

LAPPEENRANTA-LAHTI UNIVERSITY OF TECHNOLOGY LUT
School of Business and Management
Master's Degree Programme in Strategy, Innovation and Sustainability

Karoliina Koistila

**CULTURAL BARRIERS TO CIRCULAR ECONOMY ADOPTION:
CONSUMER AWARENESS AND ATTITUDES TOWARDS REFURBISHED ICT
DEVICES**

Master's thesis 2020

Examiners: Professor Karl-Erik Michelsen
Associate Professor Laura Albareda

ABSTRACT

Author	Karoliina Koistila
Title	Cultural Barriers to Circular Economy Adoption: Consumer Awareness and Attitudes towards Refurbished ICT Devices
Year of completion	2020
Master's thesis	90 pages, 13 figures, 8 tables and 2 appendices
Examiners	Professor Karl-Erik Michelsen and Associate Professor Laura Albareda
Keywords:	circular economy, cultural barrier, consumption, consumer, awareness, attitude, refurbishment, ICT

The aim of this qualitative research is to explore consumption's role in circular economy and discover what cultural barriers prevent circular economy adoption. This objective is achieved by studying consumers' awareness of and attitudes towards refurbished personal ICT devices and if consumers' behaviour changes when awareness of consumption's consequences increases. Consumers' decision-making process regarding the buying of these devices is also explored.

This research was conducted in Helsinki, Finland in 2020. The primary data that was used for this study was acquired by 34 semi-structured interviews, of which 14 were pilot and 20 final interviews. The interviews were done in a store selling consumer electronics. Consumers, who were browsing for smart phones, laptops or tablets were approached for interview. The data was analysed with thematic and content analysis methods.

The results indicate that consumers lack information of circular alternatives, their availability in the market and the consequences of linear consumption. The concept of circular economy and more specifically of refurbishment is unknown for most consumers. Increased information was seen to significantly change consumers' perception of reused devices, which had an impact on their buying behaviour. Lack of transparency of the refurbishment process and recycling activities was also emphasised in this study. It was seen to cause uncertainty and doubt in consumers. A third emphasised aspect in the results is consumers' misperception of electronic products' lifetimes and quality. These three barriers all ultimately lead to lack of consumer awareness, which is, according to this research, the most pressing cultural barrier in the way of circular consumption.

TIIVISTELMÄ

Tekijän nimi	Karoliina Koistila
Työn nimi	Kulttuuriset esteet kiertotaloudessa: kuluttajien tietoisuus ja asenteet kunnostettuja mobiililaitteita kohtaan
Työn valmistumisvuosi	2020
Pro gradu -tutkielma	90 sivua, 13 kuvaa, 8 taulukkoa and 2 liitettä
Tarkastajat	Professori Karl-Erik Michelsen ja apulaisprofessori Laura Albareda
Hakusanat:	kiertotalous, kulttuuriset esteet, kulutus, kuluttaja, tietoisuus, asenteet, mobiililaitte

Tämän laadullisen tutkimuksen tavoitteena on tutkia kulutuksen roolia kiertotalouden toteutumisessa ja selvittää, mitä kulttuurisia esteitä kiertotalouden toteutumisen tiellä on. Tämä tavoite saavutetaan tutkimalla kuluttajien asenteita ja tietoisuutta kunnostettuja mobiililaitteita kohtaan, kuluttajien ostopäätösprosessia näiden laitteiden ostamiseen liittyen ja sitä, miten heidän käytöksensä muuttuu kun tietoisuus kulutuksen vaikutuksista lisääntyy.

Tutkimus toteutettiin Helsingissä alkuvuonna 2020. Tutkimuksen primaarinen aineisto koostui 34 semistrukturoidusta haastattelusta. Näistä haastatteluista 14 oli testihaastatteluita ja 20 lopullisia haastatteluita. Haastattelut toteutettiin liikkeessä, joka myy kuluttajaelektroniikkaa. Haastatteluun valittiin sellaisia henkilöitä, jotka etsivät uutta puhelinta, kannettavaa tietokonetta tai tablettitietokonetta.

Tutkimuksen tulokset osoittavat, että kuluttajilla ei ole laajaa tietoa kiertotaloutta tukevien tuotteiden olemassaolosta tai saatavuudesta, tai lineaarisen kulutuksen seurauksista. Kiertotalouden määritelmä, ja erityisesti kunnostetun elektroniikan konsepti, on useimmille tuntematon. Lisääntynyt tieto näytti merkittävästi parantavan mielikuvaa kunnostetuista tuotteista, joka vaikutti ostokäyttäytymiseen. Läpinäkyvyyden puute kunnostusprosessissa ja elektroniikan kierrätyksessä korostui tutkimuksessa. Tämä läpinäkyvyyden puute aiheuttaa epävarmuutta kuluttajissa. Kolmas merkittävä havainto oli, että kuluttajilla on lievästi vääriä käsityksiä elektronisten laitteiden käyttöajasta ja laadusta. Nämä kolme havaintoa viittaavat kaikki siihen, että kuluttajilta puuttuu tietoisuutta kiertotaloutta tukevista vaihtoehdoista ja niiden potentiaalista, joka tämän tutkimuksen perusteella on suurin este kiertotaloutta tukevalle kulutuskäyttäytymiselle.

ACKNOWLEDGEMENTS

I would like to thank the Finnish education system for enabling me to study 17 years free of charge, and the Employment Fund for the financial support that enabled me to go back to university as an adult. Thank you also to my supervisors at LUT, Kalle Michelsen and Laura Albareda, for your guidance. I am also grateful for the input of all the interviewees who took part in this study.

The biggest thanks go to my spouse, friends and family, who always support me in everything that I decide to do.

27 April 2020

Karoliina Koistila

TABLE OF CONTENTS

1. INTRODUCTION	1
1.1. Background of the study	1
1.2. Research gap and research questions.....	3
1.3. Scope of the study	4
1.4. Structure	5
2. LITERATURE REVIEW	6
2.1. Circular economy	6
2.1.1. Definitions and concept	6
2.1.2. Circular Economy in Finland: The Finnish and the EU Frameworks	11
2.1.3. Circular economy barriers	13
2.2. Consumption in the circular economy	15
2.2.1. Consumer attitudes and behaviour	16
2.2.2. Factors that affect consumer behaviour	18
2.2.3. The main challenges to circular consumption	20
2.2.4. Technology consumption	21
2.3. ICT products' role in circular economy	22
3. THEORETICAL FRAMEWORK.....	25
4. METHODOLOGY AND DATA COLLECTION.....	29
4.1. Research design	29
4.2. Data collection methods	30
4.3. The semi-structured interview design	31
4.4. Data analysis methods	32
4.5. Reliability and validity	34
5. EMPIRICAL RESULTS AND FINDINGS	36
5.1. Sample	36
5.2. Consumers' decision-making in purchasing personal ICT devices.....	39
5.3. Awareness of refurbished personal ICT devices	41
5.4. Attitudes towards refurbished personal ICT devices.....	44

5.5. The impact of increased awareness on the decision-making process.....	51
5.6. Demographics' influence on buying behaviour.....	54
6. DISCUSSION AND CONCLUSIONS.....	56
REFERENCES	62
APPENDICES.....	72

LIST OF TABLES AND FIGURES

Table 1. Age and gender structure.....	36
Table 2. Reasons for buying a new device.	38
Table 3. Research done in the decision-making process.	40
Table 4. The most mentioned attributes affecting the purchase decision.....	45
Table 5. Reasons to choose the purchasing location.	45
Table 6. Negative aspects associated with reused devices.	47
Table 7. Why Taitonetti's customers bought or considered buying a reused computer.	49
Table 8. Reasons for changing and not changing opinions.	54
Figure 1. Waste hierarchy based on the EU model.	8
Figure 2. Barrier framework.....	13
Figure 3. Consumer decision-making model.....	28
Figure 4. Device structure.	37
Figure 5. Internal information search.	40
Figure 6. External information search.	40
Figure 7. Types of research.	41
Figure 8. Awareness of refurbished devices' existence.	42
Figure 9. Level of awareness of the consequences of electronics consumption and production. ...	43
Figure 10. Feelings towards reused devices.	48
Figure 11. Reactions to information about consequences.	49
Figure 12. Changes in consumers' perception of reused electronic devices.....	52
Figure 13. Specific change patterns in consumers' perception of reused electronic devices.....	53

LIST OF SYMBOLS AND ABBREVIATIONS

B2B	Business-to-business
C2C	Consumer-to-consumer
CE	Circular Economy
CO ₂	Carbon dioxide
EU	European Union
GHG	Greenhouse gas
ICT	Information and Communications Technology
PCE	Perceived Consumer Effectiveness
VAT	Value-added tax

1. INTRODUCTION

1.1. Background of the study

Consumption has traditionally been used as a measurement of welfare and regarded as the main driver of economic growth. Consumption is not only luxury, it is also a personal necessity and it is needed for a functioning economic system. (Sheth, Sethia and Srinivas 2011, 24.) However, due to population growth, increase in income, technological development and the deeply rooted growth mindset, among other reasons, we are currently experiencing rapid overconsumption of natural resources (Wiedmann *et al.* 2015, 6275) and are exceeding the planetary boundaries (Rockström *et al.* 2009).

Circular economy has been proposed as one solution to this problem. By extending the life cycle of produced goods by repairing, reusing, remanufacturing and recycling them, we can reduce the amount of virgin materials in production chains. The aim is to develop systems, which would enable us to achieve sustainable production and consumption. (Kirchherr, Reike and Hekkert 2017, 224.) Reducing consumption is the main challenge, however (Peronard and Gammelgaard Ballantyne 2019, 5), and is prioritised over repair, reuse, remanufacture and recycling in the waste hierarchy (European Commission 2019a).

Material objects and the relationships people build with their belongings characterise the contemporary society (Magaudda 2015, 3). Especially personal information and communication technology (ICT) devices, such as smartphones, computers and tablets, have become a crucial element in how we interact in the social world (*ibid.*, 1), even shaping identities and status. These devices are, however, quite problematic causing environmental and social damage, especially in the sourcing, manufacturing and end-of-life stages of their life cycle (Deng, Babbitt and Williams 2011, 1205; Williams 2011, 356; Fitzpatrick *et al.* 2015, 974; Ryder and Zhao Houlin, 2019).

ICT devices have large potential for material recovery and reuse (André, Ljunggren Söderman and Nordelöf 2019, 268). ICT has undergone a fast technological development (Schaller 1997, 53; André *et al.* 2019, 268) with the downside being that this fast development and fast product

cycles result in underutilising the lifetimes of these products (Proske *et al.* 2016, 2, 7). These products contain a vast amount of different metals and minerals (Graedel *et al.* 2015, 6295) that can be reused. This would reduce the global environmental impacts of personal ICT devices by reducing the need to extract primary materials (Cole *et al.* 2019, 418).

Recent research has concluded that the main barriers to circular economy are cultural, such as doubtful company culture and lack of interest expressed by consumers. Indeed, consumers are key actors in the circular economy – it won't succeed without attitude and behaviour changes, for example giving up ownership of goods and adopting a lifestyle of repairing and reusing (Camacho-Otero, Boks and Nilstad Pettersen 2018, 2). Some studies have already indicated a shift in consumer behaviour (Egol, Clyde and Rangan 2010). It seems that in some cases individual attitudes towards sustainability are already adopted (Salonen *et al.* 2014, 76), but it has not led to actual behavioural changes, especially not in the collective level (Leiserowitz, Kates and Parris 2004, 37). However, circular economy is not only on consumers' shoulders, but requires cross-sector cooperation. Societies for example can encourage reusing of products, which can inflict positive attitudes in consumers (Gaur *et al.* 2015, 32), and companies can implement circular business models to offer circular options for consumers.

The reuse business has grown rapidly in recent years and it spans through almost all product categories, including personal ICT products. There are several providers of reused and refurbished personal ICT products in Finland, of which one of them was interviewed for this paper. Taitonetti Oy is the biggest seller of refurbished computers in Finland. Circular economy is one of their key principles. They buy used computers and laptops from leasing companies, refurbish them and sell them in their physical store or, mostly, on their online store. Their products are considered to be of high quality, because they only buy devices used by companies: devices manufactured for business-use are usually more efficient and made of higher quality materials, with a longer expected lifetime than consumer devices. During 2019 they sold approximately 28 000 used devices, and calculated almost 4 million kg of saved CO₂ emissions. (Heikkilä 2020a, 2020b.)

1.2. Research gap and research questions

Even though circular economy has been much talked about in recent years, the potential of it remains largely unexplored (Korhonen *et al.* 2018, 545; Marrucci, Daddi and Iraldo 2019, 8) and according to de Jesus and Mendonça (2018, 85), the CE framework needs “more empirical content”. However, literature on CE has grown significantly in recent years (Geissdoerfer *et al.* 2017, 22; Marrucci *et al.* 2019, 8) and focused mainly on the production side of production and consumption systems (Marrucci *et al.* 2019, 8). Most studies have focused on tools, metrics, instruments and indicators on the single-firm and industry levels. Norms, values and visions of circular economy in our prevailing culture have not been studied in the same amounts. (Korhonen *et al.* 2018, 551; Merli, Preziosi and Acampora 2018, 717.) Especially, in relation to culture, the consumer point-of-view is still somewhat unexplored (Kirchherr *et al.* 2017, 229; Camacho-Otero *et al.* 2018, 1). This would indicate a gap in research, that I aim to address.

Circular economy has been suggested as a new paradigm shift (Merli *et al.* 2018, 719; Marrucci *et al.* 2019, 2), which would fundamentally change how we produce and consume. However, for a paradigm shift to occur, circular economy should be fully integrated in our society. In addition, as Korhonen *et al.* argue (2018, 550), the two stages of a paradigm shift should undergo a transformation before the shift can occur. The two stages are the paradigm stage, which is related to norms and values and culture, and the second, the practice stage, is more descriptive and analytic, focusing on tools, metrics and instruments. As mentioned, the existing research has largely focused on the second stage, and therefore it would be important to conduct studies that would focus on the first stage, so that we can eventually move towards a paradigm shift. Therefore, filling the identified research gap would require studies on how the needed transformation can be triggered and adopted in the individual level (Camacho-Otero *et al.* 2018, 17-18).

Reuse activities originate from the B2B market. The consumer-perspective on reuse activities is still somewhat unexplored in research (van Weelden, Mugge and Bakker, 2016, 744) as well as consumers’ perception of remanufactured products (Gaur *et al.* 2015, 31). After studying the relation of consumption and CE, Camacho-Otero *et al.* (2018, 8) identified the types of studies conducted in the field of consumption in the CE. Over 60% of the 113 papers reviewed focused

on drivers and barriers affecting consumers' adoption of CE solutions, making it the most researched area in this field. Following the main research paradigm, the focus of this paper is on consumer attitudes on CE solutions. This aspect is considerably less studied by scholars (7 out of 113 papers), as well as on the level of awareness of the existence of CE alternatives to new products, which has been identified as one of the main barriers of CE implementation (Kirchherr *et al.* 2018, 268; Vermunt *et al.* 2019, 898). Several researchers have concluded that existing research is not enough to completely understand how consumers feel about reused products (van Weelden *et al.* 2016, 2). These are the aspects I aim to address with this study.

Based on the above analysis, the research questions for this thesis are the following:

What are the cultural barriers which affect consumers' attitudes and purchase decisions?

Sub-question 1. How do consumers form purchase decisions for personal ICT devices?

Sub-question 2. What is the level of awareness of the existence of refurbished personal ICT devices among consumers shopping for a new alternative of such products?

Sub-question 3. What are the cultural explanations for not choosing the circular alternative?

Sub-question 4. How do consumers' perception and attitudes towards the circular alternative change when they are told about the environmental and social impact of electronics' production and consumption?

1.3. Scope of the study

This study focuses on consumption of personal ICT devices, i.e. smart phones, laptops and tablets, and studies how this kind of consumption fits in the concept of circular economy.

Electronic devices are found to be the least connected with ethical problems by consumers (Wheale and Hinton 2007, 313), even though high environmental and social concerns are associated with their manufacturing and disposal (Williams 2011, 356; Fitzpatrick *et al.* 2015,

974; Graedel *et al.* 2015, 6295; Ryder and Zhao Houlin 2019). This presents interesting research possibilities. Because electronic and ICT devices include a very wide variety of different products, some limitations were needed. Smart phones, laptops and tablets were chosen, because they represent a typical consumer device, their life cycles are relatively short and are therefore replaced quite often, and they have proven to have high potential for refurbishment and reuse (Ylä-Mella, Keiski and Pongrácz 2015, 375-376).

The terms refurbish and remanufacture describing reuse strategies are often used as synonyms in literature, even though there is a slight difference (van Weelden *et al.* 2016, 743). Because limiting the study on one of these terms would limit existing research too much, both of these terms are used.

Qualitative methods were chosen for this study and interviews are to be conducted in an actual purchasing location. This is because most studies in this field regarding customer acceptance, attitudes or behaviour are quantitative and done in hypothetical situations (van Weelden *et al.* 2016, 744). The focus of this study is on consumers who are shopping for *new* smart phones, laptops or tablets. This limitation to new products was necessary to discover the level of awareness of the circular alternatives available on the market and attitudes toward them.

In order to understand how behavioural change comes about, it is important to discover people's motives, beliefs and attitudes (Stern 2000, 408). Consumers' acceptance, attitudes and beliefs, that lead to a change in consumption behaviour, are in a key role in achieving circular economy. Therefore, the limitation of focusing on discovering awareness and attitudes was made.

1.4. Structure

This paper is organised as follows. First, existing research relating to circular economy, consumption behaviour and ICT devices is presented in the literature review. This is followed by the theoretical framework that guided the execution of the research process. In chapter 4, the research context, methods for data collection and analysis, and reliability and validity are presented. This is followed by the results and key findings of the research, and finally discussion and conclusions are presented.

2. LITERATURE REVIEW

In this section, research relevant to this study is reviewed. The purpose of this section is to get a wide understanding of circular economy and how consumption fits in the concept, and to explore the research that has already been done in the field. First, the CE concept is explored; what it means, where are we in implementing it in Finland and the EU and what are the most pressing barriers preventing the implementation. Next, consumption in the CE is explored and lastly personal ICT products' potential to CE is evaluated.

2.1. Circular economy

This first chapter explores the concept of CE; what does it mean and what has happened in the field of CE in recent years.

2.1.1. Definitions and concept

Circular economy as a concept is not new, as it has been discussed more or less since the 1960s (Kirchherr *et al.* 2018, 264). For example Boulding (2013, 4–5), in 1966, writes about the “spaceman economy” of the future, defined as a closed, cyclical system which can produce material goods, but where production and consumption are minimised. Today the CE discussion revolves mainly around sustainable development, and CE has indeed been proposed as one solution to our current environmental problems (Homrich *et al.* 2018, 526; Korhonen *et al.* 2018, 544).

Circular economy has been defined in different ways and therefore criticized as too vague for proper implementation (Kirchherr *et al.* 2017, 221). CE has been proposed to arise from or relate to a variety of other concepts, such as the green economy (ibid, 221), cleaner production (Kravchenko, Pigosso and McAloone 2019, 2), industrial ecology, cradle-to-cradle (Geissdoerfer *et al.* 2017, 6) and product-service-systems (de Jesus and Mendonça 2018, 75). After a throughout review of published research, Korhonen *et al.* (2018, 547) came to the following definition:

“CE is a sustainable development initiative with the objective of reducing the societal production-consumption systems' linear material and energy throughput flows by applying materials cycles, renewable and cascade-type energy flows to the linear system. CE promotes high value material cycles alongside more traditional recycling and develops systems approaches to the cooperation of producers, consumers and other societal actors in sustainable development work.”

This definition includes three important aspects that require elaboration. First, we are currently living in a linear, “take-make-waste” economy, where goods are produced from virgin materials, used and then disposed of (Andersen 2007, 2; Kristensen and Mosgaard 2020, 2). This induces major pressure to all dimensions of sustainability, the environment, society and economic, and does not help our efforts of staying within the nine defined planetary boundaries (Rockström *et al.* 2009, 25). For example, the current linear economy is creating greenhouse gas emissions, biodiversity loss (McDonough and Braungart 2002, 18) and waste (Balanay and Halog 2016, 223), poverty and cultural disturbance, as well as lost investments (Prno and Scott Slocombe 2012, 346).

Secondly, circular economy is often seen as a synonym for recycling (Ranta *et al.* 2018, 71). However, recycling is only one aspect of CE. This can be described with the 4R framework, which for example the EU uses as guideline in its waste management (European Commission 2019a). The 4R's are Reduce, Reuse, Recycle and Recover. The order of these terms is significant, as each of them depict priority over the others, i.e. the 4R framework presents a waste hierarchy. (Kirchherr *et al.* 2017, 223.) This hierarchy can also be extended to include six (Bonilla Hernandez *et al.* 2019, 547) or even nine steps (Potting *et al.* 2016, 5). Please see Figure 1 for a demonstration of the hierarchy.

The first step, reduce, happens before a product is classified as waste, by using less resources throughout the product's life cycle (Bonilla Hernandez *et al.* 2019, 547). Preventing waste altogether saves efforts in the later stages of the product life cycle.

Reuse has different definitions depending on the framework. In its simplest form, reuse means that another user uses a product discarded by its previous owner. In this case, the product is in

good condition to be used again. If the product can no longer fulfil its original function, it can be repaired or refurbished, or its components can be used to remanufacture a similar product. (Potting *et al.* 2016, 5.) There is no clear consensus how refurbish and remanufacture should be defined, but there is a slight difference between the two, relating to quality standards and to the level of disassembly (Gaur *et al.* 2015, 31). In refurbish the product stays mainly the same, but it or its components are updated to a satisfactory condition (Gaur *et al.* 2015, 31; van Weelden, *et al.* 2016, 743), and in remanufacture, components from different sources can be used to build a new product, that has the same functions and quality as the original (Matsumoto *et al.* 2016, 129).

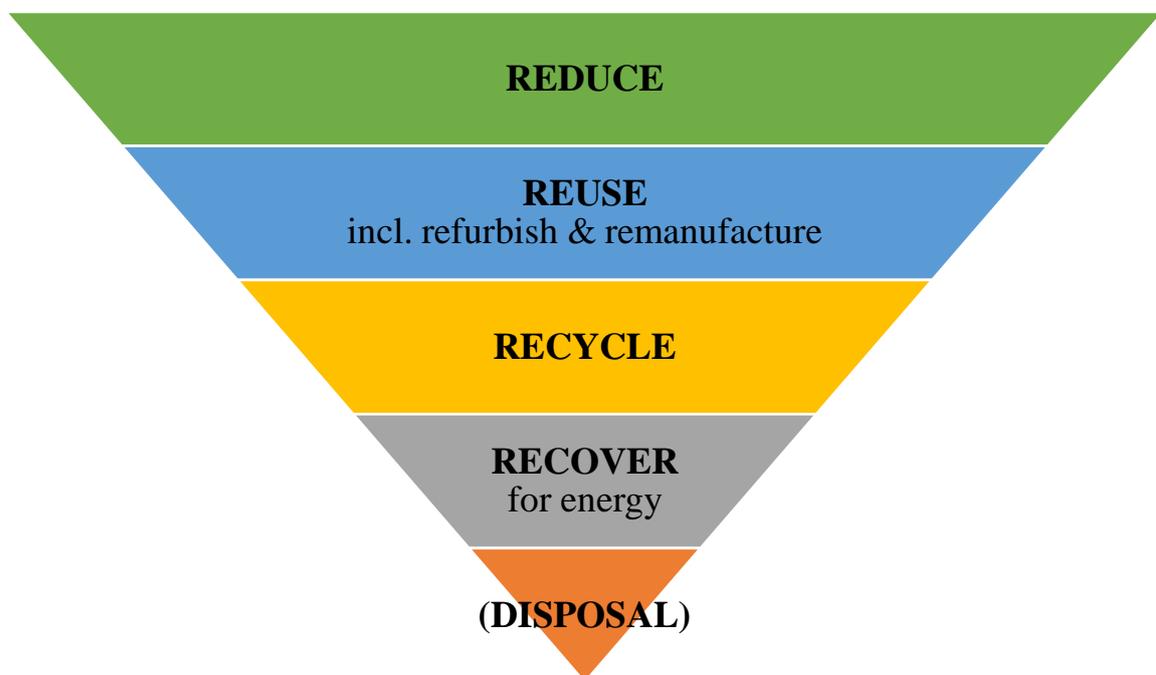


Figure 1. Waste hierarchy based on the EU model (European Commission 2019a).

Recycling can be defined as using materials that are considered waste to manufacture new products (Bonilla Hernandez *et al.* 2019, 547). Often this means downcycling, i.e., the material quality decreases during the recycling process and the end-product is of lower quality or value than the original product (McDonough & Braungart 2002, 56 as cited in Kirchherr *et al.* 2017, 223). This is because products often contain many different materials, in an alloy form. Separating them for recycling is difficult, and they might compromise the quality. (Johnson *et al.* 2007, 1762.) Therefore, all recycling should aim for upcycling, which means that the material keeps or increases its quality even though its function might change. In practice,

downcycling is inevitable at some point because of physical laws such as thermodynamics. (Nylén and Salminen 2019, 533.)

If a material cannot be utilised in the previous steps of the hierarchy, it should be incinerated to recover as much energy as possible and used as fuel or energy (European Commission 2012, 31). In an ideal situation, the last step of the hierarchy, disposal, is unnecessary.

The waste hierarchy and the R-frameworks are not without critique. Ljunggren Söderman and André (2019, 11) argue, that the prioritisation of reuse, repair and other life-extension operations over recycling is too simplified and cannot be fully justified for all products. The R-frameworks are not sufficiently tested in real-life conditions and therefore they don't take certain conditions, such as low recycling rates, losses in repair or remanufacture or individual product characteristics into account (ibid). The different steps of the hierarchy might also overlap or be interconnected with each other. Thus, prioritising might not at all times be appropriate, and the impacts of individual products should be carefully studied, for example with life cycle or material flow analyses. (Blomsma and Brennan 2017, 610.)

Implementing the 4R framework requires that products are designed to last and to be cascade-type products from the start – they should be easily dismantled at end-of-life to enable efficient recycling and reuse of materials. Cascading materials means that they are used for another purpose or in an another industry than was originally intended (Repo and Anttonen 2017, 2). Eco-design focuses on sustaining materials' value throughout their life cycle and enabling multiple life cycles for a product. (Franco 2019, 2).

In circular economy, waste is redefined as resource. According to the first law of thermodynamics, the total material and energy stay the same in a closed system, such as the planet. In a linear economy, goods become waste after consumption, and circularity is achieved when some of this waste is used again as resource. However, some scholars argue, that fully circular economies are not possible. The second law of thermodynamics dictates, that entropy is bound to increase in a closed system. (Andersen 2007, 134–135.) Also, recycling requires energy and generates waste, meaning that circular processes, just as well as any other process using material and energy, will eventually lead to resource exhaustion and waste generation

(Korhonen *et al.* 2018, 42). However, a circular system can slow down the growing entropy, because circularity reduces the need for primary inputs. (Andersen 2007, 134–135.) Also, this has been contested by stating that the earth is actually an open system that is the receiver of infinite energy flows from the sun. Therefore, by using solely renewable energy, complete circularity could in theory be achieved. In practice, however, the existence of entropy means that every CE activity should be carefully analysed for global environmental impact, as circularity does not automatically mean sustainable. (Korhonen *et al.* 2018, 42.) Recycling in the meaning of downgrading requires more energy and other resources than reuse, repair, refurbishment and remanufacture (*ibid.*, 38). Therefore, the previous steps in the waste hierarchy are important: using goods to their full potential before recycling maximizes their lifetime.

Lastly, the definition also includes a mention of systems. Seiffert and Loch (2005, 3) determine systems as complicated structures, that are composed of many, interlinked parts. Systems thinking, therefore, means understanding the interlinkages and the different relationships between the system's components. In systems thinking, the whole system is studied instead of individual things. Many of the problems in industrial systems today arise from not being capable of comprehending and managing complex systems. (Evans, Fernando and Yang 2017, 204.) System perspective and whole system design is one of the most important methods to create sustainable value (Perey *et al.* 2018 638). It is also a key success factor in circular economy, because closing the loop for full circularity requires wide acceptance, cooperation and a holistic comprehension (Balanay and Halog 2016, 223). Circular economy is also a good example of a complex system. Circularity is impossible to achieve by one actor, it requires wide cooperation between different actors of society involving all products and services. (Sitra 2019a.)

Circular economy has been suggested as a new paradigm shift (Merli *et al.* 2018, 719; Marrucci *et al.* 2019, 2), which would fundamentally change how we produce and consume. However, for a paradigm shift to occur, circular economy should be fully integrated in our society. In addition, as Korhonen *et al.* argue (2018, 550), the two stages of a paradigm shift should undergo a transformation before the shift can occur. The two stages are the paradigm stage, which is related to norms and values and culture, and the second, the practice stage, is more descriptive and analytic, focusing on tools, metrics and instruments. By today, we have already

focused on the practice stage. Studies about how circular economy can be achieved and with what kind of technology it can be implemented have been done, and for example in Finland we have a functioning infrastructure supporting it. However, our culture should be supportive of the change before the paradigm shift can actualise.

Franco (2019, 14) revealed a circular economy paradox in his study. It seems, that currently the waste streams are not sufficient to make full recycling profitable, which would indicate that we need to increase production and consumption. This goes against the whole idea of CE, but is only true in the traditional capitalist economy. In CE, the basis for decisions should be social and environmental concerns. (Andersen 2007, 2.) When primary materials in production systems are minimized, benefits can be obtained. Thus, successful implementation of CE requires a change in our economic system and a change of mindset concerning wealth (Salonen *et al.* 2014, 77).

Because of the Finnish context of this study, it is necessary to understand the current situation of CE in Finland and in what frameworks it is being implemented. This is explored in the next chapter.

2.1.2. Circular Economy in Finland: The Finnish and the EU Frameworks

The 2019 programme for the Finnish government mentions circular economy as one solution to achieving a low-carbon economy. For example, means to promote CE through taxation and investments, and improvements in waste recycling are mentioned in the programme. The intention is also to keep Finland's leadership position in the field of CE and draft and implement a "horizontal, strategic circular economy programme" with relevant indicators over the current governmental term of 2019–2022. (The Finnish Government 2019, 36, 45-46.)

In 2015, a Circular Economy Action Plan was adopted in the EU. It included 54 actions, most of which were completed by March 2019. The Action Plan supported a cross-sectoral, systemic approach covering whole supply chains. (European Commission 2019b.) Based on the implementation report, the EU was able to improve in a vast array of issues regarding circular design and production, waste, secondary and critical raw materials and plastics, as well as

started actions that support consumers in making more informed choices (ibid, 2–8). However, there remained several aspects that still need to be worked on. On 11 March 2020, the EU launched an updated version of the Circular Economy Action Plan. This new plan focuses on the design and producing stages of product life cycles. The goal is that resources stay within the EU economy as long as possible. Legislation will be proposed which will ensure that products on the EU market will be designed to last, to be reused, repaired and recycled. (European Union 2020a.) What is significant especially considering electronic products, the legislation would also tackle planned obsolescence that is widely known to exist in electronics' design (see page 23) (Lobos and Babbitt 2013, 20). In addition, electronics and ICT products are one of the core areas of development, and “Circular Electronics Initiative” is proposed to promote long lifetimes and improvements in waste management (European Commission 2020).

Both Finland and the EU have studied citizens' perceptions of CE. According to a survey conducted by Sitra, 83% of the Finnish people agree fully or partly, that Finland should actively support circular economy (Laita 2019). Sitra has, with several stakeholders, drafted a road map for Finland to achieve circular economy. According to the road map, there are four steps that need to be taken before circular economy can be implemented successfully. These include an economic reform that renews the definition of competitiveness and growth, support for renewable energy technologies and efficient energy use, treating natural resources as scarce and supporting material efficiency, and lastly, a change of everyday behaviour. These actions are cross-sectoral and require the effort of all societal sectors from government to citizens. (Sitra 2019b.)

According to Eurobarometer, one of the biggest concerns for citizens is the amount of waste, that keeps growing. Citizens agreed that changes in consumption and production behaviour is the best way to address environmental problems. Over 60% of Europeans would use their ICT devices longer, if their performance would not decrease significantly. (European Union 2020b.) This is a good example of cross-sectoral collaboration; longer product use times are not only on consumers' shoulders, it requires appropriate product design measures as well.

Even though much has been done already to enable the CE transition, there remain several barriers that prevent the full adoption of CE. These will be explored next.

2.1.3. Circular economy barriers

A big part of CE research has focused on barriers to its implementation (Vermunt *et al.* 2019, 892). Barriers are such obstacles, that prevent or hinder the transition process and the adoption of circular initiatives (Van Eijk 2015, 5). Barriers are often categorised, for example based on the actors affecting the barrier (cultural, market, regulatory, technological barriers) (Van Eijk 2015, 5) or, if a certain point of view is used, into external and internal barriers (Mont *et al.* 2017, 25). Sometimes also the physical limits to CE, e.g. the laws of thermodynamics, are included in the barriers, as well as time-related and spatial limitations (Korhonen *et al.* 2018, 41). This study follows the examples of the studies by de Jesus and Mendonça (2018) and Kirchherr *et al.* (2018) and the categorisation into regulatory, technological, market and cultural is used. The framework is demonstrated in the Figure 2 below.

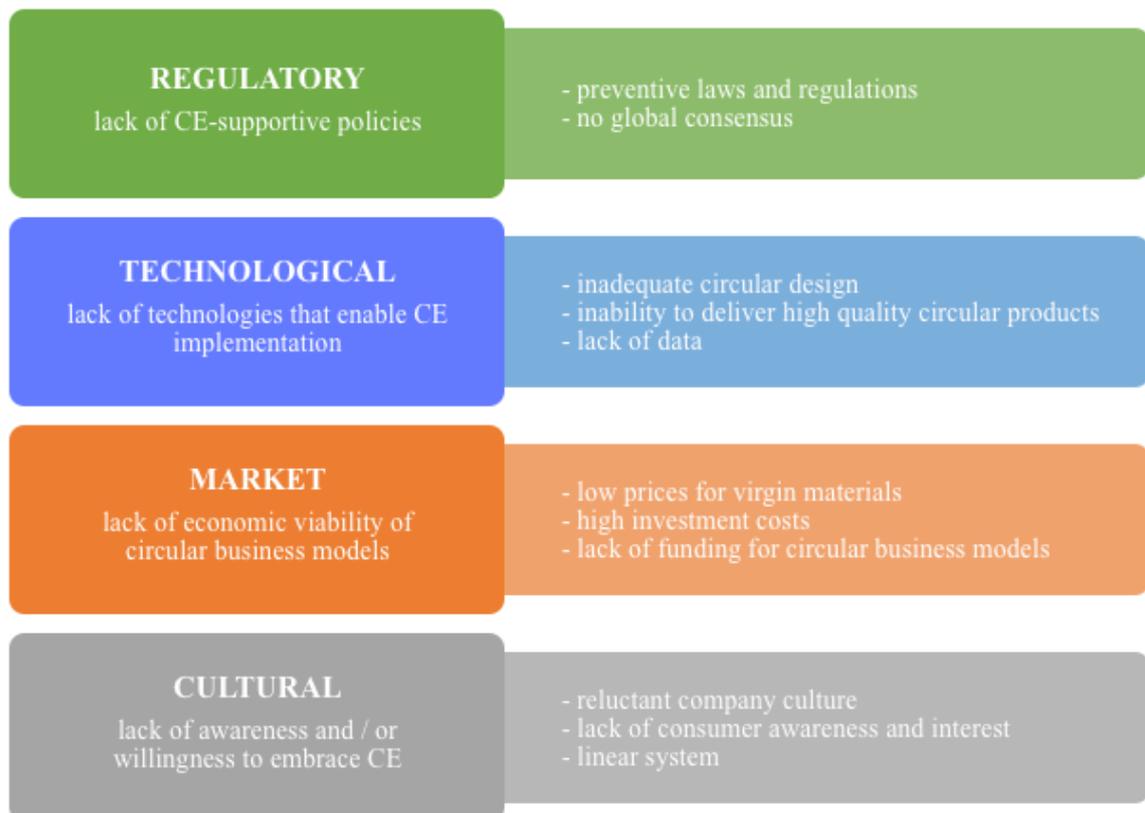


Figure 2. Barrier framework (Kirchherr *et al.* 2018).

Regulatory barriers mean such policies, laws and regulations that inhibit the transition to CE, or the lack of policies supportive of CE transition (Kirchherr *et al.* 2018, 269). Current problems regarding regulation are, for example, that waste legislation and classification prevent utilising waste in some cases (Van Eijk 2015, 11; Vermunt *et al.* 2019, 897), heavy taxation makes small-scale reuse business unprofitable compared to mass production of new products (Whalen, Milios and Nussholz 2018, 125) and value-added tax and other such incentives support consumption over using services (Vermunt *et al.* 2019, 893). Policies that would support the CE transition, on the other hand, could be financial support for circular business models (Kirchherr *et al.* 2018, 269), promotion of pay-per-use services through taxation (Van Eijk 2015, 10) and obligatory requirements to recover reusable materials (*ibid.*, 12).

Technological barriers relate to the things that are needed for CE to be implemented (Kirchherr *et al.* 2018, 266) – recycling and other CE supportive technologies and skills on how to use and develop them (Rizos *et al.* 2016, 10; Tura *et al.* 2019, 91), sufficient data and transparency in supply chains to enable tracing sourced materials (Pheifer 2017, 14), product design that enables repair, dismantling and reuse (Mont *et al.* 2017, 30) and preventing that recycling results in downgrading the material quality (Govindan and Hasanagic 2018, 297). Applicable technology is essential for CE transition (Kirchherr *et al.* 2018, 269), and in a literature review conducted by de Jesus and Mendonça (2018, 81), 35% of the most often mentioned barriers among the reviewed articles were technical.

Market barriers include barriers related to prices, financing and investments (Kirchherr *et al.* 2018, 268). Because the economy currently works in a linear fashion, closing the loop requires investments in novel methods of production and waste management, and this naturally increases the costs of CE initiatives. Prices for virgin materials are often lower than for recycled ones (Mont *et al.* 2017, 28), making it difficult for CE solutions to compete, and Rizos *et al.* (2016, 3–4) mention that moving from linear to circular business models needs large investments and some circular business models have higher starting costs than their linear alternatives. Even though CE has been identified to bring financial benefits in the long-term, the short-term benefits might remain low (Govindan and Hasanagic 2018, 296). This combined with high short-term spending (*ibid.*), requires businesses to have resilience to wait for the long-term benefits.

The fourth barrier category is cultural barriers, which ranges from company culture and managerial acceptance towards CE to the public's awareness on CE and consumers' acceptance of circular products (Shahbazi *et al.* 2016, 440; de Jesus and Mendonça 2018, 81; Ranta *et al.* 2018, 80; Vermunt *et al.* 2019, 893). Kirchherr *et al.* (2018, 268) found, that the two most pressing barriers are cultural: “lacking consumer interest and awareness” and “hesitant company culture”. Linear business models were also rated high in their research, which can be included in the cultural category as linear economy is part of our prevailing culture. Rizos *et al.* (2016, 10), Govindan and Hasanagic (2018, 300) and Vermunt *et al.* (2019, 898) report similar results. These results would indicate that the main thing in the way of CE transition is that it has not become mainstream, and it would seem that the focus has shifted from technology to cultural aspects. However, there are conflicting results among recent research, such as in the study by de Jesus and Mendonça (2018, 81), where cultural barriers were the least pressing barriers, rather identifying cultural and social aspects as important drivers (*ibid.*, 85).

What must also be noted here, is that these barriers are in many ways related to each other. For example, even when technological barriers are overcome, their implementation might still be prevented by financial, or market, barriers (de Jesus and Mendonça 2018, 85). Kirchherr *et al.* (2018, 270) identified a chain reaction especially between market and cultural barriers, for example low prices for virgin materials affect in consumers' interest to buy them, which on the other hand affects on companies' culture supporting the traditional, linear model.

As consumption is at the focus of this study and the most pressing barriers seem to be at least partly related to consumption, its role in the circular economy will be reviewed in the next section.

2.2. Consumption in the circular economy

Approximately 70% of GHG emissions are caused by household consumption (Salo and Nissinen 2017, 11). The average annual carbon footprint of a Finn is approximately 10 000 kg (Sitra 2018). This is one of the highest in the world and almost 6000 kg more than the global average (Lettenmeier *et al.* 2019, 29). The higher the income, the higher the footprint is (Alhola *et al.* 2019, 3). Products account for 13% of the average Finn's footprint (Lettenmeier *et al.* 2019,

42), and even though the impact of ICT devices on the footprint is small (ibid), consumption as a whole has a major impact on our social and environmental problems.

The relationship between circular economy and consumption is not yet entirely covered by research. Sustainable consumption, however, is a more widely studied concept and will be used in this paper to describe circular consumption as well. This is justified given the close relationship of sustainable development and circular economy (Kirchherr *et al.* 2017, 229; Camacho-Otero *et al.* 2018, 4). The development of “green” products is also increasingly related to circular economy aims (Zaharia and Zaharia 2014, 138). This chapter explores consumer culture, consumer behaviour and the acceptance of circular products among consumers.

Culture is a uniform structure that determines its members’ behaviour (Bajde 2014, 13), or according to the consumer culture theory, culture frames consumers with possible choices, feelings and thought, making some behaviour patterns more likely than others (Arnould and Thompson 2005, 869). Culture is not stable: it changes and evolves over time (Bajde 2014, 13). Consumer culture is *“a social arrangement in which the relations between lived culture and social resources, and between meaningful ways of life and the symbolic and material resources on which they depend, are mediated through markets.”* (Arnould and Thompson 2005, 869)

Consumption is heavily linked to cultural and social contexts (Gaur *et al.* 2015, 43; Peronard and Gammelgaard Ballantyne 2019, 6). Consumption is a necessity, the method to fulfil our basic needs. However, consumption also plays a significant role in determining who we are and how we fit in the social world. (Jackson 2005, v.) Motives relating to status or social or cultural norms can lead to sustainable consumption (Zaharia and Zaharia 2014, 139), just as well as they lead to conventional consumption choices (Gullstrand, Lehner and Mont 2016, 10).

2.2.1. Consumer attitudes and behaviour

There are two aspects to consumption: on one hand, there is the tangible aspect, consumption behaviour, and on the other hand, there is an intangible aspect of consumption, i.e., the attitudes and values related to consumption behaviour. Attitudes and values are important, because they

affect how we make our consumption choices and also how they are interpreted: whether to increase or decrease similar consumption. (Sheth *et al.* 2011, 27.)

Consumer behaviour is what, where, how, how much, when and why consumers buy (Kotler and Armstrong 2011, 134, as cited in Buerke *et al.* 2017, 960), and it affects, in negative and positive ways, both the consumer on an individual level and the society (Buerke *et al.* 2017, 963). Consumption is important for our “personal, social and economic well-being”, but also comes with negative impacts to business, society, consumers and the environment (Sheth *et al.* 2011, 24). Sustainable consumption can be defined as fulfilling current needs without compromising future generations’ ability to fulfil their needs, in line with the famous definition of sustainable development by the Brundtland commission (United Nations 1987, 37; Buerke *et al.* 2017, 962). Sustainable consumption is about caring of the consequences of consumption (this comes from attitudes and values) and limiting the amount of consumption with behaviour (Sheth *et al.* 2011, 27).

Consumer behaviour is affected by several factors, such as age, gender, income, circumstances, level of knowledge or awareness as well as personal habits, attitudes and values (Bray, Johns and Kilburn 2011, 604; Salonen *et al.* 2014, 62; Buerke *et al.* 2017, 961). According to Stern (2000, 416), there are four types of variables that have impact on behaviour. These are *attitudinal aspects*, such as values, beliefs and personal norms, *external factors*, such as social or cultural influences, regulations or incentives or a physical difficulty to perform some action, *personal capabilities*, e.g. required skills and knowledge of making some action, available resources and sociodemographic variables (age, income) and, finally, *habits or routine*. Different kinds of behaviour are affected by different variables and the variables influence behaviour in different ways, and also in interaction with other variables. (Stern 2000, 416-417, 419.)

There is no clear consensus as to what a sustainable, green or ethical consumer is (Jackson 2005, 4). According to Stone (1954, 39-40), there are four types of consumers: (1) people who prioritise the price-quality ratio, (2) people who prioritise the place of purchase, for example because of prior experiences or relationship, (3) people who prioritise the easiness of the purchasing action and (4) people who are motivated by the consequences of consumption.

Sustainable consumption belongs most to the fourth type (Salonen *et al.* 2014, 60), which according to Stone (1954, 40) represents 18% of the population.

In a recent study by Kuudes Helsinki (2019), Finnish and Swedish consumers were categorised into nine categories, of which the Devoted, Guardians and Uncompromising are the most likely to consume in a sustainable manner. They worry about the world's current state, which affects their consumption decisions. (Kuudes Helsinki 2019, 9-21.) As the name implies, the Devoted, representing 13% of the population, is the most enthusiastic about sustainable consumption and lifestyle. They are willing to make an effort for responsible choices and fulfilling their own values brings them happiness. (ibid, 16.) They have a strong conscience and believe that they can influence the world with their behaviour, they value simplicity, education and well-being and they feel very unconditional about sustainability (ibid, 17). They expect transparency from brands and hope that the demand for sustainability will increase in all industries in the future (ibid, 19). The Bystanders are the least likely to engage in sustainable consumption. They follow norms, avoid risks, reject trends and trust habits. They don't believe they can make an impact with their own choices and don't think about their consumptions' consequences. They represent 16% of the population. (ibid, 61-62.)

2.2.2. Factors that affect consumer behaviour

Several researchers have concluded that demographic aspects cannot be solely used in describing sustainable consumers, because the relationship between these variables and sustainable behaviour remains complex due to conflicting results from studies in this field. (Diamantopoulos *et al.* 2003, 477; Pedrini and Ferri 2014, 134). For example, some researchers have found, that females are more likely to consume more sustainably than males (Cohen, Pant and Sharp 2001, 329; Gilg, Barr and Ford 2005, 491) while others have concluded gender to have no meaning in this regard (O'Fallon and Butterfield 2005, 377; Pedrini and Ferri 2014, 134). Similar results have been obtained for age, income and educational level for example (Gilg *et al.* 2005, 491; O'Fallon and Butterfield 2005, 396; Pedrini and Ferri 2014, 134). Nationality and cultural differences have been found to have some impact in making sustainable consumption choices; different nationalities value different sustainability labels and environmental sustainability has been found to be more impactful in emerging economies than

in developed countries (Bangsa and Schlegelmilch 2020, 12). However, according to O'Fallon and Butterfield (2005, 391), the extent to which nationality has impact is unclear, because comparison between studies focused in different nations is difficult.

Factors that have been found to more clearly drive sustainable consumption are attitudes, knowledge, values, beliefs, intentions and habits (Bangsa and Schlegelmilch 2020, 9). According to Gaur *et al.* (2015, 43), sustainable consumers have a stronger desire to buy remanufactured products due to their values and higher level of environmental awareness. This is supported by Gilg *et al.* (2005, 499), who found that consumers who make sustainable consumption choices are more probable to have pro-environmental and pro-social values.

Awareness is related to consequentialism (Salonen *et al.* 2014, 60); awareness of consumption's consequences has been found to be a driver (Kumar Panda *et al.* 2020, 9) and even a prerequisite (Hansen and Schrader 1997, 459) for sustainable consumption behaviour. The issue with awareness is also emphasised by Stern (2000, 414), who argues, that information that shapes the beliefs of making a difference with your personal actions and of your behaviour's consequences have influence in pro-environmental behaviour. Also according to Buerke *et al.* (2017, 979), the belief that a difference can be made with individual consumption choices leads to more sustainable consumption. Gilg *et al.* (2005, 484) write about the same phenomenon, called the Perceived Consumer Effectiveness (PCE). In a more recent study, it was found that the higher concern for the future, generativity, the more likely the individual is to make sustainable consumption choices (Shiel, Paço and Alves 2020, 7). Most research has focused on attitudes, values, beliefs, intentions and knowledge as the main driver for social change, leaving the role of habits and routines as well as personal skills somewhat ignored (Shove 2010, 2; Bangsa and Schlegelmilch 2020,10).

Choosing a more sustainable option is often seen as some sort of a sacrifice (Zaharia and Zaharia 2014, 139). Sustainable options might be more expensive than the conventional alternatives (Olson 2013, 171; Mont *et al.* 2017, 28) which leads to economical sacrifice, or the consumer feels she needs to sacrifice quality or performance over a reused product (Olson 2013, 171). By purchasing sustainable options, consumers can show that they can and want to buy a product that benefits others or the environment (Zaharia and Zaharia 2014, 139), which can

impact your status as an informed and caring individual. This kind of a consumption decision can also be made to fulfil symbolic aims, rather than utilitarian, if the main motivation is to enhance self-identity (Koenig-Lewis *et al.* 2014, 96).

2.2.3. The main challenges to circular consumption

There is an identified gap between attitudes and behaviour, and the above-described perception of trade-offs might be one of the reasons that lead to this gap (Olson 2013, 181), also called the halo effect (Wheale and Hinton 2007, 314). Even though values and attitudes towards environmental protection or sustainability have been identified, they have not led to behavioural changes (Leiserowitz *et al.* 2004, 37). According to Leiserowitz *et al.* (2004), this is because there are three types of barriers in the way: 1) other values, such as those favouring economic growth, are prioritised higher than environmental protection, 2) individuals might lack some resources, such as time, money or knowledge, that would help them to realise their values, and 3) there are structural barriers that need to be overcome in the societal level before individuals can take action, such as insufficient infrastructure to choose public transportation (*ibid.*, 39). Wheale and Hinton (2007, 313–314) report similar results, and mention brand loyalty, lack of information on ethical problems and trade-offs as reasons for the halo effect. Due to trade-offs, a consumer is likely to choose a product that is a compromise between her values, attitudes and other priorities, which therefore is not the most sustainable option. When the sustainable option is superior in terms of all important aspects, such as price, quality and performance, it is likely to be chosen by all consumers. (Olson 2013, 172–173.) What is interesting to note, however, is that when a company has behaved in an unethical manner, the reputational damage cannot be corrected even with quality products, even if quality would be a priority in other circumstances (Folkes and Kamins 1999, 258).

Similar findings have been gained in circular economy research. Govindan and Hasanagic (2018, 297) report a lack of awareness of CE among the public. Customers regard recycled, refurbished or reused products as inferior to new products – that they are of lower quality, unsafe to use or unhygienic (Gullstrand *et al.* 2016, 9; Pérez-Belis *et al.* 2017, 270; Vermunt *et al.* 2019, 898). Vermunt *et al.* (2019, 898) discovered as well that customers might not see what added value the CE-supportive product would bring, and it was seen as less trendy as the new

alternative. In product-as-a-service business models, one clear barrier seems to be that as customers are used to the traditional ownership-based model, they are reluctant to use leasing services for example, because they wish to own instead of loan (ibid). Products, and especially owning them, are seen as symbolising social status and consumers have a general desire specifically for new items (Gullstrand *et al.* 2016, 10).

Environmental benefits are not high on the list of reasons to engage in circular consumption (Abbey *et al.* 2015, 28), and consumers might not even be aware of the environmental benefits of a reused product (van Weelden *et al.* 2016, 747). The main reason to buy reused is that it is often a way to save money, i.e. the reasons to buy used products are mostly economic (Ylä-Mella *et al.* 2015, 380). Another important factor is, that second-hand shopping is a similar way to express one's style and personality, as for some is buying new products (Gullstrand *et al.* 2016, 13). Michaud and Llerena (2011) studied consumers' willingness to pay for remanufactured products. Their key findings were that consumers are not ready to pay extra for remanufactured products even when informed of the product's environmental benefits, because of worries about the product's quality. However, when consumers were informed about the new alternative's negative environmental impact, it reduced their willingness to pay for that new product. (Michaud and Llerena 2011, 417-418.)

2.2.4. Technology consumption

Technology is one of the primary consumption categories of current times (Kozinets 2008, 879), and the power or contemporary technologies is significantly connected with today's consumer culture (Magaudda 2015, 12). Personal ICT devices, such as smartphones, computers or tablets, have quickly become important elements in our lives. These devices are central in our social lives and relationships, and they have become valued cultural objects with symbolic meaning in the modern digital society. (ibid, 1.) Technology today has even the possibility to bring a sense of community and involvement, which exceeds the traditional, practical role that technology has (ibid, 13). Brands, as well, have high cultural significance in today's consumer culture and brands are important drivers for buying decisions (Gaur *et al.* 2015, 44). The popularity of Apple's products is a good indication of this. The popularity of Apple and fans' devotion to the brand has even been described as a cult (Kahney 2004). The hype around

Apple's (as well as some other brands) annual announcements of new models is high (de Kok 2019). This culture is heavily characterised with the desire for newness, associating technology with status and identity and the wish of always using the most up-to-date technology.

2.3. ICT products' role in circular economy

Information and communication technology (ICT) products have large potential for material recovery and reuse (André *et al.* 2019, 268). This chapter will explore the potential and review the problems associated with ICT products' production and consumption.

Manufacturing of ICT products is an energy and resource intensive process (Williams 2011, 356): a clear majority of electronics' life cycle energy consumption occurs in the production phase (Deng, Babbitt and Williams 2011, 1205) and these products contain a vast amount of different metals and minerals (Graedel *et al.* 2015, 6295), including conflict minerals (Fitzpatrick *et al.* 2015, 974). Due to the increased consumption of these products, they are also creating vast amounts of waste. E-waste was reported to amount to 44.7 million tonnes in 2016, of which small ICT devices, such as mobile phones, laptops and tablets, accounted for 3.9 MT. (Ryder and Zhao Houlin 2019.) Despite the problems in electronics' production, consumers are not associating ethical problems to electronics (Wheale and Hinton 2007, 313), which implies a lack of communication and awareness of the problems.

ICT has undergone a fast technological development, due to Moore's law dictating that the processing power of microchips doubles every two years (Schaller 1997, 53; André *et al.* 2019, 268). The downside with this fast development and fast product cycles is that the lifetimes of these products often go underutilised (Proske *et al.* 2016, 2, 7). For example, most phones, that are disposed of after the average time of using it for 2.3 years (Statista 2020), still work when disposed or replaced (Proske *et al.* 2016, 7). Another potential category for circular economy is ICT products that are returned to the seller by customers. These convenience returns are functional products that are returned because of change of mind, and they only require some testing and a new package to be sold again. (Abbey *et al.* 2015, 26.)

ICT products' reuse can be argued to enhance sustainable development and support the triple bottom line concept. Reuse and life-extension activities bring large environmental benefits, for example related to energy consumption and resource use (Cooper 2005, 55). It is also beneficial socially, as second-life products are often cheaper than new products and therefore more people can afford them (Babbitt, Williams and Kahhat, 2011, 5366). Lastly, reuse has economic impacts due to reuse and recycling activities offering new business models and employment (Cooper 2005, 55).

Several studies have indicated that electronics' reuse is beneficial for the environment, and while material recovery and recycling is key in CE, reuse and life extension are often the preferred solutions (Deng *et al.* 2011, 1205; Bakker *et al.* 2014, 15; André *et al.* 2019, 277), as indicated also by the waste hierarchy. ICT and other electronics contain scarce metals in different components. Studies show, that during the use of said products, net losses of each metal contained in the product are experienced. This is because of low recycling rates, either due to these products not reaching a recycling facility or to many metals not being functionally recycled yet. (Ljunggren Söderman and André 2019, 12.) Recycling and disposing of electronics can also cause exposure to hazardous substances. To mitigate the costs of recycling, the western world has a history of shipping used electronics to be recycled in the developing countries, where labour costs and environmental regulation are lower. (Williams 2011, 355.) There are also informal recycling activities, for example in China, India and Pakistan. These practices cause major environmental problems and health risks in the recycling locations. (Babbitt *et al.* 2011, 5366.)

Many reasons can prevent or hinder reuse activities of consumer electronics, such as planned obsolescence. Planned obsolescence means the deliberate design of short lifetimes, and it is widely acknowledged to exist especially in the ICT sector (Lobos and Babbitt 2013, 19–20), also by consumers (Proske *et al.* 2016, 4). Planned obsolescence appears in different ways, for example smartphones' buttons or screens break and batteries start dying fast (material obsolescence), operating systems stop receiving updates (functional obsolescence) and repair costs are relatively high when compared with new products' prices (economic obsolescence) (ibid, 1). Lobos and Babbitt (2013, 3) argue also, that planned obsolescence doesn't necessarily mean that the product becomes technically obsolete. New products' appearance and experience

are also designed to incite consumer interest so that it makes older models seem outdated and untrendy. This is called psychological obsolescence (Proske *et al.* 2016, 1).

Other reasons that can prevent reuse are high repair costs or the complexity and density of products (Raihanian Mashhadi *et al.* 2016, 717). Furthermore, electronic waste is found to be poorly handled during collection, which can damage the products beyond repair (Cole, Gnanapragasam and Cooper 2017, 159). Also, the environmental benefits are not always as obvious as one could imagine. Not all individual products are worth refurbishing, if a lot of energy or additional materials are needed and the result would not extend the product's lifetime significantly. (Ljunggren Söderman and André 2019, 9.)

The reuse business has grown rapidly in recent years and it spans through almost all product categories, including personal ICT products. There are several providers of reused and refurbished personal ICT products in Finland, of which Taitonetti Oy was interviewed for this paper. Circular economy is one of their key principles. They buy used computers and laptops from leasing companies, refurbish them and sell them in their physical store or, mostly, on their online store. Their products are considered to be of high quality, because they only buy devices used by companies: devices manufactured for business-use are usually more efficient and made of higher quality materials, with a longer expected lifetime than consumer devices. During 2019 they sold approximately 28 000 used devices, and calculated almost 4 million kg of saved CO₂ emissions. (Heikkilä 2020a, 2020b.)

3. THEORETICAL FRAMEWORK

As mentioned, consumer behaviour is affected by several factors, from demographic variables to advertising. According to Stern (2000), there are four types of variables that have impact on behaviour:

- 1) *attitudinal aspects*, such as values, beliefs and personal norms,
- 2) *external factors*, such as social or cultural influences, regulations or incentives or a physical difficulty to perform some action,
- 3) *personal capabilities*, e.g. required skills and knowledge of making some action, available resources and socio-demographic variables, and
- 4) *habits or routine*.

Different kinds of behaviour are affected by different variables and the variables influence behaviour in different ways, and also in interaction with other variables. (Stern 2000, 416–417, 419.) This study focuses on the level of awareness of circular options and of consumption's consequences, on discovering personal attitudes towards circular options and on how these attitudinal and informational aspects impact the buying decision.

Awareness

Sustainable consumption is highly related to the awareness of the impacts of one's own consumption choices, including impact to the environment, society and oneself (Buerke *et al.* 2017, 968). However, it must be noted that there are different types of awareness that have impact on the buying decision: in addition to being aware of the consequences of consumption, the consumer needs to be aware of the sustainable options' existence to be able to make improved decisions. Both of these components need to be taken into consideration when assessing consumer awareness. (Chartrand 2005, 209.) Also, PCE, the belief that you can influence the environment with your consumption choices, has impact on the decision (Gilg *et al.* 2005, 484, Buerke *et al.* 2017, 979). According to Koenig-Lewis *et al.* (2014, 95), when consumers do not understand the connection between their consumption behaviour and its impact, habit and heuristics have stronger influence on the decision.

Awareness alone can be the basis for choice: some consumers buy brands that are familiar to them, even if they know the product does not bring them any additional benefits (Engel, Blackwell and Miniard 1995, 339). This brand loyalty, or inertia, can lead to the attitude-behaviour gap discussed in chapter 2.2, among other barriers to making sustainable choices, such as prioritisation of price, perception of quality, insufficient information and cynicism (Bray *et al.* 2011, 601). Misperception, or inaccurate knowledge, regarding a product can also have strong impact in purchase decisions (Engel *et al.* 1995, 336). For example, Bray *et al.* (2011, 605) found a common perception among consumers that a product's quality is lower when the manufacturer prioritises ethical aspects, even though there is no empirical proof of such a correlation. Information might be biased by the individual's own motives, emotions or it just fails to correspond with reality (Ajzen 2011, 1116).

Attitudes

According to Stern (2000, 416), attitudinal factors include beliefs, values and personal norms. Attitude is the evaluation of something. It is formed by the person's beliefs and feelings about an object, and attitudes determine the intention of behaving in some way. (Engel *et al.* 1995, 362, 364, 366.) Traditionally, technological products have not aroused strong feelings, but as personal ICT devices have a significant role in lifestyles today, it can be argued that feelings form attitudes as well as beliefs when it comes to making decisions about these devices. Feelings can also impact in a negative manner, for example if a product of a certain brand has not functioned properly before (*ibid.*, 382). There is a difference between the intention to behave in some manner and the actual action, and, as with attitudes as well, intentions' capability to predict behaviour varies (Ajzen 2011, 1115). Ajzen argues, that intentions predict behaviour well, even though intentions change as time passes, because the attitudes, beliefs and norms that formulate intention change as time goes on (*ibid.*).

Attitudes are not static: they can change due to unexpected events and situations, such as an attractive promotion (Engel *et al.* 1995, 386), or new information (Glasman and Albarracín 2006, 781). Attitudes are often formed after a direct contact with the object, i.e. from experience (Engel *et al.* 1995, 390). Attitudes that are formed on experience are usually stronger and thus more likely to lead to behaviour (Kraus 1995, 6). Confidently held, decisive and easy to retrieve

from memory attitudes are also better predictors of behaviour than those held in doubt or those that are ambivalent or inconsistent (Glasman and Albarracín 2006, 779, 812).

The model

The reasons and methods of consumption have been widely studied in research (Cooper 2005, 52). To understand how awareness and attitudes affect consumers' decision-making, Engel, Blackwell and Miniard's (1995) model of consumer decision-making process ("the EKB model") is adapted to the purpose of this study. The EKB model has been widely used since its development in 1968. The model describes consumers' decision-making as a process including different phases of problem solving. (van Weelden *et al.* 2016, 745.) The original model, as well as other similar models, have been criticised for treating consumers as rational actors who spend a lot of time making purchase decisions, and for not including the effects of impulse, habits or emotions for example (Mowen 1988, 16; Jackson 2005, vii; Koenig-Lewis *et al.* 2014, 96). However, according to Ajzen (2011, 1116), it is of no significance how, rationally or irrationally, people reach their beliefs, because their attitudes, norms and locus of control is always the result of their beliefs. Thus, it can be said that behaviour, or the purchase decision in this case, is reasoned or planned (*ibid.*).

The model has been revised several times, and the latest includes the notion that individual differences, such as attitudes, and environmental influences, such as culture, have impact on the purchase decision (Engel *et al.* 1995, 143–145). Still, the model includes several steps before the actual decision and therefore describes a decision-making process. Such a process has been stated to work well for analysing behaviour related to buying utilitarian products that cause high involvement, such as mobile phones (Mowen 1988, 17; van Weelden *et al.* 2016, 745). Phones, as well as laptops and tablets, are expensive and they have a significant importance in consumers' lives, and thus consumers are prone to consider their purchase carefully, as suggested by the EKB model (van Weelden *et al.* 2016, 745).

The adapted EKB model, incorporated with other theories mentioned in this chapter, is presented in Figure 3. The purpose of the model is to guide data collection. It shows the connection of awareness and attitudes to decision-making and clarifies their impact in the final decision.

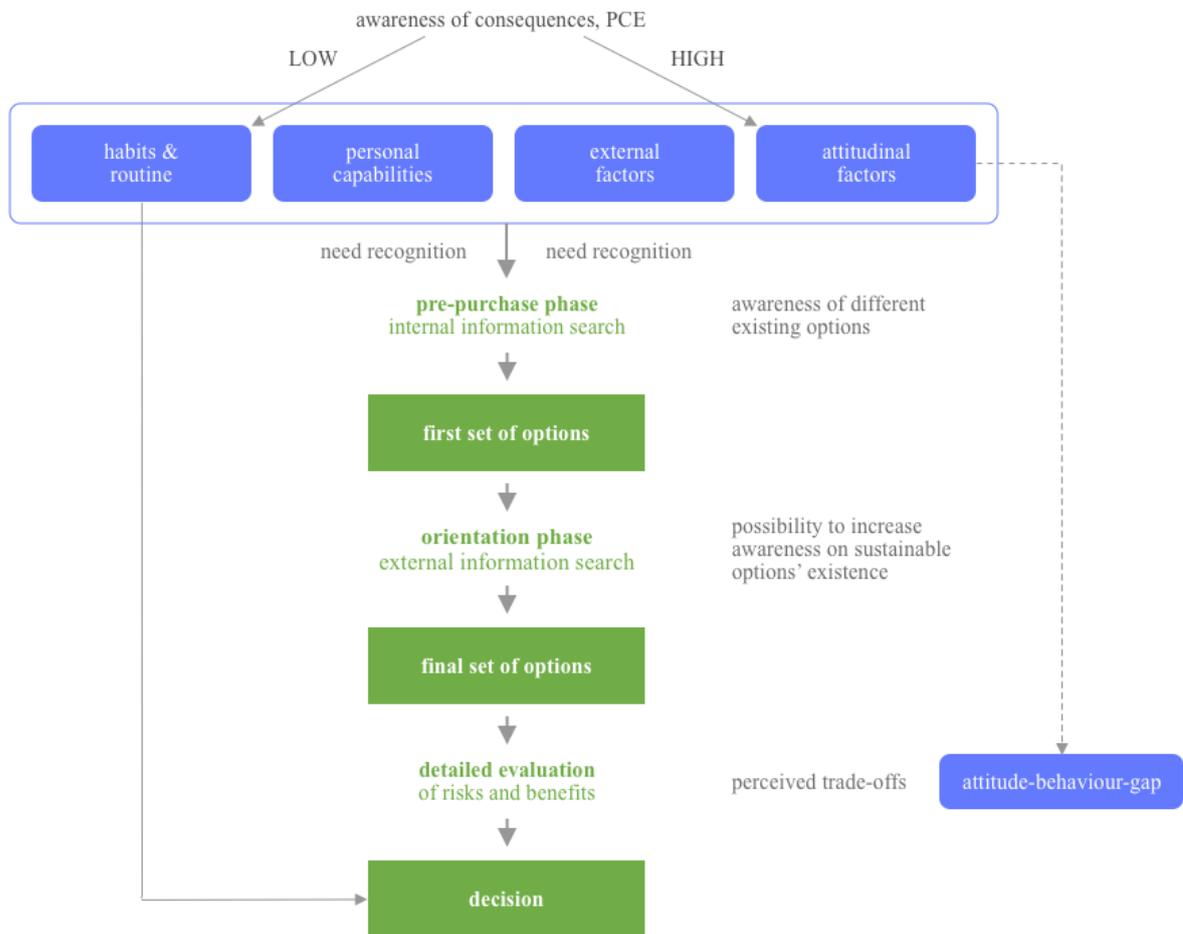


Figure 3. Consumer decision-making model adapted from Engel *et al.* 1995, van Weelden *et al.* 2016 and Stern 2000.

The decision-making process starts with identifying a need. This is affected by four categories: external factors, personal capabilities, habits and routine and attitudinal factors. These categories also guide the whole process. After need recognition, the consumer begins an internal information search, called the pre-purchase phase. Here the consumer recalls different options from memory, which potentially could fulfil the identified need. These become the first set of options. Then the consumer engages in external information search, or the orientation phase, where they search other viable options to add to their first set of options. These become the final set of options, which are then carefully evaluated for risks and benefits. The product with the most favourable balance of risks and benefits will be selected and the purchase made.

4. METHODOLOGY AND DATA COLLECTION

4.1. Research design

The aim of this research is to find out how well consumers know about alternatives to linear products and discover their beliefs and attitudes towards the circular alternatives. The aim is also to gain understanding on how these beliefs and attitudes change after the consumers are told about the consequences of electronics' consumption, or if this has any impact at all. The aim is to explain what role information about environmental and social consequences play in making the purchase decision. Qualitative research methods were considered the most appropriate to fulfil these aims and the study follows an exploratory research design.

Qualitative research methods were chosen for this study, because it was necessary to gain descriptive data, and qualitative approaches are better suited for uncovering reasons, beliefs and attitudes (Saunders *et al.* 2016). Qualitative methods are also suitable for studying new phenomena, such as circular economy, of which knowledge is still limited (Franco 2019, 1). Multiple qualitative methods were used: semi-structured consumer interviews, unstructured interview of Taitonetti Oy's representative and Taitonetti's customers' messages on Taitonetti's Facebook page. Therefore, this study is a multi-method qualitative study (Saunders *et al.* 2016, 168).

The exploratory design was selected, because it enables learning more about the research topic and gain understanding of problems and phenomena. It was also necessary to have the possibility to adapt the research based on interview results, which is one of the advantages of exploratory research. (Saunders *et al.* 2016, 174–175.) Exploratory approaches have also been used in research focusing on consumer attitudes before (Bray *et al.* 2011, 600), further justifying the selection.

This study focuses on refurbished laptops, smart phones and tablets. The refurbishment business has developed heavily during the recent years and there are many alternatives for consumers to buy, also in Finland. Despite these options, electronics consumption produces increasing amounts of waste, indicating that consumption is not experiencing a downturn.

Refurbishment is a valid method to increase the lifespan of electronic products, therefore making refurbished electronics good example of a circular product, that can be used to study consumers' awareness and attitudes of circular products.

4.2. Data collection methods

The research commenced with studying existing literature on circular economy and consumption. Several databases, accessible via LUT University library services, were used to gain a broad view of the literature. Articles were carefully chosen based on their publication year, number of citations and relevance to the topic.

Before the actual data collection interviews, pilot interviews were conducted to test the questions' suitability and different possible methods for making the interviews. Some pilot interviews were done as structured internet mediated interviews and some as telephone interviews. In total 14 people was included in the pilot sample. From the results it was clear that interaction between the interviewer and the interviewee is needed to get satisfying answers; despite of instructions, some questions were slightly misunderstood or answers were not complete and it was too easy to answer by only "yes" or "no". Telephone interviews provided better results, which indicated that the final interviews should include the possibility to explain questions and ask additional questions if the initial answer is not sufficient.

Semi-structured interviews were chosen as the primary data collection method. Semi-structured interviews are a typical choice for qualitative research (Saunders *et al.* 2016, 391). As will be explained in chapter 4.3, it was necessary to have the possibility vary the way the questions are asked and adapt the interview plan according to what the interviewee is telling. Therefore, a semi-structured design was preferred over a structured interview (*ibid*). I also wanted to keep the interview tone conversational and informal, because I was going to interview consumers, but also some structure was needed to keep the interviews relatively short to encourage people to participate in the middle of their shopping. Also these aspects spoke for semi-structured interviews (Eriksson and Kovalainen 2008, 82). Semi-structured interview design is also suitable for exploratory objectives, because it enables the collection of consumers' personal experiences and point-of-views (Saunders *et al.* 2016, 392; van Weelden *et al.* 2016, 745).

The target group was consumers, who were browsing new laptops, smart phones or tablets in a retail store selling consumer electronics. This field of research is lacking studies that are done in an actual market setting (van Weelden *et al.* 2016, 744), and according to Engel *et al.* (1995, 385), attitudes are good indicators of behaviour when they are measured relatively close to when the behaviour is assumed to occur. These reasons spoke for making interviews in an actual purchasing location. The interviews were done in Helsinki, in a consumer electronics store called Power, during two consecutive days in February 2020. The consumers who were seen to look at laptops, smart phones or tablets were asked to participate. 20 people were interviewed, making the final sample 34 people in total.

To gain understanding of the refurbished electronics' industry, a representative of the biggest seller of refurbished laptops in Finland, Taitonetti Oy, was also interviewed. This interview was an in-depth, unstructured interview done via Skype. Informal, unstructured interviews are used, when the researcher wants to explore an area that she is interested in, but does not know about in detail (Saunders *et al.* 2016, 391). The interview lasted for 54 minutes and the discussion led to an increased understanding of the refurbished electronics market. As part of the interview, the company also asked their customers on their Facebook page, why they decided to buy a refurbished computer, to aid me to gain the customer perspective. They received 34 replies in total, which will be analysed as secondary data.

4.3. The semi-structured interview design

The interview plan was formed based on the theoretical framework and the research questions. Some of the interview questions were modified after the test interviews, as mentioned. The final interview questions in Finnish and in English with detailed motivations for each question can be found in Appendix 1. The way and in what detail the questions were asked was different for each participant, because it was important to keep the interview tone conversational. The language used (Finnish or English) depended on the interviewee's preferences.

The participants were first informed about the reasons and purpose of the interview. A permission to record the interview was acquired from all participants. They were also reminded

that all information is for research purposes and encouraged to answer honestly, as well as told that everything they say will be treated in an anonymous manner.

The interviews started with demographic questions to confirm the participants' age and gender, followed by a question confirming that they are buying or thinking of buying a product that is relevant to this study (i.e. a laptop, smart phone or tablet). The next six questions were related to the interviewees' decision-making and buying process. Their purpose was to discover how the participants typically make their final purchase decision and what are the most important product characteristics for them that impact the decision. Questions 10–13 were about discovering the participants' level of awareness and attitudes towards used ICT devices and their sellers. Question 14 was designed to discover the participants' level of awareness and knowledge of ICT devices' environmental and social impact. The participants were then told about the consequences of electronics' consumption and production. The amount of details told varied based on what the interviewee had answered in the 14th question. After informing about the consequences, question 16 inquired whether the told consequences aroused some thoughts or feelings in the participant. This was designed to find out, if the participants' attitudes and awareness changed when they were more familiar with the consequences. Next some details about how the refurbished electronics market operates were told, and similarly the amount of details varied based on what had been gathered in questions 10–13. The last questions were to discover how the participants' view of refurbished electronics changed and if they would be willing to buy them in the future. The last question “Could you buy a refurbished, used device from a company in the future? If not, what should change so that you could buy one?” was especially designed to find out if the knowledge of consumptions' consequences and circular options in the market affect the purchase decision.

4.4. Data analysis methods

I used thematic analysis to analyse the data. Thematic analysis can be used to understand large amounts of qualitative data and integrate data from different sources (Saunders *et al.* 2016, 579), which was necessary considering the multi-method design of this study. To find answers to the research questions, it was also necessary to find themes, patterns and relationships from the data, for which thematic analysis is an ideal method (*ibid.*).

The analysis was made following the thematic analysis procedure by Saunders *et al.* (2016, 580–587). First, I got familiar with the data by transcribing the semi-structured consumer interviews, the pilot interviews done via phone and the in-depth interview of Taitonetti Oy's representative. The structured, internet-mediated pilot interviews did not need to be transcribed, because the replies were already in text form. Short summaries were made of each interview, including the online pilot interviews, to describe the key points that the interview brought up.

All interviews were then coded to aid further analysis. With coding, the data can be divided into categories with similar meanings, which makes it easier to manage the data and find relevant points later on in the process (*ibid.*, 580). All similar meanings across all interviews were given the same code, and a list of codes with definitions was kept (Appendix 2). Mostly inductive coding strategies were used in this stage, because using deductive *a priori* codes derived from the theory proved to be problematic and the list inadequate. Therefore, I used *in vivo* codes using terms mentioned by the interviewees, and in some cases narrowed the amount of codes down into wider themes with codes that I developed to better describe the data and enable fulfilling the research objectives. Due to the list of codes changing along the way, it was necessary to go back to already coded interviews, re-read them and code them again according to the updated list of codes, to ensure consistency.

After thematic analysis, some content analysis techniques were also used, because it was necessary to analyse the data also quantitatively to provide deeper answers to the research questions. According to Saunders *et al.* (2016, 613) this is appropriate and content analysis can be used as a secondary method with primary data. As content analysis was used as a secondary method, the procedure did not follow a rigorous manual for the analysis. The same interview transcripts and coding mentioned previously were used. The purpose of using the method was to analyse manifest content and enable calculating frequencies. It was important to demonstrate some aspects with numerical values.

The data acquired from Taitonetti's customers was also coded and analysed with content analysis.

4.5. Reliability and validity

Reliability is about the consistency of the research and the possibility to replicate it to achieve the same results (Saunders *et al.* 2016, 202). The different threats to reliability mentioned by Saunders *et al.* (2016, 203), were taken into account when designing this study, the data collection and analysis. The participant errors and biases were minimised by making all interviews in the same location, by not approaching individuals who were clearly on their way out of the store, not continuing the invitation to participate if the person stated to be in a hurry, and taking the interviews away from the busiest areas of the store. However, it was a public, open space, where some participants might have felt the need to alter their responses in the fear of someone else listening, which could have led to a participant bias. Researcher errors and biases were minimised by following the research design from beginning to end, by preparing for the interviews well in advance and by not letting personal feelings or thoughts affect how the results are interpreted.

Even though qualitative research does not necessarily need to be replicated (Saunders *et al.* 2016, 205), the research process has been described in this paper in detail to increase reliability.

Training and doing a pilot study are some of the ways to increase reliability (Yin 2014, 71). This was achieved by doing test interviews before the final data collection. However, some questions were still found to be lacking when doing the final interviews and they needed to be altered. Semi-structured interview design, however, allows this (Saunders *et al.* 2016, 391). For example, when discovering what the interviewee thinks about used electronics, it was necessary to specifically ask, if the person associates used electronics to consumer-to-consumer sales to be able to make the distinction between the consumer-to-consumer and business-to-consumer market in later stages of the interview. Question 19 was found to be badly formed when analysing the data. The question asked whether or not the participant could buy a refurbished device *in the future*. It would have been more appropriate to ask, if the new information they received was enough to make them consider the refurbished option *now*, when they were about to buy a new device. Also, the different interview methods between the pilot and the final sample might affect the comparison of the samples.

Validity is achieved if the used research methods are appropriate for the study, the analysis has been done correctly and the results can be generalised (Saunders et al. 2016, 202). The analysis methods were chosen carefully to fit the purpose and aim of this study. The analysis was also done with care and by following the process presented in Saunders *et al.* (2016).

5. EMPIRICAL RESULTS AND FINDINGS

In this section I will go through the results and findings of the analysis process. First, some demographic details and a description of the sample will be presented. After that, findings will be explained per each research question. Lastly, demographics' influence on buying behaviour will be presented. Relevant quotes will be included in some cases to demonstrate and give examples of the issues. When the interview was done in Finnish, the quote is translated into English.

5.1. Sample

The total sample was 34 people, of which 14 participated in the pilot interviews and 20 in the final interviews. The sample included 20 men and 14 women. Equal number of both gender representatives were approached for the interview, but there were less women visiting the store and they were more hesitant to participate. Therefore, the sample includes more men. The sample is also more heavily composed of younger people. All people who suited the set target group, regardless of their age, were approached to participate, but at the time of interviews, younger people visited the interview location more than over 45-year-olds. This same emphasis was present also in the pilot sample because it consisted of people I know, who are approximately the same age. The age and gender structure of the sample is presented in Table 1.

Table 1. Age and gender structure.

Age group	Pilot	Final	Total	Share %
15-24	2	5	7	21 %
25-34	6	6	12	35 %
35-44	4	6	10	29 %
45-54	0	1	1	3 %
55-64	2	1	3	9 %
over 65	0	1	1	3 %
<i>Total</i>	<i>14</i>	<i>20</i>	<i>34</i>	<i>100 %</i>
Gender	Pilot	Final	Total	Share %
female	7	7	14	41 %
male	7	13	20	59 %
other	0	0	0	0
<i>Total</i>	<i>14</i>	<i>20</i>	<i>34</i>	<i>100 %</i>

Most participants had bought or were buying smart phones and laptops, and six people were buying a tablet or a hybrid device combining the elements of tablet and laptop. Hybrid devices are included in the tablet category. The device structure is presented in Figure 4. The average time the interviewees had been using their current or previous devices was 3.6 years. Laptops were used 4.8 years, phones 2.4 years and tablets 6.5 years on average. Eight participants were not able to recall the precise number of years but said to have used the device for several years. These were not included in the calculations.

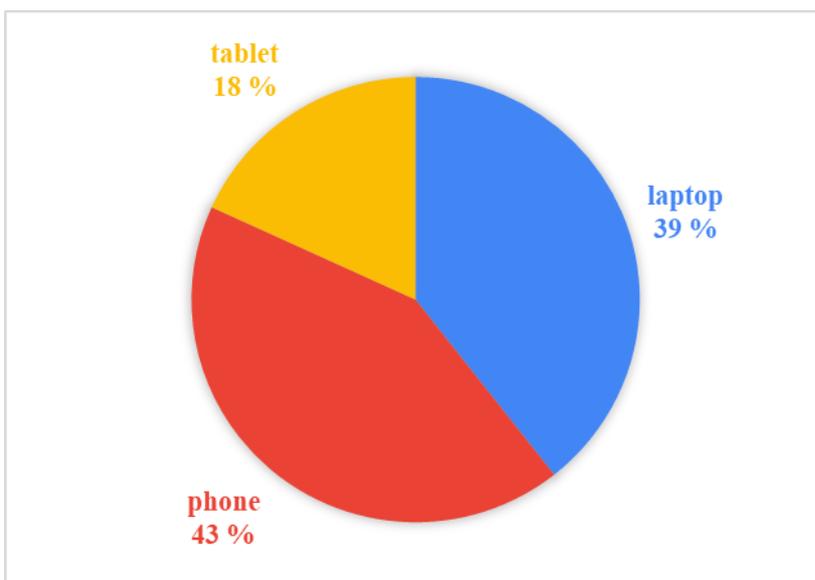


Figure 4. Device structure.

Reasons for buying a new device are presented in Table 2. The most common reason for buying a new device was that the previous or current device was somehow broken. This was mentioned by eight people, 24% of the total sample. Other common reasons (five mentions each) were that the person had a new purpose or need that their current device could not fulfil or was not capable of doing; they wanted to change their device, for example because it was old; and that the current device, or its battery for example, does not function as well as it used to. Technological development was mentioned as the primary reason by four people. They were interpreted to want a new device because their current device was starting to become out-of-date; there were new attributes or functionalities in the market. Other, less mentioned reasons were broken screens, gift and a new need that requires a new kind of a device that is not replacing a previous one. Both of those who mentioned a broken screen, also mentioned that the replacement of the

screen is too expensive to be worth it; they rather buy a completely new device. One person was not able to identify why she is buying a new device. Regarding the reason ‘current device is broken’ must be noted that people see something being broken in very different ways. For some, broken means that the device cannot be used anymore, and for some it can mean some minor fault that is inconvenient but does not prevent using the device. But, because the reasoning behind these mentions could not be interpreted from the data, they are all assumed to be broken in the sense that they cannot be used anymore. The bad battery and broken screen reasonings indicate planned obsolescence, but also they could be categorised into the ‘desire for change’ category, because these faults do not necessarily require buying a new device, they could just be replaced. This would mean that desire for newness outweighs broken devices as primary reason to buy new.

There are some interesting differences between the pilot and final samples. The two most common reasons are dominated by the pilot sample, where “broken” and “bad battery” were emphasised. Only one person, who mentioned bad battery as the primary reason for buying a new one, had tried or even considered changing the battery before buying a completely new device. The most common reasons in the final sample are very different; desire for change, new purpose and technological development.

Table 2. Reasons for buying a new device.

Why did you decide to buy a new device?	Pilot	%	Final	%	Total	%
current device is broken	5	36 %	3	15 %	8	24 %
current device does not function anymore as hoped, incl. bad battery	5	36 %	0	0 %	5	15 %
desire for change	1	7 %	4	20 %	5	15 %
a new purpose for which the current device is not capable of	1	7 %	4	20 %	5	15 %
technological development	0	0 %	4	20 %	4	12 %
current device is difficult to use or inconvenient	1	7 %	1	5 %	2	6 %
broken screen, repairing not worth the cost	1	7 %	1	5 %	2	6 %
other, gift	0	0 %	2	10 %	2	6 %
a new need, no current device	0	0 %	1	5 %	1	3 %

5.2. Consumers' decision-making in purchasing personal ICT devices

Sub-question 1. How do consumers form purchase decisions for personal ICT devices?

The results seem to support the theoretical model for the most part. These results are shown in Table 3 and in Figure 5 and Figure 6. In total, 73% admitted that they did some kind of an internal information search, which is the first stage of the decision-making process. Most people, 56%, had some brand in mind when they embarked on the buying process. Apple was mentioned by 10 people in the final and seven people in the pilot sample, making it the most popular brand. While 50% of the total sample clearly wanted an Apple product, the rest either did not specify a brand or mentioned some other brand. Four people had some specific model in mind in addition to the brand, and two only had some vague idea or criteria in mind in the internal information search. Two people based their external information search on experience, either own or someone else's. Seven people said that they did not have anything in mind before the external information search stage.

Of those 76% who confirmed to do external information search, 32% did their search online comparing prices and attributes of different models. Eight people incorporated online and in-store research, of which three specifically mentioned that they visit multiple stores. Three people actively follow technological and model development online. When combining these together, it can be inferred that 65% does some sort of online research prior to the purchase decision. Only 12% visit stores only, to talk to sales personnel and to test the devices. Eight people said that they don't or didn't do any prior research. This is because they trust experiences they heard from friends or because they are so committed to a brand that they feel they don't need to do any research. This is questionable, because brand loyalty solely is not enough to justify purchasing a certain model, as brands usually have several models to offer. Therefore, it might be that these people actually did some minor research but just didn't identify it when asked. What is also interesting, is that four people in the pilot sample said to do no research in the second stage, but low price is one of the priorities they mentioned later. It requires some kind of research to find out the cheapest price.

Table 3. Research done in the decision-making process.

Did you have some options already in mind?	Pilot	%	Final	%	Total	%
yes, certain brand	8	57 %	11	55 %	19	56 %
no	3	21 %	4	20 %	7	21 %
yes, certain brand and model	2	14 %	2	10 %	4	12 %
some criteria in mind	0	0 %	2	10 %	2	6 %
yes, based on own previous experience	0	0 %	1	5 %	1	3 %
yes, based on experiences heard from others	1	7 %	0	0 %	1	3 %
Did you study different options beforehand?	Pilot	%	Final	%	Total	%
yes, online comparisons	7	50 %	4	20 %	11	32 %
yes, online + in-store	0	0 %	5	25 %	5	15 %
no, brand loyalty	4	29 %	1	5 %	5	15 %
yes, only in stores to test the devices and talk to sales	1	7 %	3	15 %	4	12 %
yes, actively follows tech development online	0	0 %	3	15 %	3	9 %
yes, online + multiple stores	0	0 %	3	15 %	3	9 %
no, don't do research of any kind	2	14 %	0	0 %	2	6 %
no, trusts others' experiences	0	0 %	1	5 %	1	3 %

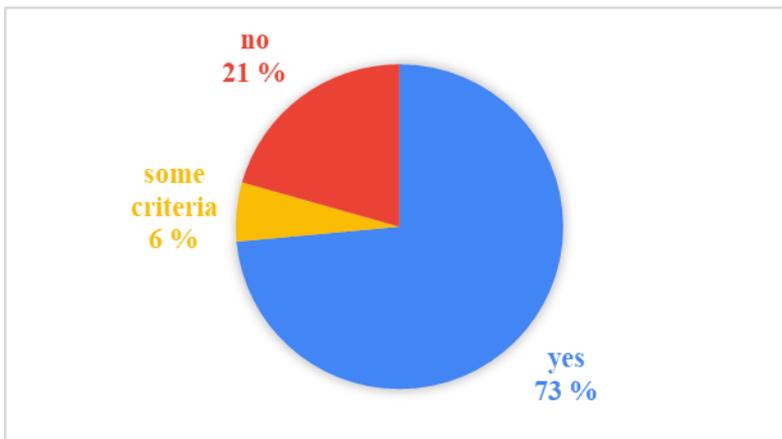


Figure 5. Internal information search.

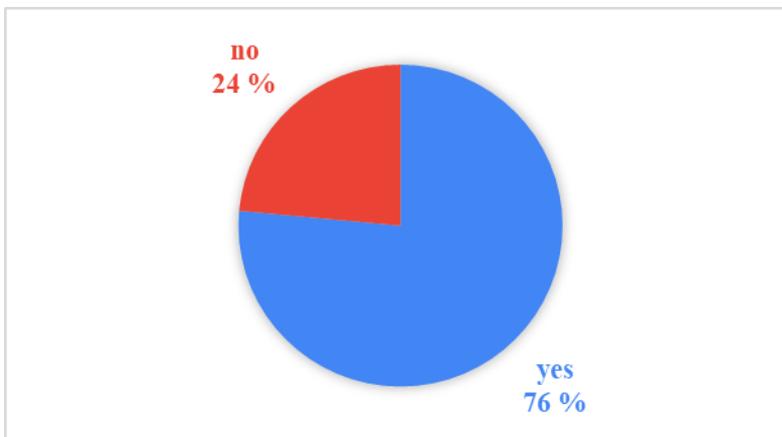


Figure 6. External information search.

When studying the data more carefully, certain patterns appear. When looking solely at the numbers presented above, it seems that over 70% of participants do research that supports the theoretical model. However, when looking at Figure 7 below, only 50% do research on both stages, the internal and external information search. This is more common in the final sample. The most common procedure (43%) in the pilot sample is to do internal, but not external information search. This would indicate that these people are more inclined to have a specific option in mind and they end up buying it. Approximately 20% in both samples did not have a specific option in mind, and therefore did longer research in the next stage. Those, who only had some criteria in mind in the beginning of the process, also did research in the second stage. These results seem logical; external research is needed especially when no clear idea of options exist.

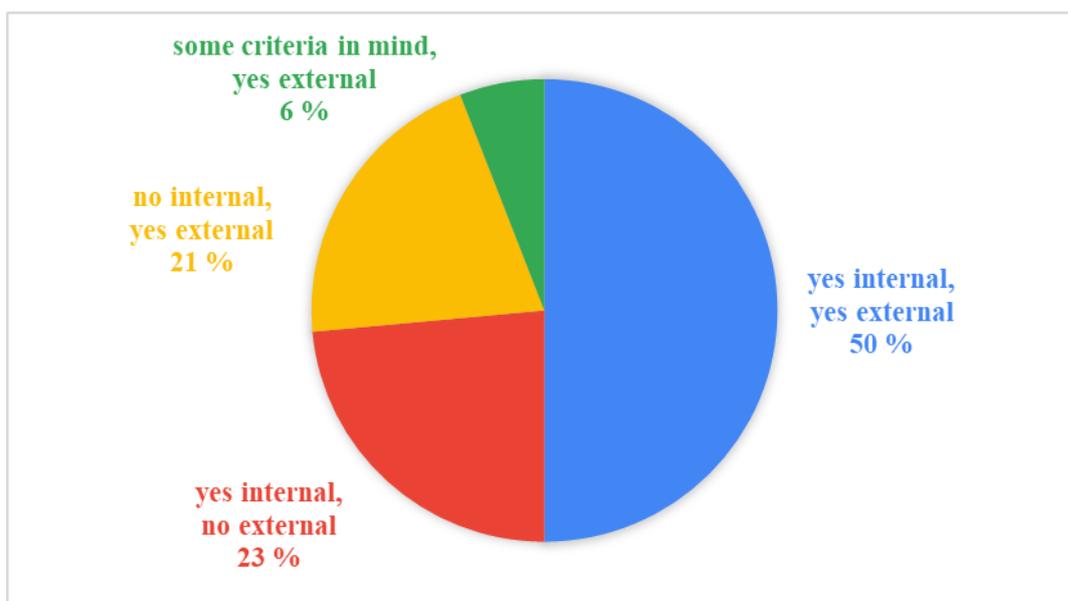


Figure 7. Types of research.

5.3. Awareness of refurbished personal ICT devices

Sub-question 2. What is the level of awareness of the existence of refurbished personal ICT devices among consumers shopping for a new alternative of such products?

When inquired whether the participant was aware that refurbished mobile devices exist in the market, a clear majority (82%) said yes. Awareness was slightly higher in the final sample than

in the pilot sample. Some people mentioned that they had sold their previous devices to companies who refurbish them and sell forward. Some mentioned the names of such companies they had heard of, and several people mentioned their friends to have good experiences from using their services. A few people mentioned that Apple sells refurbished devices as well, and that some consumer electronics stores have outlets with convenience returns. Three people had some experience with international companies, and two of them had had a negative experience. All in all, the level of awareness of the mere existence was high, but there was no deeper understanding of how the refurbishment business works.

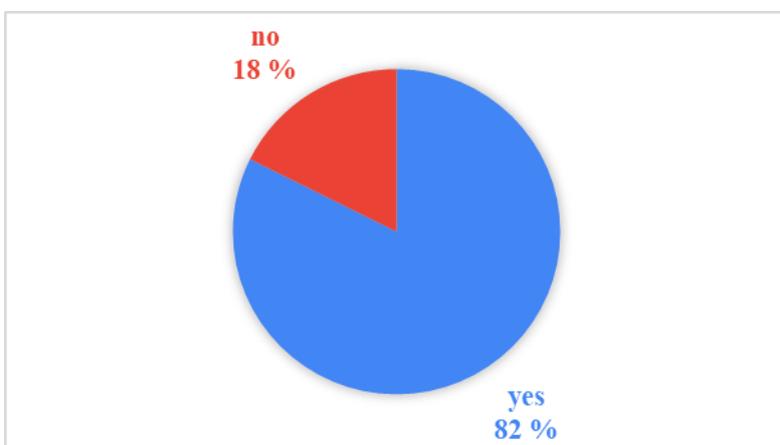


Figure 8. Awareness of refurbished devices' existence.

When discussing about the consequences of electronics consumption, seven people of the 20 in the final sample indicated to know them well. Five people mentioned the environmental benefits that can be achieved by recycling, reusing materials, buying second-hand or extending use-times. The environmental issues associated with electronics were also mentioned five times, for example problems with mining and waste were mentioned, as well as overconsumption of natural resources. Social issues were clearly mentioned by two people. These included for example mentions of child labour, poor working conditions, and lack of transparency in supply chains. Some also associated the problems to a certain country or continent, that they had heard about in the news.

In addition to the 35% knowing the consequences well, 30% had general awareness of the consequences. People in this category were not able to tell anything specific they knew, but they said or otherwise indicated to be aware in some level.

“I don’t know any details. I know of course that in some way they [electronic devices] consume natural resources. I haven’t looked into the matter.” Male, 43

“I don’t know very much. I can’t even tell you what I would know. But of course there is some kind of an impact.” Female, 25

The rest 35% did not know anything or knew very little of the consequences. Four people clearly stated that they know nothing, of which one also said that she is not interested in such matters. The rest said to know something, but when asked to clarify, spoke of something else or talked about irrelevant aspects.

“Especially laptops I don’t think so. They have one thing that affect the person, not the environment. Every laptop has a fan . . . it can cause damage to your body. Not so much on air or others.” Male, 36

“I know very little of electronics, regarding other products I know more. There is not much information in the media”. Female, 28

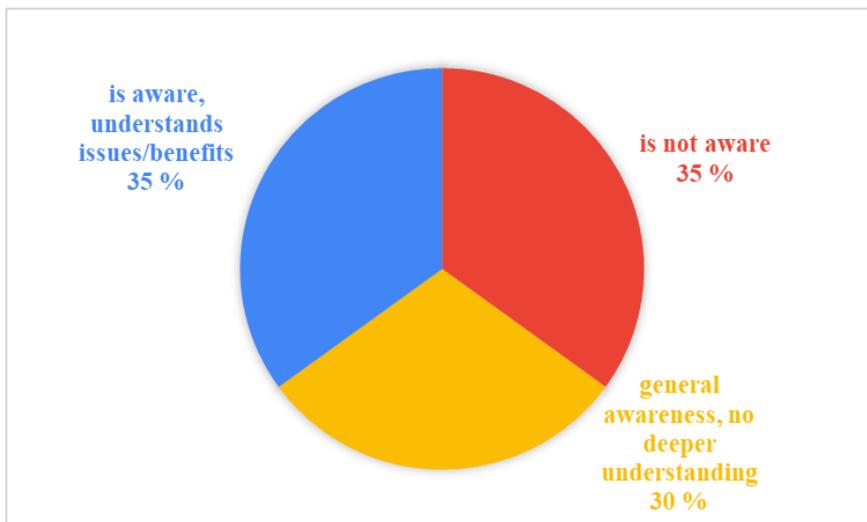


Figure 9. Level of awareness of the consequences of electronics consumption and production.

5.4. Attitudes towards refurbished personal ICT devices

Sub-question 3. What are the cultural explanations for not choosing the circular alternative?

When asked what are the most important attributes that have an impact on the buying decision, no clear environmental or utilitarian values were expressed. One person mentioned that the ability to repair the device or replace some parts, such as the battery, is important, which indicates some environmental values or understanding. Five people mentioned longevity as important, in a sense that the device must last long in use. This can indicate environmental values, but it can also come from a desire for convenience and quality. The most mentioned attributes are presented in Table 4.

There are some interesting differences between the pilot sample and the final one. In general, the pilot sample values cheaper, easy-to-use devices and Apple as a brand, while the final sample values efficiency, screen quality and longevity. For example, price is clearly the most mentioned attribute in the pilot sample, where 79% of people mentioned it. However, in the final sample, only four people (20%) mentioned price. In addition, three people in the final sample mentioned price in connection with quality indicating that the higher the price, the higher the quality of a product, and this is what matters to them. These results would indicate, that for the buyers in the interview location, low price is not as significant as for my pilot sample participants. This perhaps can be explained by the profile of the store; Power is not associated with the lowest prices and it is located in a high-end department store. When asked about the reasons to visit this specific store, most people mentioned that its location is convenient for them or that they were visiting the department store also. It might be, that those who favour low price above other attributes, go somewhere else. What is also significant, is that the final sample participants value the efficiency - speed, processor power and memory - of the device and its reliability more than the pilot sample. This, like longevity mentioned earlier, could indicate some understanding of the importance of longer use times, but it cannot be said for sure.

An interesting notion in the results is that seven of those, who had brand loyalty towards Apple, also mentioned price as one of their priorities. Apple is not known for its cheap prices, quite the contrary. In these cases, it seems that brand loyalty is especially strong, and price only matters

when considering which model to buy. These people could be especially responsive towards the refurbished alternatives, because they enable combining a more expensive brand and price priorities.

Table 4. The most mentioned attributes affecting the purchase decision.

What matters the most?	Pilot	%	Final	%	Total	%
price	11	79 %	4	20 %	15	44 %
speed, power, memory	2	14 %	10	50 %	12	35 %
user experience, easy-to-use	6	43 %	3	15 %	9	26 %
screen quality	2	14 %	7	35 %	9	26 %
brand: Apple	4	29 %	4	20 %	8	24 %
battery	3	21 %	4	20 %	7	21 %
external characteristics (e.g. size, design)	3	21 %	4	20 %	7	21 %
compatibility with other devices	2	14 %	4	20 %	6	18 %
quality	3	21 %	2	10 %	5	15 %
functioning, reliable	1	7 %	4	20 %	5	15 %
longevity	0	0 %	5	25 %	5	15 %
camera quality	1	7 %	4	20 %	5	15 %

Table 5. Reasons to choose the purchasing location.

Why this store?	Pilot	%	Final	%	Total	%
price and payment related	11	79 %	4	20 %	15	44 %
location / convenience	1	7 %	10	50 %	11	32 %
no reason	1	7 %	2	10 %	3	9 %
model comparison	0	0 %	2	10 %	2	6 %
instant availability	1	7 %	1	5 %	2	6 %
advertising	0	0 %	1	5 %	1	3 %

In the beginning of the interview, 32% of people mentioned that they considered buying a used device when they were thinking about buying a new one. Reasons to consider the reused option were price- and environment-related. The reasons for not choosing it in the end were practical, such as could not wait for the delivery because current device was broken or that the new device could be paid in instalments and the reused couldn't. Some mentioned that they tried to find a suitable, used device, but couldn't, or that they wanted a specific model that was not available in the reused market. The rest of the reasons were negative, such as risks and prices were considered too high. The rest, those who had not considered to buy a used alternative, justified their answer with several reasons. Desire for newness was mentioned several times, prices are not low enough to cover the risk and there is fear of receiving an out-of-date device.

When discussing more about the feelings and images reused electronics cause in the interviewees, a clear majority of people in both samples, 65%, associated negative things to reused devices. They mentioned things such as technological development making devices out of date, lack of warranty, battery problems and quality and monetary risks. Lack of trust and a fear of scams was also present in the answers. Lack of transparency was mentioned often, meaning that the device's history is not known to the buyer, and therefore it is impossible to know how the device has been treated and what has been the reason for the seller or previous owner to give it up. Adjectives that were associated to reused devices were faulty, worn out, old and unsatisfactory. The several mentions of lack of warranty in both questions indicates, that consumers don't know how the refurbishment business works and associates the terms "reused" or "second-hand" heavily to consumer-to-consumer sales. This causes uncertainty and lack of trust. There are also differences between the samples. In the final sample, technological development, lack of transparency and quality risks were mentioned the most. In the pilot sample the most pressing associations to reused products were lack of warranty and battery problems.

"I am afraid of getting scammed. It is difficult to make the purchase decision, because I am afraid if this is right, or why it is so cheap, and so on. So this is why I end up buying new devices." Male, 23

"I associate it [buying used devices] to consumer-to-consumer sales. I don't really know where people buy these from. I am sure there are some online groups . . . I don't trust it, a phone would not be the first thing I would buy as used." Female, 24

"I wouldn't buy electronics second-hand. If it is used, it is not in an acceptable shape. Technology gets old, these devices today, they don't last long. I have never liked to buy second-hand stuff in any form." Male, 59

Table 6. Negative aspects associated with reused devices.

Negative associations	Pilot	Final	Total
technological development	1	5	6
lack of warranty	5	1	6
lack of transparency	0	5	5
quality risk	0	4	4
battery problems	3	1	4
faulty	0	3	3
monetary risk	1	2	3
shorter lifetime	0	2	2
fear of scams, no trust in the seller	0	2	2
stolen products	1	1	2
worn out	2	0	2
old	2	0	2
unsatisfactory	1	1	2
uncertainty	1	0	1
doubts about updates	1	0	1

21% of the total sample had a positive and 15% neutral image of reused electronics. Positive images often occurred from good experiences; either from own past experiences or experiences heard from friends and relatives. Positive things mentioned were lower price, better for the environment, and that they were considered just as viable options as the new ones. Reliability and availability were also mentioned by one person. Those, who said that the goodness of reused devices depends on the seller or the device, its history or the need, were categorised in the neutral category.

“I have a positive image of them. You should not buy a new one just because it is new, but because you have a need. If the reused device works just as well as the new one, why not. It depends on the purpose.” Male, 37

“They are cheaper, immediately available and reliable.” Male, 24

“It depends on the device, what specs, why it has been made and what it has been used for, and based on this I form my view. Also what is relevant is why the first person has given it up. I think about this from consumer-to-consumer perspective . . . it depends whether it is relevant for my need.” Male, 42

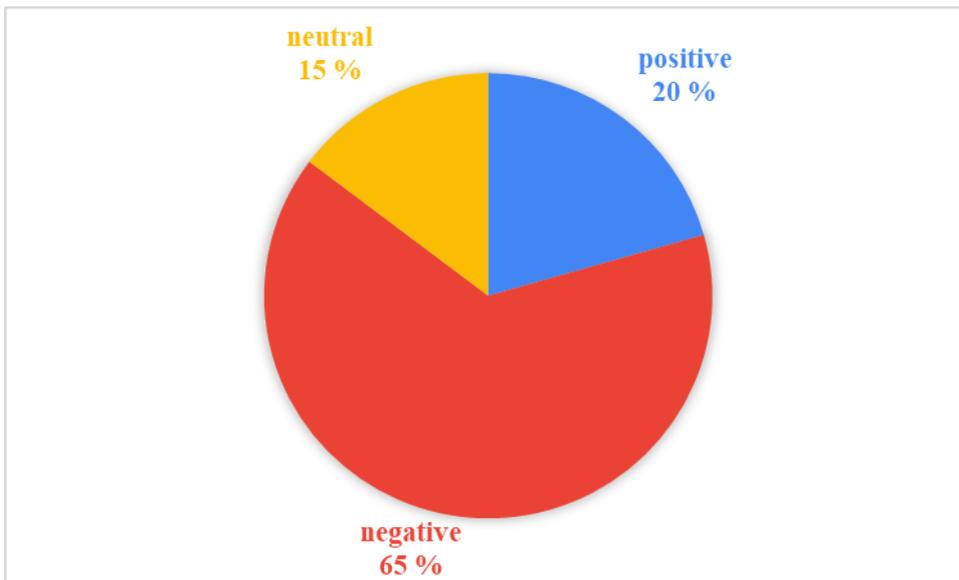


Figure 10. Feelings towards reused devices.

It is interesting to compare these results with the replies Taitonetti Oy received when asking their customers “Why did you buy / consider buying a reused computer instead of a new one?”. These replies are visible on Table 7 below. Taitonetti’s customers valued price and quality over other reasons. Price was mentioned 16 times (47% of respondents) and quality 12 times (35%). In addition, price-quality-ratio was mentioned 10 times (29%). Also, long use time and environmental reasons were quite high on the list, both mentioned six times (18%). Thus, their opinion seems to be quite different when comparing with the aspects the interview sample mentioned as barriers. These customers have experienced that the refurbished, business laptop or computer is of much better quality than a new consumer device with the same price; they think it’s more efficient and lasts longer, which is the opposite of what the interview sample thinks of used electronics.

“Price/quality. With the price of a supermarket laptop I got a device that has more power, is more comfortable to use and most likely lasts longer . . . when buying a business device from a known brand, you can get spare parts even after many years if needed.”

Table 7. Why Taitonetti’s customers bought or considered buying a reused computer.

Reasons to buy a reused computer	Times mentioned	%
price	16	47 %
quality	12	35 %
price-quality-ratio	10	29 %
longevity	6	18 %
environment	6	18 %
efficiency	3	9 %
good / professional service	3	9 %
familiar seller / prior experience	2	6 %
no bloatware	2	6 %
specific operating system	2	6 %
comfortability	1	3 %
spare parts	1	3 %
suitability for need	1	3 %
reliable	1	3 %
pro technology	1	3 %
better	1	3 %
attributes	1	3 %

After telling about the consequences of electronics production and consumption (please see Appendix 1), feelings and thoughts were inquired from the interview participants. The different answers were coded into six categories, presented in Figure 11, where one person can be included in several categories because participants reacted in complex ways. This figure only includes the final sample, because this question was asked in combination with another question from the pilot sample, and therefore the results are not comparable.

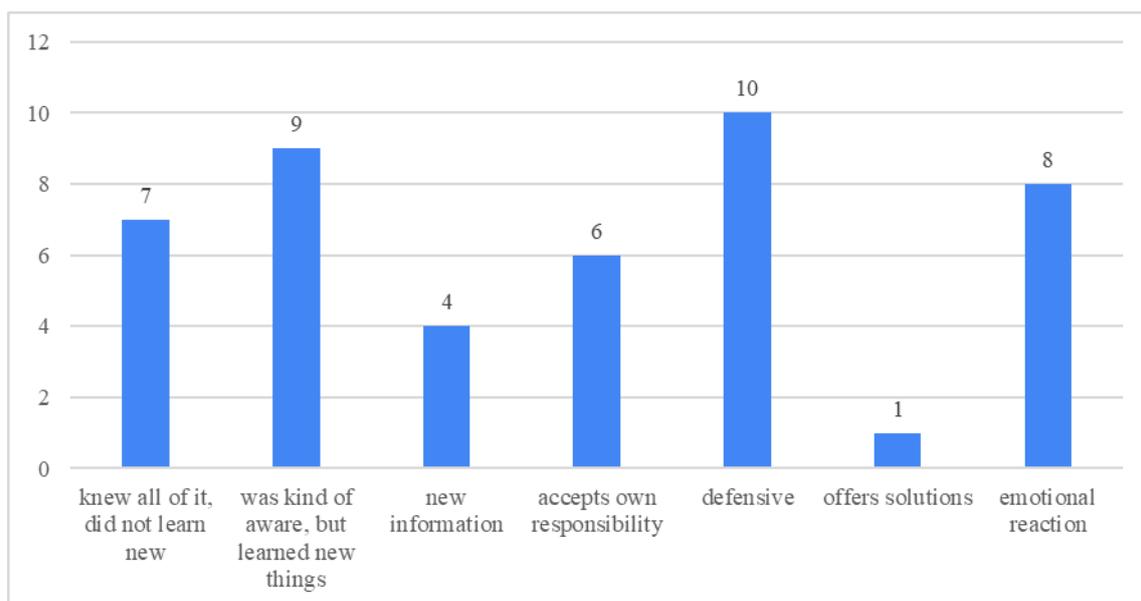


Figure 11. Reactions to information about consequences.

Based on the level of knowledge, the participants were categorised into three groups, those who knew all of the things I told them, those who said that they were aware of the issues in some level, but never really thought about them, and those who mentioned that all of it was new information to them. The second group was the biggest with nine people. In addition to this, the participants' reactions were categorised into four groups. Eight people experienced an emotional reaction. They said they felt anxiety, sadness, shock or annoyance and the things they were told made them think about the issues more carefully. Some also mentioned to be surprised, for example for the amount of waste mentioned. One person started to talk about the different solutions that are needed to fix the issues with consumption. A clear majority, however, expressed some sort of a defence reaction or started to blame others for the issues mentioned. The defence reaction became evident from responses such as the following:

“. . . what annoys me the most is that why do companies have to make so many different, all kinds of models and systems. Even though I try to recycle right and do other things, why do big companies want to make so many different kinds, couldn't they focus on making them properly and less maybe.” Female, 25

“It's a shame that these are not talked about more. Especially those conflict things, I haven't realised that a smart phone could cause so much. It's terrible. But big companies are always bad for the environment, it's not a secret. All of it makes sense. I'm sure I know this deep down, but because it is not talked about and it's not in the media . . . so it doesn't stay in people's minds. Maybe if people were given more information, maybe that would help them to make better decisions.” Female, 24

“I pretty much knew all about that. Yes, it's a bad situation, but we just cannot survive without these devices anymore.” Male, 59.

Those, who inclined to blame others instead of considering their own consumption, most often blamed big companies or overproduction in general, or just other consumers, who they think consume more than them. Lack of media coverage on these issues was also mentioned often, and one person said that governments should take greater responsibility. Six people clearly

acknowledged that themselves are partly responsible or that overconsumption in general is problematic.

“It makes me think about consumption. Here I am buying a new phone because I just don’t like the old one, even though there is nothing wrong with it.” Male, 37

“I knew about these already. That’s why I will buy a device that I can use for a long time, pay a little more for it and treat it well. Cheap products don’t last.” Male, 34

5.5. The impact of increased awareness on the decision-making process

Sub-question 4. How do consumers’ perception and attitudes towards the circular alternative change when they are told about the environmental and social impact of electronics’ production and consumption?

As mentioned, question 15 was about informing the participant about the consequences of electronics’ production and consumption and question 17 clarified the refurbishment concept. Please see Appendix 1 to see the interview questions. When solely looking at numbers, there is a clear growth in those who could buy a refurbished device when comparing answers in the beginning of the interview with those at the end. Answers to question 10 “When you were thinking about buying a new device, did you consider buying a used device?” were coded to ‘yes’ and ‘no’ answers, and answers to question 19 “Could you buy a refurbished, used device from a company in the future?” to ‘yes’, ‘maybe’ and ‘no’. First, 32%, or 11 people, said to have considered a reused device. At question 19, 56% said they could buy a reused device, and 26% said maybe. This means there was an increase of 24 percentage points, or if yes and maybe are combined, 50 percentage points’ increase in those who regard reused electronics in a positive manner. Only 6 people did not change their view from negative towards positive.

The same pattern can be seen with questions 12 and 18 that were about the characteristics and perception of reused devices. At first, 65% held a negative perception and described reused devices with negative words. 15% were neutral and 21% positive. However, when asked again

after clarifying the refurbishment concept, only 24% remained negative while 76% perceived reused devices as positive or somewhat positive. These changes are visible in Figure 12.

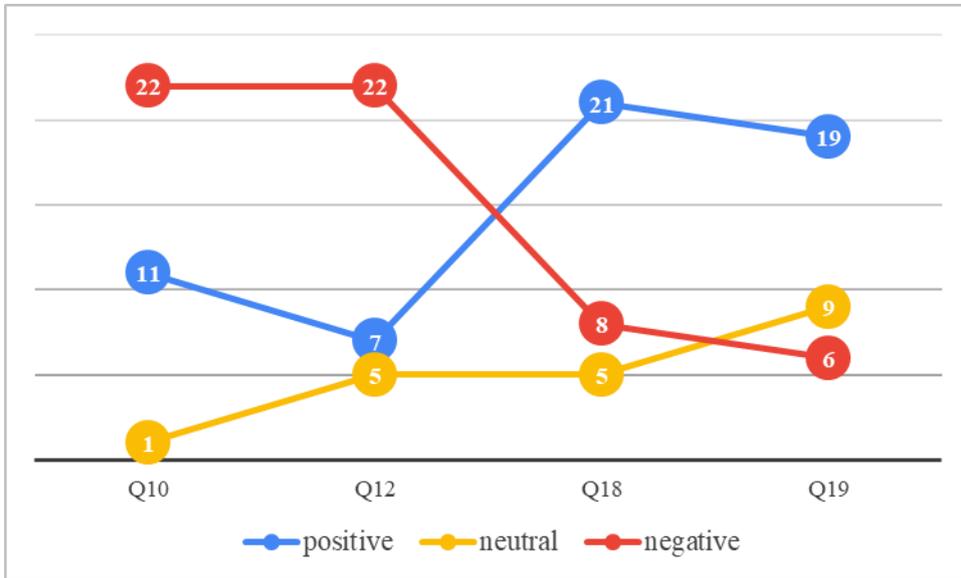


Figure 12. Changes in consumers' perception of reused electronic devices.

When studying these responses more thoroughly, more specific change patterns can be seen. 29% of participants changed their view from negative to positive (10 people), and 26% (nine people) from negative to neutral. This means 56% of all participants changed their view of reused electronics after they received more information. 18% (six people) stayed negative throughout the interview and 26% (nine people) stayed positive. These are represented in Figure 13. Those, who remained negative, were for the most part consistent also with their reasoning: quality and monetary risks, technological development as well as lack of transparency were mentioned. The new information they received was not enough to convince them, and two of them had a previous, bad experience with used electronics that heavily affected their opinion. One entirely new reason arises in this question, a fear of a complicated buying process, mentioned by two people in the final sample. This could be due to the new information and not entirely understanding yet how the refurbishment market works. One respondent was slightly contradictory. He had considered a reused alternative but hadn't found a suitable one, but he also said that if he could not afford a new device, he would buy a used one. When asked whether the new information changed his view, he stated that he knew all of it already, and used devices are good for those who do not demand as much power and efficiency as he does. Price was not

an issue anymore. Despite his initial, positive answer to question 10, he was coded as consistently negative due to rest of the interview clearly indicating a negative perception.

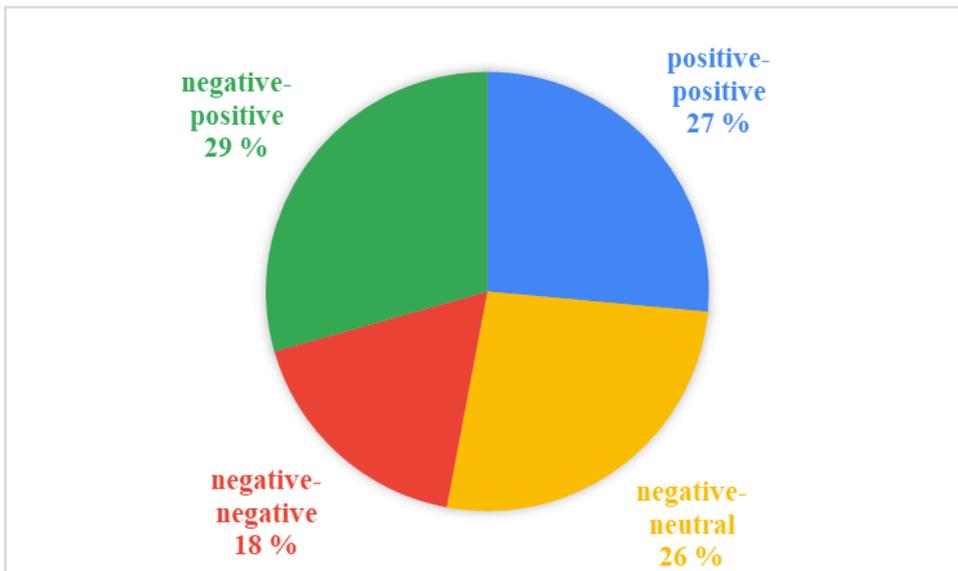


Figure 13. Specific change patterns in consumers' perception of reused electronic devices.

Those, who changed their view from negative to neutral or positive mentioned warranty, environmental benefits and their higher trust for professional sales. Five people specifically said that the new information they received had an impact on their final answer. For some, the lower price of refurbished products sounded appealing, and two people who had not known about refurbishment before, said that this information convinced them. One person was more convinced of reused electronics' quality after learning more about them. The most mentioned reasons for changing or not changing opinions are presented in Table 8.

Again, there are interesting differences between the samples. The pilot sample was impressed on warranty being included in refurbished devices, and this made them change their minds. The final sample, on the other hand, was now more convinced because of the new information in general and also regarding the environmental benefits. The most mentioned reason for not changing their opinion was "no guarantee of quality" in both samples. The second most mentioned reason in the pilot sample was technological development, which is interesting because this reason has not emphasised in the pilot sample in previous questions. For the final sample the second most mentioned reason was lack of transparency, which is consistent with earlier results.

Table 8. Reasons for changing and not changing opinions.

What made you change your mind?	Pilot	Final	Total
warranty	4	2	6
environmental benefits	0	6	6
increased information	1	4	5
more trust in professional sales	1	3	4
lower price is appealing	0	3	3
info on refurbishing	2	0	2
more convinced of the quality	0	1	1
Why this did not change your mind?	Pilot	Final	Total
no guarantee of quality	2	3	5
lack of transparency	0	3	3
prices not low enough	1	2	3
technological development	2	1	3
complicated process	0	2	2
lack of trust	0	2	2
desire for newness	0	1	1

Consistent positive and consistent negative categories, however, are somewhat problematic in this case. There were those, who truly expressed the same opinion in every question, but there were also some answers that were more prone to interpretation. For example, one person was buying a tablet as a gift. He expressed positive perceptions of reused electronics in the beginning and said that he could very well buy a reused version for himself, but not as a gift. In the end he justified his choice by stating that the risk is too high. He was coded into the consistently negative category, because he was consistent in that he would not buy reused electronics in the purpose he had. This leaves out that he actually had a positive attitude towards the reused option. However, due to his answers, he was categorised also in the attitude-behaviour-gap-group. Twelve people in total (35%) indicated some level of attitude-behaviour-gap. This was seen with those participants, who reacted in positive ways to recycling and reuse, and might have even indicated some environmental values at some point in the interview, but either stated clearly to not being ready to buy a refurbished device, or it could be inferred in their responses.

5.6. Demographics' influence on buying behaviour

When comparing female and male participants and different age groups in different questions throughout the interview, the results are not consistent. There is no clear evidence that would indicate that either gender or any age group would be more likely than others to consume

sustainably. Male participants were more aware of consumptions' consequences (50% vs. 21%) and had more often considered buying a used device before (35% vs. 29%). However, towards the end of the interview, female participants expressed more positive responses. 64% of female participants and 40% of males said they could buy a used device after learning more about them and the consequences of consumption, and 64% of women, 50% of men, participants changed their view from negative to neutral or positive.

All age groups could not be compared to each other due to the low number of over 45-year-olds in the sample. When comparing the other three groups, 15–24-, 25–34- and 35–44-year-olds, the 15–24 and 35–44 groups were more positive than the 25–34 group.

The device had no impact on the change of opinion; all three categories were connected to change in equal amounts. However, phone buyers were slightly more positive throughout the interview than laptop or tablet buyers.

6. DISCUSSION AND CONCLUSIONS

The aim of this research was to explore the cultural barriers preventing circular consumption and discover what role awareness and attitudes have in making purchase decisions. In this final chapter I will discuss the themes that were emphasised in this research and their implications. The purpose is to give an answer to the main research question, ‘What are the cultural barriers which affect consumers’ attitudes and purchase decisions?’ as well as develop an understanding of consumption in circular economy and the difficulties associated with it.

As discussed in chapter 2.2., consumption has a major role in our current environmental and social problems. However, it is also one of the most impactful ways for individuals to make a difference and contribute to a more sustainable living. One of the problems regarding consumption is that we have developed a mindset that regards consumption as a reward. It’s a reward for our hard work at school and work and the reason why we have aimed for continuous personal wealth creation. High carbon footprints go hand-in-hand with wealth, and even though more and more people can afford luxury products nowadays, consumption is still a problem only for the wealthy. Lifestyles are harder to change when they have already been established, but it is necessary for the wellbeing of us and the environment.

Despite the efforts Finland and the EU have seen to enable the adoption of CE in recent years, and despite the growing hype around circular economy, we seem to be far from the suggested paradigm shift. Like other research before, the results of this study indicate that those who recognise their responsibility as a consumer and are willing to make changes to their lifestyle and consumption habits, are a minority. Many people said to know something about the variety of problems regarding consumption in general and/or the manufacture of ICT devices, but not as many of them were acting accordingly. This study used the case of personal ICT devices to study what is preventing us from fully embracing circular economy as consumers. The results are largely supportive of earlier research, but also new phenomena were discovered. There are three themes that are emphasised in the results: lack of information, lack of transparency and desire for long use times. These themes all ultimately point to lack of consumer awareness. They seem to be the most important cultural barriers to circular consumption and describe well the current consumption culture.

As mentioned in chapter 2.1.3, Govindan and Hasanagic (2018, 297) and Kirchherr et al. (2018, 268) found that lack of consumer awareness is one of the most pressing barriers to circular economy. My analysis suggests that this is true also in the consumption of personal ICT devices. Lack of information was explicitly stated by the interview participants, but it also became visible in other ways, such as when talking about the reasons for not buying used electronics. Even though many said to know about the reused options, when analysing the answers, it became clear the refurbishment concept is fairly unknown. Even though general awareness of the reused options is quite high, most consumers don't know the details of how the refurbishment industry works and have negative associations towards used electronic products.

The results indicate that consumers think their barriers for buying circular are mostly technological. My analysis suggests that this is a slight misperception. Yes, technology develops fast and ICT companies practice planned obsolescence, as mentioned in chapter 2.3., and consumers know this. However, when comparing earlier research and information gained from industry professionals with my results, the negative associations consumers have towards personal ICT devices seem to mostly arise from lack of information and experience. Misperception clearly is also a major barrier and, like Engel *et al.* (1995, 336) and Bray *et al.* (2011, 605) have also shown, can have big impacts on buying behaviour.

Lack of transparency has not been emphasised in earlier research but became one of the most mentioned aspects in this study. In my opinion, it can be considered a valid concern from the consumer perspective. It is not currently possible to track the used devices' history completely, especially if the device has been used by a consumer. This understandably causes concern in potential buyers and should be acknowledged by the industry. It could potentially be solved by increasing transparency in the refurbishment process and explaining simply what parts of the device have been repaired or replaced. The results indicate that a big issue with the reused options is that consumers have no trust in their quality. This might come from the fact that the selling and buying of used items has traditionally happened in the consumer-to-consumer market. This can also be corrected with increasing transparency in the refurbishment industry. Another aspect of this barrier seems to be lack of understanding of the handling of e-waste and its reuse and recycling practices and customs in different countries. Not understanding or knowing how and where electronic devices are recycled increases mistrust. Based on my

analysis, consumers rather keep their devices at home, where their confidential information is safe, and which does not cause harm to other people. This induces another practical implication, which is that the national recycling processes should be more transparent and focus should be put on the conditions of the recycling countries.

The third barrier is the desire for long use times, which is, again, related to planned obsolescence and technological development. However, there is also a misperception, which makes it suitable for the cultural barrier framework. Consumers' expectations for the lifetimes of personal ICT devices are lower than what they actually are, and my results regarding this support earlier research, such as Wieser and Tröger (2015) in Proske *et al.* (2016, 4). However, one cannot underestimate the experience consumers have; many have experienced first-hand how their devices become outdated within a couple of years. The big ICT manufacturers should acknowledge their responsibility in the matter and design longer-lasting products, and the refurbishment industry could try to prove that their older devices last longer than consumers expect, for example by doing research and publishing the results.

From this analysis it can be seen that all of these barriers are somehow related to lack of awareness. There was also a clear change in attitudes, awareness and perceptions after telling the participant about the consequences of ICT consumption and production and/or the refurbishment business. 56% changed their perception or opinion from negative to neutral or positive. This finding supports Glasman and Albarracín's (2006, 781) argument that new information can change attitudes. If consumers knew more about the circular options and their environmental and social benefits, as well as the negative consequences of linear production, it would impact their consumption behaviour.

Based on my analysis of the results, it is clear that the awareness of consequences and attitudes shaped by prior experiences, information, hearsay and misperception for example, have significant impact on consumption behaviour. The biggest theoretical contributions of this study relate to this. When analysing the theoretical model and its suitability for the consumption of personal ICT devices, I discovered that the power of new information seems to be especially strong in the second information search stage, where most of the final sample was at the time of the interview. The practical implication from this is that the businesses in the refurbishment

industry should especially try to influence consumers in this stage of their decision-making, i.e. try to advertise in places where consumers browse for potential options to take into their final consideration set.

Technology consumption is heavily induced by the rapid development and release of new models and making them attractive to consumers. My results indicate the same thing; desire for newness and technological development as reasons to buy a new device were more common than broken devices. This makes it difficult for the circular options to become mainstream in this field, because the circular options are not considered to have the same feeling of newness. The refurbishment industry can ease this by creating an experience around the product, such as some companies provide a special box for the item so that the consumer can experience the thrill of unboxing the product. However, this also calls for a dramatic change of consumer culture, more so than with some other products that are easier to recycle and that don't cause high involvement or feeling. The thrill of new and fast cycles are especially associated with the culture around technology. Unlike many other cultural aspects, the image of technology is that it does not get better when it gets older; the concept of 'vintage ICT' does not exist. Therefore, circular economy just might not work in this context yet. The high-tech industry, however, can influence this with design measures.

What could also be interpreted from the results, is that consumers are not willing to make an effort to gain new information or educate themselves on more sustainable buying behaviour. Many of the interview participants indicated to know something or be generally aware of the different problems that exist in the industry and generally in consumption, but blamed others for not providing more information or doing something to solve the issues. Based on my own experience I could say that there is plenty of information available for those who are willing to search for it and embrace it. It could be argued therefore, that even if these matters would be more covered in the media for example, people would forget about it fairly soon if they would even read the news. Somehow consumers should be encouraged to embrace a completely different kind of a mindset on consumption, and the care for the environment and other people should become a priority in their lives. This means a cultural change. It's not solely up to individuals however, Circular Economy needs to be supported and encouraged by the society as a whole. Like system thinking suggests, the solution to our consumption problems comes

from cooperation. We need more support to circular products and their providers, companies need to adopt new business models and individuals need to embrace the circular products.

Culture is a wide concept, and cultural barriers can be understood in a myriad of ways. This study focused on consumer awareness and attitudes, which on the other hand enabled a deeper dive into this topic, but on the other is also a limitation, because it makes it impossible to compare different kinds of cultural barriers to find out the most pressing. However, I believe this study revealed that cultural barriers, lack of consumer awareness especially, is prevalent in the consumption of (circular) personal ICT devices. I would say that today the technological barriers are mostly overcome, which is consistent for example with Kirchherr *et al.* (2018, 269). Even though planned obsolescence does exist, the things consumers are most afraid of in reused devices can be overcome with refurbishment and remanufacture. There was some indication to market barriers in the results, for example some considered prices to be too high when compared to the risk they perceive reused devices to have. However, when information about the quality spreads, it will decrease the risk and therefore delete the price issue as well. Regulatory barriers are not visible in the results, but regulative actions could work as driver for mainstreaming the circular options. Based on this analysis, it can be concluded that cultural barriers are the main barriers preventing circularity in the field of personal ICT devices. These barriers have major impact on individuals' purchasing behaviour; lack of awareness is preventing them from making informed decisions and the lack of pro-environmental and pro-social values makes them prioritise other aspects in decision-making.

However, it must be noted that the concept of awareness is quite ambiguous. Despite the efforts of defining it in chapter 3, the many personal characteristics affecting it make it difficult to draw foolproof conclusions. I have treated awareness as a cultural aspect, but individuals are also exposed to different amounts of external influences, which affect their level of awareness as well as beliefs, values and attitudes. Therefore, the results should be looked at with a critical lens.

It must also be noted that the sample size was small and therefore the amount of data was limited. This naturally has guided the analysis and the results could be different when analysing a larger sample. The final interviews were also done only in one location. Including stores with

different profiles could have provided an opportunity to compare results, and could provide an area for future research. As this was an exploratory study, the analysis of relationships between variables was loose. With an explanatory study, deeper patterns could possibly have been found. This could have better explained why some changed their opinion in the end and others didn't, as well as characterisation could have been made of those consumers who could most likely change their minds.

The emphasis of lack of transparency was a new finding and could be studied further. It is currently not possible to know the used devices' history, which causes uncertainty in potential buyers.

REFERENCES

- Abbey, J. D., Meloy, M. G., Blackburn, J. & Guide, V. D. R. (2015) Consumer Markets for Remanufactured and Refurbished Products. *California Management Review*, 57(4), pp. 26–42.
- Ajzen, I. (2011) The theory of planned behaviour: Reactions and reflections. *Psychology and Health*, 26(9), pp. 1113–1127.
- Alhola, K., Mäenpää, I., Nissinen, A., Nurmela, J., Salo, M. & Savolainen, H. (2019) Julkisten hankintojen ja kotitalouksien kulutuksen hiilijalanjälki ja luonnonvarojen käyttö. ENVIMAT-mallinnuksen tuloksia. Suomen Ympäristökeskuksen raportteja 15/2019. Suomen ympäristökeskus (SYKE).
- Andersen, M. S. (2007) An introductory note on the environmental economics of the circular economy. *Sustainability Science*, 2(1), pp. 133–140.
- André, H., Ljunggren Söderman, M. and Nordelöf, A. (2019) Resource and environmental impacts of using second-hand laptop computers: A case study of commercial reuse. *Waste Management*, 88, pp. 268–279.
- Arnould, E. J. and Thompson, C. J. (2005) Consumer Culture Theory (CCT): Twenty Years of Research. *Journal of Consumer Research*, 31(4), pp. 868–882.
- Babbitt, C. W., Williams, E. and Kahhat, R. (2011) Institutional Disposition and Management of End-of-Life Electronics. *Environmental Science and Technology*, 45, pp. 5366–5372.
- Bajde, D. (2014) Consumer Culture Theory: Ideology, Mythology and Meaning in Technology Consumption. *International Journal of Actor-Network Theory and Technological Innovation*, 6(2), pp. 10–25.
- Bakker, C. et al. (2014) Products that go round: exploring product life extension through design. *Journal of Cleaner Production*, 69, pp. 10–16.
- Balanay, R. and Halog, A. (2016) Charting policy directions for mining's sustainability with circular economy. *Recycling*, 1(2), pp. 219–231.
- Bangsa, A. B. and Schlegelmilch, B. B. (2020) Linking sustainable product attributes and consumer decision-making: Insights from a systematic review. *Journal of Cleaner Production*, 245, p. 118902.
- Blomsma, F. and Brennan, G. (2017) The Emergence of Circular Economy - A New Framing Around Prolonging Resource Productivity. *Journal of Industrial Ecology*, 21(3), pp. 603–614.
- Bonilla Hernández, A. E., Lu, T., Beno, T., Fredriksson, C. & Jawahir, I. S. (2019) Process sustainability evaluation for manufacturing of a component with the 6R application. *Procedia Manufacturing*, 33, pp. 546–553.

- Boulding, K. E. (1966) The economics of the coming spaceship earth. In: Jarrett, H. (eds.) *Environmental Quality in A Growing Economy: Essays from the Sixth RFF Forum*, 3, pp. 1–20.
- Bray, J., Johns, N. and Kilburn, D. (2011) An Exploratory Study into the Factors Impeding Ethical Consumption. *Journal of Business Ethics*, 98(4), pp. 597–608.
- Buerke, A., Straatmann, T., Lin-Hi, N. & Müller, K. (2017) Consumer awareness and sustainability-focused value orientation as motivating factors of responsible consumer behavior. *Review of Managerial Science*, 11, pp. 959–991.
- Camacho-Otero, J., Boks, C. and Nilstad Pettersen, I. (2018) Consumption in the Circular Economy: A Literature Review. *Sustainability*, 10(2758), pp. 1–25.
- Chartrand, T. L. (2005) The Role of Conscious Awareness in Consumer Behavior. *Journal of Consumer Psychology*, 15(3), pp. 203–210.
- Cohen, J. R., Pant, L. W. and Sharp, D. J. (2001) An Examination of Differences in Ethical Decision-Making Between Canadian Business Students and Accounting Professionals. *Journal of Business Ethics*, 30, pp. 319–336.
- Cole, C., Gnanapragasam, A., Cooper, T. and Singh, J. (2019) An assessment of achievements of the WEEE Directive in promoting movement up the waste hierarchy: experiences in the UK. *Waste Management*, 87, pp. 417–427.
- Cole, C., Gnanapragasam, A. and Cooper, T. (2017) Towards a circular economy: exploring routes to reuse for discarded electrical and electronic equipment. *Procedia CIRP*, 61, pp. 155–160. The 24th CIRP Conference on Life Cycle Engineering.
- Cooper, T. (2005) Slower Consumption. Reflections on Product Life Spans and the “Throwaway Society”. *Journal of Industrial Ecology*, 9(1–2), pp. 51–67.
- Deng, L., Babbitt, C. W. and Williams, E. D. (2011) Economic-balance hybrid LCA extended with uncertainty analysis: Case study of a laptop computer. *Journal of Cleaner Production*, 19(11), pp. 1198–1206.
- Diamantopoulos, A., Schlegelmilch, B. B., Sinkovics, R. R. and Bohlen, G. M. (2003) Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. *Journal of Business Research*, 56(6), pp. 465–480.
- Egol, M., Clyde, A. and Rangan, K. (2010) The New Consumer Frugality. *Strategy+Business*. Available at: <https://www.strategy-business.com/article/00023?gko=bb11c> (Accessed: 14 January 2020).
- Van Eijk, F. (2015) Barriers & Drivers towards a Circular Economy - Literature Review. Acceleratio B.V. Available at: <https://www.circulairondernemen.nl/uploads/e00e8643951aef8adde612123e824493.pdf>. (Accessed: 3 January 2020).

Engel, J. F., Blackwell, R. D. and Miniard, P. W. (1995) *Consumer Behavior*. Eight Edition. The Dryden Press.

Eriksson, P. and Kovalainen, A. (2008) *Qualitative Methods in Business Research*. London: Sage.

European Commission (2012) *Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste*. Available at: http://ec.europa.eu/environment/waste/framework/pdf/guidance_doc.pdf. (Accessed: 8 January 2020).

European Commission (2019a) *Directive 2008/98/EC on waste (Waste Framework Directive)*. Available at: <https://ec.europa.eu/environment/waste/framework/> (Accessed: 8 January 2020).

European Commission (2019b) *Report From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions On the implementation of the Circular Economy Action Plan*. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52019DC0190> (Accessed: 19 December 2019).

European Commission (2020) *New Circular Economy Action Plan, Changing how we produce and consume: New Circular Economy Action Plan shows the way to a climate-neutral, competitive economy of empowered consumers*. Available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_20_420 (Accessed: 12 March 2020).

European Union (2020a) *Circular Economy Action Plan. For a cleaner and more competitive Europe*. Available at: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf (Accessed: 12 March 2020).

European Union (2020b) *Circular Economy Action Plan. The European Green Deal*. Available at: https://ec.europa.eu/commission/presscorner/api/files/attachment/863182/EU_Greendeal_Circular_economy_en.pdf.pdf (Accessed: 12 March 2020)

Evans, S., Fernando, L. and Yang, M. (2017) *Sustainable Value Creation—From Concept Towards Implementation*. In Stark, R., Günther, S., and Bonvoisin J. (eds.) *Sustainable Manufacturing - Challenges, Solutions and Implementation Perspectives*. Springer Nature, pp. 203–220.

The Finnish Government (2019) *Inclusive and Competent Finland – a socially, economically and ecologically sustainable society*. Programme of Prime Minister Sanna Marin's Government 10 December 2019. Publications of the Finnish Government 2019:33. Helsinki.

Fitzpatrick, C., Olivetti, E., Miller, T. R., Roth, R. and Kirchain, R. (2015) *Conflict Minerals in the Compute Sector: Estimating Extent of Tin, Tantalum, Tungsten, and Gold Use in ICT Products*. *Environmental Science and Technology*, 49, pp. 974–981.

- Folkes, V. S. and Kamins, M. A. (1999) Effects of Information About Firms' Ethical and Unethical Actions on Consumers' Attitudes. *Journal of Consumer Psychology*, 8(3), pp. 243–259.
- Franco, M. A. (2019) A system dynamics approach to product design and business model strategies for the circular economy. *Journal of Cleaner Production*, 241, p. 118327.
- Gaur, J., Amini, M., Banerjee, P. and Gupta, R. (2015) Drivers of consumer purchase intentions for remanufactured products: A study of Indian consumers relocated to the USA. *Qualitative Market Research: An International Journal*, 18(1), pp. 30–47.
- Geissdoerfer, M., Savaget, P., Bocken, N. M. P. and Hultink, E. J. (2017) The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, 143, pp. 757–768.
- Gilg, A., Barr, S. and Ford, N. (2005) Green consumption or sustainable lifestyles? Identifying the sustainable consumer. *Futures*, 37(6), pp. 481–504.
- Glasman, L. R. and Albarracín, D. (2006) Forming Attitudes That Predict Future Behavior: A Meta-Analysis of the Attitude–Behavior Relation. *Psychological Bulletin*, 132(5), pp. 778–822.
- Govindan, K. and Hasanagic, M. (2018) A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective. *International Journal of Production Research*, 56(1–2), pp. 278–311.
- Graedel, T. E., Harper, E. M., Nassar, N. T. and Reck, B. K. (2015) On the materials basis of modern society. *Proceedings of the National Academy of Sciences of the United States of America*, pp. 6295–6300.
- Gullstrand, E., Lehner, M. and Mont, O. (2016) Exploring consumer attitudes to alternative models of consumption: motivations and barriers. *Journal of Cleaner Production*, 123, pp. 5–15.
- Hansen, U. and Schrader, U. (1997) A Modern Model of Consumption for a Sustainable Society. *Journal of Consumer Policy*, 20(4), pp. 443–468.
- Heikkilä, I. (2020a) Interview. 28 January 2020.
- Heikkilä, I. (2020b) Tietokoneiden päästölaskelma 2019. Taitonetti Oy. Available: https://taitonetti.fi/index.php?route=blog/article&path=2&article_id=61. (Accessed: 28 January 2020).
- Homrich, A. S., Galvão, G., Gamboa Abadia, L. and Carvalho M. M. (2018) The circular economy umbrella: Trends and gaps on integrating pathways. *Journal of Cleaner Production*, 175, pp. 525–543.

Jackson, T. (2005) *Motivating Sustainable Consumption: A Review of Evidence on Consumer Behaviour and Behavioural Change*. A Report to the Sustainable Development Research Network. Guildford, UK.

de Jesus, A. and Mendonça, S. (2018) Lost in Transition? Drivers and Barriers in the Eco-innovation Road to the Circular Economy. *Ecological Economics*, 145, pp. 75–89.

Johnson, J., Harper, E. M., Lifset, R. and Graedel, T. E. (2007) Dining at the Periodic Table: Metals Concentrations as They Relate to Recycling. *Environmental Science and Technology*, 41(5), pp. 1759–1765.

Kahney, L. (2005) *The Cult of iPod*. No Starch Press.

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A. and Hekkert, M. (2018) Barriers to the Circular Economy: Evidence From the European Union (EU). *Ecological Economics*, 150, pp. 264–272.

Kirchherr, J., Reike, D. and Hekkert, M. (2017) Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, 127, pp. 221–232.

Koenig-Lewis, N., Palmer, A., Dermody, J. and Urbye, A. (2014) Consumers' evaluations of ecological packaging - Rational and emotional approaches. *Journal of Environmental Psychology*, 37, pp. 94–105.

de Kok, M. (2019) Apple has lost its hype bite. *Trendmark*. Available at: <https://www.trendmark.io/blog/2019/6/19/apple-has-lost-its-hype-bite> (Accessed: 27 January 2020).

Korhonen, J., Nuur, C., Feldmann, A. and Eshetu Birkie, S. (2018) Circular economy as an essentially contested concept. *Journal of Cleaner Production*, 175, pp. 544–552.

Korhonen, J., Honkasalo, A. and Seppälä, J. (2018) Circular Economy: The Concept and its Limitations. *Ecological Economics*, 143, pp. 37–46.

Kotler, P. and Armstrong, G. (2011) *Principles of marketing*. 14th edn. Pearson Education, Upper Saddle River.

Kozinets, R. V (2008) Technology/Ideology: How Ideological Fields Influence Consumers' Technology Narratives. *Journal of Consumer Research*, 34, pp. 865–881.

Kraus, S. J. (1995) Attitudes and the Prediction of Behavior: A Meta-Analysis of the Empirical Literature. *Personality and Social Psychology Bulletin*, 21(1), pp. 58–75.

Kravchenko, M., Pigosso, D. C. and McAloone, T. C. (2019) Towards the ex-ante sustainability screening of circular economy initiatives in manufacturing companies: Consolidation of leading sustainability-related performance indicators. *Journal of Cleaner Production*, 241, p. 118318.

Kristensen, H. S. and Mosgaard, M. A. (2020) A review of micro level indicators for a circular economy – moving away from the three dimensions of sustainability? *Journal of Cleaner Production*, 243, p. 118531.

Kumar Panda, T., Kumar, A., Jakhar, S., Luthra, S., Garza-Reyes, J. A., Kazancoglu, I. and Nayak, S. S. (2020) Social and environmental sustainability model on consumers' altruism, green purchase intention, green brand loyalty and evangelism. *Journal of Cleaner Production*, 243, p. 118575.

Kuudes Helsinki (2019) *The Informed Consumer*. Available at: <https://kuudes.com/theinformedconsumer/> (Accessed: 19 February 2020).

Laita, S. (2019) The updated Finnish road map to a circular economy offers a new foundation for funding well-being. Sitra. Available at: <https://www.sitra.fi/en/news/updated-finnish-road-map-circular-economy-offers-new-foundation-funding-well/> (Accessed: 19 December 2019).

Leiserowitz, A. A., Kates, R. W. and Parris, T. M. (2004) *Sustainability Values, Attitudes, and Behaviors: A Review of Multi-national and Global Trends*. CID Working Paper No. 113. Cambridge, MA: Science, Environment and Development Group, Center for International Development, Harvard University.

Lettenmeier, M., Akenji, L., Toivio, V., Koide, R. and Amellina, A. (2019) 1,5 asteen elämäntavat. Miten voimme pienentää hiilijalanjälkemme ilmastotavoitteiden mukaiseksi? Sitran selvityksiä 148. Helsinki.

Ljunggren Söderman, M. and André, H. (2019) Effects of circular measures on scarce metals in complex products – Case studies of electrical and electronic equipment. *Resources, Conservation and Recycling*, 151, p. 104464.

Lobos, A. and Babbitt, C. (2013) Integrating Emotional Attachment and Sustainability in Electronic Product Design', *Challenges*, 4(1), pp. 19–33.

Magaudda, P. (2015) Apple's Iconicity: Digital Society, Consumer Culture and the Iconic Power of Technology. *Sociologica*, 1/2015.

Marrucci, L., Daddi, T. and Iraldo, F. (2019) The integration of circular economy with sustainable consumption and production tools: Systematic review and future research agenda. *Journal of Cleaner Production*, 240, p. 118268.

Matsumoto, M. et al. (2016) Trends and research challenges in remanufacturing. *International Journal of Precision Engineering and Manufacturing - Green Technology*, 3(1), pp. 129–142.

McDonough, W. and Braungart, M. (2002) *Cradle to Cradle: Remaking the Way We Make Things*. New York. North Point Press.

Merli, R., Preziosi, M. and Acampora, A. (2018) How do scholars approach the circular economy? A systematic literature review. *Journal of Cleaner Production*, 178, pp. 703–722.

- Michaud, C. and Llerena, D. (2011) Green Consumer Behaviour: an Experimental Analysis of Willingness to Pay for Remanufactured Products. *Business Strategy and the Environment*, 20, pp. 408–420.
- Mont, O., Plepys, A., Whalen, K. and Nußholz, J. L. K. (2017) Business model innovation for a Circular Economy: Drivers and barriers for the Swedish industry – the voice of REES companies. *Mistra REES*. Lund University.
- Mowen, J. C. (1988) Beyond consumer decision making. *Journal of Consumer Marketing*, 5(1), pp. 15–25.
- Nylén, E.-J. A. and Salminen, J. M. (2019) How does the circular economy discourse affect policy-making? The case of streamlining waste utilisation in Finnish earthworks. *Resources, Conservation & Recycling*, 149, pp. 532–540.
- O’Fallon, M. J. and Butterfield, K. D. (2005) A Review of The Empirical Ethical Decision-Making Literature: 1996 – 2003. *Journal of Business Ethics*, 59, pp. 375–413.
- Olson, E. L. (2013) It’s not easy being green: The effects of attribute tradeoffs on green product preference and choice. *Journal of the Academy of Marketing Science*, 41(2), pp. 171–184.
- Pedrini, M. and Ferri, L. M. (2014) Socio-demographical antecedents of responsible consumerism propensity. *International Journal of Consumer Studies*, 38(2), pp. 127–138.
- Perey, R., Benn, S., Agarwal, R. and Edwards, M. (2018) The place of waste: Changing business value for the circular economy. *Business Strategy and the Environment*, 27(5), pp. 631–642.
- Peréz-Belis, V., Braulio-Gonzalo, M., Juan, P. and Bovea, M. D. (2017) Consumer attitude towards the repair and the second-hand purchase of small household electrical and electronic equipment. A Spanish case study. *Journal of Cleaner Production*, 158, pp. 261–275.
- Peronard, J.-P. and Gammelgaard Ballantyne, A. (2019) Broadening the understanding of the role of consumer services in the circular economy: Toward a conceptualization of value creation processes. *Journal of Cleaner Production*, 239, p. 118010.
- Pheifer, A. G. (2017) *Barriers & Enablers to Circular Business Models*. A whitepaper. ValueC. The Netherlands.
- Potting, J., Hekkert, M., Worrell, E. and Hanemaaijer, A. (2016) *Circular Economy: Measuring innovation in the product chain*. Policy report. PBL Netherlands Environmental Assessment Agency. The Hague.
- Prno, J. and Scott Slocombe, D. (2012) Exploring the origins of “social license to operate” in the mining sector: Perspectives from governance and sustainability theories. *Resources Policy*, 37(3), pp. 346–357.

Proske, M., Winzer, J., Marwede, M., Nissen, N. F. and Lang, K-N. (2016) *Obsolescence of Electronics - the Example of Smartphones*. Electronics Goes Green 2016+. Berlin, September 7–9, 2016.

Raihanian Mashhadi, A., Esmaeilian, B., Cade, W., Wiens, K. and Behdad, S. (2016) Mining consumer experiences of repairing electronics: Product design insights and business lessons learned. *Journal of Cleaner Production*, 137, pp. 716–727.

Ranta, V., Aarikka-Stenroos, L., Ritala, P. and Mäkinen, S. J. (2018) Exploring institutional drivers and barriers of the circular economy: A cross-regional comparison of China, the US, and Europe. *Resources, Conservation and Recycling*, 135, pp. 70–82.

Repo, P. and Anttonen, M. (2017) *Emerging consumer perspectives on circular economy*. HopefulNESS 2017 - The 13th Nordic Environmental Social Science Conference.

Rizos, V., Behrens, A., van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., Flamos, A., Rinaldi, R., Papadelis, S., Hirschnitz-Garbers, M. and Topi, C. (2016) Implementation of circular economy business models by small and medium-sized enterprises (SMEs): Barriers and enablers. *Sustainability (Switzerland)*, 8(11).

Rockström, J., Steffen, W. L., Noone, K., Persson, Å. and Chapin, E. F. III. (2009) Planetary Boundaries: Exploring the Safe Operating Space for Humanity. *Ecology and Society*, 14(2), pp. 1–25.

Ryder, G. and Zhao Houlin, H. (2019) The world's e-waste is a huge problem. It's also a golden opportunity. World Economic Forum. Available at: <https://www.weforum.org/agenda/2019/01/how-a-circular-approach-can-turn-e-waste-into-a-golden-opportunity/> (Accessed: 17 January 2020).

Salo, M. and Nissinen, A. (2017) Consumption choices to decrease personal carbon footprints of Finns. Reports of The Finnish Environment Institute 30/2017. Finnish Environment Institute. Helsinki.

Salonen, A. O., Fredriksson, L., Järvinen, S., Kortenieniemi, P. and Danielsson, J. (2014) Sustainable Consumption in Finland—The Phenomenon, Consumer Profiles, and Future Scenarios. *International Journal of Marketing Studies*, 6(4), pp. 59–82.

Saunders, M., Lewis, P. and Thornhill, A. (2016) *Research Methods for Business Students*. 7th edition. Harlow, Essex. Pearson Education.

Schaller, R. R. (1997) Moore's Law: past, present, and future. *IEEE Spectrum*, 34(6), pp. 52–59.

Seiffert, M. E. B. and Loch, C. (2005) Systemic thinking in environmental management: Support for sustainable development. *Journal of Cleaner Production*, 13(12), pp. 1197–1202.

- Shahbazi, S., Wiktorsson, M., Kurdve, M., Jönsson, C. and Bjelkemyr, M. (2016) Material efficiency in manufacturing: swedish evidence on potential, barriers and strategies. *Journal of Cleaner Production*, 127, pp. 438–450.
- Sheth, J. N., Sethia, N. K. and Srinivas, S. (2011) Mindful consumption: A customer-centric approach to sustainability. *Journal of the Academy of Marketing Science*, 39(1), pp. 21–39. doi: 10.1007/s11747-010-0216-3.
- Shiel, C., do Paço, A. and Alves, H. (2020) Generativity, sustainable development and green consumer behaviour. *Journal of Cleaner Production*, 245, p. 118865.
- Shove, E. (2010) Beyond the ABC: climate change policy and theories of social change. *Environment and Planning A: Economy and Space*, 42(6), pp. 1273–1285.
- Sitra (2018) Keski-vertosuomalaisen hiilijalanjälki - Sitra. Available at: <https://www.sitra.fi/artikkelit/keski-vertosuomalaisen-hiilijalanjalki/> (Accessed: 12 April 2020).
- Sitra (2019a) How are we progressing? Available at: <https://www.sitra.fi/en/articles/how-are-we-progressing/> (Accessed: 19 December 2019).
- Sitra (2019b) The Critical Move - Finland's Road Map to the Circular Economy 2.0. Available at: www.sitra.fi/finlandsroadmap (Accessed: 19 December 2019).
- Statista (2020) Smartphone replacement cycle worldwide 2013-2020. Available at: <https://www-statista-com.ezproxy.cc.lut.fi/statistics/786876/replacement-cycle-length-of-smartphones-worldwide/> (Accessed: 12 March 2020).
- Stern, P. C. (2000) Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues*, 56(3), pp. 407–424.
- Stone, G. P. (1954) City Shoppers and Urban Identification: Observations on the Social Psychology of City Life. *The American Journal on Sociology*, 60(1), pp. 36–45.
- Tura, N., Hanski, J., Ahola, T., Stähle, M., Piiparinen, S. and Valkokari, P. (2019) Unlocking circular business: A framework of barriers and drivers. *Journal of Cleaner Production*, 212, pp. 90–98.
- United Nations (1987) Report of the World Commission on Environment and Development: Our Common Future.
- Vermunt, D. A., Negro, S. O., Verweij, P. A., Kuppens, D. V. and Hekkert, M. P. (2019) Exploring barriers to implementing different circular business models. *Journal of Cleaner Production*, 222, pp. 891–902.
- van Weelden, E., Mugge, R. and Bakker, C. (2016) Paving the way towards circular consumption: exploring consumer acceptance of refurbished mobile phones in the Dutch market. *Journal of Cleaner Production*, 113, pp. 743–754.

- Whalen, K. A., Milios, L. and Nussholz, J. (2018) Bridging the gap: Barriers and potential for scaling reuse practices in the Swedish ICT sector. *Resources, Conservation and Recycling*, 135, pp. 123–131.
- Wheale, P. and Hinton, D. (2007) Ethical Consumers in Search of Markets. *Business Strategy and the Environment*, 16, pp. 302–315.
- Wiedmann, T. O., Schandl, H., Lenzen, M., Moran, D., Suh, S., West, J. and Kanemoto, K. (2015) The material footprint of nations. *Proceedings of the National Academy of Sciences of the United States of America*, 112(20), pp. 6271–6276.
- Williams, E. (2011) Environmental effects of information and communications technologies. *Nature*, 479, pp. 354–358.
- Yin, R. K. (2014) *Case Study Research: design and methods*. 5th edition. Thousand Oaks, California. Sage Publications, Inc.
- Ylä-Mella, J., Keiski, R. L. and Pongrácz, E. (2015) Electronic waste recovery in Finland: Consumers' perceptions towards recycling and re-use of mobile phones. *Waste Management*, 45, pp. 374–384.
- Zaharia, C. and Zaharia, I. (2014) The greening of consumer culture. *Economics, Management, and Financial Markets*, 9(1), pp. 136–141.

APPENDICES

Appendix 1. Final interview questions.

	Question in Finnish	Question in English	Motivation
1	Sukupuoli	Gender	Demographics
2	Ikä	Age	Demographics
3	Millaista laitetta olet täältä etsimässä?	What device are you looking for?	To make sure the person is suitable for interview.
4	Minkä takia päätit ostaa uuden laitteen?	Why did you decide to buy a new device?	To find out the need that commences the decision-making process.
5	Kuinka kuinka kauan käytit nykyistä laitetta?	How long did you use your previous device?	Comparison with the average use-time in literature.
6	Kun päätit hankkia uuden laitteen, oliko sinulla mielessäsi joitakin vaihtoehtoja valmiiksi? Millaisia?	When you decided to buy a new device, did you have some options already in mind? What kind of options?	To find out how the decision-making process proceeds and if it supports the model.
7	Tutkitko vaihtoehtoja etukäteen? Jos kyllä, millä tavalla tutkit vaihtoehtoja (kävitkö esimerkiksi monissa kaupoissa tai tutkitko vaihtoehtoja netissä) ja mitä ominaisuuksia vertailit? Jos et, miksi et?	Did you study different options beforehand? If yes, how did you study them (did you visit stores, browsed the internet)? If you didn't study options, why not?	To find out how the decision-making process proceeds and if it supports the model.
8	Miksi tulit juuri tähän liikkeeseen?	Why did you come to this specific store?	To find out if the location has some role in the decision-making process.
9	Kun mietit uuden laitteen ostamista, tai kun vertaillet niitä, mitkä asiat tai ominaisuudet ovat tärkeimpiä sinulle?	What characteristics are the most important ones for you when you are thinking about buying a new device or are making comparison between models?	To find out what matters most in making the purchase decision, to discover attitudes and values.
10	Kun mietit laitteen ostoa, harkitsitko käytetyn laitteen ostamista? Jos	When you were thinking about buying a new device, did you	To discover attitudes towards second-hand electronic devices and

	kyllä, millaista harkintaa teit, tutkitko vaihtoehtoja? Jos et, miksi et?	consider buying a used device? If yes, did you study the possibilities of buying a used device? If not, why not?	possible misperceptions relating to refurbished electronics.
11	Jos harkitsit käytetyn laitteen ostoa, miksi et ostanut sitä?	If you considered buying a used device, why didn't you?	
12	Mitä asioita tai ominaisuuksia sinulle tulee mieleen käytetystä laitteesta?	What things come to your mind about used devices?	To discover attitudes towards second-hand electronic devices, and the level or knowledge about their properties / possible misperceptions relating to refurbished electronics.
13	Tiesitkö, että on yrityksiä, jotka kunnostavat käytettyjä laitteita ja myyvät niitä eteenpäin? Millaisia asioita tiedät?	Did you know, that there are businesses who repair used devices and sell them? What kind of things do you know about them?	To discover the level of awareness of the possibilities to buy a refurbished phone, laptop or tablet.
14	Jos ajatellaan kulutusta, niin kaikella kulutuksellahan on jonkinlaisia vaikutuksia ihmisiin, yhteiskuntaan ja ympäristöön. Tiedätkö mitään elektroniikan vaikutuksista?	Let's think about consumption. All consumption has some kind of impacts on people, societies and the environment. What is your level of knowledge about the impacts related to electronics?	To discover the level of awareness on consumptions' consequences.
15	<i>Elektroniikan vaikutukset ihmisiin ja ympäristöön:</i> Tuotamme noin 50 miljoonaa tonnia elektronista jätettä vuosittain (= 4 500 Eiffel-tornia). Tästä määrästä noin 4 miljoonaa tonnia aiheutuu älypuhelimista, läppäreistä, tableteista ja vastaavista laitteista. Vain 20 % tästä kierrätetään asianmukaisesti.	<i>The impact of electronics' production and consumption to people and the environment:</i> We produce approximately 50 million tonnes of electronic waste per year worldwide. This equals to 4 500 Eiffel towers. Of this total amount, approximately 4 million tonnes is caused by smart phones, laptops, tablets and similar small,	To inform the consumer about the consequences of electronics' consumption.

	<p>Esimerkiksi älypuhelimet sisältävät yli 40 eri metallia ja mineraalia, jotka louhitaan maaperästä. Osa näistä on jo nyt äärimmäisen harvinaisia ja vaikeasti löydettävissä. Osa on lisäksi ns. konfliktimineraaleja, eli niitä louhitaan alueilta, joilla on käynnissä aseellinen konflikti, esimerkiksi sisällissota. Koska mineraaleille on niin suuri kysyntä, kaikki sodan osapuolet haluavat saada tuloista osansa, ja näin mineraalit lietsovat konfliktia.</p> <p>Kaivostoiminta on yhdistetty mm. lapsityövoiman käyttöön, huonoihin työoloihin, orjatyövoimaan ja muihin ihmisoikeusrikkomuksiin, ja se aiheuttaa esimerkiksi maaperän ja vesistöjen saastumista, metsäkatoa ja suuria kasvihuonekaasupäästöjä.</p>	<p>mobile devices. Only less than 20% of this is recycled as should be.</p> <p>For example, smart phones can include over 49 different metals and mineral, that have to be mined from the earth. Some of these are already now rare and difficult to find. Additionally, some of them are so called conflict minerals, which means that they are mined from areas that have an on-going armed conflict, such as a civil war. Because the demand for these minerals is so high, all the different parties want their share on the profits, which agitates the conflict.</p> <p>The mining business is connected to child labour, poor working conditions, slavery and other human rights abuses, and it causes for example soil and water pollution, deforestation and large greenhouse gas emissions.</p>	
16	Herättikö nämä asiat jotain ajatuksia?	What are your thoughts or feelings about these?	To discover how attitudes and awareness change after informing about the consequences.

<p>17</p>	<p><i>Tietoa kunnostetun, käytetyn elektroniikan liiketoiminnasta:</i> Esimerkiksi läppäreiden osalta tämä toimii niin, että koneet ostetaan usein leasingfirmoilta, jotka ovat siis yrityksille liisanneet laitteet. Erityisesti läppäreiden osalta tämä tarkoittaa yleensä tehokkaita työkoneita, joiden elinikä on useita vuosia. Laitteita kuitenkin käytetään yrityksissä 2-3 vuotta, jonka jälkeen leasingfirma siis myy ne eteenpäin.</p> <p>Käytetyt laitteet kunnostetaan toimiviksi tai jopa uutta vastaavaan kuntoon. Ne tyhjennetään tiedoista, puhdistetaan ja niistä saatetaan vaihtaa osia, jos ne ovat kuluneet. Laitteilla voi olla 1-3 vuoden takuu. Laitteen hinta on pääosin alhaisempi kuin vastaavan uuden laitteen.</p> <p>Käytetyn laitteen ympäristövaikutukset ovat merkittävästi pienemmät kuin uuden laitteen. Mitä pidempään jo olemassaolevia tuotteita käytetään, sitä vähemmän raaka-aineita täytyy louhia maaperästä. Elektroniset laitteet ovat arvokkaita materiaalipankkeja: jos ei laitetta tai sen osia voi käyttää sellaisenaan, niiden sisältämät</p>	<p><i>Information about how the refurbished electronics business works:</i> For example with laptops, the business can work so, that the computers are bought from leasing companies, who have leased these devices to their client companies. These kind of devices are usually efficient machines designed for professional use, and their estimated life time is several years. However, they are usually used in the companies from 2 to 3 years, after which the leasing company re-sells the devices forward.</p> <p>The used devices are refurbished into functioning or even as-good-as-new condition. They are emptied, cleaned and some parts can be changed if they are worn out. The devices can have a guarantee/warranty of 1-3 years. The price is lower than a similar device as new.</p> <p>The environmental impacts of used devices are smaller than new devices'. The longer we use already existing products, the less we have to mine raw materials from the ground. Electronic</p>	<p>To inform the consumer about the circular option and tell facts about it. To enable comparison with information received in questions 10 and 12.</p>
------------------	---	--	---

	materiaalit voidaan käyttää jonkin toisen tuotteen valmistamiseen.	devices are valuable material banks: if the device or its parts cannot be used as they are, the materials in them can be recovered and used to manufacture new products.	
18	Muuttaako tämä käsitystäsi käytetyistä laitteista? Millä tavalla tai miksi ei?	Does this information change your view about used devices? How or why not?	To discover how attitudes and awareness change after informing about how the refurbished electronics business works.
19	Voisitko ostaa kunnostetun, yrityksen myymän käytetyn laitteen tulevaisuudessa? Jos kyllä, miksi? Jos et, minkä pitäisi muuttua, jotta voisit ostaa käytetyn laitteen?	Could you buy a refurbished, used device from a company in the future? If yes, why? If not, what should change so that you could buy one?	To discover if the knowledge of consumptions' consequences affect the purchase decision.

Appendix 2. List of codes.

	Questions	Codes
1	Gender	female male other
2	Age	15-24 25-34 35-44 45-54 55-64 over 65
3	What device are you looking for?	laptop phone tablet
4	Why did you decide to buy a new device?	technological development current device does not function anymore as hoped, incl. bad battery current device is difficult to use or inconvenient current device is old / desire for change current device is broken broken screen, repairing not worth the cost a new purpose for which the current device is not capable of a new need, no current device gift
5	How long did you use your previous device?	[amount of years] can't say
6	When you decided to buy a new device, did you have some options already in mind? What kind of options?	yes, certain brand yes, certain brand and model yes, based on own previous experience yes, based on experiences heard from others some criteria in mind no
7	Did you study different options beforehand? If yes, how did you study them (did you visit stores, browsed the internet)? If you didn't study options, why not?	yes, actively follows tech development online yes, online comparisons yes, online + in-store yes, online + multiple stores yes, only in stores to test the devices and talk to sales no, trusts others' experiences no, brand loyalty no

8	Why did you come to this specific store?	<ul style="list-style-type: none"> model comparison location / convenience advertising price and payment related instant availability no reason
9	What characteristics are the most important ones for you when you are thinking about buying a new device or are making comparison between models?	<ul style="list-style-type: none"> price quality price-quality-ratio safety reliability, stability, functioning user experience repair possibility camera quality transparency no bloatware brand battery efficiency (processing power/memory/speed) longevity compatibility with other devices operating system suitability for need availability external characteristics (looks/weight/size/design/feeling) physical attributes (screen/keyboard/usb ports)
10	When you were thinking about buying a new device, did you consider buying a used device? Why?	<ul style="list-style-type: none"> no, tech gets old / used electronics don't last no, desire for newness no, bad prior experience no, price difference not big enough to be worth the risk no, risks too high no, lack of warranty no, no trust in the seller no, lack of transparency no, unhygienic no, battery problems yes, environmental reasons yes, price yes, could buy in certain conditions yes, good prior experience

11	If you considered buying a used device, why didn't you?	certain model not available didn't find a suitable one problems with transparency risks too high prices too high new device can be paid in instalments could not wait for delivery it's not a priority desire for newness
12	What things come to your mind about used devices?	neutral feelings depends on seller depends on the device and its history positive experiences and feelings ecological option reliable lower price good prior experiences (others/own) negative feelings shorter lifetime lack of transparency technological development quality risk monetary risk fear of scams, no trust, stolen products lack of warranty battery problems uncertainty faulty worn out old unsatisfactory doubts about updates
13	Did you know that there are businesses who repair used devices and sell them? What kind of things do you know about them?	no yes own experience as seller of used devices Swappie Apple's refurbished products convenience returns friends' experiences online stores international chains general knowledge of refurbished

<p>14</p>	<p>Let's think about consumption. All consumption has some kind of impacts on people, societies and the environment. What is your level of knowledge about the impacts related to electronics?</p>	<p>no knowledge not interested misperception general awareness</p> <p>knowledge about environmental <u>benefits</u> recycling valuable raw materials reuse of precious metals longevity second-hand better</p> <p>knowledge about <u>environmental issues</u> batteries mining hazardous waste natural resources consumption transportation, long supply chains shipping of waste energy consumption (use-phase)</p> <p>knowledge about <u>social issues</u> rare metals conflict minerals child labour association to some country/area lack of transparency in supply chains poor working conditions not ethical</p> <p>other some brand better/worse than others</p>
<p>15</p>	<p>The impact of electronics' production and consumption to people and the environment</p>	

<p>16</p>	<p>What are your thoughts or feelings about these?</p>	<p>I was already aware / did not increase knowledge was kind of aware but hadn't thought about it new information</p> <p>accepts own responsibility: overconsumption is a problem makes sense makes me think about my own consumption</p> <p>blames others / defence mechanism: overproduction / big companies the problem not on individuals' responsibility / I cannot make a difference not enough information available, not in the media governments should intervene we cannot survive without these devices I recycle</p> <p>offers solutions: recycling, material reuse transparency in recycling knowledge about origin country, where do products come from using longer time and with care</p> <p>emotional reaction: worries about child labour lost for words makes me think anxiety shock annoyance sadness surprised about amount of materials / waste</p>
<p>17</p>	<p>Information about how the refurbished electronics business works</p>	

<p>18</p>	<p>Does this information change your view about used devices? How or why not?</p>	<p>yes, new info yes, but... no, won't consider no, because already knew all about it no, my knowledge did not increase and did not change view</p> <p>positive made me think seems useful environmental benefits less production new information more trust in professional sales sounds appealing price savings</p> <p>negative reused good for those who do not need power reliability depends on the seller still sceptical planned obsolescence needs more information about it bad prior experiences defensive needs longer warranty long life associated with new products</p>
------------------	---	--

<p>19</p>	<p>Could you buy a refurbished, used device from a company in the future? If yes, why? If not, what should change so that you could buy one?</p>	<p>yes yes, because friends have had good experiences yes, this new info makes me think about it yes, professional business increases security yes, if price is right / price-quality-ratio yes, if the process is easy yes, if it has warranty yes, if battery has been changed yes, if the device's history is known yes, if I can find a suitable one yes, if trustworthy seller</p> <p>maybe maybe, needs a guarantee that it works maybe, depends on the seller maybe, if warranty is acceptable maybe, environmental benefits not my priority maybe, from someone I know maybe, if I was sure it has time left</p> <p>no no trust no, I need power no, planned obsolescence no, not convinced of the quality – fear of losing money no, prices should be lower in relation to the risk no, desire for newness no, I need the same warranty and return service as new devices</p> <p>what should change / what would increase your trust? transparency info about environmental benefits info on where to find them more information generally</p>
------------------	--	--