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Introducing Circular Economy to Furniture Industry

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The aim of this thesis is to introduce circular economy model to furniture industry where today, furniture waste is treated as bulky or mixed waste and recycling is left to the hands of individuals. In industries where recycling and remanufacturing are functioning, the responsibility belongs to producers due to effective legislation.

Circular economy offers a model to furniture businesses where products are made from materials that can be reused or replaced when the item is reaching its end of life. In a circular economy, the company can build a stronger customer relationship through reverse logistics where products are taken back for remanufacturing or recycling and along with that, the environment and the whole economy saves resources and money.

Four companies shared their expertise to support the idea of circular economy. Closer examination supported the evidence gathered from multiple international studies describing the benefits of circular economy. An online survey was conducted to disclose furniture retailers and manufacturers thoughts on recycling and circular economy. Another survey was conducted to find out how Finnish consumers recycle their old furniture, what are their thoughts on current furniture recycling as well as furniture remanufacturing.

From the consumer survey results it is evident that consumers already take part in recycling and would be willing to choose remanufactured or furniture made from recycled materials over new ones. Effective and profitable recycling is desired from both consumers and companies. The findings also illustrate how with legislation and producer responsibility recycling issues have been tackled in other industries. With evidence provided in this thesis, a switch to circular economy models in furniture industry could be carried out thus gaining benefits for companies, economies as well as our environment.

Keywords	Circular economy, Furniture, Waste, Sustainability, Remanufacturing, Legislation, Interviews, Survey, Natural resources

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1 Introduction

Most of the furniture industry at the moment is following a linear economy concept; products are made from virgin raw materials, transformed into products and eventually discarded as waste (Braungart et. al 2006:1). According to European Federation of Furniture Manufacturers (UEA) furniture waste mostly ends up in landfills or is incinerated without proper recycling or remanufacturing (UEA cited in Forrest et al 2017:12). At the moment furniture recycling is mostly run by charity organisations or individuals selling from one to another (Forrest et al: 2017:12).

Circular economy is a system where products are designed out of waste, energy is produced by using renewable energy and growth is redefined by diverging from take-make-waste concept (Ellen MacArthur Foundation 2012:2). The aim of this thesis is to investigate how furniture recycling could be turned into business, what effect circular economy would have in the industry as well as examine consumer behaviour regarding recycling. Four furniture companies with ambitious sustainability plans will be interviewed to disclose the possibility of circular economy emerging into company's business model. With support of recent studies regarding circular economy and the example companies the author aims to tackle any barriers that prevent companies from switching from linear economy business models to more sustainable ones.

To understand Finnish furniture retailers' and manufacturers' thoughts about recycling and possible circular economy possibilities in the Finnish business environment a quantitative research method will be used by sending an online survey to 15 companies. The results will be discussed to provide detailed information about the current situation concerning furniture recycling and to bring forth methods to build better and more functional furniture recycling.

A quantitative method will be used to collect information regarding consumer behaviour. An online survey will be sent to individuals through social media and the author's personal networks including co-workers, friends and family and the aim is to understand how consumers recycle, would they be willing to pay for a better furniture

recycling system and what motivates them to recycle in general. The objective is to identify if there are any behavioural differences between consumers regarding age, gender, residential area and income.

The reports mentioned in this thesis count furniture to be for regular everyday use such as tables, sofas, shelves, beds and chairs and exclude building products like walls, panels and sanitary equipment. Therefore, in this thesis, furniture is including furniture that can be bought from furniture retailers and manufacturers although the practices suggested for future furniture business could be incorporated into built-in furniture like kitchen and bathroom furniture as well.

1.1 Thesis structure

This thesis comprises of eight sections; first being an introduction of the thesis and its structure as well as the author's explanation for the chosen topic.

In the second section furniture industry and waste management in Europe will be explained in detail to provide the reader with information why circular economy is essential for furniture industry. Pros and cons in current waste management are discussed in this section.

Third section comprises of relevant literature on circular economy. By examining literature and analysing possible outcomes of circular economy the author aims to present procedures that could be done to diverge from linear to circular economy.

Circular economy opportunities in the furniture industry are introduced using reports regarding remanufacturing in the fourth section. Successful recycling practices from other industries are explained in comparison with the current furniture recycling.

Fifth section will disclose the effectiveness of circular economy policies within a company by introducing companies around Europe which have ambitiously departed from regular linear economy practices in the business world. The companies are experts of sustainability and have incorporated circular economy into a functioning

business and will describe steps that any company could do to alienate from linear business models which are mainly used today.

In the sixth section surveys for Finnish retailers and manufacturers will be analysed to obtain better understanding of companies' thoughts on circular economy and recycling. A conclusion of the results will follow the results.

The seventh section analyses consumer recycling behaviour by examining answers gathered from an online survey which was done in February 2019. The answers will support the authors aim to disclose the need for a better furniture recycling.

The final section will conclude the findings into a comprehensive synopsis of how the current furniture industry could be turned into a functioning circular economy. With the evidence gathered both from recent literature, case companies and the findings from all three surveys the author will disclose the urgent need for organised furniture recycling easily accessible for consumers.

1.2 Personal approach

Ever since I started selling furniture in 2017, I started to wonder what happens to all those old, expensive quality furniture when they reach their end of lives. Always being a treasure hunter myself, digging through vintage stores, old recycling centres and auctions both in Finland and overseas, I realized the quality pieces I was selling are not ending up in those flea markets. Within the recent years I have put a lot of thought to consuming in general and what drives us to do it so abundantly despite the current environmental situation.

Circular economy, where products are made from recyclable materials that can be reused or dissembled and made to something new as a concept fascinates me. What if we could make products that last longer, replace some products with services and after disposal, waste could be returned back to production? Considering that the planet

overshoot day[1] was in August 1st in 2018 it is evident that we produce too much, consume too much and waste too much. If products were made to last longer and from materials that could be turned to new products after their first purpose, we could avoid relying on borrowed time and resources.

[1] "In 2018, Earth Overshoot Day fell on August 1. Earth Overshoot Day marks the date when humanity has exhausted nature's budget for the year. For the rest of the year, we are maintaining our ecological deficit by drawing down local resource stocks and accumulating carbon dioxide in the atmosphere." (Global Footprint Network 2019)

2 Furniture industry & waste management in the EU

Furniture industry in Europe employs around 1 million people in over 130 000 companies which are mostly small or medium sized enterprises (European Commission website 2019a). In 2017 production amounted to over EUR 90 billion which is around one fourth of the global furniture industry (CSIL 2018). While Western Europe dominates the industry by market share, Eastern Europe is growing fast. Germany, Italy, Poland and the United Kingdom are among the 12 largest furniture producers globally and together hold a share of 15 % of world production and more than 60 % of Europe's production (CSIL 2018).

Furniture industry in Europe is facing various challenges including competition especially from China (which is now the largest exporter to the EU), innovation, structural problems like ageing of the workforce, and higher operational costs in the EU due to higher standards in sustainability, covering technical as well as environmental matters (European Commission website 2019a).

It is typical for furniture industry to have separate manufacturers and retailers. Some companies provide a wide range of all kind of furniture including sofas, tables, shelves and even carpets, curtains and other decorative items and some have specialized for example only in beds and mattresses and accessories associated with them.

2.1 Waste management in the EU & Finland

Waste management has been one of Europe’s top priorities during the last decades in order to prevent climate change[2]. Although waste management continues to improve in the EU, a significant amount of potential secondary raw materials such as metals,

[2] Global climate change refers to the change of the climate caused by human activities such as burning of fossil fuels (Nasa 2019)

wood, glass, paper and plastics are lost in the EU economy (European Commission website 2019b).

Eurostat, which is a statistical office for European Union, includes both household waste and bulky waste (which includes furniture) in municipal waste category in their waste management reports (Eurostat 2017:11). In 2016 total waste production in the EU amounted to an average of 480 kg of municipal waste per person. Nearly 50 % of it was either composted or recycled while a quarter was landfilled (European Commission 2018a:1). Target of 50 % recycling rate for 2020 has been set for EU countries in a Waste Framework Directive and even more ambitious targets for later years: 55 % for 2025, 60 % for 2030 and 65 % for 2035 (Directive 2018/851: Article 11). Based on reviews by the Member States, 14 countries are at risk of missing the target for 55 % recycling rate. These countries include Bulgaria, Croatia, Cyprus, Estonia, Finland, Greece, Hungary, Latvia, Malta, Poland, Portugal, Romania, Slovakia and Spain (European Commission 2018a:2).

First step in increasing the recycling rates for municipal waste could be separating furniture from waste streams and introducing a functioning recycling for furniture. To give a few examples, industrial recycling for plastic packaging and reuse has been around both in Sweden and Finland since the early 1990's and Sweden pioneered in public plastic recycling for households in 2008 (Rinki 2019). In Finland, Fortum started plastic recycling operations in 2016 and is now collecting all household plastic packaging around Finland (Fortum 2019). Before that plastic packages were thrown away along with mixed waste. In Finland, recycling of bottles and cans started with returning glass bottles for cleansing and refill as early as 1950's and is now a part of everyday life in Finland (Palpa 2019).

2.2 Furniture waste in the EU & Finland

Furniture itself consists of materials like chipboard, medium density fibreboard, wood, metal and aluminium, plastic and different textiles and even electric appliances (for example in motorised beds). Some of the materials are recycled already in Finland (Helsinki Region Environmental Services Authority HSY 2019a) but as of now, furniture

is considered along with trees and large car parts as bulky waste in the EU area (European Environment Agency 2019).

There is limited information of what happens to used furniture but evidence suggests that most furniture reach landfill as a final destination (Forrest et al. 2017:12). According to European Federation of Furniture Manufacturers (UEA) statistics 80% to 90% of the furniture waste is incinerated or sent to landfill, with only 10 % recycled (UEA as cited in Forrest et al. 2017). Incineration is the case in countries like Finland and Sweden where less than 1 % of all waste ends up in landfills (Statistics in Finland 2019 & Avfall Sverige 2018:7). Low recycling rates might be due to the fact that furniture is considered as bulky waste and not separated from other municipal waste correctly and a proper recycling service is missing.

In Finland, furniture waste is regarded as mixed waste if it contains more than one material and ends up burnt for energy. However, for example completely wooden furniture may be recycled as wood and metal legs from a sofa can be recycled as metal (HSY 2018). Even though incineration for energy itself is a form of recycling, destroying fully functional furniture seems rather wasteful.

HSY charges a fixed price for different furniture items according to their size and the payment goes under "waste management payment" (HSY 2019b). Similar pricing occurs nationally in waste centres. In Finland waste policy follows the order of priority stated in figure below (Ministry of the Environment 2019).

- Primarily, the generation of waste should be avoided.
- If waste is generated, it must be prepared for reuse or reused.
- If reusing is not possible, waste must be primarily recovered as materials (recycled), and secondarily recovered as energy.
- Waste may be disposed in landfills only if its recovery is not technically or financially feasible

Figure 1. Order of priority in waste management.

This policy follows the same hierarchy as the Article 4 in Waste Framework Directive which is a directive commissioned by the European Commission (Directive 2008/98/EC 2008:10).

In Helsinki metropolitan area HSY operates in the field of waste management, water services as well as provides information on environment (HSY 2018). There are five sorting stations where waste such as carton, paper, metal, domestic hazardous waste and metals can be brought. Metal, electronic and electronic devices, paper, impregnated wood, glass packages, carton and cardboard can be brought free of charge and other waste is priced according to volume and measured by either cubic meters or litres (HSY 2019b). Similar waste centres operate around Finland to cover the rest of the country.

The operating manager of the sorting stations in Helsinki region Eetu Keinänen describes the stations to be just like the ones at home, just with bigger containers. Therefore when one brings used furniture to sorting stations, it is chargeable just like national waste collection is funded directly from residents. Small furniture, for example decorative items, chairs or similar suitable for resale can be left at the stations for free and HSY takes them to a recycling centre. When furniture is brought to sorting stations, a customer is advised to take for example metal legs apart but this is not a service that HSY offers. On the other hand, when furniture or any other waste is burnt, metal is the only material left so even after the process, metals are collected. (Interview with Eetu Keinänen, Operational Manager at Sortti Stations 2019).

2.3 Directive for waste of electronic and electrical equipment (WEEE)

For waste were to be recycled correctly, European Commission has set standards and directives for member states to follow. As described by the EU "a directive is a legislative act that sets out a goal that all EU countries must achieve" (European Union 2019). All EU countries can decide how to achieve the goals by devising their own laws.

One successful directive concerns electronic and electrical waste. The production of modern electronics requires the use of expensive and scarce resources such as metals,

plastic and minerals (European Commission website 2019b). To ensure resource efficiency, improve the environmental management of electronic and electrical waste and to contribute to circular economy within the EU, the improvement of collection, treatment and recycling of electronic equipment has been acknowledged to be essential (European Commission website 2019b).

Waste of electronic equipment (WEEE) such as televisions, fridges and cell phones is one of the fastest growing waste streams in the EU and in 2005 its annual waste amounted to 9 million tons and is expected to amount to 12 million tons by 2020. Due to WEEE's complex and hazardous content, if it is not properly managed after use, it may cause major environmental and health problems. (European Commission website 2019b)

First suggestions of a directive for electronic waste came as early as 1996, when the Parliament asked the Commission as quoted in the upcoming directive to "present proposals for Directives on a number of priority waste streams, including electrical and electronic waste, and to base such proposals on the principle of producer responsibility" (Directive 2002/96/EC 2003:24). The directive became effective in 2003 and was replaced with a more detailed version in 2012 called Directive 2012/19/EU (European Commission, 2018).

All EU member states have to provide an accessible place for private households to return their used electronics free of charge in order to accelerate the rate of re-use and recycling of WEEE (Directive 2012/19/EU 2012:40). When an electrical device reaches the end of its life cycle, it may be returned to recycling centres free of charge, since the recycling fee has already been paid when the appliance was first purchased. With an extended producer responsibility[3], manufacturers and importers are obliged to arrange a cost-free reception network for all used electrical and electronic equipment (SER-kierrätys 2019).

[3] "Extended Producer Responsibility (EPR) is a policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products" (OECD Better policies for better lives 2019).

2.4 Problems regarding recycling of WEEE

European Union has funded a project called Countering WEEE Illegal Trade Project (CWIT) which aims to analyse and provide information and recommendations to support the European Commission, law enforcement authorities and customs organizations in countering illegal trade of WEEE in and from Europe. According to their report in 2015, only 35 % of all the e-waste (9,45 million tonnes) discarded in 2012 were recycled or handled properly. The remaining 65 % (6,15 million tonnes) were either exported (1,5 million tonnes), recycled under non-compliant conditions in Europe (3,15 million tonnes), scavenged for valuable parts (750 000 tonnes) or thrown in other waste bins (750 000 tonnes). (Huisman et al. 2015:6)

The results were estimated by calculating the reported amount of collected and recycled WEEE by Member States' (EU countries + Norway and Switzerland) estimate of how much ends up in waste bin and with scrap metal. The reason for either illegal shipment or illegal processing is to avoid for example sorting costs and testing. The study estimates that more than 10 times the exported amount is mismanaged or illegally traded within EU itself. (Huisman et al. 2015:16,18)

To outline the problem, electronic and electronic waste is valuable and even with legislation the official recycling rates are dragging from their highest potential rate. The economic value is lost immediately when recycling goes through non-compliant recycling and valuable parts are lost every day when the recycling is not fully functional. Focus is now to improve the collection rates by monitoring WEEE networks, improving treatment, harmonising penalties and educating consumers. (Huisman et al. 2015:47)

3 Circular economy

3.1 Background of the term

> "For the sake of picturesqueness, I am tempted to call the open economy the "cowboy economy," the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent behaviour, which is characteristic of open societies. The closed economy of the future might similarly be called the "spaceman" economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy" (Boulding 1966:7-8).

The first idea of a "circular economy" came perhaps from Kenneth Boulding's essay *The Economics of the Coming Spaceship Earth* (1966). In the essay, he states how our whole economy is based on strictly contemporary solutions and believes that as long as people are living for themselves in the present day, it will be hard to find solutions for the future. He explains a theory of the "cowboy economy", which is an economy we now live in where consumption and production is thought to be good and the success of the economy is measured by the outcome of both. In contrast, he explains of "spaceman economy" where consumption and production are rather bad than good elements (Boulding 1966:6-7). His essay has been widely used when defining circular economy and the term itself became relevant in the early 2000's when the term was already used by many schools of thought and the missing loop in the life of a product was acknowledged.

One of the pioneers of the concept circular economy is Walter Stahel who along with Genevieve Reday described in their report *The Potential of Substituting Manpower for Energy* (1976) an economy in loops and its impact on resource savings, waste prevention, economic competitiveness and job creation (Product-Life Institute 2019). Following the same ideology, in 2002 William McDonough and Michael Braungart composed a book called *Cradle-to-Cradle* which is an objection to "cradle-to-grave" thinking, where products are made to eventually being discarded as waste (van Dijk, Tenpierik & van den Dobbelsteen 2013:23). In cradle-to-cradle design a product is designed to last longer with attaining value until the end of its life and even after that, it could be turned to something else again (Braungart et al. 2006:7). As Andersen

(2007:134) argues, the first law of thermodynamics states that in a closed system total energy and matter remains constant meaning the amount of waste generated must be equal to the amount of resources consumed (2007:134). The cradle-to-cradle design can be referred to nature where waste becomes food for another and products can be re-utilized for new high quality materials just like biological nutrients return back to the soil (McDonough 2019).

In *Towards the Circular Economy, a* report by Ellen MacArthur Foundation[4] the term circular economy was conceptualized to be "an industrial system that is restorative or regenerative by intention and design" (2012:7). The report provides a comprehensive understanding of how circular economy would not only help companies to increase revenues by reusing, re-manufacturing and recycling but also explain how switching to a circular economy would limit the need of natural resources, save energy, affect positively on our climate as well as decrease political risks when taken into consideration where most of the world's oil lies (Ellen MacArthur Foundation, 2012: 19).

The study suggests that instead of products, companies would offer services or lease products for the time needed. Another suggestion is to lengthen the product's life cycle, for example a washing machine would work 10 000 times instead of 1000 times (2012:30). When comparing circular economy and linear economy, another downside to the latter is the value lost in materials after disposal (Achterberg & Hinfelaar, 2016:4) whereas in a circular economy, value is kept as long as possible and even after disposal (Ellen MacArthur Foundation, 2012:30). Similarly, Bocken, de Pauw, Bakker & van der Grinten describes circular economy in two ways; slowing and closing resource loops either (i) through the design of long-life goods by repairing and remanufacturing or (ii) through recycling, when the loop between post-use and production is closed (2016:309).

[4] Ellen MacArthur Foundation provides insights and resources to support a transition to circular economy by providing reports to businesses and government authorities (Ellen MacArthur Foundation Mission 2019).

3.2 It all comes down to limited natural resources

To really understand the need for circular economy one must first understand the importance of limited resources. Today, we live in a world where resources are used as if they last forever; using fossil fuels are contributing to climate change and in order to fight against it and most specifically preventing the global temperature rising of 1.5 °C[5], we must change business models to more restorative ones where resources are used not only efficiently but more *prudently*. As expressed by Commoner already half a century ago, we have broken out of the circle of life, we are not driven by our biological need anymore but we want to conquer the nature (Commoner, 1971:ch. 13). He emphasises that "the end result is the environmental crisis, a crisis of survival. Once more, to survive, we must close the circle. We must learn how to restore to nature the wealth we borrow from it." (Commoner, 1971:ch. 13)

Some primary resources like oil and metal are resources that will eventually disappear and to cope with that limitation, it is necessary to reuse the materials that once were dug up from the earth. Linear system where companies extract virgin materials, apply energy and labour to produce a product and sell it to a consumer, is extremely vulnerable to risks, especially higher resource prices. The price for natural resources rose in the start of the new millennium for the first time in over a century, and it is forcing companies to alter their business models (Ellen MacArthur Foundation 2012:10, 14). In a circular economy, reuse, remanufacturing and longer product cycles replace the make-take-waste concept and therefore erases the problem of urgent need for new, virgin materials over and over again.

Comparing with natural resources, human labour is a renewable resource and as argued by Stahel, should therefore not be taxed (2013:10). He calls it the "sustainable taxation" which means that tax should be implemented in non-renewable resources such as raw materials and fossil fuel energy and not on renewable resources - human labour and renewable energy. He carries on to argue that if non-renewable resources

[5] According to Intergovernmental Panel on Climate Change (IPCC) a risk of global warming over 1.5 C must be prevented in order to avoid risks including shortage of water, sea level rise, extreme weather events and decrease in oceanic ecosystems (IPCC Report 2018, Ch. 3)

were taxed more it would make recycling more profitable when now virgin materials have a cost advantage (2013:7).

Greenhouse gases caused by waste management and industry accounted to less than 13 % of all greenhouse gases in the world in 2016 and 8 % came from industrial processes and product use (Eurostat 2019:4). Surprisingly, though greenhouse gases have decreased significantly from 1990, production itself has increased and at first glance it might seem that with efficient production, we could somehow compensate our ever-growing consumption. As Williams Jevons argued already in 1865, increased efficiency in using a natural resource only created greater demand for the resource instead of decreasing the demand for it (Jevons 1865 cited in Clark & Foster 2001:95). When efficiency is improved, demand increases and in a sense gives room for more consumption. Therefore, decrease in *consumption*, especially consumption of brand new products should be implemented rather than focusing on improving efficiency.

3.3 Benefits of circular economy

According to Ellen MacArthur Foundation the outcomes of circular economy would be beneficial not only for the environment but for the business makers, consumers and the whole economy (2012:9-10). To mention a few, there would be substantial energy savings, decrease in waste generated between extracting materials and production and possible employment benefits for the economy (Ellen MacArthur Foundation 2012:9-10). As argued in their report, extracting materials from the earth and converting them to a commodity product uses a huge amount of energy which could be saved through reuse or remanufacturing (Ellen MacArthur Foundation 2012:16). If a product is made once from virgin raw materials and then re-used or remanufactured for a new or same purpose as it was made before, less waste is generated along the life cycle (Material Flow Data Portal 2018). Align with that, according to OECD Green Growth report it is estimated that about fifth of raw materials extracted worldwide ends up as waste and therefore, as not recovered, is lost to the economy (OECD Green Growth 2013:10).

Companies on the other hand would gain new profits by reverse cycling; companies should aim to attain value from their products at the end of their lives by using for example reverse logistics. Taking back products for re-use or re-manufacturing,

increase products re-sale, reduce material bills and warranty risks and improve customer interaction and loyalty. (Ellen MacArthur Foundation 2012:9-10)

There has been no EU contribution to separate furniture waste from bulky waste, even after several studies, including *Towards the Circular Economy* by Ellen MacArthur Foundation (2012) and *Circular Economy Opportunities in the Furniture Sector* by the European Environmental Bureau (2017) suggesting the monetary as well as environmental benefits would be considerable if furniture would be recycled or reused. In 2015 European Commission adopted an ambitious plan to close the loop with a Circular Economy Action Plan, which consists of several targets from the avoidance of single-use plastics to plans of moving the economy to circular one (European Commission 2015). *Monitoring framework for the circular economy* (2018b) is a report investigating ten indicators of different areas including production, raw materials and waste management. The report describes the transition to circular economy as "tremendous opportunity to transform our economy and make it more sustainable, contribute to climate goals and the preservation of the world's resources, create local jobs and generate competitive advantages for Europe in a world that is undergoing profound changes." (European Commission 2018b:1)

By leaning on these reports mentioned above as well as the EU's ambitious plans towards circular economy, it is evident that it is already considered as a solution rather than an option.

4 Circular economy and furniture industry

4.1 Opportunities in furniture industry

Furniture comprises of multiple raw materials such as wood, chipboard, sawdust, fibreboard, metal, plastic, fabric, and electronic appliances and could expand as far as recycled plastic, metal, chipboard and so on. As of now, metal is the most common recycled material in furniture manufacturing when examining companies sustainability reports. In Finland plastic packages are recycled and used as a raw material for different industries and recycled plastic can be found in products like vases, buckets (Orthex Group, 2019) and cleaning products (Sinituote, 2019). As of now, furniture recycling lies in the hands of individual consumers, recycling centres which sell other commodities from clothes to tableware and smaller vintage or antique shops.

A study called *Revision of EU Green Public Procurement (GPP) Criteria for Furniture* conducted by Joint Research Centre, European Commission, is evidence based scientific support to the European Commission policymaking process (Donatello, Gama Caldas, Wolf, 2019). The objective for the study was to identify the main environmental impacts of furniture products and to outline ways to reduce the impact by respecting relevant scientific, legal and political considerations. Life-cycle-assessment of a product was calculated following a result that the biggest impact (80-90 %) to the environment was caused by materials and components used, and recyclability as well as durability were to be considered. Second biggest impact was caused by manufacturing, assembly of components and for example the use of chemicals on surface coatings. Packaging, transportation and use phase in that order followed manufacturing and the importance of well-organized transportation and durability of a product were listed. The end-of-life impacts vary depending on the materials used, and the separation of components was described to be difficult. (Donatello, Gama Caldas, Wolf, 2019: ch. 2)

4.2 Remanufacturing

One way to participate in circular economy is remanufacturing. Remanufacturing is to return a previously used product to a product that meets the same requirements as a new one (Krystofik et al. 2018:14). According to Guide et al. (2003:303) with product recovery, requirements for virgin materials as well as energy consumption will reduce. A comprehensive study conducted by European Remanufacturing Network (ERN) called *Remanufacturing Market Study* describes the situation of remanufacturing in Europe by addressing any barriers that are in the way of remanufacturing in industries like aerospace, automotive, furniture, machinery, medical devices and rail (Parker et al. 2015). A survey was sent to 20 000+ companies that were identified very likely to have remanufacturing actors and received 206 responses; a response rate of 1%. Out of those responses, ERN drew conclusions about barriers for remanufacturing, which in furniture can be found in figure 2 below.

- Limited market for remanufacturing
- Concern of remanufacturing taking over the primary market
- Cost of remanufacturing compared to low-price furniture
- Availability of certain material
- Concern of legislation for example concerning chemicals used in furniture
- Logistics and storage capacity (Parker et al. 2015:81-82)

Figure 2. Barriers for remanufacturing as described by ERN.

Based on the report's findings, despite the barriers there is an opportunity to reach markets with remanufactured end-of-life products in the furniture industry. According to the responses, extending the product's life through remanufacturing reduces the environmental and economic costs of that product. Motives for remanufacturing include securing the supply of spare parts, protecting the brand image, adhering to government legislation, and most importantly the ongoing concern of the environment. (Parker et al. 2015:81-82)

4.3 Examples of successful recycling in other industries

Today, recycling centres and charity organisations receive furniture as donations along with all other household items and sell them onward. Consumers can use online platforms such as Facebook, Tori.fi or auction websites to meet possible buyers. Nonetheless, systematic and standardized *furniture* second hand stores are missing completely.

In the automotive industry, "recycling" of used cars is made easy for consumers; many want a car but a new car might be too expensive for some. In case a consumer wants to buy or sell an old car, a car dealership offers both possibilities in the same place (DeMuro 2014). This part-exchange enables consumers to sell and buy cars through the same dealership (Motors 2019). In an example scenario, a person has a five year old X-brand car and wants to buy a new Y-brand car. The customer goes to a dealership and part-exchanges the X for a new Y. Now the dealership has new stock to sell and the customer has a new car. The value of the car is determined by specialists and only ends up in scrapyard if no one is willing to pay for the car.

If this were to be modelled to furniture business the value of the furniture would be determined by professional furniture salespersons and consumers would not have to worry about selling or discarding their used furniture. Recycling fee[6] would be included in the price of new furniture and would last until rejection. This system would ensure that only furniture that is not in a suitable condition would end up incinerated. Examples of a functioning recycling as above include waste of electronic and electrical appliances, car tyre recycling[7], recycling of batteries and small accumulators[8] and bottle recycling. They all follow the same principle; recycling of a product has to be effortless for consumers and the best way to ensure that is to include a recycling fee in the price and offer a third party operator to manage proper recycling.

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[6] Similar recycling fee as obligatory WEEE recycling fee as mentioned in section 2.3.
[7] End-of-life car tyres can be returned to any car tyre selling store for free of charge (Finnish Tyre Recycling 2019).
[8] Battries and small accumulators can be returned to any store that sells similar products free of charge (Paristokierrätys 2019).

5 Sustainability & four case studies

In a qualitative research, the researcher may use several methods for collecting data ranging from interviews to analysis of documents or personal experience (Denzin & Lincoln 1994:2). For this thesis, four companies were approached which met the criteria desired for this topic and four replied immediately. Therefore, these interviews were seen as examples rather than participants in a study.

Four enterprises were interviewed via email and by phone to give their expertise on how to make sustainable choices starting from the production and ending at the reuse of furniture. Some were chosen by searching online and some were familiar to the author. The companies showed an excellent imagination of creating sustainable products, tackling supply chain problems or attaining value from used products. The interviews were done by emails and by phone in February 2019 and the questions can be found in Appendix 1.

It is notable to mention, that three out of four companies were office furniture companies focused in business-to-business sales. At the moment various office furniture companies use reverse-logistics and maintain their products for further use but the absence of such companies in private consuming sector is significant.

5.1 Sustainability along the product life line

Manufacturing is the creation of products to meet certain needs and wants by using raw materials and energy (Businessdictionary 2019). Sustainable manufacturing is the same process without compromising the future generation's needs (Davis et al.1995 cited in Pathak et al. 2017:21). Sustainable manufacturing include attributes such as recycled materials, bio-based materials, environmentally friendly supply chain or easy replacement (Morton 2012:35).

Today, traditional supply chain has been replaced more and more with a green supply chain management which means that instead of linear supply chain where material and

information flow is from one end to another is replaced with green supply chain (Emmet & Sood 2010:9). In a traditional one, there is limited collaboration regarding information, carbon footprint or greenhouses gases between partners in the chain. In contrast, in a green supply chain, the environmental effects, extraction of raw materials and final disposal of goods are clearly thought out (Emmet & Sood: 9). Emmet & Sood argue that companies would gain better, especially healthier profits if "going green". On the other hand, as Davies argues (cited in Blanchard 2010: ch. 16) that a green initiative has to be justified just like any other expenditure, and the cost is still a greater indicator than environmentalism (Blanchard 2010: ch. 16).

Remanufacturing is the recovering of a used product and turning it back to a functioning one. Bakker (2014:10) argues that product life extension such as remanufacturing and refurbishing can be achieved through product design. In other words, with better materials that last longer as well as offering refurbishment, furniture companies could extend the life of a product resulting in cost savings (Abbey et al. cited in Krystofik et al. 2018:14) and energy savings especially in furniture remanufacturing (Gutowski et al. 2011:4543).

5.2 Ecobirdy summary of an interview

The interview was done in February 2019 by e-mail with the founder Joris Vanbriel.

Ecobirdy is more than just a furniture company; it creates children's furniture out of plastic toy waste and also educates youngsters about sustainability with their storybook collection. Ecobirdy was founded by Vanessa Yuan and Joris Vanbriel after wanting to create solutions for waste problems as well as raise awareness on the growing plastic waste. The reason for picking plastic toys seems to hold a deeper purpose and can be observed through unpleasant facts about plastic toys revealed on their website; 80 % of plastic toys end up in landfills or are incinerated, they have about 6 months of lifetime, and 500 bottle caps hold the same monetary value as one toy. Because most recycling centres do not take in hard plastic, Ecobirdy started collections at local schools. Now Ecobirdy collects old plastic toys, upcycle the waste and produce furniture 100 % out of the waste. (Ecobirdy 2019)

The idea of using only recycled plastic is ambitious and the reason for picking plastic as described by founder of Ecobirdy:

> Awareness of the global plastic problem and the motivation for us as industrial designers to have the capability to make a real difference to it. Make products made of recycled material look beautiful and attractive. Change the perception toward recycled products: design products instead of waste (Interview with Joris Vanbriel, founder of Ecobirdy).

Ecobirdy's sustainability does not comprise only of sustainable production but also by designing a school programme to inspire young generation. The company wants to spread environmental and social awareness by working with sheltered workshops and by not charging the schools they work with.

Ecobirdy does not use plastics when wrapping their products but recycled cardboard with paper tape. Even though the production process is described to be hard, they are driven to pursuit their idea.

> It's much more difficult than working with virgin plastic. It takes time, energy and budget to recover the used plastic and transform it into a raw material for the production of design products. It's more expensive, but we think it's worth to do (Interview with Vanbriel, founder of Ecobirdy).

5.3 Kinnarps: summary of an interview

The interview was done in February 2019 by e-mail with corporate sustainability manager Johanna Ljunggren.

Kinnarps is a Swedish furniture company founded by Jarl and Evy Andersson in 1942. Kinnarps provides interior solutions for companies and public spaces. It is one of the biggest furniture manufacturers in Europe and has a total of six factories in Sweden. They consider themselves as an ecological and sustainable company with a wide range of practices to have as little impact on the environment as possible (Kinnarps, 2019).

Kinnarps has an ambitious sustainability plan; not only are they setting high targets to become more sustainable, they are doing it with great imagination. To mention a few targets, they are aiming to be climate-neutral with transportation by using their own trucks and choosing the best possible fuel, they are aiming to provide more circular

services and on top of that, instead of plastic packaging, Kinnaprs wraps furniture in recyclable blankets.

The company has created a sustainability index called "the better effect index" to help meet customers' needs regarding sustainability. In the figure below are shown six areas that define sustainability. The highest grade for each section is 3 points and the average of the points makes the total grade. The system was launched in 2017 and now most of their products are marked with this index. It has helped customers to assess the sustainability performance as well as helped the company to discuss which areas are relevant to measure. (Kinnarps, 2019)

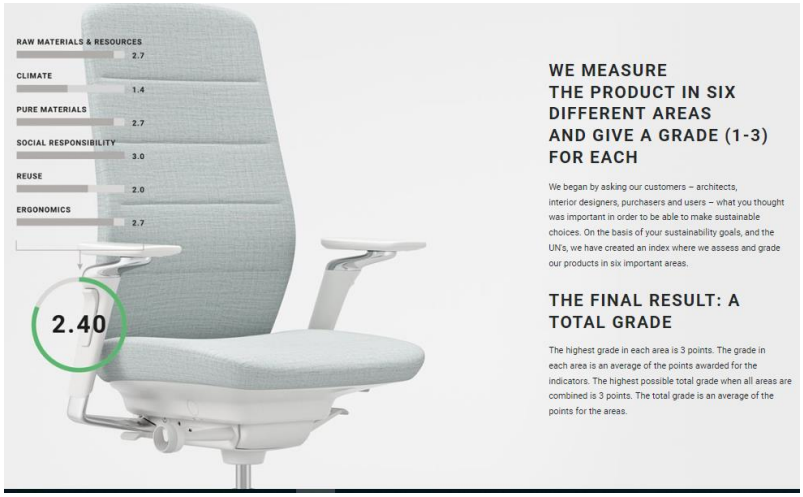

Figure 3. Example of better effect index. Picture obtained from Kinnarps' website.

Three most important sustainability choices Kinnarps has made are their own transportation, own production sites in Sweden where they are able to ensure good working conditions as well as control the efficiency of resources and the control of in-going material to systematically check the requirements for each material and component. The most original sustainability policy is perhaps the usage of recyclable blankets described by corporate sustainability manager Johanna Ljunggren:

> ..we use blankets and cardboard sheets as packaging material which we after delivery take back and reuse. It enables us to save packaging material and get more products into each container... The reason for choosing blankets was that our founder saw that it was a huge waste and costly to buy new packaging material that was just thrown away (Interview with Johanna Ljunggren, corporate sustainability manager Kinnarps).

As well as their own transportation, the use of blankets started as early as 1959 which clearly states the company has been a pioneer in ecological way of thinking. The hardest sustainability choice for Kinnarps has been to motivate customers into sustainable habits; sometimes customers are not affected by a certain sustainability aspect on a product. Reuse and refurbishment is already part of Kinnarps repertoire of services and is described by Ljunggren as below:

> We offer services to refresh and repair products by, for example, reupholstering or changing parts. Reusing the legs on tables and changing table top is one of the most common repairs that we do. We are developing more services and business models connected to circularity (Interview with Johanna Ljunggren, corporate sustainability manager Kinnarps).

The use of recycled materials such as metals and chipboard in the production is common for Kinnarps. The quality of recycled material and their availability is a matter of concern for Kinnarps.

5.4 Green Furniture Concept: summary of an interview

The interview was done in February 2019 by e-mail with the founder of Green Furniture Concept Johan Berhin

Green Furniture Concept was founded by Johan Berhin in 2007. He describes the beginning of the journey on their company website:

> When I started making furniture I was shocked by how smelly furniture manufacturing was, literally, with glues and coatings, and I decided to make a difference. The Green Furniture brand was introduced at the Stockholm Furniture Fair in 2010, based on the idea of creating sustainable modern classics. Furniture with heart and soul, pieces that say something about both your taste and your sense of responsibility. Design that is better because it is made according to sustainable principles, made to the highest standards of quality, so that your piece can be with you for a long time. Furniture made using strong emotional language that forges a relationship between the piece and people. (Berhin, company website)

Today, Green Furniture Concept is pursuing Berhin's wishes and beyond; they are using hard wax oil instead of varnishes, they plant their own trees in Sweden in order to avoid forest harvesting and they have another plantation in Colombia. Berhin describes why they started plantations:

> We started to plant trees locally and close to production as a statement, 1 tree per furniture module, because there is no Swedish veneer (we use Finish birch and German beech and oak) and we wanted to lift that question and have that 'fixed' long term. Planting for furniture timber rather than for paper production. From the first trees we actually start taking our Leaf Lamp Tree stems now, thus our own cycle (Interview with Johan Berhin, founder of Green Furniture Concept 2019).

Three most important sustainability choices for Green Furniture Concept are cradle-to - cradle design - using cyclic materials in their production, using the Nordic Ecolabel[9] as a base line for their products and circular economy by using reverse logistics. Berhin describes the reasons for reverse logistics:

> "Long warranty (15 years) and buy back system within the warranty period. Puts a demand on us for easy maintenance systems to keep the furniture in shape like new over time. Also demands timeless design (for us to be able to resell after 15 years)" (Interview with Johan Berhin, founder of Green Furniture Concept).

Their principle to use cyclic materials has been the hardest to pursue and especially replacing glues has been difficult. For recycled materials in production they use discarded planks, recycled plastic and 30-80 % of steel is recycled depending on the product.

5.5 Martela: summary of an interview

The interview was done in February 2019 by phone with product and design director Kari Leino.

Martela was founded in the 1950's and carries a long history in remanufacturing. Martela is the leading office furniture company that sells furniture from business to business and uses reverse logistics in its services; they buy or take back old office furniture and refurbish and resell them. In 2017 they took more than 3,7 million

[9] The Nordic Swan Ecolabel is a voluntary, positive ecolabelling of products and services with a common Nordic registered trademark, the Nordic Swan Ecolabel. Its purpose is to give consumers a clear and concise environmental product information, as well as promoting the development of products that are environmentally-sound.

kilograms worth of used furniture and after refurbishment, 23 000 pieces found a new home (Martela, 2019).

When asked about the reasons why Martela is recycling, Leino emphasized the word "responsibility"; at Martela, they want to be responsible not only in the form of choosing the right materials for their furniture but also maintain them after use and giving a new life to the old furniture. In the business world, interiors may change over time quite rapidly. Sometimes old interior is to be changed and that is where Martela wants to make a difference by purchasing old furniture back to avoid discarding functioning furniture.

Increase in environmental awareness in Martela's customers can be seen clearly within the last few years according to Leino. Especially bigger clients pay attention to environmental friendliness and sustainability and some clients even prefer used furniture entirely in their office interior which gives an advantage for Martela.

Martela has calculated a carbon footprint for their furniture and an example can be found below in figure 4. The calculations count the total emissions in production, logistics, material, packaging and waste and lastly, the potential savings if the piece is recycled. With this calculation, Martela can give out direct information regarding their furniture's environmental impact. According to Leino, this has been a useful tool for them to compete against other furniture companies.

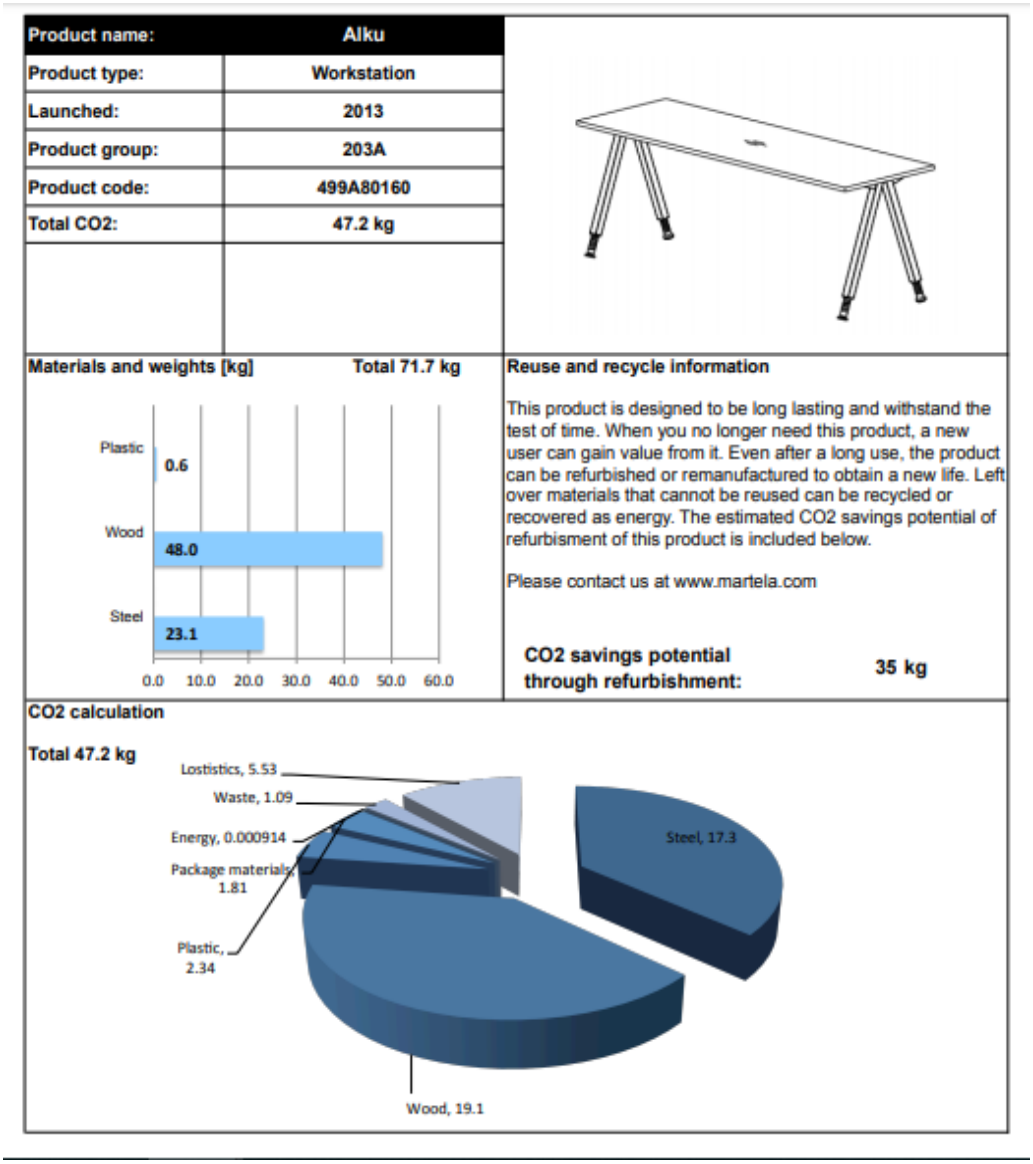

Figure 4. Martela's carbon footprint calculations for a product. Picture obtained from Martela's website.

Martela actively uses recycled materials in the production. Recycled metal is used more than plastic due to availability and the compatibility for their furniture. Some recycled materials unfortunately do not meet the same requirements than virgin materials but the volume and quality is constantly growing says Leino. After discussing with Leino, it seemed obvious that there is constant growth in recycled materials for production and the quality is improving at a rapid pace.

5.6 Other successful sustainability strategies

In the recent years especially recycled materials have been trendy within individual designers. In 2018 for example plastic was the material of the year in London Design Festival, where furniture designers gather to present their work (London Design Fair 2018).

When examining at even the most ambitious companies like Green Furniture Concept and Kinnarps which thrive on sustainability, it seems that reaching 100 % of recycled materials is still either too expensive or impossible to exploit in all components necessary in furniture, at least in a bigger scale. Pentatonic is a London and Berlin based company which makes all their products out of waste (Pentatonic 2019). Their aim is to create functioning products completely out of waste and change the view of waste through their products (Pentatonic 2019).

IKEA announced to use renewable and recycled materials in its production by 2030 (Reuters 2018). IKEA being one of the leading furniture manufacturers, their future plans according to their sustainability report from 2017 are ground breaking when it comes to circular economy. IKEA mentions three focus areas which are healthy & sustainable living, circular & climate positive and fair & equal. To mention a few commitments from all areas, IKEA wants to offer healthy and sustainable living to all by offering better, smart and more affordable products as well as offer a wider range of sustainable food in their restaurants. By 2030 they want to "be a circular business built on clean, renewable energy and regenerative resources, decoupling material use from our growth. The aim is to end our dependency on virgin fossil materials and fuels". (IKEA Sustainability Report 2017)

They are committed to turn their waste into resources and sourcing only renewable and recycled materials. By doing so, they are changing their business into an effective circular economy. They will also ensure access to competence and skills development, provide stable and predictable employment and make gender equality a reality (IKEA Sustainability Report 2017). If industry leader IKEA is altering its business to a more circular one, it should be only a matter of time smaller rivals follow.

6 Surveys for Finnish retailers and manufacturers

In quantitative research the aim is to establish laws of behaviour. Results are best collected by using surveys or questionnaires with large samples (McLeod 2017). In a quantitative research, researcher's involvement is minimal which therefore protects the research from biased information (Carr 1994:717). On the other hand, when respondents do not have the chance to explain their answers it may direct the results towards researcher's desired direction (Carr 1994:718).

For this thesis, a survey for manufacturers and retailers was conducted in order to understand motives for possible remanufacturing as well as thoughts about recycling of furniture in general in Finland. Companies were chosen to represent both high-end quality brands as well as low priced brands. Some were specialized in certain furniture and some offered a wide range of all kind of furniture. 15 companies received the questionnaire and five manufacturers and three retailers responded. The survey was originally in Finnish and translated version of the survey can be found in the Appendix 2.

6.1 Results of the survey

Manufacturers were both small-and-medium sized as well as larger firms that had over 100 employees. They all focus mainly on business-to-business sales. All five companies stated that they use recycled or natural materials fit for reuse in their production. One company mentioned that they use recycled materials, despite such materials are not easily available and the quality does not meet the same requirements as virgin materials.

Reasons for companies to increase the use of recycled materials in the future were "wider selection of recycled materials" along with "environmental benefits", both generating four responses. Four companies saw that "recycled materials should be used more but the behaviour of consumer does not guide to that direction". 80 % of the companies were not refurbishing their products although according to two

companies, upholstered products like sofas can be re-upholstered in case a client asks for it.

Three out of five companies responded that municipal waste management should take care of proper furniture recycling and 80 % of respondents say that the responsibility belongs to consumers.

Retailers were all larger companies having over 50 employees. Respondents were all focused mainly on online-sales. All companies stated that the recycling of furniture at the moment is too difficult for entrepreneurs and it should be more profitable. All the respondents pay attention to product's environmental friendliness when buying them from suppliers. Same trend regarding the use of recycled materials occurred as with manufacturers; all companies saw that recycled materials should be used more but consumer behaviour is not guiding entrepreneurs to that direction. 100 % of responded stated that consumers have the main responsibility in recycling their furniture.

All eight respondents had to describe the word circular economy and below are few of them translated.

"Important goal that will come true when it's profitable."

"Significant business model where business, consumers expectations and inevitable resource savings meet"

"The future"

6.2 Conclusions of the survey

Both the survey made by ERN (2015) regarding remanufacturing and the survey conducted for this thesis suggests that recycled materials in production as well as demand for a better recycling process are slowly emerging to the industry. Poor availability of recycled materials was a concern among all respondents yet willingness to contribute to circular economy practices was visible. Most companies said that

environmental reasons guides them for better decision making but consumers do not seem so enthusiastic about recycled materials.

Refurbishing is not a common practice within companies although some offer reupholstering services. Both retailers and manufacturers believe that the main responsibility of recycling belongs to consumers which argue against their ideas about circular economy. Unless the value in discarded furniture is not seen by the company, the recycling remains in consumer's hands. Perhaps similar "resistance" has been visible in industries where now recycling belongs to producers.

Fortunately all companies already used or paid attention to recycled materials in production and would be willing to increase the use if consumers would show interest in recycled materials. It also seems that environmental thinking is guiding companies and as soon as selection for recycled materials grows, the usage will increase.

7 Consumer recycling behaviour survey

Although systematic or legislated furniture recycling is missing from Finland, people still tend to recycle their furniture either by selling or giving them away. To understand furniture recycling behaviour of consumers in Finland, a quantitative research method was used in a form of an online survey and was sent out in February 2019 and 844 responses were received. The survey was written in Finnish in order to avoid language barriers within respondents. Translated version of the survey can be found in Appendix 3.

Observed units included consumers' age, gender, residence, residential area, salary, and size of household. Due to the low percentage of men participating in the survey, gender distinction is not considered in the results. Variable questions were related to consumer behaviour and the respondents had the opportunity to choose multiple options. Some of the variable questions that were analysed the most can be found in figure 5 below.

- where do consumers mainly buy their furniture
- where do consumers discard their used items such as furniture, clothes and other accessories
- what do consumers think about recycling centres
- do consumers refurbish their old furniture
- what is a good price for refurbished furniture
- what do consumers think happens to old used furniture, in case a customer buys new furniture and the salesperson agrees to discard old furniture

Figure 5. Examples of variable questions used in the survey.

7.1 Results for the online survey

The author's objective was to find out whether factors such as age, residential area or salary effect consumer's behaviour regarding either recycling or purchase behaviour. In a growing trend to be more ecological, ethical and aware of environmental problems, it is fascinating to analyse if there are any variations between generations, residential areas or persons' wealth. The first three diagrams will present the distribution of age, salary and residential area and they were the factors analysed the most to investigate differences between respondents behaviour. It is notable to mention that the respondents had the opportunity to choose multiple options and therefore the percentages used (unless otherwise informed) represent the percentage of all replies, not of all respondents.

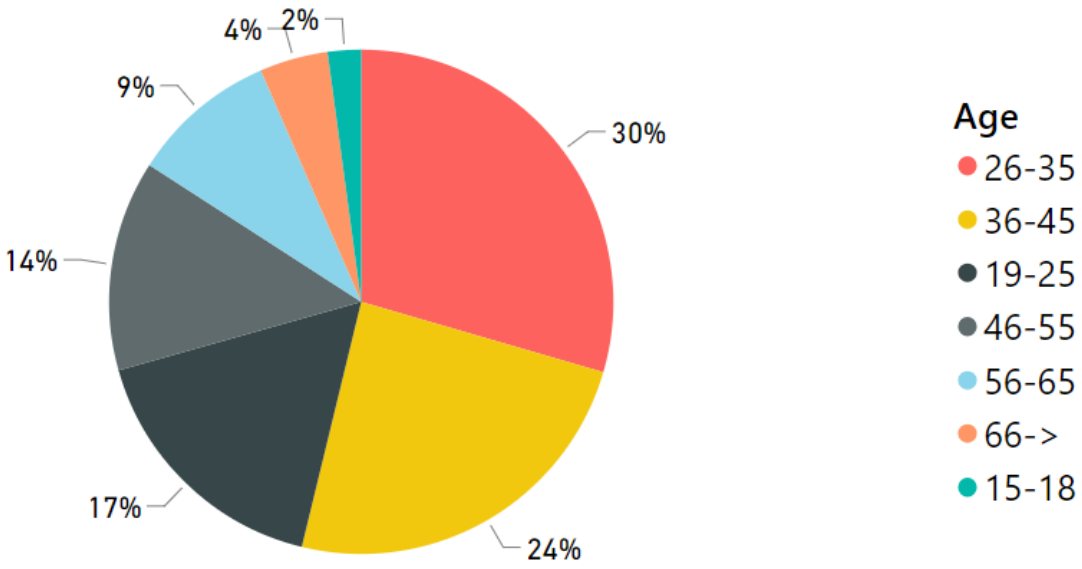

Figure 6. Age represented in percentages.

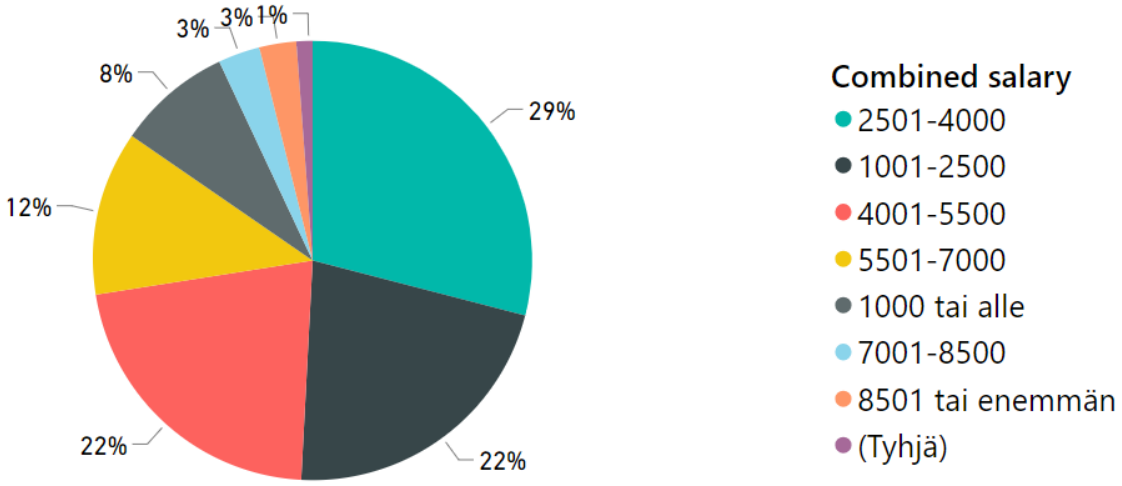

Figure 7. Combined net salary in a household represented as percentages. 1000 tai alle = 1000 or less. 8501 tai enemmän = 8501 or more.[10]

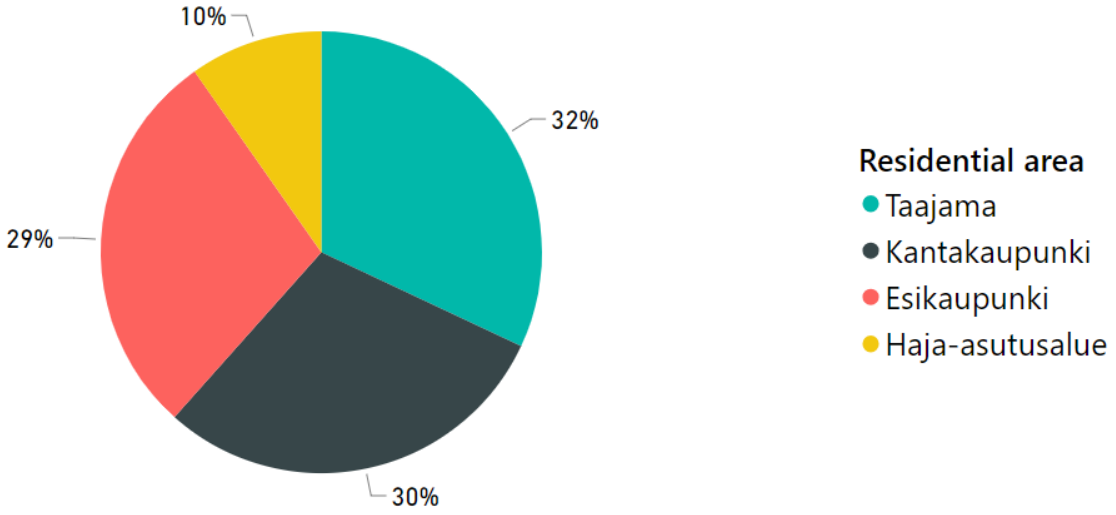

Figure 8. Residential area represented as percentages. blue = urban area, grey = inner city, pink = suburb, yellow = countryside.

[10] Around 59 % or respondents are either one or two person households and therefore salary is predominantly less than €4000/month

"Where do you mainly buy your furniture" question generated 1605 replies due to multiple choices. Over 70 % replied furniture stores to be at least one of the places where furniture were purchased. This portion increased slightly along with age as well as increase in salary. More than 50 % of all replies were either online or regular second hand shops or recycling centres (814 out of 1605 replies). Price determined consumer's purchase decision within younger respondents and the quality of materials seemed to be more important for older respondents, although the differences were very small.

Over 30 % from all respondents chose "give away" as one option when asked where their old/used furniture is taken. "Sell onward" was picked as one option by almost 30 % of respondents and "recycling centre/UFF/Fida[11]" generated 25 % of respondent's options. However, 13 % of respondents chose "landfill" as an option even though according to law, landfills accept only waste that cannot be incinerated due to financial or technical reasons (Ministry of the Environment 2018). Differences between answers due to age and residential area were only marginal as well as the impact of salary.

For used household items like clothes, decorative items and toys the answers followed the same trend; most people sell their items, give them away or take them to recycling centres. Less than 6 % of replies were "rubbish bin". The younger the people the more they chose option "sell onward" for both household appliances and furniture and the older the people the less "rubbish bin" option was chosen. This seems rather surprising considering the information younger generation has regarding waste issues. Older generation were perhaps taught not to discard anything in waste bins.

It is worth mentioning that "textile recycling" was chosen by 25 % of respondents yet such recycling is missing entirely in Finland. Used textiles can be either returned to certain clothing stores that offer recycling or to charity organisations. Textiles that are returned to "textile collection bins" at waste centres are transported to either UFF or Fida for sorting (Kierrätys.info 2019). Some are sent to African countries and some are

[11] UFF (U-landshjälp Från Folk till Folk is a Swedish organisation working globally for climate and global development (UFF 2019). Fida is a Finnish charity organization (Fida 2019).

sold in Finland (Kierrätys.info 2019). Dirty and defective textiles are incinerated (HSY 2019a) yet new plans are emerging in Finland for that (for further information see www.telaketju.turkuamk.fi).

Most common option for question related to thoughts about recycling centres was option "mixed items with potential useful products" with over 43 % of all replies. "Wrinkled sofas, old tables, and out-of-date old furniture" was chosen by 17 % of respondents as one option except people over the age 56; among them, only 10 out of 116 respondents chose that option.

The figure below represents the amount in euros that consumers would be willing to pay for service where furniture would be taken into appropriate *recycling* on behalf of a consumer. From respondents, almost a half answered 10 euros to be an appropriate price for the service. Recycling centre in Helsinki as well as recycling services in Pirkanmaa already collect furniture directly from consumers for free (Pirkanmaan Kierrätys ja Työtoiminta Ry & Kierrätyskeskus). Considering that, it seems that people would be willing to pay for an effective service as such. As of now, most furniture retailers charge approximately 30-40 euros for a service, in which old furniture is taken away in exchange for a new one. Some furniture retailers mention on their websites to recycle wood, plastic and cardboard but since most furniture is made of multiple materials and therefore do not fall into that category, they up incinerated (Kruunukaluste, Vepsäläinen).

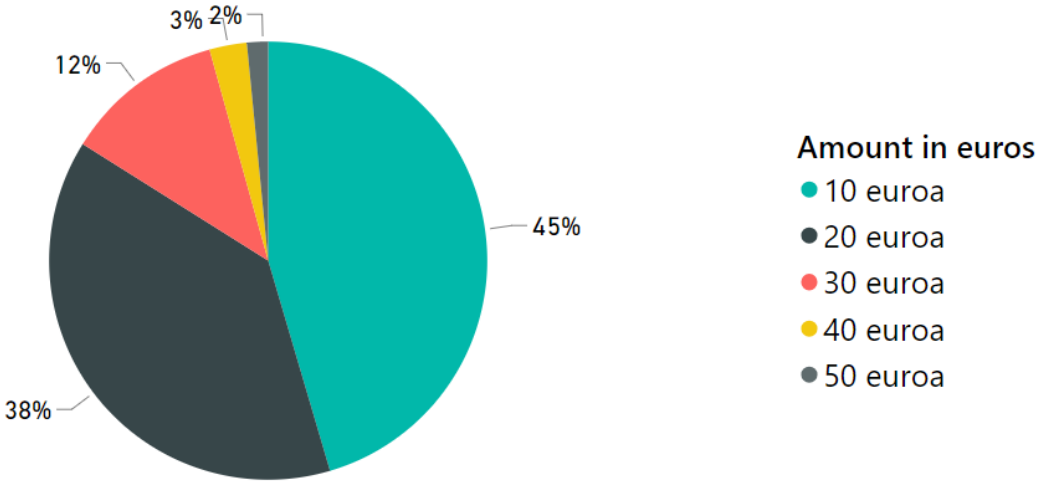

Figure 9. How much consumers would be willing to pay for a service, that on the behalf of consumer takes old furniture to appropriate recycling. Euroa = euros.

Almost 60 % of respondents said, that if there were a professional refurbishment/remanufacturing company which would sell refurbished quality furniture with a wide selection, they would buy remanufactured instead of brand new if the price meets quality. The price according to respondents should be somewhere between 40 and 60 % of a similar new product (87 % of respondents said either 40 or 60 %). Less than 3 % wanted to buy completely new furniture. Still, over 7 % would prefer furniture that is made completely out of virgin materials instead of some materials being recycled, upcycled or reusable materials. Over 60 % of respondents fix old furniture by themselves or take them to a professional.

Furniture is regarded as mixed waste and often furniture retailers advertise "taking old furniture to recycling", while actually they are taken to waste centres to be incinerated for energy. In a situation, "where a salesperson takes your old furniture for recycling in exchange for a new one what do you think happens to the old furniture", most people (55,6 %) chose "parts of it are recycled and rest incinerated" as one option. Out of all respondents, 43 % replied as one option that furniture is taken to landfill. As already argued above, landfills are only for waste that recycling is not technically or financially possible, and therefore the amount of the replies is surprising (Ministry of the Environment 2019). Almost 30 % of respondents chose "furniture is dissembled and parts are recycled" as one option and 23 % believes that furniture is sold onward.

Respondents were asked to freely describe the current furniture recycling situation in Finland; whether it is effective, well-organised or ineffective. Below are some translated quotations from varied opinions. To mention, 130 respondents mentioned it to be easy and 92 respondents said difficult and 45 said ineffective.

"Recycling is easy. It would be great if big retailers would recycle in a bigger scale."

"Simple! For example Fida and Recycling Centre in Helsinki takes your old furniture for free, could it be any easier?"

"There should be better transportation services, now furniture ends up in waste bins."

"Without a car, ineffective!"

"Difficult and not very profitable. Furniture nowadays is made from cheap chipboard and resale value is nonexistent."

Facebook and online second hand shops such as Tori.fi were mentioned several times as a helpful tool to either sell or buy furniture. Many mentioned bedbugs as a reason not to buy used furniture from private sellers or second hand shops. On the other hand, if furniture second hand shops were considered as quality shops with guarantees, it would perhaps prevent such problems.

7.2 Conclusions of the results

Several conclusions can be drawn from the survey, one of them being that people in general seem to be willing to recycle their furniture either by selling, giving them away for charity or recycling centres. Hardly any differences were found between age, residential area or salary. Furniture is mostly bought from furniture stores but a significant amount of people also use second hand shops and recycling centres as shopping places. Age influences certain factors; antique stores and recycling centres were visited more by people over the age of 56 and younger people seemed to use second hand shops and stores. This may result from the fact that younger people

either buy their first furniture or want them new or very cheap and older people tend to find treasures in antique shops. Still, most people would prefer refurbished furniture over brand new and virgin materials in production were only demanded by few regards of age or salary.

The respondents seemed to have consistent ideas of what happens to furniture at waste centres and would be willing to pay for a service that properly recycles furniture. A large amount of respondents seem to be unaware of furniture pick-ups. Many had hopes for functioning furniture recycling by thinking furniture is actually sold onward when it is exchanged for a new one by furniture retailers. Also a notable portion answered to use textile recycling which does not exist in Finland. It seems that consumers are easily "greenwashed" meaning they are falsely conveyed to believe a service or institution is environmentally friendly when it actually is not (Scheer & Moss, 2019).

Already a large portion responded to refurbish their furniture and almost all would be interested in buying quality refurbished furniture over a brand new one. It seems that a market for remanufacturing as well as a quality second hand furniture stores is possible and quite desired. Especially open answers at the end gave an impression that consumers prefer used yet functional furniture over brand new furniture and are quite anxious about the non-existent, systematic recycling.

8 Conclusions

Circular economy as a business model has been incorporated to successful furniture companies as discussed in this thesis. In the light of the reports introduced in this thesis as well as survey responses, legislation concerning furniture waste is well needed to avoid wasting functioning furniture. At the moment plenty of reusable furniture are discarded and incinerated annually losing the entire value once put in them. Consumers are facing situations where furniture recycling is left to them and producers and retailers are not involved in the process.

As examples from other industries have shown us, when monetary value has been added to recycling it becomes so functional and part of everyone's every-day life it seems quite foolish to bypass the opportunity in furniture industry. If companies were to maintain their furniture, customer relationships would last longer, products would last longer and the waste piles would decrease. Not to mention the business side that would emerge from it; functional furniture would find new owners and refurbishing would be practiced in a bigger scale. Altering business models to more circular ones through reverse-logistics and remanufacturing is possible as can be seen from the case companies. At the moment most companies that do that are office furniture companies and the next step is to make the transition in the consumer market.

If the legislation would be executed similarly as WEEE directive, tyre recycling or bottle recycling, the value of furniture would be examined by professionals and the responsibility would shift from individuals to producers, importers and retailers. With this procedure, consumer would still pay for the waste management fee yet it would be immersed in the first price and would guarantee that the furniture would be kept in use as long as it holds true value. The EU has already committed to take action to contribute to circular economy and has seen the tremendous opportunities that it holds and the first step is to take action in ineffective waste legislation in every industry.

Considering the survey responses gathered from both furniture entrepreneurs and consumers, furniture recycling is already practiced thoroughly yet no one is taking full responsibility to handle it nor profiting from it. If recycling is left to the hands of an

individual, desirable results await us in the future. As soon as legislation is executed and businesses take responsibility of their products after-life, change will be visible.

If there ever was a time to appreciate old and used furniture it should be now and it should be pursued economically to generate jobs, decrease waste and ensure the protection of our environment. Ongoing concern of limited natural resources as well as the increase in consumption should be critically evaluated when deciding the direction of our future. If production is following a linear model it will find its end one way or another. The easiest way of ensuring recycling in whatever industry is to increase the producer responsibility through legislation and decrease the responsibility of a consumer by making the process as easy as possible.

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Interview questions for case studies

Ecobirdy

What made you start using plastic as a raw material?

Are there any other sustainability choices that Ecobirdy is doing than production?

Is it difficult to process used plastic?

How big is your market roughly at the moment?

How do you handle shipping to other countries?

Is Ecobirdy thinking about expanding to other areas of recycling, for example using other recycled materials in your furniture?

Kinnarps

What are the three most important choices Kinnarps has done to be more sustainable?

Which sustainability choice has been the hardest to pursuit? Why?

How easy was it to switch to using your own trucks or have you always had your own logistics?

At Kinnarps, you wrap all your products in recyclable blankets. Are these blankets used multiple times? What made you choose this method and was it easy to manage?

Have you thought of offering re-manufacturing services for your customer's used furniture? For example buy them from old customers, restore them and sell them as used?

Are you using recycled material, for example metal, plastic or fabrics in production? If not, why?

Has environment consciousness been visible in the behaviour of your customers?

Green Furniture Concept

What are the three most important choices Green Furniture Concept has done to be more sustainable?

Which sustainability choice has been the hardest to pursuit?

Green Furniture Concept is planting trees both in Sweden and Colombia, what made you do this? Where there any troubles starting it and how well is it working now?

You are using hard wax oil instead of varnish, what made you do that?

Have you thought of offering re-manufacturing services for your customer's used furniture?

Are you using recycled material, for example metal, plastic or fabrics in the production? If not, why?

Has environment consciousness been visible in the behavior of your customers?

Martela – translated questions

Martela sells used office furniture, what made Martela do that?

How much do customers buy used furniture in relation to new furniture?

Has environment consciousness been visible in the behavior of your customers?

Martela has calculated carbon footprint for furniture, was it an easy process to make and do customers pay attention to it?

Do you use recycled materials in production in example metals or plastics?

Survey for furniture manufacturers and retailers

Manufacturers

How many employees does your company have?

- 1-5 employees
- 6-20 employees
- 21-50 employees
- 51-100 employees
- over 1000 employees

In how many cities does your company have offices counting warehouses, stores and production?

- 1
- 2-5
- 6-10
- 11-20
- 21 or over

In which of the below is your company mainly focused on? You may choose multiple options.

- Online sales
- Walk-in stores
- Business-to-business

Does your company use recycled materials in production? Recycled materials include natural materials, materials fit for reuse, recycled metal, aluminium, plastic or upcycled materials.

- Yes
- No

If not, why? You may choose multiple options. You may explain in your own words.

- Recycled materials are not easily available
- Recycled materials are more expensive than virgin materials
- The quality of recycled materials does not meet the same requirements
- We don’t think it is necessary

What would make your company use more recycled materials? For example recycled textiles in upholstery, recycled metal, plastic. You may choose multiple options. You may explain in your own words.

- International quality standards for recycled materials

- Wider selection
- Economic benefit
- Bigger tax on virgin materials if it could be replaced with recycled materials
- Image benefit
- Environmental benefit
- Own words

From answers below, which options best describe your company's views about recycled materials in furniture production? You may choose multiple options. You may explain in your own words.

- Recycled materials should be used more
- There is great demand for furniture made from recycled materials
- They should be used more but consumer behaviour does not guide to that direction yet
- We don't see them necessary
- Unless there are specific standards for recycled materials the usage won't increase much in the future
- Recycled materials have a negative effect on the quality
- Recycled materials have an increasing effect on the price
- Own words

Does your company reupholster/remanufacture furniture when a customer discards them?

- Recycled materials should be used more
- There is great demand for furniture made from recycled materials
- They should be used more but consumer behaviour does not guide to that direction yet
- Unless there are specific standards for recycled materials the usage won't increase much in the future
- Recycled materials have an increasing effect for price
- Own words

If not,why? You may explain in your own words.

Who mainly should take care of proper recycling of furniture? You may explain in your own words.

- Consumers
- Furniture manufacturers
- Furniture retailers
- Waste management

What does the mean "circular economy" bring to your mind?

Retailers

How many employees does your company have?

- 1-5 employees
- 6-20 employees
- 21-50 employees
- 51-100 employees
- over 1000 employees

In how many cities does your company have offices counting warehouses, stores and production?

- 1
- 2-5
- 6-10
- 11-20
- 21 or over

In which of the below is your company mainly focused on? You may choose multiple options.

- Online sales
- Walk-in stores
- Business-to-business

Do you feel like furniture recycling is made easy for entrepreneurs? You may explain in your own words.

- No, it should be easier
- Yes, we think it is working well
- We feel that furniture recycling should be better organized and profitable for companies
- Proper furniture recycling is non-existent at the moment

How does your company handle logistics from supplies to warehouse? You may explain in your own words.

- Out-sourced logistics
- Own logistics

How does your company handle logistics from warehouse to customers? You may explain in your own words.

- Out-sourced logistics
- Own logistics

Does your company mainly pay attention to products environmental friendliness when purchasing them from suppliers? For example are recycled materials such as natural materials, recyclable materials or fit for reuse used in production?

- Yes
- No

If you offer any especially ecological brands in your selection is it visible in your sales? If it is, how?

From answers below, which options describe your ideas about recycled materials in furniture production the best? You may choose multiple options. You may explain in your own words.

- Recycled materials should be used more
- There is great demand for furniture made from recycled materials
- They should be used more but consumer behaviour does not guide to that direction yet
- Unless there are specific standards for recycled materials the usage won't increase much in the future
- Recycled materials have an increasing effect for price
- Own words

Who mainly should take care of proper recycling of furniture? You may explain in your own words.

- Consumers
- Furniture manufacturers
- Furniture retailers
- Waste management

What does the mean "circular economy" bring to your mind?

Survey regarding recycling behaviour of consumers

Gender

- Female
- Male

Age

- 15-18
- 19-25
- 26-35
- 36-45
- 46-55
- 56-65
- 66 and over

Household size

- 1 person
- 2 persons
- 3 persons
- 4 persons
- 5 persons
- 6 and over

Combined net salary within household

- less than 1000
- 10001-2500
- 25001-4000
- 4001-5500
- 5501-7500
- 7501-8500
- 8501 and over

Do you live in a

- Apartment building
- Row house
- Detached house
- Semi-detached house

What describes your residential area the best?

- inner city
- suburb
- urban area

- countryside

Where do you mainly buy furniture? You may choose multiple options.

- Furniture stores
- Furniture store's website
- Online second hand shops
- Second hand shops
- Recycling centres
- Antique stores

Have you bought anything recycled in the past year? If yes, what?

- No
- Clothes
- Furniture
- Household appliance
- Electronic devices
- Kids toys/clothes/goods
- Other

Where do you mainly take your old/used furniture? You may choose multiple options.

- Waste centre
- Landfill
- Sell onward
- Give away
- To the nearest skip
- Recycling centre/Pelastusarmeija/Uff/Fida/similar

Where do you take your old, clothes or other household items that are in good shape? You may choose multiple options.

- Recycling centre/Pelastusarmeija/Fida/Uff/similar
- Sell onward
- Give away
- Rubbish bin
- Textile recycling

What are your thoughts about recycling centres? You may choose multiple options.

- Wonderful treasures
- Mixed items with potential useful products
- I would not spend my time shopping there
- Wrinkled sofas, old tables, out-of-date old furniture
- Cheap products and with a little bit of effort could be treasures
- I can take my used furniture there

If there were a professional firm specialized in refurbishing and remanufacturing quality furniture, would you prefer buying furniture from there rather than from a conventional furniture store?

- If quality meets price
- Gladly, I don't need unused furniture, if used one is in good shape
- No, I want new furniture

Do you refurbish/fix your old furniture? If yes, how?

- No
- Yes, I fix them myself
- Yes, I take them to a professional

What do you think would be a good price for a quality remanufactured/used furniture made from quality raw materials?

- 80 % of similar new one
- 60 % of similar new one
- 40 % of similar new one
- 20 % or less of similar new one

Which one from the two options would you choose? Recycled materials mean natural, reusable or recycled materials.

- New furniture, where recycled materials have been used
- New furniture, where virgin materials have been used

How long does furniture serve its purpose for you? You may choose multiple options

- Until they appeal to my eye
- Until they break
- If I find a better one I will gladly purchase a new one
- Depends on my life situation, new family members, relocation or something similar

If you use a service, where a salesperson takes your old furniture for recycling in exchange for a new one, what do you think happens to the old furniture? You may choose multiple options.

- Furniture is dissembled and parts are recycled
- Furniture is sold onward
- Furniture is refurbished and sold onward
- Parts of it are recycled and rest incinerated
- Furniture is taken to landfill

How much would you be willing to pay for a service, where your furniture would be taken to appropriate recycling on behalf of you?

- 10 euros

- 20 euros
- 30 euros
- 40 euros
- 50 euros

Which option below guides your purchase decision when buying a new furniture? You may choose multiple options.

- Price
- Quality of materials
- Environmental friendliness of materials
- Resale value
- Recyclability

Below you may describe your thought about current furniture recycling in Finland. Is it effective, well-organized, ineffective?