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Sustainable Consumption as a tool Towards Achieving the 2050 Circular Economy Goal of the Netherlands: " Case study of Dutch Household in Leeuwarden"

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Abstract

Presently, the world's economy is becoming unsustainable. Consumers are becoming the major influence on unsustainable consumption. Demographic growth has also affected sustainability negatively. There is a fear that the number of middle class population will increase in the near future if proper actions are not taken to reverse the current consumption style to a more sustainable way. In an attempt to implement strategies to achieve this goal, there is a need to shift from the linear "take-make-and-dispose" patterns of consumption and production to a more circular models where goods and services (are properly utilized, reused, recycled, and the consumption is in a way reduced. The benefits of circular model cannot be fully achieved by a single stakeholder approach. For this reason, to realize a more circular economy, not only the collaboration of suppliers and purchasers are highly necessary but it is also important to understand the market needs. Therefore, the research question driving this work was: What are the driving factors that can influence sustainable consumption of home appliances in Dutch households of Leeuwarden towards achieving circular economy? By applying a mix research method approach, the findings allow the main author to conclude that, sustainable consumption behavior of household can be influenced when promotional sales serves as the tool used to introduce a new brand of electronic product and also speedup sales for them. In most cases household can as well decide to change their electronic appliances to express their personality, worth and status in the society. This was in affirmation with the work of Meijkamp in 2000 that **price, attitude** and **habit** can affect sustainable consumption. Consumers show willingness to corporate with the WEEE regulation by returning their used product back to manufacturers.

The thesis concluded that consumers accepts the transition to buying services from manufacturers looking at the maintenance concern, if the risks involved are minimal and to an extent the concern for the environment.

Keywords: Sustainable consumption and product, Circular Business Model, policy instrument, Service economy.

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CHAPTER 1: INTRODUCTION

Presently, the world's economy is becoming unsustainable. Therefore, increase in the level of consumption contributes to change in the state of the ecosystem, resource depletion, global warming and other environmental problems (EEA, 2013; UNEP, 2013). Looking at the globe in general, sustainable consumption has received much attention owing to the persistent rise in population as a result of the current consumption style in our contemporary society which is not ecologically friendly. However, several governmental, civil society and business actors have seen the importance of incorporating more sustainable consumption style across the globe, most importantly in developed countries of the global north (UK Government 2005; WBCSD 2012).

From the report of OECD (2008b), "consumers are the key drivers of sustainable consumption and therefore are very important towards achieving sustainable development". In the same vein, economic growth has been regarded as a major determinant of household consumption and this is obvious in countries like China and India where the population is increasingly high (OECD 2008a).

Another driver of unsustainable consumption is the steep growth of the world population (approximately 6 billion in 2000 to over 8.2 billion by 2030) (OECD, 2008a). Several international policy organizations (Organization for Economic Co-operation Development(OECD), United Nations Commission for Sustainable Development and National research programs (including United State, Norway, and Netherlands) are beginning to realize that current consumption style of natural resources are unsustainable (Lim, 2017). The countries conforming to the OECD aim to address the major challenges of social, environmental and economic aspects at the national level, of which Netherlands has confirmed its commitment (OECD, 2008b).

Correspondingly, in the work of Clark (2007), "the United Nation's Summit in 2002 listed the following areas of Sustainable Consumption (SC) objectives to address: (i)

to develop programme on awareness campaign, especially for youths through education, advertising, and information on consumers; (ii) to develop and adopt information tools about consumer behavior in order to better understand household SC attitudes". Furthermore, several Task Forces were formed from the global multi-stakeholder process to provide a platform for developing countries to promote the implementation of Sustainable Consumption and Production (SCP) at the national and international level (UNEP, 2011).

Due to the consumption style generally, the world is experiencing an increased growth on Waste of Electrical and Electronic Equipment (WEEE), looking at the case of the household (Kumar et al., 2017). The management pattern of WEEE varies according to countries structure. The European Commission regulations in 2003 suggest that, "the collection, sorting and disposition options for WEEE from the households are solely dependent on the extended producer responsibility (EPR[1])". In trying to reverse the supply chain logistics, several prospects to curtail the end-of-life of WEEE are taken into consideration and implemented for the purpose of achieving a more backwardness in the supply chain (Kilic et al., 2015). The propositions on this encompass the repair, and maintenance of products, their reuse, refurbishment, remanufacturing, and/or recycling WEEE as a potential raw material (Borner & Hegger 2018). Products can easily be retrieved from retailers, distributors and the manufacturers which is possibly converted to raw materials in the production phase (Agrawal et al., 2015; Kilic et al., 2015).

To this effect, the idea behind consumption needs to be seen not as an activity of purchasing goods but as a process of decision making, actions which include purchasing, product use, and the safe handling of the remainder after usage. In the light of this, it has become increasingly clear that the conceptualizing of sustainable consumption is the key factor to sustainable economies (UNEP, 2011). The notion of anti-consumption plays key role towards achieving sustainability (Lim, 2017). Several

[1]EPR means that the end-of-life management of used goods with the purpose of enforcing and making best use of a backward logistics supply chain are dependent on the producers of the product (Agrawal et al., 2015).

people in Europe prefer to stay away and not consume goods that does not conform with their conservation perspective (Sandikci & Ekici, 2009).

The present linear model (take-make-waste) has contributed tremendously to make the world a circle of waste production and further resulting to shortage of natural resources (Bechtel et al., 2013). The concept of circular business model (CBM) has been introduced to retard the amount of waste generated in the course of business activities and add value to products through reusing, recycling, and retention of material (Mostaghel et al., 2017).

1.1 Problem Statement

From the traditional economic model, consumption is directly associated to the growth of an economy which consequently leads to the exploitation and use of natural resources. For conservation ideologies this situation will lead to unsafe living condition in a long range. Even further, there is a fear that the wastes generated by the middle class population will increase in the near future if proper actions are not taken to reverse the current consumption style to a more sustainable way.

In an attempt to implement strategies to achieve this goal, there is a need to shift from the linear "take-make-and-dispose" patterns of consumption and production to a more circular models where goods and services (refrigerators, washing machine, TVs and other appliances) are properly utilized, reused, recycled, and the consumption is in a way reduced. This will further strengthen and promote circular economy without disputing the fact that the environment will be devoid of emissions of Green House Gases (GHGs). To accelerate the transition to a circular economy the Dutch government set-out to sponsor the prioritized sectors "consumer goods, biomass and food, plastic, manufacturing, and construction" so that by 2050, consumers will be using sustainable produce, renewable energy and improve a lifestyle towards minimization of waste (Dutch Ministry of Infrastructure and the Environment & Ministry of Economic Affairs, 2016).

This research will focus mainly on the household of Leeuwarden which is the capital city of Friesland in the Northern part of the Netherlands. Leeuwarden is regarded as

an urban area with a population size of about 107897 people(Municipality of Leeuwarden, 2015).

Therefore, to address the issue of unsustainable consumption practices at the household level of Leeuwarden, there is a need to better understand the business of circular economy in which resources are used effectively to ensure "zero waste" practices. Therefore, investigating the consumption style of households and how products can be strategically designed in a circular business model to promote household sustainability, especially in the energy consumption, is the bone of contention. Household uses energy for several purposes: to heat up water, for cooking, warming the room, lighting, power their electronics, for refrigerating and washing clothes. These home appliances also have environmental impacts if they are not properly utilized, especially after post-consumption stage.

Determining the consumers' role on post consumption to reintegrate the materials into the economic cycles will be the main research objective of this project. Reusing secondary materials can effectively relief primary materials in industries and the household level. This will only be achieved by applying circular business models as explained by Ellen MacArthur Foundation (2012) and Accenture (2014), e.g. Circular economy seems to be one of the way forward for a sustainable consumption and production. Most concretely, this research seeks to address the factors influencing the transition to sustainable consumption practices of electronic equipment at the household level while promoting circular economy.
The benefits of circular model cannot be fully achieved by a single stakeholder effort (The Parliament Magazine. 2014). For this reason, to realize a circular economy, the collaboration of suppliers and purchasers is highly necessary.

1.2 Research Objective

The practices of circular economy and sustainable consumption and production nexus are extensively, but not uniquely, anchored on the principles (Reuse, Reduce, Recycle, closing loop and preventing waste). These principles are considered in this research as contributors to the reduction of energy consumption of Leeuwarden Household (Ellen

MacArthur Foundation, 2012). In the light of this, the research objective is: To understand the factors which influence consumers' behavior towards acceptance of novel services at the household level of Leeuwarden.

1.3 Research Questions

General research question: What are the driving factors that can influence sustainable consumption of home appliances in Dutch households of Leeuwarden towards achieving circular economy?

Sub-questions

1. What are the factors that influence Dutch households behavior towards sustainable consumption practices?
2. What are the views and propositions of households with regards to leasing of most conventional consumer products and services?
3. What factors can influence manufacturers to include household consumers in their Circular Business Model?

CHAPTER 2: LITERATURE REVIEW

This chapter reviews the literature of the key concept that is necessary for this research and is based mainly on works of previous researchers, academic journals and magazines. The literature starts with the history and explanation of circular economy globally, the principles of CE and thereafter, a circular business model developed from the concept of circular economy. Furthermore, this chapter analyses the concept of sustainable consumption and theories that is used to study sustainable consumption. In addition, the policy instruments that can be used to promote CE through the application of sustainable consumption in households are reviewed. Finally, the

WEEE as applicable to the EU and the state of art of the WEEE in the Netherlands is discussed, then an analytical framework is developed from the literature review.

2.1. The concept of circular economy

According to Murray et al (2015) "circular economy is yet to have a general acceptable definition". Maria et al (2015) noted that, in recent years the discussion about CE has drawn much attention from the academia and also from interested companies who are interested in closing the loop and maintain a zero waste. Nevertheless, CE involves closing loop flow of materials and utilizing raw materials and energy through multiple phases. Correspondingly, "CE is defined as an industrial system that is restorative and regenerative by design and ensures that products, materials and components are utilized at all times, differentiating both technical and biological cycles" (The Ellen MacArthur Foundation, 2012). The concept of CE is seen as a reassuring approach to the world's sustainability issue (Ellen MacArthur Foundation, 2016). The Ellen MacArthur Foundation has help publicize the move to a circular economy using the circular business models (Ellen MacArthur Foundation, 2016 & European Commission, 2018). In Europe CE is part of the future strategies to sustainable consumption, for instance, the action plan which the European Commission applies to achieve a CE are: revitalizing, recycling and avert loss of valuable materials; establish jobs and boosting the economy; reveal how new business models, eco-design and mutual industrial benefits can advance Europe toward zero-waste; and lessen GHG and environmental impact (Ellen MacArthur Foundation, 2016). The works of Leider & Rashid in 2016 highlighted three important view for the implementation of CE are enlisted as: (1) Environmental concerns through the reduction of solid waste, increase in landfill and release of harmful gases; (2) improving the economy by redesigning products, supply chains and choice of materials; (3) manage the issue of resource depletion through minimization in material usage and further reuse and recycle products. For proper implementation of CE, all stakeholders have to be strongly carried along and be functional. When an actor in the chain becomes unsustainable the circle degenerates (Ellen MacArthur Foundation, 2015).

Furthermore, in CE, two cycles as shown in the diagram below are developed: The bio-cycle explains how human activities can regenerate disordered materials, whereas, in a technical cycle, human interventions recover the materials and recreate order with sufficient energy available (The Ellen MacArthur Foundation, 2012).

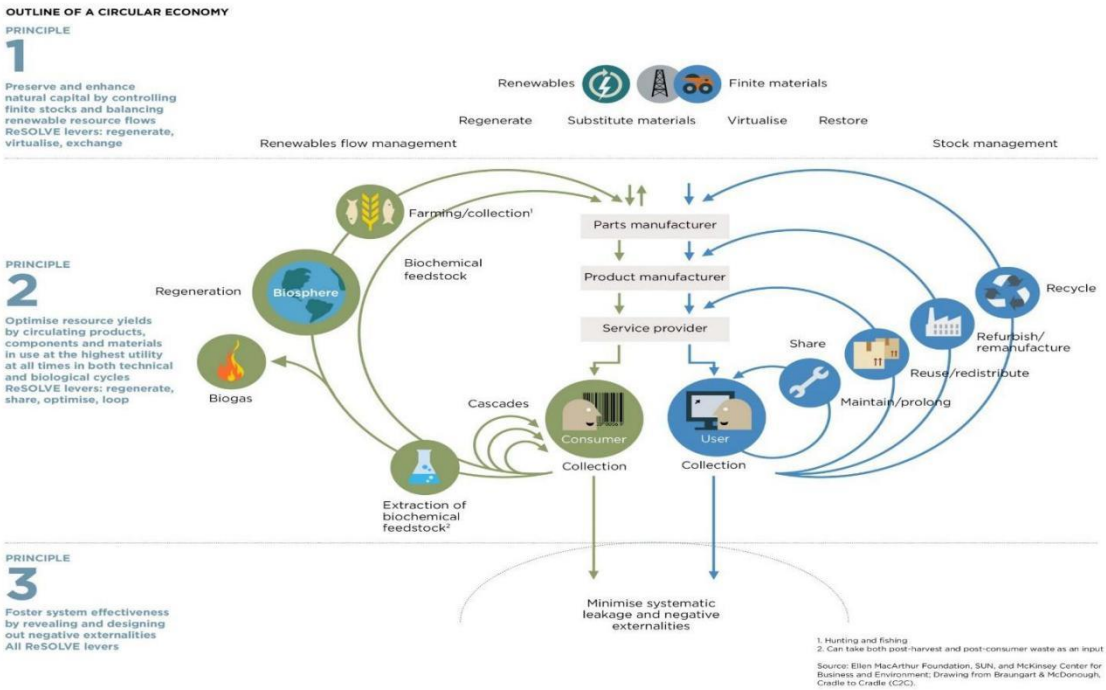

Fig 1. Outline of a Circular Economy (The Ellen MacArthur Foundation, 2012)

The research however, focuses on the technical part of the cycle since the topic is major on energy consumption and it forms part of the analytical framework in assessing how manufacturers can provide services to households. This will help to answer the second research question.

According to the Ellen MacArthur Foundation (2012), three basic principles can be derived from Figure 1:

a) **Conserve and promote natural capital by the control of finite stocks and creating a balance among renewable resource flows:** This describes the necessity to look for the likelihood of dematerialization most importantly when resources are needed, renewable resources are selected where possible.

b) **Utilize the use of resources, by reusing products, circulating components, and the optimum use of materials at all time in both cycles :** This means that the design of product should be in such a way that it can be easily decoupled, refurbished, remanufactured and recycled so that materials can be circulating in the economy. If products are designed in such a way that it can be easily dismounted after usage, it can be reused to produce new products.

c) Promote the System productiveness: This involves making sure there is no release of substances that can have serious environmental impact and managing externalities such as climate change, land use, pollution of air and water.

From the principles here above, Walter R. Stahel (2016) derived a circular business model that meets, in principle all the conditions of CE:

1. Reduces the use of natural resources while promoting the use of secondary resources and handling the entire value chain appropriately.
2. Ensure the design of products for easy repairs and update.
3. When designing a product, it has to be in such a way that it can be dissembled and recycled (eco-design).
4. Customers do not buy products or manufacturers do not sell products rather, it should under a lease agreements between consumers and manufacturers (performance as a service).
5. Build products that cause minimal amount or no environmental harm or waste during the production phase, or ensures that the generated waste can be used by other companies as a resource.
6. Make sure that during production process of goods, renewable energy should be maximized.
7. Motivate staff and management to adopt a 'circular' approach in their reasoning and operations
8. Aim for an optimal stability between financial, social and ecological value,

2.1.1. Business model innovation in CE

New concepts and practical applications using business models are made manifest by manufacturers (Chesbrough, 2010). The work of Boons et al (2013) suggest that, the transition to a circular business model requires a radical initiative and disruptive

business model approach. At the same time, new business models should be based closely on a clear understanding of consumers opinion and behavioral pattern (Antikainen et al., 2015). In a case study of Finland consumers perception and behavior pattern by Antikainen et al (2015); one clear example of disruptive business model driven solely on a sharing economy (SE) and has adequately created and enforced new importance to consumers is the Uber and Airbn. The sharing economy and service oriented businesses have been known to be not only the major drivers which favors the transition towards CE, rather as a means of large, even though unexploited possibilities for existing companies and intending business owners (Antikainen et al., 2015). This will as well be applied in the research to understand how the Dutch household perceives share-services with neighbors.

The study on business model innovation (BMI) can be viewed simultaneously. In the first place, sustainable business model innovation (SBMI) put together the concept of sustainable business thinking and business model innovation (Antikainen et al., 2015). Instead of focusing solely on developing economic value, SBMI focuses on the societal, environmental and stakeholders benefits (Boons & Ludeke-Freund, 2013). Bocken in 2014, highlighted the focal point of SBMI as distinguishing several model sustainable schemes for companies, for example, encouraging eco-efficiency, making waste resourceful, and delivering functionality instead of ownership. “The study of sustainable business model (SBM) and the circular business model (CBM) has a close relationship and can further be classified as subcategory of business models” (Antikainen et al, 2015).

The concept is that a CBM must not necessarily close the loops of product on its own around the walls of its system boundaries, rather can contribute to a system of BMs which in combination can close a material loop with the aim of attaining circular economy (Mentink, 2014). However in real sense, with regards to physical and functional confinements, there is no true existence of 100% CBM[2] neither is there 100% linear BMs (Antikainen et al,. 2015). Recent study indicate that several

[2]Mentink defines CBM in 2014 as “the principle guiding the creation, delivering and capturing of values by a company within a closed loop system of product material flow”.

companies are fighting the problem of transitioning towards a business model that incorporates circular economy and to further be sustainable (Antikainen et al., 2015). Correspondingly, Sommer (2012) pointed out that, adopting the concept of CE-based business models has been relatively low within organizations. Unlike SBMI, "CBMI focuses on the potentials an organization can explore to promote extend lifespan of services, renewability, reuse, repair, upgrade, refurbishment, capacity sharing, and dematerialization" (Accenture, 2014).

The business model will form part of the research framework in answering consumers perceived value on leasing agreement of products and services. To this effect, the second, third and fourth principles of CE economy mentioned here above will be integrated as part of the analytical framework.

2.1.2. Consumer Practices

CBM needs to be captivating by consumers to ensure a successful compliance of consumers. It is imperative to understand the interplay between consumer practices and life events for a suitable and profitable transition to towards CEs (Antikainen et al., 2015). Similarly, Lammi et al (2011) identified the desire for consumers to consume in a more sustainable way should there be simple possibilities and materials available to influence their consumption choices. Furthermore, a consumption-based behavioral pattern has be seen as order of the day such that a lot of people are prefer to buy material things (Trentmann, 2009). Maria et al in 2015 equally noted that, the practices, routines and habits of consumers does not equate their affirmative opinion of the issues inherent to the environment. Particularly, "those important transformation life scenarios (e.g. relocation, marriage, divorce, childbirth and death) contribute to material acquisition, adaption and disposal" (Aalto & Varjonen, 2014). Moreover, changing consumer behavior and routines can be seen as an effective method towards achieving durability in the market (Maria et al., 2015). Mylan in 2015 noted that, for a business model to be successful consumers have to be reminded of the present existing models; to this effect, it is easier for consumers to accept a business model which has a little bit of similarity with the existing model.

This research will focus mainly on various services which can be rendered to consumers as a replacement to the conventional system of owning products. For example, consumers sometimes employ the services of laundering, watching televisions in 3D, storing their foods in the refrigerator or driving to rural region. Owning a car, washing machine, refrigerator or luxurious TV are avoidable expenses which can be rendered as a service. Hence, Antikainen et al (2015), explained the idea of service driven economy; "a lasting solution to buying products is rather to buy service that provides several options and renders a particular product as at when needed". The services rendered by companies has to be cost-effective, low risk, environmental friendly, easy to use, and further correspond to the existing pattern of consumption; this implies that, new business services are easily adapted so long as they correspond with ongoing development styles and if they have a close link with existing practices (Mylan, 2015).

2.1.3. Consumers in the Product-Service Systems PSS

This study on PSS has centered on researching the fundamental ways to shift from a product based organization to service based or value proposition based organization. Looking at the fact that services rendered based on customers value are totally different from selling a product along with its services (Roy & Cheruvu, 2009). In the course of providing innovative measures on the B2B and B2C platform, the study on PSS have given broader clarification of the entire processes involve (Roy & Cheruvu, 2009). The study of PSS[3] has focused majorly on the environmental and commercial implications of business to consumers (B2C) relationship, without considering the views and opinion of consumers, especially in the household level (Mont & Plepys, 2003). Important to note is that, in order to achieve a successful BM that incorporates service driven economy in the household level, the consumer acceptance must not be undermined but necessary majors on their opinion must be taken into account. However, several factors have been on discussion as to the acceptance of service

[3]PSS can be defined as "a mix of tangible products and intangible services designed and combined so that they are jointly capable of fulfilling final customer needs" (Tukker and Tischner, 2006).

rendering to consumers in the household (modified from Rexfelt & Hjort af Ornäs, 2009). Below is a table of the factors influencing consumer acceptance of the BM and the authors.

Table 1. Factors affecting the consumer acceptance of services (adopted from Rexfelt Hjort Af Ornas, 2009)

Category	Factors	Author
Price	Perceive fixed and variable cost, insight in total life-cycle costs	Meijkamp, 2000; Mont, 2004b; Schrader, 1999);
Product/service	Perceived relative advantages compared to alternatives. Availability wherever and when ever needed, convenience. Transaction costs (time and money)Quality of the PSS, reliability	Littig, 2000; Meijkamp, 2000; Mont, 2004a; Schrader, 1999; Ornäs, 2009 Meijkamp, 2000; Schrader, 1999 Meijkamp, 2000; Schrader, 1999 Meijkamp, 2000
Consumer	Habits as an obstacle to acceptance. Issue of ownership.Environmental attitudes, may have relatively little importance.	Meijkamp, 2000 Littig, 2000 Littig, 2000; Meijkamp, 2000
Relationship with company	Reputation, image.Uncertainties risks, costs and responsibility.Communication between supplier and consumer	Mont, 2004b; Schrader, 1999 Mont, 2004b Mont, 2004b

2.2 Sustainable Consumption and Production

Promoting sustainable consumption and production is an important aspect of limiting social and environmental externalities, which helps to achieve long-term economic growth that is consistent for sustainable development (OECD, 2008a).

2.2.1 Government tools and instruments which encourage sustainable consumption and production in households

According to EEA (2005) report, "European Union (EU) has a high priority on sustainable use and management of primary resources, which was influenced in 2001 when the EU adopted the Sustainable Development Strategy and the Sixth Environmental Action Programme". Similarly, the establishment and stimulation of the "Marrakech process" or the 10-year framework on sustainable consumption and production (SCP) pioneered by United Nations Environmental Program (UNEP) and the United Nation Department of Economic and Social Affairs (UNDESA) was recommended in 2002 at the Johannesburg Summit (OECD, 2008a; UNEP, 2011).
To address the issue of sustainable consumption in European Union, the combination of different instruments (economic, legislative and communicative) where applied by the EU member states (Pape et al, 2011).

To count the environmental impact of households consumption, government of OECD countries introduced different policy instruments to help reduce the current consumption style of households according to OECD (OECD, 2008a; 2008b). Those instruments include (i)taxes and charges, (ii)standards and mandatory labelling, (iii)thermal efficiency standards, grants, (iv)subsidies and incentives, (v)communication campaign, (vi)voluntary labeling, (vii)education, and advertising.

2.2.1.a Taxes and charges

Taxes and charges which can be seen as fiscal measures aim to appeal to the self-interests of household (consumers and producers using the monetary provision of disincentives for pro-environmental behavior) (Buckingham, 2008; De Young, 1993; Linden & Carlsson-Kanyama, 2003).

In a survey of the European Union on SCP, an estimate of the 2002 plastic bags levy had serious effect on the reduction of plastic bags consumption in Ireland by 92% generating about 12.7 million Euros in 2003 (UNEP 2004). According to Pape et al

(2011), several scholars have interpreted the success of this plastic bag levy in terms of "Value-action gap." The effect of plastic bags with regards to waste disposal cannot be over emphasize since many people were aware of the implications, however their attitude did not change until the government of Ireland introduced an economic incentive through regulation (Doran, 2007). Correspondingly, consumers reacted to the levy in a negative way for many years until key stakeholders were involved a negotiation which resulted to widespread publicity campaign prior to the introduction of the levy (Pape et al., 2011).

2.2.1.b Standard and mandatory labeling

In 2005, Thogerson indicated that eco-labeling was an economic instrument that gives consumers knowledge to promote environmental awareness through the supplying information on products, packaging or advertising material. These measures as mentioned by Pape et al. (2011), involves self-declared product oriented claims and labels (e.g. recycled) and also third party or certification of environmental labels (e.g. organic certification in Ireland; EU Flower for sustainable tourism products). However, the OECD (2008b) report states that, "education is one of the vital tools that is used to provide consumers with the necessary skills and competence needed to be a sustainable consumer".

2.2.1.c Subsidies and incentives

Subsidies and incentives (Monetary grants, donations, and tax reduction) are instruments used to encourage sustainable consumers in most OECD countries who select more sustainable products and service (OECD, 2008b). As seen in the case of tax and charges, subsidies aim at transport sector which motivates consumers to patronize vehicles with low level of CO_2 emissions, hybrid or other fuel used vehicles (OECD, 2008b).

The government of OECD countries established a scheme for the promotion of the use of cleaner vehicles in OECD countries like Denmark, France, Netherlands,

Sweden, Japan, and the United Kingdom (OECD, 2008b). For example in the case of the Netherlands, Germany, Norway, Italy, and Hungary where negative externalities that are associated with the usage of Internal Combustion Engine (ICE) vehicles are penalized with taxes but the electric vehicles(EV) are partially or totally exempted (Levay et al., 2017). Furthermore, as the taxes for ICE vehicles increases the more EV owners benefit from the exemptions (Levay et al., 2017).

In the Netherlands, UK and France, the main economic instrument used is the subsidy given to EV owners, example of the Netherlands, a subsidy of 1000 euro is given for the purchase of an energy efficient car for one year thereby increasing the demand for such cars to 100% (Levay et al., 2017; OECD, 2008b).

In addition, economic incentives that supports the efficient use of energy in the household level of are found majorly in OECD in countries like Canada, France (whic provides incentives for electric boilers), Denmark (encourages the use of energy efficient windows) and the United kingdom (here insulation, water and space heaters are subsidized) (OECD, 2008b). In countries like Germany, Denmark and Spain, there are subsidies for thermal and solar heaters (UNDESA, 2007).

In 2002, an incentive scheme called the Nu Spaarpas was launched to encourage sustainable consumption in Rotterdam, Netherlands (OECD, 2008b). The scheme which implies “earning of green points” encourages consumers to separate their waste to enable recycling, use public transport, fair trade or green products (OECD, 2008b). Correspondingly, the scheme provides two things to consumers: the green points that can be redeemed for public transport tickets or discounts on sustainable goods, and consumers’ behaviour in choosing sustainable goods and services (OECD, 2008b).

All in all, in this research the above policy instruments explains how it has been applied in other business fields and the role of government in achieving sustainable consumption using subsidies and incentives to shape the behavior of consumers. This thesis will look at how policy instrument can be used to also influence households behavior towards achieving circular economy in Leeuwarden.

2.2.2 Policy instruments as used in The United Kingdom

In 2014, Gale highlighted that UK was among the first countries to embrace the idea of SCP. However, UK releases a document in 2003 “Changing Pattern: the UK Framework for Sustainable Consumption and Production” (Gale, 2014). The framework which was formulated by the action of Changing Patterns, was based on the principles of (i) decoupling economic growth from environmental degradation; (ii) targeting policies which are vital to reduce the effect of resource use on the environment; (iii) encourage and engage consumers to be active and practice more SCP (UK Government, 2003; 2005). After this initiative, the UK Government releases the strategy for achieving the sustainable development goal “Securing the Future” (Gale, 2014). However, the goal of SCP in UK was to achieve more with less by closing the loops through circular economy ‘reducing, reusing and recycling of used materials’ (UK Government 2005, p. 43).

As mentioned by Flanagan and Weatherall (2013), some of the backup initiatives by the UK government to encourage sustainable consumption are; Green Carbon Hub, and the Voluntary Retail Initiative for Televisions, Love Food Hate Waste and Every Actions Counts Campaigns.

According to Gale (2014), the programs established by the UK government aim to improve the efficient use of products (houses, boilers and TVs), to reduce waste generation in most sectors (household food consumption, energy use and industry) and to encourage the sustainability of living, through the use of advertising campaign and community based monitoring. Three policy instruments were used to promote the initiatives: **Regulations** (establishing new standards and efficiency), **Economic incentives** (subsidies for industries and consumers), and **Information** (education and awareness campaigns to inform industry and consumers about the environmental implications of unsustainable purchasing decisions) (Gale, 2014).

Correspondingly, Flanagan and Weatherall (2013, p.3) explains the nexus between encouraging change in policy at the local, national or European level and the movement for consumers to change their behaviour towards consumption regarded as complex. Similarly, Gale (2014) pointed out that, “in order for citizens to fully embrace the concept of sustainable consumption choices in UK, an efficient

environmental along with consumer awareness campaign and engagement of stakeholders is vital".

2.2.3 Theoretical perspective of household consumption behavior

Spaargaren (2011) stated that, different branches of knowledge have formulated analyses on sustainable consumption however, the economists and social models have covered the argument which is seen from the individualist view. Correspondingly, Balderjahn et al (2013) introduced a quantitative relation for measuring the consciousness of sustainable consumption (CSC) which integrates three major aspects; environmental, social and economic approaches. The environmental and social aspects are regarded as positive act of consumption on the contrary the economic perspective is concerned about consumers choice not to buy products or to forgo specific purchases (Hüttel et al., 2018). Two perspectives of household behavior towards sustainable consumption are discussed below.

2.2.3.a Economic Perspective:

To properly interpret consumers behavior, the economic model is widely used at several aspects of analysis, especially in the study of choice making in microeconomics (Deaton, 1992). There is a postulation that in economic theory the dominant neoclassical cognitive content states that, the goal of maximizing utility can be seen from the conduct of an individual. (van den Bergh & Ferrer-i-Carbonell, 1999). Accordingly, prices of products and individual income influences consumption choices, since individuals are assumed to have invariant preference (Liu et al., 2016).
Balderjahn et al. (2013), "identify three non-purchasing qualities as economically sustainable: borrowing instead of buying products, refraining from affordable acquisitions, and abstaining from needless purchases". A consumer that is economically sustainable plays an important role in the minimization of material consumption (Lorek & Fuchs, 2013). Furthermore, in addressing the current ecological and social challenges, it is vital for household to imbibe the economical sustainable consumption lifestyle (Hüttel et al., 2018). In the light of this, Seegebarth et al (2016) pointed out that there is a positive link between economically sustainable consumption and consumers' psychological and financial performance.

The basis of decision making in this model is on the believe that the style of living and attitude individual is driven by self-interest and rational behavior (OECD, 2008). The economic model has not succeeded in addressing the irrational factors of consumers' behaviour however, this approach was disagreed by several researchers (Skitovsky, 1976). The attitude of consumers on bounded rationality as stated by Thaler (1980), is gaining strong recognition rather than utility maximization within the aspect of economics. For example, the theory of bounded rationality considers the low-cost hypothesis in purchase (Diekmann & Preisendorfer, 2003), the high cost of transaction, irregularities of information and cognitive dissonance (Simon, 1972).

2.2.3.b Social Psychological Approach SPA

"To better understand consumer behavior comprehensively and response to environmental policies, the economics combined with other discipline of social sciences like sociology and psychology were developed" (OECD, 2008a). This theory according to Guo et al (2018), deals with the interaction of the individual (people's belief, attitude, goal, emotion, intentions), and environment (resources, result of actions, and physical conditions) and behavior of consumers.

The socio-psychological model has been used in different study to understand household sustainable consumption pattern by looking at the link between people's social context and their state of mind (Liu et al., 2016). Researchers Dezso & Loewenstein (2012) and Tinson & Nuttall (2007) have stated that violating the social norms and responsibilities that guide the act of borrowing behavior negatively affects consumers relationship with their neighbors. In essence, the theory is seen as the best predictor of consumer behavior, whereas perceived norms, behavioral control, and attitudes help to explain the motive which strongly influence the performance of behavior (Liu et al., 2016).

From the perspective of conceptual research (Belk, 1988; Richins, 1994; Tauber, 1972), consumers prefer possession in order to pass across personal identity, social status and success. Additionally, consumers prefer ownership in order to bypass social

dependencies and obligations (Belk, 2010; Jenkins et al., 2014). The behavioral theories are mainly: social cognitive theory, social norms theory, theory of reasoned action, theory of planned behavior, goal-oriented behavior model, value-belief–norm theory, norm activation theory and self-regulated behavior.

A better way to predict and change the behavior of consumers is the use of the *Reasoned Action theory* (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980). This theory according to Liu et al (2016), is seen as the best predictor of consumers behavior style. However, attitudes, perceived norms, perceived behavioral control determine the motives which have a major influence on behavioral performance. Correspondingly, the key decision weighing factor is the individual weighing (ZEW, 2013).

The theory of Reasoned Action was first developed in 1970 and it offers a conceptual framework which accounts for individual behavior relating to health and safety, politics, marketing, the environment, the workplace and many other areas (Liu et al., 2016). Similarly, the theory of Reasoned Action was criticized since it does not provide any knowledge about habits, cognitive considerations or emotional factors, influences, and factors that has of external to individual intentions (ZEW 2013). In a like manner, Ajzen (1991) proposes the theory of Planned Behavior to examine both the external and internal factors that contribute to individual consumer behavior on products. The theory of Planned Behaviour understands consumers attitudes as the pursuit of goal whose attainment is unpredictable, and it introduces the addition of variable-perceived behavioral control which accounts for this uncertainty (Liu et al., 2016).

This research will apply the economical and socio-psychological model. To answer the first sub-research question, the factors that influence the behavior of consumers in making a sustainable choice of products and whether the Dutch household prefers a service to home appliances(on lease agreement basis) or ownership of products will as well be looked at.

The study of sustainable consumption will be viewed using Chinese household to show the implication of future effect of unsustainable consumption when the

household level is neglected.

2.2.4 Sustainable consumption in Chinese household

In the past decades analysis of the Chinese consumption lifestyle from the social perspective approach show that the expenditure rate of Chinese households has increased tremendously about threefold from 2000 to 2011 in both urban and rural household and the growth is expected to continue (Liu et al., 2016). The high speed growth is attributed to investment-led national strategy that is reinforced by industrialization, urbanization and the rising of a new middle class (Steinbock, 2010). Studies show that environment related problems in China, for example, the growing carbon footprint, rising emissions of SO_2, NOx , and COD are the result of unsustainable household consumption practices (Fan et al., 2012; Liu & Wu, 2013). . Globally, the greenhouse gas (GHG) emissions resulting from household consumption in China is the third highest when considering the direct and indirect environmental impacts. China is behind USA and Europe in terms of GHG emissions (Tukker, 2006).

2.2.4.a Analyzing the Chinese Consumption style using the Social Perspective Approach (SAP)

According to Liu et al (2016), "the empirical research on everyday life of consumer behaviour, for example housing, food consumption, mobility and clothing, domestic use of energy, water and waste services has gained increase popularity most specifically in the social practice approaches in the Chinese household". Households' everyday lifestyle is considered the key unit for studying sustainable consumption rather than focusing on individuals and on structure (Liu et al., 2016). Consumption which is seen as an element of social life is understood as a series of re-occurrence practices that is reproduced by knowledgeable and capable agent connected to situated social practices (Giddens, 1984; Spaargaren, 2011). On that note, analyzing the transitions towards a sustainable consumption, the Social Practices Approach provides a model for integrating both aspects of agency and structure (Liu et al., 2016)**.**

Three basic assumptions on the consumption pattern of household in China were postulated from the SPA:

Firstly, in order to achieve sustainable consumption, the behavioral pattern of consumers must be considered. Consumers are naturally unsustainable even if the proper technologies, infrastructures and (green) products are put in place because studies have shown that (Liu et al., 2016).

Secondly, understanding sustainable consumption behaviour requires an in-depth study which is beyond individual approaches and look at specific, everyday embedded social practices where consumers engage in their specific lifestyle (Fan et al., 2012; Liu et al., 2016).

Thirdly, research on sustainable consumption needs to focus on the nexus between choice configuration and behavioral choices developed with the system of provision (Liu et al., 2016).

2.3. THE WASTE from ELECTRICAL ELECTRONICS EQUIPMENT (WEEE) in EU

It is expected that there will be a 45% increase in the amount of WEEE produced in Europe between 1995 and 2020. In the light of this, the pattern for waste management in Europe has been based on three cornerstones; (i) waste prevention (ii) recycling and reusing and; (iii) a better final method of disposal (European Union, 2002). Several discussions on methods of processing waste have been carried out by researches to ascertain the sustainability of recycling and reusing of WEEE (Detzel et al., 2004, Grether et al., 2003, Prognos, 2002). The WEEE directive was focused primarily on ensuring producers adhere to the policy set by the European Commission (EC) to take back and plan a proper treatment of the WEEE collected (Khetriwal et al., 2011). The European Commission has set a target for recycling and recovery of WEEE but in terms of imposition, the supply chain structure was not considered (Khetriwal et al., 2011). The report of Huisman et al (2008) highlighted that the focal point to achieve the objective of the WEEE policy is based on the collection stage, but the amount of electronic waste that is collected for recycling or reusing is considerably small percent in the EU. A study on the environmental benefit of the WEEE recycling and reusing has been carried out in Swiss and Netherlands recycling systems with the aim of tackling the eco-efficiency and recyclability of consumer electronic end used products (Hischier et al., 2003; Huisman 2003). WEEE such as

computers, televisions, refrigerators and cell phones correspond to the evolving growing waste stream in the entire globe which cuts across a large variety of products (Balde et al., 2015).

The proper management of the WEEE can contribute to environmental, economic and social benefits. In the first place, sustainable management of WEEE can decrease health and environmental problems related to harmful components. Another benefit of proper WEEE management is the activity of recycling which may help to deliver insufficient and important materials for the economy and decrease of the environmental pressure connected with the consumption of fresh raw materials (Cucchiella et al., 2015). However, Gonzalez et al. (2017) suggest that the process of reusing WEEE products can in away contribute to better economic and ecological efficiency by prolonging the use stage and cutting down the manufacturing of new ones. Furthermore, Williams et al. (2008) noted that " increases in the re-use phases greatly reduce the net environmental implications". Correspondingly, Truttmann and Rechberger (2006) are of the opinion that "measures applied to encourage re-use of materials should be assessed using the cost benefit analysis". The success factors and possible barriers by manufacturers who practice re-using as a business model were identified in the works of Kissling et al. (2013). The quality of the item to be re-use which is delivered through the activities of re-used processes is the key success factor in the value chain. On the contrary, the major impediment concerns the access to reasonable amount of WEEE with the possibility to be re-used.

2.3.1. The State of the Art for WEEE in the Netherlands

According to Borner and Hegger in 2018, Netherlands is experiencing difficulty of applying the EPR system as highlighted in the WEEE (E-waste) directives. However the country seems to be comparatively successful in WEEE management. It has been noted that in 2014, 44% of E-waste (320000 tons) which was introduced by producers was collected and treated (Nationaal (W)EEE Register, 2015). this was a good record since the target set by WEEE Directive was to achieve 45% of E-waste to be collected by 2016 around EU but not the 65% goal set by 2019 (European Union, 2012; National (W)EEE Register, 2015) The approach for WEEE (E-waste) generated by the Dutch system has an advance strategy and varies when examined with the systems of other developed countries (Börner & Hegger 2018). The strategy

points towards various types of EPR implementation that is applicable in different EU countries (Borner & Hegger 2018). The WEEE regulation as directed by the EU was introduced in the Dutch legislation by the Ministry of Infrastructure and Environment; this regulation is known as "Regeling AEEA" which means (regulation on discarded electric and electronic equipments) (Inspectie Leefomgeving en Transport, n.d. 2018; Staatscourant, 2014). However, before the WEEE directive was implemented fully in the Netherlands, there has been a similar WEEE legislation at the national level (Cahill et al., 2011, p. 459). According to the Regeling AEEA, it is the responsibility of producers and importers of EEE to take care of the facilities they place in the market immediately it gets to the life span and disposal stage (Inspectie Leefomgeving en Transport, n.d.2018). Producers are mandated to provide the necessary finance for waste management strategies (Inspectie Leefomgeving en Transport, n.d. 2018; Rijkswaterstaat Leefomgeving, n.d.). Waste are collected, sorted and disposed by two compliance schemes (Wecycle and WEEE Nedarland) at the national level in Netherlands (Vereniging Producentenverantwoordelijkheid Nederland; WEEE Nederland 2015). In recent times, the government of the Netherlands introduced the "chain responsibility" which indicates it is a collective effort of all stakeholders "producers, municipalities, retail stores, and treatment facilities to take care of E-waste produced (Inspectie Leefomgeving en Transport, n.d.; Rijkswaterstaat Leefomgeving, n.d.; Staatscourant, 2014). For example, when E-waste are collected from Dutch household separately without the involvement of all stakeholders, the Mayor and Alderman held accounted for (Staatscourant, 2014). Distributors of EEE are oblige to establish collection center at the retail stores free of charge when the environment for sales is within $400m^2$ (European Union, 2012, p. 45). Furthermore, in Netherlands retailers are mandated to create a chance for consumers to return their E-waste of small appliance (European Union, 2012, p. 45).

This research is focused on how manufacturers of eletrical and electronics products can develop a business model which involves collection of WEEE products backs to be reused for production of other minor appliances.

2.4. ELEMENTS OF THE ANALYTICAL FRAMEWORK

From the theoretical perspective of sustainable consumption and the policy instruments presented in section 2.2, this research incorporates circular business model to study the behaviour of household perception and compliance towards service provision for sustainable use of home appliances (boilers, TVs, refrigerator heaters and so on) to minimize energy consumption. This is further explained in the research framework (Figure 2).

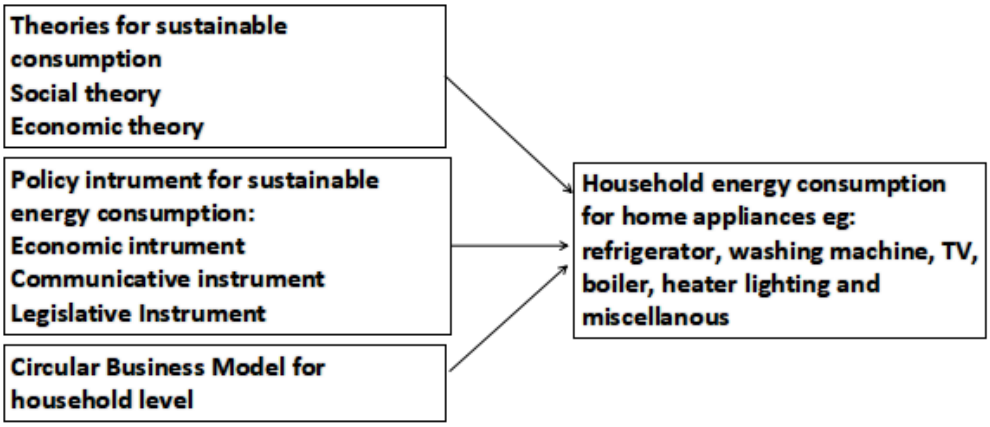

Fig2: Elements of Analytical framework for studying sustainable energy consumption in Dutch household of Leeuwarden towards achieving 2050 Circular Economy.

The figure above depicts that, theories of sustainable consumption were used to study the factors which influences consumer purchase behavior and how consumers can be integrated in the business models of manufacturers if the necessary instruments are been introduced by the government

CHAPTER 3: RESEARCH DESIGN

In this chapter, the methodology applied to collect and analyze data is presented. The chapter presents the description of the research framework, the research question and definition of concepts. Thereafter, the methodology applied to collect and analyze data is detailed. The pattern of this research is quantitative by means of a survey with close-ended questions; the survey was applied online and in person. The theories

which explains consumer behavior is based on secondary data. Primary data is collected from surveys in Leeuwarden and interview with an expat on CBM.

3.1 Research Framework

According to Vershuren and Doorewaard (2010, p. 65), a research framework is seen as a schematic presentation of the research objective. Seven steps are used to present the research framework of this project which is shown below:

Step 1: Characterizing briefly the objective of the research project.

To identify important theories that can help promoting sustainable consumption and further understanding the Dutch consumers behavior in the household level through the promotion of Circular business model in order to further achieve the 2050 circular economic goals in Leeuwarden.

Step 2: Determining the research object

Vershuren and Doorewaard (2010) define research object as the phenomenon under study. In this research, the Dutch household in Leeuwarden is the research object.

Step 3: Establishing the nature of research perspective

From the definition of Verhuren and Doorewaard (2010) “research perspective is the ‘spotlight’ or lenses’ that can be used to study the research object closely. The research will look at the ways energy consumption can be sustainable in the households. With the application of a circular business model where manufacturers render services in the form of service providers; and not as sales of products and how household perceive shared services with neighbors. In order to elaborate some recommendations, the research used survey questions and comparative analysis to answer the research questions. The research looks at the perception of households on sustainable consumption of home appliances. This research intend to view the acceptance of CBM in the household level and tries to open windows for future studies in this field.

Step 4: Determining the sources of the research perspective

The research will look at the theories explaining consumers' perceived value and instruments that can be used to promote sustainable energy consumption. Furthermore, the research will use the concept of circular business model to further explain the behavior of household in promoting sustainable consumption in nexus with circular economy.

Table 2: Sources of the research perspective

Key concept	Theories
Sustainable consumption	Policy instruments
Consumers perceived value	Theories of consumers perceived value
Circular business model	Circular Economy

Step 5: Making a schematic presentation of the research framework

The schematic presentation of the research is presented in Figures 3 and 4 below. The figure 3 explains the conceptual framework and criteria for assessing the research. It is centered on circular business models, theoretical perspective of consumers behavior and instruments that support sustainable consumption.

Figure 4 depicts that to aid the transition towards a circular business model, the behavior of Dutch household need to be considered. Moreover the behavior of the consumers can be further attributed to environmental, social and economic reasons as this is explained by the theoretical approach of sustainable consumption. All in all, both figures try to illustrate the main theoretical elements to respond to the question about the factors that can influence transition of Dutch households to a circular economy by using a circular business model as a tool for the transition.

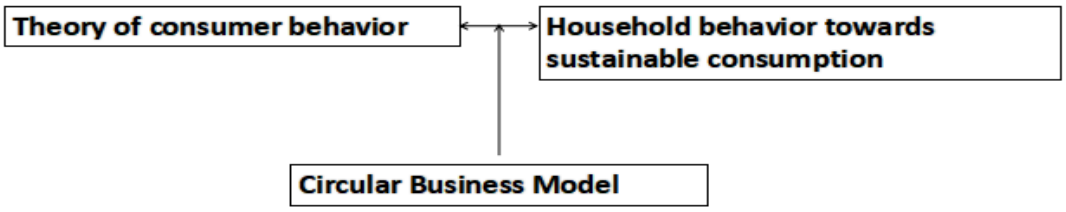

Figure 3: Interrelation of the coneptual model

The research framework is explained through the following flowchart below.

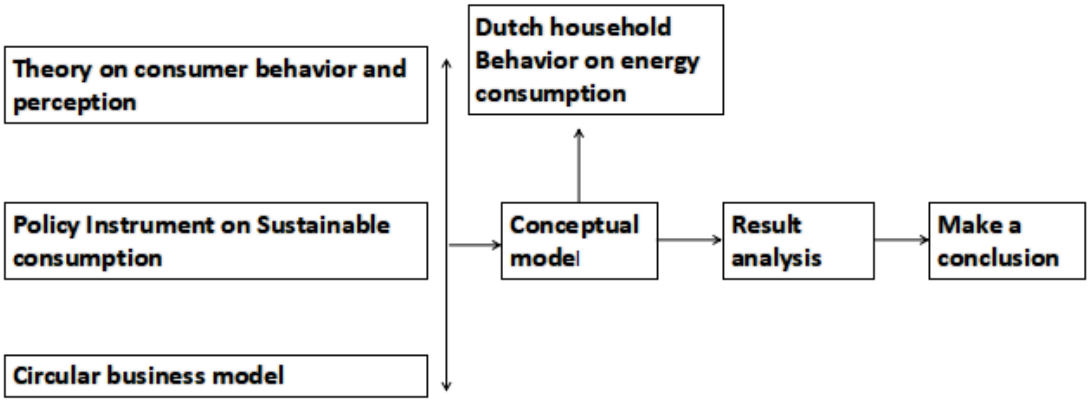

Figure 4: research framework

Step 6: Formulating the research framework in the form of arguments which are elaborated

A: This refers to the sources from relevant literature that serves as the research perspective which is formulated from theories of consumer behavior and instruments that can fashion consumers attitude with the incorporation of a business model to achieve sustainable consumption in the households.

B: In this section, the theories are applied in a conceptual model to the research object. It indicates how households are analyzed in a conceptual model, although the use of questionnaires to gather data is applied.

C: The results of the analysis are here interpreted for a better conclusion and recommendation.

D: In this part, the research will draw conclusions looking at how household behaviors can influence sustainable consumption and the approach of CBM as a tool for achieving circular economy.

Step 7: Checking whether the model requires any change

There is no indication that the research design requires any changes.

3.2 Research question

Central research question

What are the important factors or tools that can possibly influence sustainable consumption of goods in Dutch household of Leeuwarden towards achieving Circular Economy?

Sub-questions

1. What are the factors that influence Dutch households behavior towards sustainable consumption practices?
2. What are the views and propositions of household with regards to leasing of most electric consumer products and services?
3. What strategy can manufacturers apply to include household consumers in their Circular Business Model?

3.3. Defining concepts

For the purpose of this research key concepts shown in figure 3 and figure 4 are defined as follows defined:

Household: Group of people cohabiting in a particular domain.

Sustainable consumption: "The consumption of goods and services that have minimal effect upon the environment, are socially equitable and economically viable

whilst meeting the basic needs of humans, worldwide" (Brundtland commission, 1989).

Circular Business Model: A business model that meets all the principles of circular economy. This includes "minimizing the use of primary material while maximizing the use of secondary materials, designing products for easy repair and recycling, making products available to consumers under a lease agreement, manufacture products that has minimal impact to the environment, promote the use of renewable energy in production of goods, encourage to have a think of circular approach in the attitude, strive for the balance between financial, social and ecological value" (Stahel, 2016).

Policy instruments: Instruments which are set aside to influence the consumer behavior when buying products so that they can select green products for example incentives and subsidies.

Home appliances: Appliances which can be electronical or mechanical machines designed to carry out household works and meet human needs for example, washing clothes, cooling foods, and cleaning

3.4 Key strategies

This research will apply various theories to study consumer behavior while looking at how consumers perceive leasing contract and/or share services with neighbors in the form of a circular business model within the household context. Correspondingly, in the appendix the survey questions for this thesis are presented and interviews with experts (an expert and manager of an organization that incorporated a CBM in his organization) were conducted to ascertain if there is a BM that includes household level and if not, what strategy can be applied to engage household. However, the desk study on the existing models is applied to further understand the key concepts. Finally, the findings will be validated by using secondary sources when possible.

3.5 Research unit

Dutch households in Leeuwarden is the research unit in this research. In particular, the household perception and behavior towards the service driven economy are in the core of this thesis.

3.6 Selection of research unit

The selection of Dutch household in the city of Leeuwarden as the research unit was based on the objectives of the Province of Friesland to transition towards a circular economy. It is mportant to note that, much research has not been carried out in this field in the province for this reason, the research fits in the city of Leeuwarden where the population is higher as compared to other cities of Friesland. This will further create an avenue for other households within the province of Friesland to embrace an environmental friendly consumption behavior (services and sharing with neighbors) which further promotes sustainable consumption.

3.7 Research boundaries

Research boundary helps to determine the limitations and focus of the research within a given time. The following boundaries are applicable in this study.

- In the aspect of consumers' behavior, the research only assessed the perceived value of consumers and what theory explains about the behavior pattern of consumers on sustainable consumption at the household level.
- This thesis looked at how households view service driven economy as an alternative to outright ownership of home appliances (refrigerator, heaters, boilers, burners, televisions and washing machine and so on).

3.8 Research material and assessing method

Verschuren and Doorewaard (2010) defined research material as the act of defining and operationalizing the key concepts of the research objective and the set of research questions. The data and set of materials needed to answer the research questions were collected via survey and interviews. 100 Dutch household answered the survey questionnaire, both online and in person.

In table 3, the data sources and assessing methods per research sub-question were indicated.

Table 3: Data and information required for assessing methods

Research sub-questions	Data/information needed to answer the research question	Type of sources of data	Data collection criteria

What theories addresses sustainable consumption	Economic and socio-psychological theories on consumer behaviors	Primary data: Dutch household	Surveys:In person and online
What are the views and propositions of household with regards to leasing of most conventional consumer products and services?	Relevant CBM and consumers perceive value Easy maintenance Better result Smaller risk Environmental concerns	Primary data: Dutch households	Survey: In person and online
What factors can influence manufacturers apply to include household consumers in their BM?	CBM	Primary data: Dutch households Expats	Surveys: on line and interview

3.9 Ethical Statement

This research involves the gathering of information from humans in form of interviews and survey questions. Therefore, it is imperative to seek the consent of participants for the survey and interviews that will be consulted. During the survey, the interviewees will be promptly informed about the motive of the survey and their information will be handled with great importance and the privacy of their details is held with utmost respect. The research used all reliable information from interviewees and questionnaire while minimizing any harm in the course of the research.

3.10 Data Analysis

Data analysis means the process of data evaluation using a analytical and logical frameworks. Descriptive analysis will be applied to explain the statistical values obtained along with graphical representation of data. The method of analysis is further discussed below.

3.11 Method of Analysis

This thesis applied quantitative and qualitative methods to answer the research questions. The perception of Dutch households on rental of home appliances are

assessed using quantitative method through the use of surveys both online and in person. Interviews were conducted with two experts on the incorporation of CBM in with the household level. The questionnaire was made accessible online to Dutch household of Leeuwarden. The household sample size of this thesis was taken from the Slovin formula with a 10% margin of error. 100 household responded to the survey questions during the period the survey was active online. The targeted sample size was calculated using the Slovin formula below:

$$n = \frac{N}{1 + Ne^2}$$

Where,

n = No. of samples

N = Total Population of Leeuwarden

e = Margin of error

Table 4: Data and method analysis

Data/Information Required to Answer the Research Question	Method of Analysis
What theories addresses sustainable consumption?	Quantitative: assessing household perception through survey
What are the views and propositions of household with regards to leasing of most conventional consumer products and services?	Qualitative: Assessing the policy instruments set aside by government to promoting sustainability through interview
What strategy can manufacturers apply to include household consumers in their CBM?	Quantitative: Assessing household opinions through survey and interviews with expats

3.12 Validation of Data

Quantitative phase: The validation of data was done based on accuracy measure of a rating scale. Furthermore, the data was validated by interviews with Dutch household and responses with household members. Interviews with two experts on CBM were used as a validation method.

3.13 Analytical framework

Figure 5 describes the analytical framework of the research. The thesis seeks to identify the economic and social instruments that can influence household acceptance of the circular business model of leasing appliance. This research also applied the theoretical perspective to study household behavior on energy consumption.

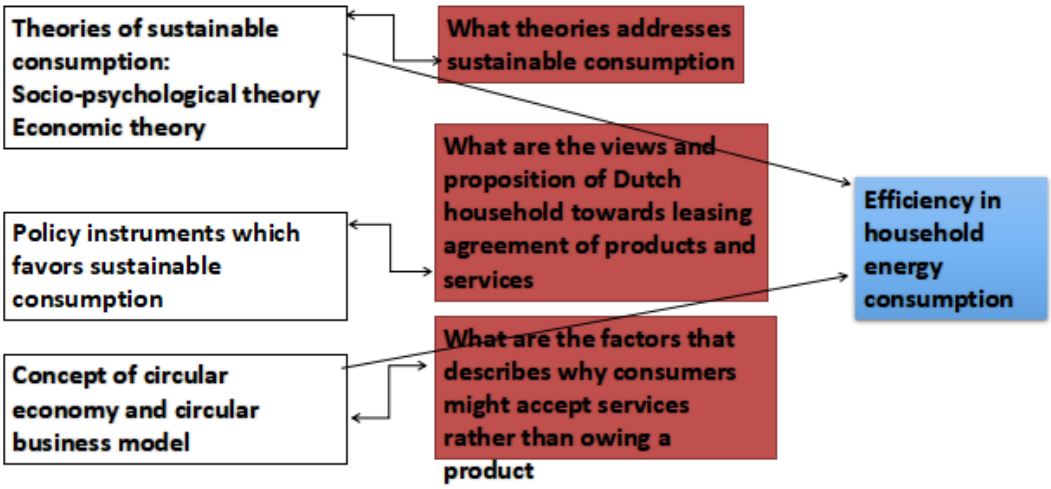

Figure 5: Analytical framework

The data analysis was conducted in the following steps:

a. First step was a review on the theoretical perspective of consumer behavior which aided to answer the first research sub-question. Dutch consumers perception on shared services was analyzed with the data obtained from the survey.

b. The second step was to understand the views and propositions of household with regards to leasing of most conventional consumer products and services. This question was answered with the aid of surveys conducted online and interviews with Dutch consumers.

c. The third step is the introduction of circular business model as a tool towards transitioning to CE and answering the third research sub-question. This step was also analyzed quantitatively through surveys conducted online and in person.

d. Last step corresponds to the integration of the findings from previous steps in order to answer the central research question.

CHAPTER 4: FINDINGS AND DISCUSSION

This chapter includes the findings of the survey conducted in Leeuwarden. The sample of this thesis comprises two research methods: (i) the survey for Dutch households in the city of Leeuwarden and; (ii) interviews with experts in the research topic. The first part of this section is dedicated to the description of the sample of people who responded to the survey.

Sample description: Demographic factors

The demographic factors considered for the Dutch consumers were the gender (figure 6), age (figure 7), educational level (figure 8) and income of Dutch household (figure 9). Additionally, in the survey there were eleven major questions and also questions that seek the opinion of households for better answering of the sub-questions.

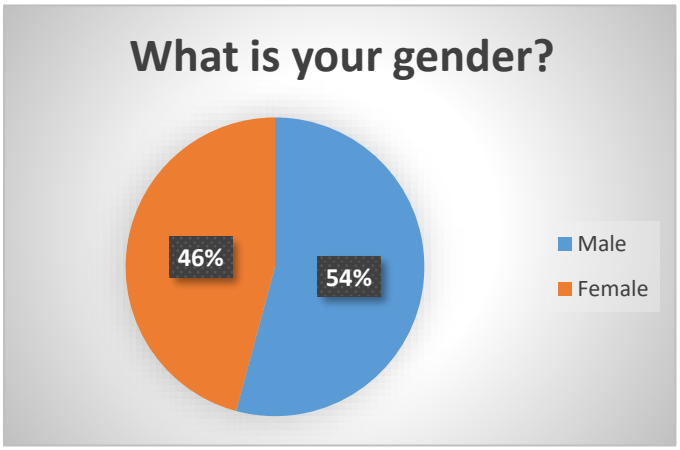

Figure 6: Pictorial representation of gender of the respondent

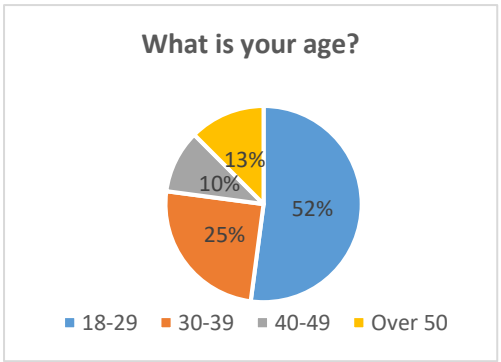

Figure 7: Pictorial representation of respondent in the survey

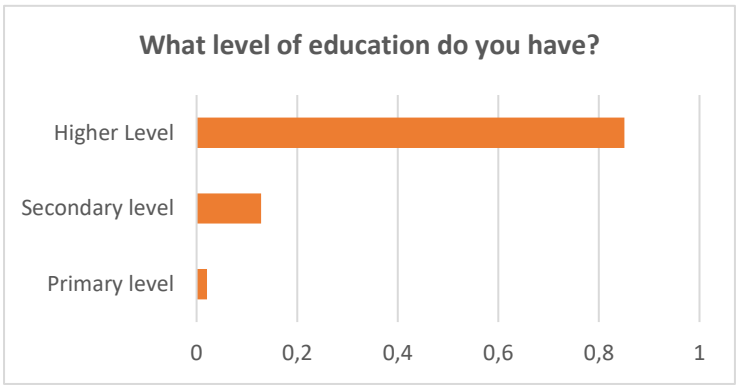

Figure 8: Educational distribution of respondent in the survey

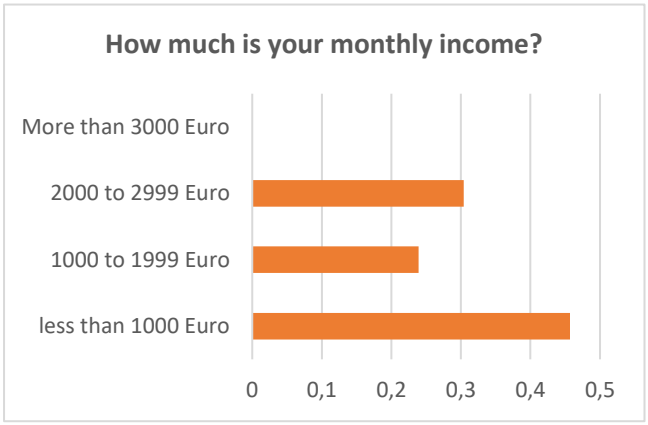

Figure 9: Monthly income of respondents in the survey

The demographic analysis was carried out to understand the group of respondents involved in the survey and their knowledge of the research topic. 54% male filled the survey. The age group of people that responded more to the survey was between 18 to 29 years old. 82% of the respondents have higher education. 30 % of respondents have monthly income between 2000 to 2999 Euros, 24% between 1000 to 1999 Euros and 45% less than 1000 Euros. The next sections present how information was gathered to answer the research sub-questions.

4.1. Household's Behavior towards Sustainable Consumption

As stated in the literature review, it is imperative to consider the factors that influence household behavior towards sustainable consumption. At this regard, the factors considered are both price of goods, product and services rendered and consumer

habits. The survey conducted in Leeuwarden addresses the factors which contribute to household behavior towards sustainable consumption.

4.1.1. What are the factors that influence Dutch households' behavior towards sustainable consumption practices?

The second question in the survey assessed the possible driving factors (business strategies) that can influence households behavior and make people purchase goods in an unsustainable manner. The answer obtained from the survey shows that 26% of the households prefer to upgrade their household appliances when new products are introduced. Meijkamp in 2000 explains why **price, attitude and habit** are contributing factors towards consumer buying behavior and relevant for sustainable consumption. On the other hand, 74% of consumers in Leeuwarden purchase goods in a more sustainable manner owing to the fact that the latest version might have a slight difference with the products currently in use. Furthermore, the old products are still in active and good state. From the literature review, the economic theory of consumer behavior explains why most household behave in a sustainable manner. The price of products and income of individuals influences their choice of consumption, owing to the fact that everyone has an invariant preference (Liu et al., 2016). This in return helps to reduce stress to new materials and curtail solid waste to the environment. Following a backup question to what happens with old products or disposal method for the old products, the information obtained from respondents suggests that they can sell it back via an online platform or in a second hand shop. Also, they can give it out as a gift but in most cases home appliances are disposed as solid waste if the product is damaged or burnt and cannot be reused. Figure 11 below shows the statistical distribution.

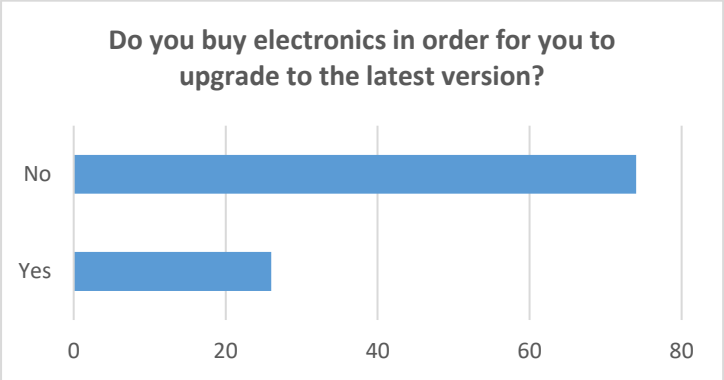

Figure 11: Responses to question two of the survey

The third question assessed the influence of manufacturers on the behavioral pattern of households in making sustainable purchasing choices of products. The data obtained shows that, the behavior of households are strongly influenced when promotional sale serves as the business instrument used for introducing new products to consumers, thereby affecting sustainable choice of selection and the buying behavior of household. When product and services are cheap, consumers tend to behave in an unsustainable way only few consider the external effect of such buying behavior. Jackson and Michaelis in 2003 suggested that, it is necessary to realize the role of consumers behaviors, lifestyles and their purchasing choice might play to achieve a sustainable consumption. Furthermore, Balderjahn et al. (2013) have pointed out three non-purchasing strategies as economically and environmentally sustainable: when someone leases rather than purchases, reducing the rate of the products which one purchases, and avoiding irrelevant purchases. In the past years the debate about environmental problems and issues has been raised especially in the Netherlands and EU at large. It should be noted that, a large number of people claim to be concerned or very much aware about the associated environmental problems with their buying behavior (Dunlap and Mertig, 1995; Diekmann and Franzen, 1999). But the reality of their claims is generally different from their actual claims. However, several researchers have pointed out that many customers are more concern and serious about the issue of environmental degradation through their lifestyle of purchasing eco-friendly products and services by patronizing businesses which consider environmental issues (Roberts, 1996; Kalafatis et al., 1999; Laroche et al., 2001). Figure 12 shows the statistical value.

Figure 12: Responses to question three of the survey

How do you think energy consumption at home can be improved?

The opinions provided by 6 households suggest that, it is good to make people aware about the environmental impact of energy consumption. This can be achieved if it is done at young age, primary school (cradle education). When households properly utilize appliances and follow manufacturers instruction "only use what you actually need" the consumption level at home will be reduced . 5 respondents suggested that, energy consumption can be improved by purchasing energy efficient appliances. Another respondent suggested that, if there could be a digital machine which helps to track energy consumed in order to ascertain the appliance which consumes energy most in the household level. A respondent also stated that people have to be conscious of the environment in purchasing and consumption, for example reduce the use of gas for cooking and shift to electric cookers or focusing on the use of solar and bio-technology at home or share solar energy with neighbors. A respondent suggested that, if appliances are owned by the manufacturers, then consumers can select the best products because they won't have to pay for the maintenance. However, in 2016 Rau's[4] circular economy model suggested that, manufacturers are accountable for maintenance of their products and remain owners of their products. This has created a new path for selling of services rather than owning products with regards to performance-based usage contracts. As an illustration, when manufacturers sell services instead of products (light instead of bulbs), or in the course of using a washing machine when it begins to malfunction, it should be the supplier's problem not the users. However in Rau's CBM, both manufacturers and consumers are sharing mutual benefits since the manufacturers make profit from rendering services instead of selling their products. This is due to the fact that service driven economy encourages innovations which helps to cut-down on material usage and in turn saves energy. Another important aspect to note is the re-usage of used material thereby, freeing the environment from waste and the value of recycled

[4] https://www.viawater.nl/news/what-can-the-sector-learn-from-circular-economy-visionary-thomas-rauretrieved on 20th June 2018.

products is in a way retained. In that case resource re-usage becomes an important aspect to consider in closing the loop for a CBM.

Considering the (What are the factors that influences Dutch households behavior towards sustainable consumption practices?), consumers are generally considered to be unsustainable. Each time households makes decision to purchase electrical and electronic product or service, there is a possibility that such decision can contribute to a more or less sustainable pattern of consumption which in turn results in to social, economic and environmental impact. The survey however, suggests that sustainable consumption behavior of an individual can be influenced when promotional sales serve as the tool used to introduce a new brand of electronic products and also speedup sales for them. In most cases household can as well decide to change their electronic appliances to express their personality, worth and status in the society. Consumers who appear to be rich purchase product unsustainably without considering the effect to the environment when they throwaway their used electronic products even though they are still in good conditions. This was in affirmation with the work of Meijkamp in 2000 that **price, attitude** and **habit** can of households can affect sustainable consumption. Even further, the amount of energy consumed is sometimes influenced by the income of an individual.

4.2.1a. Household's Opinion Towards novel services

This research looked at consumers views and willingness towards renting services from manufacturers and also shared services with neighbors. About this, some information was gathered from the literature review and presented in the following sections.

What are the views of households with regards to leasing of most conventional consumer products and shared services?

The fifth question in the survey assessed consumers perception and willingness to corporate towards a business model that encourages recycling, reusing and refurbishing of products by returning the used appliances when it get to its lifespan. From the figure 13 below, 81% of the entire respondent sample agrees to return their appliances rather than throwing it away while 19% does not prefer to return the

appliances. A follow up question to determine what they intend to do with the used items, was answered by 20 respondents who provided the following information: 6 respondents suggested that they will only return the appliances if they are properly oriented on the importance to do that. Another respondent said that they can drop it at the bin area for the municipality to dispose it. Furthermore, 11 respondents are of the view of selling them as a secondhand when they are still in good state. 3 respondents are of the opinion that manufacturers who introduces CBM in their activities should label products with "return and get a new one at a discounted price"; this can influence consumers adherence to instructions.

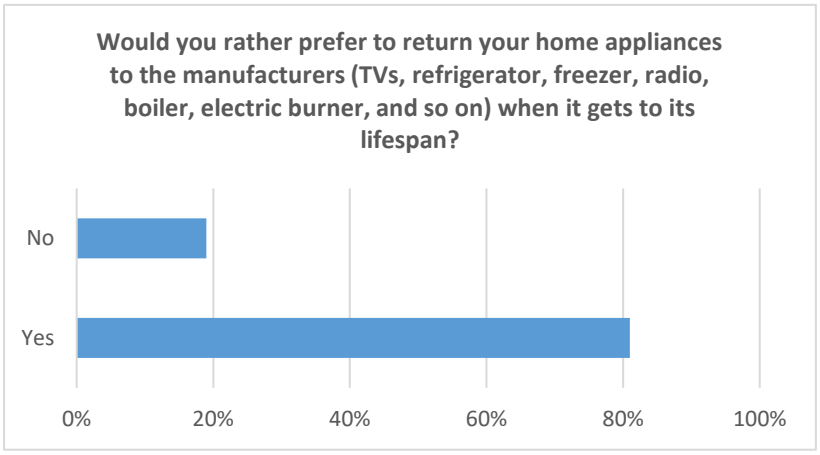

Figure 13: Responses to question five of the survey

The sixth question assessed household willingness to rent home appliances as an alternative to outright ownership of certain domestic products. The answer to the question was given by selecting a yes or no. The figure 15 below shows that 25% of Dutch household in Leeuwarden are willing to rent home appliances if the business model is familiar and if the purpose of usage is not frequent as compared to the previous model. Equally, it has been proposed by researchers that consumers will definitely embrace a shift to any business model considering the high price of products which in a way contribute to the success of a CBM (Littig 2000; Mont 2004a; Schrader 1999). Important to note is that, consumers also tend to transition towards CBM if rendering services are considered beneficial compared to buying and owning products (Littig, 2000; Meikjamp 2000; Mont 2004a; Scrader 1999; Ornas 2009). Meijkamp (200) and Schrader (1999) highlighted that when the accessibility of rendering services at any given point in time, it is obvious that consumers behavior

will be influenced towards the acceptance of novel services. However, 75% of the population does not prefer a service renting as a best option. This can be attributed to the unfamiliarity of the business model that is meant to be introduced. In a research conducted by Antikainen et al (2015) in Finland, similar result was obtained in the case of renting a car and hobby equipment, consumers seems to be willing to rent and encourage the shift to a service driven economy if the business model is well-known and yields better results to the environment, but show a significant aversion in the case of renting a cloth. For this latter, Antikainen et al (2015) suggested that, the possible reason that can influence consumers behavior can be their personal nature of cloth and since they are worn on every day they prefer ownership rather than leasing.

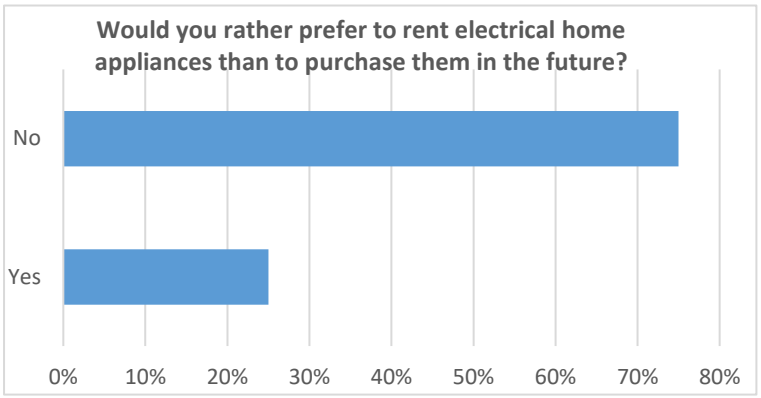

Figure 14: Responses to question six of the survey

The seventh question assessed the motivating factor (smaller risk, Better result, easy maintenance and environmental concerns) that could trigger household consumers to transition from ownership to a service driven (renting/leasing) economy. 45% percent of the respondents are comfortable with a lease contract because they tend to accept the fact that the risk involved in renting services is minimal. Also another prime motivating factor that can make people want a lease contract is the concern for the environment and the maintenance of the appliances are solely dependent on the company rendering services to them. Comparatively, the work of Antikainen et al. (2015) mentioned a similar but opposite view on the motivating factors in Finland for consumers to switch to a lease-based model of washing machine; maintenance concerns are the major reasons while consumers prefer renting to ownership, even further, energy efficiency and environmental friendly results are also important drivers. Below is the tabulated result obtained (see figure 15).

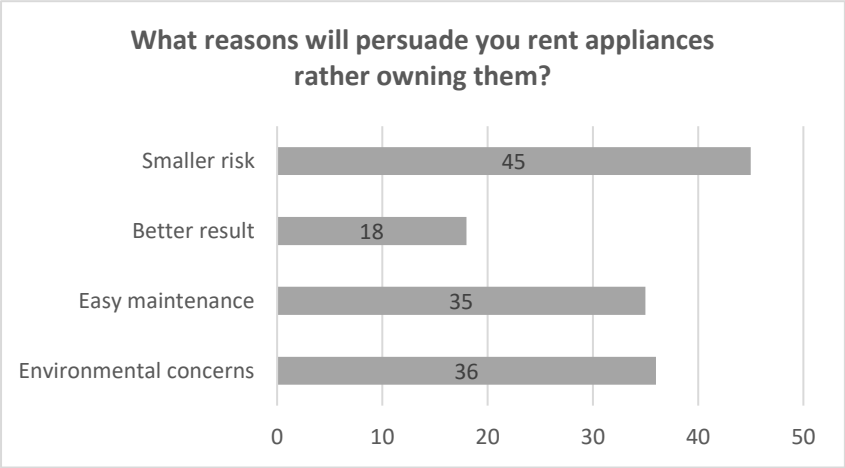

Figure 15: Responses to question seven of the survey

4.2.2b. Households and Shared services

The eighth question in the survey assessed the perception of household towards shared services with neighbors. The data obtained suggested that 79% of the population does not consider sharing appliances with neighbors whereas, 21% of the population are willing to share their home appliances (see figure 16 below). This can be attributed to the consumer behavior as the social-psychological theory suggested. According to Guo et al (2018), this theory deals with the interaction of individuals, environment and consumer behavior. ***People's belief, emotion, goal, attitude*** and ***interaction*** with neighbors are paramount. Sharing appliances with neighbors and the future unpleasant results of such actions are sometimes what household tries to prevent. For example if a household decides to share solar panels as means of electricity with neighbors and the other neighbor refuses to comply with the rules of using the renewable energy, it can result to future conflict with neighbors. Several researchers have stated that violating the norms associated to borrowing and sharing with neighbors can have a negative impact on the relationship of the neighbors (Dezso & Loewenstein 2012 and Tinson & Nuttall 2007). Below is the figure of the results obtained which is in a way different from the prior studies of Antikainen et al in 2015. According to Antikainen et al. (2015), consumers in Finland are comfortable with consumer to consumer shared services

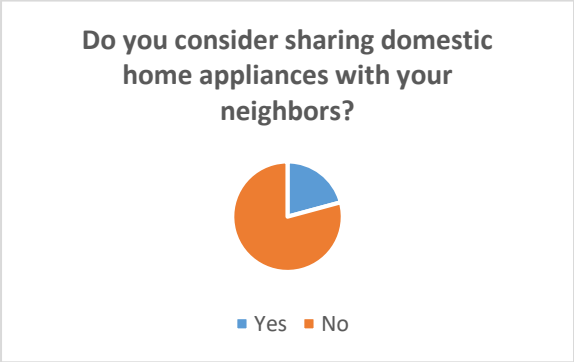

Figure 16: Responses to question eight of the survey

The ninth question assessed the proposition of households renting home appliances and/or ownership of the appliances. The result obtained from the survey as presented in table 5 shows that, 47% of households prefer to rent solar panel while 53% prefers to purchase the product. Also, similar result was obtained in the case of washing machine. However, in the case of other appliances listed in the table the percentage of those who prefer to rent these appliances are considerably low as compared to those who prefer to purchase the home appliances. Prices of products and services rendered are the considerable factor which affects consumer preference.

Consumer habits are considered to be a hindrance to a service driven economy, also the problem of ownership cannot be neglected in the discus (Meijkamp 2000 and Littig 2000). Several researchers have proposed that when the price of a product is high, consumers tend to shift to available alternatives thereby making the CBM to be successful (Littig 2000; Mont 2004a;Schrader 1999). Conversely, when services rendered are considered to be relatively advantageous when measured to buying and owning products, consumers will definitely be persuaded to shift towards any of the CBM (Littig, 2000; Meikjamp 2000; Mont 2004a; Scrader 1999; Ornas 2009). To demonstrate, Meijkamp (2000) and Schrader (1999) stated that when services rendered is accessible at any point in time and the quality of service is reliable, then consumers habit will be influenced towards circularity.

Table 5: percentage of items preferred to rent/purchase

Domestic items	Prefer to rent in percentage	Prefer to purchase in percentage
Solar panel	47%	53%
Television	15%	85%
TV receiver	34%	63%
VCR/DVD recorder	19%	81%
Computer	10%	90%
Radio	9	91%
HiFi	22%	78%
Lighting	20%	80%
Washing machine	43%	57%
Dish washer	28%	72%
Dish dryer	29%	71%
Electric oven	28%	72%
Microwave oven	14%	86%
Electric burner	28%	72%
Electric cooker	18%	82%
Gas cooker	13%	85%
Electric kettle	5%	95%
Vacuum cleaner	20%	80%

Pressing iron	19%	81%
Car	23%	70%

Considering the sub RQ2, Consumers are willing to return their used products back to the manufacturers for reusing and refurbishment. But in the case of buying services from manufacturers the result obtained from the survey indicates that the respondents are not willing to buy services from manufacturers. This can be attributed to green

consumers' lack of awareness on the environmental benefits of a service driven economy (William et al., 2009). However, consumer agrees to transition to buying services from manufacturers looking at the maintenance concern, if the risks involved are minimal and to an extent the concern for the environment. Furthermore, the survey indicates that respondents are not comfortable with shared services with neighbors.

4.3. Incorporating Household in the CBM of Manufacturers

This section looks at how manufacturers can include household in their business model. Looking at the WEEE policy of EU and reusing of products, there exist a nexus between the manufacturers and household consumers. Interviews were conducted with two expats and from the survey question seeking household opinion on the areas which manufacturers can improve to influence the participation of household in their CBM are used to answer the research sub-question three.

What factors affects manufacturers from including household consumers in their CBM?

This question was answered by the respondents opinion from the survey and interviews conducted with two experts on the use use of CBM.

Another question from the survey seeks the opinion of households with regards to what manufacturers can do to influence household acceptance of noble services? The question was answered by 46 respondents however, the opinion of household were categorized according to the similarity of their suggestions. 26 respondents from the households suggest that they prefer to rent home appliances from the manufacturers, if the business model includes replacement with another device. Correspondingly, 5 respondents suggest that manufacturers should produce sustainable products and create proper awareness. 6 respondents think that if the products are energy efficient and environmentally friendly, consumers who are eco-friendly will be motivated to lease. 3 respondents considered cost of the product and services. If the price of product is reduced it can influence consumers' behavior. 2 respondents suggest that if the benefits of circular business model are obvious then they can buy into the CBM. A respondent suggested sales promotion and discount on services. This indicates that

few household are aware of the discussion on circular economy while some people need proper orientation. 1 respondent also gave an opinion that manufacturers should provide reliable information on the environmental effects of home appliances and offer affordable pricing. Another respondents opinion is to extend the lifespan of their products. The public should be strongly convinced on how serious are the environmental issues of unsustainable consumption. Furthermore, a respondent suggested that less recyclable products should be more expensive. A respondent gave a suggestion that manufacturers should prioritize enlightenment as a tool to create clear understanding of the business model to audience. Additionally, household should be encouraged to return used electronics back so that it can be properly recycled by providing incentives for consumers who consume products sustainably. For example, manufacturers can place labels on products indicating that products can be returned if properly used and be exchanged for a new appliance at a subsidized price. Finally, a respondent suggested that manufacturers should share information about the energy consumption (energy labels); make them aware of the costs of energy consumption and CO_2 emissions of an appliance during the production, use and demolition phase not only in abstract numbers but comparing it with something. For example: this product saves 10% the CO_2 emissions of a flight from Amsterdam to New York. It needs to be tangible evidence and comparable for consumers to shift into a noble services.

An interview which was conducted via a phone call on the 20th of June 2018, with an expert (who preferred to remain anonymous), from a company that includes CBM in their business to ascertain the nature of their BM and seek their perception on how household can be included in their CBM noted that, presently, there is no circular business model involving household participation in their company. However, there are basically two types of businesses in which are in operation; the Business to Consumers (B2C) and the Business to Business (B2B). The B2C part of the company involves no close loop. On the other hand, in the B2B part, there are close loop businesses and this is the aspect of they fully operate. The close loop systems are mainly related to emerging system. The close loop systems of their operation in the B2B are; services rendered in the form of repair and maintenance and all the activities involving service rendering. Furthermore, the company has the leasing part which is done together with their capital, then other companies sign a lease contract with them

while they render maintenance of their products. Additionally, the refurbish and upgrade business is also part of their services.

As an illustration, companies who are on a lease contract with this company can decide to change their contract the business model aimed at closing the loop in this company. Close business loops are not necessarily seen as sustainable. The company has under sustainability programs, the green products. This green Products cut across all the businesses and there are so many green products for consumers which are under sustainability principles. However in the case of the company's Close Business loops is not done with consumers but its centered on business to business. Introducing the household level in the business of this company is somehow difficult. For this reason, there is a new company called "Signify". For example the lighting of this company which is light as a service or pay per use model is not anymore part of the company but it has been handled by the other part of the company "Signify". In Signify there you have Business to consumers model. But close business loops in this company lighting is based on B2B. When you look at the company from close business loops perspective or Circular Economy the issue of household consumers is almost not existing but there are other companies like "Signify" which renders B2C and as well closing the loop with consumers. The major impacts with consumers are the green products in the company, but these green products have different criteria, they do not actually close the loop. In the light of this, there is still a link for the company to render a B2C business if they wants to include the household level, in a way there is a scheme which exists in Europe where you have to give back the product to the manufacturers' since they have the responsibility to take the product back. That is the WEEE legislation which means Waste for Electrical and Electronic Equivalent. And it cut across different household Electrical devices. In that perspective, there is an EU policy which exists already on the topic of taking used products back for reusing and refurbishing. Additionally, a lot of it is based on recycling it is not necessarily based on closing the Business loops. Furthermore, since there are already certain elements that can enable closing the loop which is this scheme created by WEEE legislation there is a possibility that the company in the near future will want to include the household consumers to their CBM but, in the meantime, people focus mainly on the lowest value which is recycling instead of reusing. According to Borner and Hegger (2018), the Netherlands which is part of the

EU member state is finding it difficult to implement the WEEE regulations on the EPR system. This has resulted to low rate of manufacturers adherence to the reusing aspect of circular economy principles.

Another interview was conducted with Bas Menthink on the 11th of July 2018 concerning possible barriers affecting the transition to a CBM with household level. During the interview the interviewee noted that; most companies in the Netherlands finds it difficult to include CBM in their businesses perhaps their focus is based mainly on business to business. The acceptance of business model depends on the service to be rendered. For example some companies who offer light services, the business to consumers aspect is much higher. Furthermore, developing a new service model especially for a variable products or for variable contracts, a lot of capital has to be invested in developing the new performance contracts, as in the case of switching from selling a product to providing a service comes with a new performance contracts. And there are quite some obstacles to overcome in developing the performance contract successfully and companies will start with the switch to perform contracts where there is the large added value for them. Then if you want to make a new contract, the municipality level is much higher as compare to the individual household and also for municipalities who have perfect lighting or industries who have factories with lighting they look for service contracts "maintenance and other repair services". Households have less interest in such services, they just buy new bulbs when the old ones are broken. There are not so many triggers for household to switch contracts to service rendering. The only reason would be a lower price. Perhaps the margin is just too small for some companies to switch and also the risk involve to get valuable products back requires the consumers to handle products in a way that it can be reused. Therefore the risk is higher with household. It is easier to make professional contract with business than with the consumer. The added value for introducing a service model for electronic equipment is too low. An entrepreneur consider the significant added value of a product before switching from one business model to another. If the added value is too low it simply cannot contribute to the profit of their business. Manufacturers comply to the WEEE regulation in the Netherlands by paying upfront in order to have their products recycled by everybody. Manufacturers pay for each product they put in the market.

Another point to note is that, if manufacturers make electronics that is in a quick development, it implies that the product you get back after usage over time becomes useless because the new version may somehow differ in components to the old product such that the collected components might not be useful anymore. The added value of reuse is for components which are still reusable.

However, there is a link between manufacturers and households even though they simply do not cover the highest margin especially the more expensive appliances like refrigerator, washing machine and laptop. For example, Bundles is the leasing model for washing machine. The building and dwelling corporation in the Dutch boom corporate with the cities like Harlingen to partner with Bosch to provide a service model for refrigerator for low income groups. This is not because Bosch saw a major source of increase margin of sales or profit but because the corporation or the renter saw a problem that the low income group often do not pay their rent and they have high energy bills because they have cheap old appliances with high energy consumption. For that reason the renters partner with Bosch to offer a lease contract of new appliances (Refrigerator) to low income household group, so that they can have a lower energy bill and then have less problems with renters not paying their rent. The idea is not primarily to increase profit for the manufacturer as noted by Prahalad (2005), that a large market exist among low income earners which manufacturers can serve by bringing changes in their business model.

The sub RQ3, factors which affects manufacturers to include household in their business model includes: the difficulty involve in transitioning to a new business model due to the large capital commitment. Most company thinks that there are no much trigger to switch to service rendering BM. Furthermore, there is a high risk included to get used electronics back for refurbishment and reusing, because most times collected electronics sometimes fade away since there are new version of that product which makes it difficult for reusing.

4.4. Comparison of research findings with the case of Finland

In Finland the amount of consumers who use circular business services is considerably less, however the consumers propose a high possibilities of using novel services in the future (Maria et al., 2015). This is similar to the findings of this research. Respondents to the survey conducted in Leeuwarden use novel services relatively low. This can be attributed to the lack of awareness of people on the benefits towards achieving the circular economy goal by 2050. The Finnish consumers who have recently used CE services tend to be more comfortable in using such services with emergence in new services. This was in affirmation with the earlier studies of researchers like Mylan in 2015 and Shove et al (2012) that people embrace new services faster if they somehow resemble the old practice. According to Maria et al. (2015) reasonable proportion of people have tried the apartment and swapping services in Finland which seems to be comfortable with neighbor relationship; they also intend to apply this services in the future. This is in contrast to the case of Leeuwarden where respondents prefer ownership to services. As stated in the literature consumers want to express their personality, worth and relationship shared with neighbors. This can be an influencing factor towards the acceptance of novel services in Leeuwarden. However, the success factors which contributed to consumers' acceptance to novel services in the case of Finland were stated to be time savings, easy maintenance and environmental concern. Circular services tend to be more convenient since the maintenance of appliances are the sole responsibility of the manufacturers. Another point to note is that, the use of circular services helps to improve the environmental condition by improving WEEE management. Naturally speaking consumers prefer cheaper articles to products with high prices. Therefore, high cost of goods can contribute positively on the reasons why consumers may prefer a shift to service economy rather than ownership (Maria et al., 2015). The case of Leeuwarden provided similar result with the Finnish case that lesser price of goods serves as an important factor towards a transition to services. The Finnish case suggest that consumers prefer to rent a washing machine on if the payment is a based on fixed payment per month but, in Leeuwarden only few respondent agree to renting of washing machine.

CHAPTER 5. CONCLUSION AND RECOMMENDATION

The purpose of this research was to understand the view and proposition of households with regards to novel services and how household can be integrated to the circular business model of manufacturers. The immediate aim of the research was to understand the factors which influence consumers' behavior towards acceptance of novel services at the household level of Leeuwarden. This chapter presents the most important findings of the entire research work. The concluding of the research are presented in section 5.1 which addresses the research question and the findings. This further led to the recommendation as presented in section 5.2. this part comprises the aspects which should be improved by all stakeholders to aid a smooth transition towards novel services in the household level. Section 5.3 comprises of the research methods used to answer the research question.

5.1 Conclusion

In order to answer the main research question on the driving factors that can influence sustainable consumption of home appliances in Dutch households of Leeuwarden towards achieving circular economy, three sub-research questions were addressed. The first sub question of the research aimed at identifying the factors that can influence Dutch households' behavior towards sustainable consumption practices. The survey conducted in Leeuwarden suggested that, consumers behavior are dependent on the strategy used to introduce a product. In most cases household can as well decide to change their electronic appliances to express their personality, worth and status in the society. Consumers who appear to be rich purchase product unsustainably without considering the effect to the environment when they throwaway their used electronic products even though they are still in good conditions. This was in affirmation with the work of Meijkamp in 2000 that **price, attitude** and **habit** of

households can affect sustainable consumption. In most cases consumers express their worth and status with new products.

The second sub research question looked at the views of households with regards to leasing of most conventional consumer products and shared services.

According to Guo et al (2018), this theory deals with the interaction of individuals, environment and consumer behavior. ***People's belief, emotion, goal, attitude*** and ***interaction*** with neighbors are paramount. Sharing appliances with neighbors and the future unpleasant results of such actions are sometimes what household tries to prevent. It has also been proposed by researchers that consumers will definitely embrace a shift to any business model considering the high price of products which in a way contribute to the success of a CBM (Littig 2000; Mont 2004a; Schrader 1999).

The third sub question sought to address the factors that affect manufacturers from including household consumers in their circular business model. It was made obvious that, the large capital commitment has made manufacturers avoid the transition to a new business model. Moreover, there is a high risk included to get used electronics back for refurbishment and reusing, because most times collected electronics fades away since there are new version of that product which makes it difficult for reusing.

5.2 Recommendation

There are two main recommendations on the research topic which are creating more awareness on circular business model especially in the aspect of novel services. The survey conducted suggested that 70% of households are not aware of circular business model and the corresponding environmental impact of unsustantainble consumption. For example, in the case of Finland, the consumers seems to be aware of the topic of shared services and show much interest if a new business model that resembles the old model will be introduce (Antikainen 2016). Therefore, it is imperative to create more enlightenment and education on the topic of circular economy. This is a key aspect to change peoples behavior towards sustainability. Another aspect to be considered is the strict adherence of policy regulations with regards to the WEEE policy. The government of the Netherlands has develop standard policy which is a wonderful avenue that aims at closing the loop. WEEE

encourages manufacturers to create collection point for used electronic appliances from consumers to be recycled. But manufacturers does not include the reusing of this appliances which is a wonderful platform to close the technical cycle. With the help of the WEEE regulation on product collection for reusing the future goals of the Netherlands to attain a more circular economy by 2050 can in a way be achieved.

5.3 Reflection of methodology

This section reflects on the research methods applied and the extent to which the findings was influenced by the method chosen.

Mixed research method approach was applied to this study. Sustainable consumption theories (both economic and social) which serves as part of the analytical framework, was used to study consumer behaviors towards energy consumption in households. The research also applied policy instruments that governments can introduced to help consumers embrace sustainability. Furthermore, circular business model was used to study how households can be involve in the business models of companies. The research was able to identify the following aspect of circular economy: Leasing, shared services, reusing, recycling, refurbishing. This method was proposed by this study as potential aspects to be considered in closing material loop. The research also proposed the product as service concept for introducing households in circular business model. The research is more concerned about how novel services can be integrated in households and further involving households in the circular business model with manufacturers. It was noted during an interview with Bas Menthink that manufacturers are scared of introducing circular business model because of the large capital involvement.

The resultant reflection on the research method was to identify areas of future research studies. The areas identified by the research was life cycle assessment of eletronic equipments in a circular economy. This was noted interview with Bas Mentink, when he stated the crucial reasons why manufacturers does not include households in the businesses due upgrade in version of electronic equipments.

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Appendix A: Consumer survey

Thank you for accepting to take part in this research for my masters thesis at the University of Twente in Enschede which aims to gain knowledge about current state of energy consumption in Leeuwarden and the factors influencing consumers choices for domestic home appliances. This questionnaire will gather information whether there are available strategies to close the loop between the some resources streams. Be

assured that all answers provided herewith will be kept in absolute confidentially-This survey would take only between 7-8 minutes to complete.

1. Do you consider energy consumption a problem in your house/home?

Yes	36
No	64
Total	100

2. Do you buy electronics in order for you upgrade to the latest version?

Yes	26
No	74
Total	100

3. If yes, what do you do with the old electronics?
_____

4. Do promotional sales affect your buying behavior?

Yes	68
No	24
Total	100

5. What appliances consume the energy most in your house?

Refrigerator	54
Washing machine	32
Gas cooker	28
Boiler	24

6. Would you rather prefer to return your home appliances to the manufacturers (TVs, refrigerator, freezer, radio, boiler, electric burner, and so on) when it gets to its lifespan?

Yes	81%
No	19%
Total	100%

If no, how do you intend to dispose them_____

7. What reasons will persuade you to rent appliances rather owning them?

Environmental concerns	36%
Easy maintenance	35%
Better result	18%
Smaller risk	45%

8. Do you consider sharing domestic appliances rather owing them?

Yes	20.8%
No	79.2%
Total	100%

9. Would you rather prefer to rent domestic appliances than purchase them?

Yes	25%
No	75%
Total	100%

10. If yes, do you consider sharing domestic appliances (washing machine, solar panel) with other neighbor?

Yes	20.8%
No	79.2%
Total	100%

11. Below is a list of domestic appliances, indicate by ticking the items you prefer to rent or purchase

Domestic items	Prefer to rent in percentage	Prefer to purchase in percentage
Solar panel	47%	53%
Television	15%	85%
TV receiver	34%	63%
VCR/DVD recorder	19%	81%
Computer	10%	90%
Radio	9	91%
HiFi	22%	78%
Lighting	20%	80%
Washing machine	43%	57%
Dish washer	28%	72%
Dish dryer	29%	71%
Electric oven	28%	72%
Microwave oven	14%	86%
Electric burner	28%	72%
Electric cooker	18%	82%
Gas cooker	13%	85%
Electric kettle	5%	95%
Vacuum cleaner	20%	80%
Pressing iron	19%	81%
Car	23%	70%

12. Do you consider the environmental impact of energy consumption?

    Yes

    No

13. What do you think companies and manufacturers can do for household influence to sustainable purchasing of home appliances?

Rent the devices from the factories so that when you want a new device that is going to be able to rent your old apartment to someone else again (2)

Produce sustainable products and make us aware.

Giving more information about purchasing sustainable home appliances.

Try to make no gas related manufacture.

More energy efficient.

I really don't know

Make it cheaper and appealing to the consumers.

Show the benefit of it.

They could go by the whole less is more saying.

Reduce the price of there product.

Sales promotions and discounts.

Provide reliable information on environmental effects of home appliances and offer affordable pricing.

Reduce purchase prices.

To extend the lifespan of their products.

Convince the public how serious is the environment issue.

Make less recyclable items more expensive.

Enlightenment. Encourage consumers to return used electronics back so that it can be properly recycled by providing incentives. For example, manufacturers can place a label on products indicating that that if product is effectively reused, after its lifespan the product can be returned and exchanged for a newer product at a reduced price.

They should make the sustainable appliances more affordable than the less sustainable appliances. This would probably result in less profit so that would be a job for the government. They should raise taxes for the less sustainable appliances and lower taxes for higher/more sustainable appliances.

To lower the price of sustainable home appliances devices.

I think they can produce more efficiency product in terms of energy saving.

Share information about the energy consumption (energy labels); make them aware of the costs of energy consumption and CO2 emissions of a appliance during the production, use and demolition phase. Not only in abstract numbers but comparing it with something. For example: this product saves 10 the CO2 emissions of a flights from Amsterdam to New York. It need to be tangible and comparable for consumers.

They should make produce with a longer lifetime.

Less energy consumption.

Don't manufacturing items which with a short life span. So consumer can stay using them instead of needing to replace them within 1 or 2 years.

Pay attention to lifespan of equipment.

Make appliances that consume less energy.

Be mindful of the material used to manufacture products. Utilize materials that will have less impact on environment and consume less energy.

Make renting attractive by promoting the advantages and the environmental impact it will have. But i think its the consumer that has to change in order to make the transition a success. And our economy us based on profits still, environment is not yet a measurement of success for companies sadly.

Tell people more about it.

Reduce energy consumption.

Create avenue to buy back disposed appliances

More advertisement and similar price for good quality items.

Longer life of their products.

Improve the equipment.

Environmental friendly products.

Recycling.

14. How do you think energy consumption at home can be improve?
Making the manufacturer owner of it. Than you will have the best products because they won't pay for the maintanance. (the idea of a circulear ecomomy by Thomas Rau)

Low energy systems

Turn off items you don't use at that moment. Don't leave whires in the power station

Bewust omgaan met verwarming, was buiten drogen bij mooi weer, wasprogramma op eco

Sun energy

Watch less tv and read books. Wash only in the weekends.

Turning off objects when not in use

More durable household items

Reduce the lights and turn off the heather

energy improving stuf

turn on energy using appliances only when in use.

yes

Consciousness, education

Reducing losses. Using the

Cradle education

Low energy consumption

15. What is your age?

18-29	52%
30-39	25%
40-49	10%
Over 50	13%
Total	100

16. What is your gender?

Male	54%
Female	46%
Total	100

17. How much is your monthly income?

less than 1000 Euro	45.70%
1000 to 1999 Euro	23.90%
2000 to 2999 Euro	30.40%
More than 3000 Euro	0
Total	100%

Appendix B: Interviews with an Expert who prefers to remain anonymous

Where do you work?

I have worked with this company for a very long time

Can you tell me about this company and there CBM including the household consumers?

Well, there is no circular business model as such in this company however, there are two types of businesses involve which are Business to consumers and business to business aspect. On the business to consumers part, there are no close loops and on the business to business perspective which is what we base fully, you have close business loops. The close business loops are mainly related to emerging system. They are what we service which is repair and maintenance close all the activities done at the piece of service. Then we have the leasing part which is done together with Philips capital, then we have what we call refurbishment which is the refurbish business, then we have the upgrade business. These are mainly what we call CBM. It is not one business model but all activities to close the business loop.

How can household consumers be influenced to purchase sustainable products?

What I initially explained is business to business not business to consumers. Close business loops are not necessarily seen as sustainable. This company has under sustainability programs what is called green products. This green Products cut across all the businesses and there lots of green products for consumers which is under sustainability. However in our operations Close Business loops is not done with consumers but its centered on business to business.

In your business model, do you think the household level can be incorporated in your business model?

Yes. For the household level it is quite difficult to be included in the business model of our company. For example the lighting in this company which is light as a service or pay per use model is not anymore part of our business. The new company name is Signify. In signify there you have Business to consumers aspects. But close business loops in our company lighting, is based on B2B. When you look at our business from close business loops perspective or Circular Economy the issue of household

consumers is almost not existing but there are other companies like I mentioned before “Signify”. What have a big impact with consumers are the green products, but this green product have a different criteria, they don’t really close the loop.

In your Opinion do you think there can be a nexus between the manufacturers and household with regards to service driven economy?

There is a link if the company wants, in a way there is a scheme which exist in Europe where you have to give back the product to the manufacturers since they have the responsibility to take the product back. That is the WEE legislation that means Waste for Electrical and Electronic Equivalent. And it has to do with different house Electrical devices. In that perspective there is an EU policy which exist already on the issue to take used products back for reusing and refurbishing. However a lot of it is based on recycling it is not necessarily based on closing the Business loops. However,there is a link since there are already certain elements that can enable closing the loop which is this scheme created by WEEE legislation but people focus mainly on the lowest value which is recycling instead of reusing.

Appendix C: Interview with Bas Mentink, Expert in CBM

What is the nature of business model in the Netherlands?

Most companies in Netherlands finds it difficult to include CBM in there businesses perhaps there focus is based mainly on business to business. The acceptance of business model depends on the service to be rendered. For example to some companies who offer light as service, the business to consumers aspect is much higher. Furthermore, developing a new service model especially for a variable products or for variable contracts, a lot of capital has to be invested in developing the new performance contracts, as in the case of switching from selling a product to providing a service comes with a new performance contracts.

What can acttualoly be a factor in the developing CBM in comapanies?

And there are quite some obstacles to overcome in developing the performance contract successfully and companies will start with the switch to perform contracts where there is the large added value for them. Then if you want to make a new

contract, the municipality level is much higher as compare to the individual household and also for municipalities who have perfect lighting or industries who have factories with lighting they look for service contracts “maintenance and other repair services”. Households are much less interest in such services, they just buy new bulbs when the old ones are broken.

What can influence household to move towards service rendering?

There are not so many triggers for household to switch contracts to service rendering. The only reason would be a lower price. Perhaps the margin is just too small for some companies to switch and also the risk involve to get valuable products back requires the consumers to safe handle products in a way that it can be reused. Therefore the risk is higher with household. Its easier to make professional contract with business than with the consumer. The added value for introducing a service model for electronic equipment is too low. An entrepreneur consider the significant added value of a product before switching from one business model to another. If the added value is too low it simply can not make way in their business.

Does manufacturers adhere to the WEEE regulations in Netherlands?

Manufacturers comply to the WEEE regulation in Netherlands by paying upfront in order to have their products recycled by everybody. Manufacturers pay for each product they put in the market. Another point to note is that, if manufacturers make electronics that is in a quick development, it implies that the product you get back after usage over time becomes useless because the new version may somehow differ in components to the old product such that the collected components might not be useful anymore. The large added value of reuse is for components which are still reusable.

In your Opinion do you think there can be a nexus between the manufacturers and household with regards to service driven economy?

Yes. there is a link between manufacturers and households even though they simply do not cover the highest margin especially the more expensive appliances like refrigerator, washing machine and laptop. For example, Bundles is the leasing model for washing machine. The building and dwelling corporation in the Dutch boom corporate with the cities like Harlingen to partner with Bosch to the provide a service

model for refrigerator with the low income groups at heart. This is not because Bosch saw a major source of increase margin of sales or profit but because the corporation or the renter saw a problem that the low income group often do not pay their rent and they have high energy bills because they have cheap old appliances with high energy consumption. For that reason the renters partner with Bosch to offer a lease contract of new appliances (Refrigerator) to low income household group, so that they can have a lower energy bill and then have less problems with renters not paying their rent.

Appendix D: Consent to take part in research project interview

I **Bas Mentink**, voluntary agree to participate in this research study interview.

I understand that even if I agree to participate now, I can withdraw at anytime or refuse to answer any question without any consequences of any kind.

I understand I can withdraw permission to use data from any interview after it, in which case the material will be deleted

 I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study

 I agree to my interview being audio-recorded

 I understand that all information I provide for this research project will be treated

Confidentially

- I understand that in any report on the results of this research my identity will remain anonymous if preferred to be so. This will be done by not explicitly mentioning my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about
- I understand that I am entitled to access the information I have provided after the interview
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information

Here as follow the name of the people involved in this research who guarantee the agreed use of this consent and the answers provided during the interview.

Researcher: *Owuamalam Ozioma Ezekiel*

Research supervisors: Dr. Laura Franco-Garcia

Participant: *Bas Mentink*

Signature of participant

Date: 11th July 2018