



PROMPT

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Contributing Partners

TUD, TA, ANEC, OCU, STIWA, UFC, BEUC, CB, ICRT

Glossary

CB	Consumentenbond, the Dutch consumer organisation
ICRT	International Consumer Research and Testing, an independent international organisation which facilitates cooperation between its members (consumer organisations) on research and testing in the field of consumer goods and services.
IZM	Fraunhofer IZM
OCU	Ediciones, Organización de Consumidores y Usuarios, the Spanish consumer organisation
PROMPT	Premature Obsolescence Multi-stakeholder Product Testing Program
StiWa	Stiftung Warentest, the German consumer organisation
TA	Association des Consommateurs Test Achats / Verbruikersunie Test Aankoop, the Belgian consumer organisation
TUD	Technical University of Delft, The Netherlands.
UFC	Union Fédérale des Consommateurs-Que Choisir, the French consumer organisation

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1 Introduction

1.1 Topic

Early product failure can arise when a product is broken beyond repair. However, a lot of products are discarded while still functioning or in need of (minor) repair. Premature obsolescence describes the phenomenon of 'the disposal of a product at a point in its 'life' that arrives too soon'. Too soon is defined in this report as a product being discarded when it is physically still functioning, or in need of (minor) repair.

Besides the functional and technical aspects related to the performance of products, several other factors can have an influence on premature obsolescence. These are the user of the product, who can have specific needs and desires while using the products; the market of the product, which is led by (technological or fashion) trends and consists of companies that want to make profit from selling products; and legal aspects around the product, such as warranties.

1.2 Scope

The focus of this report is on white goods and user electronics, and more specifically, on the following four main product groups: washing machines, vacuum cleaners, (smart) televisions and smartphones. This product group choice for the PROMPT project was carefully made in a Multi-Criteria analysis by the project team.

1.3 Objective

In this report, we provide an overview of the state-of-the-art knowledge on reasons to replace products addressing the aforementioned topics: the user, market and legal aspects. The data used for this report is from both scientific literature and reports from consumer associations.

The report starts with an overview of (scientific) literature and insights from consumer studies related to the user and market issues of premature obsolescence are presented. This literature study consists of two parts. First chapter two presents a general overview of the different types of (premature) product obsolescence that exist and the general reasons why people replace their products. In the second part of the literature study, presented in chapter three, state-of-the-art knowledge for the four product groups are provided on the average lifetime, expected lifetime, replacement motivations, barriers towards repair activities, national differences in repair activities and possibilities for lifetime extension. Finally, in chapter four an analysis was done on existing legal provisions on guarantee and repair for elements that might be promoting or hampering products being actually repaired. Based on these, improvement recommendations are formulated.

1.4 Partners

TU Delft was responsible for the scientific literature on user and market related factors of premature obsolescence, for both the general reasons for premature replacement, and the product specific average and expected lifetimes, reasons for replacement, repair barriers and life time extension possibilities. TA was responsible for the meta-analysis of different attitudes on national level (European countries) and the legal analysis and recommendations. Insights from the scientific literature were complemented by reports from the user associations throughout the report (TA, OCU, STIWA, ANEC, UFC, BEUC, CB & ICRT).

2 Overview of the user and market issues related to premature obsolescence

Introduction

Currently we live in a 'throwaway society'. It appears to be common to discard products while still functioning, or while their lifetime (technically) could be extended by repair or the right maintenance activities. These products are considered as 'prematurely obsolete'.

The aim of chapter two is to provide a state-of-the-art overview of reasons why users replace products, for other reasons than the product being broken 'beyond repair'. First, the term product obsolescence is defined and the role of the user and user perception is explained. Second, different types of (relative) obsolescence and user's reasons for product replacement are discussed. Third, the influencing factors on user's replacement behaviour are documented and the chapter ends with a conclusion.

2.1 Definition of the term product obsolescence

To better understand the term obsolescence, a literature research was done to determine its origin. The term Planned Obsolescence was first introduced by Bernard London in 1932 as a way to end The Great Depression. Later Packard discusses 'planned obsolescence' in 1960 with his book 'The waste makers', in which he criticized industry for provoking obsolescence by designing products that break earlier or are sensitive to trends and fashion. He distinguished obsolescence of function, quality and desirability. More recently, Granberg (1997) defined two types of obsolescence. He described absolute obsolescence as the physical wear down of the product and therefore related to durability, and relative obsolescence as an evaluation of the product in comparison with new products. In this context, it is important to pinpoint the outcomes of the research of Echegaray (2016) about 'The widespread feeling of living in throwaway society'. He reported scepticism towards the durability of new products among consumers, and he states that this weakens the demand for repair and second-hand.

2.2 The user perception in product obsolescence

Although industry plays an important role in obsolescence by creating a demand for new products and by steering towards (early) product replacement through new (technological) developments in products and the launch of marketing campaigns to make more profit, users also play a role in this system. Responses from users' research (documented in chapter 4) show that a lot of household products are disposed for other reasons than being broken 'beyond' repair (Hennies & Stamminger, 2016; Harmer et al. 2019; Hennies & Stamminger, 2016; Wieser & Tröger, 2018) and, in this way, maintain today's throwaway attitude.

All this raises the question what exactly drives users to dispose of products that still function, and more importantly, what do users consider as 'still functioning' and makes them consider a product as 'obsolete'.

When replacing a product that still functions, the lifetime is determined by the user's decision to replace (Antonides, 1991) and the user perception of a product that is regarded as 'obsolete' (Cooper, 2004). Perception in this report is defined as follows: the way in which something is interpreted, in this case by the user. This can depend on for example (social) norms, values and

personal needs or desires etc. Whether or not a product is perceived as 'obsolete' and is likely to be disposed of, has a significant effect on product obsolescence. Relative obsolescence can be considered as resulting from a user's decision to replace a functional product, and, as described before, results from a trade-off of an 'old' and a 'new' product. Therefore, users' have a key role in the early replacement of products (Cooper 2004).

In this report we use the following definitions:

- **Absolute obsolescence:** refers to the physical wear down of the product, when a product is broken and cannot be repaired.
- **Relative obsolescence:** depends on the users' evaluation of a product in comparison to new products, when a product is physically still functioning but considered obsolete by the user

2.3 Types of obsolescence

As this state-of-the-art overview focuses on the reasons why users replace products, for other reasons than the product being worn out or broken 'beyond repair', relative obsolescence is interesting to look further into. After studying the different types of relative obsolescence, it was concluded that some types (i.e. quality and technological) can be related to absolute obsolescence as well.

The most reoccurring and overlapping terms were listed and some redefinitions and combinations were made according to the literature insights. The findings are summarized below.

- **Quality obsolescence**

Quality obsolescence can be both absolute and relative. It is absolute when one or more product functionalities fail and the product is broken, for example a washing machine with a broken pump. Quality obsolescence is relative when a decline in product functionality performance is perceived by the consumer, but the product in theory is still functioning. For example, a shortened battery life of a smartphone or a decrease in suction power of a vacuum cleaner (Packard, 1960; Van Nes et al., 1999; Mugge et al., 2005; Guiltinan, 2009).

- **Technological obsolescence**

Technological obsolescence can be both absolute and relative. It is absolute (i.e. binary, either working or not working) when a new (technological) innovation prevents the product from functioning properly, for example (software) updates that are required in order for a product to perform or a new USB port on a smartphone that makes the old port obsolete. Technological obsolescence is relative (i.e. continuous, decreasing in performance, often over time) when a 'new' (technological) innovation outperforms the 'old', even though this specific feature of the 'old' product is still functioning. For example, a smart function on a TV, or the accessibility to the faster 4G network that is only possible with newer versions of phones (Packard, 1960; Antonides, 1991; Cooper, 2004).

- **Economic obsolescence**

Economic obsolescence is considered as relative obsolescence and refers to financial outlay, value and depreciation of the 'old' product compared to a new product. The product is replaced for another product because of financial reasons. For example, a washing machine that is more efficient in terms of energy consumption and therefore saves money during the use phase (Antonides, 1991; Van Nes et al., 1999; Cooper, 2004; Khan et al., 2018).

- **Ecological obsolescence**

Ecological obsolescence is considered as relative obsolescence and refers to the ecological footprint of a product. For example, when an old diesel car is replaced by a new electric car that is less harmful for the environment (Van Nes et al., 1999; Wilson et al., 2017).

- **Aesthetic obsolescence (aka Trend obsolescence)**

Aesthetic obsolescence is another type of relative obsolescence and refers to the attractiveness of a product in relation to new products. For example a sleeker design of a new version of a phone that makes the previous version look outdated, or a vacuum cleaner that looks dirty compared to a new one and has traces of usage from over the years, but still performs well in terms of functionality (Packard, 1960; Antonides, 1991; Cooper, 2004; Mugge et al., 2005; Burns, 2010).

- **Psychological obsolescence**

Psychological obsolescence is considered as a type of relative obsolescence and refers to social influences of products, social status, belonging to a group and peer pressure, and the symbolic value of products. For example, peer pressure plays a role when all your friends own the newer version of a smartphone and you do not want to stay behind and replace the 'old' product. Van Nes et al., 1999; Cooper, 2004; Burns 2010; Wilson et al., 2017).

- **Social obsolescence**

Social obsolescence results from changes in society and social norms. For example, it is now considered 'normal' for everyone to own a smartphone. Even essential parties (e.g. banks, health insurances) and the government expect you to own one for their services. Besides that, there is an increased consciousness about the negative impact of plastic waste, the food and clothing industry, flying. People are also becoming more and more aware of the impact of products on the environment. This is also a change in the societal way of acting, consuming and consumer decision making in buying new products.

- **Legal obsolescence**

Legal obsolescence refers to products that do not comply to new laws or safety standards, and can be driven by, among others, ecological, health and safety requirements. For example, the EU restrictions of vacuum cleaners in terms of noise and heat production, or diesel cars that are not required to drive within city areas any more. Note that social norms are often reflected in legislations. They are, however, stricter requirements and driven from the government, where social norms are more society driven (Mugge et al., 2005, Burns, 2010; Wilson et al., 2017).

When looking at the different types of obsolescence found in the literature, some additional comments can be made. First, quality and technological obsolescence can entail both absolute and relative obsolescence. As already mentioned, in most situations the perception of a product being worn out is highly subjective and depends on the user (an exception is absolute, quality obsolescence when the product completely stops functioning and is broken beyond repair). There is a grey area of depreciation of function over time (relative, quality obsolescence) and the extent to which this 'function loss' is still acceptable to the user. This strongly depends on the perception of the consumer on what is still acceptable in terms of product performance, for example, a decrease in suction power of a vacuum cleaner, or a limited battery life of a smartphone. A similar rationale can be given for new innovations that outperform the features of the 'old' product (relative, technological obsolescence). This 'grey area' can be a reason to push the consumer towards premature product replacement, before it actually breaks.

Second, aesthetic and psychological obsolescence often go together in the literature (Cooper, 2004). Their commonality is that both types often concern the attractiveness of the product. However, aesthetic obsolescence in this definition is about product appearance, which can also concern signs of use or wear and tear. Psychological obsolescence is more focused on social influences like status, belonging to a group and peer pressure. Therefore, these types of obsolescence are differentiated in this report.

Lastly, one can argue that economic and ecological obsolescence are overlapping as well, as buying an energy efficient washing machine saves money and is better for the environment in terms of usage. However, it can be questioned whether without a monetary incentive the same well-functioning product was replaced for solely ecological reasons. Nevertheless, there are some examples of pure ecological replacement found, such as electrical cars that replace 'old' fuel engine cars. For this reason, economic and ecological types of obsolescence are differentiated as well.

2.4 Reasons to replace products

The different types of obsolescence that are defined in chapter 2.3 are the reasons behind the user's decision to replace products. In reality, it is almost always a combination of several types of product obsolescence that leads to the eventual decision to replace (Cox et al., 2013).

Van Nes and Cramer (2005) made a typology of four general reasons to replace products. They defined *Wear and tear*, when the product is broken/ does not function (at the initial level) anymore; *Improved utility*, when the product does not function sufficiently due to improved demands for safety/economy of use of the product; *Improved expression*, when the product does not function sufficiently due to comfort/quality/expression reasons, and *New desires*, when the product is functioning well but replaced due to a need for particular product characteristics that are offered in new products.

The different types of obsolescence (chapter 2.3) and the four general replacement reasons (Van Nes & Cramer, 2005) strongly relate to and overlap each other. To further investigate this relationship, both the types of obsolescence and the typology of replacement reasons are included in table 1. *Wear and tear* is mostly linked to absolute obsolescence. *Improved utility* is a more 'rational' reason behind the decision to replace, such as economical, ecological, technological, social and legislative obsolescence. Both *improved expression* and *new desires* are related to the more 'emotional' reason to replace, thereby relating to the aesthetic and psychological obsolescence.

Table 1: Different types of obsolescence and their link to replacement typology Van Nes & Cramer (2005)

Type of Obsolescence	Related to:	Reference	Absolute vs. Relative obsolescence	Link to typology on replacement reasons of Van Nes and Cramer:
Quality	Product functionality and performance	Packard, 1960; Van Nes et al., 1999; Mugge et al., 2005; Gultinan, 2009	Absolute or Relative	Wear and tear
Technological	(Technological) Innovation or developments	Packard, 1960; Antonides, 1991; Cooper, 2004	Absolute or Relative	Wear and tear (absolute obsolescence); improved utility, improved expression, new desires (relative obsolescence)
Aesthetic	Product appearance (trends in design, signs of wear and tear)	Packard, 1960; Antonides, 1991; Cooper, 2004; Mugge et al., 2005; Burns, 2010	Relative	Improved expression, new desires
Psychological	Social influences (status, peer pressure) and symbolic value of products	Van Nes et al., 1999; Cooper, 2004; Burns 2010; Wilson et al., 2017	Relative	Improved expression, new desires
Economic	Value depreciation of the 'old' compared to the 'new' product	Antonides, 1991; Van Nes et al., 1999; Cooper, 2004; Khan et al., 2018	Relative	Improved utility
Ecological	The ecological footprint of the 'old' product compared to the 'new' product	Van Nes et al., 1999; Wilson et al., 2017	Relative	Improved utility
Social	Social norms of products and its use	Burns 2010; Wilson et al., 2017	Relative	Improved utility
Legal	Legislations around products	Mugge et al., 2005;	Relative	Improved utility

In reality, early replacement of functioning products is unlikely caused by solely one type of obsolescence. For example, a smartphone can be replaced because of a weak battery, a broken screen and because a newer version was available, and a vacuum cleaner can be replaced because of its decreased suction power and a defect in the hose. The user's decision to replace is thus generally a combination of different motivations (van Nes and Cramer, 2005; Cox et al., 2013). Next to that, users tend to justify their replacement behaviour. They tend to feel guilty to replace a for example a smart phone that still functions (Wilhelm, Yankov and Magee, 2011). In general, the

more reasons the user has to replace, (e.g. a broken screen, combined with low memory capacity and a relatively low-quality camera compared to newer versions) the more likely they will eventually be persuaded to do so.

2.5 Influencing factors on the decision to replace products

In addition to the different product-related reasons to replace products, there are also several other factors of influence. These are related to the user (related to its specific needs and desires), and the situational context (related to changes in financial/living situation). These factors are discussed below and visualized in figure 1.

User influences

This factor is related to the users' attitude towards products and perceptions about what is considered as 'obsolete' or in need of repair (Bayus, 1991). Besides that, it refers to the differences between people that explain why, in the same situation, different people make different choices (Van Nes & Cramer, 2005). This is strongly related to differences within demographic factors, such as age, gender, income, geographic location and education (Bayus, 1991;) (Atlason et al., 2017; Lieder et al 2017). For example, in general younger consumers buy cheaper products and use them for a shorter period of time than elderly consumers (Hennies & Stamminger, 2016). Innovators are more sensitive to trends than conservative consumers, and will be more likely to replace their products when a new version of a smartphone enters the market.

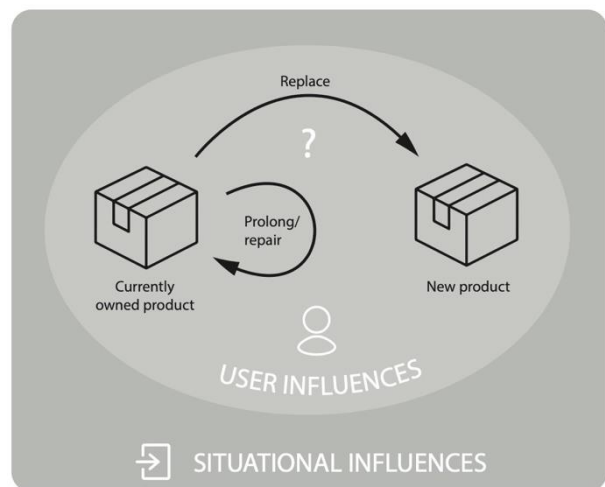


Figure 1 The user decision to either replace or extend the lifetime/repair a product, and the influencing factors

Situational influences

In literature situational influences extrinsic to the product, and changes in the context of the user have a proven influence on (early) product replacement as well. These are changes in the financial situation, for example when one receives a heritage of a family relative or gets a job promotion, and the occurrence of (special) life events, for example moving to another house or starting a family (Bayus, 1991; Van Nes & Cramer, 2005; Schäfer et al., 2012). For example, having a baby may trigger a need for a new washing machine.

2.6 Conclusion

Previous research showed that there are many different reasons why users replace products for other reasons than the product being worn out or broken 'beyond repair', see table 1 for a summary of the results. From the literature, several conclusions can be drawn.

Regarding the effect of absolute obsolescence, a 'broken' or useless product partially depends on what the user considers as 'broken' or useless. There is a grey area, for example, when a decrease in functionality occurs. The suction power of a vacuum cleaner still functions, but not as

well as it used to. This cannot be neglected and plays a large role in the replacement behaviour. Furthermore, users tend to justify their replacement behaviour. The more reasons they have to replace, the more likely they will act accordingly. Lastly, the ultimate decision to replace a well-functioning product results from an interplay of multiple factors. It is often a combination of multiple reasons, and influenced by context, user and product characteristics. This makes user behaviour regarding the replacement of well-functioning products complex and difficult to predict. In order to get more insight in reasons for replacement, in the next chapter an analysis is conducted on the four product categories (washing machines, vacuum cleaners, TVs and smartphones) separately.

3 Insights of product replacement and repair per product category

Introduction

In this chapter, we provide an overview of insights from the scientific literature and data collected by consumers organisations related to the product categories chosen by the PROMPT project. The average life time of the product (how long products are actually used), the expected use time (how long consumers expect to use a product), the reasons for replacement, the consumer's trade-off between replacement or repair, and possibilities for extending the product lifetime are listed for each product category. Table 2 provides an overview of the used references.

Table 2: Overview of the literature per product category

	Washing machines	Vacuum cleaners	Televisions	Smart Phones
Average life time	Bakker et al (2014)	Bakker et al (2014)	Bakker et al (2014)	Sabbaghi & Bedhad (2018)
	Hennies & Stamminger (2016)		Hennies & Stamminger (2016)	Wilson (2017)
	Tecchio et al (2019)			Wieser, Tröger and Hubner (2015)
Expected use/lifetime	Wieser, Tröger & Hübner (2015)	Wieser, Tröger & Hübner (2015)	Wieser, Tröger & Hübner (2015)	Wieser, Tröger & Hübner (2015)
	WRAP (2013b)	WRAP (2013b)		(Sabbaghi & Bedhad, 2018)
	(Boyano Larriba et al (2017)	EEB (2019)		Jaeger-Erben & Hipp (2018)
	EEB (2019)	(Rames et al. (2019)		Suckling & Lee (2015)
	Jaeger-Erben & Hipp (2018)			EEB (2019)
Reasons for replacement	Hennies & Stamminger (2016)	Harmer et al (2019)	Hennies & Stamminger (2016)	Echegaray (2016)
			Khatriwal & First (2012)	Wieser & Tröger (2018)
			Echegaray (2016)	Wilhelm (2012)
				Wilhelm, Yankov & Magee (2011)
				Wilson (2017)
Replacement vs Repair	Tecchio et al (2016)	Harmer et al (2019)	Hennies & Stamminger (2016)	Sabbaghi & Behdad (2018)
	Tecchio et al (2019)	Pérez-Belis (2017)	McCollough (2009)	Wieser & Tröger (2018)
	Hennies & Stamminger (2016)			
Purchase factors	Jindal (2015)	Visser, Schoormans & Vogtländer (2018)	Islam et al (2016)	Islam et al (2016)
		Chang (2014)		Wieser & Tröger (2018)
				Wilhelm (2012)

3.1 Washing machines

Average use/lifetime

The average lifetime of a washing machine before its first failure is 12.6 years (Tecchio et al, 2019). This is in line with the average lifetime of 12.7 years reported by the European Union with survey data from 2015 (Boyano Larriba et al., 2017). However, data per country tends to differ, and we can witness a decreasing trend in the average lifetime per category. For example, Dutch data shows the average lifetime of washing machines decreased from 12.1 years in 2000 to 11.7 years in 2005 (Wang et al 2013; Bakker et al 2014). Another more recent Dutch survey study (n=5292) with data from en 2018 conducted by Consumentenbond (2019) showed that the average lifetime of washing machines is 11.9 years. In this study the brand seems to make a large difference in lifetime, ranging in average from 6.4 years of Samsung being the lowest and 16.1 years of Miele being the highest.

Furthermore, the age of the consumer and the purchase price both have an effect of the average lifespan. Elderly people keep the product longer compared to young people (12.6 vs 9.7 years). Furthermore, there is a large difference in lifespans between expensive and cheap washing machines. Fifty percent of the low-cost/no name brand washing machines only lasted for 5 years or less, while 50% of the expensive washing/top brand machines lasted more than 15 years. Lastly, it is worth mentioning that elderly tend to spend more on their washing machines than young people (Hennies and Stamminger, 2016). Summarizing, we can conclude that the average lifetime of a washing machine is between 9.7 and 12.7 years.

Expected and desired use/lifetime

A research conducted in 2017 among German consumers shows that the average expected lifetime of washing machines was around 14 years. Figure 2 shows the distribution of the lifetime expectations (Jaeger-Erben & Hipp, 2018).

Furthermore, Figure 3 compares the expected lifetime of a washing machine in general, to the use time of the last (owned) device and to the expected usage time of the currently (owned) devices, see figure 3. Looking at the figures, consumers seem to expect that their washing machines will last shorter than what they expect from a washing machine in general.

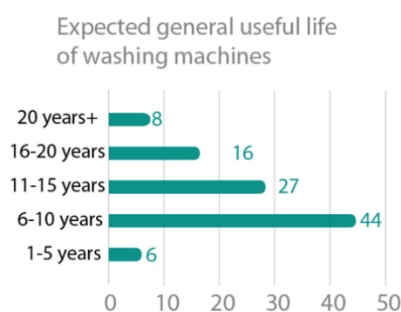


Figure 2- How long should a washing machine hold in your view? (n = 1757)

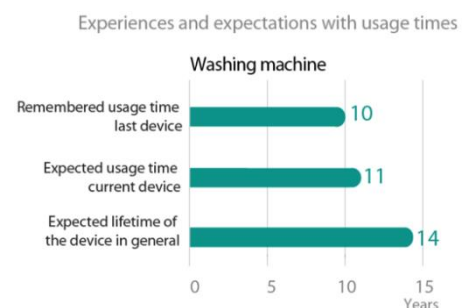


Figure 3 - Comparison of the averages for the expectations and experiences of washing machines lifetimes (n = 1757)

This difference was also found in a survey about Austrian consumers' expectations on washing machines expected and desired lifetimes. Consumers seemed to expect that a washing machine would perform its function longer than their own use time, see table 3 (Wieser et al., 2015).

Table 3: Results from the survey study about 'expected' and 'actual' lifetime of washing machines (Wieser et al 2015)

	Question	Average age
Expected Lifetime	'How long do you expect a washing machine to last or flawlessly function under normal intensity of use' (n=995)	12.7 years
Actual Lifetime	'How long would your normally use a washing machine before storing, disposing or discarding?' (n=605)	8.3 years

Additionally, based on a report from the JRC Science hub consolidating data from the European Union in 2015, the expected lifetime of a washing machine is around 11.5 years (EEB, 2019; Boyano Larriba et al 2017). Remarkably, in a study from the UK based on GfK data from 2012 consumers were much less optimistic. The results show that consumers expect washing machines to last six years on average (WRAP, 2013b). This might indicate a difference between European countries. All summed up, the expected lifetime ranges from 6 to 14 years.

Reasons for replacement

Looking at the replacement motivations for washing machines, data collected from 733 German households shows that 69% of the washing machines were replaced because of a defect. This means that 31% of the replaced washing machines are discarded while still functioning. For this 31%, different reasons were given, such as 'resource efficiency was not satisfying', 'I was given a new appliance', 'I was no longer satisfied with the features', 'I no longer liked the appliance' and 'other reasons', see table 4 (Hennies & Stamminger, 2016).

Table 4: Reasons why users discard their washing machine (Hennies & Stamminger, 2016)

Why did you discard the appliance?	
The appliance was defective.	69%
I no longer liked the appliance.	1%
I was not satisfied with the features.	2%
I was given a new appliance.	4%
I had another reason.	14%
The resource efficiency of the appliance was not satisfying.	10%
Total (n)	733

Barriers towards repair

The Austrian RUSZ (Reparatur-und Service-Zentrum) collected data from appliances that were sent to a repairer and monitored what happened to these products. The data included 6672 defective washing machines. Three main reasons not to repair were uncovered: first, the overall costs of spare parts and labour being regarded as too high by consumers (78%); second, the technical feasibility of the repair, such as the lack of available spare parts or ineffective design for disassembly (15%); third, repair being judged as non-viable for functional reasons or for the likeliness of the product to fail again- and the consumer being advised to discard the appliance (7%) (Tecchio et al., 2016; Tecchio et al., 2019).

Repair attitudes across Europe

A study among members (N=5368) of four European consumer organisations found that only around half (table 5) of the consumers had repaired their washing machine when it broke down (Euroconsumers, 2019a, 2019b, 2019c, 2019d).

Table 5: Repair of washing machines; Base: respondents who acquired a new washing machine and had a problem with it (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

Washing machines Did you repair it?	Belgium (n=236)	Italy (n=594)	Portugal (n=202)	Spain (n=243)	Total (n=1275)
Yes	48%	59%	53%	55%	55%

Among the multiple reasons that make consumers decide against repairing their washing machine, cost-related motives are by far the most pronounced (table 6). This trend can be seen in Belgium, Italy, Spain and Portugal (Euroconsumers, 2019a, 2019b, 2019c, 2019d) as well as Germany (Reichelt, 2020). Similar trends were found in two studies which focused on the Flemish region in Belgium by Netwerk Bewust Verbruiken, N=1000 (2019) and the Flemish Government Department of Environment, N=3000 (2017).

Table 6: Reasons for not repairing | Base: respondents who acquired a new washing machine, had a problem with it and did not repair it (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

If not, why? (multiple response set)	Belgium (n=123)	Italy (n= 242)	Portugal (n=95)	Spain (n=108)	Total (n=568)
The repair costs were too high	41%	48%	39%	45%	44%
The device wasn't worth the repair cost anymore	42%	39%	40%	36%	39%
Repair was not possible	13%	13%	16%	15%	14%
No spare parts available	9%	7%	14%	5%	8%
The device could still be used	12%	9%	3%	6%	8%
Other reason	11%	5%	11%	9%	8%
It would have given a lot of work (time/effort)	4%	5%	0%	5%	4%

Euroconsumers (2019a, 2019b, 2019c, 2019d) found that on average, consumers who had already a breakdown and repaired it are willing to repair their washing machines up to an age of nine years and five months. Furthermore, more expensive washing machines are more likely to be repaired than low-cost models and severe problems that put a washing machine out of use are less likely to be repaired than smaller issues (Euroconsumers 2019a, 2019b, 2019c, 2019d; Reichelt, 2020, Flemish Government Department of Environment, 2017).

Additionally, the proportion of the original purchase price which a consumer is willing to pay towards the repair of his product declines with the age of the product (Euroconsumers 2019a, 2019b, 2019c, 2019d). Consumers seem to be aware of this and indicate themselves that the original purchase price and residual value play an important role in the decision whether or not to repair a product (Flemish Government Department of Environment, 2017).

Possibilities to extend product lifetime

There is a relatively higher willingness to pay for extended warranties of washing machines (Jindal, 2015). This is also shown in the report from WRAP based on GfK data in the UK, where 87% of the participants indicated to be prepared to pay more for a washing machine if it had a longer guarantee (2013b). Extending warranties potentially ensures that consumers will use the product for at least the time the warranties lasts, and will be more likely to consider repair since this will be covered by the warranty.

An online survey among German consumers (n=1757) in 2017 shows the purchase criteria for washing machines. On the following question: 'What role did the following aspects play in the selection of the current washing machine?' Robust and durable, and low water and electricity consumption are rated as most important, see figure 4 (Jaeger-Erben & Hipp, 2018). These factors are closely linked to characteristics of long-lasting, sustainable products.

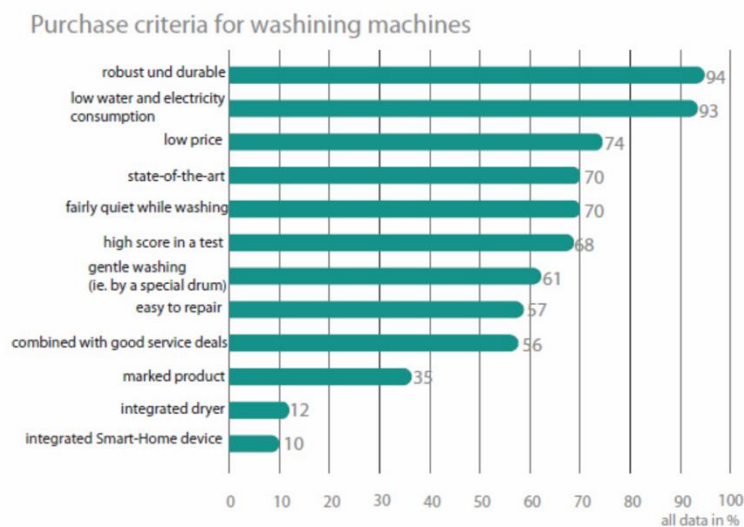


Figure 4 - What role did the following aspects play in the selection of the current washing machine? Percentages represent the sums for the answers "a rather large" / "a large role" (N = 1757)

3.2 Vacuum cleaners

Average lifetime

The average lifetime of a vacuum cleaner was 8,1 years in 2000 and 8,0 in 2005. (Wang et al 2013; Bakker et al 2014). A review study on vacuum cleaners prepared for the European Commission estimates the average lifespan of canister vacuum cleaners to eight years (with two years of standard variation) and for cordless and robot vacuum cleaners to 6.0 years (with three years of standard variation) (Rames et al., 2019). According to latest data from FNAC-DARTY (2019), the average lifetime of a canister vacuum cleaner is around 6.7 years in France and 6.9 years in Belgium. These values are higher than for handheld vacuum cleaners, where the average life time is around 5.6 years in France and 5.8 years in Belgium.

Expected use/ lifetime

According to the European Environmental Bureau, the expected lifetime of a vacuum cleaner is 6,5 years (EEB, 2019). This number is based on a review report of vacuum cleaners including multiple surveys funded by the European Union (Rames et al., 2019). Research on Austrian consumers expectations on expected and desired lifetimes of vacuum cleaners shows an

interesting difference: consumers seem to expect that a vacuum cleaner performs its function for longer than the actual time they will use the vacuum cleaner, table 8 (Wieser, Tröger & Hübner, 2015). A study from the UK based on GfK data from 2012 shows that on average, consumers expect vacuum cleaners to last 5 years (WRAP, 2013b).

Table 7: Results from the survey study about 'expected' and 'actual' lifetime of vacuum cleaners (Wieser et al 2015)

	Question	Answer
Expected Lifetime	'How long do you expect a vacuum cleaner to last or flawlessly function under normal intensity of use' (n=996)	10.3 years
Actual Lifetime	'How long would you normally use a vacuum cleaner before storing, disposing or discarding?' (n=639)	6.0 years

Reasons for replacement

An online survey (n=507) in the UK (Harmer et al., 2019) showed that 34% of the discarded vacuum cleaners were not working at all. The other 66% were still functioning (to some extent) when discarded. For all the discarded vacuum cleaners, the most common reason to replace it was that it was 'not working efficiently' (44%). This means that 56% the vacuum cleaners were still performing their function well when discarded. Besides that, 47% of the participants cared if their vacuum cleaner had signs of wear and tear. This could stimulate early product replacement. Lastly, differences in consumer profile played a role: consumers that care about cleanliness were more likely to replace their vacuum cleaner while it was still functioning. There is also a difference between the different types of vacuum cleaners (canister, cordless and robot). In the "baromètre du SAV" FNAC-DARTY (2018), they estimated the average lifetime of robot vacuums at three years. The main reason for a reduced lifetime of handheld and robot vacuum cleaners is usually the limited battery lifetime.

Barriers towards repair

In the event of a vacuum cleaner not switching on, eighteen percent of the participants from an online survey conducted with households in the UK (N=507) had their vacuum cleaner repaired. This suggests that the step to repair is not taken by default. The same research shows that users face barriers to maintenance and repair, such as product's design that prevented repair, the lack of an adequate service, inconvenience and cost. Besides that, replacement by new machines with new features was relatively affordable (Harmer et al, 2019).

Repair attitudes across Europe

In their study on repair attitudes, Euroconsumers (2019a, 2019b, 2019c, 2019d) found that overall, less than half (table 8) of the consumers had repaired their vacuum cleaner when it broke down, though this result is not stable across the four countries in which this survey was taken.

Table 8: Repair of vacuum cleaners Base: respondents who acquired a new vacuum cleaner and had a problem with it (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

Vacuum cleaners	Belgium (n=170)	Italy (n=327)	Portugal (n=127)	Spain (n=102)	Total (n=726)
Did you repair it?					
Yes	26%	56%	38%	47%	45%

Similar to washing machines, cost-related motives are by far the most pronounced (table 9) among the multiple reasons that make consumers decide against repairing their vacuum cleaner. This trend can be seen in Belgium, Italy, Spain and Portugal (Euroconsumers, 2019a, 2019b, 2019c, 2019d) as well as Germany (Reichelt, 2020). It is also shown by two studies (Flemish Government Department of Environment, 2017; Netwerk Bewust Verbruiken, 2019) that focused on the Flemish region in Belgium.

Table 9: Reasons for not repairing vacuum cleaners Base: respondents who acquired a new vacuum cleaner, had a problem with it and did not repair (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

If not, why? (multiple response set)	Belgium (n=126)	Italy (n= 141)	Portugal (n=79)	Spain (n=54)	Total (n=400)
The device wasn't worth the repair cost anymore	34%	33%	34%	43%	35%
The repair costs were too high	29%	36%	33%	17%	31%
Repair was not possible	16%	11%	25%	19%	16%
The device could still be used	17%	14%	9%	9%	13%
No spare parts available	11%	9%	10%	13%	11%
Other reason	12%	7%	5%	6%	8%
It would have given a lot of work (time/effort)	6%	9%	4%	7%	7%

In all four countries, more expensive vacuum cleaners are more likely to be repaired than low-cost models and severe problems that put the appliance completely out of use are less likely to be repaired than smaller issues (Euroconsumers, 2019a, 2019b, 2019c, 2019d; Reichelt, 2020, Flemish Government Department of Environment, 2017). On average, members of consumer organisations are willing to repair their vacuum cleaners up to an age of seven years and ten months (Euroconsumers, 2019a, 2019b, 2019c, 2019d).

A study by the Flemish Government Department of Environment (2017) in Belgium found that residual value and the original purchase price of a product play an important role in the decision whether or not to repair a product. Similar trends were found by Euroconsumers in Italy (2019b), Portugal (2019c), Spain (2019d) and Belgium (2019a) in that the proportion of the original purchase price which a consumer is willing to pay towards the repair of his product declines with the age of the product.

Possibilities to extend product lifetime

A study from Philips about Consumer Lifestyle (2010) (n=950) has shown that most of the users stated that their purchase decision for a vacuum cleaner was mainly based on reliability & durability, key features, the brand and value for money (Figure 5). Note that the graph in figure 5 is split in two types of vacuum cleaners, one type with less than 1600W (n=255) and another type with more than 1600W (n=696), to see whether the user took environmental aspects into account during purchase. As can be seen, for the vacuum cleaners with less than 1600W, the environment was taken into account as primary reason to buy the product (Visser et al., 2018).

Lastly, as shown in figure 5, reliability and durability are considered as the primary reason to buy a vacuum cleaner. These factors are highly related to product longevity, and therefore (indirectly) positively influencing the environment. This is an interesting input for the testing program of PROMPT, and should be communicated to the consumer.

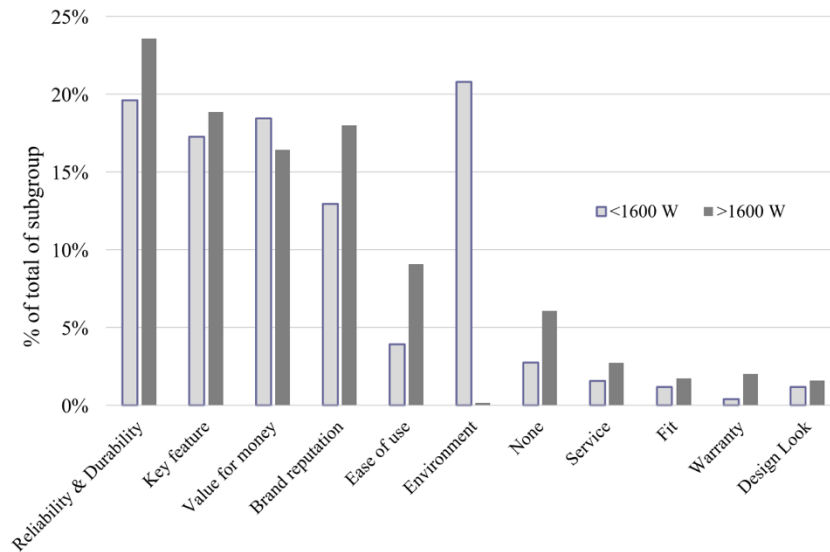


Figure 5 - The primary reason to buy a vacuum cleaner. Divided in Low input (<1600W; N=255) and High input (>1600W, N =696) users. Grand Total (N=951) (Visser et al., 2018).

3.3 (smart) TVs

Average lifetime

The average lifetime of TVs in Dutch households is ten years for both 2000 and 2005 (Wang et al., 2013; Bakker et al 2014). Another study for the German Environmental Agency showed that the average lifetime of TVs is estimated around ten years as well (Prakash et al., 2016). More recent studies, such as a JRC study from 2019, showed that the average lifetime ranges from 5-10 years (Sanfelix et al., 2019). This range is also supported by statistics from FNAC-DARTY, documenting 7.4 years in France and 8.0 years in Belgium (2019). Lastly, there is a difference in product lifetime from 1,5 years between elderly (10.8 years) and young people (9.3 years) (Hennies & Stamminger, 2016).

Expected use/ lifetime

Surveys of Austrian consumers' expectations on expected and desired product lifetimes of TVs shows an interesting difference. Consumers seem to expect a TV to perform its function longer than the actual time they will use it (table 10) (Wieser et al 2015).

Table 10: Results from the survey study about 'expected' and 'actual' lifetime of TVs (Wieser et al 2015)

	Question	Answer
Expected Lifetime	'How long do you expect a TV to last or flawlessly function under normal intensity of use' (n=997)	11.0 years
Actual Lifetime	'How long would you normally use a TV before storing, disposing or discarding?' (n=748)	7.3 years

Reasons for replacement

About 44 % of TV's are disposed when defective. From the 56% that were still functioning, 16% of the participants indicated that they were no longer satisfied with the features, 16% no longer liked the TV, 8% were given a new appliance, 2% replaced the TV because the resource efficiency was not satisfying, and 15% for other reasons (table 11) (Hennies & Stamminger 2016).

Table 11: Reasons why users discard their TV (Hennies & Stamminger, 2016)

Why did you discard the appliance?	
The appliance was defective.	44%
I no longer liked the appliance.	16%
I was not satisfied with the features.	16%
I was given a new appliance.	8%
I had another reason.	15%
The resource efficiency of the appliance was not satisfying.	2%
Total (n)	875

Barriers towards repair

Looking at barriers for repair, advertisements seem to stimulate replacement over repair, as they persuade consumers to buy a new product. Arguments to convince the consumer are design features and increased performance (Bayus 1988; McCollough 2009). Besides that, the purchase price of the TV has an influence. The lower the price of the TV, the lower the likeliness to repair (Hennies and Stamminger, 2016).

Repair attitudes across Europe

Table 12: Repair of televisions; Base: respondents who acquired a new TV and had a problem with it (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

Televisions Did you repair it?	Belgium (n=101)	Italy (n=274)	Portugal (n=121)	Spain (n=112)	Total (n=608)
Yes	35%	48%	41%	47%	44%

Similar to other product types, in more than half of the cases, multiple reasons make consumers decide against repairing their TV, of which cost-related motives are by far the most pronounced (see table 13). This trend can be seen in two studies that were done in the Flemish region of Belgium (Flemish Government Department of Environment, 2017; Netwerk Bewust Verbruiken, 2019) as well as a German survey (Reichelt, 2020), and is confirmed by Euroconsumers (2019a, 2019b, 2019c, 2019d) for Belgium, Italy, Portugal and Spain.

Table 13: Reasons for not repairing; Base: respondents who acquired a new TV, had a problem with it and did not repair it (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

If not, why? (multiple response set)	Belgium (n=66)	Italy (n= 143)	Portugal (n=71)	Spain (n=57)	Total (n=337)
The repair costs were too high	27 %	32 %	37 %	28 %	31 %
The device wasn't worth the repair cost anymore	23 %	32 %	28 %	28 %	29 %
The device could still be used	18 %	17 %	20 %	16 %	18 %
Repair was not possible	17 %	13 %	21 %	12 %	15 %
Other reason	15 %	10 %	6 %	21 %	12 %
It would have given a lot of work (time/effort)	9 %	13 %	7 %	12 %	11 %
No spare parts available	11 %	6 %	14 %	7 %	9 %

Euroconsumers (2019a, 2019b, 2019c, 2019d) found that consumers in four European countries are willing to repair their TV until it reaches an age of four years old. More expensive TV's are more likely to be repaired than cheaper models and severe problems are less likely to be repaired than smaller issues (Euroconsumers, 2019a, 2019b, 2019c, 2019d; Reichelt, 2020; Flemish Government Department of Environment, 2017), but unlike for some other product types, for televisions, the age does not present a clear trend in consumers' repair behaviour (Euroconsumers, 2019a, 2019b, 2019c, 2019d).

Additionally, the proportion of the original purchase price which a consumer is willing to pay towards the repair of his product declines with the age of the product (Euroconsumers, 2019a, 2019b, 2019c, 2019d). Consumers seem to be aware of this and indicate themselves that the original purchase price and residual value play an important role in the decision whether or not to repair a product (Flemish Government Department of Environment, 2017).

Possibilities to extend product lifetime

Looking at the purchase decision for televisions, a survey in Bangladesh found that the price of the new device has the highest priority (54%), followed by warranty (38%), brand (4%) and installation (3%) (Islam, 2016). Warranty has a relative high effect on the purchase decision, and could have a positive influence on the product lifetime, therefore it is interesting to consider it for the testing program. Note that this is a study might not reflect the European scope of this project.

3.4 Smartphones

Average lifetime

A survey of Austrian residents in 2014 shows that the average lifetime of smartphones is around 2.7 years (Wieser et al 2015). A shorter lifetime of 1 year and 10 months is found in a survey from 2016 in the UK, but this may be due to the fact that the question was about use duration of mobile phones, instead of average lifetime (Wilson 2017). Statistics from FNAC-DARTY showed an average of 3.0 years in France and 4.3 years in Belgium (2019).

Expected use/lifetime

Several surveys have been performed on the expected lifetime of smartphones. A survey on a sample of U.S. students shows that the expected lifetime of a smartphone is 2.8 years (Sabbaghi & Bedhad, 2018).

Second, a survey amongst German consumers (2017) shows the expected lifetime of smartphones. The average was around 4 years. For the distribution this expectation (figure 6) (Jaeger-Erben & Hipp, 2018). This average is relatively high because 9% of the participants expected their smartphone to last longer than 8 years. The researchers noted that this might be related to a wish for a smartphone to last that long, rather than an expected useful life. However, this wish also shows a willingness from the consumer to own a long-lasting smartphone.

Furthermore, the expected lifetime of a smartphone in general was compared to the remembered usage time of the last (owned) device and the expected usage time of the currently (owned) devices, (figure 7). Looking at the results, consumers seem to expect their smartphone to last less than smartphones in general, meaning, smartphones might be replaced before 'end-of-life' (the product being broken beyond repair).



Figure 6 - How long should a smartphone hold in your view? (N = 1813)

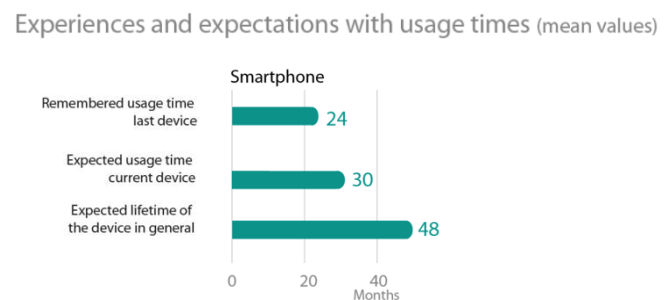


Figure 7 - Comparison of the averages for the expectations and experiences of washing machines lifetimes (n = 1813)

In a third survey from the European Environmental Bureau, the expected lifetime of a smartphone was 3 years (EEB, 2019). This number is based on a literature review from Suckling & Lee (2015).

Finally, the survey of Austrian consumers on expected and desired product lifetimes of mobile phones shows, similar to TVs and vacuum cleaners, that consumers seem to expect the mobile

phone to perform its function significantly longer than they will actually use it (table 14) (Wieser et al. 2015). Note this research was about mobile phones, not specifically smartphones.

Table 14: Results from the survey study about 'expected' and 'actual' lifetime of mobile phones (Wieser et al 2015)

	Question	Answer
Expected Lifetime	'How long do you expect a mobile phone to last or flawlessly function under normal intensity of use' (n=996)	5.2 years
Actual Lifetime	'How long would you normally use a mobile phone before storing, disposing or discarding?' (n=842)	2.7 years

Taking previous surveys all together, we can conclude that the expected lifetime of smartphones is between 2,7 and 3,0 years, not taking the research of Jaeger-Erben & Hipp into account, because of possible misinterpretation of the question by the participants.

Reasons for replacement

A survey with Austrian residents (2014) has shown that around 30% replaced their smartphone because it was defective, see figure 8 (Wieser & Tröger, 2018).

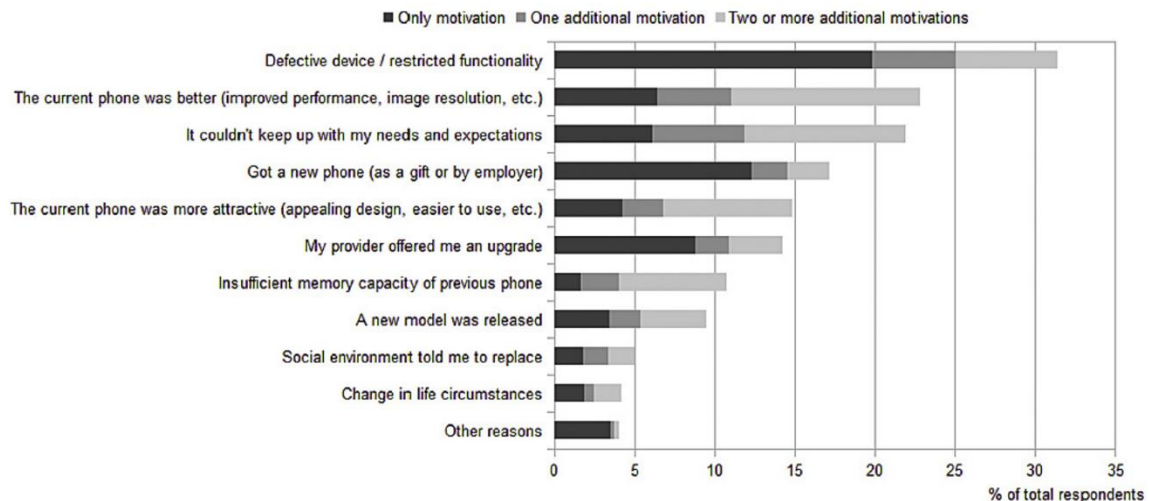


Figure 8 - Reasons for mobile phone replacement of Austrian residents (2014) (Wieser & Tröger, 2018).

Research in Brazil about replacement of mobile phones reported that 33% of replaced phones were broken beyond repair, 21% in need of repair and 47% still functioning (Echegaray 2016). Technological and quality obsolescence are the main reasons to replace smartphones (Wilson et al 2017). This is also shown in a study with 254 undergraduate students from Northwest U.S. university, 50% is willing to replace their mobile phone when a new version enters the market (Wilhelm et al, 2011). Lastly, but also important in phone replacement, in the same study of Wilhelm 41% indicated they replaced due to the contract renewal of their phone.

Barriers towards repair

Looking at repair, the willingness to pay for repair services seems to decrease with an annual rate of 6,7% during the use phase (Sabbaghi et al 2017). This research also shows that costly repair services and insufficient access to repair infrastructure may dissuade consumers from repairing. Sixty-six percent of the users do not even attempt to repair defective phones, partly due to the high costs of repair and the belief that phones could not be repaired. From consumers with a

defective phone, 34% did attempt to repair it. From that percentage, 43% were broken beyond repair, 31% were repairable and 26% did not know how to repair after the first attempt (Wieser and Tröger, 2018), see figure 9.

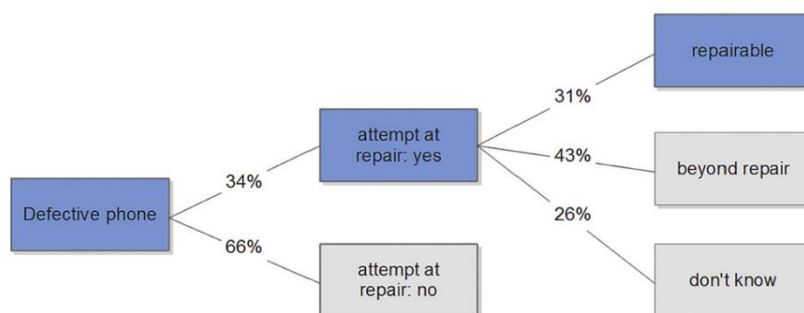


Figure 9 - Defective phone, attempts to repair yes/no, percentage of phones that were repairable (2014) (Wieser and Tröger, 2018)

Repair attitudes in European countries

In a 2019 survey, executed amongst 5368 members of consumer organisations in four countries, Euroconsumers asked if they repaired their smartphone when it became defect. Half (table 15) of the consumers indicated they did (Euroconsumers, 2019a, 2019b, 2019c, 2019d).

Table 15: Repair of smartphones; Base: respondents who acquired a new smartphone and had a problem with it (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

Smartphones Did you repair it?	Belgium (n=281)	Italy (n=721)	Portugal (n=236)	Spain (n=333)	Total (n=1571)
Yes	37%	53%	54%	46%	50%

Similar to other product types, in just over half of the cases on average, cost-related motives are by far the most pronounced (table 16) of the multiple reasons that make consumers decide against repairing their smartphones. This trend can be seen in Belgium, Italy, Spain and Portugal (Euroconsumers, 2019a, 2019b, 2019c, 2019d) as well as Germany (Reichelt, 2020). Similar results have also been found by two studies that focused on the Flemish region in Belgium (Flemish Government Department of Environment, 2017; Netwerk Bewust Verbruiken, 2019).

Table 16: Reasons for not repairing smartphones; Base: respondents who acquired a new smartphone, had a problem with it and did not repair it (Euroconsumers, 2019a, 2019b, 2019c, 2019d)

If not, why? (multiple response set)	Belgium (n=175)	Italy (n=332)	Portugal (n=127)	Spain (n=153)	Total (n=787)
The repair costs were too high	34%	39%	32%	27%	34%
The device wasn't worth the repair cost anymore	26%	33%	33%	32%	31%
Repair was not possible	19%	18%	17%	20%	18%
The device could still be used	18%	13%	17%	12%	15%
Other reason	17%	7%	13%	16%	12%
It would have given a lot of work (time/effort)	13%	14%	6%	11%	12%
No spare parts available	4%	5%	3%	3%	4%

In all four countries, consumers are willing to repair their smartphone, on average, until the age of three years and seven months, yet newer smartphones are more likely to be repaired than older ones (Euroconsumers, 2019a, 2019b, 2019c, 2019d). Furthermore, expensive models are more likely to be repaired than budget phones (Euroconsumers, 2019a, 2019b, 2019c, 2019d; Reichelt, 2020; Flemish Government Department of Environment, 2017) and severe problems that put the device completely out of use are less likely to be repaired than smaller issues (Euroconsumers, 2019a, 2019b, 2019c, 2019d).

Additionally, the proportion of the original purchase price which a consumer is willing to pay towards the repair of his product declines with the age of the product (Euroconsumers, 2019a, 2019b, 2019c, 2019d). Consumers seem to be aware of this and indicate themselves that the original purchase price and residual value play an important role in the decision whether or not to repair a product (Flemish Government Department of Environment, 2017).

Possibilities to extend product lifetime

Wilhelm (2012) reports in a conjoint experiment to discover the relative importance of phone design attributes that durability and phone customization were found to have a significant impact on phone preference. They are considered a fashion statement for young adults. Customization and durability are also considered as enablers to prolong lifetime of mobile phones, and therefore, could be an interesting addition for the testing program.

An online survey among German consumers (n=1813) in 2017 shows the purchase criteria for smartphones. On the following question: 'What role did the following aspects play in the selection of the current smartphone?' Long-lasting battery and robust and durable were the most important criteria, see figure 10 (Jaeger-Erben & Hipp, 2018). These factors are closely linked to characteristics of long-lasting smartphones.

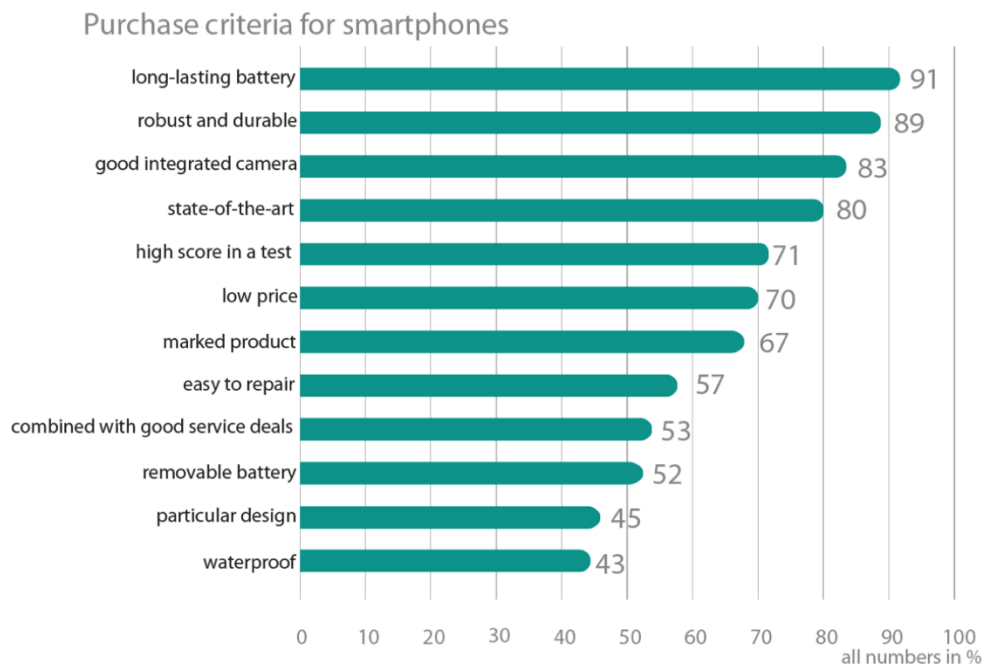


Figure 10 - What role did the following aspects play in selecting the current smartphone? Percentages represent the sums for the answers "a rather large" / "a large role" (n = 1813)

3.5 Conclusion

After looking at the products categories separately, some commonalities and differences can be found. A summary of the most important findings of the research are documented below

Average life time

First, in general the average lifetime of all four product categories seem to be in decline, as the average lifetimes of all categories are becoming shorter over time (Bakker et al 2014). Furthermore, in comparison with the other product categories, the lifetime of mobile phones is relatively low, with an average between 1.8 and 2.7 years. An overview of the average lifetime found in literature and studies of consumer associations is shown in table 17.

Table 17: Average lifetime of products (Bakker et al., 2014)

Product	Washing Machine	Vacuum Cleaner	(Smart) TV	Smartphone
Average lifetime	9.7 – 12.7 years	6.7 – 8.1 years	9.3 – 10.8 years	1.8 – 2.7 years

Expected lifetime

Looking at the expected lifetime, it is worth noticing that consumers expect products' lifetime before malfunctioning to be longer than the time they will use them (washing machine 8.3 vs 12.7; vacuum cleaner 10.3 vs 6.0 years; TV 11.0 vs 7.3 years; smartphone 5.2 vs 2.7 years) (Wieser et al 2015). This might imply that the consumer has a role in premature obsolescence of products. Even if products lasted as long as they think they should, consumers indicate they expect not use it for that total amount of time, and replace it before.

Reasons for replacement

Regarding reasons to replace products, responses from users' surveys show that 31% of washing machines (Hennies & Stamminger, 2016), 66% of vacuum cleaners (Harmer et al. 2019), 56% of TVs (Hennies & Stamminger, 2016), and 69% of smartphones (Wieser & Tröger, 2018) were disposed for other reasons than being broken 'beyond' repair. For three out of four product categories this is above 50% of the discarded products. This provides evidence for the relevance of investigating the user and market related factors in relation to early product replacement.

Barriers towards repair

Looking at the barriers towards repair, these are quite similar for the different product categories. The price of repair, e.g. labour costs and price of spare parts, are the first barriers. On top of that, readily available new products make it very easy for the consumer to buy a new one. Next to that, the effort of finding out what is wrong, and a lack of a good repair infrastructure (taking to repairer, having a replacement in the meantime) and low availability of spare parts are considered barriers for repair for all product categories.

Possibilities to extend product lifetime

Lastly, regarding possibilities to extend product lifetime, warranties are considered as positively influencing the lifetime of products. Consumers in general prefer more durable products, but the relatively high price of these products might prevent them from actually buying more durable alternatives. Consumers are willing to repair their product for many years. However, in practice, this willingness is often countered by multiple factors of which especially the price of repair and its relation to the original purchase price, the perceived residual value of their product, the uncertainty of the outcome of the repair and how long the product will before another repair is needed.

4 Legal Analysis and recommendations

Introduction

The Consumer Sales and Guarantees Directive (CSGD) 1999/44/EC guarantees at least two years of coverage for new products. During the first six months of which, any lack of conformity that becomes apparent is presumed to have existed at the time of delivery (reversal of the burden of proof). Most EU-countries apply the minimum duration but in certain countries a longer period is applicable (e.g. Finland, Ireland, The Netherlands, Norway and Sweden) sometimes depending on the expected lifespan of the product in question (European Commission, n.d.).

In this chapter we analyse national law provisions and guarantee conditions of sellers and manufacturers, as well as consumer experiences with the ways in which these provisions and conditions are put into practice, in search for elements which might promote or prevent premature obsolescence. Finally, we discuss gaps and formulate recommendations for improvement.

4.1 Methodology

The EU Directive 1999/44 left room for different levels of consumer protection on a national level. The goal of this analysis was to find any obstacles for repair or other factors promoting premature obsolescence in the national legal system, the guarantee conditions of retailers and manufacturers.

National legal system

We explored the specific national legislative system for provisions that might promote or counteract premature obsolescence (e.g. reversal of the burden of proof, specific legislation on repair, the availability of spare parts ...)

Guarantee conditions retailers and manufacturers

In a second stage, guarantee conditions of retailers and manufacturers were analysed.

For Belgium, TA selected the 16 most relevant retailers on the Belgian market, based on the number of physical stores, the number of different product categories and products in their offer (reference date: 13/09/2019).

The selection of the manufacturers was based on the Belgian results from the web tool that was launched in the context of PROMPT and with which consumer organisations collect direct consumer feedback on products that broke down. For each of the four PROMPT product categories, the manufacturers representing at least 70% of the reported products (reference date 15/1/2020) were selected. This resulted in three manufacturers for televisions, four for mobile phones, seven for vacuum cleaners and five for washing machines. Because several of these manufacturers are active in more than one product category (e.g. Samsung, Bosch ...), guarantee conditions of a total of 14 brands were analysed.

For Spain, OCU selected the three most relevant retailers, based on their market share, presence of the PROMPT product categories in their offer, the retailer having both online activities and physical shops, and the number of complaints OCU received from consumers.

The selection of the manufacturers was based on the Spanish results from the web tool that was launched in the context of PROMPT and with which consumer organisations collect direct

consumer feedback on products that broke down. For each of the four PROMPT product categories, the three manufacturers with the highest number of reported products (reference date 15/1/2020) were selected. A total of twelve sets of conditions were analysed.

The different guarantee conditions are analysed for their legality and completeness of their clauses, the information that is provided and exclusion clauses or any other clauses or elements that might encourage consumers to replace their product.

4.2 National legal provisions on guarantee and repair

In this paragraph we zoom in on the legislative provisions on guarantee and repair that are present in the countries of the partners of the PROMPT consortium. Only a minority of the EU member states goes beyond the minimum requirements of the CSGD: as few as four member states provided a legal guarantee period of more than the two years, and a mere three member states applies a reversal of the burden of proof for more than six months. The table in Annex I (European Commission, 2017) gives a broader overview of national key provisions based on the CSGD in the national consumer law of the EU member states.

- Belgium

Belgian law makes use of CSGD articles 8(2), 5(2) and 7(1) (reference EU website) but does not go beyond their requirements (European Commission, n.d.). The reversal of the burden of proof is applied during the first six months after the good has been delivered to the consumer. During this period, any lack of conformity will be presumed to have existed at the time of delivery (Belgian FPS Economy, 2019).

Additionally, a specific law (Economic Law Code: Art. VI, 83) prohibits the seller from limiting consumers' legal guarantee rights through his general conditions.

In 2019, several legislative proposals on planned obsolescence were introduced, all of which are still pending at the time of writing.

- France

French national law goes beyond Art. 5(3) CSGD and applies the reversal of the burden of proof for two years after delivery of the goods (European Commission, n.d.).

With the new circular economy law that has been adopted at the end of January 2020, second hand goods will be covered by a legal guarantee of one year, during which the burden of proof will be reversed as well.

When goods are repaired, they will benefit from an additional six months of legal guarantee. If repair of a defective product is not foreseen by the seller, it will be replaced and the replacement product will benefit from another two years of legal guarantee (instead of the remaining legal guarantee of the initial product, as is provided by the CSGD).

Additionally, French national law has multiple other relevant provisions:

- In 2015 a law (L. 213-4-1 of the consumer code) took effect, which classifies planned obsolescence as an offence.
- Since 2015, manufacturers are obligated to indicate how long spare parts will be available at the point of sales.
- It is forbidden to destroy unsold goods.

- Spare parts will have to be kept available for at least five years for certain product categories.

Pending measures:

- As of 1 January 2021, a repair score will appear on smartphones, washing machines, TV's, computers and lawn mowers. The score will range from 0 to 10 and will be based on five criteria, including the price of spare parts. The French Ministry of the Environment is aiming to finalize the scoring system by July 2020. By January 2024, the repair index will morph or be complemented by a durability index, which will allow consumers to easily select longer-lasting products.

The new law also opens the door for manufacturers to integrate a 'usage meter', tracking what the product has been through (for example washing cycles, battery charges, etc). This will be useful information, especially for consumers who buy second-hand products, as the meter will indicate the number of times the appliance was used in the past;

- The French government will investigate the role of software in short-lived devices.

- Germany

German law made use of CSGD Art. 7(1) to define a minimum guarantee period of one year for second hand products (European Commission, n.d.), but does otherwise not go beyond the directive. The legal guarantee applies during two years after the delivery of the goods. During the first six months of which, any lack of conformity will be presumed to have existed at the time of delivery.

- Italy

Italy used CSGD articles 5(2) which limits consumers' time to notify the seller of the lack of conformity within two months after becoming aware of it and Art. 7(1) regarding the duration of the legal guarantee for new (two years) and used (one year) products (European Commission, n.d.). During the first six months after delivery of the product, the burden of proof is reversed.

Furthermore, the Italian Consumer Code contains additional articles regarding misleading and comparative advertising (Art 21-25) and regarding the Liability for damage caused by defective products (Art. 128-135).

Additionally, there is a bill proposal on programmed obsolescence (dl. 615) in the Industry committee of the Senate, which is still pending at the time of writing.

- Portugal

Portuguese national law made use of CSGD articles 5(2) which limits consumers' time to notify the seller of the lack of conformity within two months after becoming aware of it and Art. 7(1) regarding the duration of the legal guarantee for new (two years) and used (one year) products (European Commission, n.d.).

Portuguese law goes beyond CSGD Art. 5(3) concerning the burden of proof: any lack of conformity which becomes apparent within two years is presumed to have existed at the time of delivery (instead of six months).

Additionally, the availability of spare parts is covered by the law.

- Spain

Spanish law follows the provisions of the CSGD, its national law "Real Decreto Legislativo 1/2007, de 16 de noviembre" incorporates the EU Directive 1999/44/CE. As foreseen by the CSGD, the burden of proof is reversed during the first six months after the delivery of the product.

Additionally, there is a regulation regarding spare parts and technical repair services, "Ley 7/1996, de 15 de enero de Ordenación del Comercio Minorista", which states that spare parts should be available for five years after the manufacturing of a product has ended. Spare parts price lists should be available for the consumers. The price of spare parts cannot be incremented when applied to the product repairing. Additionally, labour costs and visit costs should not be higher than the average costs estimated for the sector.

- The Netherlands

Dutch law goes beyond the CSGD provisions by not providing a time limit for guarantee. Instead, products need to comply with the consumers' reasonable expectations under normal use. These 'reasonable expectations' are defined based on the type of product, the information that was provided by the seller, the sales price and the brand's reputation and statements about the product in question. For example, if a cheap washing machine breaks down after three years, it could be considered as to be expected, however if a more expensive washing machine from a brand who uses its reliability as a sales proposition, three years would be too soon (Meindersma, 2018, Government of the Netherlands, n.d.).

Consumers' guarantee rights go therefore beyond the seller's or manufacturer's guarantee period and are to be seen as guarantee rights outside of the guarantee period (Consumentenbond, n.d.).

However there is a limitation in time for notifying the seller about the non-conformity. Therefore, Dutch law makes use of CSGD article 5(2) which limits the time that a consumer has to notify the seller of the lack of conformity to two months after the consumer became aware of it (European Commission, n.d.).

Once the consumer notified the seller, there is a limitation period of two years for the consumer to repeat his complaint to the seller if the latter did not take action after being notified for the first time. Additionally, during the first six months after the consumer has received the product, the burden of proof is reversed. After this period, it is up to the consumer to prove that the product's failure was not due to improper use.

4.3 Guarantee conditions

Guarantee analysis Belgium

The guarantee conditions of 16 retailers and 14 manufacturers were analysed for their completeness, conformity with the applicable national legislation, exclusion clauses and any other elements dissuasive to the exercise of the right of guarantee. Belgium and Spain were the only countries for which sufficient research was available within the consumer organisations that are partner in the PROMPT project.

Retailers' guarantee conditions are more general and focus on the practical side of the guarantee procedure, whereas the manufacturers' conditions are more specific about the product and contain exclusions.

Out of 16 retailers in Belgium that were analysed, eight were conform the Belgian law, seven were conform but certain information about the legal guarantee (such as the duration or the consumer's free choice between repair and replacement) were missing or too vague. The conditions of one retailer contained clauses that were in conflict with Belgian law, stating that the return shipment of the article would have to be paid by the client and that the guarantee isn't transferable. Even though one retailers' condition presented clauses that are in conflict with Belgian law, it is more concerning that the provided information is often incomplete or lacks preciseness and clarity.

Within the guarantee conditions of the manufacturers, the situation in Belgium is quite different from what we observed in the retailers' conditions. The manufacturers' guarantee conditions were also analysed for their completeness, conformity with the applicable national legislation, exclusion clauses and any other elements dissuasive to the exercise of the right of guarantee. All of the analysed conditions give less protection than provided by the legal guarantee and only mention that the legal guarantee takes precedence over the manufacturers' conditions with legal expressions, such as "without prejudice to the law of the member state", "If this exclusion is not (fully) permitted by applicable law, warranties will be provided to the extent required by applicable law" or "In accordance with other provisions of national law". In addition to the wording, the lack of sufficient knowledge of the legal guarantee provisions (Chafea, 2015) makes these clauses insufficiently clear to many consumers and sellers.

Clauses that are in conflict with the legal provisions concern: the duration of the guarantee (e.g. not extending the guarantee with the duration of the repair), consumer's right of choice between repair and replacement, coverage of repair and transport costs, limiting or excluding guarantee coverage for specific parts (e.g. batteries, 'sensitive' parts made from plastic, rubber etc. ...).

This can become an issue if the seller adjusts his guarantee obligation to the conditions of the manufacturer (e.g. in the advice he gives when a consumer wants to make a guarantee claim).

Guarantee analysis Spain

The guarantee conditions of three Spanish retailers were analysed. None of these contained any illegal clauses, but similar to Belgium, all three offered incomplete information on the consumers' legal rights. One retailer advises consumers to claim their guarantee with the manufacturer first and contact the retailer if they encounter problems, while legally it is the other way around.

Amongst the guarantee conditions of the twelve manufacturers that were analysed, a large majority refers to the Spanish Guarantee law (Real Decreto Legislativo 1/2007). The main aspects of the legal guarantee are always included but, in several cases, important information is missing or unclear. For example, it is not mentioned that the warranty period is suspended while the product is being repaired, or that there is a six month guarantee on repaired products, or it is insufficiently clear that the transport of the product during a guarantee claim is not to be paid by the consumer.

Only in two cases, manufacturers show conditions that are in conflict with the national law, followed by legal wording stating that this condition is only valid in so far as it does not conflict with national law. Interestingly, not all manufacturers who applied this same technique in Belgian (Benelux/Belux) guarantee conditions, did so in their Spanish guarantee conditions.

Guarantee in practice

Through the analysis of the guarantee conditions of retailers, we learned even though often vague or incomplete, no major issues were present in the basic theoretical frame that they provide. More issues were found in the guarantee conditions of manufacturers, and even though in most member states (Chafea, 2015) no direct contract exists between the manufacturer and the

consumer, the seller does depend on the manufacturer to be able to meet the guarantee claims from consumers. In specific cases, the consumer will even have the legal right to turn directly to the manufacturer to make a claim: when a seller goes into failure or can't meet the guarantee claim for any other reason. Blasco et al (2015) found that even though in most cases consumers make their guarantee claim with the original seller of the product, they are more likely to turn to the manufacturer for a solution as the problem becomes more important.

The often unclear, misleading and sometimes illegal clauses in the guarantee conditions of manufacturers, together with a limited of knowledge of the legal guarantee rights with the consumers (Watson et al, 2017, Chafea 2015) as well as the sellers (Chafea, 2015, European Commission, 2015), makes for a situation in which the handling of guarantee claims in practice might differ from the theory provided by the guarantee conditions and more importantly the legal provisions in national law. However, only few sources are available on consumers' experiences with guarantee.

36% of consumers within the 28 member states (Chafea, 2015) and 37% to 48% of consumers within Belgium, Italy, Portugal and Spain (Blasco et al, 2015) were very satisfied with how the problem they had with their product was handled. Both studies also found that consumer satisfaction with the way sellers handled their problem was higher than with the way manufacturers did. However, Blasco et al. (2015) indicates that in their study this difference was not statistically significant in Italy. Chafea (2015) also observed that the proportion of consumers who took action after their product had a problem and were very satisfied with the way it was handled, was higher within the first six months after purchase than after one year (41% vs. 30%). This idea is also supported by Watson et al. (2017) who states that after the first six months after purchase guarantee claims have a limited chance of success.

Yet, in between 4% and 13% (Blasco et al., 2015) and between 6% and 26% (Chafea, 2015) of the cases where consumers encountered a problem with their product, they did not take any action to resolve it while the legal warranty was still applicable. Chafea (2015) distinguishes three main barriers (figure 11):

- *Complex/long process to execute rights:* for 30% of cases, respondents thought it was unlikely that the problem would have been resolved, or that the process would have taken too long, or that they did not know the procedure to file a complaint
- *Lack of awareness:* For 17% of cases, respondents assumed their product's guarantee had expired, even though it was bought in the last two years.
- *Burden of proof:* For 14% of cases, respondents abandoned their guarantee claim because they had to prove they did not cause the problem themselves.

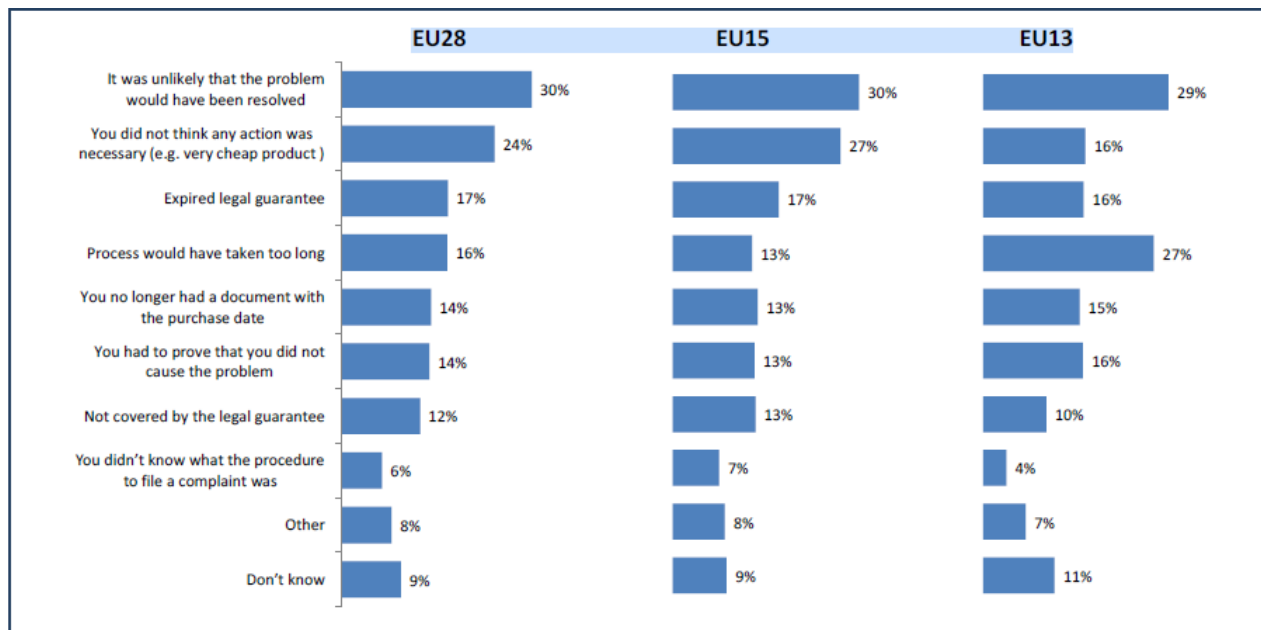


Figure 11 – Reasons for not taking any action when a problem occurred (multiple response) (Chafea 2015) Base: all problems for which no action was taken (EU28: n=1779; EU15: n=862; EU13: n=917)

For a large majority of consumers, their guarantee claim had a positive outcome (figure 12), but for 10% (PT) to 22% (ES) their claim had no result (Blasco et al, 2015). Additional research would be needed to determine why.

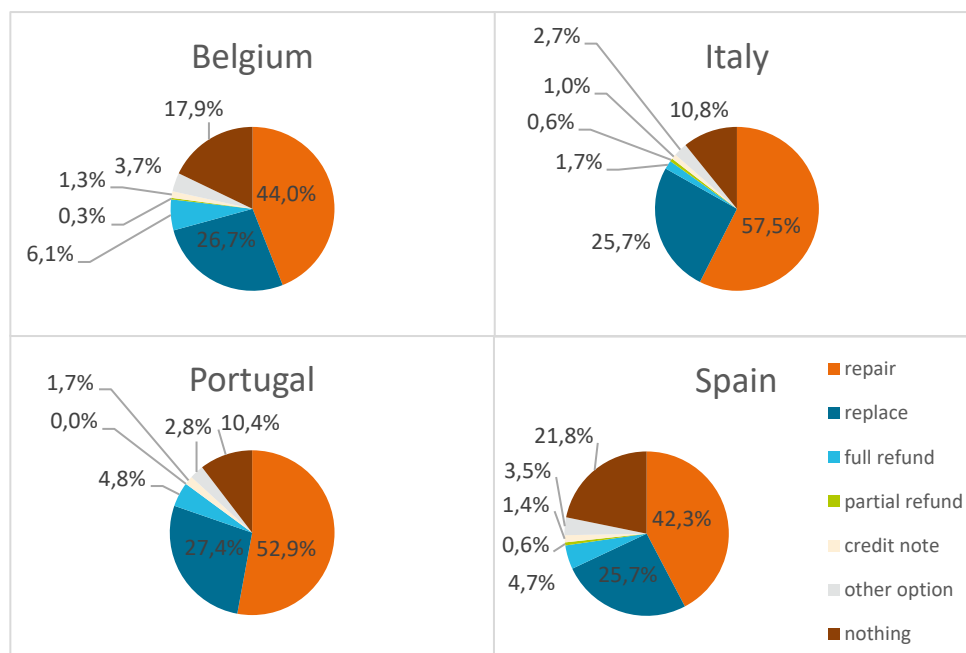


Figure 12 – Result when making use of the warranty (Blasco et al., 2015)

4.4 Conclusion, Gaps & recommendations

In search for legal aspects that might promote premature obsolescence, we looked at the provisions in the national legislations. All have at least the minimum protection as provided by the CSGD, though some EU member states go beyond. Little research has been done on the performance and effectiveness of the different guarantee provisions in the national law of the member states. We did however not find any legal provisions which directly promote premature discarding of products.

A majority of consumers has a basic knowledge of their guarantee rights, but many get confused by the difference between the legal and the manufacturer guarantee. We think that with the manufacturers' conditions often showing illegal clauses, many sellers that are too little informed about the legal provisions will not likely try to go against the conditions provided by the manufacturers. Few consumers are informed enough to claim their legal rights if these aren't being honoured by the seller or manufacturer.

Both legal provisions and guarantee conditions leave much room for divergent interpretations in practice. We have been able to identify the following gaps in the available data and suggest that more research should be done on:

- National data on issues/experiences of consumers with the execution of legal and commercial guarantee, for the purpose of comparing the performance of the different guarantee systems. E.g. how do systems perform where the legal guarantee is not limited in time compare to systems where it is limited in terms of performance?
- Consumer awareness/knowledge of their legal rights, especially when challenged with conflicting information
- Seller knowledge of legal rights (in defence to the manufacturers' conditions)
- The application of legal guarantee after the transition to 1y reversal of the burden of proof, e.g. through mystery shopping.
- Differences in the application of guarantee for different types of products, in particular small household appliances.
- The extent to which legal guarantees prevent premature obsolescence could be limited by the fact that the retailer is legally bound by the agreement and not the manufacturer. No information is available on how the retailers echo their obligations to consumers or manufacturers in their supplier contract.

Based on our analysis, we make the following recommendations regarding guarantee:

- In the foreseen revision of the consumer law directive, longer guarantee period for certain categories of products might be useful.
- Capacity building with consumers especially following the transposition into national legislation of the updated Sales of Good directive (DIRECTIVE (EU) 2019/771, which expands the period of reversal of the burden of the proof to the first year of product.
This is needed to raise awareness of consumer rights so consumers know when and how to claim them and make them more resilient in situations where their rights are being challenged.
- Equalisation of the reversal of burden of proof with the duration of the legal guarantee

(E.g. by having the burden of proof be in favour of the consumer for the whole duration of the legal guarantee because it is practically and financially not viable for a consumer to hire a certified expert to such end)

- Simplification of the guarantee procedure, information at point of sale, harmonisation between legal and manufacturer guarantee

The manufacturer guarantee has an impact on the application of consumer rights. By making manufacturer guarantee at least match the legal guarantee, less confusion will be created for consumers and sellers which should improve performance of the legal guarantee.

Annex I – Key provisions of the CSGD

The table below (European Commission, 2017, Annex 5 p. 148) gives an overview of the key legislative provisions on guarantee per EU member state. This table was created in the context of the 2017 fitness check of EU consumer and marketing law. The table reflects the situation as of July 2016.

Member States	Duration of legal guarantee (years)	Notification obligation on consumers	Reversal of burden of proof period	Hierarchy of remedies
Austria	2	No	6 months	Yes
Belgium	2	Yes ²¹⁷	6 months	Yes
Bulgaria	2	Yes ²¹⁸	6 months	Yes
Croatia	2	Yes	6 months	Free choice
Cyprus	2	Yes	6 months	Yes
Czech Republic	2	Yes ²¹⁹	6 months	Yes
Denmark	2	Yes	6 months	Yes ²²⁰
Estonia	2	Yes	6 months	Yes ²²¹
Finland	no fixed time limit	Yes	6 months	Yes
France	2	No	2 years	Yes
Germany	2	No	6 months	Yes
Greece	2	No	6 months	Free choice
Hungary	2	Yes	6 months	Yes
Ireland	6*	No	6 months	Yes + short term right to reject ²²²
Italy	2	Yes	6 months	Yes
Latvia	2	Yes	6 months	Yes ²²³
Lithuania	2	Yes ²²⁴	6 months	Free choice
Luxembourg	2	Yes ²²⁵	6 months	Yes ²²⁶
Malta	2	Yes	6 months	Yes
Poland	2	No	1 year	Yes ²²⁷
Portugal	2	Yes	2 years	Free choice
Romania	2	Yes	6 months	Yes
Slovakia	2	Yes	6 months	Yes
Slovenia	2	Yes	6 months	Free choice
Spain	2	Yes	6 months	Yes
Sweden	3	Yes	6 months	Yes
The Netherlands	no fixed time limit	Yes	6 months	Yes
United Kingdom	6 (5 in Scotland)*	No	6 months	Yes + short term right to reject ²²⁸

Note. Reprinted from "Report on the Fitness Check of EU consumer and marketing law", by European Commission, 2017, SWD(2017) 209 final Annex 5, p. 148.

*The seller's liability in these Member States is only limited by the prescription period.
Green shading denotes Member State going beyond minimum standards of Directive 1999/44/EC.

²¹⁷ The trader and the consumer may agree that the lack of conformity has to be notified by the consumer within two months since he became aware of it. Wet betreffende de bescherming van de consumenten bij verkoop van consumptiegoederen/Loi relative à la protection des consommateurs en cas de vente de biens de consommation (2004), see:

http://www.ejustice.just.fgov.be/cgi_loi/loi_a.pl?language=nl&caller=list&cn=2004090138&la=n&fromtab=wet&sql=dt=%27wet%27&tri=dd+as+rank&rech=1&numero=1.

²¹⁸ See Article 126 of the Consumer Protection Act. However the existence of that rule was not formally notified to the European Commission.

²¹⁹ The Czech law indicates 'the consumer has to contact the trader without undue delay after discovery of the defect'. Act No 89/2012 Coll., the New Civil Code ('Nový občanský zákoník', and NCC).

²²⁰ In Denmark the consumer may claim a refund if the defect is significant, but not if the seller offers to repair or replace the product. Article 78 of the Sale of Goods Act (Købelov):

<http://www.sprog.asb.dk/sn/Danish%20Sale%20of%20Goods%20Act.pdf>.

²²¹ The Estonian rules are based on the idea of a free choice of remedy, giving, however, the seller the possibility to deal with the fault by way of repair or replacement.

²²² S.I. No 11/2003 — European Communities (Certain Aspects of the Sale of Consumer Goods and Associated Guarantees) Regulations 2003, <http://www.irishstatutebook.ie/eli/2003/si/11/made/en/print>.

²²³ Since a legislative change in 2015.

²²⁴ Consumer has to notify within a reasonable time, according to Article 6.327 of the Civil Code No. VIII-1864 of 18 July 2000.

²²⁵ The consumer has to inform the seller about any non-conformity of the product within a 'reasonable period' but since this period is not defined, it effectively means two years after the delivery. Under Art. L. 212-6, subparagraph 2 there is a second two-year time-limit for bringing an action to enforce a guarantee; it runs from when the consumer reported the non-compliance of the goods to the trader.

²²⁶ Remedies should be carried out within one month by the seller. If this is not the case, the consumer can request a replacement and receive a full refund of the product price, or keep the product and obtain a partial refund. However, the consumer can obtain further price reductions for damages if the consumer can provide proof that the non-conformity of the faulty good created additional costs or was dangerous to health.

²²⁷ The Polish rules applicable since December 2014 are based on the idea of a free choice of remedy, giving, however, the seller the possibility to deal with the fault by way of repair or replacement.

²²⁸ Consumer Rights Act 2015, Section 20 on the Right to Reject, see <http://www.legislation.gov.uk/ukpga/2015/15/contents/enacted>

(European Commission, 2017)

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