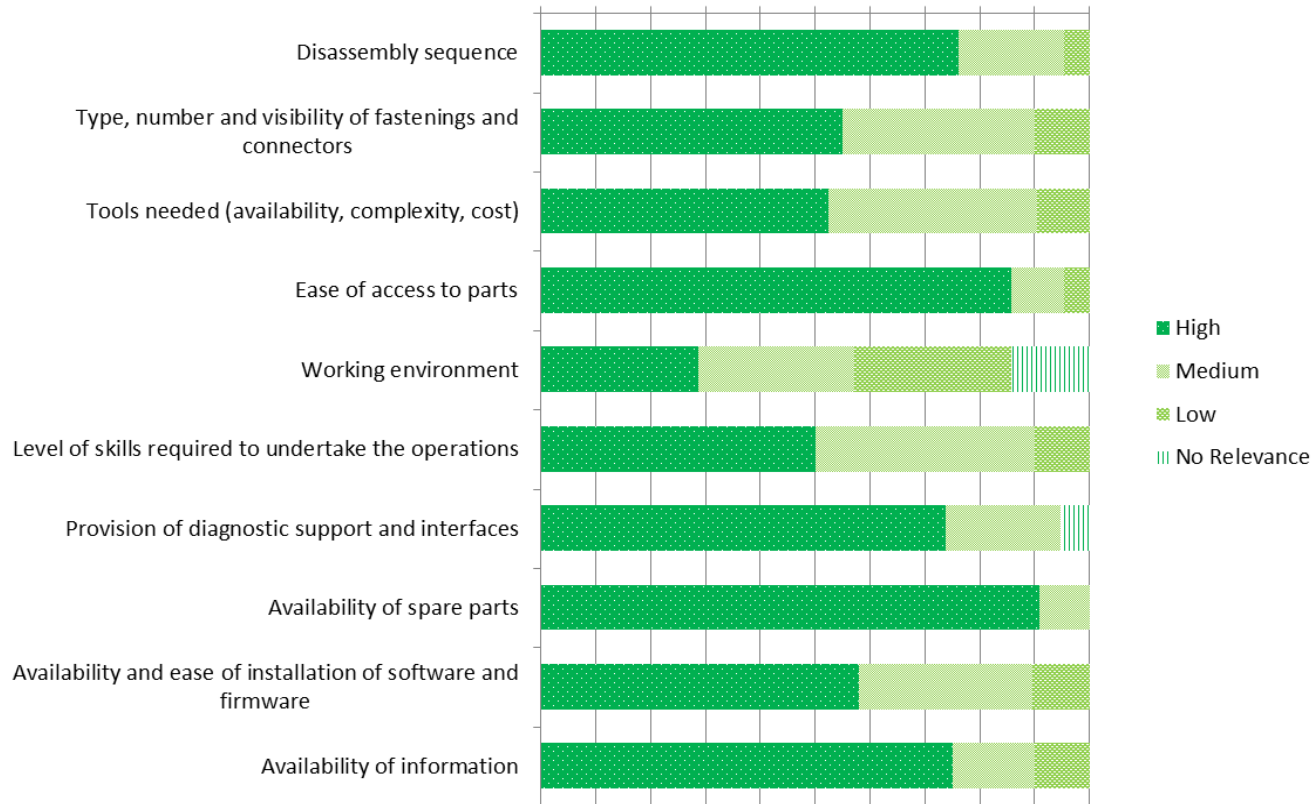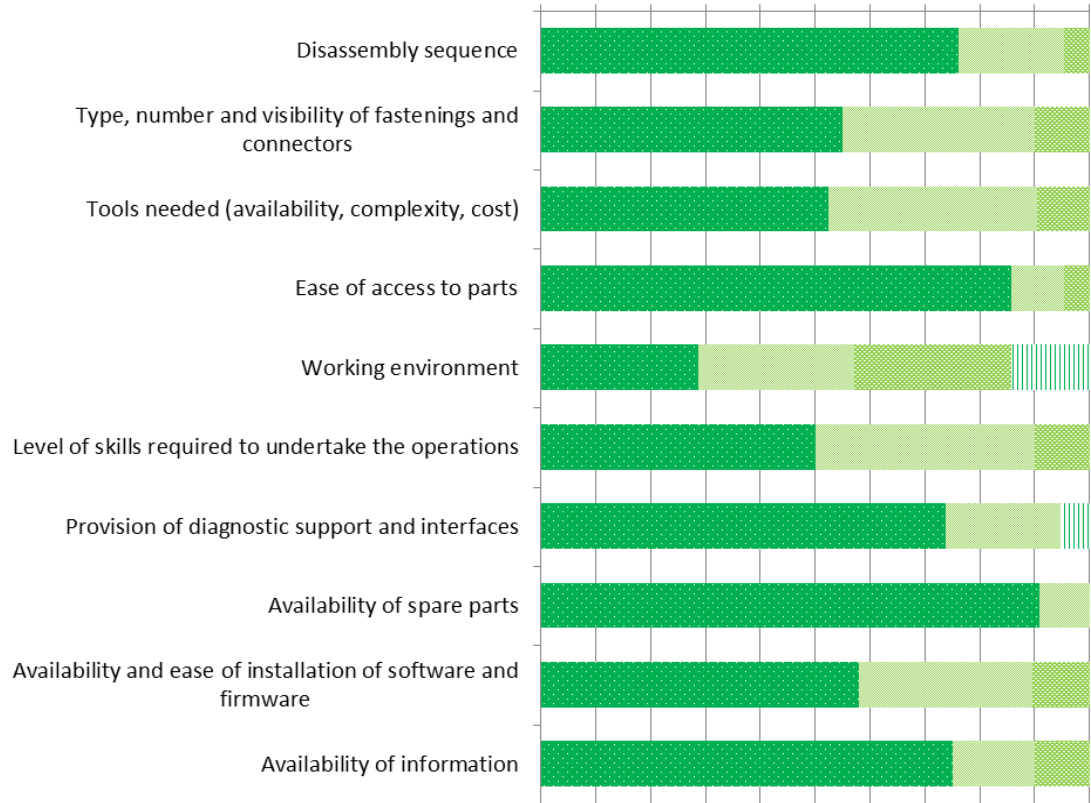
Design, operation/service, users information

From 10 initial parameters…
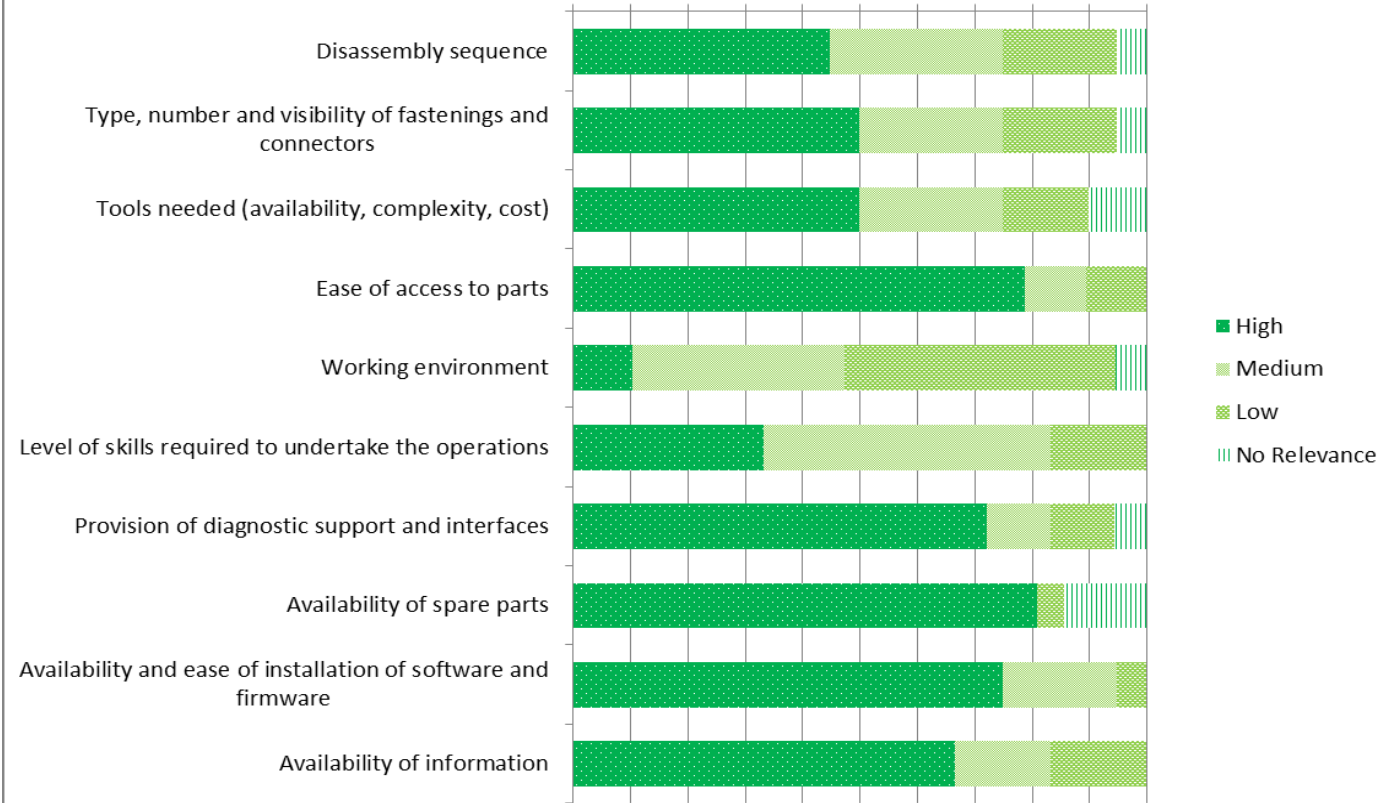
Design, operation/service, users information

Reparability			Upgradeability
Availability of spare parts	2.9	2.7	Availability and ease of installation of software and firmware
Ease of access to parts	2.8	2.7	Ease of access to parts
Disassembly sequence	2.7	2.5	Provision of diagnostic support and interfaces
Availability of information	2.7	2.5	Availability of information
Provision of diagnostic support and interfaces	2.6	2.5	Availability of spare parts
Availability and ease of installation of software and firmware	2.5	2.2	Type, number and visibility of fastenings and connectors
Type, number and visibility of fastenings and connectors	2.5	2.2	Level of skills required to undertake the operations
Tools needed (availability, complexity, cost)	2.4	2.2	Disassembly sequence
Level of skills required to undertake the operations	2.4	2.2	Tools needed (availability, complexity, cost)
Working environment	1.6	1.5	Working environment

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Additional parameters of potential interest:
1. Guarantee issues
2. Return of models
3. Data transfer and deletion
4. Safety issues
5. Availability of OEM qualified service engineers
6. Ease of restoring product to working condition after repair

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… to 10 + 6 − 4 = 12?

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Complex A&V, related to other aspects ➝ Ease of access to parts

Not relevant, no influence ➝ Working environment

Additional parameters of potential interest:
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3. Data transfer and deletion
4. Safety issues
5. Availability of OEM qualified service engineers
6. Ease of restoring product to working condition after repair

Difficult A&V ➝ 4. Safety issues

Difficult A&V ➝ 6. Ease of restoring product to working condition after repair

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Discussion points

1. Which **parameters** should be explicitly **excluded** from the scoring framework?

2. Which parameters should be necessarily **included** in the scoring framework?

3. What should be the **relative importance** of each of the parameters?

Priority parts of products

Priority parts

- Priority parts are those components, assemblies, or any other hardware or software constituents with a higher need/importance/frequency to be repaired and/or upgraded
    - ❖ To reduce the complexity of the assessment
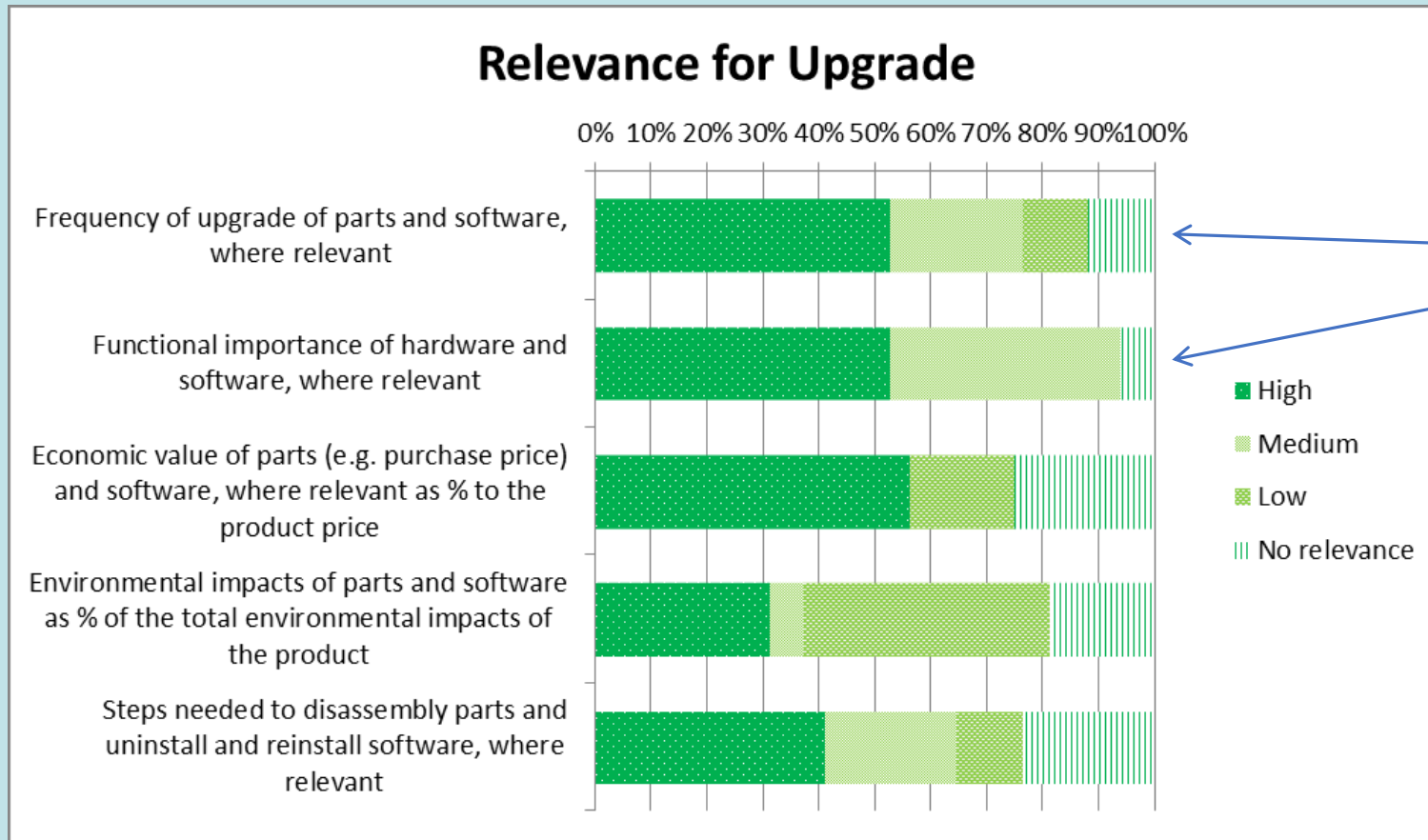   - ❖ To focus on parts more prone to be repaired / upgraded

https://tech4bytes.wordpress.com/basic-computing/optical-mouse/
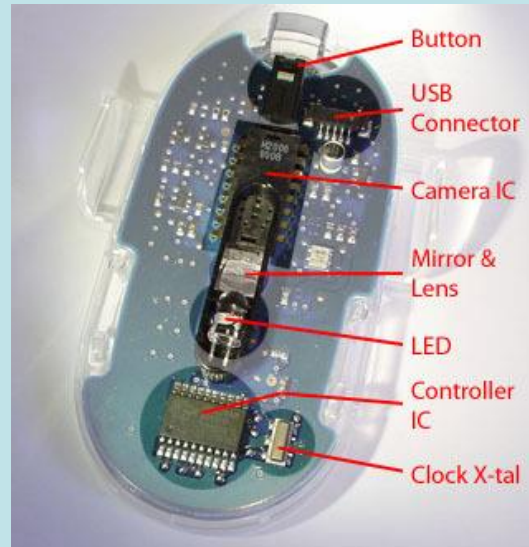
Relevance for Repair - Indications from the initial questionnaire
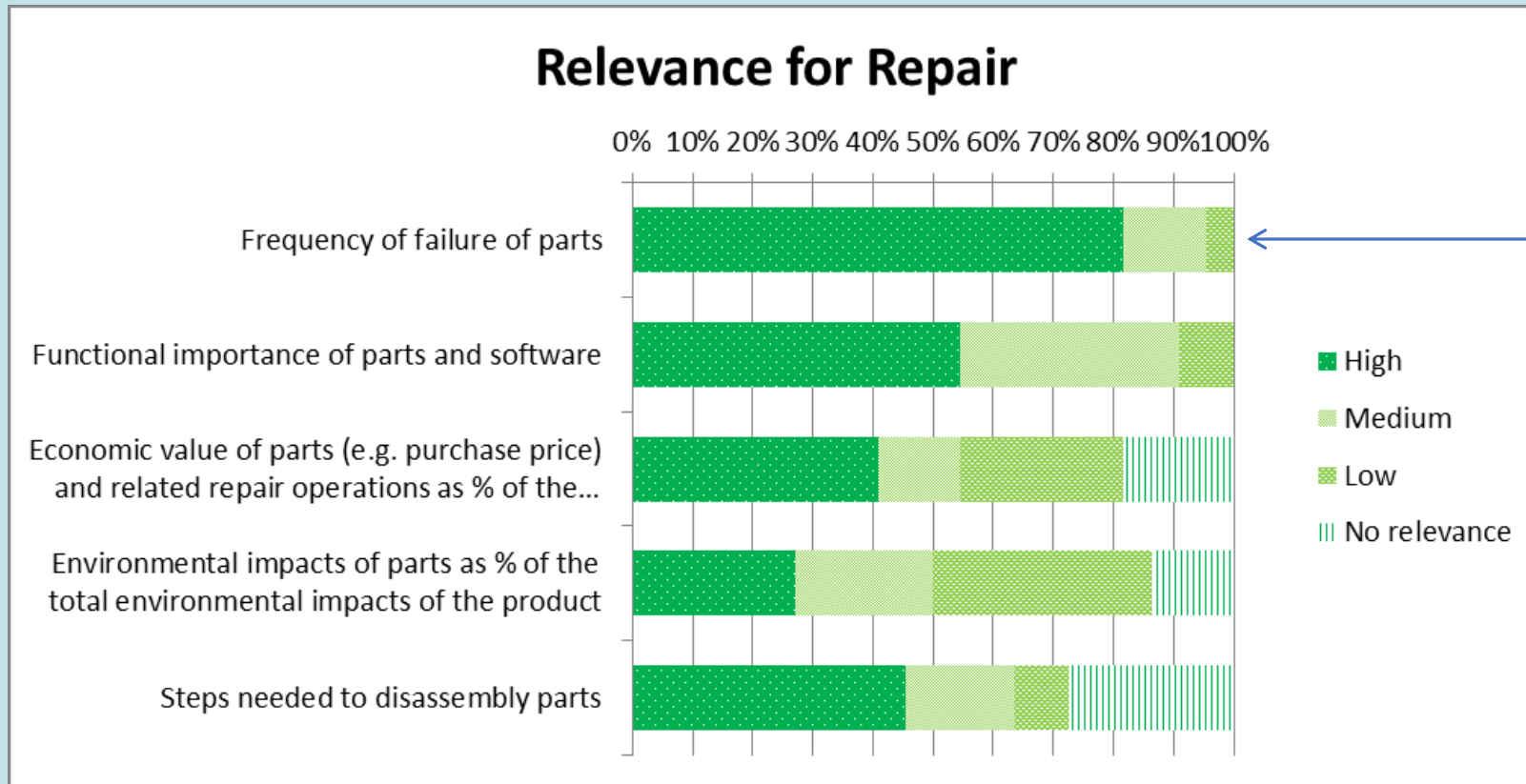
Relevance for Upgrade - Indications from the initial questionnaire

Key findings

- **Priority for Repair:** Focus on parts subject to higher of **failure** rate

- **Priority for Upgrade:** Focus on parts subject to **rapid technology changes** or **changes in use profiles** over life time of the product.

- **Relevant information** needed, including input **from experts**

- **Failed parts** potentially to be replaced **with enhanced functionality or capacity**

- Attention to be given to the **software and firmware upgradability**

Discussion points

- **Do you agree with the strategy proposed to identify priority parts** or do you have any recommendations**?**

- **How to balance simplification** of the assessment with the need to **differentiate among products** (within a specific product group)?

Classification, rating, assessment and verification

List of parameters

1. Disassembly sequence

2. Type, number and visibility of fastenings and connectors

3. Tools needed (availability, complexity, cost)

4. Ease of access to parts

5. Working environment (e.g. home, professional repair site, manufacturing plant)

6. Level of skills required to undertake the operations

7. Provision of diagnostic support and interfaces

8. Availability of spare parts

9. Availability and ease of installation of software and firmware

10. Availability of information (e.g. repair and/or upgrade manuals, exploded diagrams)

11. Guarantee issues

12. Return models

13. Data transfer and deletion

14. Safety issues

15. Availability of OEM qualified service engineers

16. Ease of restoring to full working condition after repair

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1. Disassembly sequence

Classification	Assessment and verification
I. Less than X steps II. Between X and Y steps III. More than Y steps X < Y Focused on priority parts	Based on documentation of disassembly steps Information to be provided in instruction manuals and/or other on-line information systems

2. Type, number and visibility of fastenings and connectors

Classification	Assessment and verification
I. Reusable fasteners are used: can be reused for the new part or the fastener is supplied with the part II. Removable fasteners are used: they are not reusable, but can be removed without causing damage or leaving residue precluding reassembly or reuse of the removed part III. Non-removable fasteners are used: the original fasteners are not removable or reusable Propose to assess only the type	Based on information provided by the manufacturer (e.g. with illustrated disassembly instructions) Information could be provided in manuals and/or other on-line platforms

3. Tools needed

Classification	Assessment and verification
I. Common tools: RU feasible without any tools, tools that are supplied with the product, or common tools II. Product-specific tools (<u>if needed</u>): RU feasible either with no specific tools, or a finite list of specific tools III. Other commercially available tools (if needed): RU feasible without the use of proprietary tools IV. Proprietary tools: RU feasible only with tools which are not available to general public V. Not feasible: RU operation is unfeasible with existing normally-available tools	The manufacturer should document the type of tools needed to RU the product Information could be provided in manuals and/or other on-line platforms

4. Ease of access to parts

This parameter is considered a combination of previous parameters like:
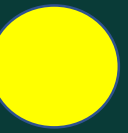- disassembly steps
- type fastenings and connectors
- tools needed

Time for disassembly (e.g. eDiM) could be used as overall indicator

This could add complexity, possibly also in terms of assessment and verification

Discussion

1. Disassembly sequence	9. Availability and ease of installation of software and firmware
2. Type, number and visibility of fastenings and connectors	10. Availability of information (e.g. repair and/or upgrade manuals, exploded diagrams)
3. Tools needed (availability, complexity, cost)	11. Guarantee issues
4. Ease of access to parts	12. Return models
5. Working environment (e.g. home, professional repair site, manufacturing plant)	13. Data transfer and deletion
6. Level of skills required to undertake the operations	14. Safety issues
7. Provision of diagnostic support and interfaces	15. Availability of OEM qualified service engineers
8. Availability of spare parts	16. Ease of restoring to full working condition after repair

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11. Guarantee issues

Classification	Considerations
I. More than 6 years of commercial guarantee offered as included in the price of the product.	Proxy for reparability, durability and quality of product
II. 5 years of commercial guarantee offered as included in the price of the product	Commitment to repair by the manufacturer
III. 4 years of commercial guarantee offered as included in the price of the product	Product not to be replaced by a new one under the warranty, unless no repair is possible
IV. 3 years of commercial guarantee offered as included in the price of the product	Evaluation referred to entire product or specific parts?
V. No commercial guarantee available	

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12. Return models
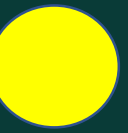
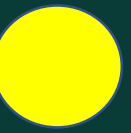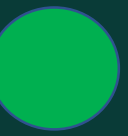| Classification		Assessment and verification
I. Lease, product as a service: The customer does not own the product, for RU process it is sent back to a location designated by the manufacturer II. Advanced replacement scheme: there is a service contract between customer and manufacturer in which an advanced replacement scheme is applied	III. Mail-back program: the user posts the product to a location designated by the manufacturer for RU process IV. User delivers product: the user drops product off at local repair facility or at a collection point V. No return model	Based on documentation provided by manufacturer and audit to check the method Information to be provided in instruction manuals and/or other on-line information systems

13. Data transfer and deletion

Classification	Assessment and verification
I. Built in: built-in secure data transfer and deletion functionality is available to support the deletion of all data contained in data storage parts II. On request: secure data transfer and deletion is available under request III. Not available: secure data transfer and deletion is not available	Based on documentation provided by manufacturer and tests/audit to check the method Information to be provided in instruction manuals and/or other on-line information systems

Discussion

1. Disassembly sequence	9. Availability and ease of installation of software and firmware
2. Type, number and visibility of fastenings and connectors	10. Availability of information (e.g. repair and/or upgrade manuals, exploded diagrams)
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7. Provision of diagnostic support and interfaces

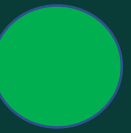| Classification		Assessment and verification
I. Visually intuitive interface: RU process can be carried out by a visual interface that can be understood without the need for supporting documentation II. Coded interface with public reference table: RU process can only be carried out with supporting documentation or software, and through reading and/or entering codes which are available in a publicly available table	IV. Publicly available hardware / software interface: RU process can only be carried out through the use of hardware and software which is publicly available V. Proprietary interface: RU process that can only be carried out using proprietary tools for diagnosis, change of settings or transfer of software, which are not included with the product VI. Not possible with any type of interface: RU process that cannot be carried out with any type of interface	Information to be provided by the manufacturer, e.g. troubleshooting, manual or portals for authorised repairers Information could be provided in manuals and/or other on-line platforms

8. Availability of spare parts

Classification I (audience)	Classification II (time availability)	Assessment and verification
I. Spare parts are publicly available to **all interested parties** II. Spare parts are available at least to **independent repair service providers** III. Spare parts are available at least to **manufacturer-authorised repair services** IV. Spare parts are available to the **manufacturer only** V. No spare parts are available	I. Spare parts are available after the time of sale for a duration that reflects the **expected maximum useful life of the product** II. Spare parts are available for a duration of time that reflects the **expected average useful life of the product** III. Spare parts are available for **2 years after the time of sale of the product** IV. Spare parts are available at the time of sale, but the duration of **availability cannot be determined**	Information by the manufacturer about the target group and/or duration of availability of spare parts provision is provided **<u>Cost</u> of spare parts and <u>delivery time</u> to be considered as well?**

9. Availability software and firmware installations
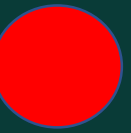
To be aligned with spare parts

10. Availability of information

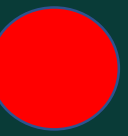| Classification I (type)	Classification II (audience)	Assessment and verification
I. Complete information available: all relevant information is available II. Comprehensive information available: not all relevant information is available as, but reasonably comprehensive information is available III. Basic information available: complete or comprehensive information is not available as described above IV. No information available: no relevant information is available	I. Publicly available II. Available to independent repair service providers III. Available to manufacturer-authorised repair service providers IV. Available to the manufacturer only	Assessment and verification based on the public information supplied by the manufacturer (e.g. manuals, on-line platforms, manufacturer website), Complemented by audits for assessing the availability of restricted information **Related to information to be provided in other parameters**

Discussion

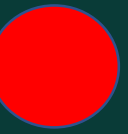|	
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5. Working environment

Classification	Assessment and verification
I. General environment: RU can be performed where the product is in use without special conditions II. Workshop environment: RU cannot be performed in the environment where the product is in use but does not require a production site environment III. Production site environment: RU can only be carried out in an environment that is comparable with the environment in which the product was manufactured	The manufacturer should document the working environment needed to RU the product Information could be provided in manuals and/or other on-line platforms Considered difficult to assess and verify

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6. Level of skills required to undertake the operations
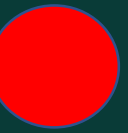
Classification		Assessment and verification
I. The RU process can be carried out by a person without any specific experience or related qualifications (layman) II. The RU process can be carried out by a person with a general knowledge of basic RU techniques and safety precautions (generalist) III. The RU process has to be carried out by a person with specific training and/or experience related to the product category concerned (independent expert)	IV. The RU process has to be carried out by a person who is directly trained and audited by the manufacturer (authorised expert) V. The RU process has to be carried out by the manufacturer VI. The RU process is not feasible with any existing skill	Based on documentation provided by the manufacturer indicating which operations can be performed by the users Information could be provided in manuals and/or other on-line platforms

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14. Safety issues

Classification	Considerations
I. There are no injury risks involved in the repair of the product II. There is some risk of injury during the repair process, so that the repair cannot be undertaken by the consumer III. There is a high risk of injury during the repair process, so that the repair cannot be undertaken by non-authorised repairers	To keep alone or merge with other parameters (working environment) Difficult to assess and verify

15. Availability of OEM qualified service engineers

Classification	Considerations
I. The manufacturer provides support of OEM qualified service engineers at any time II. The manufacturer provides support of OEM qualified service engineers during the warranty period III. The manufacturer does not provide support of OEM qualified service engineers	To keep separated or integrated in other parameters (level of skills)

16. Ease of restoring to full working condition after repair

Classification	Considerations
I. The product functions as before, with no or minimal loss of quality and aesthetics II. The product functions as before, however there is some loss of quality and/or aesthetics III. The product does not function as before	Guarantee from the manufacturer that the product will function as before after any type of RU operation is performed Difficult to assess and verify

Discussion

1. Disassembly sequence	9. Availability and ease of installation of software and firmware
2. Type, number and visibility of fastenings and connectors	10. Availability of information (e.g. repair and/or upgrade manuals, exploded diagrams)
3. Tools needed (availability, complexity, cost)	11. Guarantee issues
4. Ease of access to parts	12. Return models
5. Working environment (e.g. home, professional repair site, manufacturing plant)	13. Data transfer and deletion
6. Level of skills required to undertake the operations	14. Safety issues
7. Provision of diagnostic support and interfaces	15. Availability of OEM qualified service engineers
8. Availability of spare parts	16. Ease of restoring to full working condition after repair

Rating of the parameters

Classes → Score (and/or pass/fail)

Normalised Score = P_i / P_{max}

- P_{max} is the score corresponding to the best classification achievable for the product group

- P_i is the score corresponding to the class of the analysed product

Discussion

Aggregation and reporting options
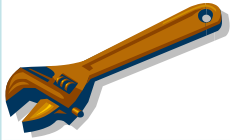
Aggregation and reporting

Aggregation options:

1. **Separate reporting** of key parameters
2. Aggregation in **1 index** for product design and/or **1 index** for service support
3. Aggregation in **2 indices**
4. Aggregation in **1 overall index**

Issues: transparency, understandability, interpretation and coverage, weighting, value choices/judging, trade-offs

➔ **Hybrid: minimum requirements + rated parameters**

Aggregation and reporting

Reporting options:

1. Binary (pass/fail)

2. Traffic lights

3. 0-5 stars (or spanners, wrenches, …)

4. Alphabetic (A-to-X)

5. Number (e.g. 1-to-10)

Aggregation and reporting

Reporting options:

1. Binary (pass/fail)

2. Traffic lights

3. 0-5 stars (or spanners, wrenches, ...)

4. Alphabetic (A-to-X)

5. Number (e.g. 1-to-10)

Discussion points

1. Which of the following **options** is technically preferable?

    - **Binary system** based on a selection of pass/fail requirements, indicating if the product is reparable or not

    - **Scoring framework** based on a selection of scoring requirements, indicating how much a product is reparable and allowing trade-offs between requirements

    - **Hybrid system** composed of both minimum and scoring requirements

2. Which parameters should be considered as **minimum requirements** and which ones should be **rated/weighted**?

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- Part I: Policy context
- Part II: Towards a Scoring System on Reparability: key aspects for a generic scoring system

  - *Approach, tools & studies, key parameters*

  - *Priority parts of products*

  - *Classification, rating, assessment and verification*

  - *Aggregation and reporting options*

- **Part III: Towards a Scoring System on Reparability: Product-specific aspects (laptops, vacuum cleaners, washing machines)**

Initial analysis of products

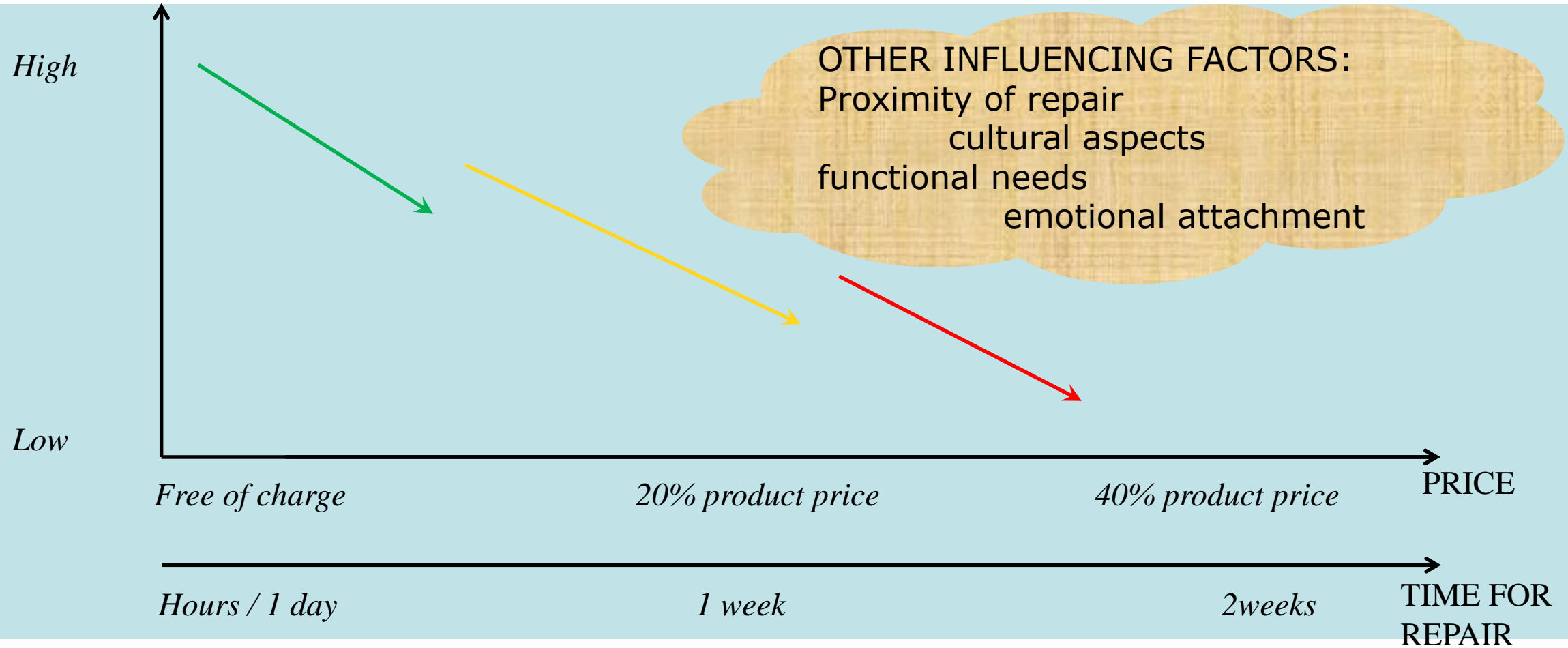General Approach

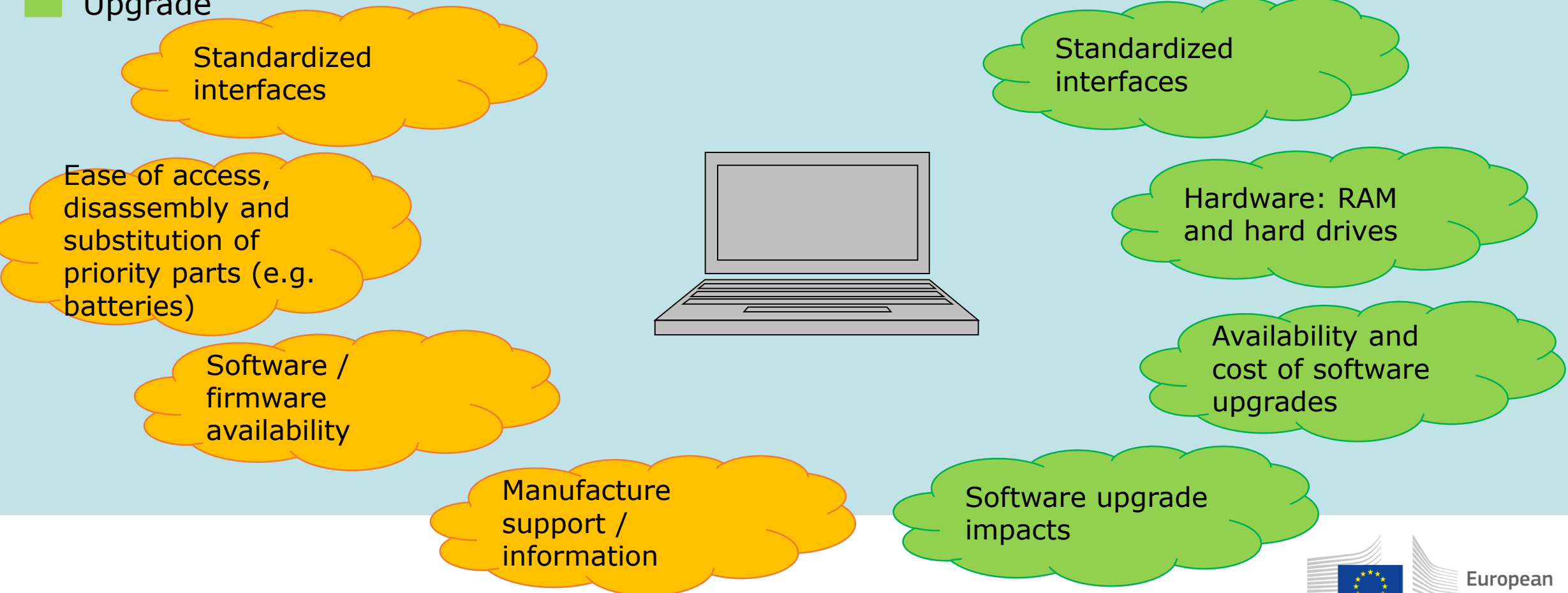**To be tailored at product specific level**

→

❖**Laptops**

❖**Vacuum cleaners**

❖**Washing machines**

WILLINGNESS TO REPAIR

OTHER INFLUENCING FACTORS:
Proximity of repair
cultural aspects
functional needs
emotional attachment

High

Low

Free of charge   20% product price   40% product price   PRICE

Hours / 1 day   1 week   2weeks   TIME FOR REPAIR

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Reparability and upgradability of laptops: factors of influence

Repair (yellow)

Upgrade (green)

Standardized interfaces

Ease of access, disassembly and substitution of priority parts (e.g. batteries)

Software / firmware availability

Manufacture support / information

Standardized interfaces

Hardware: RAM and hard drives

Availability and cost of software upgrades

Software upgrade impacts

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Specific needs to include in the system to assess reparability / upgradability

■ Repair
■ Upgrade

Ease of access (e.g. battery)

Modularity

Perceived obsolescence
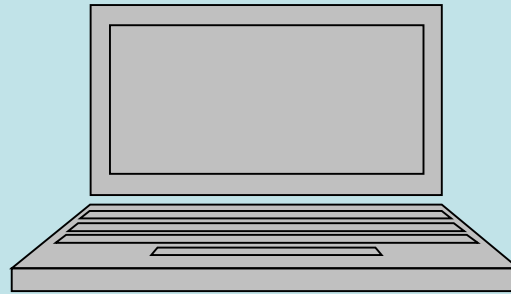
Costs of upgrade

Availability and cost of software upgrades

Ease of access internal parts (Hard drives and RAM

Amounts of extraction slots

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Reparability and upgradability of vacuum cleaners: factors of influence

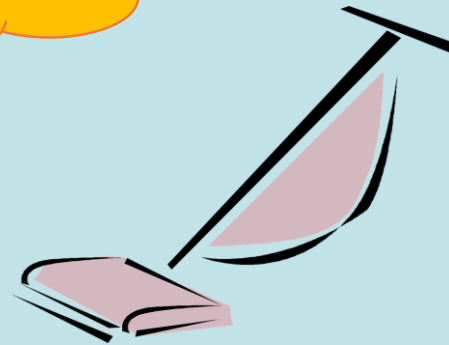Repair

Upgrade

Ease of access, disassembly and substitution

Availability and costs of spare parts

Interoperability and standardized components

Complexity and safety of the product

Software/firmware upgradability for robot vacuum cleaner.

In general not considered very relevant for this product group

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Specific needs to include in the system to assess reparability / upgradability

Repair

Upgrade
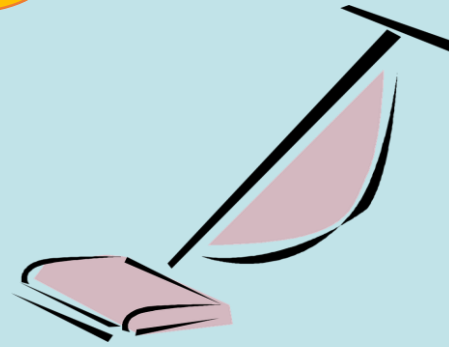
Ease of access of parts / tools needed

Availability and price of spare parts

Priority parts: at least motor and hose

For robot vacuums, priority parts include software/firmware.

Software/firmware upgradability for robot vacuum cleaner.

In general not considered very relevant for this product group

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Reparability and upgradability of washing machines: factors of influence

Repair
Upgrade

Priority parts (e.g. drum, control panel)

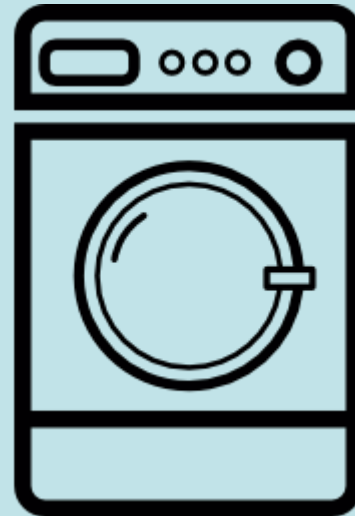Diagnostic tools / availability of information

Cost and time of repair

Ease of access of parts / tools needed

Standardized components

Modularity / standardisation of interface

In general not considered very relevant for this product group

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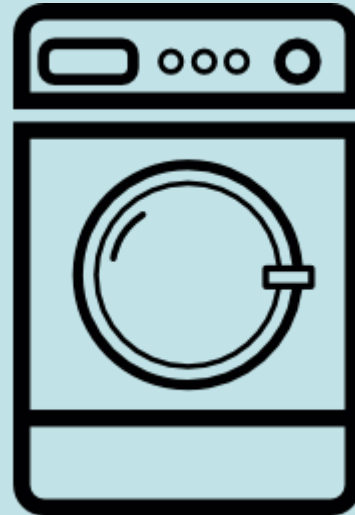# Specific needs to include in the system to assess reparability / upgradability

■ Repair
■ Upgrade

Priority parts (e.g. drum, control panel)
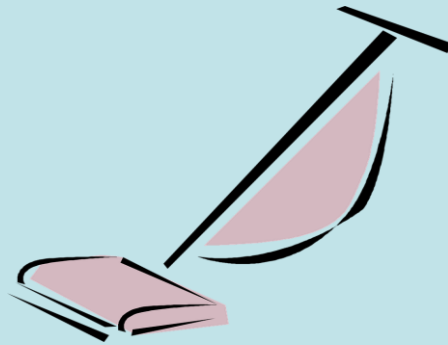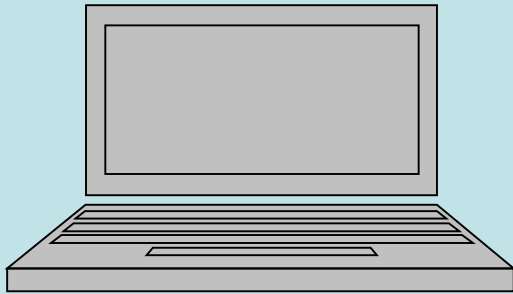
Availability and costs of spare parts

Ease of access, disassembly and substitution (brushes, bearings)

In general not considered very relevant for this product group

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Discussion

- Preliminary indications gathered. Further input wanted to shape the general approach at product specific level

- Oral or written feedback welcome!

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Thanks for
your attention

Functional Mail Box:

JRC-B5-REPAIRSCORE@ec.europa.eu

Study website:
http://susproc.jrc.ec.europa.eu/ScoringSystemOnReparability/contactus.cfm

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