European Commission

Consumer study on the impact of reparability information formats on consumer understanding and purchase decisions

Final report

Followed by the Executive summary

April 2020

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1. Introduction

1.1. Study purpose

The EU Ecodesign Directive[1] and the Energy Labelling Regulation[2] aim to improve the environmental performance of products by establishing minimum design requirements and by obligating the provision of consumer information related to a product's energy efficiency and other environmental and performance characteristics. The EU Circular Economy Action Plan[3] and Ecodesign Working Plan 2016-2019[4] aim to promote the transition to a more circular economy through a series of measures that cover the whole life cycle of a product. In those documents, the Commission indicated their intention to explore more systematically the possibility of establishing ecodesign and energy labelling requirements related to reparability, durability, and upgradability.

The 2018 Behavioural Study on Consumers' Engagement in the Circular Economy[5] found that information on reparability and durability of products steers consumer choice towards more reparable and durable products. In this study, a reparability indication was already tested (see Figure 1.1). The Commission Joint Research Centre has recently conducted a technical study on the analysis and development of a scoring system to indicate reparability.[6] This scoring system enables the calculation of one overall reparability score, based on performance on several parameters (e.g. availability of spare parts, ease of disassembly, etc.).

The present study focuses on the communication of reparability information to consumers. Introducing mandatory product reparability information should not only help consumers to easily compare products on this aspect and identify well-performing products, but should also incentivise producers to take reparability of their products more closely into account during design and manufacturing.

More specifically, the primary aim of the present study is to provide insight into the most effective way of communicating reparability information in terms of achieving optimal consumer **understanding** of the information and guiding **choices** towards better performing option(s). This is achieved by examining the effects of different reparability information designs on consumer understanding of the reparability information and on consumer choice (processes). In addition, we examine whether communicating product reparability information can promote **repair behaviour**: when

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[1] 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.

[2] Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU.

[3] COM(2015) 614 'Closing the loop - An EU action plan for the Circular Economy'.

[4] COM(2016) 773 'Ecodesign Working Plan 2016-2019'.

[5] London Economics consortium (2018). *Behavioural Study on the Consumers' Engagement in the Circular Economy*.
https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf.

[6] JRC Technical Reports (2019). *Analysis and development of a scoring system for repair and upgrade of products*.

consumers see that a product is easy to repair, are they more likely to consider repairing it if it breaks?

Figure 1.1. Example of previously tested reparability indication

The current study focuses on three aspects of reparability information:

1) *Icon format*: the study investigates which repair icon is most effective, such as repair tools or a depiction of the repair process.[7]
2) *Scale format*: the study investigates which scoring system is most suitable to indicate performance, such as a letter scale, numeric scale, or traffic light system.
3) *Information vehicle*: the study investigates the most suitable location of the reparability information, i.e. as part of the energy label or as separate information.

1.2. Study overview

The study was carried out in two steps. First, a **qualitative pre-study** was conducted in which both consumers and visual communication and labelling experts were consulted. This qualitative pre-study and its findings are discussed in more detail in Chapter 2. Based on the pre-study, the icon alternatives were narrowed down and optimized for consumer testing within a quantitative **large-scale online experiment**. Here, consumer understanding, choice (processes), and repair intentions in response to the different icon alternatives were systematically studied in a consumer survey in **7 Member States** with samples of about **1400 respondents** per Member State (9929 respondents in total).

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[7]   Initially, another aim of this study was to test different *information formats*. However, as discussed during the Consultation Forum on a scoring system for reparability (5 July 2019, Brussels), and in consultation with the Client, it was decided to use a level-based approach, with four reparability levels, from A (easy to repair) to D (difficult to repair), for all reparability indications tested in the study.

2. Qualitative pre-study

In this chapter, we briefly summarise the methodology and results of the qualitative pre-study. This pre-study consisted of focus groups with consumers as well as expert consultations. For a more elaborate overview of the pre-study, we refer to the complementary report "Results focus groups and expert consultations".

2.1. Methodology

Focus groups

Two focus groups were organised: one in the Netherlands (Amsterdam) and one in Germany (Dresden). Given that Dresden is situated in the East of Germany (former DDR), this provides some geographical spread, and hence, more varied insight into consumer responses to reparability information.[8] A detailed step-by-step manual and workbook were developed to ensure that all relevant information was obtained. As a starting point, a reparability indication similar to the one presented in Figure 1.1 was used (i.e. representing crossed "repair tools").

The focus group focused on three aspects of reparability information:
- Consumer responses regarding the *icon format*, including how the reparability icon should be visually presented and whether additional information or explanation is necessary;
- Consumer responses regarding the *scale format*: which scoring system is most suitable to indicate performance, such as letter scales, numeric scales, or star ratings systems;
- Consumer responses regarding the *information vehicle*: what is a suitable location for reparability information, e.g. as separate label or as part of the energy label.

More specifically, the focus group explored how consumers interpret (an icon indicating) reparability and what they associate it with, whether they find a reparability indication useful and important, what scoring system might be most effective, how understanding might be improved, where reparability information might be best provided, when and why consumers (do not) repair products, and which trade-offs consumers make between reparability and energy efficiency.

Expert consultations

Consultations with visual communication and labelling experts were held.[9] The experts were consulted on how the reparability indication might be (mis)understood and how it might be improved to facilitate consumer understanding.

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[8] Of course, given that only two focus groups were held, the results cannot automatically be considered to also reflect perceptions in other EU regions. The large-scale quantitative online experiment, which was implemented in seven Member States with adequate geographical coverage, better reflects EU-wide perceptions.

[9] Consultations took place via phone, e-mail, and/or face-to-face meetings. Experts that were consulted included Prof. dr. Fons Maes, Tilburg University, the Netherlands; Prof. dr. Simone

2.2. Results

This section briefly summarises the results of the pre-study that were used for designing the online experiment.

Regarding the *icon format*, it appeared that the "repair tools" icon was often associated to "DIY" or installation steps (e.g. the tools needed for assembly or reparability) instead of reparability per se. Further, the "crossed" tools were sometimes misinterpreted by consumers as "do not use". Similarly, the experts indicated that consumers should ideally be explained the meaning of the icon (e.g. through **information campaigns**), that one should **avoid crosses** within the icon, and that **other icons** might better convey the intended meaning (e.g. a "repair worker").

Regarding the *scale format*, the ABCD-indication was sometimes spontaneously linked to the steps to take or type of tools needed, instead of the ease of repair. Some focus group members also misinterpreted the direction of the score: a high reparability score was sometimes interpreted as meaning low quality or low reparability. Experts also suggested that (some) consumers could misinterpret an "A" as meaning that a product has a *low* reparability score, since for example on the energy label, an "A" indicates *low* energy consumption. These issues might be remedied by (1) combining letter scales with intuitive **colour-coded scales** to provide easy-to-process information about the direction of the scale[10], and (2) **adding a brief explanation** regarding the meaning of a better and worse score (easy vs. difficult to repair). Here, an **information campaign** that clarifies the direction and meaning of the scale is expected to be helpful as well. Finally, the preferred *amount of categories* used in the scale was explored; consumers indicated that a substantially higher or lower number than four is not desirable. In the focus group in Germany a three-point scale was preferred; here, respondents saw added value of having a middle category.

Regarding the *information vehicle*, some consumers tended to better understand the indication to represent reparability when it was presented on the energy label; however, others then linked it to energy efficiency. Consumers disagreed on the optimal vehicle for reparability information; on the one hand, the **energy label** was considered an appropriate vehicle and may provide more context. On the other hand, the energy label was considered too crowded already to add more information. **Alternatives for positioning** the reparability indication that were proposed include on the product package, on the product, or on the shelf (i.e. near other product information).

Finally, the pre-study suggested that consumers may have many different interpretations of what exactly constitutes a product that scores well on reparability (e.g. spare parts are locally available, the repair is cheap, all parts can be replaced,

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Pettigrew, The George Institute for Global Health, Australia, and Prof. dr. Michael Siegrist, ETH Zurich, Switzerland.

[10] Consumers in the focus group in Germany noted that colour-coding may only be helpful when presenting the reparability indication as a separate label. On the energy label, presenting a colour-coded indication in addition to the colour-coded energy efficiency scale might create confusion and contribute to further crowding of the energy label.

etc.), and are aware of trade-offs in repair vs. replace decisions that might prevent them from choosing to repair a broken product and instead buy a new one (e.g. waiting time associated with repair, repair costs, lower risks with new products). Notably, the focus groups also suggested that consumers do *not* seem to believe that a good reparability score is a guarantee for a more durable product.

Alternatives to be tested in the quantitative study

Findings of the pre-study offered valuable insight into manners in which the reparability indication could be optimised. For example, results indicated that the "repair tools" icon could be improved by presenting the tools *in parallel*. In addition, it could be wise to assess alternative reparability icons to see if they better convey the intended meaning of the icon. Promising alternative icons could be those representing a **repair worker**, the **repair process**, or the parts of a product that frequently require repair (**priority parts**). The pre-study also suggested that **colour-coding** (for labels that are not presented on the energy label) as well as **explanatory text** (e.g. "easy to repair" and "difficult to repair") regarding the meaning of the reparability scale could substantially improve understanding. In addition, the pre-study offered some insight into consumer preferences regarding alternative locations of the label (placement near **other product information**).

The final alternatives that were tested in the quantitative study were:

1. Regarding **icon format**:
   a. an icon depicting (parallel) repair tools;
   b. an icon depicting a repair worker;
   c. an icon depicting the repair process;
   d. an icon depicting priority parts of a product.
2. Regarding **scale format**:
   a. a black ABCD scale (in line with the house style of the EU energy label);
   b. a colour-coded ABCD scale;
   c. a colour-coded ABCD scale with textual end labels ("easy" and "difficult").
3. Regarding **information vehicle**:
   a. as part of the EU energy label;
   b. as separate information.

When placed on the EU energy label, the reparability indication must conform to the EU energy label house style. The icon must be relatively simple (due to space limitations and to avoid an overly crowded label) and the scale must be a black letter scale. The reparability indication that was tested on the EU energy label adhered to these rules. However, the effectiveness of such "simple" icons[11] in guiding choice behaviour might be strongly improved when the meaning of the icon is explained to consumers. Therefore, it was also tested to what extent **pre-informing** consumers about the meaning of the reparability indication (vs. not) on the energy label increases its effectiveness. For products that were included in the study but that did not have an energy label (i.e. smartphones) the effect of providing pre-information was tested as

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[11] Note that the word "simple" refers to the simplicity of the graphic design, not to the ease of comprehension (icons with simple designs can be difficult to understand).

well, since pre-informing consumers about the reparability indication should also increase its effectiveness when the indication is presented as a separate label.
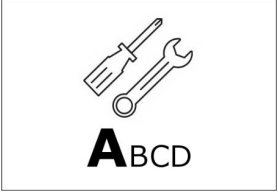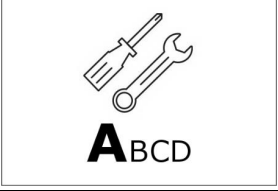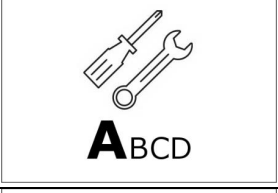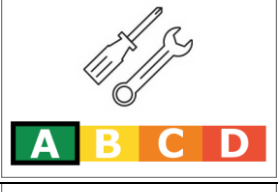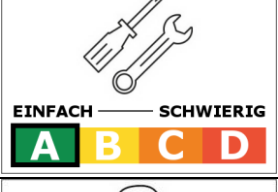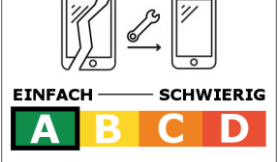
Where appropriate, the reparability indications were adjusted to the products that were included in the study (smartphones, TVs, and washing machines). Table 2.1 provides an overview of the conditions that were tested in the online experiment. Because there is no EU energy label for smartphones, it was tested instead whether adding an EU logo (EU flag) increases the effectiveness of the reparability indication (see Figure 2.1). This logo is also displayed on the EU energy label and may function as a trust mark.[12]

Together, these conditions allow us to examine:
- Whether reparability information is effective in guiding choices towards more reparable product alternatives (Table 2.1: *C1-C8 vs. C9*);
- If the level of comprehension/use of reparability information depends on the **location** where it is presented: on the energy label or as a separate small label on the product information display (Table 2.1: *C1 vs. C3, for televisions and washing machines*);
- If the level of comprehension/use of reparability information depends on the presence of the **EU logo** (Table 2.1: *C1 vs. C3, for smartphones*);
- To what extent **pre-informing** consumers about the availability and meaning of the reparability indication prior to exposure increases comprehension/use of the information (on the energy label; Table 2.1: *C1 vs. C2*);
- If the use of a **colour-coded** scale (outside the energy label) facilitates comprehension/use of the reparability information (Table 2.1: *C3 vs. C4*);
- If the use of **textual end labels** ("easy" and "difficult") for the reparability scale aid comprehension/use of the reparability information (Table 2.1: *C4 vs. C5*);
- If a **more detailed icon** aids comprehension/use of the reparability information (Table 2.1: *C5 vs. C6, C7 and C8*);
- Which **detailed icon** most clearly represents reparability: a repair worker, repair process ("from broken to whole"), or showing priority parts (Table 2.1: *C6 vs. C7 vs. C8*).

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[12] See e.g. Atkinson, L., & Rosenthal, S. (2014). Signaling the green sell: The influence of eco-label source, argument specificity, and product involvement on consumer trust. *Journal of Advertising*, *43*(1), 33-45.
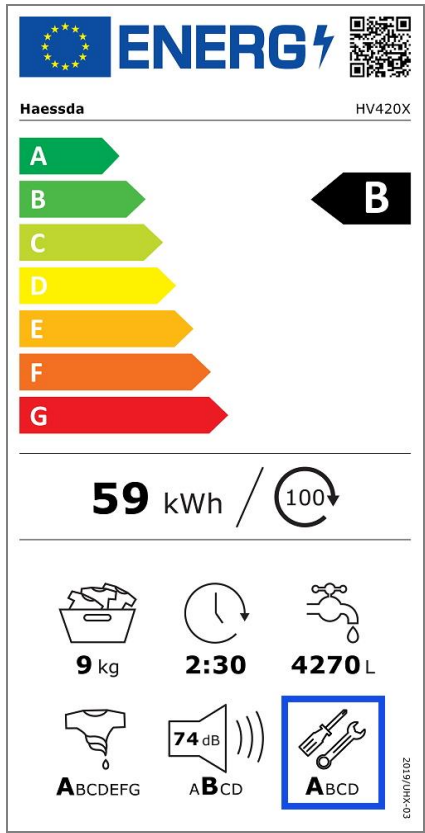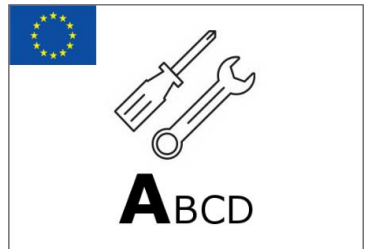
Table 2.1. Types of reparability information included in the online experiment

Condition number	Icon format	Scale format	Information vehicle	Pre-information	Design
C0	NA (control group)	NA	NA	No	--
C1	Repair tools	Energy label style	On energy label/with EU flag	No	
C2	Repair tools	Energy label style	On energy label/with EU flag	Yes	
C3	Repair tools	Energy label style	On product information display	No	
C4	Repair tools	Colour-coded	On product information display	No	
C5	Repair tools	Colour-coded + textual end labels	On product information display	No	
C6	Repair worker	Colour-coded + textual end labels	On product information display	No	
C7	Repair process	Colour-coded + textual end labels	On product information display	No	

Condition number	Icon format	Scale format	Information vehicle	Pre-information	Design
C8	Priority parts	Colour-coded + textual end labels	On product information display	No	

Note – The designs reflect examples. For conditions C5-C8, the text indicating the meaning of the scale was country-specific. For conditions C7 and C8, the designs for smartphones are shown in the table; however, in the consumer test, the reparability icons were product-specific.

Figure 2.1. EU logo as trust mark

On energy label	As separate label

3. Quantitative study: online experiment and survey

In this chapter, the content of the online questionnaire is first briefly outlined, followed by a description of the sample. After this, the results of the online experiment are described. The complete online questionnaire is provided in Appendix A.

3.1. Methodology

Each respondent was assigned to one of the conditions presented in Table 2.1; i.e. a respondent was only exposed to *one type* of reparability indication. Each respondent completed the product choice task for all three products of interest (smartphones, TVs and washing machines)[13]; the remainder of the measures were completed for one of the three product types (randomly assigned).

Respondents completed the following tasks/measures (in this order):

1. **Product choice task**: Respondents were presented with three product sets (smartphones, TVs, and washing machines) consisting of six products each. The order of presentation of the product sets was randomised. Each product within a set carried realistic product information such as price, energy efficiency, quality-related information, etc. Respondents could "zoom in" on this product information to inspect it. Depending on the condition, each product also carried a reparability indication (with scores ranging from A-D), which was presented alongside the product information label (or on the energy label) (see Figure 3.1). This way, it could be tested if (and which) reparability indications steer choice towards to the better performing (easier-to-repair) option.

2. **Repair decision task**: Respondents read the scenario that their smartphone/TV/washing machine was broken and that they needed to make a decision to either have the product repaired or buy a new product (second-hand, same model, or newer model). Prices for each option were provided. Buying a newer model was most costly (approx. 103% of the original purchase price), followed by buying a new, similar model (approx. 90% of the purchase price), buying a second-hand similar model (approx. 70% of the purchase price), and having the product repaired (approx. 25% of the purchase price). A reparability label was presented on the broken product (with either an "A" or "D" score). It was examined if a better reparability score promotes repair decisions, and whether this differs depending on which reparability indication is used.

3. **Attention**: Respondents were presented the reparability indication in isolation and asked whether they had looked at it when making product choices.

4. **Understanding**: Respondents were presented the reparability indication in isolation and were asked whether they understood the indication and found it clear, both before and after the intended meaning had been explained to them

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[13] These products were selected in consultation with the Client. For these products, reparability is a relevant consideration, they are widely used in the EU, and vary in purchase price and whether or not they carry an energy label.

(subjective understanding). They also completed a multiple-choice question about the meaning of the icon (objective understanding of the icon). Finally, they completed a *product identification task* in which they were again presented with one of the product sets and asked to identify the best and worst reparable product (objective understanding of the scale).

Figure 3.1. Examples of products carrying reparability information
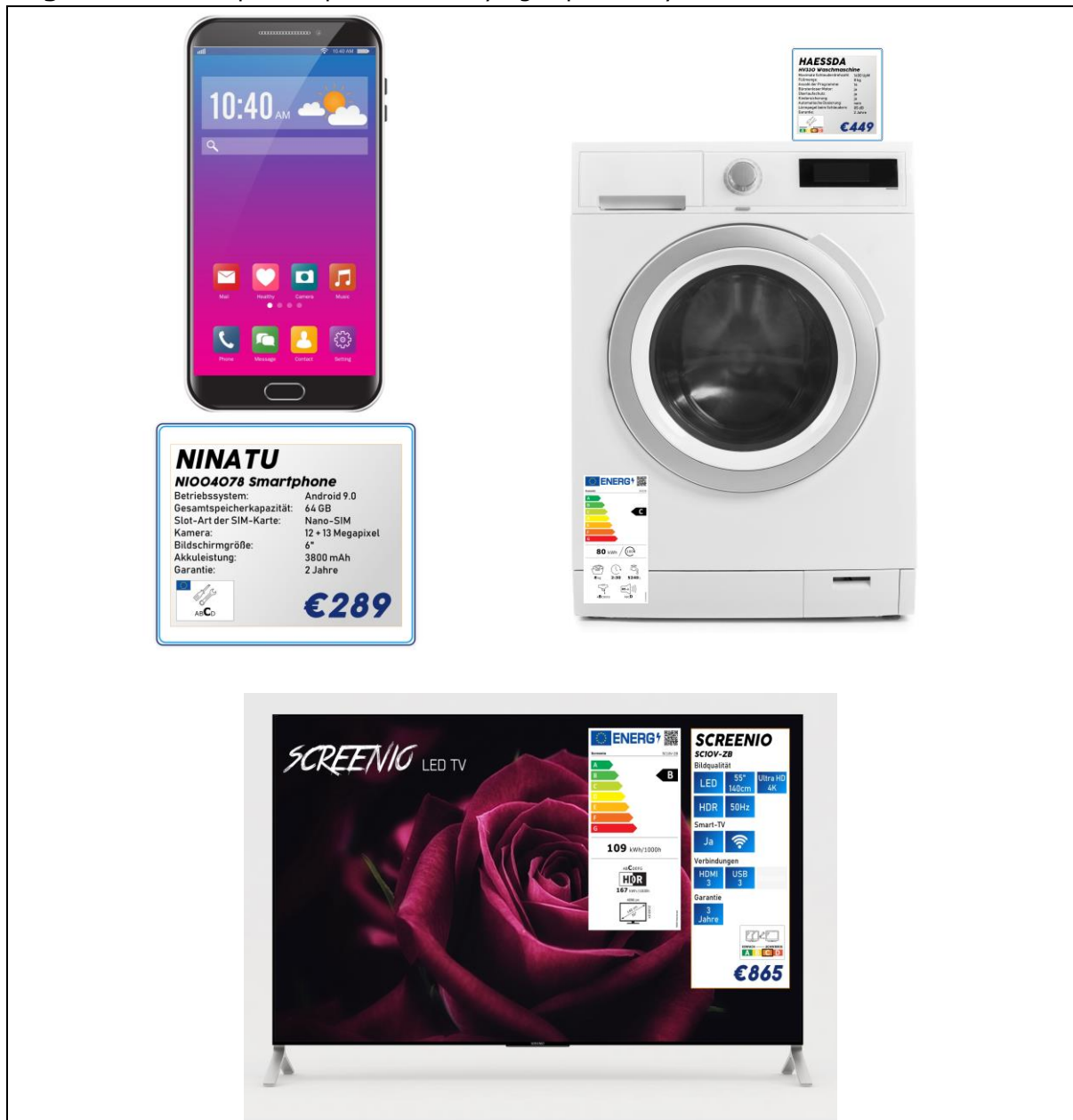
Note – Respondents could zoom in on the product information to inspect it**.**

5. **Importance**: Respondents were shown the reparability indication in isolation and were asked to what extent they found the reparability information important when making product choices regarding smartphones/TVs/washing machines.
6. **Associations**: Respondents were presented the reparability indication in isolation and received a multiple-choice question on their beliefs regarding what a good

score indicates (e.g. the product is guaranteed to last long, consumers can easily repair the product themselves, spare parts are readily available, etc.). For respondents who saw the "priority parts" icon, a follow-up question was asked regarding the meaning of the icons depicting the priority parts.

7. **Willingness to pay for better reparable products**: Respondents were presented with two identical pictures of smartphones/TVs/washing machines, with one scoring "A" and the other scoring "D" on reparability. They were informed that the products only differed in how easy or difficult they were to repair. Next, they were asked how much they would pay for each of the smartphones. The purchase price of the product that was difficult to repair was provided as a reference point. This way, it could be assessed whether consumers are willing to pay more for a product that is easier to repair.

8. **Post-experiment questionnaire**: Finally, respondents completed a post-experiment questionnaire to obtain information about the relative importance of product reparability (vs. other product characteristics), general and past repair vs. replace behaviours, general circular economy-related behaviours, whether or not they had recently seen a reparability information campaign, and socio-demographic characteristics.

3.2. Sample description

The experiment was conducted online in seven countries: Germany, Czech Republic, Italy, the Netherlands, Portugal, Romania and Sweden.

Table 3.1. Sample description: socio-demographics

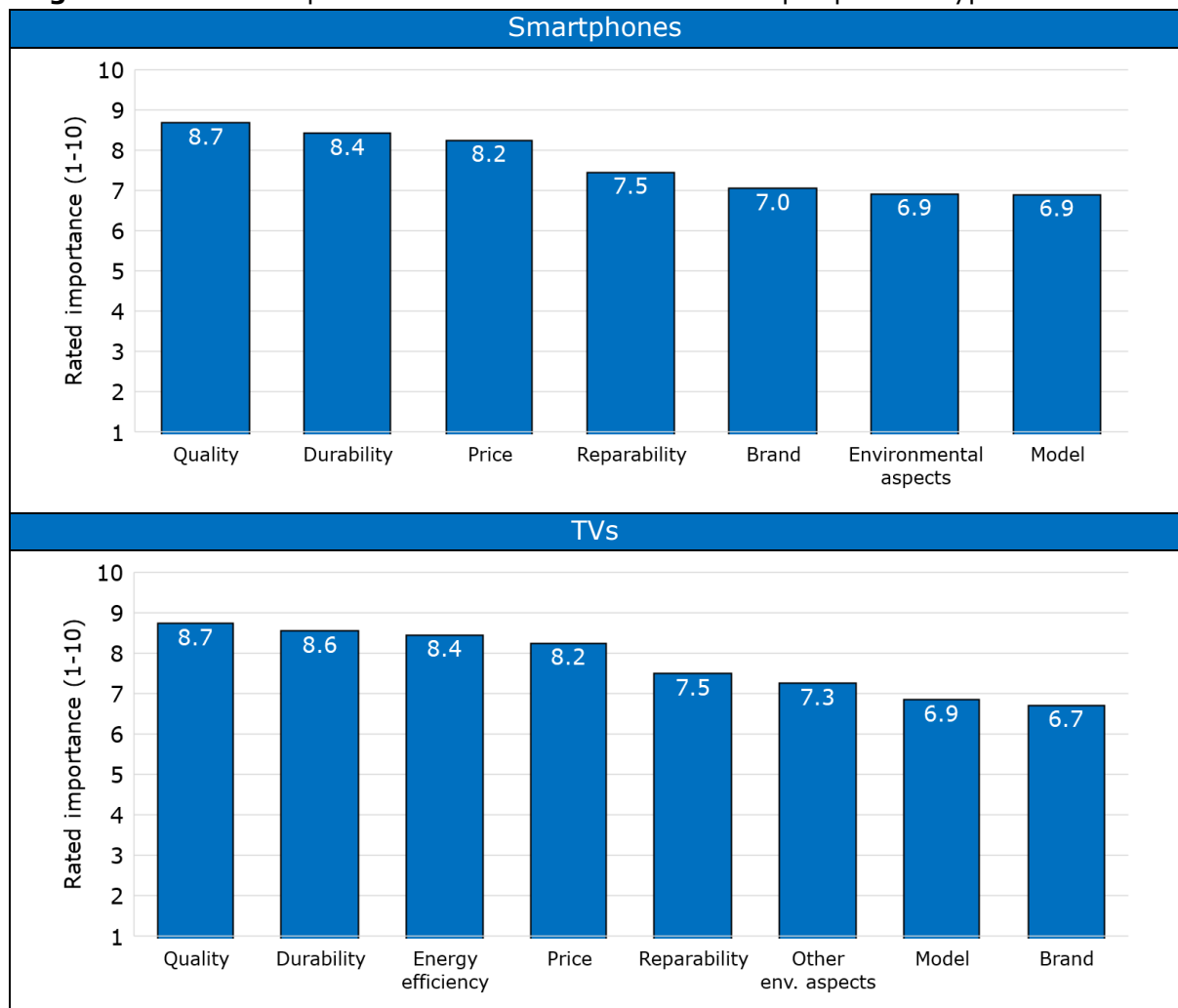|	Total	DE	CZ	IT	NL	PT	RO	SE
Sample size	9929	1418	1428	1414	1410	1427	1424	1408
Gender								
Male	49,5%	50,4%	50,1%	49,7%	49,5%	48,0%	50,0%	48,4%
Female	50,6%	49,7%	49,9%	50,3%	50,5%	52,0%	50,0%	51,6%
Age								
Age: 18-34	28,4%	29,7%	28,6%	25,9%	28,2%	27,3%	29,4%	30,1%
Age: 35-54	42,0%	40,6%	42,4%	44,3%	41,1%	43,2%	41,9%	40,1%
Age: 55-70	29,6%	29,7%	29,0%	29,8%	30,7%	29,5%	28,7%	29,8%
Education								
Elementary school or less	3,2%	6,1%	6,4%	2,5%	0,9%	0,4%	0,4%	5,7%
Some high school	9,3%	8,1%	31,9%	6,2%	3,0%	6,3%	1,5%	7,9%
Graduated from high school	37,4%	41,4%	38,7%	49,1%	41,8%	35,7%	21,6%	33,4%
Graduated from college/university	28,7%	19,0%	13,5%	13,5%	37,2%	36,4%	46,8%	34,5%
Post-graduate degree	16,3%	17,4%	6,1%	25,3%	10,0%	15,4%	27,6%	12,1%
Studying full-time	3,0%	4,5%	2,6%	2,1%	3,6%	3,9%	1,0%	3,5%
Financial situation[14]	2,8	2,7	2,9	3,1	2,5	3,1	2,9	2,5

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14 Financial situation ("*Would you say that making ends meet every month is…*") measured on a 5-point scale with 1 = *very difficul*t to 5 = *very easy*.

In total, 9929 respondents completed the experiment (between 1408 and 1428 respondents per country). Table 3.1 provides a description of the respondent sample, in total, and per country. The following section provides insight into the general attitudes and behaviour related to repairing products of the respondent sample.

3.2.1. Importance of reparability in purchase decisions

Respondents were asked to rate the importance of different product characteristics when making purchase decisions regarding smartphones, televisions, or washing machines. The results are provided in Figure 3.2 (country-specific results are presented in Appendix C). Across the three product types, respondents consider quality, durability, energy efficiency (where applicable), and price as most important, followed by reparability.

Figure 3.2. Rated importance of different characteristics per product type[15]

Smartphones

| Quality | Durability | Price | Reparability | Brand | Environmental aspects | Model |
| 8.7 | 8.4 | 8.2 | 7.5 | 7.0 | 6.9 | 6.9 |

TVs

| Quality | Durability | Energy efficiency | Price | Reparability | Other env. aspects | Model | Brand |
| 8.7 | 8.6 | 8.4 | 8.2 | 7.5 | 7.3 | 6.9 | 6.7 |

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[15] Importance of product features was measured on a scale from 1 (not at all important) to 7 (extremely important). Responses were rescaled to 1-10 to facilitate interpretation.

Figure 3.2. *Washing machines* chart showing Rated importance (1-10): Quality 8.7, Durability 8.7, Energy efficiency 8.7, Price 8.2, Reparability 7.9, Other env. aspects 7.5, Model 6.7, Brand 6.6
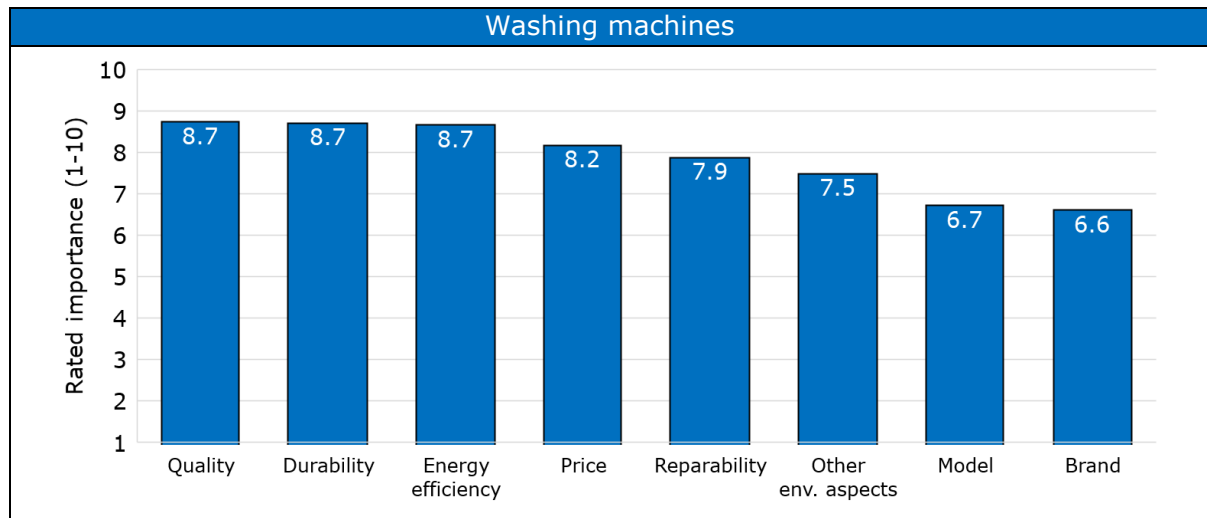
3.2.2. General repair/replacement behaviour and perceived barriers

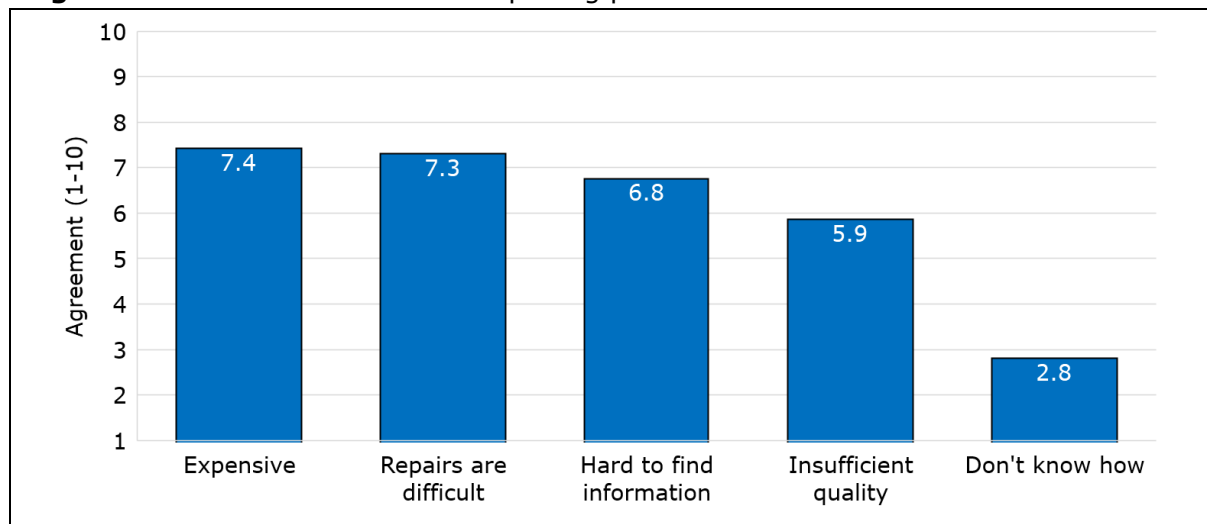Respondents were asked what they usually do if an appliance breaks (and the warranty period has expired): replace it with a new one without first considering a repair, or first considering whether the product can be repaired. Overall, 22% of the respondents indicate that they usually replace it with a new one, while the remainder **(78%) indicated they first consider a repair**.

Figure 3.3. Perceived barriers to repairing products[16]

Chart showing Agreement (1-10): Expensive 7.4, Repairs are difficult 7.3, Hard to find information 6.8, Insufficient quality 5.9, Don't know how 2.8

Respondents were also asked to rate to what extent they experience certain **barriers to repairing** products: whether they think repairs are expensive, whether they think that products nowadays are difficult to repair, whether they think it is hard to find information about repairs, whether they think that the quality of repairs is insufficient,

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[16] Agreement with statements (e.g. "Repairs are usually expensive" and "It is difficult to find information about the reparability of products") was measured on a scale from 1 (completely disagree) to 7 (completely agree). Responses were rescaled to 1-10 to facilitate interpretation.

and whether they know how to get products repaired/repair products themselves.[17] A high price for repairs, a difficulty to repair products nowadays, and a difficulty to find information were perceived as the most important barriers (see Figure 3.3).

3.2.3. Prior repair/replace behaviour

To gain insight into actual past repair vs. replace behaviours, respondents were presented with a list of 14 products and indicated whether it happened, in the last five years, that one of these products broke down and they had to make a decision to replace or repair the product.[18] Next, they indicated the (approximate) purchase price of the product, whether the product broke down within the warranty period, and what they did with the broken product. The results per product are displayed in Appendix C.

Figure 3.4. Prior repair/replace behaviour (product that broke down most recently)
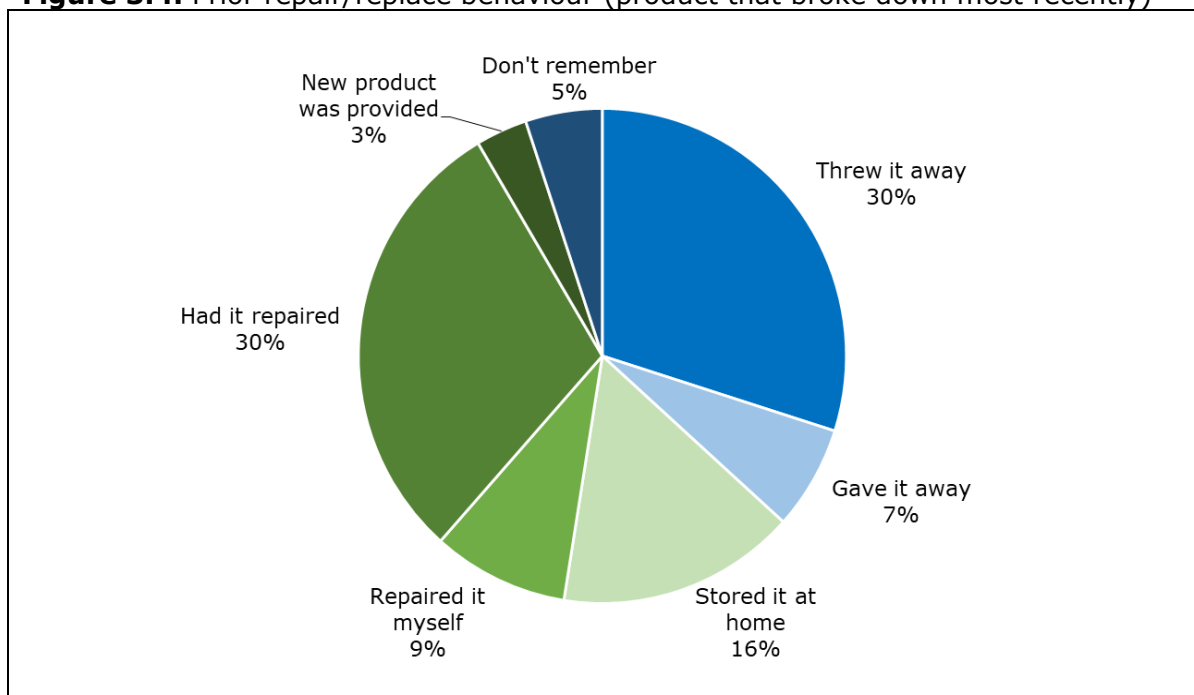
Overall, 87% of respondents indicated that at least one product had become defective over the last five years. The products that broke down most often were smartphones (18%) and washing machines (15%). This mainly occurred outside of the warranty period (81%). When asked what they did with the broken product, **four in ten (40%) respondents had it repaired or repaired it themselves**, almost **one-third (31%) threw it away,** and **16% stored the broken product at home** (see Figure 3.4).

Products that are generally cheaper (coffee machines, vacuum cleaners, printers, and microwaves) were more often thrown away: about half of the respondents did this (49%). These products were also repaired less often (28%).

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17   This last question was reverse-coded.
18   When multiple products had broken down, they were instructed to select the product that broke down most recently.

Among respondents who did not have the product repaired (more specifically, respondents who threw away the product, gave it to somebody else, or stored the broken product at home), the most frequently mentioned **reasons for not repairing** the product were that the repair would have been **too expensive** (29%), the product was **obsolete** (20%), the respondent preferred a **newer model** (17%), or the product **could not be repaired** (16%; see Figure 3.5).

Figure 3.5. Most frequently mentioned reasons for not repairing a broken product[19]
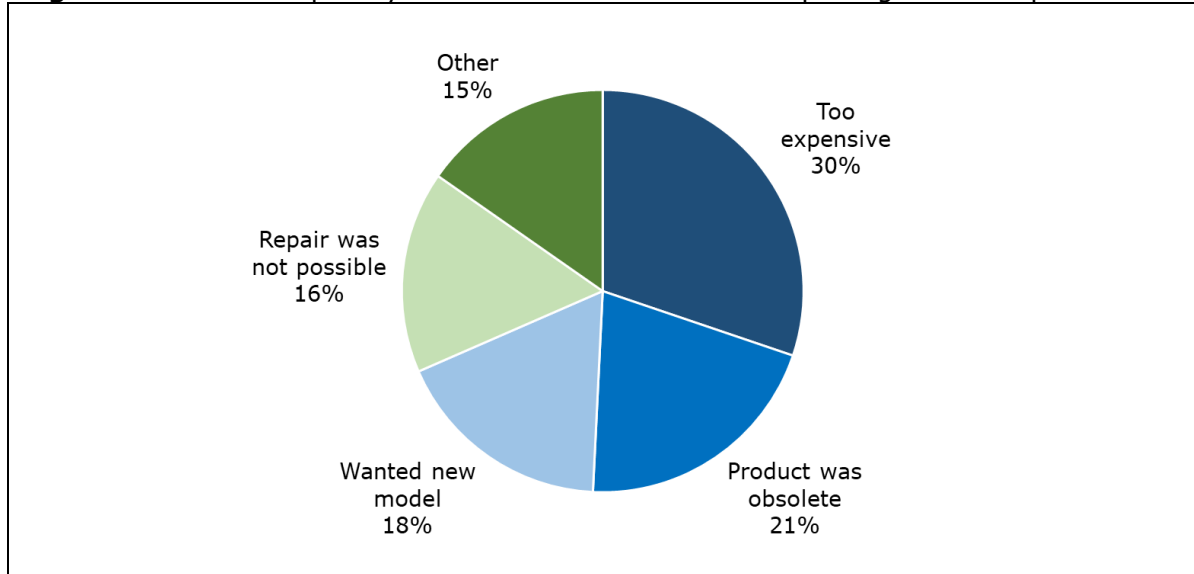
3.3. Results of the experiment

This section presents the results of the experiment. Now, we examine which type of reparability information is most effective across the range of outcome measures included in the study. We first examine the effects of the different reparability indication formats on the key outcome measures, choice behaviour and repair intentions. Subsequently, we examine the underlying processes, and investigate whether and how the information format influences whether the reparability information is (1) looked at, (2) understood, and (3) perceived as important.

3.3.1. Effects on choice behaviour

In the product choice tasks, respondents were exposed to six smartphones, six TVs and six washing machines with product information (see Figure 3.6). They either saw these product assortments with reparability information (one out of eight information alternatives) or the exact same assortments without reparability information (control condition). All product characteristics other than the reparability information alternatives, such as product prices, were kept *constant* across information conditions (i.e. they cannot explain shifts in choice behaviour). Full descriptions of the products in each assortment are provided in Appendix B.

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[19] "Other" includes: "It did not occur to me this was an option"; "I did not know how to repair/where to get it repaired"; "It would have been too much effort/time-consuming"; "The parts/materials required weren't available"; "I did not know how long the product would work after the repair"; "Other, namely…."; "I don't know/don't remember".

Figure 3.6. Example of a product assortment used in the experiment

Note – Products were displayed in random order. Respondents could zoom in on the product information to inspect it.

Choices in the control condition reflect the attractiveness of the products in the absence of reparability information and constitute a baseline against which respondents' choices in the reparability information conditions can be compared. Thus, in order to assess the effectiveness of product reparability information, we examine whether the presence of this information causes a shift in choices towards more reparable products *relative to the baseline*. More specifically, we examine shifts (1) in

the percentage of respondents that selected the product that is easiest to repair (there was one product with reparability class A in each product set), and (2) in the average reparability of the selected products. The latter measure does not only assess shifts in choices towards the *most* reparable (class A) product, but is more generally sensitive to shifts towards more reparable alternatives (also from C to B, for instance).

To be able to calculate the average reparability score of the selected products (per experimental group), more reparable products received higher scores, as follows: A = 4, B = 3, C = 2, D = 1. The scores were then averaged into an average reparability score. For instance, if 20 respondents selected a product with reparability class B, 20 respondents a product with reparability class C and 10 respondents a product with reparability class D, the average reparability score is (20*3)+(20*2)+(10*1))/50 = 2,20. The average reparability score of the selected products can range between 1 (all respondents choose products with reparability class D) and 4 (all respondents choose products with reparability class A).

In the next section, we investigate which reparability indication(s) is/are effective in guiding choices towards more reparable product alternatives (relative to the baseline). In addition, we systematically examine effects of the **icon format** (repair tools vs. repair worker vs. repair process vs. priority parts), **scale format** (with vs. without colour-coding, and with vs. without textual end labels), **information vehicle** (inside vs. outside the energy label, and with vs. without EU logo), and **pre-information** (present vs. absent). Table 3.2 provides the results.

Box 3.1. How to read the results tables

> *Throughout this chapter, descriptive results (i.e. mean scores and percentages) per information condition are presented in tables. The green shading helps to identify **effective** reparability information. The superscripts help to **further discriminate** between more and less effective information alternatives.[20] This is further explained below.*
>
> **Shading of cells**
>
> *All information conditions that **perform (statistically significantly) better than the no information condition (the baseline)** are shaded **green.***
>
> **Meaning of superscripts**
>
> *In each column, the information alternative with the highest score (mean score or percentage) has superscript "a". Scores with **different** superscripts are **statistically significantly different** from each other (at p < 0,05): the observed difference is highly unlikely to be due to chance (e.g. 35%ᵃ versus 24%ᵇ in Table 3.2, second column). Scores with the **same** letter in their superscript are **not significantly different** from each other: the observed difference could be **due to chance** (e.g. 2,42ᵇ versus 2,39ᵇ in Table 3.2, third column). Some scores have superscripts with multiple letters (e.g. 22%ᵇᶜ in Table 3.2, second column). These fall in between two*

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[20] In this chapter, we report the results of statistical analyses that properly account for the measurement scales of the outcome variables (e.g. linear regression models for continuous outcomes and logit models for binary outcomes). All analyses controlled for the influence of the respondents' age, gender, financial situation, and country.

scores that are significantly different (e.g. 24%[b] and 21%[c]), but are themselves not significantly different from either score. Finally, **bold-faced** scores reflect the information alternative with the highest score as well as other information alternatives that perform equally well (the difference with the best performing alternative is not statistically significant, i.e. the difference may be due to chance).

Presence (vs. absence) of reparability information

We first examine the effectiveness of the reparability information as a separate small label on the product information display (Table 3.2: C3-C8 vs. C0). Green shaded scores in Table 3.2 indicate that the (specific type of) reparability information is effective in guiding choices towards more reparable product alternatives relative to the control condition in which reparability information was absent. The results show that, averaged across the three product types (smartphones, TVs, and washing machines), **all reparability indications are effective in promoting choices for more reparable products**.[21] On average, out of the six products in each assortment, the product with the best reparability class attracted 23% of the choices when reparability information was displayed (C3-C8) versus 18% when this information was absent (a 5%-point increase).
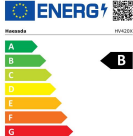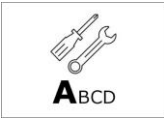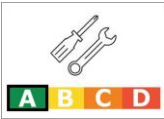
Scale format

Overall, there are no significant differences in effectiveness between the different scale formats. On average, 22% of the respondents selected the most reparable product independent of whether or not the scale was colour-coded and independent of whether or not textual end labels were used (see Table 3.2: C3 vs. C4 vs. C5).

Icon format

The effectiveness of the reparability indication in guiding choices towards more reparable products also did not depend on specific icon format. Averaged across the three product types, 22% of the respondents who were exposed to the simple icon depicting repair tools (C5) chose the most reparable (class A) product. In the groups that were exposed to the more detailed reparability icons, respectively 24% (repair worker), 23% (repair process) and 23% (priority parts) of the respondents selected this product. Differences between these percentages are not statistically significant (see Table 3.2: C5 vs. C6 vs. C7 vs. C8).

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[21] Overall, there are significant differences between reparability indication conditions in the choice for the most reparable product ($\chi^2(8) = 129,12$; $p < 0,001$) and the average reparability of the selected products ($\chi^2(8) = 185,86$; $p < 0,001$).

Table 3.2. Effects of reparability information on product choices

Reparability information		% of respondents that selected the most reparable product (class A)	Avg. reparability of the selected products (score 1 to 4)
C0. No information (baseline)		(18%)[d]	(2,32)[d]
Simple icon on energy label (or with EU logo)*:			
C1. Not pre-informed		21%[cd]	2,34[cd]
C2. Pre-informed		**35%[a]**	**2,60[a]**
On information display:			
C3. Simple icon		22%[bc]	2,39[bc]
C4. Simple icon + coloured scale		22%[bc]	2,40[b]
C5. Simple icon + coloured scale + textual end labels		22%[bc]	2,38[bc]
C6. Detailed icon: repair worker + coloured scale + textual end labels		24%[b]	2,42[b]
C7. Detailed icon: repair process + coloured scale + textual end labels		23%[bc]	2,39[b]
C8. Detailed icon: priority parts + coloured scale + textual end labels		23%[bc]	2,40[b]
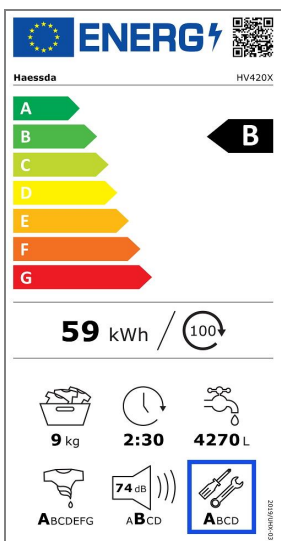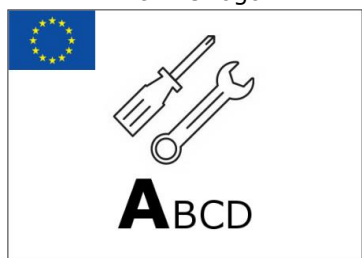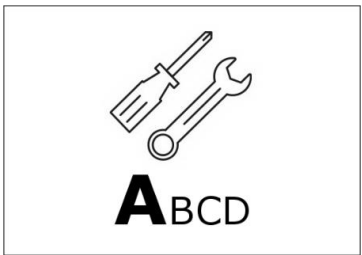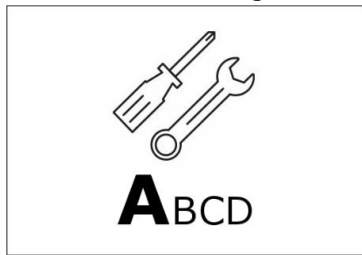
Note – In order to calculate the average reparability of the selected products, the products were scored such that more reparable products received higher scores (A = 4, B = 3, C = 2, D = 1). The average reparability score can range between 1 (all respondents choose products with reparability class D) and 4 (all respondents choose products with reparability class A). Percentages and averages with different superscripts (in columns) indicate statistically significant differences at $p < 0,05$. If the superscripts are the same, the means are not significantly different (i.e. the difference is likely due to chance). If the superscripts differ (a vs. b), the difference in means very likely reflects a real difference between the information formats rather than chance variation.

* Note that smartphones do not have energy labels. For smartphones, the simple "repair tools" icon was presented with the EU logo (EU flag), as shown in Figure 3.7.

Information vehicle
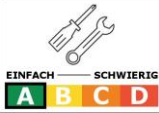
Thus far, we have examined the effectiveness of reparability information as a separate, small label presented on the product information display. However, we also included in the test a situation in which the repair tools icon was presented on the EU energy label. The information vehicle effect was tested for washing machines and TVs, which have energy labels. For smartphones, which currently do not have energy labels, we tested the impact of adding the EU logo (EU flag) to the simple icon on the product information display (see Figure 3.7). Since different effects were tested for different product types, we examine these effects through analyses at the product level. Table 3.3 provides the results per product type (for all information alternatives).[22]

Figure 3.7. Effects of information vehicle and EU logo

	Televisions/Washing machines	Smartphones
C1. Simple icon	On energy label	On information display With EU logo
C3. Simple icon	On information display	On information display without EU logo

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[22] There were significant differences between the three product types in the effectiveness of the different reparability indications in guiding choice behaviour towards more reparable product alternatives: Reparability information x product type interaction: $\chi^2(16) = 27,39$; $p = 0,037$ (average reparability) and $\chi^2(16) = 23,28$; $p = 0,106$ (choice for the most reparable product).

Table 3.3. Effects of reparability information on product choices: per product type

Reparability information		% of respondents that selected the most reparable product (class A)				Avg. reparability of the selected products (score 1 to 4)		
		Smart-phone	TV	Washing machine		Smart-phone	TV	Washing machine
C0. No information (baseline)		$(15\%)^c$	$(14\%)^c$	$(26\%)^c$		$(2,44)^c$	$(2,39)^b$	$(2,12)^d$
Simple icon on energy label (or with EU logo)*:								
	C1. Not pre-informed	$14\%^c$	$19\%^b$	$29\%^{bc}$		$2,45^c$	$2,41^b$	$2,17^{cd}$
	C2. Pre-informed	**$29\%^a$**	**$25\%^a$**	**$50\%^a$**		**$2,81^a$**	**$2,57^a$**	**$2,42^a$**
On information display:								
C3.		$16\%^{bc}$	$16\%^{bc}$	$33\%^b$		$2,51^{bc}$	$2,43^b$	$2,22^{bc}$
C4.		$19\%^b$	$18\%^b$	$30\%^{bc}$		$2,51^{bc}$	$2,44^b$	$2,25^{bc}$
C5.		$19\%^b$	$17\%^{bc}$	$30\%^{bc}$		$2,51^{bc}$	$2,43^b$	$2,20^c$
C6.		$17\%^{bc}$	**$20\%^{ab}$**	$35\%^b$		$2,53^b$	$2,45^b$	$2,28^b$
C7.		$16\%^{bc}$	$19\%^b$	$34\%^b$		$2,49^{bc}$	$2,44^b$	$2,26^{bc}$
C8.		$19\%^b$	$16\%^{bc}$	$34\%^b$		$2,54^b$	$2,41^b$	$2,24^{bc}$

Note – Averages with different superscripts (in columns) indicate statistically significant differences at $p < 0,05$. If the superscripts are the same, the means are not significantly different (i.e. the difference is likely due to chance). If the superscripts differ (a vs. b), the difference in means very likely reflects a real difference between the information formats rather than chance variation.

* Note that smartphones do not have energy labels. For smartphones, the simple "repair tools" icon was presented with the EU logo (EU flag), as shown in Figure 3.7.
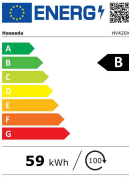
The results show that the effectiveness of the reparability indication in promoting choice for products with better reparability scores does not depend on the location of the information (on or outside the EU energy label) or the presence of the EU logo (see Table 3.3: C1 vs. C3). More specifically, the percentage of respondents who selected the TV or washing machine with reparability class A did not differ between the consumer groups that saw the (exact same) information on the EU energy label (19% for televisions and 29% for washing machines) versus on the product information display (16% and 33%, respectively; differences are not statistically significant). Similarly, the percentage of respondents that opted for the smartphone with reparability class A did not differ between the groups that saw the reparability indication with (14%) versus without (16%) EU logo. Also, we do not observe significant differences in the average reparability of the selected products between these conditions.

Pre-information

It was also investigated whether pre-informing consumers about the presence and meaning of the reparability information increases the effectiveness of this information. This effect was tested for the situation in which the repair tools icon was displayed on the EU energy label for washing machines and TVs (and with the EU logo on the product information display for smartphones). The pre-information itself[23] was generally well understood: 70% reported to completely understand the information, 26% understood it to some extent, and only 3% reported not to understand the information.

The findings in Table 3.2 (overall results) and Table 3.3 (results per product type) reveal strong positive effects of the pre-information (C1 vs. C2). When reparability information was provided in the form of a simple icon (repair tools) in energy label style without pre-information, 21% of the respondents opted for the most reparable product (see Table 3.2: C1). This rose to 35% when information about the reparability indication was provided prior to exposure to the product assortments (see Table 3.2: C2). This effect was present for all product types (see Table 3.3: C1 vs. C2).

Exposure to public media campaign

Some consumers may have been pre-informed about the environmental impacts of product disposal through other channels. In some countries, public media campaigns have recently been launched aimed at informing consumers about the benefits of repairing (vs. replacing) broken products, for instance. Respondents were asked whether they had seen such a public media campaign in the past year. Overall, 13% of respondents indicated that they clearly remembered such a campaign, 25% indicated that they vaguely remembered such a campaign, and 62% did not recall

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[23]   Respondents read: *"From now on, manufacturers of various devices are obliged to provide information to consumers regarding how easy or difficult the device is to repair when it breaks. This information is provided on a scale from class A to class D, where A means that the product is easy to repair and D means that the product is difficult to repair. Products in class B and C are neither easy nor difficult to repair. Which class a product belongs to depends on three aspects: (1) how easy it is to disassemble the product, (2) the extent to which repair information is available, and (3) the extent to which spare parts or software updates are available. Products in class A score well on each of these aspects. Products in class D, in contrast, score poorly on one or more aspects."*

having seen such a campaign. In particular in the Netherlands relatively many consumers (32%) clearly remembered having seen a reparability-related campaign.[24]

A follow-up analysis was conducted to gain insight into whether and how prior exposure to a reparability-related media campaign influences the effectiveness of the various types of reparability information. Here, we zoom in on TVs and washing machines, for which the repair tools icon was tested both on and outside the EU energy label, and compare the group of respondents that (vaguely or clearly) remembered having seen a reparability-related campaign with the group that had not seen such a campaign in the past year. The results, visualised in Figure 3.8, show that the effectiveness of the repair tools icon in promoting choice for products that are easier to repair strongly increased when consumers where pre-informed via a public media campaign, both when this icon was presented as a separate label on the information display and as part of the EU energy label.[25] Exposure to a reparability-related campaign also enhanced the effectiveness of the repair process icon (see Figure 3.8). As a result, it seems that which type of reparability information is most effective depends on whether or not consumers were previously exposed to a related media campaign: Whereas the repair worker icon generally performed best among non-informed consumers (62% of the respondent sample), the simple repair tools icon and the repair process icon generally performed best among consumers who had seen a reparability-related campaign in the past year (38% of the respondent sample). The differences with the other information alternatives are not always statistically significant, however.[26] The strong increase in effectiveness of the repair tools icon among consumers who had seen a reparability-related campaign might be due to the fact that this icon more closely resembled reparability logos used in such campaigns[27], which would suggest that consistency in communication is important.

(Other) differences between product types

The results in Table 3.3 also provide insight into the generality of the findings related to effectiveness of the different icon and scale formats that were tested outside the energy label. In line with the overall results, the average reparability score of the chosen product alternatives does not significantly depend on the specific scale format used – black letter scale, colour-coded, or colour-coded with textual labels – for any of the product types (C3 vs. C4 vs. C5).

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[24] DE: 16% (clearly remember) vs. 24% (vaguely remember) vs. 60% (not seen); CZ: 6% vs. 21% vs. 73%; IT: 11% vs. 23% vs. 66%; NL: 32% vs. 33% vs. 35%; PL: 7% vs. 25% vs. 68%; RO: 9% vs. 24% vs. 67%; SW: 9% vs. 28% vs. 63%.

[25] Reparability information x campaign interaction: $\chi^2(8) = 21,64$; $p < 0,01$ (average reparability).

[26] For consumers that had not seen a campaign (62% of the sample), the repair worker icon significantly outperformed the repair tools icon regardless of its scale format (ps < 0,05), with the repair process and priority parts icons falling in between. For consumers that remembered having seen a campaign (38% of the sample), the simple repair tools icon (with coloured scale) significantly outperformed the priority parts icon (p < 0,05), with the other icon/scale formats falling in between.

[27] See e.g. https://sire.nl/campagnes/waardeer-het-repareer-het/

Figure 3.8. Impact of prior exposure to reparability-related campaign
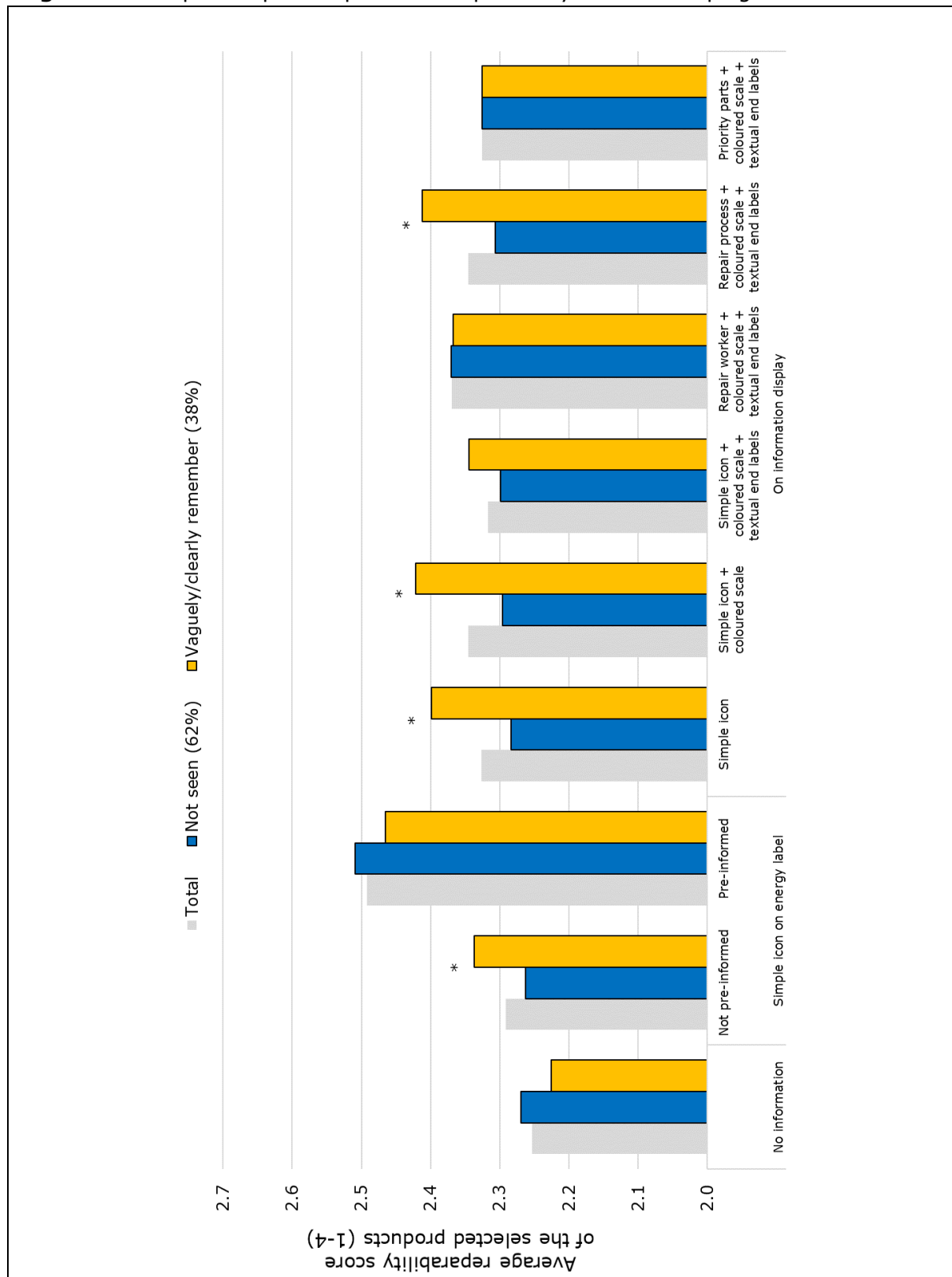
Note – Difference in average reparability score between groups that clearly remembered having seen a reparability-related media campaign (*N* = 1267) versus not (*N* = 8662).
* The difference in average reparability score between "vaguely remember/not seen" and "clearly remember" is significant at *p* < 0,05.

We also do not observe any differences in the effectiveness of the various icon formats – repair tools, repair worker, repair process or priority parts – for smartphones and televisions. Only for washing machines, the repair worker icon (mean reparability score = 2,28; see Table 3.3: C6) appeared to work slightly better than the repair tools icon (mean reparability score = 2,20; see Table 3.3: C5), with the other two icon formats falling in between.
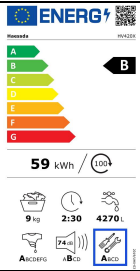
Differences between countries

There are also significant differences between countries in consumers' responses to reparability information.[28] Table 3.4 shows the results. In this table, the countries are ordered in terms of consumers' self-reported repair behaviour, measured (in the post-experiment questionnaire) as the percentage of respondents reporting that they "usually first see if I can have the product repaired/if I can repair the product myself" (rather than "I usually replace it with a new one without really considering having it repaired or repairing it myself"). This percentage ranged from 66% in Sweden and 68% in Germany up to 86% in Italy and 89% in Portugal (see Table 3.4, first row).

The effectiveness of the reparability information in guiding choices towards more reparable products appears to depend on the common repair behaviour of consumers in a specific country. In countries where consumers have a strong tendency to repair or consider repairing their defective products (Italy and Portugal), most of the tested reparability indications were effective (green shaded cells in Table 3.4). In contrast, in countries where this tendency seems to be less strong (Sweden, Germany, and the Netherlands), none of the reparability information formats effectively promoted choices for more reparable products when no pre-information was provided.

The reparability indication depicting a repair worker was effective in steering choices towards more reparable products in the largest number of countries (three out of seven: Czech Republic, Italy and Portugal; see Table 3.4). Thus, without pre-informing consumers, none of the reparability indications was able to increase choice for more reparable products in a majority of the countries in the sample. However, when consumers were informed about the meaning of the reparability indication prior to decision-making, the effectiveness of the information in promoting choice for more reparable products strongly increased. In fact, in that case, the reparability information encouraged choice for more easily reparable products in *all* countries (see Table 3.4). The impact of pre-information was only tested for the situation in which the repair tools icon is placed on the EU energy label, but is unlikely to be specific to this situation. Increasing consumer awareness of the presence and meaning of the reparability information is expected to improve understanding and use of the information in decision-making, regardless of the specific icon and scale format used.

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[28] Reparability information x country interaction: $\chi^2(48) = 75,24$; $p = 0,007$ (average reparability) and $\chi^2(48) = 64,99$; $p = 0,052$ (choice for the most reparable product).

Table 3.4. Effects of reparability information on product choices: per country[29]

	Avg. reparability of the selected products (score 1 to 4)						
	SE	DE	NL	RO	CZ	IT	PT
Self-reported repair behaviour[30]	66%	68%	76%	78%	81%	85%	89%
C0. No information (baseline)	$(2,35)^b$	$(2,32)^b$	$(2,32)^b$	$(2,40)^b$	$(2,30)^b$	$(2,32)^{cd}$	$(2,21)^d$
Simple icon on energy label (or with EU logo):							
C1. Not pre-informed	$2,39^b$	$2,35^b$	$2,35^b$	$2,39^b$	$2,38^{ab}$	$2,25^d$	$2,29^{cd}$
C2. Pre-informed	$\mathbf{2,60^a}$	$\mathbf{2,59^a}$	$\mathbf{2,54^a}$	$\mathbf{2,72^a}$	$2,47^a$	$\mathbf{2,55^a}$	$\mathbf{2,71^a}$
On information display:							
C3.	$2,42^b$	$2,35^b$	$2,36^b$	$2,43^b$	$2,34^b$	$2,48^{ab}$	$2,31^{cd}$
C4.	$2,41^b$	$2,37^b$	$2,34^b$	$2,46^b$	$2,41^{ab}$	$2,47^{ab}$	$2,34^{bc}$
C5.	$2,42^b$	$2,36^b$	$2,37^b$	$2,42^b$	$2,34^b$	$2,43^{bc}$	$2,35^{bc}$
C6.	$2,39^b$	$2,37^b$	$2,39^b$	$2,37^b$	$\mathbf{2,48^a}$	$2,49^{ab}$	$2,46^b$
C7.	$2,44^b$	$2,33^b$	$2,42^{ab}$	$2,41^b$	$2,30^b$	$2,51^{ab}$	$2,35^{bc}$
C8.	$2,36^b$	$2,34^b$	$2,35^b$	$2,47^b$	$2,39^{ab}$	$2,42^{bc}$	$2,45^b$

Note – Averages with different superscripts (in columns) indicate statistically significant differences at $p < 0,05$. If the superscripts are the same, the means are not significantly different (i.e. the difference is likely due to chance). If the superscripts differ (a vs. b), the difference in means very likely reflects a real difference between the information formats rather than chance variation.

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[29] Overall, there are significant differences between reparability indication conditions in the average reparability of the selected products in each of the countries: Germany ($\chi^2(8) = 29,65$; $p < 0,001$), Czech Republic ($\chi^2(8) = 18,08$; $p < 0,021$), Italy ($\chi^2(8) = 39,04$; $p < 0,001$), the Netherlands ($\chi^2(8) = 17,15$; $p < 0,029$), Portugal ($\chi^2(8) = 82,77$; $p < 0,001$), Romania ($\chi^2(8) = 47,56$; $p < 0,001$), and Sweden ($\chi^2(8) = 21,79$; $p < 0,001$).

[30] Percentage of respondents reporting that they "usually first see if I can have the product repaired/if I can repair the product myself" (rather than "I usually replace it with a new one, without really considering having it repaired or repairing it myself").

3.3.2. Effects on intention to repair (vs. replace)

After the choice tasks, respondents were asked to imagine that their smartphone, TV or washing machine was broken (after 1, 2 and 5 years, respectively). They read that the product was no longer covered by a warranty and that it was not insured, and that they had to make a decision either to have the product repaired or to replace it with a new product (second-hand, same model, or newer model). In all cases, buying a newer model was most costly (approx. 103% of the original purchase price), followed by buying a new, similar model (approx. 90% of the purchase price), buying a second-hand similar model (approx. 70% of the purchase price), and having the product repaired (approx. 25% of the purchase price). Furthermore, half of the respondents that were exposed to reparability information were shown the broken product with reparability class A, the other half were shown the product with reparability class D (see Figure 3.9). Since consumers are unlikely to be confronted with the full energy label when making repair/replace decisions, the reparability information was always presented as separate information next to the product, as in Figure 3.9.[31]

Figure 3.9. Repair/replace decision task (example)

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[31] In fact, the same could be argued about the isolated reparability indication. We assume here that consumers have easy access to this information when making the decision to repair or replace the broken product.

Table 3.5. Repair/replace decisions: per product type

	Smartphone (after 1 year)	TV (after 2 years)	Washing machine (after 5 years)
Have it repaired	**71%**	**66%**	**67%**
Buy a similar one – new	8%	11%	12%
Buy a similar one – second-hand	4%	3%	4%
Buy a newer model	16%	21%	16%

On average, the intention to have the defective product repaired was slightly higher for the smartphone (71%, after 1 year) than for the washing machine (67%, after 5 years) and the TV (66%, after 2 years; see Table 3.5). Overall, the intention to have the product repaired was highest in Portugal (79%), followed by the Czech Republic (71%), the Netherlands (68%), Sweden (67%), Romania (64%), Germany (64%), and Italy (63%).

Effects of positive reparability information on repair decisions

In this section, we examine whether the presence and type of reparability information affects consumers' decisions to repair or replace broken products, if these are easy to repair (reparability class A). In order to facilitate interpretation of the findings, we look at three general types of reparability information, namely (1) a simple icon depicting repair tools in the energy label house style (i.e. with black letter scale), (2) the same, repair tools icon with colour-coded scale and/or textual labels (i.e. *not* in the energy label house style), and (3) a more detailed icon (i.e. repair worker, repair process, or icon depicting priority parts).

Table 3.6. Intention to repair product that is *easy* to repair (class A)

Reparability information	% respondents that intend to repair product that is easy to repair (class A)			
	Total	Smart-Phone	TV	Washing machine
No information (baseline)	(68%)[b]	(74%)[ab]	(66%)[a]	(66%)[b]
Simple icon (energy label style)				
Not pre-informed	69%[b]	68%[b]	70%[a]	68%[b]
Pre-informed	77%[a]	81%[a]	75%[a]	75%[a]
Simple icon (other)	69%[b]	71%[b]	67%[a]	69%[b]
Detailed icon	67%[b]	72%[b]	63%[a]	67%[b]

Note – Averages with different superscripts (in columns) indicate statistically significant differences at $p < 0,05$. If the superscripts are the same, the means are not significantly different (i.e. the difference is likely due to chance). If the superscripts differ (a vs. b), the difference in means very likely reflects a real difference between the information formats rather than chance variation.

The results in Table 3.6 reveal no significant differences in respondents' intentions to repair (rather than replace) the broken product between different types of reparability information, neither overall (first column), nor for specific product types (last three columns). More specifically, respondents did not more often make the decision to

repair the broken product if they were shown the product with the information that this product was easy to repair (reparability class A) than if such information was not provided to them. We also do not observe differences in intentions to repair the easy-to-repair product between different types of reparability indications (simple icon in the energy label house style vs. simple icon with colour-coded scale and/or textual labels vs. detailed icons).

However, the findings are different for consumers that were pre-informed about the presence and meaning of the reparability indication (which was tested for the repair tools icon in energy label style). Such pre-information generally enhanced the effectiveness of the reparability indication in promoting decisions to repair (rather than to replace) products. Across the three product types, 77% of pre-informed respondents reported that they would repair the broken product, against 69% when such pre-information was not provided (and 68% if no reparability information was provided at all; see Table 3.6). A similar pattern of results is observed for all three product types, but the differences are most pronounced for washing machines and smartphones (see Table 3.6).

Effect of reparability class (easy vs. difficult to repair) on repair decisions

In addition to investigating whether the presence of the information that the product is *easy* to repair *promotes* repair (rather than replace) decisions, we also examine to what extent the presence of the information that the product is *difficult* to repair *prevents* repair decisions, compared to the situation in which such information is not provided. Table 3.7 shows the overall results as well as the results for each of the product types. As before, percentages in green shaded cells are significantly different from the baseline (i.e. the percentage of respondents that intend to repair the defective product in the absence of reparability information). Here, bold-faced percentages indicate that the decision to repair (vs. replace) the broken product significantly depends on the specific reparability class presented (A vs. D).

Overall, the results demonstrate that when respondents were not pre-informed, the presence of a good reparability score (class A) did not promote repair decisions, and the presence of a poor reparability score (class D) also did not reduce repair decisions, relative to the baseline (no reparability information). However, when consumers received information about the reparability indication prior to making decisions, the reparability indication (easy vs. difficult to repair) did affect their decision.[32] While, overall, respondents were significantly *more* likely to have an easy-to-repair (class A) product repaired if this information was available (versus not; 77% vs. 68%), they were not significantly *less* likely to have a difficult-to-repair (class D) product repaired (63% vs. 68%; see Table 3.7).

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[32] Reparability information x reparability score (A vs. D) interaction: $\chi^2(3) = 14{,}75$; $p = 0{,}002$.

Table 3.7. Intention to repair (vs. replace)

Reparability information	% respondents that intend to repair (vs. replace)							
	Total		Smart-phone		TV		Washing machine	
	Easy to repair (A)	Difficult to repair (D)	Easy to repair (A)	Difficult to repair (D)	Easy to repair (A)	Difficult to repair (D)	Easy to repair (A)	Difficult to repair (D)
Simple icon (energy label style)								
Not pre-informed	69%	67%	68%	70%	70%	66%	68%	64%
Pre-informed	**77%**	**63%**	**81%**	**69%**	75%	67%	**75%**	**54%**
Simple icon (other)	69%	68%	71%	69%	67%	66%	69%	69%
Detailed icon	67%	66%	72%	69%	63%	66%	67%	64%
No information (baseline)	(68%)		(74%)		(66%)		(66%)	

Note – In this table, bold-faced percentages indicate that the decision to repair (vs. replace) the broken product significantly depends on the specific reparability class presented (A vs. D). Green shaded percentages are significantly different from the baseline (i.e. the percentage of respondents that intend to repair the defective product in the absence of reparability information).

Further analysis revealed that the impact of the reparability score on repair vs. replace decisions differs across product types. Respondents were *more* likely to have an easy-to-repair (class A) washing machine repaired, but *less* likely to have a difficult-to-repair (class D) washing machine repaired if this information was present (vs. absent). In contrast, while respondents were also more likely to have a broken smartphone repaired if it fell in class A, they were not less likely to have it repaired if it fell in class D. A similar result pattern is observed for TVs, but the differences with the baseline (no information) condition are not statistically significant (i.e. may be due to chance; see Table 3.7).

3.3.3. Effects on attention

Most respondents (46%) indicated that they had briefly looked at the reparability information when making product choices. About a third (32%) reported to have studied the reparability information in detail, and 22% did not look at the information at all. The amount of attention paid to the reparability information significantly differs between the different types of reparability information (see Table 3.8).[33]

Scale and icon format

The reparability information received more attention if the scale was colour-coded (29% and 30%) than if it was not (24%), but did not receive more attention if textual end labels were used (30%) versus not (29%, see Table 3.8: C3 vs. C4 vs. C5). There were also no significant differences in attention paid to the information between icon formats (see Table 3.8: C5 vs. C6 vs. C7 vs. 8).

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[33] Effect of reparability information: $\chi^2(7) = 195{,}40$; $p < 0{,}001$.

Information vehicle

Overall, the amount of attention paid to the reparability information did not depend on whether or not it was presented on the EU energy label/with the EU logo (24% vs. 24%, see Table 3.8: C3 vs. C1). When the reparability information was displayed on the energy label (for televisions and washing machines), 24% reported to have looked at this information in detail, versus 22% when the information was displayed outside the energy label (the difference is not statistically significant, i.e. may be due to chance). When the EU logo (flag) was included in the reparability information (for smartphones), 26% reported to have looked at this information in detail, versus 28% when the EU logo was absent (the difference is not significant).

Pre-information

Pre-information strongly increased the attention paid to the reparability information when making product choices. About half of the pre-informed respondents (49%) indicated that they had studied the reparability information in detail. In the absence of such prior information, the exact same product reparability information was looked at in detail by only 24% of the respondents (see Table 3.8: C1 vs. C2).

3.3.4. Effects on subjective understanding
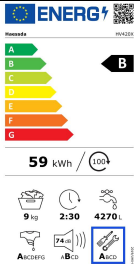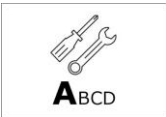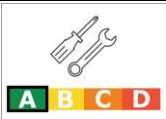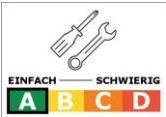
Both subjective (self-declared) and objective (factual) understanding were assessed in the experiment. To assess subjective understanding, the reparability indication was shown in isolation and respondents were asked (1) whether they understood the meaning of the pictogram (on a scale from 1 = *yes, completely* to 4 = *no, not at all*), and (2) whether they thought the pictogram was clear or unclear (on a scale from 1 = *very clear* to 5 = *very unclear*). Later in the questionnaire, the meaning of the pictogram was explained to the respondents[34], and they were asked once more to indicate whether they (now) though the pictogram was clear or unclear (again, on a scale from 1 = *very clear* to 5 = *very unclear*).

Scale format

Both the colour coding of the scale and presence of textual scale labels ("easy" and "difficult") significantly improved the extent to which respondents (subjectively) understood the reparability information. Subjective understanding rose from 53% for the simple icon (outside the energy label) to 66% if the scale was colour-coded, to 86% if the scale was colour-coded and textual labels were used (see Table 3.8: C3 vs. C4 vs. C5). Similarly, we observe strong increases in perceived clarity due to the colour coding of the scale and use of textual labels, both before (40% vs. 53% vs. 76%) and after the explanation (78% vs. 84% vs. 89%, see Table 3.6).

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[34] *"This pictogram indicates product reparability, or how easy or difficult a product is to repair when it breaks. This information is provided on a scale from class A to class D, where A means that the product is easy to repair and D means that the product is difficult to repair."*

Table 3.8. Attention and subjective understanding

Reparability information		Attention (% studied in detail)	Subjective understanding (% I think so/completely)	Perceived clarity (% clear/very clear)	
				Before explanation	After explanation
On energy label (or with EU logo):					
	C1. Not pre-informed	24%[d]	57%[f]	48%[f]	79%[c]
	C2. Pre-informed	**49%[a]**	**94%[a]**	**83%[a]**	**90%[a]**
On information display:					
C3.		24%[d]	53%[g]	40%[g]	78%[c]
C4.		29%[c]	66%[e]	53%[e]	84%[b]
C5.		30%[bc]	86%[b]	76%[b]	**89%[a]**
C6.		32%[bc]	85%[bc]	76%[b]	**90%[a]**
C7.		34%[b]	83%[c]	69%[c]	**88%[a]**
C8.		31%[bc]	77%[d]	62%[d]	84%[b]

Note – Averages with different superscripts (in columns) indicate statistically significant differences at $p < 0.05$. If the superscripts are the same, the means are not significantly different (i.e. the difference is likely due to chance). If the superscripts differ (a vs. b), the difference in means very likely reflects a real difference between the information formats rather than chance variation.

Icon format

Furthermore, certain icon formats appear easier to understand than others. Of the four icon formats included in the test – repair tools, repair worker, repair process, and priority parts – the icons depicting repair tools (86% and 76%) and a repair worker (85% and 76%) are best understood and perceived as most clear (before explanation). After the meaning of the information is explained, the icons depicting

repair tools (89%), a repair worker (90%) and the repair process (88%) are all equally well understood. The icons depicting priority parts are less well understood (77%) and perceived as least clear, both before (62%) and after explanation (84%, see Table 3.8: C5 vs. C6 vs. C7 vs. C8).

Information vehicle

Before the meaning of the reparability indication was explained to respondents, subjective understanding and perceived clarity of the simple icon (i.e. the repair tools icon with black letter scale) was higher, on average, when this information was presented on the EU energy label/with the EU logo (57% and 48%) than when it was presented on the product information display/without the EU logo (53% and 40%, respectively, see Table 3.8: C1 vs. C3). Further analysis revealed that this difference was driven by an information vehicle effect (for televisions and washing machines): When the reparability information was displayed on the energy label, significantly more respondents reported to understand the information (61%) and to find it (very) clear (51%) than when the same information was displayed outside the energy label (53 and 39%, respectively[35]). Subjective understanding and perceived clarity were unaffected by the presence (vs. absence) of the EU logo (for smartphones)[36]. After the explanation, the simple icon was perceived as clear or very clear by about 80% of the respondents (see Table 3.8), regardless of whether it was presented on or outside the EU energy label and with or without an EU logo.

Pre-information

Not surprisingly, pre-information strongly improved understanding of the reparability information. 94% of the pre-informed respondents reported to understand the meaning of the reparability indication versus only 57% of respondents who saw the same reparability indication without being pre-informed. The reparability indication was perceived as clear or very clear by 83% of the pre-informed respondents before explanation, and by 90% after explanation. Among the respondents that were not pre-informed, this was only 48% and 79%, respectively (see Table 3.8: C1 vs. C2).
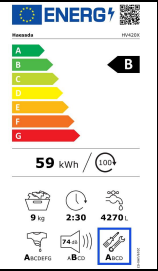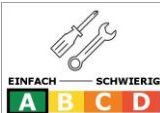
3.3.5. Effects on objective understanding

Objective understanding was assessed via multiple-choice questions. The first question assessed whether respondents correctly understood that the information indicates reparability (i.e. how easy or difficult a product is to repair), and not, for instance, durability. Results are in Table 3.9.

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[35] ps < 0,05.

[36] Subjective understanding: 51% (with EU logo) versus 53% (without EU logo). Perceived clarity (before): 42% (with EU logo) versus 41% (without EU logo). Perceived clarity (after): 80% (with EU logo) versus 81% (without EU logo). Differences are not significant.

Table 3.9. Objective understanding: icon

Reparability information		How easy or difficult the product is to repair **(correct answer)**	Which tools are required for (dis)assembly	The length of the warranty period	The expected lifetime of the product (how long the product lasts)	Whether you can repair the product yourself or need a professional repair service	None of the above	I (really) don't know	Total
On energy label (or with EU logo):									
[energy label image]	Not pre-informed	34%[d]	13%	5%	9%	15%	6%	18%	100%
	Pre-informed	**70%[a]**	5%	3%	3%	13%	3%	3%	100%
On information display:									
C3. [icon]		35%[d]	12%	6%	10%	13%	4%	20%	100%
C4. [icon]		37%[d]	9%	7%	17%	12%	4%	16%	100%
C5. [icon]		**67%[ab]**	8%	2%	3%	11%	4%	5%	100%
C6. [icon]		64%[b]	6%	3%	3%	12%	6%	6%	100%
C7. [icon]		**67%[ab]**	4%	3%	4%	13%	4%	7%	100%
C8. [icon]		58%[c]	6%	2%	4%	13%	6%	11%	100%

Scale format

About a third of the respondents accurately understood that icon depicting repair tools indicates product reparability. Other response options that were relatively frequently selected were "which tools are required for (dis)assembly" (12%) and "whether you can the product yourself or need a professional repair service" (13%). About 1 in 5 respondents indicated that they did not know what the information indicates (20%, see Table 3.9: C3). While using a colour-coded scale (37%) rather than the black letter scale that is typically being used on the energy label (35%) did not help in understanding that the information indicates how easy or difficult the product is to repair, adding the scale labels – "easy" and "difficult" – strongly improved comprehension (to 67%, see Table 3.9: C3 vs. C4 vs. C5).

Icon format

There are also differences in objective understanding between the four icon formats (repair tools, repair worker, repair process and priority parts). The icons depicting repair tools (67%), the repair process ("broken-to-whole"; 67%) and a repair worker (64%) are understood significantly better than the icons depicting priority parts (58%). There are no significant differences in objective understanding between the first three icon formats (see Table 3.9: C5 vs. C6 vs. C7 vs. C8).

Information vehicle
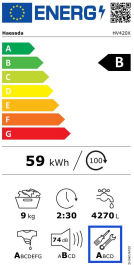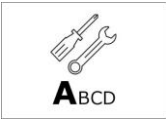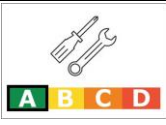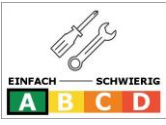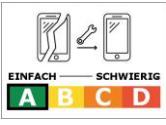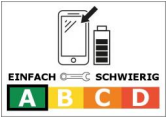
When presented in the energy label house style, the percentage of respondents who accurately understood that the information indicates product reparability did not depend on whether the information was actually presented on the EU energy label (37%) or not (35%; for televisions and washing machines), nor on the presence (32%) or absence (36%) of the EU logo (for smartphones).

Pre-information

Not surprisingly, objective understanding of the information strongly improved (from 34% to 70%) when respondents were pre-informed about the presence and meaning of the reparability information (see Table 3.9: C1 vs. C2). Interestingly, note that adding the scale labels "easy" and "difficult" was equally effective in increasing objective comprehension of the information as pre-informing consumers about its meaning (67% vs. 70%, this difference is not statistically significant). The percentage of respondents that reported not to know what the information indicates dropped from 18% to 3% when respondents were informed about the meaning of the reparability information prior to exposure.

It was also assessed whether respondents accurately interpreted the scale, that is, whether they correctly understood that the scale runs from A = easy to repair to D = difficult to repair. To assess this, respondents were exposed to small product assortments and asked to identify (1) the product that is easiest to repair, and (2) the product that is most difficult to repair. Results in Table 3.10 reflect the percentage of respondents that selected the correct product.

Table 3.10. Objective understanding: scale

Reparability information		Accurate product identification (%)		
		Easiest to repair	Most difficult to repair	Total
On energy label (or with EU logo):				
	C1. Not pre-informed	57%[c]	56%[b]	56%
	C2. Pre-informed	**70%[a]**	**71%[a]**	71%
On information display:				
C3.		59%[c]	60%[b]	60%
C4.		58%[c]	59%[b]	59%
C5.		**68%[ab]**	**72%[a]**	70%
C6.		**68%[ab]**	**69%[a]**	68%
C7.		65%[b]	**70%[a]**	68%
C8.		**66%[ab]**	**68%[a]**	67%

Scale and icon format

In line with the results on objective comprehension of the icon's meaning, we observe no differences in the ability to identify most and least reparable products between the group that saw the colour-coded scale (58% and 59%) and the group that saw the black letter scale (59% and 60%; see Table 3.10: C3 vs. C4). In contrast, adding the textual labels – "easy" and "difficult" – again significantly improved objective comprehension: the percentage of respondents that accurately identified the products that were easiest and most difficult to repair rose from 58% to 68% and from 59% to 72%, respectively, when textual end labels were added to the colour-coded scale (see Table 3.10: C4 vs. C5). There were no significant differences in the extent to which respondents were able to identify most and least reparable products across the various icon formats (see Table 3.10: C5 vs. C6 vs. C7 vs. C8).

Information vehicle

Respondents' ability to identify the most and least reparable products in the product set did not depend on the information vehicle or the presence of the EU logo. More specifically, respectively 64% and 61% of the respondents accurately selected the product with the best (A) and worst (D) reparability score when the reparability indication (in energy label house style) was presented with the EU logo (for smartphones), against 61% and 62% when the EU logo was absent (differences are not statistically significant). Similarly, there were no significant differences in respondents' ability to identify the most and least reparable products in the product set when the reparability icon was presented on the energy label (53% and 53%, respectively) versus outside of it (58% and 59%, respectively). Thus, while subjective understanding of the icon (in energy label house style) was higher when it was presented on the energy label (see section 3.3.4), objective comprehension was not.

Pre-information

Again, and perhaps not surprisingly, accurate identification of the most and least reparable products significantly increased (from 57% and 56% to 70% and 71%, respectively) when respondents were pre-informed about the meaning of the reparability information (see Table 3.10: C1 vs. C2).

3.3.6. Associations

A multiple response question was used to assess respondents' beliefs about a product with a good reparability score (class A). The reparability indication was presented in isolation (the specific alternative depended on the experimental group the respondent was in) and respondents were asked to indicate their associations ("What do you think this pictogram tells you about this product?"). The results are in Table 3.11. Since respondents could select multiple answers, row-wise percentages do not add up to 100% in the table. *Intended* associations – i.e. related to (1) the ease of (dis)assembly, (2) the availability of repair information, and (3) the availability of spare parts/software updates) – are shaded grey. Respondents reported 1,8 associations, on average.

Overall, the largest group of respondents (43%) thinks that the reparability class A indicates that product can be **repaired quickly** if it breaks. Also, relatively many respondents believe that the information indicates that you can **easily repair the**

product yourself (26%), that **spare parts and/or software updates are readily available** (25%), and that the **expected cost of the repair is low** (24%).

The intended associations, namely (1) that the product is easy to disassemble with commonly available tools, and (2) that repair information is readily available and (3) that spare parts and/or software updates are readily available, were selected by respectively 19%, 20% and 25% of the respondents, on average.

Respondents did not strongly associate the reparability indication with durability or quality aspects. On average, 5% associated a class A reparability indication with a long product lifetime, 3% associated it with a long warranty period, 6% with high product quality, and 2% with low product quality.

Scale and icon format

In general, the associations that respondents have with the reparability indication do not strongly depend on the specific type of information they were exposed to (see Table 3.11). The (intended) belief that a product with a class A reparability indication is easy to disassemble with commonly available tools was less strong among respondents who saw the repair process icon (C7: 14%) than among respondents who saw any other format (17-20%[37]; other differences between icon/scale formats are not significant). In line with the results of the pre-study, the association with self-repair ("If the product breaks, you can easily repair the product yourself") was significantly stronger for the repair tools icon with colour-coded scale and textual labels (C5: 30%) than for the repair worker (C6: 25%) and repair process (C7: 25%) icons with the same scale format. This association was also stronger for the repair tools icon with colour-coded scale and textual labels (C5: 30%) than for the same icon with a black letter scale (C3: 23%) or colour-coded scale without textual labels (C4: 22%).[38] The association with professional repair services ("If the product breaks, you need a professional repair service to do the repair") was reported by 9% of the respondents, and did not significantly depend on the specific icon or scale format used (see Table 3.11). Importantly, the repair worker icon thus did not evoke stronger associations with professional repairs than the other icon alternatives.[39]

Pre-information
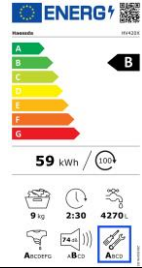
When respondents were pre-informed about the meaning of the reparability indication (which included information on the three aspects the reparability score is based on), slightly more respondents selected the intended associations (shaded grey in the table). Yet, still more pre-informed respondents believed that the reparability information indicates that the product can be **repaired quickly** (40%) and/or that you can **easily repair the product yourself** (34%) if it breaks.

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[37] ps < 0,05.
[38] ps < 0,05.
[39] ps > 0,10.

Table 3.11. Associations

Reparability information		It is easy to disassemble the product with commonly available tools (intended association)	Repair information is readily available for this product (intended association)	Spare parts and/or software updates are readily available for this product (intended association)	It is guaranteed that the product has a long lifetime (it lasts long)	The product has a long warranty period	If the product breaks, it can be repaired quickly	If the product breaks, the expected cost of the repair is low	If the product breaks, the tools depicted in the pictogram are sufficient to do the repair	If the product breaks, you need a professional repair service to do the repair	If the product breaks, you can easily repair the product yourself	The product breaks easily	The product is of low quality	The product is of high quality
On energy label (or with EU logo):														
	C1. Not pre-informed	16%	19%	23%	5%	3%	40%	23%	5%	10%	21%	2%	2%	8%
	C2. Pre-informed	23%	23%	27%	4%	3%	40%	19%	6%	9%	34%	1%	1%	5%
On information display:														
C3.		20%	21%	25%	5%	3%	42%	23%	5%	9%	23%	1%	1%	7%
C4.		17%	20%	27%	7%	4%	43%	25%	6%	9%	22%	1%	2%	8%
C5.		20%	17%	26%	4%	3%	45%	25%	5%	8%	30%	2%	1%	6%
C6.		19%	20%	26%	4%	4%	44%	28%	4%	11%	25%	2%	2%	6%

Reparability information	What do you think this pictogram tells you about this product?												
	It is easy to disassemble the product with commonly available tools **(intended association)**	Repair information is readily available for this product **(intended association)**	Spare parts and/or software updates are readily available for this product **(intended association)**	It is guaranteed that the product has a long lifetime (it lasts long)	The product has a long warranty period	If the product breaks, it can be repaired quickly	If the product breaks, the expected cost of the repair is low	If the product breaks, the tools depicted in the pictogram are sufficient to do the repair	If the product breaks, you need a professional repair service to do the repair	If the product breaks, you can easily repair the product yourself	The product breaks easily	The product is of low quality	The product is of high quality
C7.	14%	18%	23%	5%	3%	47%	24%	4%	10%	25%	3%	2%	6%
C8.	20%	18%	24%	4%	2%	42%	25%	4%	8%	28%	1%	2%	4%
Significant differences between scale/icon formats (C3-C8)?	Y	N	N	Y	N	N	N	N	N	Y	N	N	Y
Total	19%	20%	25%	5%	3%	43%	24%	5%	9%	26%	2%	2%	6%

Respondents who saw the priority parts icon received an additional multiple-choice question regarding the meaning of the two symbols (priority parts) displayed at the top. Only a relatively small group of respondents believed that the symbols reflect product parts that often need repair: 16% for smartphones, 6% for TVs and 10% for washing machines (see Table 3.12).

For smartphones, most respondents believed that the symbols indicate that the reparability score only pertains to the depicted product parts (39%). For TVs and washing machines, most respondents believed that the symbols reflect what type of product the reparability score pertains to (46% and 34%, respectively). About 1 in 5 respondents indicated that they didn't understand the meaning of the symbols depicting priority parts for smartphones (display and battery) and TVs (display and remote controller). For washing machines (door and electronic board), almost a third of the respondents did not know the meaning of the symbols (see Table 3.12).

Table 3.12. Associations with the priority parts icon

		They reflect product parts that often need repair **(correct answer)**	The reparability score only pertains to these product parts	They reflect what product the reparability score pertains to	I (really) don't know	Total
Smartphones		16%	39%	27%	19%	100%
TVs		6%	29%	46%	19%	100%
Washing machines		10%	26%	34%	30%	100%

3.3.7. Perceived importance and willingness to pay

Finally, we examine whether consumers find the reparability information important and the extent to which they would be willing to pay more for a product that is easier to repair. In order to assess consumers' willingness to pay for more reparable products, two identical products (smartphones, TVs, or washing machines) were shown to respondents, one with reparability class A and one with reparability class D (see Figure 3.10 for an example).[40] Respondents were informed that the products only differed in how easy or difficult they are to repair. To provide a reference point, they also received information on the purchase price of the product that was difficult to repair (class D). Respondents were asked to indicate the maximum price they would be willing to pay for each of the two products.[41]

Overall, 55% of the respondents considered the reparability information very (32%) or extremely (23%) important. This percentage strongly differed across countries.[42] It was highest in Portugal (72%) and Romania (72%), followed by Italy (69%), Germany (53%) and the Czech Republic (49%), and lowest in Sweden (37%) and the

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[40] To diminish carry-over effects from the understanding task, respondents were presented with products from a different product category in the WTP task.

[41] Non-euro currencies (Czech crowns, Romanian lei, and Swedish crowns) were first converted into euros. Then, extreme amounts (0,5% of the responses) were identified as outliers and removed from the analysis.

[42] $\chi^2(6) = 708,07$; $p < 0,001$.

Netherlands (35%). Respondents indicated that they were willing to pay 25% (€74) more for a smartphone with reparability score A (compared to D), 20% (€93) more for a TV with reparability score A (compared to D), and 20% (€98) more for a washing machine with reparability score A (compared to D), on average.

Figure 3.10. Example of product images used in the willingness-to-pay task

The results, summarised in Table 3.13, further reveal significant differences in the perceived importance of the information across the various information types.[43] Slightly more respondents considered the reparability information important if it was provided in the form of a simple icon with a coloured scale (58%) as compared to the two other scale formats (both 54%, see Table 3.13: C3 vs. C4 vs. C5). There were also small differences in the perceived importance of the information between icon formats: More respondents found the information important if they saw the icon depicting the repair process (59%) than if they saw the icon depicting repair tools (54%) or priority parts (54%), with the repair worker icon falling in between (55%, see Table 3.13: C3 vs. C4 vs. C5).
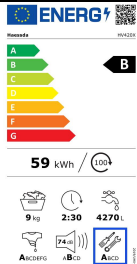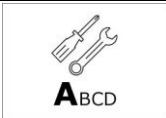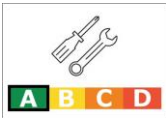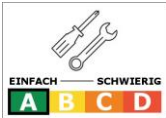
All in all, perceived importance of the reparability information is highest for the icon depicting the repair process and the icon depicting repair tools without textual end labels (see Table 3.13). Finally, after exposure to information on the meaning of the reparability information, significantly more respondents considered the reparability (very) important (from 53% to 57%, see Table 3.13: C1 vs. C2).

The extent to which respondents are willing to pay more for more reparable products did not significantly depend on the specific type of reparability information that was displayed.[44] Differences in average prices reported in Table 3.13 that have the same letter in their superscript are not statistically significant, which means that they may be due to chance (note that these means are sensitive to a few large values).

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[43]   Effect of reparability information: $\chi^2(7) = 16,20$; $p < 0,05$.
[44]   Effect of reparability information: $F(7, 8665) = 1,80$; $p = 0,084$; Reparability information x product type interaction: $F(14, 8665) = 0,91$; $p = 0,542$.

Table 3.13. Perceived importance and willingness to pay

Reparability information		Perceived importance (% very/ extremely Important)	Willingness to pay (more) for product that is easier to repair (D → A)		
			Smartphone	TV	Washing machine
On energy label (or with EU logo):					
	C1. Not pre-informed (baseline)	53%[b]	€80[a]	€89[ab]	€111[ab]
	C2. Pre-informed	**57%[ab]**	€75[ab]	€97[ab]	€94[ab]
On information display:					
C3.		54%[b]	€86[a]	€96[ab]	€91[ab]
C4.		**58%[a]**	€76[ab]	€106[a]	€109[ab]
C5.		54%[b]	€65[b]	€92[ab]	€95[ab]
C6.		55%[ab]	€73[ab]	€86[ab]	€84[b]
C7.		**59%[a]**	€65[b]	€89[ab]	€111[a]
C8.		54%[b]	€62[b]	€88[b]	€93[ab]
Average WTP for product that is easier to repair			+€74 (+25%)	+€92 (+20%)	+€98 (+20%)

4. Conclusion and discussion

The present study examined the effectiveness of reparability information designs in communicating the intended message and guiding choices towards better reparable products and more product repairs (rather than replacements). Based on qualitative focus group research in the Netherlands and Germany as well as input from (visual) communication experts, various icon and scale formats were developed and subsequently tested in a large-scale online experiment among nearly 10.000 consumers in seven EU Member States. In addition, we examined the impact of the location of the information, on the EU energy label versus not, and of the presence of the EU logo.

The reparability of products was generally perceived as an important product characteristic when making purchase decisions (it was scored between 7,5 and 8 on a scale from 1 to 10). It was perceived as more important than the brand, model and environmental aspects (other than energy efficiency), but less so than quality, durability, price, and energy efficiency (when applicable). Overall, 22% of the respondents indicated that if an appliance breaks, they usually replace it with a new one without considering having it repaired. The large majority of respondents (78% overall) indicated that they usually first consider a repair. This percentage was highest in Portugal (89%) and Italy (85%) and lowest in Sweden (66%) and Germany (68%).[45] The most important barriers to repairing products were (1) high repair costs, (2) perceived difficulty of repairing products nowadays, and (3) perceived difficulty of finding information about the reparability of products. Communicating information about product reparability to consumers could reduce (especially) the last two barriers.

In line with the above findings, communicating product reparability information to consumers was effective in steering choices towards more reparable product alternatives in the online experiment.[46] Out of the six product alternatives in each assortment, the product with the best reparability class attracted 23% of the choices, on average, when reparability information was provided via a small label on the product information display. The exact same product attracted only 18% of the choices, on average, when reparability information was absent. Thus, the communication of reparability information in the experiment resulted in an average increase of 5%-point (or 28%) in the choice share for the product with the best reparability score relative to the baseline attractiveness of this product. However,

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[45] The results on related measures, such as the intention to have the defective product repaired in the experiment, were fairly consistent, with the exception of Italy. Whereas the percentage of respondents who reported to first consider a repair if a product breaks down was high in Italy compared to other countries, the percentage of respondents who intended to repair the defective product in the experiment was actually lowest in Italy.

[46] In this study, we looked at two indicators for the reparability of product choices: (1) the percentage of respondents who selected the product with the best reparability class, and (2) the average reparability score of the selected products. Averaged across the three product types, the result patterns for these two indicators are very similar. For ease of interpretation, we focus on the results related to choice of the most reparable product here.

some of the tested information formats performed better than others. These differences in performance are discussed in the next section.

4.1. Relative effectiveness of the tested icon and scale formats

We first zoom in on the various scale and icon formats that were included in the test as a separate small label on the product information display (C3-C8). Table 4.1 presents the integrated results on the range of outcome measures for the tested icon and scale formats (product choice, attention, subjective and objective understanding, and perceived importance of the information). The colour coding used in this table indicates the performance of the information format *relative to* the other alternatives that were included in the test. Green shaded outcomes indicate best performing alternatives, grey shaded outcomes indicate worst performing alternatives, and non-shaded outcomes fall in between. Finally, outcomes shaded light green indicate that the performance of that alternative was neither significantly different from the best, nor from the worst performing alternative(s).

Averaged across all product types and countries, all information formats were effective in guiding consumers' choices towards more reparable product alternatives. The effectiveness of the reparability information did not depend on the specific scale or icon format: All formats appeared equally effective, on average. However, we did observe marked differences in (self-declared) attention and understanding across information types.

Based on the integrated results in Table 4.1, the **repair tools** icon and **repair worker** icon, both with **colour-coded scale with textual end labels**, seemed to work best overall. These information alternatives generally attracted most attention and were best understood. But what explains their high performance, their scale format (colour-coded with textual labels) or the icons (repair tools/repair worker)? To answer this question, we systematically examine the effects of the various scale and icon formats across the range of outcome measures.

Scale format

In the experiment, the repair tools icon was tested with three different scales: a black letter scale, a colour-coded scale, and a colour-coded scale with country-specific scale labels ("easy" and "difficult"). Perhaps not surprisingly, the colour-coded scale with country-specific textual labels performed best. The black letter scale performed poorly relative to the other scale formats (see Figure 4.1). Using a colour-coded scale rather than the black letter scale significantly improved self-declared attention to and understanding of the information, but did not enhance objective (factual) understanding of the meaning of the icon (i.e. understanding that it relates to reparability, not e.g. durability) and the scale (i.e. understanding that the scale runs from A = easy to repair to D = difficult to repair). Only when textual labels were added to the colour-coded scale, objective understanding improved as well (see Figure 4.1).

Table 4.1. Relative effectiveness of the tested reparability information formats

The colour coding used in this table indicates the performance of the information format relative to the other alternatives that were included in the test. The coding scheme is based on the statistical (in)significance of the differences observed across information alternatives on the various outcome measures. Green shaded outcomes indicate best performing alternatives (i.e. with the highest score or not significantly different from it), grey shaded outcomes indicate worst performing alternatives (i.e. with the lowest score or not significantly different from it), and non-shaded outcomes fall in between. Finally, outcomes shaded light green indicate that the performance of that alternative was neither significantly different from the best, nor from the worst performing alternative(s).

Reparability information	1. Product choice	2. Attetnion	3a. Subjective understanding	3b. Perceived clarity — Before explanation	3b. Perceived clarity — After explanation	4. Objective understanding — Icon	4. Objective understanding — Scale	5. Perceived importance
On information display:								
C3. (ABCD)	light green	grey	grey	grey	grey	grey	grey	grey
C4. (A B C D)	light green	white	white	white	white	grey	grey	green
C5. (EINFACH—SCHWIERIG A B C D)	light green	green	green	green	green	green	green	grey
C6. (EINFACH—SCHWIERIG A B C D)	light green	green	green	green	green	green	green	light green
C7. (EINFACH—SCHWIERIG A B C D)	light green	green	white	white	green	green	green	green
C8. (EINFACH—SCHWIERIG A B C D)	light green	green	white	white	white	white	green	grey

Figure 4.1. Scale performance
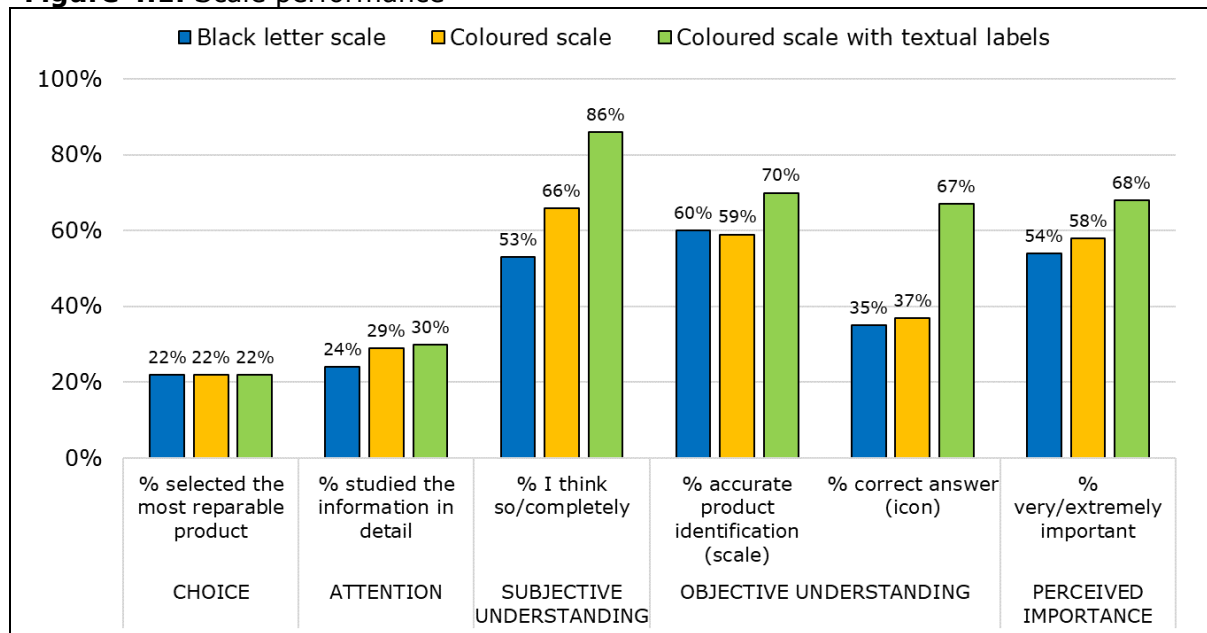
This finding that a colour-coded scale with country-specific textual end labels ("easy" and "difficult") improves (factual) understanding may not be very surprising. A relevant question here is whether the improvement in objective comprehension is large enough to justify an indication that is not language-neutral. On the one hand, the improvements in objective understanding are substantial. Without textual scale labels, the repair tools icon with colour-coded scale (C3) was accurately understood to indicate how easy or difficult a product is to repair (rather than e.g. the expected lifetime of the product or the length of the warranty period) by only 37% of the respondents (see Figure 4.1). This rose to 67% when scale labels were included. Products in the assortment that were easiest (or most difficult) to repair were accurately identified by 59% of the respondents. This percentage rose to 70% when scale labels were added. In both cases, the impact of adding scale labels was as large as the impact of pre-information, which consistently showed strong and positive effects on all outcome measures.

On the other hand, averaged across all product types and countries, product *choices* were unaffected by the scale format. In the experiment, the product that was easiest to repair was selected in 22% of the cases when the repair tools icon was presented as a separate label (a 4%-point increase relative to the baseline attractiveness of the product), and this percentage was independent of the specific scale format used (black letter, coloured, coloured plus text; see Figure 4.1). The results further suggest that the effectiveness of a scale without textual labels might improve after exposure to a public media campaign. This campaign effect is discussed in more detail in the next section.

Icon format

Next to the relatively simple repair tools icon, more detailed icons were tested (all with colour-coded scales with textual end labels) which depicted a repair worker (C6), the repair process (from broken to whole; C7), and the specific product's priority parts

(C8). While there were quite large differences in performance across scale formats, the differences in performance between icon formats are small (see Figure 4.2) and often non-significant (i.e. small differences in Figure 4.2 may be due to chance, see chapter 3 for the detailed (statistical) findings). Looking at the integrated results in Table 4.1, the repair tools and repair worker icons seem to perform slightly better than the repair process and priority parts icons. Respondents reported (slightly) better understanding of these icons and they were perceived as (slightly) clearer already before their meaning was explained to the respondents.

There were no significant differences across the four icon formats on product choices, attention to the reparability information and objective understanding of the scale (which was the same for each icon type). Objective understanding that the icon relates to reparability (and not e.g. durability) was equally high for the repair tools, repair worker and repair process icons, but significantly lower for the priority parts icon. The relatively poor comprehension of the priority parts icon was also reflected in respondents' answers in the association test: Only a small proportion of the respondents correctly understood that the product parts displayed reflect product parts that often need repair (6-16% depending on the specific product type). A much larger group thought that the priority parts reflected the specific product the reparability score pertains to (e.g. a smartphone, washing machine, etc.) or that reparability score *only* pertained to the parts displayed in the icon.

Figure 4.2. Icon performance
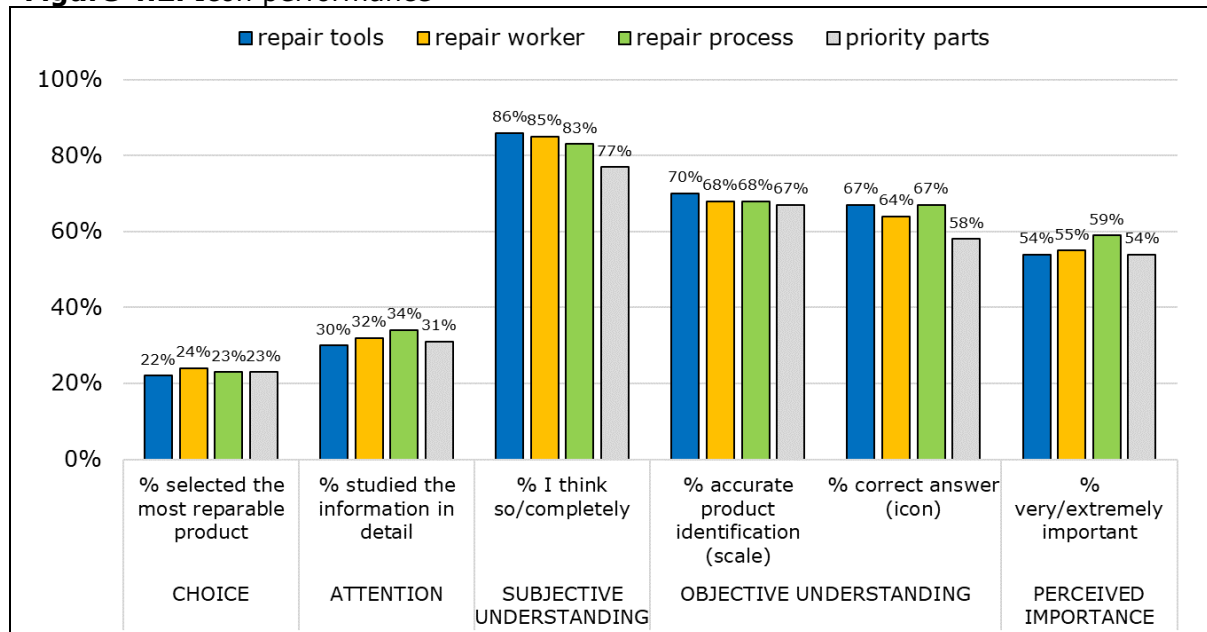
As noted earlier, the repair tools and repair worker icons seem to perform best overall (see Table 4.1). Importantly, the association test showed that the repair worker icon did not evoke significantly stronger associations with professional repairs (vs. self-repairs) than the repair tools icon (respectively 11% and 8% of the respondents reported this association). However, the repair tools icon (with scale labels "easy" and "difficult") was more strongly associated with self-repairs (30%) than the repair worker icon (25%).

More generally, most consumers associated a class A reparability indication with speedy repairs (43%) and easy self-repairs (26%). The intended associations – easy to disassemble with commonly available tools, readily available repair information, and readily available spare parts and/or software updates – were reported by respectively 19%, 20% and 25% of the respondents. Note, however, that without pre-information consumers have no insight into the precise factors underlying the product reparability score. As such, these percentages do not reflect (mis)understanding, but rather the strength of these associations evoked by the reparability indication.

As previously noted, we did not observe significant differences in the impact of the various icon formats (repair tools, repair worker, repair process or priority parts) on product choices. However, a more in-depth analysis suggested that in certain situations, the repair worker icon was slightly more effective in guiding choices towards products that are easier to repair than (some) other icon types. More specifically, the repair worker icon (1) resulted in a higher average reparability of the selected products than the repair tools icon for *washing machines* (but not for smartphones or televisions), (2) was effective in guiding choices towards more reparable products in *more countries* (than other icons were), and (3) significantly outperformed the repair tools icon (regardless of its scale format) among consumers who *had not been recently exposed to a reparability-related media campaign* (the majority of the sample). In contrast, the effectiveness of the repair tools and repair process icons appeared to improve after exposure to a reparability-related campaign. This may suggest that particularly these icon types benefit from an information campaign, which may be due to the similarity of icons used (in the case of the repair tools icon) or because exposure to the campaign makes it easier to grasp the meaning of the icon (which is more likely for the more complex repair process icon). Note, however, that it could also be that consumers who find reparability important are simply more likely to use this information in decision-making when it is present *and* more likely to have good memory for reparability-related campaigns (i.e. the relationship may not be causal).

If not placed on the EU energy label, the reparability information was communicated via separate small labels that were displayed close to the other product information. The labels visually stood out from the other (mostly textual) information. Note that this might have increased the effectiveness of the reparability information in guiding choices towards more reparable products. If the reparability information had been less salient, its effect might have been smaller.[47]

4.2. Information vehicle: on the EU energy label or not?

If reparability information is to be displayed on the EU energy label, it needs to conform to energy label style rules (relatively simple black line icon, black letter scale, etc.). The simple repair tools icon, which performed well, would fit well on the energy label. However, the results in the previous section already suggested that the black letter scale may not be optimal for communicating reparability information. A colour-

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[47] See e.g. Bettman, J. R., Luce, M. F., & Payne, J. W. (2008). Preference construction and preference stability: Putting the pillow to rest. *Journal of Consumer Psychology*, *18*(3), 170-

coded scale significantly improved attention to and understanding of the reparability information, especially when the scale ends were textually labelled.

Figure 4.3. On vs. outside the EU energy label (washing machines and televisions)
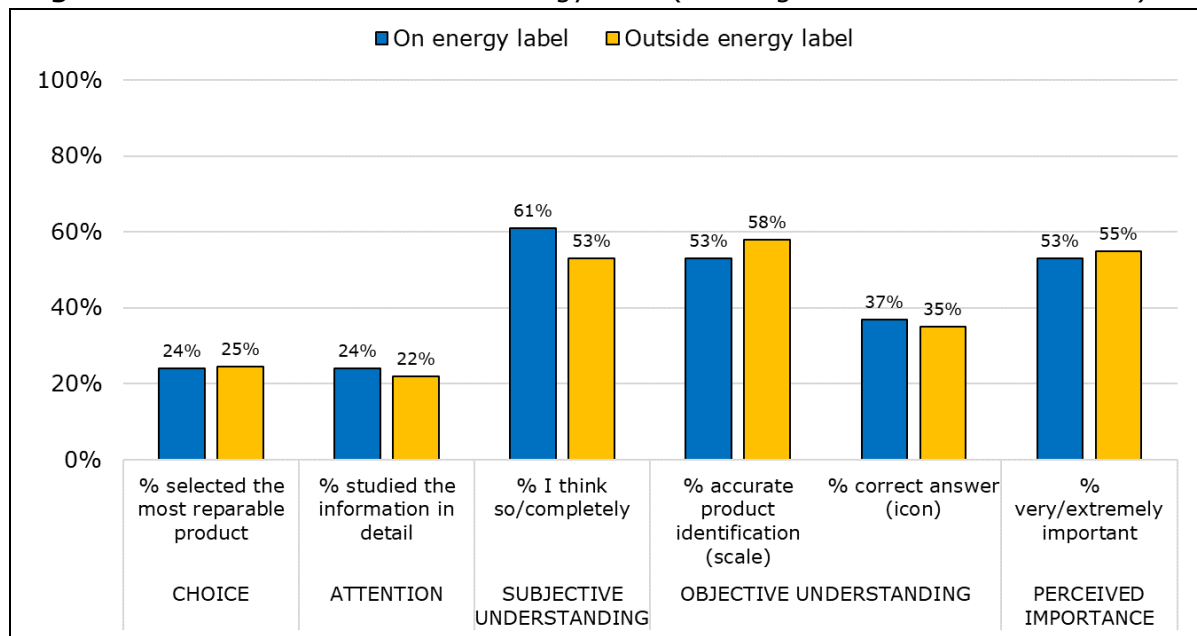
While not very effective outside the EU energy label, it could be that the repair tools icon with black letter scale performs well when it is displayed on the energy label. This could be the case, for instance, if the information on the energy label draws more attention, or if the energy label context makes the reparability information easier to understand. To test whether such an information *vehicle* effect exist, we compared the situation in which the simple repair tools icon with black letter scale was presented as a small label on the product information display with a situation in which the exact same reparability indication was displayed on the EU energy label. The size of the icon and black letter scale was kept constant across the two situations, to rule out that differences can be explained by the salience of the information (e.g. size of the icon). Figure 4.3 shows the results.

The effectiveness of the reparability indication did not strongly depend on whether or not it was presented on the EU energy label. We only observed a significant difference in subjective understanding. If the reparability information was displayed on the EU energy label, significantly more respondents reported to understand the information (61%) than if the same information was displayed as a small label on the product information display (53%; see Figure 4.3). Other differences were not statistically significant (i.e. may be due to chance).

All in all, integrating the reparability information in the EU energy label thus does not seem to be a bad option per se. The same reparability indication was as effective on the EU energy label as it was outside of it, and even reached higher levels of

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174; Reisch, L. A., & Zhao, M. (2017). Behavioural economics, consumer behaviour and consumer policy: state of the art. *Behavioural Public Policy*, *1*(2), 190-206.

subjective understanding when placed on the energy label. However, including the information in the energy label imposes restrictions on the icon and scale format, which must adhere to the energy label house style. Our findings demonstrate that the reparability indication that conformed to the energy label house style, i.e. the repair tools icon with black letter scale, performed poorly relative to other information formats included in the test. As discussed in the previous section, the overall effectiveness of the reparability indication significantly improved if the black letter scale was replaced by a colour-coded scale, especially if textual labels were used. Thus, the relatively poor performance of the reparability indication on the EU energy label seems to be driven by the poor performance of the black letter scale relative to the other scale formats rather than by the location of this information.

Impact of the EU logo

For smartphones, which do not have energy labels, the impact of adding an EU logo to the reparability indication (repair tools icon with black letter scale) was tested instead. Figure 4.4 shows the results with versus without EU logo. None of the differences were statistically significant. In other words, the effectiveness of the reparability indication did not depend on the presence of the EU logo.

Figure 4.4. With vs. without EU logo (smartphones)
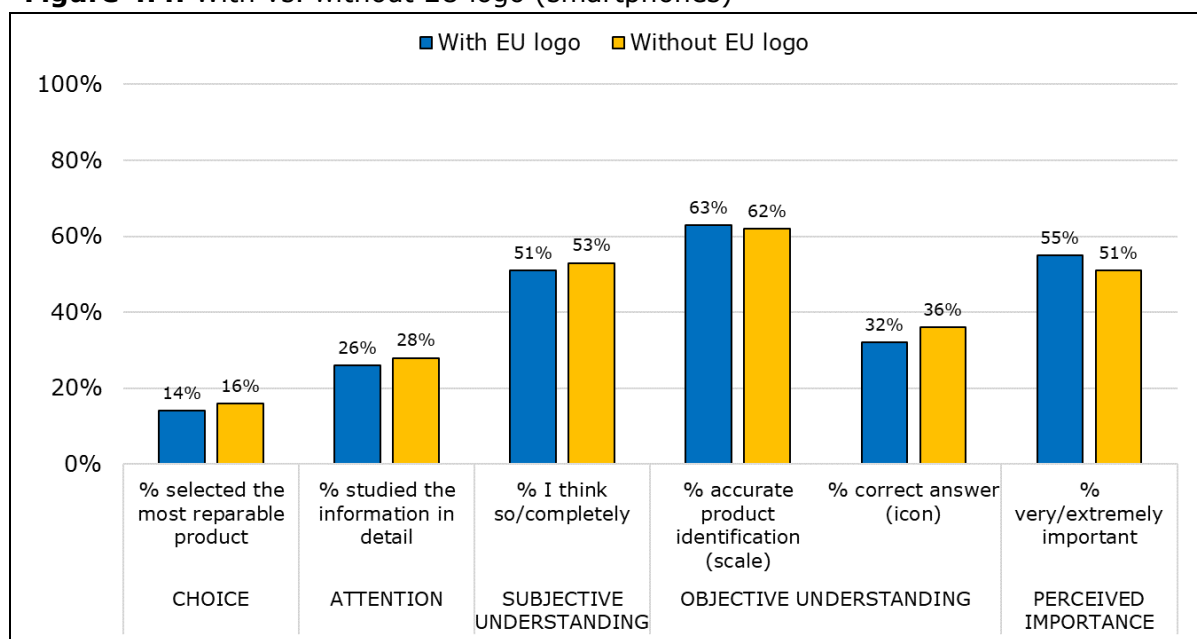
4.3. The intention to repair (vs. replace)

In addition to the effects on purchasing decisions, we also examined whether the presence of reparability information affects consumers' decisions to actually repair (versus replace) a product when it becomes defective. When respondents were not pre-informed about the reparability information, they were *not* more likely to make the decision to repair (rather than replace) the broken product if the product had a reparability score A than if it had score D (or if this information was absent), regardless of its format. Thus, the reparability information appears to have a stronger

effect on consumers' product choices than on their willingness to repair rather than replace a broken product.

Consumers' willingness to repair might be driven more by the cost rather than the ease of the repair: High repair costs were perceived as the most important barrier to repairing products. In the experiment, the costs varied across repair and replacement options (e.g. a new model was more expensive than a second-hand model) and across product types, but the cost of the repair did not depend on the reparability score (A versus D). If in reality products that are easier to repair are also less costly to repair and consumers are (made) aware of this, reparability information might have a stronger impact on repair decisions. However, the present findings suggest that if such a link between ease and costs does not exist, the impact of reparability information on actual repair decisions may be limited (unless consumers are pre-informed, see the next section).

4.4. The impact of pre-information

Finally, we also tested the impact of pre-informing consumers about the presence and meaning of the reparability information. Some of the respondents that were exposed to the repair tools icon (with black letter scale) read a short explanation prior to the product choice task ("Before you leave the house, you read the following article in the newspaper"), while other respondents did not receive this information. Figure 4.5 shows the results for informed versus non-informed respondents.

Figure 4.5. The impact of pre-information
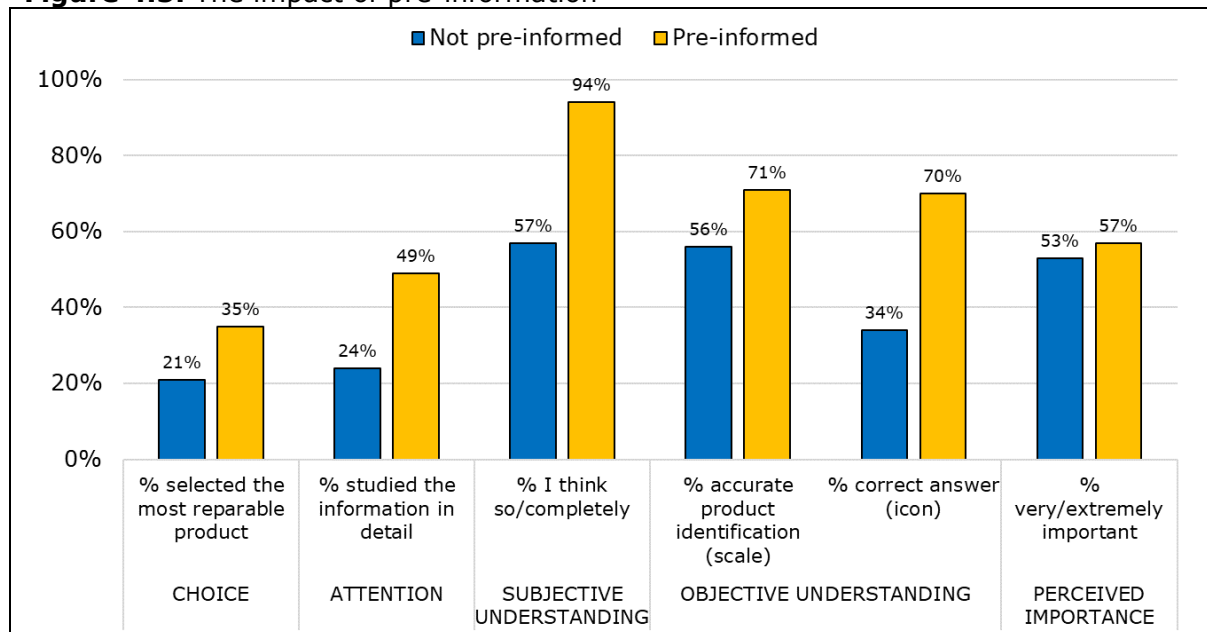
The results in Figure 4.5 show the strong positive impact of pre-information on almost all outcome measures (only the difference in perceived importance of the information was not statistically significant). When respondents were pre-informed about the meaning of the reparability information (here, the repair tools icon with black letter scale), its performance greatly improved. In fact, in that case, the icon outperformed

the other icon alternatives on virtually all aspects (attention, understanding, choice, etc.), the reparability information became effective in guiding choices towards more reparable products in *all of the selected countries*, and also affected *repair decisions*. When consumers were pre-informed, they were more likely to repair rather than replace a broken product if it had a good reparability score than if it had a bad reparability score (or if this information was not communicated at all). Interestingly, they were not less likely to repair a broken product if the reparability indication communicated that it was difficult to repair than if such information was not available.

The strong and positive impact of pre-informing consumers about the meaning of the reparability indication is unlikely to be specific to the repair tools icon and black letter scale, however. Rather, providing such information prior to exposure to product reparability scores in a purchase setting is expected to enhance understanding and use of these scores in decision-making, regardless of the specific information format used. It thus seems crucial to have a strong information campaign to pre-inform consumers about the presence and meaning of the reparability indication.

4.5. Summary

This section summarizes the key findings of this study.

Key finding 1: The presence of reparability information guides choices towards more reparable alternatives

In line with earlier studies[48], this study shows that providing reparability information is effective in guiding product choices towards more reparable products. In the present study, the communication of reparability information resulted in a 5%-point increase in the choice share of the product with the best reparability score (from 18% to 23%).

Key finding 2: Of the tested alternatives, the repair tools icon and the repair worker icon, both with colour-coded scale and scale labels "easy" and difficult", performed best overall

The different types of reparability indications that were tested in the online experiment were equally effective in promoting choice of more reparable products, but some reparability indications received more attention and were better understood than others. As regards the icon format, the repair tools icon and repair worker icon performed slightly better overall than the icons depicting the repair process and priority parts (keeping the scale format constant). The priority parts icon was understood relatively poorly. As regards the scale format, colour-coding improved self-reported but not objective understanding of the reparability indication. Only when country-specific scale labels ("easy" and "difficult") were added to the colour-coded scale, objective understanding substantially improved. Therefore, overall, the repair tools icon (#3) and the repair worker icon (#4) both with colour-coded scale with textual labels performed best. Note, however, that by using such scale labels, the

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48 London Economics consortium (2018). *Behavioural Study on the Consumers' Engagement in the Circular Economy*.
    https://ec.europa.eu/info/sites/info/files/ec_circular_economy_final_report_0.pdf;
    GfK consortium (2019). *Consumer Market Study to support the Fitness Check of EU consumer and marketing law*.
    https://www.centerdata.nl/en/projects-by-centerdata/fitness-check-eu-consumer-and-marketing-law.

indication is no longer language neutral.

Key finding 3: There is no *vehicle effect*; reparability information was as effective on the EU energy label as outside of it (as a separate label).

If the reparability information is to be displayed on the EU energy label it must adhere to EU energy label style rules. The repair tools icon with black letter scale, which conformed to these rules, was as effective on the EU energy label as it was outside of it. Self-reported understanding of the reparability indication was slightly higher when this reparability indication was displayed on the EU energy label than when it was presented as a separate label.

However, outside the energy label, where there is no need to adhere to these specific style rules, the other scale formats outperformed the black letter scale. The superior performance of the repair tools icon (#3) presented outside the EU energy label is driven by the good performance of the colour-coded and labelled scale rather than by the difference in location of this information.

Key finding 4: Pre-informing consumers strongly enhances the effectiveness of the reparability indication

Pre-informing consumers about the presence and meaning of the reparability indication seems crucial: It greatly enhanced the effectiveness of the reparability indication in all of the surveyed countries. Pre-information had strong and positive effects on understanding of the reparability information, use of this information in making product choices (14%-point increase in the choice share of the product with the best reparability score), and actual repair intentions.

Appendix A. Questionnaire

Value of X1	Reparability icon type	Location reparability information	Explanation prior to exposure to reparability information	Number of respondents per country
1	Simple icon A-D	On energy label*	No	150
2	Simple icon A-D	On energy label*	Yes	150
3	Simple icon A-D	On product information card	No	150
4	Simple icon Green A – Red D	On product information card	No	150
5	Simple icon plus text Green A – Red D	On product information card	No	150
6	Detailed icon: Repair worker Green A – Red D	On product information card	No	150
7	Detailed icon: Repair process Green A – Red D	On product information card	No	150
8	Detailed icon: Priority parts Green A – Red D	On product information card	No	150
9	No reparability information (control group)	On product information card	No	150

Smartphones do not have energy labels. Here, we aim to test whether the presence (vs. absence) of the EU logo (EU flag) in the icon influences the extent to which consumers take into account reparability information in their product choice. Respondents in this conditions will see smartphones for which reparability information includes the EU logo and is displayed on the product information card.

Reparability icon type	Designs		
If X1 < 4: Simple icon A-D	A**B**CD		
If X1 = 4: Simple icon Green A – Red D	**A** B C D		
If X1 = 5: Simple icon plus text Green A – Red D	EASY — DIFFICULT **A** B C D		
If X1 = 6: Detailed icon: repair worker	EASY — DIFFICULT **A** B C D		
If X1 = 7: Detailed icon: repair process ('broken-to-whole')	EASY ——— DIFFICULT **A** B C D	EASY ——— DIFFICULT **A** B C D	EASY ——— DIFFICULT **A** B C D
If X1 = 8: Priority parts	EASY ⚒ DIFFICULT **A** B C D	EASY ⚒ DIFFICULT **A** B C D	EASY ⚒ DIFFICULT **A** B C D

Value of X2	Product type	Number of respondents per country
1	Smartphones	1400
2	TVs	1400
3	Washing machines	1400

Value of X3	Product order			Number of respondents per country
	PART 1A	PART 1B	PART 1C and other parts	
1	X2 = 1 (smartphones)	X2 = 2 (TVs)	X2 = 3 (washing machines)	467
2	X2 = 2 (TVs)	X2 = 3 (washing machines)	X2 = 1 (smartphones)	467
3	X2 = 3 (washing machines)	X2 = 1 (smartphones)	X2 = 2 (TVs)	467

Value of X4	Chosen product	Number of respondents per country
1	High reparability score	600
2	Low reparability score	600

Respondents are **randomly assigned** to the levels of **X1** and **X3**. Each respondent will be exposed to all product types (all values of **X2**). The order depends on the value of **X3**, as follows:

If X3 = 1, then X2 = 1 (PART 1A), X2 = 2 (PART 1B), X2 = 3 (PART 1C and other parts).
If X3 = 2, then X2 = 2 (PART 1A), X2 = 3 (PART 1B), X2 = 1 (PART 1C and other parts).
If X3 = 3, then X2 = 3 (PART 1A), X2 = 1 (PART 1B), X2 = 2 (PART 1C and other parts).

Respondents assigned to X1 < 9 are randomly assigned to values of **X4**.

Scripter: please ensure that respondents cannot go back to previous questions.
Screen 1 [Socio-demographics]
All respondents:
Q1. What is your gender?
1 Man
2 Woman

Q2. What is your age?

GENERAL INTRODUCTION
Screen 2 [General introduction]
All respondents:
This questionnaire is about the purchase of products. We are interested in how people form impressions of the products they encounter while shopping, and how they make buying decisions.

This questionnaire consists of three parts and will take about 15 minutes to complete.

Screen 3 [Introduction choice task]
All respondents:
This is the first part of the questionnaire.

In this part, you will see several small product assortments. You will see smartphones, televisions and washing machines.

Each time, imagine that you are in a real store and actually intend to buy the product. Please take a look at the choice options and make choices exactly as you would do in reality.

Screen 4 [Prior information manipulation]
If X1 = 2, then: Now, imagine that before you leave the house, you read the following article in the newspaper.

New symbol shows how easy it is to repair products

From now on, manufacturers of various devices are obliged to provide information to consumers regarding how easy or difficult the device is to repair when it breaks.

Display "Reparability_icon_3.jpg"

This information is provided on a scale from class A to class D, where A means that the product is easy to repair and D means that the product is difficult to repair. Products in class B and C are neither easy nor difficult to repair. Which class a product belongs to depends on three aspects:
- How easy it is to disassemble the product
- The extent to which repair information is available
- The extent to which spare parts or software updates are available

Products in class A score well on each of these aspects. Products in class D, in contrast, score poorly on one or more aspects.

Q3. Do you understand this information?
1 No, not at all
2 Yes, to some extent
3 Yes, completely

Else: skip this screen.

Task 1A

Screen 5 [Choice task 1 - introduction]
All respondents:
Now, imagine that you are visiting a store that sells consumer electronics. You are specifically looking for a new [*if X2 = 1, then* smartphone; *if X2 = 2, then* television; *if X2 = 3, then* washing machine]. Imagine that you consider buying one of the six [*if X2 = 1, then* smartphones; *if X2 = 2, then* televisions; *if X2 = 3, then* washing machines] on the next screen.

Screen 6 [Choice task 1]
All respondents:

Q4. If you had to make a choice, which of these [*if X2 = 1, then* smartphones; *if X2 = 2, then* televisions; *if X2 = 3, then* washing machines] would you choose?

If X2 = 1 (smartphones) display "VX_T1_P1.jpg to VX_T1_P6.jpg"
If X2 = 2 (televisions) display "VX_T2_P1.jpg to VX_T2_P6.jpg"
If X2 = 3 (washing machines) display "VX_T3_P1.jpg to VX_T3_P6.jpg"

Scripter: The value of VX (label variant) depends on the value of X1 (V1 for X1 = 1, V2 for X1 = 2, etc.).
Scripter: Please randomize the order of the six images.
Scripter: Respondents should be able to zoom in on each product image.
Scripter: Respondents should be able to select one of the six products. Please record their choice.

Task 1B

Screen 7 [Choice task 2 - introduction]
All respondents:
Now, imagine that you are looking for a new [[*if X2 = 1, then* smartphone; *if X2 = 2, then* television; *if X2 = 3, then* washing machine]. Again, imagine that you are in a real store and consider buying one of the six [*if X2 = 1, then* smartphones; *if X2 = 2, then* televisions; *if X2 = 3, then* washing machines] on the next screen.

Screen 8 [Choice task 2]
All respondents:
Q5. If you had to make a choice, which of these [*if X2 = 1, then* smartphones; *if X2 = 2, then* televisions; *if X2 = 3, then* washing machines] would you choose?

If X2 = 1 (smartphones) display "VX_T1_P1.jpg to VX_T1_P6.jpg"
If X2 = 2 (televisions) display "VX_T2_P1.jpg to VX_T2_P6.jpg"
If X2 = 3 (washing machines) display "VX_T3_P1.jpg to VX_T3_P6.jpg"

Scripter: Please randomize the order of the six images.
Scripter: Respondents should be able to zoom in on each product image.
Scripter: Respondents should be able to select one of the six products. Please record their choice.

Task 1C

Screen 9 [Choice task 2 - introduction]
All respondents:
Finally, imagine that you are looking for a new [*if X2 = 1, then* smartphone; *if X2 = 2, then* television; *if X2 = 3, then* washing machine]. Again, imagine that you are in a real store and that you consider buying one of the six [*if X2 = 1, then* smartphones; *if X2 = 2, then* televisions; *if X2 = 3, then* washing machines] on the next screen.

Screen 10 [Choice task 2]
All respondents:
Q6. If you had to make a choice, which of these [*if X2 = 1, then* smartphones; *if X2 = 2, then* televisions; *if X2 = 3, then* washing machines] would you choose?

If X2 = 1 (smartphones) display "VX_T1_P1.jpg to VX_T1_P6.jpg"
If X2 = 2 (televisions) display "VX_T2_P1.jpg to VX_T2_P6.jpg"

If X2 = 3 (washing machines) display "VX_T3_P1.jpg to VX_T3_P6.jpg"

Scripter: Please randomize the order of the six images.
Scripter: Respondents should be able to zoom in on each product image.
Scripter: Respondents should be able to select one of the six products. Please record their choice.

Screen 11 [Intention to repair versus replace]

If X2 = 1:
Now, imagine that you have bought the following smartphone. You paid *€449*.

If X1 = 9 and X2 = 1, display "phone.jpg"
If X1 = 1, X2 = 1, and X4 = 1, insert "phoneV1A.jpg"
If X1 = 1, X2 = 1, and X4 = 2 insert "phoneV1D.jpg"
If X1 = 2, X2 = 1, and X4 = 1, insert "phoneV2A.jpg"
If X1 = 2, X2 = 1, and X4 = 2 insert "phoneV2D.jpg"
If X1 = 3, X2 = 1, and X4 = 1, insert "phoneV3A.jpg"
If X1 = 3, X2 = 1, and X4 = 2 insert "phoneV3D.jpg"
Etc.

If X2 = 1:
You are satisfied with this smartphone. After one year, however, it suddenly slips out of your hand and falls all the way down the stairs. When you pick it up, you notice that it is broken.

Unfortunately, the damage is not covered by a warranty or insurance. The smartphone is repairable, but you cannot do it yourself.

You must now decide whether you have the smartphone repaired or buy a new one. To make a decision, you list your options:

Option 1. Have it repaired	**Option 2. Buy a similar model**	**Option 3. Buy a newer model**
You bring your smartphone to a professional repair shop. It will be repaired using only original parts. **Cost: €112**	You buy a new smartphone. It's a similar model with the same features as your current smartphone. **Cost:** • **New: €409** • **Second-hand (as good as new): €315**	You buy a brand new smartphone. It's a newer model with better features than your current smartphone. **Cost: €459**

Q7. What would you do? Please select your preferred option.

If X2 = 2:
Now, imagine that you have bought the following television. You paid *€655*.

If X1 = 9 and X2 = 2, display "tv.jpg"
If X1 = 1, X2 = 2, and X4 = 1, insert "tvV1A.jpg"
If X1 = 1, X2 = 2, and X4 = 2 insert "tvV1D.jpg"
If X1 = 2, X2 = 2, and X4 = 1, insert "tvV2A.jpg"

If X1 = 2, X2 = 2, and X4 = 2 insert "tvV2D.jpg"
If X1 = 3, X2 = 2, and X4 = 1, insert "tvV3A.jpg"
If X1 = 3, X2 = 2, and X4 = 2 insert "tvV3D.jpg"
Etc.

You are satisfied with this television. After two years, however, it suddenly stops working.

Unfortunately, the television is no longer covered by a warranty and it is not insured. The television is repairable, but you cannot do it yourself.

You must now decide whether you have the television repaired or buy a new one. To make a decision, you list your options:

Option 1. Have it repaired	**Option 2. Buy a similar model**	**Option 3. Buy a newer model**
You bring your television to a repair shop. It will be repaired by a professional using only original parts. **Cost: €165**	You buy a new television. It's a similar model with the same features as your current television. **Cost:** • **New: €599** • **Second-hand (as good as new): €490**	You buy a brand new television. It's a newer model with better features than your current television. **Cost: €675**

Q8. What would you do? Please select your preferred option.

If X2 = 3:
Now, imagine that you have bought the following washing machine. You paid *€799.*

If X1 = 9 and X2 = 3, display "wash.jpg"
If X1 = 1, X2 = 3, and X4 = 1, insert "washV1A.jpg"
If X1 = 1, X2 = 3, and X4 = 2 insert "washV1D.jpg"
If X1 = 2, X2 = 3, and X4 = 1, insert "washV2A.jpg"
If X1 = 2, X2 = 3, and X4 = 2 insert "washV2D.jpg"
If X1 = 3, X2 = 3, and X4 = 1, insert "washV3A.jpg"
If X1 = 3, X2 = 3, and X4 = 2 insert "washV3D.jpg"
Etc.

You are satisfied with this washing machine. After five years, however, it suddenly stops working.

Unfortunately, the washing machine is no longer covered by a warranty and it is not insured. The washing machine is repairable, but you cannot do it yourself.

You must now decide whether you have the washing machine repaired or buy a new one. To make a decision, you list your options:

Option 1. Have it repaired	**Option 2. Buy a similar model**	**Option 3. Buy a newer model**
Your washing machine will be repaired at your home. It will	You buy a new washing	You buy a brand new washing

be repaired by a professional using only original parts. **Cost: €200**	machine. It's a similar model with the same features as your current washing machine. **Cost:** • **New: €729** • **Second-hand (as good as new): €559**	machine. It's a newer model with better features than your current washing machine. **Cost: €825**

Q9. What would you do? Please select your preferred option.

PART 2: UNDERSTANDING

Screen 12 [Icon understanding in isolation – introduction]
All respondents:
You just saw several smartphones, televisions, and washing machines with product descriptions. Some of the product information was displayed graphically in the form of a figure or pictogram. On the next screens, you will see some examples of figures and pictograms that you may have seen before when making product choices. We are interested in your opinion regarding how clear or unclear these figures and pictograms are.

Screen 13 [Icon understanding in isolation – filler task]
All respondents:
Please have a look at the image below.

Display "EEscale.jpg"

Screen 14 [Attention, understanding, and clarity – filler task]
Q10. Did you look at this information when making product choices earlier in this questionnaire?
1. Yes, I studied it in detail
2. Yes, I looked at it briefly
3. No, I did not look at it at all

Q11. Do you understand this information?
1. Yes, completely
2. I think so
3. I think not
4. No, not at all

Q12. Do you think this information is clear or unclear?
1. Very clear
2. Clear
3. Neither clear, nor unclear
4. Unclear
5. Very unclear

Screen 15 [Icon understanding in isolation – filler task]
All respondents:

Display "EEscale.jpg"

Q13. This information was, amongst others, provided on the televisions you just saw. What do you think this information indicates?

It indicates…

1. the energy consumption of the television compared to the average television
2. the energy consumption of the television compared to other televisions with the same screen size
3. the quality of the television
4. the extent to which the television meets European quality standards of electrical safety
5. the durability of the television (how long it lasts)
98. none of the above
99. I (really) don't know

Screen 16 [Relevance - filler task]
All respondents:

Display "EEscale.jpg"

This figure indicates the energy efficiency of a product. A higher energy class (e.g., an "A") means that a product uses less energy compared to similar products on the market (e.g., compared to TVs with the same screen size).

Q14. Now, imagine that you are planning to buy a new [*if X2 = 1, then* smartphone; *if X2 = 2, then* television; *if X2 = 3, then* washing machine].

How important would this information on the energy efficiency be to you when comparing different models?
1. Extremely important
2. Very important
3. Fairly important
4. Not very important
5. Not at all important

Screen 17 [Attention, understanding, and clarity in isolation – focal task]
If X1 = 9: skip this screen.

Now, please have a look at the pictogram below [*If X1 = 1 OR X1 = 2, then* that is outlined in blue].

If X1 = 1, then display "Reparability_icon_1.jpg" [icon highlighted on energy label]
If X1 = 2, then display "Reparability_icon_2.jpg" [icon highlighted on energy label]
If X1 = 3, then display "Reparability_icon_3.jpg"
If X1 = 4, then display "Reparability_icon_4.jpg"
If X1 = 5, then display "Reparability_icon_5.jpg"
If X1 = 6, then display "Reparability_icon_6.jpg"
If X1 = 7, then display "Reparability_icon_7.jpg"
If X1 = 8, then display "Reparability_icon_8.jpg"

Q15. Did you look at this pictogram when making product choices earlier in this questionnaire?
1. Yes, I studied it in detail
2. Yes, I looked at it briefly
3. No, I did not look at it at all

Q16. Do you understand the meaning of this pictogram?
1. Yes, completely
2. I think so
3. I think not
4. No, not at all

Q17. Do you think this pictogram is clear or unclear?
1. Very clear
2. Clear
3. Neither clear, nor unclear
4. Unclear
5. Very unclear

Screen 18 [Icon understanding in isolation – focal task]
If X1 = 9: skip this screen.

If X1 = 1, then display "Reparability_icon_1.jpg" [icon highlighted on energy label]
If X1 = 2, then display "Reparability_icon_2.jpg" [icon highlighted on energy label]
If X1 = 3, then display "Reparability_icon_3.jpg"
If X1 = 4, then display "Reparability_icon_4.jpg"
If X1 = 5, then display "Reparability_icon_5.jpg"
If X1 = 6, then display "Reparability_icon_6.jpg"
If X1 = 7, then display "Reparability_icon_7.jpg"
If X1 = 8, then display "Reparability_icon_8.jpg"

Q18. What do you think [*If X1 = 1 OR X1 = 2, then* the highlighted, *else* this] pictogram indicates?
It indicates…
1. which tools are required for assembly/disassembly
2. how easy or difficult the product is to repair
3. the length of the warranty period
4. the expected lifetime of the product (how long the product lasts)
5. whether you can repair the product yourself or need a professional repair service
6. none of the above
7. I (really) don't know

Screen 19 [Icon understanding in product context – product identification task]
If X1 = 9: skip this screen.

If X2 = 1 (smartphones) display "VX_T1_P1.jpg to VX_T1_P6.jpg"
If X2 = 2 (televisions) display "VX_T2_P1.jpg to VX_T2_P6.jpg"
If X2 = 3 (washing machines) display "VX_T3_P1.jpg to VX_T3_P6.jpg"

Here, you see one of the product assortments you saw earlier once again.

Q19. According to you, which of these products is <u>easiest to repair</u>?

Scripter: Please randomize the order of the six images.
Scripter: Respondents should be able to zoom in on each product image.
Scripter: Respondents should be able to select one of the six products. Please record their choice.
Scripter: Add answer option "I (really) don't know".

Screen 20 [Icon understanding in product context – product identification task]
If X1 = 9: skip this screen.

If X2 = 1 (smartphones) display "VX_T1_P1.jpg to VX_T1_P6.jpg"
If X2 = 2 (televisions) display "VX_T2_P1.jpg to VX_T2_P6.jpg"
If X2 = 3 (washing machines) display "VX_T3_P1.jpg to VX_T3_P6.jpg"

Q20. According to you, which of these products is <u>most difficult to repair</u>?

Scripter: Please randomize the order of the six images.
Scripter: Respondents should be able to zoom in on each product image.
Scripter: Respondents should be able to select one of the six products. Please record their choice.
Scripter: Add answer option "I (really) don't know".

Screen 21 [Icon understanding in isolation – focal task]
If X1 = 9: skip this screen.

If X1 = 1, then display "Reparability_icon_1.jpg" [icon highlighted on energy label]
If X1 = 2, then display "Reparability_icon_2.jpg" [icon highlighted on energy label]
If X1 = 3, then display "Reparability_icon_3.jpg"
If X1 = 4, then display "Reparability_icon_4.jpg"
If X1 = 5, then display "Reparability_icon_5.jpg"
If X1 = 6, then display "Reparability_icon_6.jpg"
If X1 = 7, then display "Reparability_icon_7.jpg"
If X1 = 8, then display "Reparability_icon_8.jpg"

[*If X1 = 1, then* The highlighted; *If X1 = 2, then* As you might know, the highlighted; *else* This] pictogram indicates product reparability, or how easy or difficult a product is to repair when it breaks. This information is provided on a scale from class A to class D, where A means that the product is easy to repair and D means that the product is difficult to repair.

Q21. Now you know its meaning, how clear or unclear do you find the pictogram?
1. Very clear
2. Clear
3. Neither clear, nor unclear
4. Unclear
5. Very unclear

Screen 22 [Reparability relevance – focal task]
If X1 = 9: skip this screen.

If X1 = 1, then display "Reparability_icon_1.jpg" [icon highlighted on energy label]
If X1 = 2, then display "Reparability_icon_2.jpg" [icon highlighted on energy label]
If X1 = 3, then display "Reparability_icon_3.jpg"
If X1 = 4, then display "Reparability_icon_4.jpg"
If X1 = 5, then display "Reparability_icon_5.jpg"
If X1 = 6, then display "Reparability_icon_6.jpg"
If X1 = 7, then display "Reparability_icon_7.jpg"
If X1 = 8, then display "Reparability_icon_8.jpg"

Now, imagine that you are planning to buy a new [*if X2 = 1, then* smartphone; *if X2 = 2, then* television; *if X2 = 3, then* washing machine].

Q22. How important would this information on product reparability be to you when comparing different models?
1. Extremely important
2. Very important
3. Fairly important
4. Not very important
5. Not at all important

Screen 22 [Reparability willingness to pay – focal task]
If X1 = 9, skip this screen.

Q23. Below, you see two [*if X3 = 1, then* smartphones; *if X3 = 2, then* televisions; *if X3 = 3, then* washing machines]. They differ only in how easy or difficult they are to repair. The [*if X3 = 1, then* smartphone; *if X3 = 2, then* television; *if X3 = 3, then* washing machine] on the left costs [*if X3 = 1, then* €449; *if X3 = 2, then* €655; *if X3 = 3, then* €799]. What is the maximum price you would be willing to pay for each of the [*if X3 = 1, then* smartphones; *if X3 = 2, then* televisions; *if X3 = 3, then* washing machines]?

If X1 = 1, X3 = 1 insert "phoneV1D.jpg" on the left and "phoneV1A.jpg" on the right.
If X1 = 2, X3 = 1 insert "phoneV2D.jpg" on the left and "phoneV2A.jpg" on the right.
If X1 = 3, X3 = 1 insert "phoneV3D.jpg" on the left and "phoneV3A.jpg" on the right.
Etc.

If X1 = 1, X3 = 2 insert "tvV1D.jpg" on the left and "tvV1A.jpg" on the right.
If X1 = 2, X3 = 2 insert "tvV2D.jpg" on the left and "tvV2A.jpg" on the right.
If X1 = 3, X3 = 2 insert "tvV3D.jpg" on the left and "tvV3A.jpg" on the right.
Etc.

If X1 = 1, X3 = 3 insert "washV1D.jpg" on the left and "washV1A.jpg" on the right.
If X1 = 2, X3 = 3 insert "washV2D.jpg" on the left and "washV2A.jpg" on the right.
If X1 = 3, X3 = 3 insert "washV3D.jpg" on the left and "washV3A.jpg" on the right.
Etc.

Screen 23 [Associations reparability concept]
If X1 = 9: skip this screen.

If X1 = 1, then display "Reparability_icon_1.jpg" [icon highlighted on energy label]
If X1 = 2, then display "Reparability_icon_2.jpg" [icon highlighted on energy label]
If X1 = 3, then display "Reparability_icon_3.jpg"
If X1 = 4, then display "Reparability_icon_4.jpg"
If X1 = 5, then display "Reparability_icon_5.jpg"
If X1 = 6, then display "Reparability_icon_6.jpg"
If X1 = 7, then display "Reparability_icon_7.jpg"
If X1 = 8, then display "Reparability_icon_8.jpg"

Q24. Here, you again see the pictogram that indicates how easy or difficult a product is to repair when it breaks.
Imagine that you see this pictogram on a certain product. What do you think is true about this product? *Multiple answers possible.*
1. It is guaranteed that the product has a long lifetime (it lasts long)
2. It is easy to disassemble the product with commonly available tools
3. The product has a long warranty period

4. Repair information is readily available for this product

5. If the product breaks, you can easily repair the product yourself

6. If the product breaks, you need a professional repair service to do the repair

7. If the product breaks, the expected cost of the repair is low

8. If the product breaks, it can be repaired quickly

9. If the product breaks, the tools depicted in the pictogram are sufficient to do the repair

10. Spare parts and/or software updates are readily available for this product

11. The product breaks easily

12. The product is of low quality

13. The product is of high quality

98. None of the above

99. I (really) don't know

Screen 22 [Associations reparability concept – additional question for icon depicting priority parts]
If X1 < 8: skip this screen.
If X1 = 9: skip this screen.

If X1 = 8, then display "Reparability_icon_8.jpg"

Q25. Here, you see the same pictogram once more. Now, please take a look at the two symbols at the top. What do you think these symbols indicate?

1. They reflect product parts that often need repair.

2. The reparability score only pertains to these product parts.

3. They reflect what product the reparability score pertains to (e.g. washing machine, smartphone, television)

4. I (really) don't know

PART 3. BACKGROUND INFORMATION
All respondents:

Screen 24 [Introduction]
Finally, in this third and last part, we would like to ask you a few more general questions.

Screen 25 [Importance of reparability in purchase decisions; behavioural study on consumers' engagement in the circular economy]
Q25. Imagine that you intend to buy a [*if X2 = 1, then* smartphone; *if X2 = 2, then* television; *if X2 = 3, then* washing machine]. Please indicate how important each of the following aspects would be to you when making your choice.

	Not important at all						Very important
Q25_1. Price	1	2	3	4	5	6	7
Q25_2. Brand	1	2	3	4	5	6	7
Q25_3. Quality	1	2	3	4	5	6	7
Q25_4. Model	1	2	3	4	5	6	7
Q25_5. Durability (expected lifespan)	1	2	3	4	5	6	7
Q25_6. Reparability	1	2	3	4	5	6	7
Q25_7. Energy efficiency *[If X2 = 2 OR X2 = 3]*	1	2	3	4	5	6	7
Q25_8. Other environmental	1	2	3	4	5	6	7

aspects [*If* X2 = 2 OR X2 = 3] Environmental aspects [*If* X2 = 1]						

Screen 25 [general repair/replacement behaviour]
Q26. When an appliance breaks and the warranty period has expired, what do you usually do? Please select the answer that fits you best.

1. I usually replace it with a new one, without really considering having it repaired or repairing it myself
2. I usually first see if I can have the product repaired/if I can repair the product myself

Screen 26 [main barriers to repair – knowledge, cost, trust in repairs, information, planned obsolescence]
Q27. Please indicate to what extent you agree or disagree with the following statements.

	Completely disagree						Completely agree
Q27_1. If my possessions break, I know where to go to get them repaired or I can repair them myself.	1	2	3	4	5	6	7
Q27_2. Repairs are usually expensive.	1	2	3	4	5	6	7
Q27_3. The quality of repairs is usually insufficient.	1	2	3	4	5	6	7
Q27_4. It is difficult to find information about the reparability of products.	1	2	3	4	5	6	7
Q27_5. Products that are nowadays on the market are difficult to repair.	1	2	3	4	5	6	7

Screen 27 [Repair/replacement behaviour – last occurrence]
Q28. Below, several products are listed that you might own. In the past five years, did one of these products break down and did you have to decide whether to replace it or have it repaired? Please select that product. If multiple products became defective, please select the one that broke down most recently.
• Smartphone
• Vacuum cleaner
• Television
• Washing machine
• Dryer
• Laptop
• Computer
• Coffee maker
• Printer
• Dishwasher
• Refrigerator
• Oven
• Microwave
• Air conditioner
• None of the products broke down or became faulty within the last five years *(Scripter: go to screen 30)*

Screen 28 [Repair/replacement behaviour – last occurrence]
Q29. Please think about the time that your [*insert answer to Q28*] broke down or became faulty. Do you remember the purchase price of that specific [*insert answer to Q28*].
1. €0 - €50
2. €50 - €100
3. €100 - €150
4. €150 - €200
5. €200 - €300
6. €300 - €400
7. €400 - €600
8. €600 - €800
9. €800 - €1000
10. €1000 - €1250
11. €1250 - €1500
12. €1500 - €1750
13. €1750 - €2000
14. More than €2000
15. I (really) don't know / don't remember

Screen 28 [Repair/replacement behaviour – last occurrence]
Q30. Please think about the time that your [*insert answer to Q28*] broke down or became faulty. Did this happen within the warranty period?
1. Yes
2. No
3. I don't know/don't remember

Q31. What did you do with the broken [*insert answer to Q28*]?
1. I threw it away
2. I gave it to somebody else
3. I stored the broken product at home but did not repair it
4. I repaired it myself
5. I had it repaired by a friend or relative
6. I had it repaired by a repair service (e.g. repair shop, repair café)
7. The manufacturer or store where I bought it repaired it without additional costs
8. The manufacturer or store where I bought it provided a new product without additional costs
9. I paid for a repair by the manufacturer or store where I bought it
10. I don't remember

Screen 29 [Repair/replacement behaviour – last occurrence]
If Q30 < 4
Q32. Did you consider the option to have the product repaired or repair it yourself?
1. Yes
2. No
3. I don't remember

If Q30 = 1:
Q33. Why didn't you have the product repaired? Please select the reason that was most important to you.
1. It did not occur to me that this was an option
2. I preferred to get a better model with new technologies
3. It would have been too expensive
4. The product could not be repaired
5. The product was obsolete

6. I did not know how to repair it/where to get it repaired
7. It would have been too much effort/time-consuming
8. The parts/materials required weren't available
9. I did not know how long the product would work after the repair
10. Other, namely…
11. I don't know/don't remember

Screen 30 [general circular economy-related behaviour]
All respondents:

Q34. Please indicate to what extent you agree or disagree with the following statements.

	Completely disagree						Completely agree
Q34_1. I always keep things I own for a long time.	1	2	3	4	5	6	7
Q34_2. I always recycle my unwanted possessions.	1	2	3	4	5	6	7
Q34_3. I always repair my possessions if they break.	1	2	3	4	5	6	7
Q34_4. I often buy second hand products.	1	2	3	4	5	6	7
Q34_5. I always buy the latest fashion for clothes.	1	2	3	4	5	6	7
Q34_6. I always buy the newest electronic goods and gadgets.	1	2	3	4	5	6	7
Q34_7. I usually buy the cheapest products available.	1	2	3	4	5	6	7
Q34_7. I always look for environmentally friendly products.	1	2	3	4	5	6	7

Screen 31 [Pro-environmental self-identity; Van der Werff, Steg & Keizer, 2013]
All respondents:

Q35. In some countries, a public media campaign was recently launched about repairing rather than replacing products. For example, you may have seen a TV spot or read an article in a magazine or on the internet aimed at making you aware that broken products can often be repaired. In the past year, have you seen such a campaign?

1. Yes, I clearly remember having seen this
2. I can vaguely remember having seen this
3. No, I have certainly not seen this

Screen 32 [Other questions]
All respondents:

Q36. What is the highest level of education you have attained?
1 Elementary (primary) school or less
2 Some high (secondary) school
3 Graduation from high (secondary) school
4 Graduation from college, university or other third-level institute
5 Post-graduate degree (Masters, PhD)
6 Other qualification
7 Prefer not to answer

Q37. Thinking about your household's financial situation, would you say that making ends meet every month is…
1 Very difficult
2 Fairly difficult
3 Neither easy nor difficult
4 Fairly easy
5 Very easy

Q38. Which of the following best describes where you live?
1 A city
2 A town
3 A village
4 The countryside

Q39. Which type of device did you use when completing this questionnaire?
1 Tablet
2 Laptop
3 Personal computer
4 Other, namely ……………………………….

Appendix B. Product sets

B.1. Smartphones

Table B.1. Features of smartphones in product set

	Product 1	**Product 2**	**Product 3**	**Product 4**	**Product 5**	**Product 6**
Reparability score (if present):	C	D	B	B	A	C
Brand name	Ninatu	Ninatu	Ninatu	VAE	VAE	VAE
Model	NI004078	NI00906	NI000950	VAE0234/9	VAEX56.0	VAE0200/2
Screen size	6	6.4	6.3	6.4	6.4	6.1
Total storage capacity	64 GB	128 GB	128 GB	64 GB	128 GB	128 GB
Operating system	Android 9.0	Android 9.0	Android 9.0	Android 9.0	Android 9.0	Android 9.0
Sim card slot type	Nano sim	Nano sim	Nano sim	Nano sim	Nano sim	Nano sim
Camera	12 + 13 MP	25 + 8 + 5 MP	48 + 8 + 5 MP	48 + 8 + 13 MP	48 + 16 + 12 MP	40 + 20 + 8 MP
Battery capacity	3800 mAh	4000 mAh	3500 mAh	4000 mAh	3500 mAh	4000 mAh
Warranty	2 years	2 years	2 years	3 years	3 years	3 years
Price	€ 289	€ 319	€ 349	€ 393	€ 412	€ 440

B.2. Televisions

Table B.2. Features of televisions in product set

	Product 1	Product 2	Product 3	Product 4	Product 5	Product 6
Reparability score (if present):	B	D	B	C	C	A
On product information display:						
Brand name	Mimasu	Mimasu	Mimasu	Screenio	Screenio	Screenio
Model	MM04523a	MM7567ZN	MM5263AN	SC3MC16	SC10V-ZB	SCB2-YC
Screen size	55" (140 cm)	55" (140 cm)	55" (140 cm)	55" (140 cm)	55" (140 cm)	55" (140 cm)
Image quality	Ultra HD 4K	Ultra HD 4K	Ultra HD 4K	Ultra HD 4K	Ultra HD 4K	Ultra HD 4K
Product type	LED-tv	LED-tv	LED-tv	LED-tv	LED-tv	LED-tv
Refresh rate	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	100 Hz
HDR support	yes	yes	yes	no	yes	yes
Smart TV	yes	yes	yes	yes	yes	yes
Connections	CI+ HDMI 3, USB 2	CI+ HDMI 3, USB 2, Bluetooth	CI+ HDMI 3, USB 3, Bluetooth	CI+ HDMI 3, USB 2	CI+ HDMI 3, USB 3	CI+ HDMI 2, USB 3
Warranty	2 years	2 years	2 years	3 years	3 years	3 years
Price	€ 649	€ 899	€ 775	€ 449	€ 865	€ 747
On energy label:						
Brand name	Mimasu	Mimasu	Mimasu	Screenio	Screenio	Screenio
Model	MM04523a	MM7567ZN	MM5263AN	SC3MC16	SC10V-ZB	SCB2-YC
Energy efficiency	B	B	A	A	B	C
Energy consumption	104 kWh	107 kWh	92 kWh	85 kWh	109 kWh	126 kWh
Energy efficiency (HDR)	D	C	B	N/A	C	D
Energy consumption (HDR)	190 kWh	158 kWh	142 kWh	N/A	167 kWh	232 kWh
Screen diameter cm, inch	55" (140 cm)	55" (140 cm)	55" (140 cm)	55" (140 cm)	55" (140 cm)	55" (140 cm)
Screen height px	2160	2160	2160	2160	2160	2160
Screen width px	4096	4096	4096	4096	4096	4096

B.3. Washing machines

Table B.2. Features of washing machines in product set

	Product 1	Product 2	Product 3	Product 4	Product 5	Product 6
Reparability score (if present):	C	B	A	B	D	C
On product information display:						
Brand name	Haessda	Haessda	Haessda	Hobu	Hobu	Hobu
Model	HV330	HV340	HV420X	HB9804-Y	HB6801	HB1220-M
Load capacity	8 kg	8 kg	9 kg	8 kg	8 kg	9 kg
Maximum spin speed	1400 rpm	1400 rpm	1400 rpm	1400 rpm	1400 rpm	1400 rpm
Number of programmes	14	16	16	11	14	10
Delayed start option	yes	yes	yes	yes	yes	yes
Automatic dosing	no	yes	no	no	no	no
Child lock	yes	yes	yes	yes	yes	yes
Spinning noise level	85 dB	74 dB	74 dB	74 dB	74 dB	75 dB
Brushless motor	yes	yes	yes	yes	yes	yes
Overfill protection	yes	yes	yes	yes	yes	yes
Warranty	2 years	2 years	2 years	3 years	3 years	3 years
Price	€ 449	€ 469	€ 579	€ 599	€ 529	€ 569
On energy label:						
Brand name	Haessda	Haessda	Haessda	Hobu	Hobu	Hobu
Model	HV330	HV340	HV420X	HB9804-Y	HB6801	HB1220-M
Energy efficiency	C	C	B	A	A	B
Energy consumption	80 kWh / 100 cycles	78 kWh / 100 cycles	59 kWh / 100 cycles	54 kWh / 100 cycles	54 kWh / 100 cycles	58 kWh / 100 cycles
Capacity	8 kg	8 kg	9 kg	8 kg	8 kg	9 kg
Water usage	5240 L / 100 cycles	4160 L / 100 cycles	4270 L / 100 cycles	3680 L / 100 cycles	4095 L / 100 cycles	4050 L / 100 cycles
Spin drying efficiency	B	B	A	A	A	B
Program duration	2:30	2:00	2:30	2:00	2:00	2:00
Noise level	85 dB	74 dB	74 dB	74 dB	74 dB	75 dB

Appendix C. Detailed results of the survey

Table C.1. Purchase characteristics and warranty status of the most recently broken product

Product	% most recently broken	Most common purchase price category (mode)	Broken within warranty period
Smartphones	18%	€200 - €300 (16%)	30%
Vacuum cleaner	7%	€50 - €100 (25%)	13%
Television	6%	€400 - €600 (17%)	20%
Washing machine	15%	€400 - €600 (24%)	11%
Dryer	2%	€400 - €600 (23%)	17%
Laptop	9%	€400 - €600 (25%)	17%
Computer	4%	€400 - €600 (19%)	17%
Coffee maker	5%	€50 - €100 (36%)	12%
Printer	4%	€50 - €100 (37%)	7%
Dishwasher	5%	€400 - €600 (30%)	11%
Refrigerator	6%	€400 - €600 (20%)	8%
Oven	2%	€400 - €600 (14.5%)	10%
Microwave	4%	€50 - €100 (25%)	9%
Air conditioner	< 1%	€200 - €300 (20%)	8%

Note – Frequencies for air conditioners are based on a small sample of N = 77 respondents.

Table C.2. Importance of product characteristics, per country[49]

	Quality	Durability	Energy efficiency	Price	Reparability	(Other) environmental aspects	Model	Brand
Germany	6,11	5,96	6,08	5,63	5,18	5,10	4,67	4,64
Czech Republic	6,13	6,04	6,06	5,79	5,50	4,78	4,58	4,59
Italy	6,13	6,05	6,17	5,77	5,75	5,49	5,19	5,19
The Netherlands	6,00	5,79	5,81	5,65	4,98	4,87	4,73	4,66
Portugal	6,16	6,19	6,27	6,14	5,62	5,46	4,80	4,77
Romania	6,44	6,36	6,29	6,07	5,81	5,50	5,52	5,56
Sweden	6,04	5,88	5,56	5,62	4,97	4,81	4,69	4,57

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[49] Importance of characteristics was measured on a scale from 1 (*not important at all*) to 7 (*very important*).

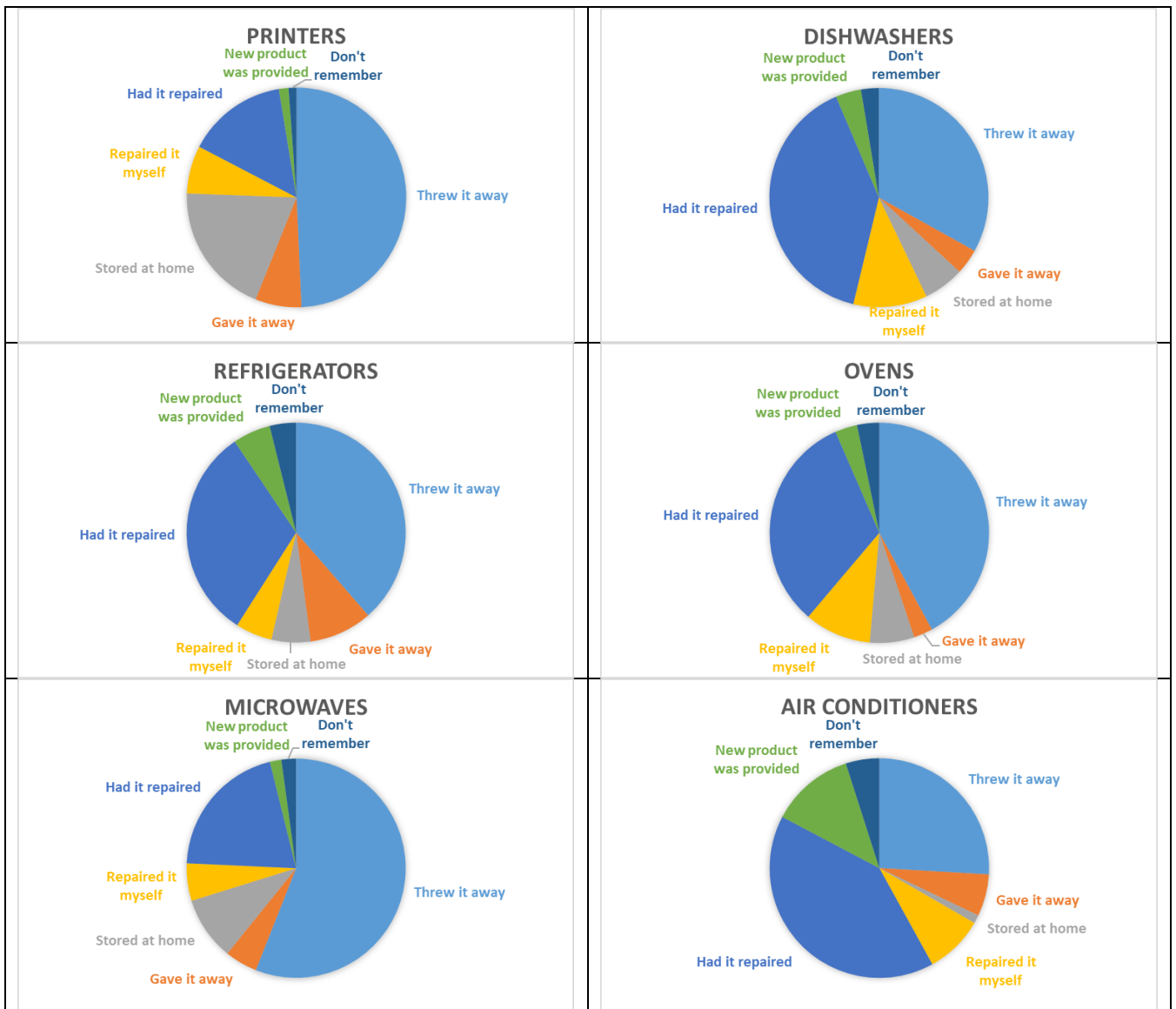**Figure C.1.** Repair/replace behaviour per product

PRINTERS

Don't remember
New product was provided
Had it repaired
Repaired it myself
Stored at home
Gave it away
Threw it away

DISHWASHERS

New product was provided
Don't remember
Threw it away
Had it repaired
Gave it away
Stored at home
Repaired it myself

REFRIGERATORS

New product was provided
Don't remember
Threw it away
Had it repaired
Repaired it myself
Stored at home
Gave it away

OVENS

New product was provided
Don't remember
Had it repaired
Threw it away
Repaired it myself
Stored at home
Gave it away

MICROWAVES

New product was provided
Don't remember
Had it repaired
Repaired it myself
Stored at home
Gave it away
Threw it away

AIR CONDITIONERS

Don't remember
New product was provided
Threw it away
Gave it away
Stored at home
Repaired it myself
Had it repaired

Figure C.2. Frequently mentioned reasons for not repairing, per product

PRINTERS

- Other
- Too expensive
- Repair not possible
- Want new model
- Product was obsolete

DISHWASHERS

- Other
- Too expensive
- Repair not possible
- Want new model
- Product was obsolete

REFRIGERATORS

- Other
- Too expensive
- Repair not possible
- Want new model
- Product was obsolete

OVENS

- Other
- Too expensive
- Repair not possible
- Want new model
- Product was obsolete

MICROWAVES

- Other
- Too expensive
- Repair not possible
- Want new model
- Product was obsolete

AIR CONDITIONERS

- Other
- Too expensive
- Repair not possible
- Want new model
- Product was obsolete

Consumer study on the impact of reparability information formats on consumer understanding and purchase decisions
Executive summary

Study background and objective

The EU Ecodesign Directive and the Energy Labelling Regulation aim to improve the environmental performance of products by establishing minimum design requirements and by obligating the provision of consumer information related to a product's energy efficiency and other environmental and performance characteristics. The EU Circular Economy Action Plan and Ecodesign Working Plan 2016-2019 aim to promote the transition towards a circular economy through a series of measures that cover the whole life cycle of a product. Amongst other things, the European Commission is exploring the possibility to propose horizontal requirements on the provision of product reparability information.

To this end, the Commission Joint Research Center (JRC) has recently developed a reparability scoring system.[1] This scoring system enables the calculation of an overall reparability score, based on the product's performance on several parameters (e.g. availability of spare parts, ease of disassembly, etc.). Communication of such reparability information to consumers should enable them to easily identify products that are easy to repair and compare products on this aspect. This should also incentivise producers to take the reparability of their products into account during design and manufacturing.

The aim of the present study, carried out by CentERdata, Ipsos and Right Brained, was to provide insight into the most effective way of communicating reparability information to consumers.

Methodology

Based on qualitative focus group research in the Netherlands and Germany as well as input from (visual) communication experts, various icon and scale formats were developed and subsequently tested in a large-scale online experiment among nearly 10.000 consumers in seven EU Member States (Germany, Czech Republic, Italy, the Netherlands, Portugal, Romania and Sweden).

Table 1 provides an overview of the reparability indications that were tested in the online experiment. The reparability indications vary in (1) *scale format* and (2) *icon format*. More specifically, the first three indications in Table 1 have different scale formats (1 = black letter scale, 2 = colour-coded scale, 3 = colour-coded scale with country-specific textual scale labels). The last four indications in the table have different icon formats (3 = repair tools, 4 = repair worker, 5 = repair process, 6 = priority parts).

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[1] JRC Technical Reports (2019). *Analysis and development of a scoring system for repair and upgrade of products*.

It was also tested whether reparability indication 1 was more effective as part of the EU energy label or as a separate small label (*vehicle effect*). Finally, we examined to what extent *pre-informing* consumers about the presence and meaning of this reparability indication increased the indication's effectiveness.

Participants of the online experiment were presented with several small product assortments (televisions, washing machines, and smartphones) and asked to make product choices. Next, they made repair/replace decisions for broken products. In these tasks, all products were presented with one of the reparability indications (randomly decided, with varying reparability scores) or no reparability information at all (control group). In addition, participants retrospectively indicated whether they had paid attention to the reparability indications and answered questions about their understanding of the indications.
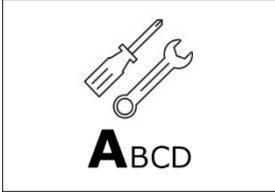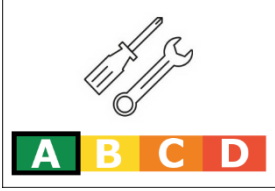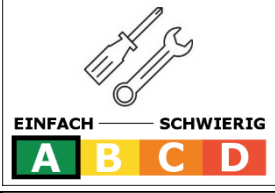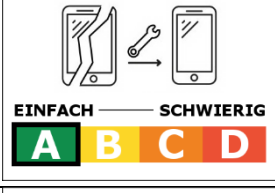
No.	Icon format	Scale format	Reparability indication
1	Repair tools	Black letter scale (energy label style)	
2	Repair tools	Colour-coded	
3	Repair tools	Colour-coded + textual end labels	
4	Repair worker	Colour-coded + textual end labels	
5	Repair process	Colour-coded + textual end labels	
6	Priority parts	Colour-coded + textual end labels	

Table 1 – The reparability indications in this table reflect examples for Germany and smartphones. For reparability indications 3-6, the textual end labels were provided in the language of the specific country. For reparability indications 5 and 6, the designs for smartphones are shown in the table. In the consumer test, these reparability icons were product-specific.

Key findings

Key finding 1: The presence of reparability information guides choices towards more reparable alternatives

In line with earlier studies[2], this study shows that providing reparability information is effective in guiding product choices towards more reparable products. In the present study, the communication of reparability information resulted in a 5%-point increase in the choice share of the product with the best reparability score (from 18% to 23%).

Key finding 2: Of the tested alternatives, the repair tools icon (#3) and the repair worker icon (#4), both with colour-coded scale and scale labels "easy" and difficult", performed best overall

The different types of reparability indications that were tested in the online experiment were equally effective in promoting choice of more reparable products, but some reparability indications received more attention and were better understood than others. As regards the icon format, the repair tools icon and repair worker icon performed slightly better overall than the icons depicting the repair process and priority parts (keeping the scale format constant). The priority parts icon was understood relatively poorly. As regards the scale format, colour-coding improved self-reported but not objective understanding of the reparability indication. Only when country-specific scale labels ("easy" and "difficult") were added to the colour-coded scale, objective understanding substantially improved. Therefore, overall, the repair tools icon (#3) and the repair worker icon (#4) both with colour-coded scale with textual labels performed best. Note, however, that by using such scale labels, the indication is no longer language neutral.

Key finding 3: There is no vehicle effect; reparability information was as effective on the EU energy label as outside of it (as a separate label).

If the reparability information is to be displayed on the EU energy label it must adhere to EU energy label style rules. The repair tools icon with black letter scale, which conformed to these rules, was as effective on the EU energy label as it was outside of it. Self-reported understanding of the reparability indication was slightly higher when this reparability indication was displayed on the EU energy label than when it was presented as a separate label.

However, outside the energy label, where there is no need to adhere to these specific style rules, the other scale formats outperformed the black letter scale. The superior performance of the repair tools icon (#3) presented outside the EU energy label is driven by the good performance of the colour-coded and labelled scale rather than by the difference in location of this information.

Key finding 4: Pre-informing consumers strongly enhances the effectiveness of the reparability indication

Pre-informing consumers about the presence and meaning of the reparability indication seems crucial: It greatly enhanced the effectiveness of the reparability indication in all of the surveyed countries. Pre-information had strong and positive effects on understanding of the reparability information, use of this information in making product choices (14%-point increase in the choice share of the product with the best reparability score), and actual repair intentions.

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[2] London Economics consortium (2018). *Behavioural Study on the Consumers' Engagement in the Circular Economy*. GfK consortium (2019). *Consumer Market Study to support the Fitness Check of EU consumer and marketing law*.