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Repairability in Austria

Insights into consumer perceptions in the context of the circular economy

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Master Thesis submitted in fulfillment of the Degree

Master of Science

in Management

Submitted to Dr. Sabine Sedlacek

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Vienna, April 2023

AFFIDAVIT

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ABSTRACT

The lifespan of many devices has decreased in recent decades, while the number of devices used per person has increased. This has led to a rise in electronic waste, largely attributed to planned obsolescence. Planned obsolescence refers to the strategy of intentionally designing products to have a shorter lifespan or to become outdated quicker. To promote a circular economy and extend the life of those devices, repair can be a crucial element. Therefore, to facilitate the transition from a linear to a circular economy, it is essential to promote the growth of the repair industry.

Efforts have been made by policymakers and businesses to establish guidelines, legislation, regulations and financial support to promote repairs. At the same time, consumers themselves are encouraged to question their consumption and switch to more sustainable alternatives. Whether these measures are successful and whether they are positively accepted by consumers depends on a variety of factors. It is necessary to understand the behavior during the purchase as well as the barriers and motivators that are critical in the decision whether to repair a defect product or not.

The aim of this thesis was to provide an overview of repairability from an economic and legal point of view and to gain insights into Austrian households' knowledge, perceptions and drivers regarding repairability. Furthermore, it was analyzed whether different measures have the potential to motivate customers to buy durable and repairable products. Based on these findings, a quantitative online survey was designed and conducted in Austria. It was evident from the results, that while respondents have a high willingness to engage in circular consumption patterns such as repair, infrastructural conditions and a lack of technical requirements and financial incentives often prevent consumers from choosing the more sustainable option of repairing.

Keywords: circular economy, planned obsolescence, repair, sustainable decision-making

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to everyone who has supported me throughout my journey in completing this master thesis.

First and foremost, I would like to thank my supervisor, Dr. Sabine Sedlacek, for her valuable feedback and guidance throughout the thesis writing process.

I am also grateful to my family and friends for their support throughout my academic journey. Their encouragement has been a constant source of motivation, and I would not have been able to complete this thesis without them.

Finally, I would like to express my appreciation to all the participants who took part in this study. Without their contributions, this research would not have been possible.

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LIST OF ABBREVIATIONS

CE	Circular Economy
EEE	Electrical and electronic equipment
EU	European Union
NEP	New Ecological Paradigm
RMB	Repair Motivation and Barriers
SDG	Sustainable Development Goals
TPB	Theory of Planned Behavior
WEEE	Waste of electrical and electronic equipment

1 INTRODUCTION

Consumption, which has been observed for many years, causes significant environmental impacts due to two main factors. The period of use of these devices has decreased in recent decades, while the number of products used per person has increased. The result is an increasing waste of electrical and electronic equipment, often due to planned obsolescence (see 2.1.1.). Some electrical devices are already outdated after two years, batteries are welded and can no longer be changed and printers and washing machines are defective shortly after the guarantee has expired. On the one hand, this circumstance leads to a waste of energy and raw materials, on the other hand, the consumer's budget is unnecessarily burdened, which can also become an economic and political problem, especially in times of high inflation.

Although mass production began with the invention of the steam engine in the 19th century, up until a few decades ago it was not only possible but also common to manufacture high-quality household appliances and consumer electronics products. The throwaway society only emerged with globalization, growing prosperity in many countries and the falling prices associated with the economies of scale. However, because of the prevailing climate, energy and raw materials crisis, this lifestyle is now being critically questioned not only by various consumer and environmental protection organizations, but also by politicians and by more and more consumers. The relevance of the topic, which has been emphasized by many, is putting manufacturers, consumers and decision-makers in politics under pressure to rethink their previous attitude. This requires the extension of the durability, repairability and usage of products and should result in a transformation process in business, politics and society. However, it is essential, that these groups are willing to allow and promote repairs on the one hand and to set up a repair infrastructure on the other.

Both the Sustainable Development Goals (SDGs) of the United Nations and the Green Deal at European level contain ambitious long-term environmental and climate policy goals that must be achieved in the near future (European Commission, n.d.). Both production and disposal are associated with environmental problems which is why extending the lifespan of electronic devices has been increasingly discussed (Emmenegger, Frischknecht, & Jungbluth, 2008). Within the current linear production and consumption model, most waste, including scarce and valuable materials, is incinerated or ends up in landfill. A circular economy is an alternative to this model. It aims to keep products and materials longer in the value chain and to recover raw

materials after the lifespan of products for their next use (see 2.2.1). In order to become more self-sufficient in the areas of energy and resources and at the same time to reduce the amount of waste, the topic of repairs is becoming increasingly important as an essential aspect of the circular economy as they result in the lifespan of products being extended and resource cycles thus being slowed down.

Although the production of repairable items is one of the pillars of the circular economy, product lifespan also depends on user attitudes and behaviors. The linear "take, make, and waste" method has influenced user behavior throughout the 20th century and is still firmly entrenched in the minds of many consumers today, who, for example, would often rather dispose of electronic devices than take them to be repaired. The availability of low-cost products, the cost of repairing versus replacing products, planned obsolescence and continuous innovation are the key factors that have caused repairs to lose their impact on product lifespans. This raises the question of which instruments are suitable for increasing supply and demand in the area of repair services in order to extend the technical service life and useful life of consumer goods and, as a result, reduce resource consumption and the amount of waste. This master thesis approaches the topic on the part of consumers and analyzes how willing they are in Austria to repair and what support would be desired from the government or from companies to remove barriers.

1.1 Research questions and objectives

Against the background, the author has developed three research questions regarding the topic of "***Austrian consumer perception towards repairability"***. The research questions that are answered in the thesis are the following:

RQ1: How willing are Austrian consumers to participate in sustainable consumption patterns respectively how aware are they of planned obsolescence?

RQ2: How do Austrian consumers perceive repairing, and what are the key factors that motivate them to choose repair over replacement?

RQ3: Which circumstances in form of economic and legislative measures may reinforce the trend towards repairing products instead of replacing them?

The purpose of this thesis is to provide an overview on repairability from an economic and legislative perspective and to gain consumer insights of Austrian households regarding their

knowledge, perception and barriers of repairability. Additionally, the objective is to analyze whether different measures have potential to induce customers to purchase durable and repairable products. Furthermore, based on the customer insights in terms of their motivation, knowledge and barriers, the goal of this research is to assess legislative and economic strategies against obsolescence in order to slow down resource-loops.

1.1 Research strategy

The research follows a linear process. First, the relevant literature will be reviewed. The results of the literature review are then used to identify relevant concepts as well as theories, which are in the following combined into a conceptual framework. Subsequently, theories on the product life, on the repair of electronic and electrical products, and on the measures taken at European and national level to enable and support repair will be analyzed. These measures are tested for their influence on purchasing behavior and the willingness to repair devices themselves or have them repaired. The empirical research enables the collection of data, which is then statistically analyzed to confirm or reject the underlying hypotheses of the respective research question. Using a quantitative research method, will make it possible to measure the incidence of various views and opinions of a selected sample. Finally, the results of the research are discussed in relation to the theories used and a conclusion is drawn.

2 LITERATURE REVIEW

2.1 Product lifetime

All items reach the end of their useful life sooner or later and then become obsolete. Obsolescence is often connected with negative connotations, however it merely means "the condition of no longer being used or useful" (Merriam-Webster Unabridged Dictionary, n.d.). It can be for objective reasons, such as when the product physically breaks down and is no longer repairable, or for subjective reasons, such as when the user no longer likes or wants the product. Research recognizes that a product's lifespan is not exclusively defined by its physical features, but also by subjective factors that contribute to a product's demise. For these reasons, the product life cycle can be influenced by technical advances on the one hand, but also solely due to a marketing strategy on the other. According to Bakker and Shuit (2017, p. 14) product lifetime is "the duration of the period that starts at the moment a product is released for use after manufacture or recovery, and ends at the moment a product becomes obsolete."

In principle, there are two different approaches to designing a life cycle which are of importance for the sustainability of products. From a technical point of view, life-cycle thinking evaluates the sequence of raw material extraction, manufacture, distribution, usage, and disposal. However, the long-established "product life cycle" idea of marketing theory is equally pertinent. In this sense, the life cycle refers to the introduction of a product to the market, the growth of sales, the process of product enhancement, and the product's eventual withdrawal from the market (Cooper T. , 2005). According to Bakker and Shuit (2017), the median lifetime of certain categories of appliances and consumer electronics decreased somewhat between 2000 and 2005. The service life of laptops fell from 4.3 to 4.1 years (-5%), that of consumer electronics from 9.4 to 7.4 years (-20%). In general, consumers want items with a lifespan substantially longer than they currently use. The targeted lifespan is 1.73 to 3.62 times longer than the use-time, depending on the product. As with use-times, desired lifetimes are positively correlated with age, wealth, and level of education (Wieser & Tröger, 2015).

2.1.1 Planned obsolescence strategy

There are a number of reasons why product designers might not create durable goods. In some instances, they might even purposefully design things to become obsolete, artificially shortening their useful lives to encourage recurrent use. Even for specialists, it can be challenging to determine manufacturers' intentions (Rampell, 2013). However, it must be noted

that not all incidences of obsolescence are intentional (Eléonore Maitre-Ekern & Dalhammar, 2016).

Planned obsolescence is a technique that deliberately shortens the lifespan of products to encourage customers to replace products quicker. This leads to the maximization of profit at the expense of consumer interests and environmental sustainability, resulting in ever-growing mountains of waste. Due to this and the associated promotion of unsustainable consumption patterns, the responsible political institutions have been discussing for some time the extent to which interventions in economic freedom are justified, sensible and possible (Bisschop, Hendlin & Jaspers, 2022). Durable goods manufacturers, on the other hand, argue that they are struggling to keep up with their own growth rates. “The more reliable and long-lasting the product, the longer the repeat purchase cycle and the slower the rate of sales growth,” says Guiltinan (2009, p. 21). Planned obsolescence is therefore a common business strategy in today's economy, employed by a variety of industries.

Although there is no universal definition of planned obsolescence or build-in obsolescence, researchers have formulated their own definitions to describe the phrase 'planned obsolescence'. Three definitions are presented below to show how the terminology and reasoning have changed over time:

- *“Planned obsolescence is the production of goods with uneconomically short useful lives so that customers will have to make repeat purchases” (Bulow, 1986, p. 729).*
- “*Built-in or planned obsolescence refers to products that are “designed to have uneconomically short lives, with the intention of forcing consumers to repurchase too frequently*” (Fishman, Gandal , & Shy, 1993, p. 361).
- “*The strategy of shortening a product's lifespan is called planned obsolescence*” (Rivera & Lallmahomed, 2016, p. 119), whereby this strategy can consist of making repairs difficult or unreasonably expensive for devices, software upgrades slowing down devices or no longer offering spare parts. In this way, consumers are being forced to buy substitute products although this is not technically necessary, just to ensure that producers can continue selling their products in saturated markets (European Parliament, 2016).

2.1.1.1 Historical Context

The phenomenon of planned obsolescence began in the 1920s, at the time of industrialization and mass production (Hübner, 2013). In the past, limited production factors led to the production of smaller quantities. With technological progress, however, mass production and consumption developed in parallel. It became easier and cheaper for manufacturers to mass-produce their items, but consumers at the time were not interested in buying them. This led to an overproduction of produce relative to demand (London, 1932). During this time, American consumption plummeted, drastically reducing the revenues of many companies who found themselves in major financial bottlenecks. To counteract this and to increase sales, some companies began intentionally shortening the lifespan of their items. This should force customers to buy more products at a quicker rate. However, such an approach only has a chance of success if all market-determining companies in an industry participate (Slade, 2006).

According to the European Parliament (2016), the first known merger of this kind came about in 1924 with the so-called lightbulb cartel when senior executives from all the major lightbulb manufacturers like Osram, Philips and General Electrics came together in Geneva to form the Phoebus Cartel. The aim of Phœbus SA Compagnie Industrielle, the company that was founded from all the participants of the cartel, was the reduction of the lifespan of their lightbulbs to the predetermined 1000 hours. Until then, household light bulbs lasted an average of 2000 hours. This allowed businesses to increase bulb sales and falsely exaggerate income. Details of the cartel's actions became public in the 1940s, when the US government questioned General Electric and many of its commercial partners for anticompetitive behavior. Although the cartel's monopoly on the lightbulb market lasted only until the 1930s, traditional lightbulbs still last 1000 hours today (European Parliament, 2016).

This was the first, but not the only example of planned obsolescence at the time. Companies like Dupont followed. When the company brought the first nylon stockings onto the market in 1940 and rightly advertised their durability, sales fell and managers realized that it was better for sales figures to build in an artificial expiration date. The development department was tasked with developing thinner and therefore more sensitive tights. The strategy was successful and stockings wore out faster leading to increased sales (Slade, 2006).

Bernard London, a New York agent and publicist, originally introduced the concept of planned obsolescence in his 1932 pamphlet “Ending the Depression Through Planned Obsolescence”. He criticized using a product until it stopped working, instead proposing that governments

should force people to discard durable products before their natural end of life in order to contribute to economic growth (London, 1932). Because the concept of a controlled shortening of product life cycles was initially too extreme, it was rejected at the time. However, the concept reappeared in a revised version in the 1950s. Since then, many producers have relied on artificial aging, but without founding an official cartel for it. Additionally, the throwaway culture has been fueled by the introduction of disposable items such as batteries, cartridges, pens and razors (Malinauskaite & Fatih, 2021). Packard (1960), in his book "The Waste Makers", emphasized the ethical component of such methods and highlighted all the social and environmental difficulties associated with planned obsolescence. He was a pioneer in laying the foundations for contemporary discussions about environmental challenges, especially ecology and sustainable development. By the late 1950s and early 1960s, the term "planned obsolescence" was in widespread use and marked the beginning of an ideological opposition to this behavior by companies (Malinauskaite & Fatih, 2021).

2.1.1.2 Types of Obsolescence

2.1.1.2.1 Actual/Physical Obsolescence

The goal of planned obsolescence is to encourage consumers to purchase new items by making older versions incompatible, only partially compatible, or by reducing the value of older versions to the user. This can be achieved in a number of ways. While some companies release newer versions sooner than necessary, others design their products to fail after a certain period of use. Prakash et al. (2016) argue that it is difficult to pinpoint the exact cause of premature aging because of the variety of causes of obsolescence. According to Guiltinan (2009), obsolescence can come in both physical and technological forms. One of the ways companies pursue this strategy is to shorten the useful life of a product through the following physical mechanisms, causing the product to no longer perform as expected.

- *Limited functional life design*

  This strategy refers to devices that are designed to last for a predetermined number of years or operations (Guiltinan, 2009). Slade (2006) illustrates this phenomenon using the example of portable radios, which in 1958 were only supposed to last three years in the USA. Another example are electronic products where the introduction of new software that no longer runs on the old systems causes artificial aging (Malinauskaite & Fatih, 2021). A good example of this is Apple, who have been sued for intentionally slowing down older iPhones via software updates. Anyone who owns an older model

and refuses an update risks no longer being able to use certain services such as iCloud, e-mail or the App Store. Thus, users are virtually forced to always upgrade to one of the latest model (Jaspers, Yogi, & Bisschop, 2022).

- *Design for limited repair*

  Consumers are less likely to have hard-to-repair items repaired because repair costs are relatively high. Instead, they are more likely to choose to buy a new one (Guiltinan, 2009). An example is the development of disposable cameras by large photo companies, that were meant to be discarded and not repaired after the film was empty. Smaller refurbishing companies have repaired and resold the discarded cameras, creating up to eight uses per camera. During this time large companies like Fuji and Kodak have managed to put most recyclers out of business by suing for copyright infringement in order to continue selling more cameras (Adolphson, 2004).

- *Design aesthetics that lead to reduced satisfaction*

  The aesthetic design of products can also lead to premature aging. On the one hand, this includes goods that appear outdated as soon as a newer model comes onto the market, on the other hand, some manufacturers intentionally use surface materials that appear unaesthetic due to signs of use. Cooper R. (2005) analyzed the characteristics of premature disposal and concluded that, for example, products with a polished surface that are easily scratched or damaged in everyday use lead to user dissatisfaction and premature disposal more quickly than items with matt surface.

2.1.1.2.2 Perceived/Technological obsolescence

In recent years, Barros & Dimla (2021) have analyzed a shift from physical to technological obsolescence strategies. When manufacturers introduce a product with improved features or at a higher technological standard to replace an existing one, this is called technological obsolescence. Strategies designed to use product aging as a method to increase sales in electrical equipment are becoming more common. According to Boone, Lemon and Staelin (2001), product variations serve as a reminder of the company's continuous product improvement, while also signaling customers that their current product is obsolete and should be replaced to stay current with the latest technology. As a result, a short product replacement period may prompt buyers to replace products sooner, regardless of the actual benefit they provide. This type of obsolescence is considered voluntary as the device is still functional and

there is no reason why buyers cannot continue to be satisfied (Aladeojebi, 2013). This phenomenon can also be referred to as perceived obsolescence, as consumers are persuaded to replace a product due to lack of technological features rather than lack of functionality.

- *Design for fashion*

  Design trends also influence decisions about the repurchase of durable products. Designers and marketers are increasingly incorporating short-lived fashion trends into watches, phones and computers, making them quickly look old-fashioned and intended to be replaced by successor models. Such design strategies act against the need for sustainability (Cooper R., 2005). Also known as style obsolescence, this concept describes situations where manufacturers or retailers try to persuade customers to replace things despite their continued physical usefulness. Marketing efforts are primarily aimed at the consumer's impression of the product and relate to changing fashion trends in shapes, colors and other aspects of design (Malinauskaite & Fatih, 2021).

- *Design for functional enhancement through adding or upgrading product features*

  Technological advances allow companies to expand the range of uses or benefits of a product. When cellphone manufacturers for example add a new feature, such as a better camera, the proportion of customers that consider a product to be obsolete increases (Guiltinan, 2009).

2.1.2 Environmental consequences and shortage of raw materials

The intentional premature obsolescence of products may not only cause financial hardship for customers, but also pollute the environment as overconsumption contributes to further shortages of raw materials and energy and thus to the depletion of limited natural resources. However, the most serious consequences of planned obsolescence occur after disposal. Due to the immense wear and tear of products, which hardly can be recycled, bulky and electronic waste are piling up in landfills. Planned obsolescence increases waste production and hence the cost of disposal. In addition, air, water and soil are contaminated by in some case toxic materials (Echegaray, 2015).

According to the United Nations Global E-Waste Monitor (2020), 53.6 million tons (Mt) of e-waste was generated worldwide in 2019. Compared to 2015, this meant an increase of 21%. A further increase to 74 tons per year is expected by 2030. Electrical and electronic equipment

(EEE) is the fastest growing source of waste worldwide partly due to shortened life cycles and limited repair options. Although recycling would be very important, especially for EEEs, only 17.4% of waste of electrical and electronic equipment (WEEE) in 2019 was collected and recycled. Globally, approximately $57 billion worth of gold, silver, copper, platinum and other high-value commodities are discarded or incinerated each year rather than recovered through recycling. Also, in the EU, the production and sales of EEE are increasing, while the useful life of the devices is shrinking. According to Eurostat (2022), the amount of EEE sold in the European Union increased from 7.6 to 11.2 million tons in the period 2011 to 2019, which reflects a 46.9% increase (Ethelbhert, Krista, & Tan, 2020).

At the same time, the total amount of WEEE collected in the EU increased from 3.0 to 4.5 million tons, which adds up to an increase of 47.6% (Eurostat, 2022). On the one hand, non-recycled waste contributes to environmental pollution, on the other hand, it can also become the source of health disasters. In fact, until the practice was banned in 2020, most of the garbage generated in Western countries was exported to developing countries and disposed of cheaply and improperly (Euronews, 2020). Improper landfilling of hazardous waste releases toxins into the soil and air, threatening the health of the local population. At the same time, there is an increasing incentive for local residents, especially in poor countries, to dismantle electronic scrap on their own in order to obtain valuable raw materials and sell them to traders at low prices. These people, especially children, do not wear protective clothing in their dangerous work and thus also danger their health (Ferronato & Torretta, 2019). Since the ban on waste exports a few years ago, waste disposal companies have been looking for cheap alternatives, which they found in Poland, among other places. Since environmental regulations and landfill costs in Poland are lower than in many other EU countries, thousands of tons of waste from Germany, Austria, Sweden and other countries have already been disposed in Polish landfills, where they pollute the environment and public health (Billig & Münstermann, 2022).

Aside from waste, planned obsolescence leads to depletion of natural resources and scarcity of raw materials and energy. The availability of metals and minerals is limited, and the risk of insufficient access to essential raw materials as a result of increased demand has been a major concern. The scarcity of raw materials is related on the one hand to political upheavals such as the Ukraine war and the confrontation between China and the USA, on the other hand to the consequences of the pandemic, unforeseeable events such as the blockade of the Suez Canal and finally to the fact that a large part of the very productive deposits are already exhausted (Cooper T. , 2017). Nowadays, the transformation of the energy and transport sectors also

requires an enormous amount of raw materials, such as cobalt, silicon, nickel, palladium and platinum. In the case of cobalt, it is assumed that the currently known raw material deposits will be exhausted in just over 10 years if the increase in consumption continues at the current rate (IW Consult, 2021). In the case of raw materials such as nickel and palladium, this is compounded by the fact that Russia is now no longer one of the most important suppliers of many of these raw materials. It is not yet possible to predict what impact this will have on the conversion of society and the economy to renewable energies and electromobility (iwd, 2022). In some cases, as in Greenland, untouched nature is perhaps in danger in order to develop new deposits (Ewing, 2021), in other cases production is carried out with the help of ecologically controversial methods such as fracking (Deutschlandfunk, 2022). In this context, it must also be noted that the development of new deposits encroaches on previously intact biospheres and further habitats for animals and plants are threatened (WWF, 2019).

2.2 Repairability and durability

2.2.1 Circular economy

Since the beginning of industrialization, the economy has been characterized by a linear production and consumption model in which goods are manufactured from raw materials, sold, utilized and then disposed of. Low resource prices and the possibility of replacing human labor with machines have led to mass production and lower prices due to increases in productivity, making globalization and the expansion of companies possible in the first place. The linear economic paradigm follows the “take, make and waste” cycle, in which raw materials are taken from the environment and transformed into new goods that are ultimately dumped back into nature. However, limited supplies of raw materials eventually run out in this system. If waste is generated, there are either disposal costs or soil might be contaminated. Furthermore, industrial processes are often inefficient, resulting in additional waste of natural resources (UNIDO, 2020). This strategy relies on a significant amount of inexpensive, readily available raw materials and energy. With a steadily growing world population, economic growth and the economic catching-up process of countries such as India and China, resource consumption continues to increase, with serious consequences for the environment as explained earlier. The current way of doing business is therefore not an option for a sustainable future.

While ecologists and economists have explored the concept of the circular economy since the 1970s, most global corporations and policymakers have favored the linear economic model until recently. The need to switch to a circular economic model has been recognized especially since

raw materials and energy have become scarce in the wake of the Covid19 pandemic and the Ukraine crisis and a sharp rise in prices has been observed (Ellen MacArthur Foundation, n.d.). Since science has turned to circular economy, several definitions have emerged, based on either product lifecycle perpetuation or environmental impact.

- The circular economy is “a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution” (Ellen MacArthur Foundation, n.d.)
- “The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended” (European Parliament, 2022b)
- “The circular economy is a system in which there is no waste, and where the products of today are also the raw materials of tomorrow” (PWC, 2018, p. 4)

Kirchherr, Reike, and Hekkert (2017) examined over a hundred classifications and found that the definition of the Ellen MacArthur Foundation is the most widely used. It should also be noted that most of the definitions have been published in the last five years, confirming that the circular economy is a relatively new concept, but one that is expected to soon replace the traditional linear economic model.

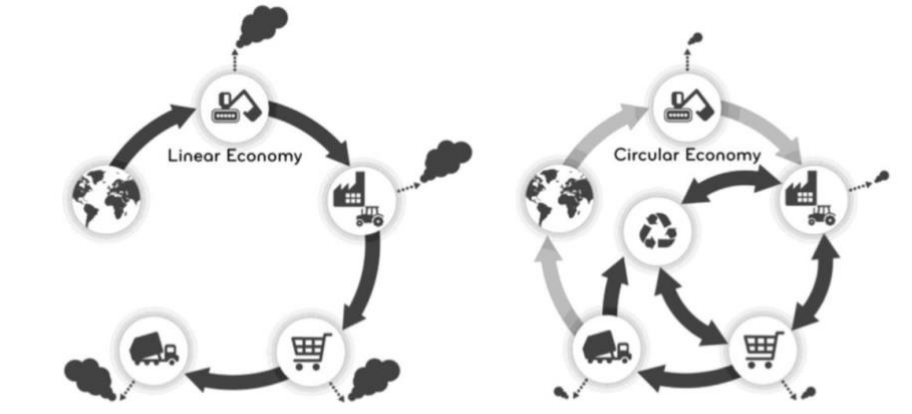

FIGURE 1: CONTRASTING THE LINEAR AND THE CIRCULAR ECONOMY CONCEPT

(Sauvé, Bernard, & Sloan , 2016, p. 52)

In contrast to the linear economic model, the circular economy works as a closed system (see figure 1) and refers to more than simply recycling. It is an economic model that transcends supply chains and industries, redefining the product creation, manufacture and consumption processes and giving companies access to new markets. This network increases the value of products and its components (PWC, 2018). Although there are many different interpretations of the circular economy, they all represent a new way to create value and ultimately prosperity by extending product life and recycling raw materials. In this way, in a circular economy, materials for new items largely consist of discarded products. In a circular economy, there is almost no waste: today's goods are tomorrow's raw materials, creating a cycle. Everything is reused, remanufactured or recycled back into raw materials. If none of this succeeds in individual cases, the waste is at least incinerated and thus used as a source of energy (UNIDO, 2020).

2.2.2 Approaches to enable the circular economy

2.2.2.1 The multiple R-frameworks

Various R-frameworks which summarize the individual strategies of the circular economy have been developed in science and practice. The most widespread is the 3R-framework, which consists of “reduce, reuse and recycle” although it is unclear which author it originally came from. Most of the literature refers to this model, even though it does not consider all components of sustainability and is originally based on the concept of the linear economy (Kirchherr, Reike, & Hekkert, 2017).

The 4R framework, which is common in waste management, introduces "recover" as the fourth R (Hua, Yue, & Danni, 2021). Beyond the 4R-framework, scholars have suggested the 9R’s with the following R’s (Kirchherr, Reike, & Hekkert, 2017):

Smart use and manufacture of products	
Refuse	the product benefit is provided differently
Rethink	using products more intensively e.g. by sharing instead of purchasing them
Reduce	reducing the use of natural resources and materials
Extended lifespan of products and components	
Reuse	reusing discarded products which fulfil their original function
Repair	continuing to use products through repair
Refurbish	refurbish old products by bringing them to an up-to-date state
Remanufacture	using parts from discarded products for new products that perform the same function
Repurpose	using a discarded product or its parts in a new product with a different function
Useful application of materials	
Recycle	processing materials to obtain the same or lower quality
Recover	Incineration of materials with energy recovery

TABLE 1: 10R-FRAMEWORK

(table based on Kirchherr et. al, 2017, p. 224)

2.2.2.2 Slowing down resource loops

Stahel W. (1994) studies two types of loops related to the closed-loop concept, shown in figure 2. The reuse of products, aimed at extending their useful life and slowing down the flow of materials and the recycling of materials, which helps to close the gap between disposal and production. The two types of loops together represent the basic concept of the circular economy, which is to close the loop of materials to eliminate waste, reduce pollution and limit the use of new resources (Sauvé, Bernard, & Sloan , 2016).

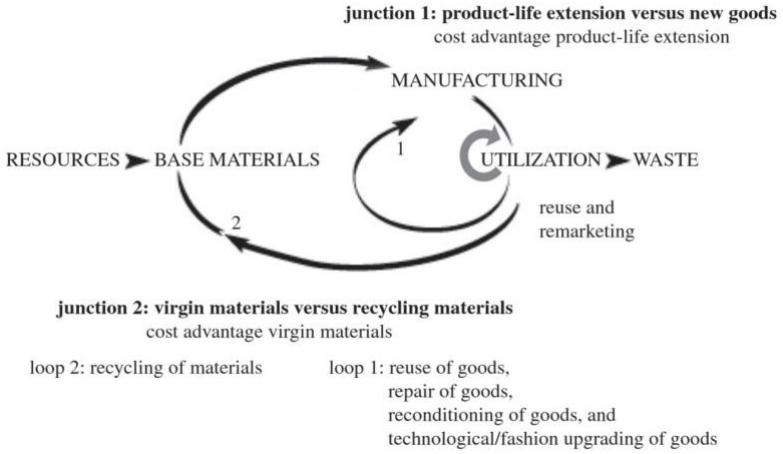

FIGURE 2: CLOSED-LOOP STRATEGY

(Stahel , 2013, p. 4)

The first cycle includes repair, refurbishment and upgrade operations, among others, because these, like reuse, extend the lifespan of products. This results in cost advantages for consumers if the purchase of new products is more expensive. In recycling, which includes the second loop, the cost benefit can come from using recycled materials. Loop 1 consists of product-specific tactics, while Loop 2 consists of material-specific strategies. Furthermore, it is shown that the shorter the loop, the more advantageous the transaction. In terms of activities, this means “don’t repair what is not broken, don’t remanufacture what can be repaired, don’t recycle what can be remanufactured” (Stahel, 2013, p. 4). However, the loop of recycling is longer, since this process takes place worldwide due to economies of scale and efficiency strategies (see figure 2), which results in the advantages of the first cycle (Stahel, 1994).

2.2.2.3 Repairability

Modern production processes rely on excessive resource and energy consumption that cannot be sustained given the limited resources. In order to reduce consumption and its negative impact on the environment, it is essential to produce durable and useful objects (McDonough & Braungart, 2002).The closed-loop strategy distinguishes between closing and slowing down resource loops: closing loops relates to recycling, while slowing down loops involves making items with long lifespans and thereby extending product lifespans (Bocken, de Pauw, Bakker, & van der Grin, 2016). As repair is the subject of this work, the main focus will be on this concept, which is defined as an "operation by which a faulty or broken product or component is returned back to a usable state to fulfil its intended use" (Ellen MacArthur Foundation, n.d.). In the sustainable development literature, the need to manage resource throughput is increasingly recognized as important, but the need to decelerate the product life cycle is often overlooked.

Repairing or replacing defective components ensures that products achieve their full expected lifespan. This allows products that would otherwise have been discarded and replaced to remain in circulation. It is therefore also considered a central lever for increasing resource efficiency and is one of the major approaches of the circular economy concept (Cooper T., 2005). On average, repairing a product saves 24 kilograms of CO2 equivalents. Even if the lower energy consumption of a new appliance is considered, replacing an old washing machine, for example, is not worthwhile from an ecological point of view. If the lifespan of all notebooks, vacuum cleaners, smartphones and washing machines in the EU were extended by just one year, around 4 million tons of CO2 could be saved (Stadt Wien, 2021). Despite the importance of the concept of repairability for closed-loop and circular systems of consumption and production, the repairability of objects has become more difficult in recent years. These considerations have discouraged consumers. This is especially true for electronic and technical items, much of which end up in landfills (Hernandez, Constanza, & Goñi, 2020). Compared to other recovery processes (remanufacturing, refurbishing and recycling), repair is the most environmentally beneficial choice as it eliminates the need for a complicated reverse logistics process and relieves take-back systems to send goods back to remanufacturing facilities. The ability to repair implies a transfer of responsibility for the lifespan of products to end users and repair shops, resulting in a significant reduction in supply chain costs.

Consumers who own products that require repair have different options for action (see figure 3). The two direct options for action in this case are either to have the product repaired or to replace it with a new product. The repair as well as the replacement purchase can take different forms. A repair can be carried out by a professional repair shop or it can be done by the user themselves. When purchasing a replacement product, the user is faced with the decision of whether to buy a new product or a used one. Next to the direct options of repairing and replacing, the owner can also choose not to act directly. The third option is to continue using the defect product, for example a smartphone with a scratched screen. It is also possible that there is no need for a new product because the function is fulfilled in a different way, such as an MP3 player that becomes obsolete if a smartphone is owned (Köppl, Simon, Meyer, & Schratzenstaller, 2019).

FIGURE 3: CONSUMER OPTIONS FOR A DEFECTIVE PRODUCT

(figure based on Köppl, Simon, Meyer, & Schratzenstaller, 2019)

Maintenance and repair are continuous operations that can be structured in a variety of ways to achieve a range of outcomes with varying degrees of effectiveness (Hernandez, Constanza, & Goñi, 2020). However, repair as a social activity lacks a structured and organized framework for its fundamental conceptual differences and connections, and the repair process can consist of distinct operations. In contrast to maintenance, repair is characterized by the occurrence of a fault (Ackermann, 2018). Thus, maintenance is inherently proactive while repair is reactive. Terzioglu, Lockton and Brass (2015, p.235) suggest the following repair types:

- Assembly repair: This form of repair requires no expertise or expertise. An example would be joining, gluing or binding of product components.
- Medium level repair: This type of repair involves actions that require a certain level of expertise which requires material knowledge and understanding.
- Advanced level repair: This type of repair includes tasks that require special skills and expertise, such as replacing a screen.

Legislative and other steps are being taken by both the EU and national governments to facilitate repairability, which are discussed in more detail in the following chapter.

2.3 Policy, institutions and governance framework

There is growing interest to improve durability and prevent planned obsolescence as the circular economy becomes a significant policy target in the EU. Currently, there is no explicit EU regulation prohibiting planned obsolescence. Rather, there are various legislative approaches to create incentives for more durable and repairable products at EU or member state level (Eléonore Maitre-Ekern & Dalhammar, 2016).

On the one hand, this is intended to protect consumers who incur high costs as a result of the manufacturers' planned obsolescence strategy, and on the other hand, a longer service life supports the EU's goals of avoiding waste, saving energy and keeping raw materials in the cycle for longer. Some nations address planned obsolescence directly in their laws or specific action plans. For example, France is the first country to adopt a law that refers to planned obsolescence and prohibits companies from intentionally shortening the lifespan of products (European Parliament, 2016). Further details on the legal aspects of planned obsolescence at European and national level follow in the sub-chapters. The explanations in this work are primarily based on those initiatives that affect either Austria alone or all member states of the EU.

2.3.1 The European strategy

Sustainability has been one of the most important goals of the European Union for two decades. As early as 1997, the aspect of sustainable development of the EU and its member states was expressly included as a goal of EU policy in the Amsterdam Treaty, which sets out the vision for the development of Europe. Parallel to the increasing awareness of the importance of environmental protection, concrete measures followed to anchor sustainability in EU politics (European Commission, n.d.).

The European goal of sustainable development is based on the 2030 Agenda, in which 17 sustainable development goals (SDGs) were adopted by the United Nations in 2015. Based on that, the European Commission published the "European Green Deal" in 2019, a growth strategy aimed at completing the transformation of Europe into the first climate-neutral continent by 2050 and at decoupling economic growth from resource consumption (FFG, n.d.). The European Green Deal primarily includes measures in the areas of agriculture, energy supply, trade, industry and transport. In 2020, as part of the European Green Deal, the Commission presented the first draft of the European climate law to enshrine the goal of climate neutrality by 2050 in law and to reduce the EU’s CO2 emissions by at least 55% until 2030 compared to 1990 (BMK, n.d.).

The European Commission approved the Circular Economy action plan (CEAP) in 2015, is now the heart of the Green Deal (European Commission, 2015). The aim of the action plan is to achieve the goal of more efficient production, use of energy and raw materials and to ensure less waste. In 2020, a new Circular Economy Action Program covering the entire life cycle of products including and the repair was launched with the goal of doubling the utilization rate of

circular materials (European Commission, 2020a). The European Commission and the European Parliament have taken up the demands of the initiative and have been implementing "Right to Repair" rules in various directives and regulations since 2020. With the help of the Eco-Design Directive, the Battery Directive and the Eco-Label, which are described in more detail in the sub-chapters, the life of objects such as smartphones and laptops is extended. In general, consumers should be encouraged to repair their devices and manufacturers should be prevented from prematurely reducing the lifespan of their products. These regulations are part of the EU's comprehensive efforts to combat the growing amounts of electronic waste and to contribute to achieving climate neutrality in Europe by 2050 (European Parliament, 2022a).

2.3.1.1 Ecodesign legislation

The EU Ecodesign Directive (Council of the European Union, 2005), in force since 2005, recognizes the potential contribution of design initiatives to circular economy goals. Decisions made during the design phase determine 80% of the environmental impact, not only in terms of energy consumption, but also in terms of lifetime, maintenance, repair, reuse, recyclability and waste management. On the one hand, these measures should help to relieve the financial burden on consumers, on the other hand, energy and raw materials should be saved and, as a result, greenhouse gas emissions in Europe should be reduced. In this way, the ecodesign standards also contribute to the circular economy and achieving climate targets (European Commission, 2019). In principle, the EU Ecodesign Directive specifies a catalog of criteria for environmentally friendly product design that must be met (Federal Ministry For Economic Affairs And Climate Action, 2022). Recently, the European Commission issued a number of new obligations within the framework of the EU Ecodesign Framework Directive, which allow more specific regulation of ecodesign and energy efficiency criteria for energy-related articles in the EU. In addition, existing laws on lifespan, water server usage and chemical labeling expanded (Mikolajczak, 2021).

In March 2022, the European Commission proposed the new Ecodesign Regulation for Sustainable Products (ESPR) which builds on the already existing Ecodesign Directive (Council of the European Union, 2009). While the previously valid Ecodesign Directive only covers energy-related products, in the future uniform minimum requirements will apply to almost all physical goods in terms of service life, upgradeability, repairability and the recycling ratio, but also in relation to the ecological footprint. In order to additionally make relevant information about the respective product accessible to consumers throughout the entire supply chain, the "digital product pass" is also to be introduced. This is intended to support consumers in their purchasing

decisions based on the environmental impact of a product and its repairability (European Commission, 2022b).

2.3.1.2 Battery directive

The durability and the possibility of replacing batteries or accumulators are crucial elements for a product life and for the possibility of repairs. Rechargeable batteries are found in most electronic products, from electric cars to electric toothbrushes. If batteries cannot be replaced, those products that would otherwise have a long life ahead of them must also be disposed of. On the other hand, batteries contain valuable raw materials and require a large amount of energy to be used in production. The EU is therefore striving to produce batteries as sustainable as possible in the future, to use them for a long time and to continue to use them in the cycle (European Parliament, 2022a).

Above all, the transformation in the mobility sector makes it necessary to deal more intensively than before with the service life and the possibility of replacing batteries. At the moment, most electric vehicle manufacturers give a guarantee of 160,000 kilometers or 8 years. After the warranty period has expired, many manufacturers either do not offer a replacement battery or the costs of changing the battery are so high that a repair is not worthwhile (ADAC, 2022). As a result, vehicles would have to be scrapped in the future even though they were still fully functional. The same applies, of course, to smartphones and other electrical devices for which a battery replacement is either not possible at all or only possible at prices that come close to buying a new one. According to a recent survey conducted by Cordella, Alfieri, Berwald, & Christian (2021), in all of the best-selling smartphones in 2019 the battery was attached to the devices with adhesive and 50% of these devices have a pull tab built in to protect the battery. If removed, the customer will lose their warranty. On new models, the battery can only be removed by an experienced repairman. This often means that these devices have to be replaced early as soon as the battery is too weak (Cordella, Alfieri, Berwald, & Christian, 2021).

In order to counteract the resulting waste of resources, the European Commission and the European Parliament have decided on the so-called Battery Directive, which is now being negotiated with the member states. In order to ensure fair competition, regulations regarding batteries are no longer to be regulated by an EU directive, but by an EU regulation. This has the advantage that the regulations for batteries no longer have to be implemented in national law, but apply immediately in all EU member states (WKO, 2020). The main objective of the scheme is firstly to ensure that batteries can be reused, remanufactured or recycled at the end of their

life. In addition, batteries must be provided with a label that reflects their CO_2 footprint over the entire service life. The aim is to communicate the environmental impact of battery production more transparently. In order to reduce the ecological footprint, new batteries should also contain a minimum proportion of recycled cobalt, lead, lithium and nickel (European Parliament, 2022c). However, the most important specification for repairability is that permanently installed or glued batteries in electronic devices are to be banned by 2024. This is intended to extend the service life of electrical devices and increase the recycling rate of raw materials. In addition, consumers should be able to replace the batteries in their devices themselves in the future, without requiring any special tools. Manufacturers must ensure that spare batteries are available for the expected lifetime of a device. In addition, information regarding the ecological footprint and the expected lifespan of the batteries should be available to consumers. The rule that it should be possible to replace individual cells in the battery with new ones should also apply specifically to e-cars (European Parliament, 2022d; Council of the European Union, 2022).

2.3.1.3 Eco-label directive and French repairability index

One of the goals of the EU is to increase the demand for sustainably manufactured durable products. To do this, it is necessary to make the environmental aspects of production along the entire supply chain more transparent for consumers, thereby raising awareness that is relevant for the purchase and usage as well as for the collection, repair and reuse of products (European Commission, 2020c).

Seals of quality that offer this transparency can help with purchasing decisions by identifying sustainable products. Ecolabeling is a voluntary method used worldwide to certify and label sustainable products. Eco-labels inform customers about the environmental aspects of the specific product or service within a specific product or service category. They can be seen as an indispensable means of communication between companies, authorities and consumers and are used by consumers to find out about the environmental quality of products and services and to verify the accuracy of this information (Riskos, Dekoulou, Mylonas, & Tsourvakas, 2021; Global Ecolabelling Network, 2014). There are many types of eco-labels on the market today (UNEP, n.d.). One of the most important is the EU Ecolabel, which has been recognized in all member states of the European Union since 1992. Over time, it has become a point of reference for customers who want to help minimize pollution by buying more environmentally friendly products (EU Ecolabel, n.d.). For example, the eco-label rules for electronic displays state that products must be manufactured in such a way that they can be repaired, that spare parts are

available for eight years and that manufacturers offer a commercial guarantee for three years free of charge (European Parliament, 2022a).

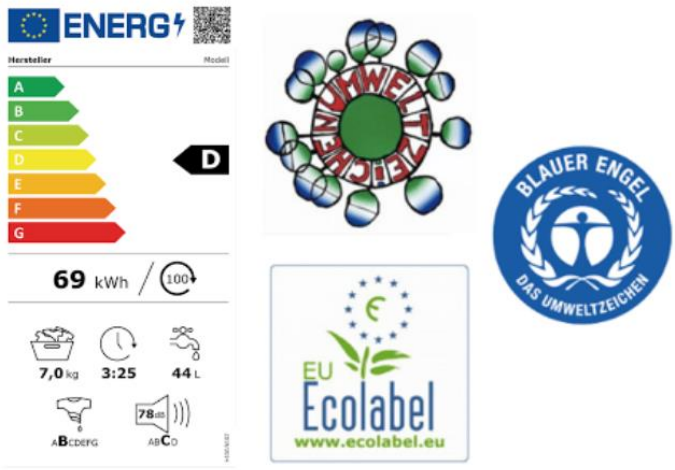

FIGURE 4: OVERVIEW EU LABELS (OWN REPRESENTATION)

The French government is taking an even stricter approach with the French Repairability Index introduced in 2019, which regulates the mandatory display of information for consumers about the repairability of electrical and electronic products (European Commission, 2020d). The purpose of the index is to encourage customers to purchase repairable products and to put pressure on manufacturers to improve the repairability of their products in order to obtain a higher index. The index applies to five categories of products sold in France since 2020. These include smartphones, laptops, televisions, washing machines and lawnmowers (Right to Repair, 2021). The calculation of the current repairability index is based on the following criteria for all affected product categories and is calculated by the manufacturer themselves:

- Free access to technical documentation for consumers
- Ease of disassembly and access to necessary tools
- Duration of spare parts availability
- Price of spare parts
- Specific sub-criteria for each product category (Ministère de la Transition écologique et de la Cohésion des territoires, 2022).

FIGURE 5: FRENCH REPAIRABILITY INDEX

(Ministère de la Transition écologique et de la Cohésion des territoires, 2022)

France plans to replace this repairability index with a durability index by 2024, which includes additional criteria such as the possibility of upcycling (UN - International Telecommunication Union, 2021). Similar, the mandatory energy consumption labeling, which provides information on the energy required to operate the device in the form of a label with categories A to G, aims to help consumers to buy sustainable, energy-saving products. Additionally, customers can scan the QR-code on the right corner of the label to receive information regarding specific features of the product and criteria for the grading (Umweltbundesamt, 2021; Europäische Commission, 2021b).

2.3.2 The national strategy in Austria

The UN SDGs and the goals of the EU's European Green Deal, both described in the previous chapters, provide the framework for implementation in Austria by 2024 (BMK, 2021a). The aim of the federal government is to play a pioneering role in the field of circular economy and to support Austria in becoming climate-neutral by 2040. The focus is on promoting sustainable consumption, among other things by improving the framework conditions for the repair of products. When it comes to consumer purchasing, there is a clear focus on transparency. As already mentioned, there are various awareness and information measures that help consumers to make more sustainable purchasing decisions, which are used in Austria as well (BMK, 2021a).

In this context, the Austrian federal government has set itself the following four specific goals that are to be implemented until 2030.

- Goal 1: Reduction of national resource consumption

  The first goal is to reduce national resource consumption by 25%. Although Austria's domestic material consumption (DMC) per capita has stabilized in recent years, it is still above the EU average at around 19 tons (BMK, 2021a).

- Goal 2: Improve resource efficiency

  This goal is about decoupling economic growth and resource consumption, which has already been partially achieved. Resource productivity rose from 1,731 euros per ton to 2,211 euros per ton between 2000 and 2018. Although economic output has increased by 31%, resource consumption has remained almost constant. Nevertheless, resource efficiency is to be increased by a further 50% by 2030. In particular, measures to avoid and collect plastic waste, but also the promotion of repairs and sustainable business models should contribute to waste avoidance and thus improve resource efficiency (BMK, 2021a).

- Goal 3: Increase the rate of use of recyclable materials

  According to Eurostat (2021b), the circular material use rate was 12% in 2020. This means that 12% of the materials used in production were obtained from material reuse. With this value, Austria is below the EU average of 12.8% The aim is to increase this usage rate by 35% by 2030 (BMK, 2021a).

- Goal 4: Reduce material consumption by 10%

  Material consumption is largely attributable to municipal waste, which mainly comes from households, public institutions and companies. This municipal waste is made up of mixed municipal waste, bulky waste, biogenic waste, hazardous waste, electrical and electronic equipment, batteries and residues such as packaging (BMK, 2021b). With municipal waste per capita of 834 kilograms, Austria was in last place in an EU comparison in 2020, as shown in figure 6 (Eurostat, 2021a). In the future, it should therefore be easier for consumers to meet their needs with less material consumption, so that the target of a 10% reduction in material consumption can be achieved (BMK, 2021a).

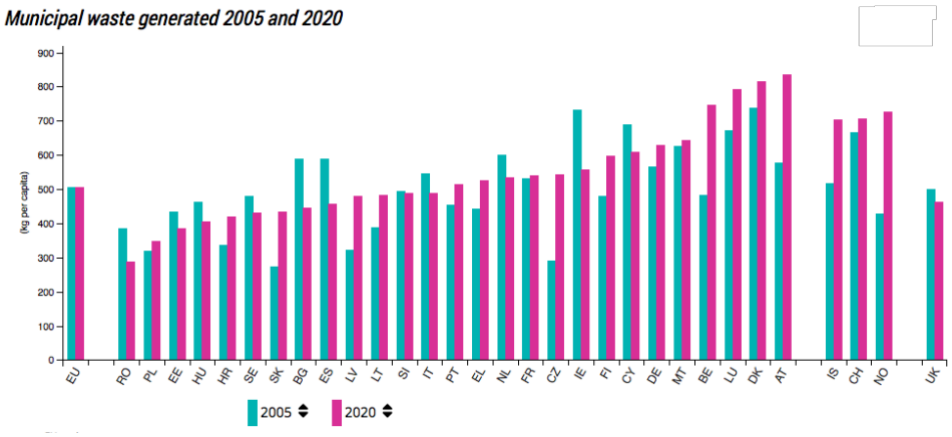

FIGURE 6: MUNICIPAL WASTE STATISTICS
(EUROSTAT, 2021A)

Achieving the four quantitative goals by 2030 as well as implementing the European Green Deal and the Circular Economy Action Plan are essential for the transition of Austria's economy to a circular economy and require both operational and legislative measures. A special focus is placed on extending the product service life through repairs (BMK, 2021a).

The following figure 7 shows the development of the repair sector in the period between 2008 and 2016 considering the number of companies, sales and the number of employees. The decline in sales and in the number of employees is particularly drastic. While there were 4,280 people employed in the repair sector in 2008, in 2016 there were only 3,860. Measured against the total employment in the service sector, the repair sector plays an average share of just 0.2% in this period. In general, it can be seen that the development of the repair sector for consumer goods has steadily declined between 2008 and 2016 (Köppl, Simon, Meyer, & Schratzenstaller, 2019).

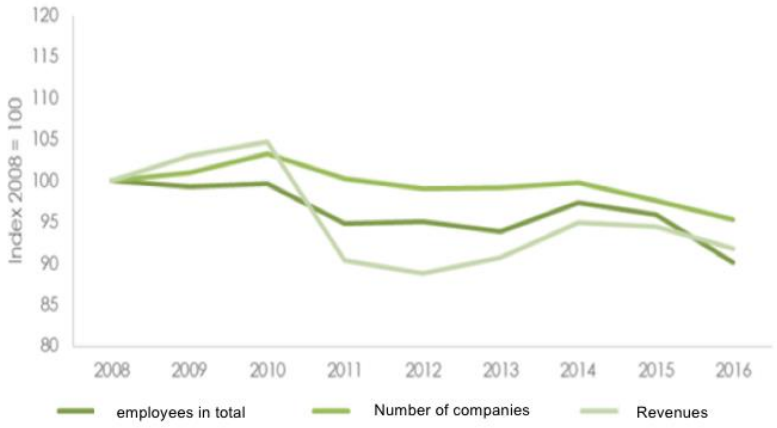

FIGURE 7: THE DEVELOPMENT OF THE REPAIR SECTOR IN AUSTRIA FOR CONSUMER DURABLES 2008 - 2016
(Köppl, Simon, Meyer, & Schratzenstaller, 2019)

This shows that repairs are no longer as popular in Austria as they were a few years ago. This is not only due to the growing prosperity of the population, but also to the ever-increasing range of cheap products that break down more quickly or are produced with a predetermined lifespan. This raises the question of which instruments are suitable to increase the supply and demand for repair services so that the technical lifespan and useful life of consumer goods can be extended and thus the consumption of resources and the amount of waste can be reduced. In order to reduce this type of consumption and promote circular use, incentives can be created, the repair network can be expanded and information can be made available at the point of sale (Köppl, Simon, Meyer, & Schratzenstaller, 2019).

2.3.2.1 Repair networks and cafes

According to the Austrian NGO Die Umweltberatung (n.d.) the first repair network in Austria was founded in Vienna in 1999. In the beginning there were 23 members, in the meantime the number of specialized repair service providers connected to the network has grown to 150. With the help of the repair network, citizens have the opportunity to easily find a qualified repair company. As a repair network, the Vienna network was a European pioneer. The repair network Vienna makes a significant contribution to resource conservation and waste prevention as well as to the preservation and creation of qualified jobs in the region. Several thousand inquiries are received every year and the increasing numbers reflect the great interest of the Viennese population in repairs. The companies in the repair network carry out around 50,000 repairs a year and thus avoid around 750 tons (Die Umweltberatung, n.d.).

Accessibility is a crucial factor when it comes to repair service providers. According to (Fachbach, Lechner and Reimann (2022), in urban regions the intention to use a repair service provider is greater than in rural ones. One explanation for this is the travel time to the repair service provider. Therefore, citizens living in urban areas with a higher density of repair service providers have shorter travel times and hence face fewer economic barriers than consumers living in rural regions (Fachbach, Lechner, & Reimann, 2022). In order to encourage the decision to have a product repaired instead of buying a new one, the aspect of easier access to repair services was taken up the Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology and services such as the "repair network" and the "repair guide" were created. These service offers provide a list of repair companies operating in Austria. The repair guide offers a systematic allocation of companies according to product categories and location. Companies can register themselves on the platform and indicate their offer. With

the exception of Vienna and Burgenland, all federal states take part in this campaign. In Lower Austria alone, more than 100 repair shops are already registered and, in addition to contributing to the circular economy, also help to ensure that jobs remain in the region (Amt der NÖ Landesregierung, 2019). For the capital cities of Vienna and Graz, an advisory board decides whether a company will be included in the repair network. The prerequisite for listing is the fulfillment of certain standards in order to guarantee consumers high quality. This includes, for example, that repair services are offered for at least three brands or that there is a uniform fee for a cost estimate (Köppl, Simon, Meyer, & Schratzenstaller, 2019).

Repair cafes are now also widespread in Austria with 16 registered locations alone in Vorarlberg. Repair cafés are mostly voluntary and therefore non-commercial repair initiatives and are supported by communities, educational institutions or non-profit organizations. Many of these initiatives, which are mostly based on the private commitment of individuals or associations, are part of the repair network. At these events, people meet to repair their broken everyday objects together. Some volunteer to offer their help, while others attend to receive help fixing their broken appliances or textiles. The repair events are generally free of charge and in addition to repair assistance, food and drinks are offered on a donation basis (Köppl, Simon, Meyer, & Schratzenstaller, 2019; RepaNET Reuse- und Reparaturnetzwerk Österreich, n.d; Verein „aha" Vorarlberg, n.d.).

2.3.2.2 Nationwide repair voucher

In 2020, the City of Vienna launched a trial run under the title “Vienna repairs – the Vienna repair voucher” in order to make the repair of objects that are still usable more financially attractive than buying new ones. The project ran in three stages from September 2020 to the end of 2021 and, with the help of repair vouchers that covered 50% of the costs up to a maximum of 200 euros, over 35,000 items were repaired instead of being thrown away. In fact, the defective items could be repaired successfully in over 90% of the cases and were thus given a second chance. This saved a total of around 350 tons of waste and 850 tons of CO2 (APA-OTS, 2021; Stadt Wien, 2021). Around 95% of the Viennese who took advantage of the repair bonus said in a subsequent opinion poll that they were "very satisfied" with the repairs carried out, and another 4% were "satisfied" (Reparaturnetzwerk Wien, n.d.).

The success of the Vienna model led to the Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology to introduce a nationwide repair bonus in April 2022. 130 million euros are available until 2026, which come from the EU

recovery fund. Private individuals residing in Austria can currently receive a subsidy of up to 100 euros for the repair of electrical and electronic devices or devices that are operated with mains cables, rechargeable batteries, batteries or solar modules, under the condition that the products are usually used in a private household. The subsidy for obtaining a cost estimate is a maximum of 30 euros. The requirement, however, is that a voucher is requested in advance via the Internet and that the repair is carried out by one of the approximately 1200 companies taking part in this campaign. The subsidy itself is deducted directly from the invoice amount (BMK, 2022).

2.3.2.3 Reduced VAT rate on repair services

Several EU countries are taking advantage of the limited scope offered by the current EU VAT Directive and tax repairs of products such as bicycles, shoes and leather goods as well as clothing and household goods at a reduced VAT rate. The following table gives an overview of the reduced VAT rates and the normal VAT rates in some EU member states. As of 2022 several EU countries apply reduced VAT rates for repairs. They can vary widely between EU member states, ranging from 6% in Belgium and Portugal to 13.5% in Ireland (Köppl, Simon, Meyer, & Schratzenstaller, 2019).

Country	Standard VAT rate	Reduced VAT rate	Period of application
Belgium	21	6	01.01.2000 until 31.12.2010 and since 01.08.2015
Luxembourg	17	8	since 01.01.2000
Netherlands	21	6	since 01.01.2000
Ireland	23	13,5	since 01.05.2001
Poland	23	8	since 01.09.2004
Greece	23	13	from 01.01.2009 until 31.07.2015
Finland	24	10	since 01.07.2009
Slovenia	22	9,5	since. 01.01.2010
Portugal	23	6	since 01.08.2015
Malta	18	5	since 01.08.2016
Sweden	25	12	since 01.08.2018

TABLE 2: OVERVIEW OF VAT RATES FOR SMALL REPAIR SERVICES IN THE EU IN 2018

(table based on Köppl, Simon, Meyer, & Schratzenstaller, 2019)

Repair services are very labour-intensive, so it is often the case that a large part of the repair costs is attributable to labor costs. For this reason, the likelihood increases that consumers will view the repair of a defective device as uneconomical and therefore prefer to replace a defective device with a new one. One possible approach to making repairs cheaper is reducing sales tax in order to strengthen the position of repair service providers. There is currently no

reduced tax rate for repairs at EU level. However, each Member State can choose the applicable VAT rates independently (European Commission, 2021a). Since January 2021, a reduced tax rate for repair services has applied in Austria, as in some other member states. Since then, the repair of bicycles, shoes, leather goods and textiles has been subject to the reduced VAT rate of 10%, but only in those cases where the material costs of the repair are less than 50%. This should give consumers an incentive, for example, to take shoes with broken soles to the cobbler instead of throwing them away (WKO, 2022).

2.4 Consumer perception

The effective development of a circular economy also depends on a variety of elements of consumer behavior, most notably willingness to accept new forms of consumption and ownership, as well as changing the way products are bought and used. Above all, consumers must be willing to rethink and change their attitudes towards consumption and ownership, because what is bought does not necessarily have to be new, what is used does not necessarily have to be owned and what is broken can be repaired, and what is outdated or obsolete can be upcycled. Camacho-Otero, Boks and Pettersen (2018) found that the main drivers of engagement in circular economy offerings are largely based on customer characteristics such as personality traits and values. Therefore, in order to establish and develop circular economy in general and repair economy in particular, a more comprehensive knowledge of consumer attitudes and associated individual characteristics is required (Rogers, Deutz, & Ramosb, 2021). The purpose of this chapter is to present the views, to better understand attitudes and behavior of consumers with regard to repair instead of new purchase as a consumer decision.

2.4.1 Planned obsolescence and repairability

Repair can extend the life of a product while avoiding the usage of raw resources. Users, however, are the ones who decide whether or not to repair their items which is why it is critical to understand their drivers in order to postpone product replacement.

The "Behavioral Study on Consumers' Engagement in the Circular Economy" published by the European Commission (2018) came to the conclusion that consumers are generally willing to behave in a circular economy-compliant manner, but without showing a great deal of commitment when there is a lack of information. The results show that, while 64% of customers repair items or have them repaired, 55% of those surveyed stated that they actually already pay

attention to whether a product can be repaired when buying it. The authors of the study attribute the fact that a large proportion of those surveyed is not interested in the repairability and durability of products due to too little information and the lack of established providers. The study of Fachbach, Lechner and Reimann (2022) revealed in that regard that age has a positive and significant impact on the willingness to repair, suggesting that older individuals tend to use repair services more often. Another observation of the research was that women are more likely to utilize a repair service provider than men.

According to the European Commission (2018), those surveyed who have never repaired gave the reason that the expected costs are too high (25-50% depending on the product), that the product no longer met their aesthetic expectations (20-30%), that they had not enough information on how to repair their products or where they could have them repaired (5-10%). The behavioral experiment has shown that the disclosure of relevant information is extremely successful in influencing purchasing decisions in the direction of items with a longer shelf life that can be repaired more easily. When such information was provided, participants were almost two times more likely to buy the item with the superior rating in terms of repairability and three times more likely to purchase the product with the higher durability rating. The study participants placed particular trust in those labels that come from the EU and promise uniform standards. These labels include, for example, the EU Ecolabel and the French Repairability Index (see chapter 2.3.1.3). On the other hand, the survey and the experiment have also shown that the will to repair immediately decreases when the specific handling requires time and effort (European Commission, 2018).

European consumers seem to have valued the durability of products for a number of years. This is also shown by the fact that 92% of respondents to a Eurobarometer survey (2013) agreed that the lifespan of items available on the market should be easily accessible as product information. However, several other studies (Richter, Leonidas, Dalhammar, & Almén, 2021; Ackermann, Ruth, & Schoormans, 2018) show that consumers want a significantly longer product life and appreciate information about the shelf life of products, although in practice they replace products after a short period of use. On the other hand, consumers are increasingly having to accept that everyday items such as washing machines, televisions, mobile phones and printers, but also lamps, fail prematurely and cannot be repaired because they are welded, or either batteries or bulbs are stuck and cannot be replaced. These practices on the part of producers not only put increasing pressure on the environment but also on consumers' budgets,

especially considering that premature failures can occur in all product categories (BEUC - The European Consumer Organization, 2015).

2.4.2 Driving factors of repairing

Following the consumer response to the degree of durability and repairability of products discussed in the previous pages, this chapter focuses on the drivers consumers face when considering repairing broken or obsolete products.

According to Terzioğlu (2021), the drivers consisting of the motivators and the barriers are divided into technical, value and emotional aspects. The basis is the behavioral model of Fogg, who considers the motivation to set an action, the ability to be able to implement it, and the triggers of the implemented behavior as the determining driving forces. She focuses her research on consumer motivation to have products repaired and potential barriers. Using semi-structured interviews, the results of which form the basis for a repair model, the dynamic relationship between the user, the item, and the repair activity is revealed. Those factors that shape the model of repair barriers and motivators (RBM) can be divided into technical, value and emotional-based, as mentioned earlier. As can be seen from figure 8, there are factors that act only as motivators (M) or barriers (B), while others can be both (M/B). More detailed explanations of the individual aspects follow in the next chapter.

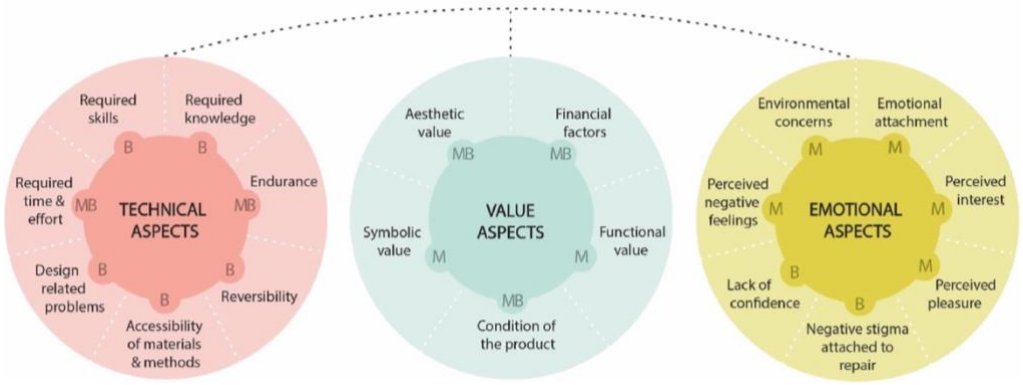

FIGURE 8: REPAIR BARRIERS AND MOTIVATORS MODEL

(Terzioğlu, 2021, p. 7)

2.4.2.1 Technical aspects

In many industries, including electronics, manufacturers are not required to provide their customers with spare parts or technical information for their products after the warranty period

has expired. Consumers can often only have their products repaired for a short time and only through the manufacturer's service. In addition, rapid technological development creates problems for independent workshops, which have to keep up to date in order to be able to carry out repairs on constantly new products. In contrast, the Internet and open source technologies enable a large number of consumers to repair their products themselves. On the one hand they provide a platform for the exchange of technical knowledge and repair guides, on the other hand users have access to a large market where they can find the spare parts and equipment they need for their repair (Hernandez, Constanza, & Goñi, 2020).

In the technical aspects of Terzioğlu's (2021) RBM model, not only necessary skills and knowledge but also special tools and materials required by the specification of the damaged goods count as barriers. A lack of access to appropriate tools and materials, a lack of information regarding their use and application, a large amount of time and labor required to carry out the necessary repairs are the main challenges faced by third-party repairs and by those, who want to repair themselves. In addition, latter often fail because of the necessary skills and knowledge (Terzioğlu, 2021). In many industries, including electronics, manufacturers are not required to provide their customers with spare parts or technical information for their products after the warranty period has expired. Consumers can often only have their products repaired for a short time and only through the manufacturer's service. In addition, rapid technological development creates problems for independent workshops, which have to keep up to date in order to be able to carry out repairs on constantly new products. In contrast, the Internet and open source technologies enable a large number of consumers to repair their products themselves. On the one hand they provide a platform for the exchange of technical knowledge and repair guides, on the other hand users have access to a large market where they can find the spare parts and equipment they need for their repair (Hernandez, Constanza, & Goñi, 2020).

With the continued development of new technologies in the market, many devices have become black boxes in which things happen without the consumer noticing. As a result, the public's understanding of how objects work has diminished over time. The resulting trend towards developing more user-friendly designs has made the end-user experience much easier than in the past, but at the same time the mechanics and components are more difficult for consumers to understand. Which is why it has become almost impossible for laypersons to repair devices such as smartphones, laptops, cars, watches or televisions. The repair process is also made more difficult for specialist workshops, since some manufacturers design their products in such a way that special tools and spare parts are required that are not available on

the open market. In this way, manufacturers force their customers to have repairs carried out only by specialist shops authorized by them. For this reason, more and more consumers are demanding that producers meet their responsibility in accordance with the Sustainable Development Goals of the UN and the relevant EU strategy and develop products taking their repairability into account (Hernandez, Constanza, & Goñi, 2020; Ackermann, 2018).

In addition to companies striving to increase sales and sell as much as possible, the massive cost pressure that has increased in recent years as a result of globalization also plays a role when companies design products in such a way that they break after the warranty period has expired and cannot be repaired or can only be repaired with difficulty. This is reflected in glued attachments, parts that cannot be removed or replaced, and housings that splinter when opened or can only be opened with special tools. Terzioğlu's (2021) shows that consumers are not interested in repairing their products when they realize that they were intentionally made with inferior materials in order to have a short lifespan. If other components fail in a device that has already been repaired, the motivation of consumers to start a repair attempt also decreases.

2.4.2.2 Value aspects

The second aspect that can act as a motivator or barrier to repair is the perceived value aspect, which relates to the features and their considered usefulness to the owner. In addition to functional features, this also includes aesthetic and symbolic properties. Furthermore, the condition of the product and its price are among the value factors that influence consumers' repair behavior (Terzioğlu, 2021). The financial aspect, which includes both the price of the original product and the financial cost of the repair, has been identified as both a motivator and an obstacle. A significant obstacle to repairing a product arises from business models where it is cheaper to buy a new product than to repair a defective one. Before repairing a product, it is common to carry out a cost-benefit analysis and, according to Terzioğlu (2021), the willingness to pay for a repair correlates with the original purchase price. In this sense, the trend towards cheap products correlates with the decreasing need to have products repaired (Hernandez, Constanza, & Goñi, 2020).

When customers weigh repair costs and warranties when buying a new product, they often find it more profitable to buy a new one. This problem is strongly influenced by the fact that items are often manufactured in countries with low labor costs, but labor costs for repairs are high in most OECD countries. Even in situations where spare parts and repair information are

accessible, replacing a product can be more cost-effective than buying the spare parts and finding a repair professional (Svensson-Hoglund, et al., 2020). Indeed, according to a study by the European Commission (2018), value for money is the main driver and the main barrier to customer participation in the circular economy. The condition of the product can be both a motivator and a barrier to repair. A barrier is considered when a product is outdated, out of fashion, or lagging behind technological advances. Even when objects fail to meet the human need for novel experiences, this can lead to disposal. The need for novelty can result in functional products being discarded. This is particularly important for items with fast innovation cycles, such as computers and mobile phones, as customers often have high demands for performance and aesthetics. On the other hand, the functionality of a product, for example, is seen as a motivator to carry out a repair. The motivation depends on the properties of the product. If it is daily in use, such as a stove or a washing machine, then the motivation to repair it quickly increases (Terzioğlu, 2021; Jaeger-Erben, Frickab, & Hippa, 2021).

2.4.2.3 Emotional aspects

Emotional elements of the RMB model are features related to user emotions. The level of connection consumers have with their products is one of the factors that has a significant impact on their repair actions (Lofthouse & Prendeville, 2018; Cooper, 2017). These emotional elements include, for example, perceived happiness, negative emotions and personal interests, but also environmental concerns and trust in the product. While environmental concerns underpin customers' decisions to repair equipment, a lack of trust is detrimental to their motivation. Some consumers feel negative or have aversive feelings when throwing away a product they value because it is broken or when they dispose of a product before the end of its useful life, while others are driven by their environmental concerns (Terzioğlu, 2021).

When the attachment to products such as furniture, clothing, cars, radios, or crockery is based on emotional circumstances, a sense of caring arises that relates to the handling of the items, the willingness to keep them, and the desire to wear them or to pass it on to the next generation. In this way, emotional circumstances act as drivers in the way of desiring to keep products for as long as possible and therefore be willing to have them repaired in the event of a defect in order to extend their lifespan. Especially when it comes to the wish to pass products on to the next generation, they are usually of high quality. The trend towards low-quality, low-priced items, on the other hand, leads to a dissolution of emotional attachment to material objects, which also reduces the motivation for repairs (Hernandez, Constanza, & Goñi, 2020; Ackermann, 2018).

3 CONCEPTIONAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

Repair, as theorized in this master thesis, is a multi-dimensional and multi-institutional activity. Based on the most recent and relevant literature, which was consulted in the course of the literature review, a comprehensive overview of the relevance and status quo of repair on the scientific, psychological and legislative level was given.

Until a few decades ago, consumers still relied on being able to use expensive consumer goods for as long as possible by repairing, refurbishing and reusing them. In the course of globalization, however, the lifestyle of a throwaway society has prevailed. In view of the low cost of new purchases, technological progress and ever shorter innovation cycles, the extension of useful life through repairs is still largely dispensed with. The constant low price of new products, which are often of poor quality, has led to a decrease not only in the demand, but also in the profitability of repair services (Laitala et al., 2021). It is only since ecological sustainability has regained importance that the conservation of resources and the product lifetime have become more important again, and thus also the topic of repair (Reith & Stöger, 2012). To promote repairs, it is necessary for politics and industry to implement technical measures and raise awareness in order to counteract planned obsolescence and thus the waste of energy and resources. At the same time, consumers are encouraged to question their consumption and switch to more sustainable alternatives (Prakash, Dehoust, Gsell, & Schleicher, 2016).

Figure 10 shows the conceptual framework developed for this thesis, which highlights the factors that influence consumers' perception to repairing. A conceptual framework describes the relationship between the major concepts in the study (Grant & Osanloo, 2014).

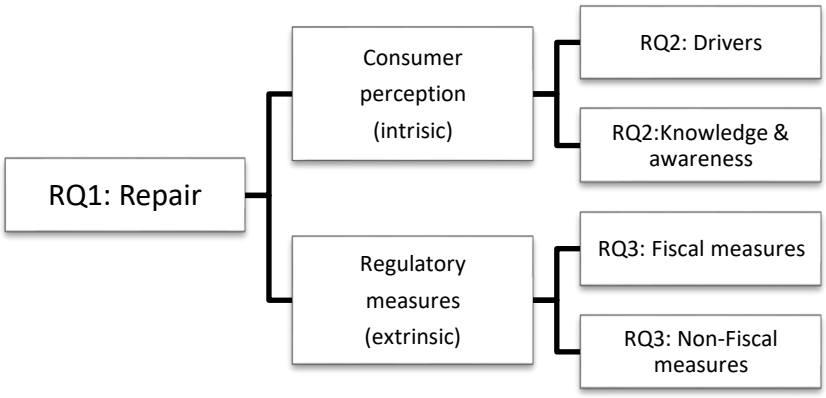

FIGURE 9: INFLUENCING FACTORS ON REPAIRS

The evaluation of the literature research has shown that many scientific studies exist on the topics of consumer awareness, sustainability, and circular economy. However, there is a gap in research on the effectiveness of the individual repair-promoting measures, especially with regard to the willingness of consumers to adopt them and to undertake actual repair activities. An important goal of this work is to investigate these issues in the context of an empirical study and thus contribute to closing the research gap. Based on research, it can be concluded that there are two concepts that have an influence on repairing. These are on the one hand the theory of planned behavior and on the other hand the theory of behavioral change through public measures.

3.1 Consumer perception: Theory of planned behavior

The psychological theory of planned behavior (TPB) was used for the empirical part of this thesis to shed more light on the relationship between planned obsolescence and consumer perceptions. The theory of planned behavior (TPB), developed by Ajzen (1985) contends that a person's decision to engage in a certain activity can be influenced by their intention to do so (see figure 10). It is considered that intentions reflect the driving forces behind actions. Generally speaking, “the stronger the intention to engage in a behavior, the more likely should be its performance” (Ajzen, 1991, p. 181).

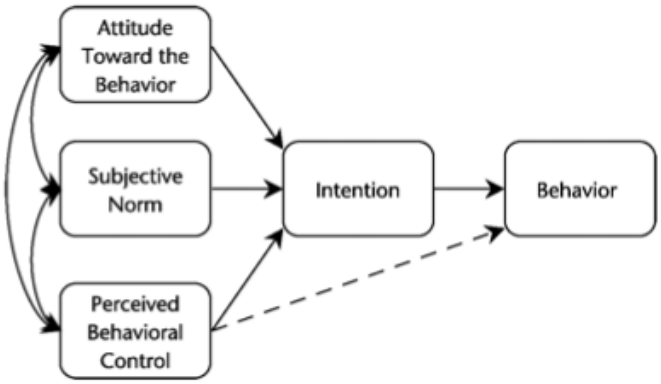

FIGURE 10: THEORY OF PLANNED BEHAVIOR

Three factors jointly influence a person's behavior and intentions according to the TPB theory. These factors are based on social influences, control limitations, and individual attitudes. Attitude towards the behavior is the sum of the individual’s knowledge as well as positive and negative attitudes towards the behavior. Subjective norms consider the degree of social pressure and the persons’ perception of the attitude of others regarding the specific

behavior. The third determinant, perceived behavioral control, expresses the extent to which the person believes they have the ability to act in a certain way. This depends on the individual's perception of internal factors as well as external factors such as the resources and support available (Ajzen, 1991).

In relation to this thesis, it can be said, that knowledge about planned obsolescence can influence purchasing decisions, as it can have an influence on personal attitudes towards repairs. The level of knowledge is also considered in the second determinant (social norm), as a higher level of knowledge and awareness regarding sustainability also influences the sense of responsibility in society. The perceived control of the person to contributing to a sustainable environment by producing less waste with the individual purchase decision plays a role in this case as well. However, this factor can only play a significant role as part of the intention if the person has sufficient knowledge on the topic. Returning to the research questions, question 1 can be derived through the first determinant of the TPB model and the answer to question 2 is presented with the intention of the TPB and results from the evaluation of all three determinants.

- RQ1: How willing are Austrian consumers to participate in sustainable consumption patterns respectively how aware are they of planned obsolescence?
- RQ2: How do Austrian consumers perceive repairing, and what are the key factors that motivate them to choose repair over replacement?

3.2 Regulatory measures: Theory of behavior change

Both the EU and the national governments are taking measures to promote sustainable consumption patterns. Repairs play an important role in this context. Among other things, the focus is on making repairs simpler and more cost-effective for consumers. Various labels, the battery directive, eco-design and national initiatives such as the Austrian repair bonus are intended to increase the proportion of repaired appliances.

Behavioral changes are usually necessary to address societal problems. Governments can support this process by using fiscal and non-fiscal instruments to set incentives, enact laws or launch information campaigns. However, the question arises as to whether public measures to promote behavioral change are effective and whether they are perceived positively by the population (Condrey & Neaves, 2019). Condrey and Neaves (2019) studied the factors influencing the effectiveness of policies and showed that when developing government policies

to promote behavior change, the government must consider the support of citizens in advance in order for them to be effective.

Eonomic incentives can have an influence on the repair decision. From a purely financial perspective, repair is only worthwhile if it does not exceed the price of a new purchase (McCollough, 2009). As mentioned in Chapter 2.4.2, the often perceived high cost of a repair service is the main barrier to participating in the circular economy. Therefore, financial initiatives are a consideration of this thesis and will be included as a factor in the empirical research. For this purpose, on the one hand it is measured whether a repair is financially worthwhile according to the respondents, on the other hand it is also asked to what extent a financial relief, for example in the context of the repair bonus or a reduced VAT, can influence the decision. In terms of technical barriers, government agencies can also help make repairs more feasible. Design-related barriers such as built-in batteries or unavailable spare parts are barriers for consumers. The repair index (chapter 2.3.1.3), for example, makes these technical aspects more transparent to customers and can also encourage them to repair. Lastly, infrastructural barriers need to be considered. Fewer and fewer repair stores and a shortage of skilled workers play a major role in this. The question arises whether more repair stores and cafes could be a motivation for consumers to have their devices repaired.

To explain the relationship between effectiveness and the fiscal and non-fiscal repair measures, the following research question arises:

- RQ3: Which circumstances in the form of economic and legislative measures may reinforce the trend toward repairing products instead of replacing them?

3.3 Hypotheses development

Figure 11 below illustrates the components of the main hypotheses relevant to answering the research questions. Based on the literature review in chapter 2, the following items were derived.

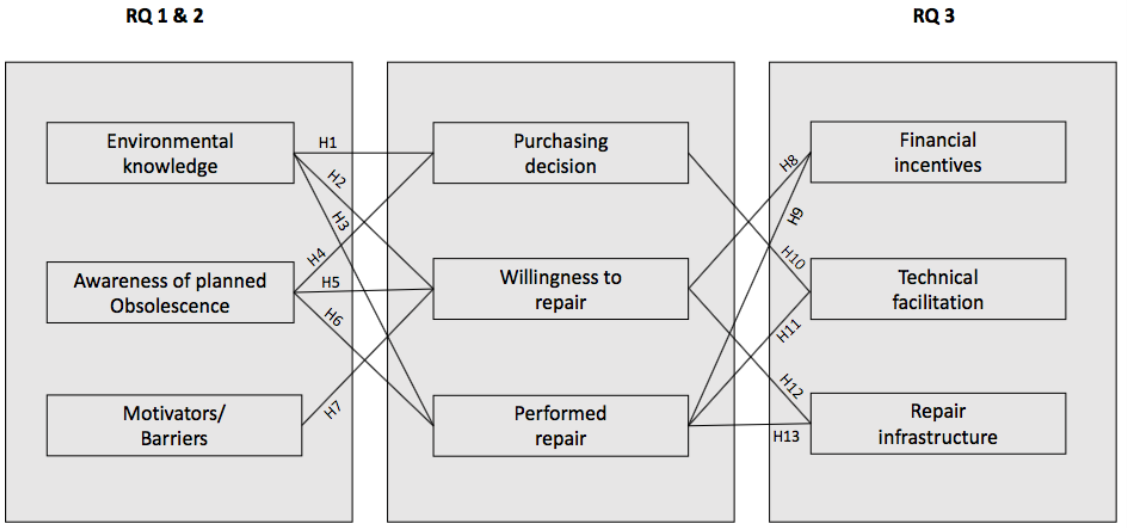

FIGURE 11: HYPOTHESES DEVELOPMENT

3.3.1 Research question 1 (H1 – H6)

H1: There is a relationship between the environmental awareness and the purchasing decision

- Independent variable: environmental awareness
- Dependent variable: purchasing decision

  - *H0: the environmental awareness does not have an impact on the purchasing decision*
  - *H1: environmental awareness has a significant impact on the purchasing decision*

H2: There is a relationship between the environmental awareness and their willingness to repair

- Independent variable: environmental awareness
- Dependent variable: willingness to repair

  - *H0: the environmental awareness does not have an impact on the willingness to repair*
  - *H1: environmental awareness has a significant impact on the willingness to repair*

H3: There is a relationship between the environmental awareness and a repair being performed

- Independent variable: environmental awareness
- Dependent variable: performed repair

  - *H0: the environmental awareness does not have an impact on a repair being performed*
  - *H1: environmental awareness has a significant impact on a repair being performed*

H4: There is a relationship between the awareness of planned obsolescence and the purchasing decision

- Independent variable: awareness of planned obsolescence
- Dependent variable: purchasing decision

  - *H0: the awareness of planned obsolescence does not have an impact on the repair being performed*
  - *H1: the awareness of planned obsolescence has a significant impact on the repair being performed*

H5: There is a relationship between the awareness of planned obsolescence and their willingness to repair

- Independent variable: awareness of planned obsolescence
- Dependent variable: willingness to repair

  - *H0: the awareness of planned obsolescence does not have an impact on the willingness to repair*
  - *H1: the awareness of planned obsolescence has a significant impact on willingness to repair*

H6: There is a relationship between the awareness of planned obsolescence and a repair being performed

- Independent variable: awareness of planned obsolescence
- Dependent variable: repair being performed

  - *H0: the awareness of planned obsolescence does not have an impact on the repair being performed*
  - *H1: the awareness of planned obsolescence has a significant impact on the repair being performed*

3.3.2 Research question 2 (HD7)

H7: There is a relationship between the motivators/barriers and the willingness to repair

- Independent variable: motivators/barriers
- Dependent variable: willingness to repair

- *H0: the motivators/barriers do not have an impact on the* willingness to repair
- *H1: the motivators/barriers have a significant impact on the* willingness to repair

3.3.3 Research question 3 (H8 – H13)

H8: There is a relationship between financial incentives and the willingness to repair

- Independent variable: financial incentives
- Dependent variable: willingness to repair

- *H0: financial incentives do not have an impact on the willingness to repair*
- *H1: financial incentives have a significant impact on the willingness to repair*

H9: There is a relationship between financial incentives and a repair being performed

- Independent variable: financial incentives
- Dependent variable: performed repair

- *H0: financial incentives do not have an impact on a repair being performed*
- *H1: financial incentives have a significant impact on a repair being performed*

H10: There is a relationship between the technical facilitation and the purchasing decision

- Independent variable: technical facilitation
- Dependent variable: purchasing decision

- *H0: technical facilitation does not have an impact on the purchasing decision*
- *H1: technical facilitation has a significant impact on the purchasing decision*

H11: There is a relationship between the technical facilitation and a repair being performed

- Independent variable: technical facilitation
- Dependent variable: performed repair

- *H0: technical facilitation do not have an impact on a repair being performed*
- *H1: technical facilitation have a significant impact on a repair being performed*

H12: There is a relationship between a repair infrastructure and the willingness to repair

- Independent variable: repair infrastructure
- Dependent variable: willingness to repair

- *H0: repair infrastructure does not have an impact on the willingness to repair*
- *H1: repair infrastructure has a significant impact on the willingness to repair*

H13: There is a relationship between the repair infrastructure and a repair being performed

- Independent variable: repair infrastructure
- Dependent variable: performed repair

- *H0: repair infrastructure does not have an impact on a repair being performed*
- *H1: repair infrastructure has a significant impact on a repair being performed*

3.3.4 Demographic differences (HD1 – HD10)

The following hypotheses are derived from the demographic variables which were collected through the online survey. The author assumes that there are differences in consumer behavior and perception that can be attributed to demographic factors. These hypotheses are not based on the literature research and have therefore not been included in figure 11. They serve to better understand the repair industry and to present an overview of demographic differences.

HD1: There is a relationship between age groups and environmental awareness

- Independent variable: age groups
- Dependent variable: environmental awareness

- *H0: the age does not have an impact on the environmental awareness*
- *H1: the age has a significant impact on the environmental awareness*

HD2: There is a relationship between awareness of planned obsolescence and age groups

- Independent variable: age groups
- Dependent variable: awareness of planned obsolescence

- *H0: the age does not have an impact on the* awareness of planned obsolescence
- *H1: the age has a significant impact on the* awareness of planned obsolescence

HD3: There is a relationship between performed repairs and age groups

- Independent variable: age groups
- Dependent variable: performed repairs

- *H0: the age does not have an impact on* performed repairs
- *H1: the age has a significant impact on* performed repairs

HD4: There is a relationship between environmental awareness and levels of education

- Independent variable: levels of education
- Dependent variable: environmental awareness

- *H0: the level of education does not have an impact on* the environmental knowledge
- *H1: the level of education has a significant impact on* the environmental knowledge

HD5: There is a relationship between awareness of planned obsolescence and levels of education

- Independent variable: levels of education
- Dependent variable: awareness of planned obsolescence

  - *H0: the level of education does not have an impact on* the awareness of planned obsolescence
  - *H1: the level of education has a significant impact on* the awareness of planned obsolescence

HD6: There is a relationship between performed repairs and levels of education

- Independent variable: levels of education
- Dependent variable: performed repairs

  - *H0: the level of education does not have an impact on* performed repairs
  - *H1: the level of education has a significant impact on* performed repairs

HD7: There is a relationship between environmental awareness and gender

- Independent variable: gender
- Dependent variable: environmental awareness

  - *H0: the gender does not have an impact on* the environmental awareness
  - *H1: the gender has a significant impact on* the environmental awareness

HD8: There is a relationship between the willingness to repair and gender

- Independent variable: gender
- Dependent variable: willingness to repair

  - *H0: the gender does not have an impact on* the willingness to repair
  - *H1: the gender has a significant impact on* the willingness to repair

HD9: There is a relationship between performed repairs and the place of residence

- Independent variable: place of residence
- Dependent variable: performed repairs

  - *H0: the place of residence does not have an impact on* performed repairs
  - *H1: the place of residence has a significant impact on* performed repairs

HD10: There is a relationship between the willingness to repair and the place of residence

- Independent variable: place of residence
- Dependent variable: willingness to repair

  - *H0: the place of residence does not have an impact on* the willingness to repair
  - *H1: the place of residence has a significant impact on* the willingness to repair

4 METHODOLOGY

In this chapter, the research design for the empirical study of this thesis will be presented. Firstly, the chosen methodology will be supported by adequate evidence, and details on the target population will be provided. Furthermore, the research sample and the data collection process will be outlined.

4.1 Research design

After conducting a literature review and constructing a conceptual framework, the study proceeds to investigate consumer perceptions of repairability and address the research questions. Given that the primary aim is to measure behavior and attitudes and draw general conclusions from a sample, a quantitative research approach was deemed appropriate (Leedy & Ormrod, 2015).

To this end, an online survey was chosen as the optimal data collection method to answer the research questions pertaining to consumer perceptions of repairability in Austria (see Chapter 3.1 and 3.2). Online surveys are a cost-effective and straightforward research instrument compared to other methods. Additionally, the quantitative data obtained from a survey allows for objective analysis and interpretation of the findings.

4.2 Target population and sampling technique

The target group relevant to this research includes everyone over the age of 18 who lives in Austria. This is a target group of about 7.3 million people (Statistik Austria, 2023), who cannot be surveyed in a representative way. To calculate a meaningful sample size, the sample-to-item ratio is used. Here, the sample size is based on the number of items in the questionnaire. According to Suhr (2006), the ratio should not fall below 5:1. The questionnaire for the present research includes 10 items and requires therefore at least 50 respondents for a meaningful analysis.

Convenience sampling as well as snowball sampling were used for this purpose. This sampling frame is easy to administer and makes it possible to collect the necessary data from a large number of people in a short time and at low cost. The convenience sampling approach was chosen to collect the data, which implies that participants are selected based on convenience factors rather than a predetermined probability (Creswell, 2009). The author chose to distribute the questionnaire online using a snowball system, mainly through social media and the author's

private network. During the data collection period, participants were asked twice at intervals of five days to forward the Survey to their contacts in order to increase the response rate.

4.3 Research approach

The survey was created on Unipark and the relevant data has been collected over a 13 day period from January 29, 2023 to February 10, 2023. The order of the questions is such that the general questions are asked first, followed by the specific questions to answer the research questions. The exact questions are detailed in the appendix 1.

Since it was expected that the respondents would consist mainly of German speakers, the questions were formulated in German only. In total, 71 closed questions were included in the survey. 32 of them are 5-point Likert scale questions, where respondents were asked to indicate how much they agree with certain statements on a scale of five. To ensure compliance with research ethics, respondents' answers have been analyzed anonymously and have only been used for the purpose of this empirical research. In addition, all recorded information has been deleted after submission of the thesis.

An effective data analysis strategy is critical to ensuring the validity and completeness of the empirical study. To assess the survey's internal consistency and content validity beforehand, it is essential to run a pilot test (Leedy & Ormrod, 2015). For this reason, a pilot test has been carried out by three participants before distributing the survey link. In this way, participants were able to help the author improve the overall quality of the survey and find errors by providing feedback on the questions, format, and length. The pilot test included two German-speaking participants. Both participants feedback has been considered and necessary adjustments have been made accordingly.

4.4 Data analysis

To conduct statistical analyses of the hypotheses (see chapter 3.3.1, 3.3.2 and 3.3.3), the data from the online survey was imported into SPSS. The first step was to perform a descriptive analysis, which involved calculating absolute frequencies and percentages for categorical variables and presenting mean, median, standard deviation, minimum, and maximum for continuous variables. The results were then displayed using pie charts, bar charts, and boxplots. Spearman rank correlations were used to test hypotheses of associations between two variables due to the positive skewness of the scale distributions and the use of ordinally scaled

variables, such as the highest level of education. A significance level of 5% was employed to reject the null hypothesis.

4.5 Sample

The survey was shared via social media with 331 Instagram followers and 403 Facebook friends, due to the high usage rate. In addition, the survey was still shared with 25 private and 15 professional contacts, assuming an overlap of contacts especially with social media and private contacts. The number of participants who came across the questionnaire through the snowballing process cannot be estimated. The survey was completed by 172 respondents in total (this equals approximately 22% response rate without snowballing).

Of the total of 172 participants, ten were excluded from the analysis because they stated that their center of life was not in Austria. In detail, 102 (63.0%) indicated they were female and 60 (37.0%) male. Half (50.6%) of the respondents were younger than 54 years. The exact distribution of age in categories is shown in more detail in figure 12. Slightly more than half reported that they had a college degree (56.8%) and another quarter reported having a high school degree (24.7%). Three participants (1.9%) had compulsory schooling as their highest educational qualification and another 27 people (16.7%) finished an apprenticeship. About two-thirds (68.5%) of the respondents lived in a city with more than 100,000 inhabitants, and about one in ten lived in a city with 10,000 to 100,000 inhabitants (9.3%). The remaining people lived in a small town (6.8%) or in a village (15.4%).

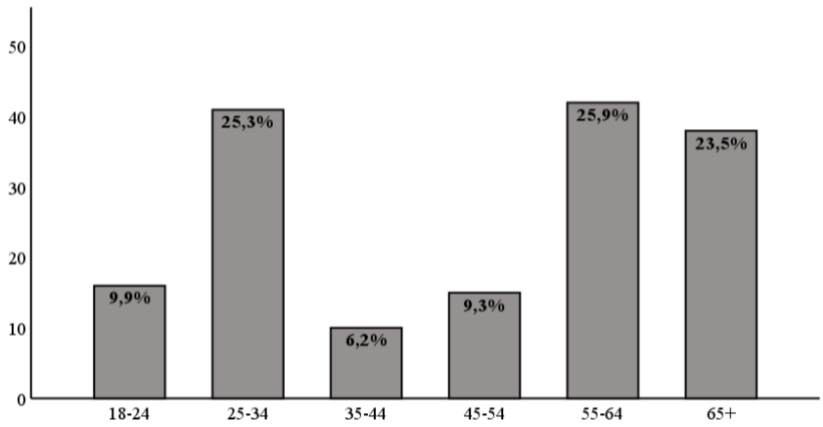

FIGURE 12: FREQUENCY DISTRIBUTION OF AGE GROUPS IN YEARS

4.6 Measurements and scales

4.6.1 Environmental awareness

Two of the questions for the section covering the topic of *environmental awareness* were taken from the New Ecological Paradigm (NEP) Scale. The NEP consists of 15 questions that assess a population's environmental outlook (Anderson, 2012). The remaining 13 questions were judged not to be adequate for answering the research questions as they were too general and not specifically tailored to the aims of the study. Further 5 questions were created by the author. To indicate their level of agreement with the statements, according to Anderson (2012), a 5-point Likert scale ranging from "strongly agree" (1) to "strongly disagree" (5) was used. Cronbach's alpha was calculated for the scale in order to measure its reliability (see table 3).

TABLE 3: DESCRIPTIVES ENVIRONMENTAL AWARENESS

Scale		Descriptives	Number of Items	Cronbach's Alpha
Environmental Awareness	*M*	1.62	7	0.730
	Md	1.46		
	Sd	0.50		
	Min	1.00		
	Max	3.71		

Figure 13 shows that there is a high level of agreement among the participants with regard to the statements of environmental awareness. The statement "I am familiar with the term sustainability and I am aware of its meaning" received the highest level of agreement while “We are approaching the limit of the number of people the earth can hold” received the lowest level.

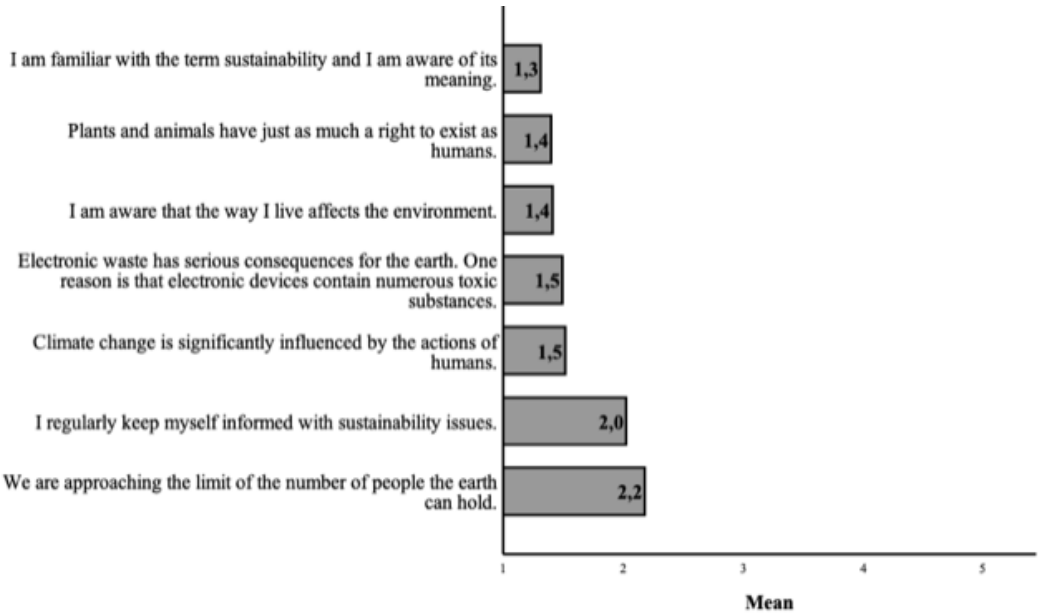

FIGURE 13: QUESTIONS - ENVIRONMENTAL AWARENESS

From the data, it appears that study participants were more likely to agree with the statements about their awareness of sustainability (1.3) and their knowledge of current sustainability issues (2.0), but less likely to agree with the scientific statement about the Earth's limits (2.2). This suggests that while participants are taking steps to educate themselves about sustainability issues, they may not fully understand the seriousness of the situation or the extent to which the Earth's capacity is at risk.

4.6.2 Awareness of planned obsolescence

The second section of the questionnaire was designed to assess the participants' *awareness of planned obsolescence*. The author created five items for this section, with the first item being dichotomous decision-making question (yes, no), and the remaining four items being measured using a 5-point Likert scale. Descriptive statistics for this section, which can be found in table 4, show that the awareness of planned obsolescence is rather high (Md=1,5).

TABLE 4: DESPRIPTIVES - AWARENESS OF PLANNED OBSOLESCENCE

Scale		Descriptives	Number of Items	Cronbach's Alpha
Awareness of planned Obsolescence	*M*	1.68	4	0.764
	Md	1.50		
	Sd	0.67		
	Min	1.00		
	Max	5.00		

It seems that a high level of agreement can be found among respondents in the following scale (see figure 14). In particular, the item "in my opinion, manufacturers should take more responsibility for the longevity of their products" was given a mean rating of 1.3 out of 5, indicating strong agreement with the statement. Additionally, it is worth noting that almost two thirds (64.2%) of the respondents are familiar with the term "planned obsolescence," which suggests a certain level of awareness of this issue among the surveyed population.

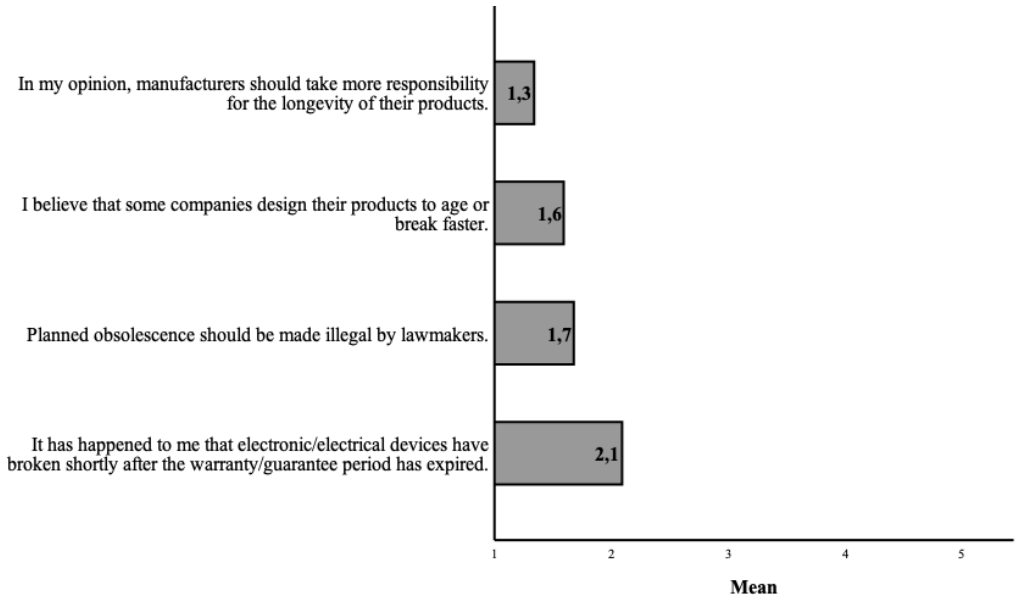

FIGURE 14: QUESTIONS - AWARENESS OF PLANNED OBSOLESCENCE

4.6.3 Purchasing decision

This section of the online questionnaire aimed to measure the impact of repairability on consumers' purchasing decisions of electronic or electrical devices. Five product groups were presented, and respondents were asked to rate the extent to which the repair factor influences their purchase decision using a 5-point Likert scale. The scale ranged from "a big factor" (1) to "no factor" (7). Table 5 provides additional descriptive statistics, including the Cronbach's alpha coefficient. The development of this scale was partly based on the empirical study conducted by Jaeger-Erben, Frickab, & Hippa (2021). Viewed across all product groups, repairability does not have a very large influence on the purchase decision (Md = 2.33).

TABLE 5: DISCRIPTIVES - PURCHASING DECISION

Scale		Descriptives	Number of Items	Cronbach's Alpha
Purchasing decision	*M*	2.49	6	0.898
	Md	2.33		
	Sd	0.91		
	Min	1.00		
	Max	5.00		

The presented product groups were analyzed to determine the extent to which repairability influences purchase decisions, as shown in figure 15. The level of agreement with the statement was not as high as in previous scales. The highest levels of agreement (2.0 and 2.4) were observed in the groups including "washing machines, dishwashers, stoves" and "smartphones,

tablets, notebooks, PCs.” The reason for this could be the high purchase price and the frequent use.

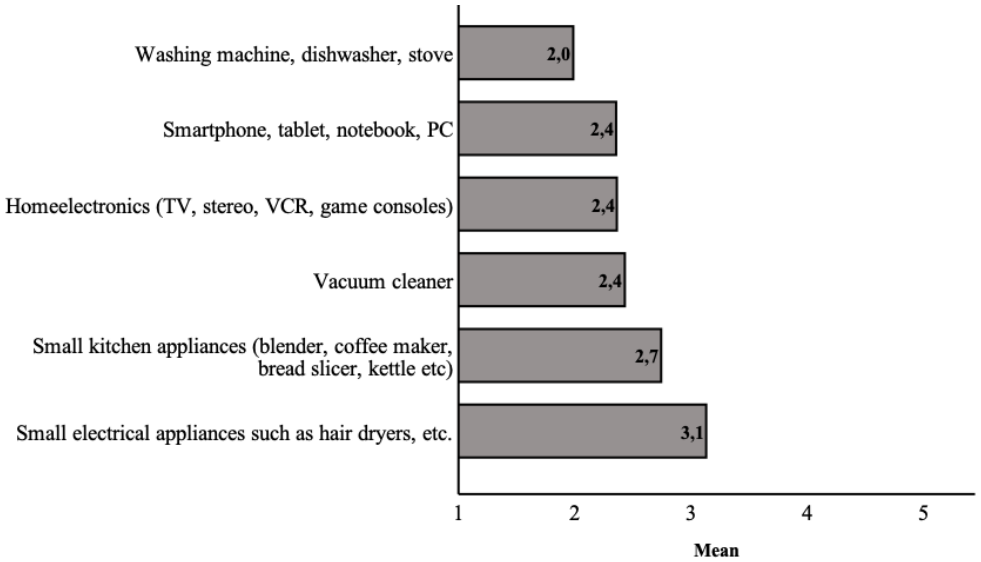

FIGURE 15: QUESTION - PURCHASING DECISION

4.6.4 Performed repair

The continued section is called performed repairs and was developed to gain insight into repair behavior of people living in Austria. The scale consists of four items aimed at finding out whether the participant has already repaired products or had them repaired. The question was constructed as a dichotomous decision-making question (yes, no). The main question of this scale is: I have already repaired or had repaired one or more devices. The results of the performed repair scale are presented below. According to the data, a significant proportion of the participants (87.6%) have undertaken the repair of one or multiple devices, with more than half of them (59.0%) having done so within the previous 24 months. Furthermore, most respondents (70.2%) were content with the quality of the repair (see figure 16).

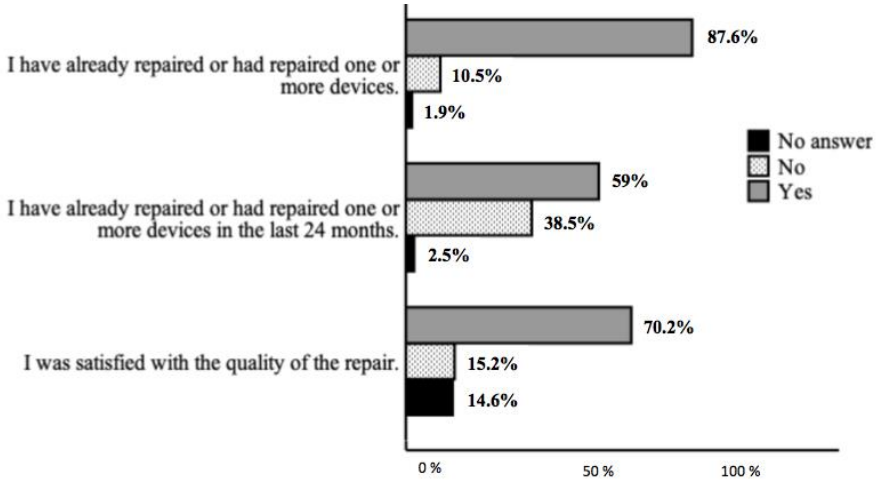

FIGURE 16: QUESTION - PERFORMED REPAIR

4.6.5 Motivators/barriers

A semantic differential, based on the empirical study of Jaeger-Erben, Frickab, and Hippa (2021), was created to assess the factors that motivate or hinder consumers from repairing products. This is a method for determining which ideas people associate with certain concepts. In the semantic differential, opinions are not asked directly, but respondents are asked to indicate with which characteristics they associate the term with. These are asked in opposing pairs of characteristics, such as "positive - negative" or "useful - useless". According to the research, the tendency is to view repairs as environmentally friendly (58%) but the data suggests also that respondents associate repair with high effort and costs (see figure 17).

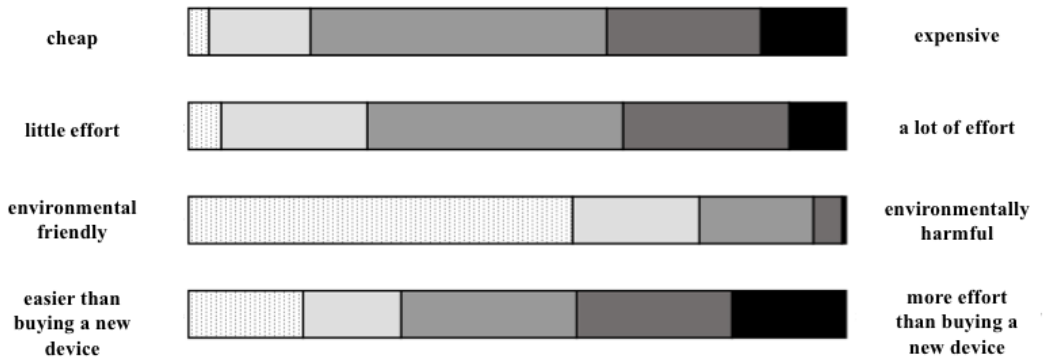

FIGURE 17: QUESTIONS – PERCEPTION

Additionally, a filter question was designed to explore the motivations or barriers related to carrying out a repair in greater detail, offering respondents the option to select multiple responses. These questions were inspired by previous research conducted by Terzioglu, Lockton, and Brass (2015). Based on the filter question, respondents who had already carried out a repair were presented with a question concerning their motivating factors for doing so (figure 18) whereas those who had not yet performed a repair were presented with questions concerning their barriers (figure 19). Out of the 162 participants, 145 were presented with questions regarding their motivations. Results revealed that 75.9% of the participants identified environmental contribution as the primary motivator, while urgency or time pressure played a relatively minor role (22%).

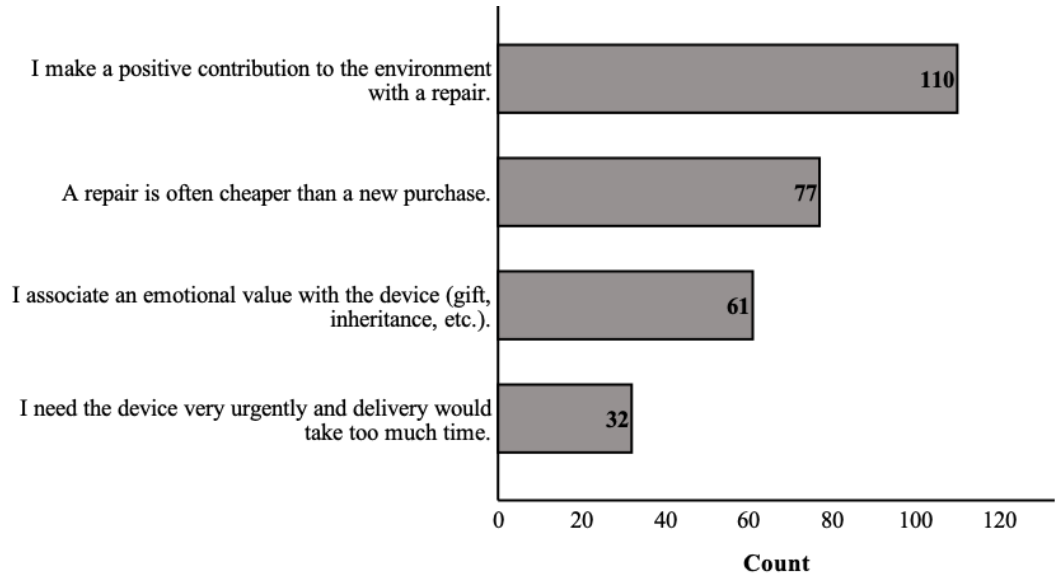

FIGURE 18: QUESTIONS - MOTIVATORS

On the other hand, 21 of the participants have not repaired a electrical or electronical device before. 66% of those identified the high cost compared to a new purchase as the greatest barrier, while the condition of the product had a significant influence on the repair decision for fewer participants (23.8%).

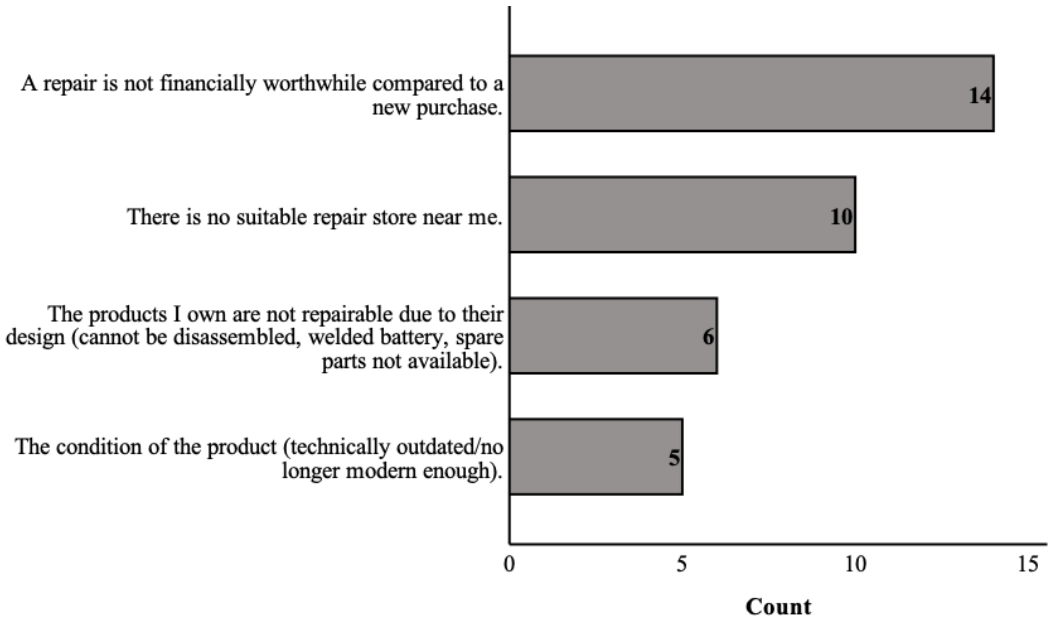

FIGURE 19: QUESTIONS - BARRIERS

4.6.6 Willingness to repair

Items such as "I would like to buy more durable and repairable products" and "the repairability of products is important to me" were asked to gain insight into the *willingness of repair* of participants. A 5-point Likert scale ranging from "completely agree" (1) to "completely disagree"

(5) was used. In table 6 the descriptives of the *willingness to repair* scale are displayed. A median of 1.75 shows a rather high level of willingness in this regard (see table 6).

TABLE 6: DESCRIPTIVES - WILLINGNESS TO REPAIR

Scale		Descriptives	Number of Items	Cronbach's Alpha
Willingness to repair	*M*	1.90	4	0.708
	Md	1.75		
	Sd	0.63		
	Min	1.00		
	Max	5.00		

The question "Friends/relatives/people around me repair their products or have them repaired" is based on the social factor of the theory of planned behavior (TPB), which was mentioned in the conceptual framework (chapter 3.1). The remaining three items were inspired by the research of Fachbach, Lechner and Reimann (2022). The following figure shows the items for the *willingness to repair* scale. In general, a tendency of agreement with the statements can be seen. The statement "I would like to buy more durable, repairable products" received the highest level of agreement with a median of 1.4. It can also be said that the repairability of products is important to the majority (88.3%) of respondents and 77.8% agree with the statement to have their next product repaired if possible.

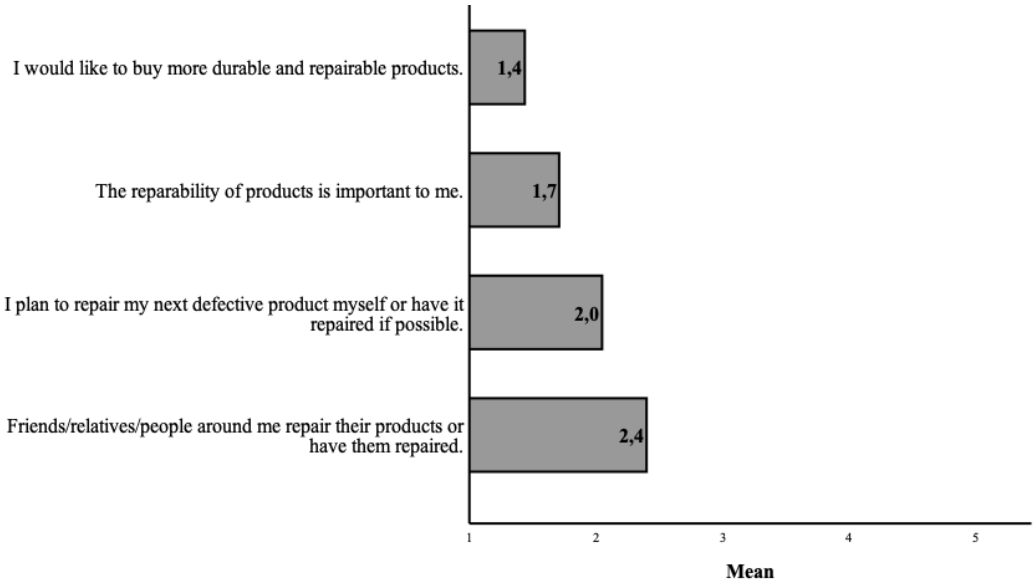

FIGURE 20: QUESTIONS - WILLINGNESS TO REPAIR

4.6.7 Financial incentives

The next section covers the *financial incentive*s. The four items were created by the author and were measured as before with a 5-point Likert scale. However, the resulting Cronbach's alpha value for the financial incentives scale was low at 0.525. Upon further analysis of the items, it was discovered that two items were measuring a different aspect of incentives compared to the others. Consequently, these two items were removed, and the scale was constructed using the remaining two items: "If repairs were cheaper, then I would have repaired more" and "Repairs should be discounted (e.g., subject to a reduced tax rate of 10%)". Following this modification, the Cronbach's alpha value improved to 0.574 (see table 7). It should be noted that Cronbach's alpha is typically lower for scales with only a few items.

TABLE 7: DESCRIPTIVES - FINANCIAL INCENTIVES

Scale		Descriptives	Number of Items	Cronbach's Alpha
Financial Incentives	*M*	1.65	2	0.574
	Md	1.50		
	Sd	0.67		
	Min	1.00		
	Max	4.50		

Note: the two items are "repairs should be discounted" and "if repairs were cheaper, than I would have more repaired."

A high level of agreement can be seen in the first two statements, which show a median of 1.6 and 1.7 respectively. Accordingly, it can be said that a large proportion of respondents would be in favor of repairs being discounted and that the price does indeed have a significant impact on the decision to repair. As already mentioned, the last two items in figure 21 were not included in the scaling, as the wording specified a different aspect.

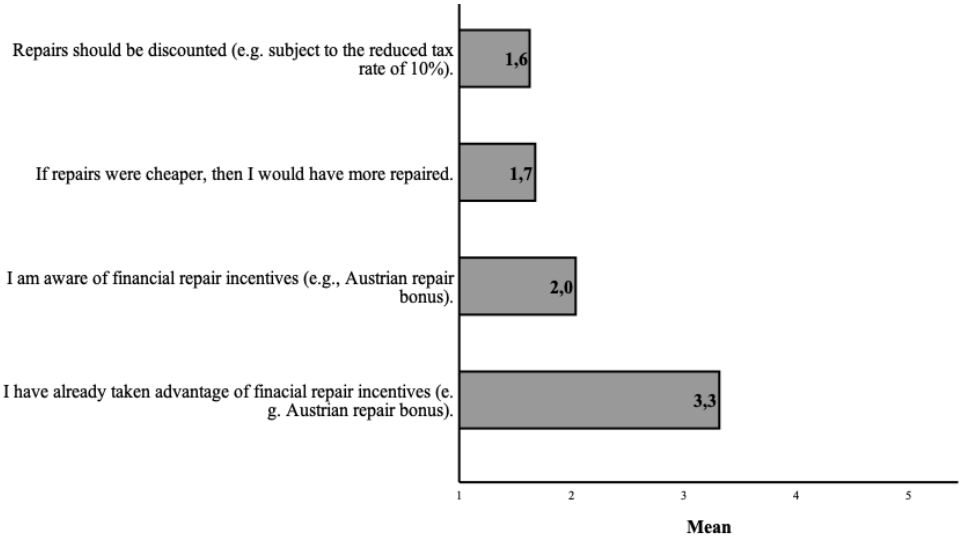

FIGURE 21: QUESTIONS - FINANCIAL INCENTIVES

4.6.8 Technical incentives

The *technical incentives* scale comprises four items, one of which is based on the consumer survey conducted by Kantar Public (2021), while the rest were developed by the author. To ensure measurement consistency, a 5-point Likert scale ranging from "agree completely" (1) to "disagree completely" (5) was used for all items. Descriptive statistics for the scale are presented in table 8. Overall, it is important (Md=1,25) to people to at least have the option of having products repaired or being able to repair them themselves.

TABLE 8: DESCRIPTIVES - TECHNICAL INCENTIVES

Scale		Descriptives	Number of Items	Cronbach's Alpha
Technical Incentives	*M*	1.46	4	0.760
	Md	1.25		
	Sd	0.55		
	Min	1.00		
	Max	4.00		

Based on the results displayed in figure 22, it is evident that there is a significant level of consensus among respondents regarding the statements presented. Specifically, a large proportion of respondents expressed a desire for easy access to spare parts, rechargeable batteries (75%), and repair instructions (68%). Additionally, more than half (54.3%) of respondents strongly agreed that they would select more durable and repairable products if a repair index were made compulsory in Austria.

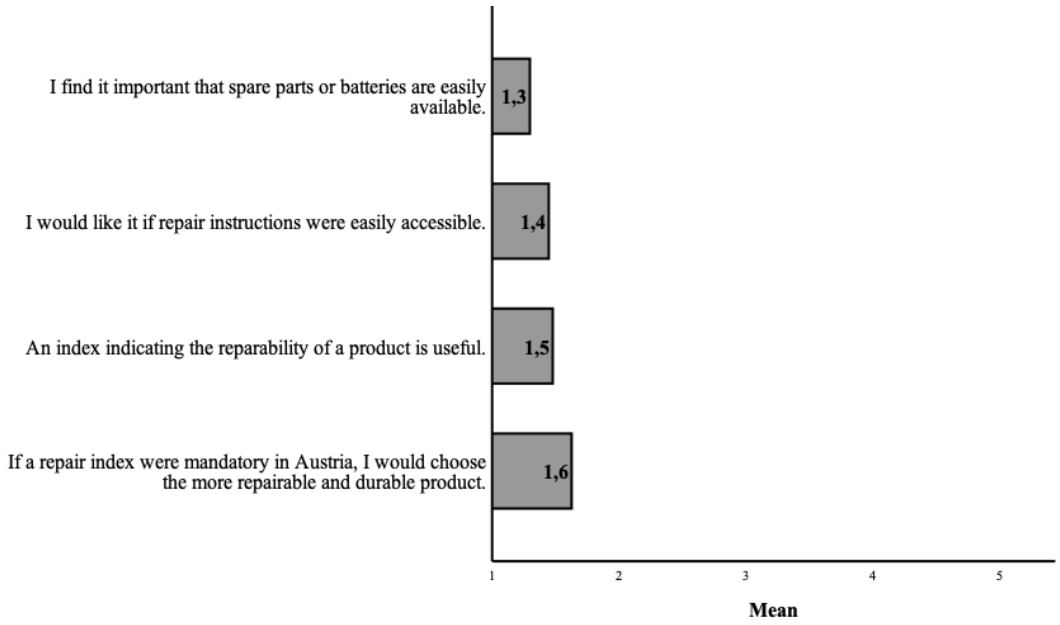

FIGURE 22: QUESTIONS - TECHNICAL INCENTIVES

4.6.9 Repair infrastructure

The questions asked in this section addressed the location as well as the satisfaction of the repair service providers in the respondents' neighborhood based on the research of Fachbach, Lechner, and Reimann (2022). The following figure visualizes the question whether repair service providers or cafes are available in the neighborhood as well as the follow-up questions (see figure 23). It can be clearly seen that more than half of the respondents (61.7%) do not know of any repair service providers or cafes in their neighborhood, but a majority (85%) of them stated that if there were any, they would take advantage of them and repair more.

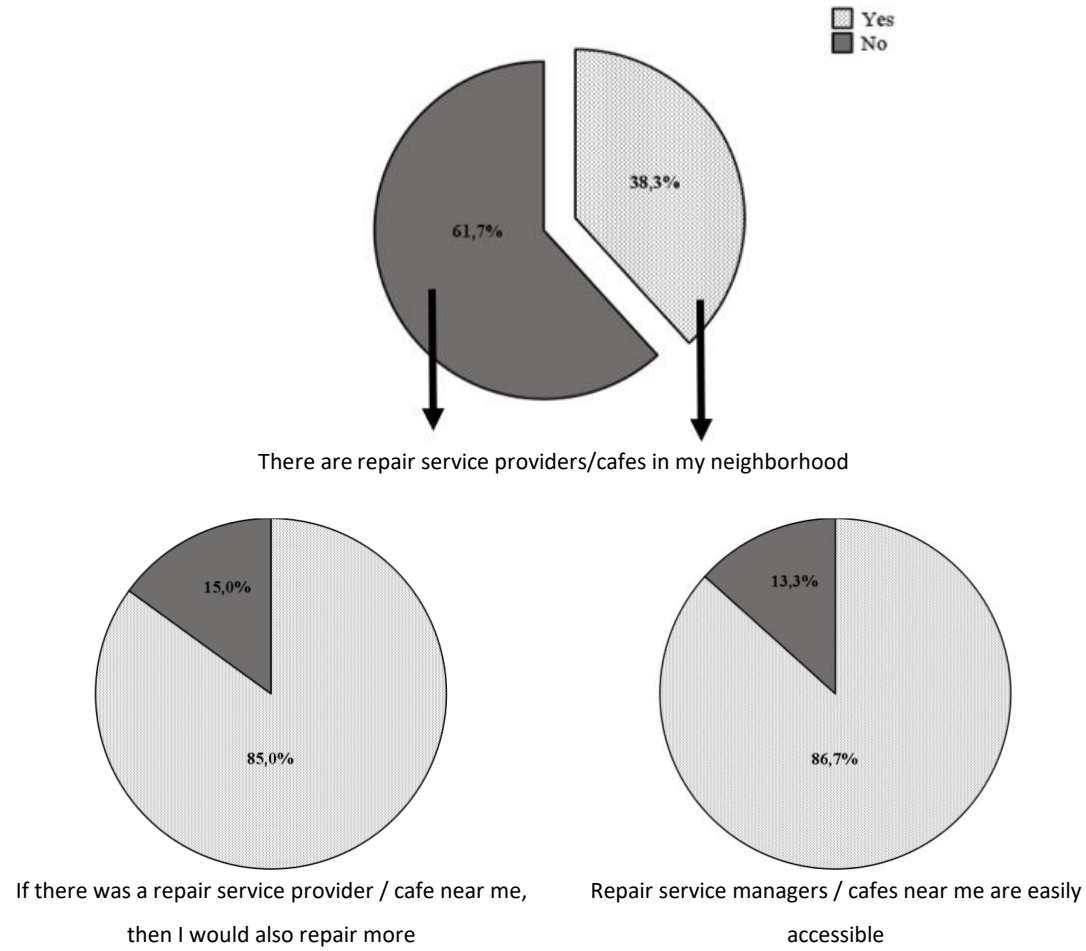

FIGURE 23: QUESTIONS - REPAIR INFRASTRUCTURE (1)

In addition, two questions were created to provide a more detailed insight into the topic of repair infrastructure. The first question was created by the author and the second is interesting in relation to the TPB model, which considers trust as an essential aspect of perceived behavioral control. To ensure consistency of the measurement scale, a 5-point Likert scale was

used, ranging from "strongly agree" (1) to "strongly disagree" (5). The results can be found in figure 24.

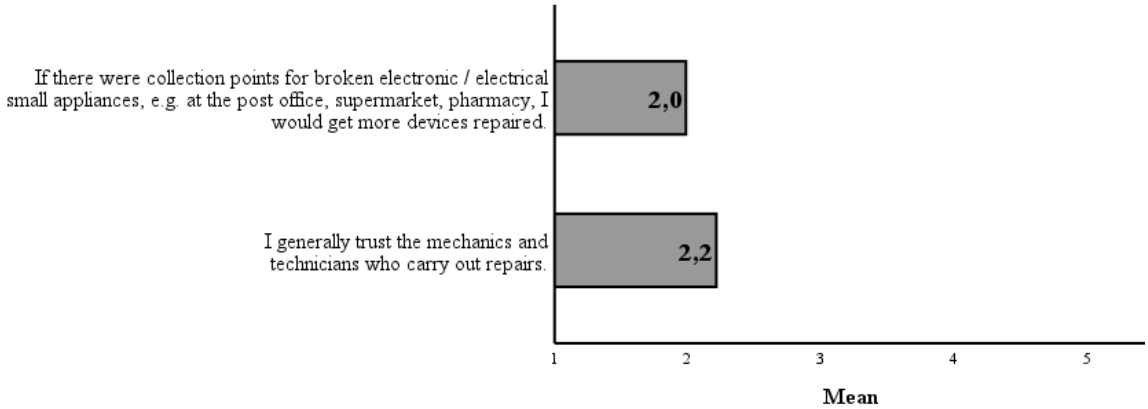

FIGURE 24: QUESTIONS - REPAIR INFRASTRUCTURE (2)

4.6.10 Perception government

In addition, four items covering the topic of the respondents' perceptions of the Austrians government with regard to measures that promote repair were developed. The items were created by the author but are not included in the hypotheses as they were used for descriptive purposes only. To ensure the consistency of the measurement scale, a 5-point Likert scale ranging from "agree completely" (1) to "disagree completely" (5) were used. The Austrian federal government's assessment in this respect can be regarded as average (Md=3), as can be seen in table 9.

TABLE 9: DESCRIPTIVES - PERCEPTION GOVERNMENT

Scale		Descriptives	Number of Items	Cronbach's Alpha
Perception government	*M*	3.13	4	0.774
	Md	3.00		
	Sd	0.84		
	Min	1.00		
	Max	5.00		

As seen in figure 25, respondents agreed less with the statements than with the previous scales. The statement "repairs have a high priority in government work" received the least agreement, with a median of 3.4. In this regard, it can be said that the participants do not perceive repair issues in government to be particularly strong.

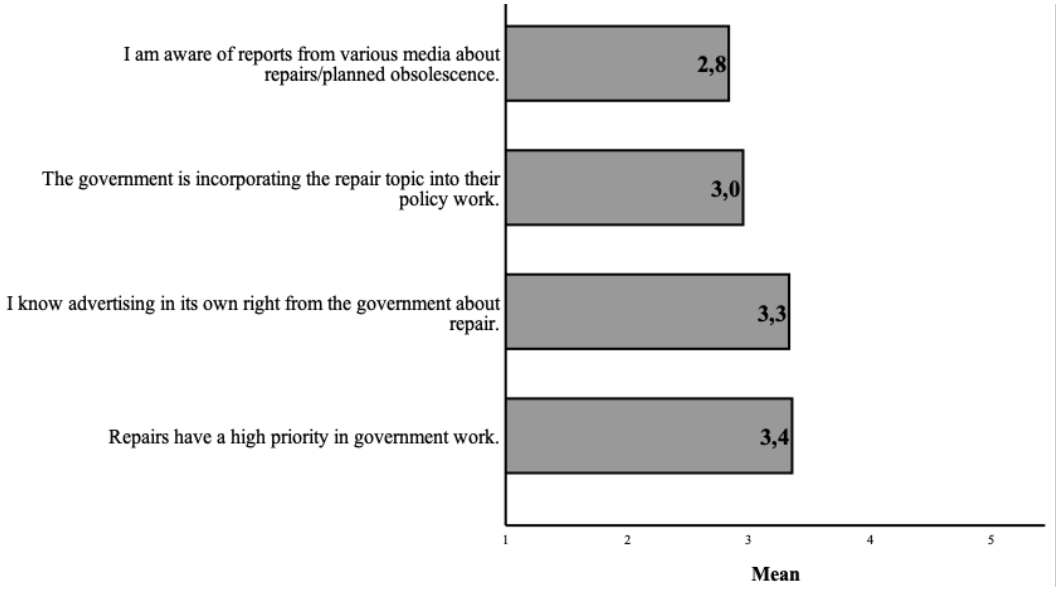

FIGURE 25: QUESTIONS - PERCEPTION GOVERNMENT

4.7 Summary of applied scales

Figure 25 displays boxplots illustrating the distribution of values for the different scales. The boxplots reveal that, with the exception of the *perception government* scale, the values are distributed with a right-skewed shape. This is evidenced by the presence of outliers at the upper end of the scale and a clustering of values at the lower end. The distributional pattern suggests a high level of agreement among respondents with the items that make up the scales. In contrast, the *perception government* scale shows a symmetrical distribution, with no clear indication of skewness. The Kolmogorov-Smirnov tests revealed all scales to be non-normally distributed (p>0.001, see appendix 3).

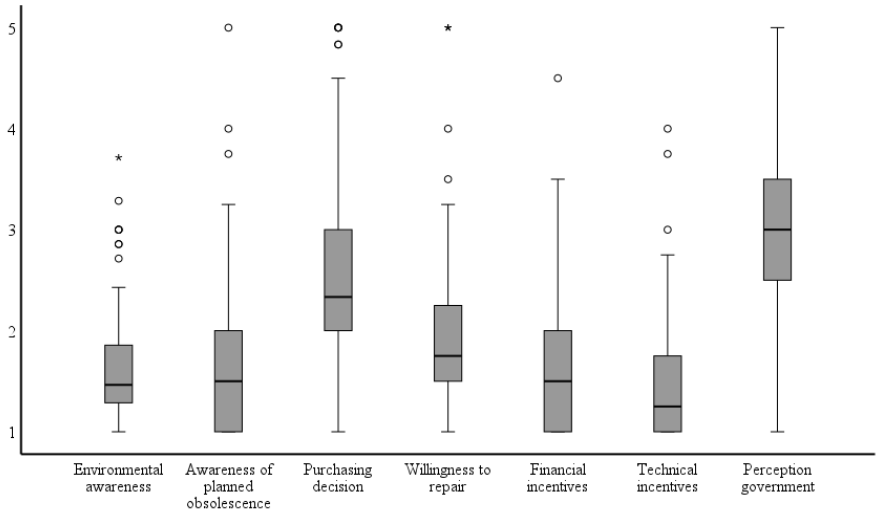

FIGURE 26: DISTRIBUTIONS OF THE VALUES OF THE SCALES

5 RESULTS

5.1 Testing of hypotheses

The subsequent pages describe the assessment of the hypotheses formulated for this study, categorized according to the research questions. Spearman correlations were used due to the non-normal distribution of the scale values, which is evident from the presence of outliers in figure 25.

5.1.1 Research question 1 (H1 – H6)

Table 10 displays the correlations (r) and the corresponding p-values (p) for all the hypotheses related to research question 1. In the following each hypothesis will be described.

TABLE 10: OVERVIEW HYPOTHESES CORRELATION - RQ1

			1	2	3	4	5
1	**Environmental awareness**	*r*	1	0,409***	**0,277*** **	**0,466*** **	**0,219** **
		p		<0,001	**<0,001**	**<0,001**	**0,005**
2	**Awareness of planned obsolescence**	*r*		1	**0,353*** **	**0,466*** **	**0,127**
		p			**<0,001**	**<0,001**	**0,109**
3	**Purchasing decision**	*r*			1	0,580***	0,220**
		p				<0,001	0,005
4	**Willingness to repair**	*r*				1	0,357***
		p					<0,001
5	**Performed repair**	*r*					1
		p					

Note: r = Spearman rank correlation, p = p-value, Correlations in bold refer to the hypotheses, *** Correlation is significant at the 0.001 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

H1: There is a relationship between the environmental awareness and the purchasing decision

The first hypothesis, which examines the link between a respondent's environmental awareness and purchasing decision, was evaluated through spearman correlation analysis. Table 10 indicates a significant correlation ($r=0.277$, $p<0.001$) between the two measures, leading to the rejection of the null hypothesis of H1. Since the correlation was positive, one may infer that a greater level of environmental awareness is linked to a greater probability of repairability being a contributing factor in the purchasing decisions.

H2: There is a relationship between the environmental awareness and their willingness to repair

Based on the conceptual research framework of this thesis, it is proposed that environmental awareness can act as a precursor to the willingness to repair. The acceptance of H2 ($r=0.466$, $p<0.001$) is supported by a significant correlation. This positive correlation suggests that an increased level of environmental awareness and knowledge can lead to a greater inclination to repair existing defect products whenever feasible.

H3: There is a relationship between the environmental awareness and a repair being performed

Hypothesis 3 examines the connection between environmental awareness and the likelihood of repairs being carried out. The null hypothesis for H3 was dismissed as a result of a significant outcome with a significant positive correlation ($r=0.219$, $r=0.005$), which suggests that environmental awareness is linked to the occurrence of repairs.

H4: There is a relationship between the awareness of planned obsolescence and the purchasing decision

Hypothesis 4 found a significant positive correlation ($r=0.353$, $p<0.001$), indicating that people who are more aware of planned obsolescence tend to prioritize repairability when making purchasing decisions.

H5: There is a relationship between the awareness of planned obsolescence and their willingness to repair

According to the conceptual research framework of this thesis, awareness of planned obsolescence is suggested to be a factor that can influence the willingness to repair. The significant correlation supporting the acceptance of H5 ($r=0.466$, $p<0.001$) confirms this proposal. This positive correlation implies that a higher level of awareness of planned obsolescence can result in a greater willingness to repair defective products.

H6: There is a relationship between the awareness of planned obsolescence and a repair being performed

Hypothesis 6 tested the correlation between the awareness of planned obsolescence and a repair being performed. No significant correlation ($r=0,127$, $p=0.109$) could be detected for H6 and hence the null hypothesis could not be rejected.

5.1.2 Research question 2 (HD7)

Spearman correlations were calculated to test the hypothesis necessary to answer research question 2. For this purpose, the statements on motivators and barriers as well as perceptions on repair were used and calculated with the willingness to repair scale. The analysis can be found in table 11 and 12.

TABLE 11: OVERVIEW HYPOTHESIS CORRELATION - RQ2 (1)

Statements		Willingness to repair
performed a repair in the past (n = 145)		
I associate an emotional value with the device (gift, inheritance, etc.).	*r*	0.000
	p	0.997
I need the device very urgently and delivery would take too much time.	*r*	-0.077
	p	0.358
I make a positive contribution to the environment with a repair.	*r*	**0,227****
	p	**0.006**
A repair is often cheaper than a new purchase.	*r*	-0.040
	p	0.636
no repair performed in the past (n = 21)		
There is no suitable repair store near me.	*r*	0.008
	p	0.973
The products I own are not repairable due to their design (cannot be disassembled, welded battery, spare parts not available).	*r*	-0.106
	p	0.649
The condition of the product (technically outdated/no longer modern enough).	*r*	-0.336
	p	0.137
A repair is not financially worthwhile compared to a new purchase.	*r*	-0.101
	p	0.663

Note: r = Spearman rank correlation, p = p-value, ** Correlation is significant at the 0.001 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

TABLE 12: OVERVIEW HYPOTHESIS CORRELATION - RQ2 (2)

Semantic differential		**Willingness to repair**
cheap – expensive	*r*	0,209**
	p	0.008
little effort – a lot of effort	*r*	0.032
	p	0.682
environmentally friendly-environmentally harmful	*r*	0,329***
	p	<0.001
easier than buying a new device – harder than buying a new device	*r*	0,237**
	p	0.002

Note: r = Spearman rank correlation, p = p-value, ** Correlation is significant at the 0.001 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

H7: There is a relationship between the motivators/barriers and the willingness to repair

Hypothesis 7 was assessed, and only one positive correlation was detected (see table 11). A significant finding was observed with a positive correlation (r=0.227, p=0.006), indicating that individuals who possess the motivator "I make a positive contribution to the environment with a repair" are more willing to engage in repairs. As a result, the null hypothesis for H7 was rejected. This outcome suggests that the participants' willingness to repair is attributed to their motivation to contribute positively to the environment. It should be noted that the motivators were presented within a filter question, and only 145 participants of the online survey responded to them. Regarding the barriers, no correlation was identified.

A Spearman correlation analysis was conducted using the values of the semantic differential and the willingness to repair scale (see table 12). The results indicated three significant positive correlations. Participants who reported that repairing was cheaper (r=0,209, p=0.008), more environmentally friendly (r=0.329, p<0.001), and easier than purchasing a new device (r=0,237, p=0.002) showed a greater willingness to repair.

5.1.3 Research question 3 (H8 – H13)

In this subchapter, the hypotheses 8 to 13 of research question 3 are examined in more detail. The corresponding Spearman correlations are presented in table 13 below.

TABLE 13: OVERVIEW HYPOTHESES CORRELATION – RQ3

			1	**2**	**3**	**4**	**5**	**6**
1	Purchasing decision	*r*	1.000	0,580***	0,220**	0,174*	**0,349*** **	0.055
		p		<0,001	0.005	0.027	**<0,001**	0.488
2	Willingness to repair	*r*		1.000	0,357***	**0,284*** **	0,507***	**0,219** **
		p			<0.001	**<0,001**	<0,001	**0.005**
3	Performed repair	*r*			1.000	**0.149**	**0,187***	**0,184***
		p				**0.060**	**0.018**	**0.020**
4	Financial incentives	*r*				1.000	0,471***	0.069
		p					<0,001	0.381
5	Technical facilitation	*r*					1.000	0.056
		p						0.481
6	Repair infrastructure	*r*						1.000
		p						

Note: r = Spearman rank correlation, p = p-value, Correlations in bold refer to the hypotheses, *** Correlation is significant at the 0.001 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

H8: There is a relationship between financial incentives and the willingness to repair

H8 examined the link between financial incentives and willingness to repair. Table 12 displays a significant positive correlation (r=0.284, p<0.001), which supports the rejection of the null hypothesis. This suggests that individuals who are more willing to repair are likely to repair more frequently if the cost of repairs was lower.

H9: There is a relationship between financial incentives and a repair being performed

Hypothesis 9 tested the correlation between financial incentives and repairs being performed. However, no significant correlation (r=0.149, p=0.060) was found, meaning that the null hypothesis could not be rejected.

H10: There is a relationship between the technical facilitation and the purchasing decision

Hypothesis 10 suggests that there is a correlation between technical facilitation measures and the purchasing decision. The study found a positive correlation ($r=0.349$, $p<0.001$), indicating that those who consider repairability when making a purchase are more likely to support technical facilitation measures like the repairability index.

H11: There is a relationship between the technical facilitation and a repair being performed

Hypothesis 11, which examined the relationship between technical facilitation measures and repair behavior, was supported as there was a significant correlation found ($r=0.187$, $p=0.018$). Therefore, the null hypothesis was rejected.

H12: There is a relationship between a repair infrastructure and the willingness to repair

Hypothesis 12 showed a significant positive correlation ($r=0.219$, $p=0.005$) between repair infrastructure and the willingness to repair, which means that a better repair infrastructure leads to a higher willingness to repair.

H13: There is a relationship between the repair infrastructure and a repair being performed

Hypothesis 13 was supported by a positive correlation ($r=0.184$, $p=0.020$), indicating that participants living in a neighborhood with a well-developed repair infrastructure are more likely to have products repaired.

5.1.4 Demographic differences (HD1 – HD10)

In this subchapter, the hypotheses referring to the demographic differences 1 to 6 are examined in more detail. The corresponding Spearman correlations for all hypotheses are presented in table 14 below.

TABLE 14: OVERVIEW DEMOGRAHIC HYPOTHESIS CORRELATION

		Age groups	Level of education	Place of residence	Gender
Environmental awareness	r	**-0.096**	**-0,168***	-0.015	**-0,157***
	p	**0.223**	**0.033**	0.854	**0,046**
Performed repair	r	**0.007**	**-0,168***	**-0,184***	-0,154
	p	**0.929**	**0.035**	**0.020**	0,053
Awareness of planned obsolescence	r	**0.069**	**-0.091**	-0.028	0,001
	p	**0.382**	**0.252**	0.725	0,989
Willingness to repair	r	-0.106	0.003	**0.057**	**-0,289****
	p	0.181	0.974	**0.473**	**<0,001**

Note: r = Spearman rank correlation, p = p-value, Correlations in bold refer to the hypotheses, *** Correlation is significant at the 0.001 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed)

HD1: There is a relationship between age groups and environmental awareness

There was no significant correlation found between age and environmental awareness in HD1 (r=-0.096, p=0.223). Therefore, the null-hypothesis could not be rejected.

HD2: There is a relationship between awareness of planned obsolescence and age groups

No significant correlation could be detected between age and awareness of planned obsolescence in HD2 (r=0.069, p=0.382). Therefore, the null-hypothesis could not be rejected. The mean values for both HD1 and HD2 are displayed in figure 27.

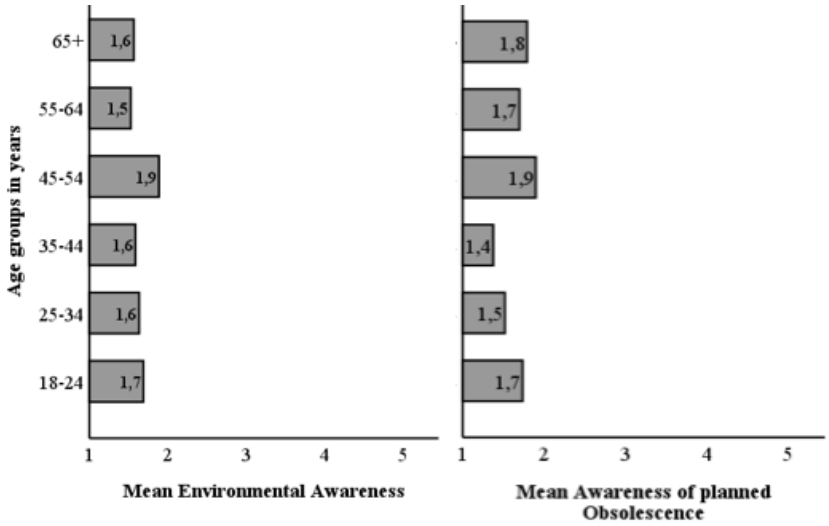

FIGURE 27: HD1 AND HD2

HD3: There is a relationship between performed repairs and age groups

No significant association was found between age and performed repair for HD3 (r= 0.007, p=0.929). The distribution of *answers* within each age group is presented in figure 28.

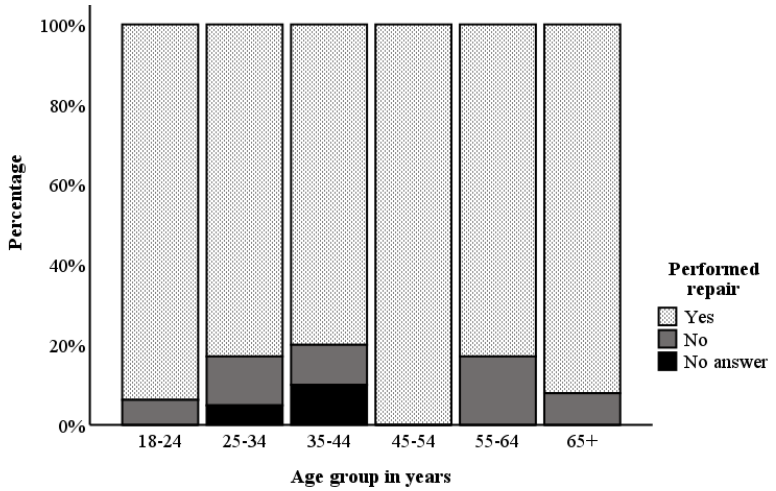

FIGURE 28: HD3

HD4: There is a relationship between environmental awareness and levels of education

HD4 revealed a significant correlation between environmental awareness and education level (r=-0.168, p=0.033), indicating that individuals with higher levels of education are more environmentally aware.

HD5: There is a relationship between awareness of planned obsolescence and levels of education

There was no significant correlation detected between awareness of planned obsolescence and the educational level (r= -0.091, p=0.252), suggesting that the educational level does not influence the awareness of planes obsolescence. Therefore, the null-hypothesis could not be rejected. The mean values for both HD4 and HD5 are displayed in figure 29.

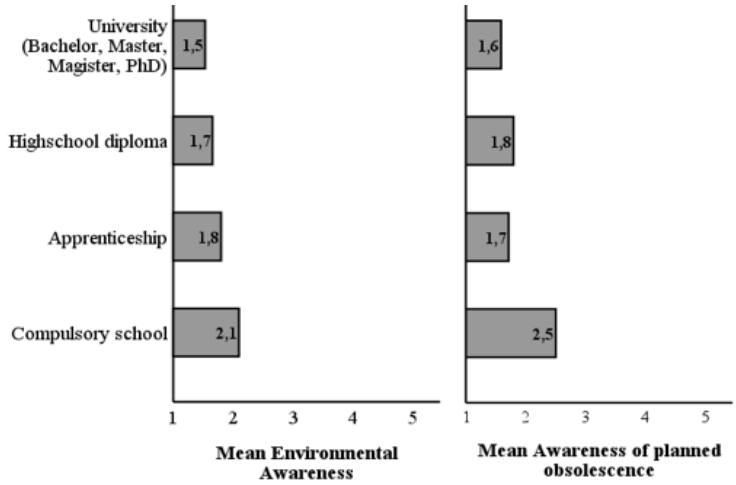

FIGURE 29: HD4 AND HD5

HD6: There is a relationship between performed repairs and levels of education

Hypothesis HD6 yielded a significant result. The analysis found a statistically significant correlation between the level of education and performed a repair (r= -0.168, p=0.035). The data suggest that a higher degree is associated with a greater likelihood of performing a repair, which is why H0 could be rejected (see figure 30).

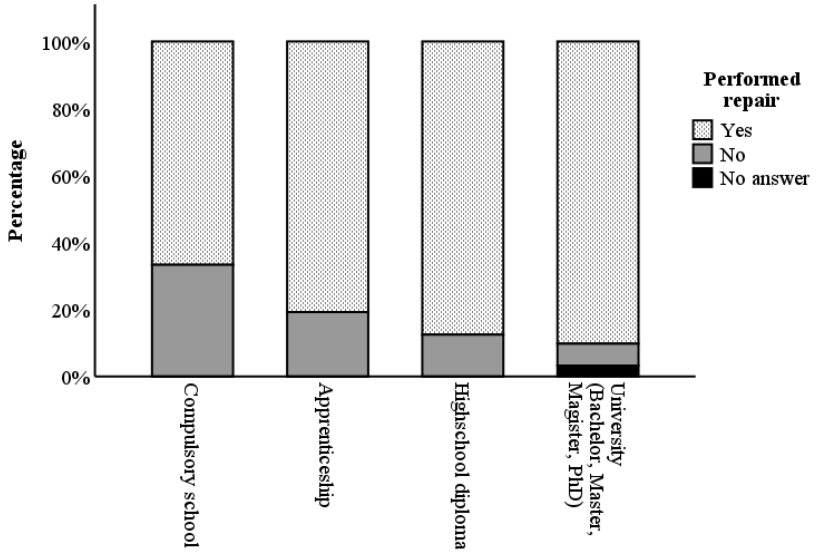

FIGURE 30: HD6

HD7: There is a relationship between environmental awareness and gender

Hypothesis HD7 yielded a significant result. The analysis found a correlation between gender and environmental awareness (r= -0.157, p=0.046). The data suggest that women have a higher environmental awareness than men. Furthermore, it is worth noting that none of the participants identified as "diverse."

HD8: There is a relationship between the willingness to repair and gender

Hypothesis HD8 yielded a significant result. The analysis found a statistically significant correlation between gender and the willingness to repair (r= -0.289, p<0.001). The data suggest that women have a significant higher willingness to repair compared to men.

HD9: There is a relationship between performed repairs and the place of residence

Hypothesis HD9 yielded a significant result. The analysis found a correlation between the place of residence and performed repair (r= -0.184, p=0.020). The data suggest that people who live in urban areas perform repairs more regularly. Figure 31 depicts that in big cities, over 90% of individuals have undertaken the repair of one or multiple devices, whereas in rural regions, the corresponding percentage stood at 70%.

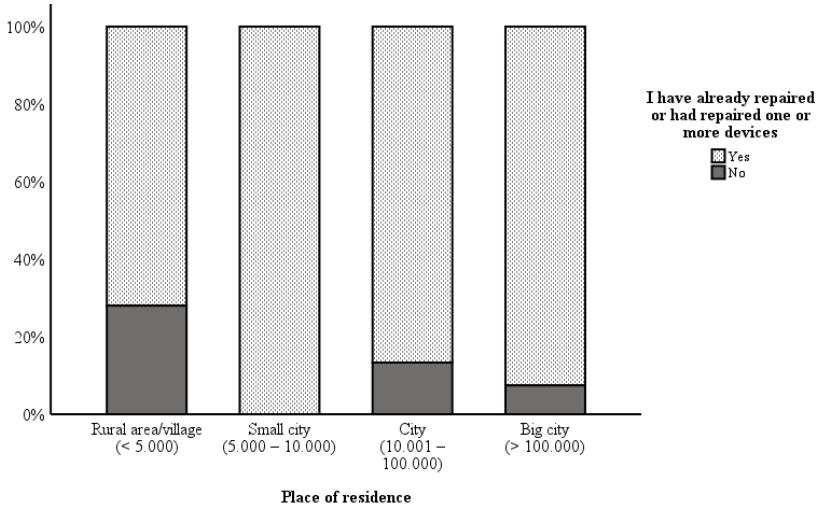

FIGURE 31: HD9

HD10: There is a relationship between the willingness to repair and the place of residence

There was no significant correlation found between the willingness to repair and the place of residence (r= 0.057, p=0.473), suggesting that the place of residence does not influence the willingness to repair. Therefore, the null-hypothesis could not be rejected.

5.2 Overview of results of hypothesis tests

Out of the total number of hypotheses tested, specifically HD6 and HD9, were rejected, whereas the remaining hypotheses demonstrated significant results and were accepted. For a comprehensive view of the study, table 15 exhibits all hypotheses along with their corresponding statistical test results.

TABLE 15: OVERVIEW OF RESULTS OF HYPOTHESIS TESTS (RQ1, RQ2, RQ3)

Hypothesis	Accepted	Rejected
H1	✓	
H2	✓	
H3	✓	
H4	✓	
H5	✓	
H6		x
H7	✓	
H8	✓	
H9		x
H10	✓	
H11	✓	
H12	✓	
H13	✓	

5.3 Discussion

5.3.1 Research question 1

How willing are Austrian consumers to participate in sustainable consumption patterns respectively how aware are they of planned obsolescence?

Despite the increased emphasis on the importance of the circular economy by different actors, such as manufacturers, consumers and policy makers, the linear model of "take, make and throw away" is still pervasive. The reasons for this are complex and include the fact that products are intentionally manufactured to break faster or appear outdated, as well as user attitudes and behaviors, and a lack of framework conditions. Against this background, the question arises to what extent Austrian consumers are willing to adopt sustainable consumption behavior, especially with regard to repairs.

The present study shows that Austrian consumers have a pronounced willingness to repair and consider the repairability of products to be important. Over 89.9% of respondents stated that they had already repaired a product, while 77.8% intend to repair their next product if feasible. Nevertheless, the analysis of the data reveals that in many cases the actual implementation of repairs is lower than the declared willingness to do so. Possible reasons for the discrepancy between declared willingness to repair and actual repairs are divers. For example, time, financial or organizational constraints could play a role in making it difficult to actually carry out repairs. In addition, a lack of skills or knowledge in the area of repair could also result in individuals being unable to make appropriate repairs despite their willingness to do so (see discussion of research questions 2 and 3).

Following the TPB model discussed in the conceptual framework (see chapter 3.1), environmental awareness and knowledge are important determinants that shape personal attitudes towards repairs. Therefore, an improvement in environmental knowledge leads to a more positive attitude towards repairs, which subsequently leads to a change in behavior. The results of hypotheses 1 to 6 show, that Austrian consumers are mostly familiar with the topic of sustainability (96.9%) and are also well informed about current issues (79.5%). The available data suggests, however, that women and those with a higher level of education have a higher level of environmental awareness. In addition, the data indicate that respondents possess a strong environmental awareness and a greater inclination towards repairing products, which motivates them to prioritize the purchase of repairable goods. This finding is consistent with the results regarding awareness of planned obsolescence.

The present study shows that those consumers in Austria who have decided to purchase products that can be repaired also subsequently carry out repairs more frequently. In particular, the 45-54 age group showed a higher level of repair activity. It was also evident that those with a higher level of education have a greater environmental awareness and therefore carry out repairs more frequently.

The available data show that consumers are aware that manufacturers intentionally design their products to break faster. A significant number of respondents (64.2%) reported familiarity with the term planned obsolescence, indicating an increased awareness of this issue within the surveyed population. The survey results emphasize that the majority of respondents assign a greater responsibility to manufacturers in addressing the issue of planned obsolescence. Additionally, a significant percentage, as much as 79%, advocate for a legal prohibition of planned obsolescence strategies.

5.3.2 Research question 2

How do Austrian consumers perceive repairs, and what are the key factors that motivate them to choose repair over replacement?

In the pursuit of a circular economy, repairing products instead of replacing them can be a valuable strategy to reduce waste and conserve resources. However, the decision to repair or replace a product rests with the user, so it is important to understand their motivations and decision-making factors in order to promote sustainable behavior.

To comprehensively address the first aspect of the research question, it is essential to emphasize the significant influence of individual perception on behavior, as highlighted in the TPB model (Ajzen, 1991). The empirical results of the present study confirm this proposition. In particular, it is shown that those participants who perceived a repair as inexpensive, environmentally friendly and comparatively less complicated than a new purchase were significantly more willing to carry out a repair.

According to the survey, more than half of the participants (58%) perceived a repair as environmentally friendly, which is related to the high level of environmental knowledge. However, only a few associated a repair with a low price (18.5%) or little effort (27.2%). Regarding the price and effort aspects, the majority of respondents showed a medium attitude. The survey revealed an almost even distribution of responses regarding the assessment of the ease of repairs compared to buying new devices. It can be surmised that the lack of specification

of a particular product group contributed to the observed distribution, as it is conceivable that each respondent was referring to a different product when answering and thus the assessment of the ease of repairs could vary. However, further research is needed to confirm this assumption.

According to Terzioğlu (2021), the drivers consisting of the motivators and the barriers are divided into technical, value-related and emotional aspects (see chapter 2.4.2). According to the results of the survey, the knowledge of making a positive contribution with the repair (emotional aspect) has been the greatest motivator for those who have already carried out a repair. The lower price compared to a new purchase also plays a major role, according to the respondents. The available data confirm this. People who cited the lower price as a motivation to carry out a repair also did so more frequently. On the other hand, people who had not yet carried out a repair stated that the high costs compared to buying a new product were a barrier to a repair (value aspect). The financial aspect, which includes both the price of the original product and the financial cost of repair, was cited as both a motivator and a barrier. These results are in line with previous studies, such as the work of Terzioğlu (2021) and the European Commission (2018).

When buying washing machines, dishwashers, ovens, smartphones, tablets, notebooks and PCs, the respondents attached particular importance to the fact that they are also repairable. This behavior may also be due to the fact that the purchase price of these product groups in particular is high and they are used frequently. These findings are in line with the European Commission's (2018) report, which highlights that consumers value durability and repairability when purchasing large and expensive products such as household appliances. According to Jaeger-Erben, Frick, and Hipp (2021), the motivation to repair is highly contingent on the product type. Specifically, products that are utilized on a daily basis, such as stoves or washing machines, elicit a stronger inclination towards repair.

The execution of repairs in Austria is currently experiencing a significant decline compared to past decades (Köppl, Simon, Meyer, & Schratzenstaller, 2019). The reason for this is not only the increased prosperity of the population, but also the increasing supply of low-priced products of inferior quality that break down more quickly and the ever faster innovation cycles. Interestingly, however, this study found that the desire for new, more modern products plays only a minor role as a factor in the decision not to repair, while the financial costs and the lack of infrastructure are significantly more decisive.

5.3.3 Research question 3

Which circumstances in the form of economic and legislative measures may reinforce the trend toward repairing products instead of replacing them?

Both the EU and national governments are currently taking steps to promote repairs and make them more accessible and cost-effective for consumers. However, the effectiveness of such measures and their acceptance by the public are important factors to consider. Drawing on behavior change theory (see Section 3.2), Condrey and Neaves (2019) suggest that policymakers must prioritize citizen support for these behaviors change policies to be successful. Despite the already implemented measures of the EU and the Austrian government regarding repairs, the evaluation showed that the scale "perception government" (see chapter 4.6.10) had the lowest agreement compared to the other scales with a median value of 3. In accordance with the findings, it can be inferred that a relatively small proportion of respondents indicated that the government places emphasis on addressing (27.8%) and prioritizing (14.2%) repair-related matters in its work. Hypotheses 8 to 13 provided insights into the measures at the political and economic level that can promote pro-repair behavior.

Design-related obstacles such as built-in batteries or unavailable spare parts prevent consumers from carrying out repairs. The majority of participants therefore wanted spare parts (75%) and repair instructions (68%) to be readily available, and the majority were in favor of introducing the French repair index (see chapter 2.3.1.3) in Austria. The results of the European Commission's behavioral study (2018) are relevant in this context. The said study revealed that consumers' limited knowledge about the durability and repairability of products exerts a significant influence on their purchasing decisions. As a result, improving consumer knowledge and providing technical information in a transparent way could help consumers to choose repairable products. The present study also confirms this assumption, as 88.3% of the participants stated that they would buy the product with the highest repair index.

As mentioned above, cost is an important factor in the decision to repair. The vast majority of participants (86.4%) in this study stated that they would be more willing to carry out a repair if the associated costs were lower. In addition, many respondents agreed with the idea that repairs of electrical and electronic equipment should be encouraged through benefits such as reduced VAT. With regard to the repair bonus, it was found that 74% of respondents had heard of it, although it should be noted that it becomes more familiar with increasing age. However, only 31.48% indicated that they had actually took advantage of it. According to the results, a

significant correlation could be observed between the awareness of the repair bonus and individuals' perceptions regarding the government's efforts towards repairs. Specifically, individuals who are familiar with the repair bonus tend to hold more positive views towards the government's efforts in this domain compared to those who are unaware of the bonus.

Infrastructural barriers such as the lack of repair service providers and skilled workers also hinder repair. While more than half of respondents (61.7%) said they did not know of any repair service providers or cafes in their neighborhood, the availability of repair shops would lead more than two-thirds of participants (85%) to repair more. The majority of repairs (72.6%) were performed by consumers living in large cities. The data also confirmed a positive significant correlation between repairs performed and size of residence. However, it is interesting to observe that there is no significant correlation between the size of the place of residence and the willingness to perform repairs. It can be concluded that although people in rural areas such as market towns or small cities show a high willingness to repair products, but they often face challenges due to insufficient infrastructure.

Overall, it can be said that technical facilitation has the strongest correlation with willingness to repair, followed by financial incentives and a well-established repair infrastructure.

5.4 Limitations

The present study utilized a chosen research instrument and sampling technique to obtain valuable insights that contributed to addressing the research questions. However, it is important to acknowledge certain limitations that must be considered. One notable limitation is associated with the convenience sampling method, which may introduce selection bias due to the researcher's self-selection of respondents. Additionally, this method is not considered representative of the general population. Given the challenges in obtaining more participants, the sample size was limited to 161, which is relatively small compared to the target group of 7.3 million people living in Austria above the age of 18 (Statistik Austria, 2023).

Demographic results of the study indicated that the participants' ages ranged from 18 to older than 65, with a median age range of 45 - 54, suggesting that the respondents were slightly older than the Austrian average of 43.2 (Statista, 2023a). To further investigate the topic in a more precise manner, future research is recommended to expand the sample size, thereby increasing the heterogeneity of the study population. Furthermore, it should be noted that a high

percentage of participants (56.8%) had university degrees, which does not accurately reflect the general public, where the percentage was 18.6% in 2022 (Statistik Austria, 2022).

An additional limitation refers to the methodology as the study solely relied on an online questionnaire. This may exclude digitally disadvantaged groups and potentially introduce sampling bias. Therefore, the inclusion of paper-and-pencil questionnaires in addition to online questionnaires could reduce this risk.

6 CONCLUSION

6.1 Summary

This master thesis has facilitated a extensive comprehension of the strategy of planned obsolescence, offering an overview of the factors contributing to its widespread prevalence in consumer society. To begin with, the theoretical basis of the product life cycle and planned obsolescence, its history and the different forms of obsolescence were discussed. As described in chapter 2.2, obsolescence can take different forms and questions not only the responsibility of manufacturers, but also that of consumers and politics. The accelerated pace of innovation cycles, frequent product introductions, and ubiquitous marketing strategies create a strong urge among consumers to opt for the latest product. In view of its enormous ecological consequences, the extension of product life cycles is becoming increasingly important in politics and society. On the one hand, there are the non-renewable raw materials that are often used for the production of cheap products and are thus missing for the energy turnaround, on the other hand, there are the growing mountains of waste with electronic scrap that are often illegally dumped and pollute wastewater and the environment. Repair is a critical element in the pursuit of the circular economy, as it contributes to a reduction in CO2-equivalent emissions, given that a significant portion of emissions occurs during the production stage. Extending the life of devices through repairs therefore minimizes the environmental impact of manufacturing.

The aim of this master thesis was to give an overview of repairability from an economic and legal point of view and to gain insights into the knowledge, perception and barriers of Austrian households regarding repairability. Additionally, the study examined various approaches that could motivate customers to purchase long-lasting and repairable products, thereby advancing the transition towards a circular economy and closing the research gap. A comprehensive literature review was undertaken, followed by quantitative research utilizing an online survey and statistical analysis, in order to accomplish this objective.

The results showed that Austrian consumers have a high level of environmental awareness and that the problem of planned obsolescence has reached the public. The majority of consumers would like products to last longer and also expect manufacturers to assume more responsibility. Perception also plays an enormous role in terms of willingness to repair, as it is often those who want to reduce their ecological footprint who are ultimately inclined to repair. However, the

data also show that there are challenges on the supply side. The data reveals that although consumers exhibit a willingness to repair their products, technical barriers, financial disincentives, and inadequate infrastructure, particularly in rural regions, impede their efforts. Hence, it is imperative to establish favorable political and economic conditions that foster demand for repair services and encourage the development of the repair industry.

6.2 Implications for relevant stakeholders

This master thesis deals with a possible approach to solve real problems, namely the shortage of raw materials and energy on the one hand and the disposal problem on the other hand. For this reason, the results can be relevant for many stakeholders. It requires environmentally aware, informed consumers, manufacturers who are willing to design their products in such a way that they are repairable, and legislators who create the necessary framework conditions.

One of the primary obstacles to repair is the cost associated with it. The reduction of indirect repair costs can be lowered with the help of regulatory interventions to improve repair capability as well as by facilitating the search for repair service providers. The Austria-wide repair bonus also contributes significantly to reducing direct repair costs. The findings of the study indicate that the repair bonus was utilized by less than one-third of the respondents, and that it can only be availed by those who possess smartphones or printers. Consumers who may not have access to such devices could be at a disadvantage as a result. It should also be questioned whether the entire savings of the reduced tax rate is passed on to the consumer.

The promotion of repairs as an accessible and cost-effective solution is crucial in improving attitudes toward repair. One way to promote the benefits of repair services is through information campaigns aimed at increasing public awareness. It is also important to expand the repair infrastructure, for example by creating repair cafes or similar facilities, to ensure that people who want to repair things have the opportunity to do so.

The last recommendation, would be the exchange of information about durability and repairability at the point of sale, for example in the form of the repair index. The results of the present study illustrate that consumers often lack information about the repairability of products and that the provision of such information can have a potentially significant impact on their purchase decision and repair decision.

6.3 Future research

During the research for this thesis, numerous significant findings were obtained regarding the attitudes and actions of Austrian consumers concerning their inclination towards repair. However, it is worth noting that there are still several other facets that require exploration in forthcoming studies.

An interesting direction for future research could be to investigate the relationship between utilizing repair services and engaging in self-repair, and to identify the factors that influence consumers' decision-making in this regard. It is suggested that such a survey could be product-specific, focusing on items such as household appliances or smartphones, to facilitate a more specific analysis and interpretation of the findings. The presented research recognizes that there is a disconnect between repair readiness and actual consumer behavior. To address this research gap, it is useful to conduct a qualitative experiment to determine actual consumer behavior. Such an experiment could provide a more comprehensive understanding of this discrepancy and identify effective strategies to bridge the gap between willingness to repair and actual behavior.

Another important aspect to be considered in future research is to conduct studies on a larger scale. In particular, similar studies could be conducted at the European level to generalize and confirm the results. A constraint of this study was the limited sample size, and expanding the sample would enhance the credibility and generalizability of the findings.

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APPENDICES

Appendix 1: Original online survey

1 Demographische Informationen

Haben Sie Ihren Lebensmittelpunkt in Österreich?

- ○ Ja
- ○ Nein

Welchem Geschlecht fühlen Sie sich zugeordnet?

- ○ Männlich
- ○ Weiblich
- ○ Divers

Zu welcher Altersgruppe gehören Sie?

- ○ 18-24
- ○ 25-34
- ○ 35-44
- ○ 45-54
- ○ 55-64
- ○ 65+

Was ist Ihre höchste abgeschlossene Bildungsstufe?

- ○ Pflichtschule
- ○ Lehrabschluss
- ○ Matura
- ○ Hochschule (Bachelor, Master, Magister, PhD)

Wo wohnen Sie?

- ○ Marktgemeinde/Dorf (< 5.000 Einwohner)
- ○ Kleinstadt (5.000 – 10.000 Einwohner)
- ○ Stadt (10.001 – 100.000 Einwohner)
- ○ Großstadt (> 100.000 Einwohner)

2 Environmental Awareness

Inwiefern stimmen Sie den folgenden Aussagen zu?

	stimme voll und ganz zu	stimme zu	stimme weder zu noch lehne ich ab	stimme nicht zu	überhaupt nicht zu
Der Begriff Nachhaltigkeit ist mir bekannt und mir ist die Bedeutung bewusst.	○	○	○	○	○
Ich befasse mich regelmäßig mit Nachhaltigkeitsthemen.	○	○	○	○	○
Mir ist bewusst, dass sich meine Lebensweise auf die Umwelt auswirkt.	○	○	○	○	○
Der Klimawandel wird durch die Handlungen der Menschen maßgeblich beeinflusst.	○	○	○	○	○
Elektroschrott hat schwerwiegende Folgen für die Erde. Ein Grund dafür ist, dass elektronische Geräte zahlreiche giftige Substanzen enthalten.	○	○	○	○	○
Wir nähern uns der Grenze der Zahl der Menschen, die die Erde aufnehmen kann.	○	○	○	○	○
Pflanzen und Tiere haben genauso ein Recht auf Existenz wie Menschen.	○	○	○	○	○

3 Awareness of planned Obsolescence

Ich kenne den Begriff „Geplante Obsoleszenz" bzw. „Geplante Alterung".

○ Ja

○ Nein

Inwiefern stimmen Sie den folgenden Aussagen zu?

	stimme voll und ganz zu	stimme zu	stimme weder zu noch lehne ich ab	stimme nicht zu	überhaupt nicht zu
Ich denke, dass einige Firmen ihre Produkte so gestalten, dass diese schneller altern bzw. schneller kaputt gehen.	○	○	○	○	○
Mir ist es schon passiert, dass elektronische/elektrische Geräte kurz nach Ablauf der Gewährleistungs-/Garantiedauer kaputt geworden sind.	○	○	○	○	○
Meiner Ansicht nach sollten Hersteller mehr Verantwortung für die Langlebigkeit ihrer Produkte übernehmen.	○	○	○	○	○
Die geplante Obsoleszenz/Alterung sollte vom Gesetzgeber verboten werden.	○	○	○	○	○

4 Purchasing decision

Wenn Sie neue elektrische oder elektronische Geräte kaufen, inwieweit ist dann die Reparaturfähigkeit bei den folgenden Produktgruppen ein Faktor, den Sie bei Ihre Kaufentscheidung berücksichtigen?

	ein sehr großer Faktor	ein großer Faktor	ein kleiner Faktor	ein sehr kleiner Faktor	kein Faktor
Waschmaschine, Geschirrspüler, Herd	○	○	○	○	○
Elektrische Kleingeräte wie Haarföhn, etc.	○	○	○	○	○
Smartphone, Tablet, Notebook, PC	○	○	○	○	○
Homeelectronics (Fernseher, Stereoanlage, Videorecorder, Gamekonsolen)	○	○	○	○	○
Küchenkleingeräte (Mixer, Kaffeemaschine, Brotschneidemaschine, Wasserkocher etc)	○	○	○	○	○
Staubsauger, Saugroboter	○	○	○	○	○

5 Performed repair

Inwiefern stimmen Sie den folgenden Aussagen zu?

	Ja	Nein	Keine Angabe
Ich habe bereits ein oder mehrere Geräte repariert oder reparieren lassen.	○	○	○
Ich habe bereits ein oder mehrere Geräte in den letzten 24 Monaten repariert oder reparieren lassen.	○	○	○
Ich war mit der Qualität der Reparatur zufrieden.	○	○	○
Ich bin prinzipiell gewillt meine Produkte reparieren zu lassen.	○	○	○

6 Motivators/Barriers

Wie würden Sie eine Reparatur bewerten?

günstig	○	○	○	○	○	teuer
wenig Aufwand	○	○	○	○	○	großer Aufwand
umweltfreundlich	○	○	○	○	○	umweltschädlich
einfacher als ein neues Gerät zu kaufen	○	○	○	○	○	aufwendiger als ein neues Gerät zu kaufen

Welche Aussagen sprechen Ihrer Meinung nach für eine Reparatur?

- [ ] Ich verbinde mit dem Gerät einen emotionalen Wert (Geschenk, Erbe etc.).
- [ ] Ich benötige das Gerät sehr dringend und eine Lieferung würde zu viel Zeit in Anspruch nehmen.
- [ ] Ich trage mit einer Reparatur einen Beitrag für die Umwelt.
- [ ] Eine Reparatur ist oft günstiger als ein Neukauf.

Welche Aussagen sprechen Ihrer Meinung nach gegen eine Reparatur?

- [ ] Es gibt keinen passenden Reparaturbetrieb in meiner Nähe.
- [ ] Die Produkte die ich besitze, sind konstruktionsbedingt nicht reparierbar (nicht zerlegbar, verschweißter Akku, Ersatzteile nicht erhältlich).
- [ ] Der Zustand des Produktes (technisch überholt/nicht mehr modern genug).
- [ ] Eine Reparatur lohnt sich finanziell nicht gegenüber einem Neukauf.

7 Willingness to repair

Inwiefern stimmen Sie den folgenden Aussagen zu?

	stimme voll und ganz zu	stimme zu	stimme weder zu noch lehne ich ab	stimme nicht zu	überhaupt nicht zu
Ich würde gerne langlebigere, reparierbare Produkte kaufen.	○	○	○	○	○
Die Reparierbarkeit von Produkten ist mir wichtig.	○	○	○	○	○
Freunde/Verwandte/Menschen in meinem Umfeld reparieren ihre Produkte oder lassen sie reparieren.	○	○	○	○	○
Ich habe vor, mein nächstes defektes Produkt selbst zu reparieren oder reparieren zu lassen wenn möglich.	○	○	○	○	○

8 Financial Incentives

Inwiefern stimmen Sie den folgenden Aussagen zu?

	stimme voll und ganz zu	stimme zu	stimme weder zu noch lehne ich ab	stimme nicht zu	überhaupt nicht zu
Wenn Reparaturen günstiger wären, dann würde ich auch mehr reparieren lassen.	○	○	○	○	○
Ich kenne Reparaturvergünstigungsmaßnahmen (z.B. Österreichweiter Reparaturbonus).	○	○	○	○	○
Ich habe Reparaturvergünstigungsmaßnahmen bereits in Anspruch genommen (z.B. Österreichweiter Reparaturbonus).	○	○	○	○	○
Reparaturen sollten vergünstigt werden (z.B dem ermäßigtem Steuersatz von 10% unterliegen).	○	○	○	○	○

9 Technical Incentives

Seit dem 1. Januar 2021 gibt es in Frankreich einen Reparatur-Index. Das Label zeigt Käufer*innen von Smartphones, Fernsehern, Laptops, Waschmaschinen und Rasenmähern in Form eines Punktestands zwischen 0 und 10 an, wie gut die Geräte reparierbar sind.

Inwiefern stimmen Sie den folgenden Aussagen zu?

	stimme voll und ganz zu	stimme zu	stimme weder zu noch lehne ich ab	stimme nicht zu	stimme überhaupt nicht zu
Ein Index, der die Reparaturfähigkeit eines Produkts anzeigt, ist sinnvoll.	○	○	○	○	○
Wenn ein Reparatur-Index in Österreich verpflichtend wäre, würde ich mich für das besser reparierbare und langlebigere Produkt entscheiden.	○	○	○	○	○
Ich finde es wichtig, dass Ersatzteile bzw. Akkus leicht erhältlich sind.	○	○	○	○	○
Ich fände es gut, wenn Reparaturanleitungen leicht zugänglich wären.	○	○	○	○	○

10 Repair infrastructure

Es gibt Reparaturdienstleister/-cafes in meiner Nachbarschaft.

○ Ja

○ Nein

Inwiefern stimmen Sie den folgenden Aussagen zu?

	stimme voll und ganz zu	stimme zu	stimme weder zu noch lehne ich ab	stimme nicht zu	stimme überhaupt nicht zu
Wenn es für kaputte elektronische/elektrische Kleingeräte Sammelstellen zB. beim Postamt, Supermarkt, Apotheke, geben würde, würde ich mehr reparieren lassen.	○	○	○	○	○
Ich vertraue generell den Mechanikern und Technikern, die Reparaturen durchführen.	○	○	○	○	○

11 Reparier infrastructure 2

Wenn es einen Reparaturdienstleister/-cafes in meiner Nähe geben würde, dann würde ich auch mehr reparieren lassen.

- ○ Ja
- ○ Nein

Reparaturdienstleister/-cafes in meiner Nachbarschaft sind leicht erreichbar.

- ○ Ja
- ○ Nein

12 Perception government

Inwiefern stimmen Sie den folgenden Aussagen zu?

	stimme voll und ganz zu	stimme zu	stimme weder zu noch lehne ich ab	stimme nicht zu	überhaupt nicht zu
Reparaturthemen werden in die Arbeit der Regierung integriert.	○	○	○	○	○
Reparaturen haben einen hohen Stellenwert in der Regierungsarbeit.	○	○	○	○	○
Ich kenne Werbung in eigener Sache von der Regierung über Reparatur.	○	○	○	○	○
Mir sind Berichte aus diversen Medien über Reparaturen/geplanter Obsoleszenz bekannt.	○	○	○	○	○

13 Endseite

Vielen herzlichen Dank für Ihre Teilnahme!

Appendix 2: Translated online survey (English)

Demographic information

	Yes	No
Do you have your place of residence in Austria?		

Gender	
	Male
	Female
	Divers

Age	

	18-24
	25-34
	35-44
	45-54
	55-64
	65+

Highest level of education	
	Compulsory school
	Apprenticeship
	Highschool diploma
	University (Bachelor, Master, Magister, PhD)

Place of residence	
	Rural area/village (< 5.000)
	Small city (5.000 – 10.000 Einwohner)
	City (10.001 – 100.000)
	Big city (> 100.000)

Environmental Awareness

	Strongly agree				**Strongly disagree**
I am familiar with the term sustainability and I am aware of its meaning.					
I regularly keep myself informed with sustainability issues.					
I am aware that the way I live affects the environment.					
Climate change is significantly influenced by the actions of humans.					
Electronic waste has serious consequences for the earth. One reason is that electronic devices contain numerous toxic substances.					

We are approaching the limit of the number of people the earth can hold.					
Humans have the right to change the natural environment to meet their needs.					
Plants and animals have just as much a right to exist as humans.					

Awareness of planned Obsolescence

	Yes	No
I am familiar with the term "Planned Obsolescence" or "Planned Aging".		

	Strongly agree				Strongly disagree
I believe that some companies design their products to age or break faster.					
It has happened to me that electronic/electrical devices have broken shortly after the warranty/guarantee period has expired.					
In my opinion, manufacturers should take more responsibility for the longevity of their products.					
Planned obsolescence should be made illegal by lawmakers.					

Purchasing decision

When you purchase new electrical or electronic devices, to what extent is repairability a factor you consider in your purchase decision for the following product groups?

	A big factor				A small factor
Washing machine, dishwasher, stove					
Small electrical appliances such as hair dryers, etc.					
Smartphone, tablet, notebook, PC					
Homeelectronics (TV, stereo, VCR, game consoles)					
Small kitchen appliances (blender, coffee maker, bread slicer, kettle etc)					
Vacuum cleaner					

Performed repair

	Yes	No
I have already repaired or had repaired one or more devices.		
I have already repaired or had repaired one or more devices in the last 24 months.		
I was satisfied with the quality of the repair.		
I am in general willing to repair or have my devices repaired.		

Motivators/Barriers

I think a repair is						
cheap						expensive
little effort						a lot of effort
environmentally friendly						environmentally harmful
easier than buying a new device						harder than buying a new device

*Filter: If **Yes** for question "I have already repaired or had repaired one or more devices"*

Reasons that speak **for** a repair	*Multiple answer possible*
	I associate an emotional value with the device (gift, inheritance, etc.).
	I need the device very urgently and delivery would take too much time.
	I make a positive contribution to the environment with a repair.
	A repair is often cheaper than a new purchase.

*Filter: If **No** answered "I have already repaired or had repaired one or more devices"*

Reasons that speak **against** a repair	*Multiple answer possible*
	There is no suitable repair store near me.
	The products I own are not repairable due to their design (cannot be disassembled, welded battery, spare parts not available).
	The condition of the product (technically outdated/no longer modern enough).
	A repair is not financially worthwhile compared to a new purchase.

Willingness to repair

	Strongly agree				**Strongly disagree**
I would like to buy more durable and repairable products.					
The repairability of products is important to me.					
Friends/relatives/people around me repair their products or have them repaired.					
I plan to repair my next defective product myself or have it repaired if possible.					

Financial Incentives

	Strongly agree				Strongly disagree
If repairs were cheaper, then I would have more repaired.					
I am aware of financial repair incentives (e.g., Austrian repair bonus).					
I have already taken advantage of finacial repair incentives (e.g. Austrian repair bonus).					
Repairs should be discounted (e.g. subject to the reduced tax rate of 10%).					

Technical Incentives

Since January 1, 2021, there has been a repair index in France. The label shows buyers of smartphones, televisions, laptops, washing machines and lawnmowers how well the devices can be repaired in the form of a score between 0 and 10.

	Strongly agree				Strongly disagree
An index indicating the repairability of a product is useful.					
If a repair index were mandatory in Austria, I would choose the more repairable and durable product.					
I find it important that spare parts or batteries are easily available.					
I would like it if repair instructions were easily accessible.					

Repair infrastructure

	Yes	No

There are repair service providers/cafes in my neighborhood.		

	Strongly agree				Strongly disagree
Repair service providers/café in my neighborhood are easily accessible.					
If there was a repair service provider/cafe near me, I would get more repaired.					
If there were collection points for broken electronic/electrical small appliances, e.g. at the post office, supermarket, pharmacy, I would get more devices repaired.					
I generally trust the mechanics and technicians who carry out repairs.					

Perception government

	Strongly agree				Strongly disagree
The government is incorporating the repair topic into their policy work.					
Repairs have a high priority in government work.					
I know advertising in its own right from the government about repair.					
I am aware of reports from various media about repairs/planned obsolescence.					

Appendix 3: Tests of normality

	Kolmogorov-Smirnov[a]		
Tests of Normality	Statistic	df	Sig.
Environmental Awareness	0.153	162	<0.001
Awareness of planned obsolescence	0.157	162	<0.001
Purchasing decision	0.096	162	0.001
Financial incentives	0.205	162	<0.001
Technical incentives	0.211	162	<0.001
Perception government	0.100	162	<0.001
Willingness to repair	0.177	162	<0.001

a. Lilliefors Significance Correction

Appendix 4: Spearman Correlation (financial incentives)

I am aware of financial repair incentives (e.g., Austrian repair bonus).

	Valid Percent	**Cumulative Percent**
Strongly agree	44,7	44,7
Agree	30,4	75,2
Neither agree nor disagree	7,5	82,6
Disagree	11,2	93,8
Strongly disagree	6,2	100,0

I have already taken advantage of finacial repair incentives (e.g. Austrian repair bonus).

	Valid Percent	**Cumulative Percent**
Strongly agree	22,8	22,8
Agree	8,6	31,5
Neither agree nor disagree	12,3	43,8
Disagree	26,5	70,4
Strongly disagree	29,6	100,0

		I am aware of financial repair incentives (e.g., Austrian repair bonus).
I have already taken advantage of finacial repair incentives (e.g. Austrian repair bonus).	*r*	0,483**
	p	0,000

		I am aware of financial repair incentives (e.g., Austrian repair bonus).
Gender	*r*	-0,050
	p	0,531
Age	*r*	-0,232**
	p	0,003
Level of education	*r*	-0,079
	p	0,320
Place of residence	*r*	0,037
	p	0,637

		Perception Government
I am aware of financial repair incentives (e.g., Austrian repair bonus).	*r*	0,297**
	p	0,000