AALBORG UNIVERSITY
DENMARK

SMARTPHONE USAGE AND E-WASTE IN DENMARK

Understanding Consumer Behaviour, Recycling Practices, and the Market for Refurbished Phones

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Abstract

This master's thesis examines the role of consumer behavior in smartphone usage, recycling practices for e-waste, and the market for refurbished phones in Denmark. The researchers reviewed relevant articles, journals, and publications to develop a conceptual framework and conducted an in-depth interview with GreenMind. A quantitative survey of smartphone users in Denmark investigated key factors such as electronic recycling, consumer awareness, preferences, and behaviors.

The study focused on the environmental impact of e-waste, finding that illegal exports are polluting developing nations and putting them at greater health risk. The paper addresses the potential of the refurbished smartphone market to reduce e-waste and promote circular consumption patterns and sustainable business practices. The findings identified gaps in consumer awareness, regulation, and collection points for used mobile phones and other devices.

Furthermore, the study showed the potential for creating an international business from used and refurbished smartphones, which could make an excellent contribution to reducing e-waste worldwide. The thesis provides valuable insights into consumer behavior, the environmental impact of e-waste, and the opportunities presented by the refurbished mobile phone market to advance sustainability.

Keywords: E-waste, Smartphone, Refurbishment, Consumer Behavior, Sustainable Business.

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List of Abbreviations

WEEE	Waste from Electrical and Electronic Equipment
ROHS	Restriction of Hazardous Substances in Electrical and Electronic Equipment
CE	Circular Economy
WHO	World Health Organization
MT	Metric Ton
EPR	Extended Producer Responsibly
EU	European Union
LRHA	Law for the Recycling of Specified Kinds of Home Appliances
LPUS	Law for the Promotion of Effective Utilization of Resources
CSR	Corporate Social Responsibility
R&D	Research and Development
GARS	Global Asset Recovery Service
PELM	Product end-of-life management
E-Waste	Electronic Waste
JV	Joint Venture
FDI	Foreign Direct Investment

Chapter 1: Introduction

The world is going through a transition period regarding resource efficiency. There are so much waste is happening all over the world almost in every sector. The consumers are always wanting something new as well as companies are often launching new products and pushing the customers to buy it. Technology is going through a rapid change and consumers are trying to adopt it and buying updated electric device when something new being launched from a popular brand. Now almost everyone is using more than one smartphone and when a new smartphone is being launched, consumers want to upgrade their device to the new one. In addition to that lot of users use their phone even less than 2 years and they upgrade their mobile phones. However, not even 25% of that mobile phone is being recycled properly which eventually turns into e-waste. (Bischof, 2019). However, under the circular economy concept offers the opportunity of regaining the value from existing products and improve the product life cycle.

Over the decade, the concept of circular economy gets a lot of attentions. There are almost 50% growth in the Scopus search on the internet regarding to the topic. (Liu et al., 2023). Circular economy is something which can be seen as a solution for different challenges such as resource management, waste management, sustainable economic benefits. Circular Economy is a model where focus is to extend the life cycle of resource, where linear model focus on a simple way, where people buy a product, use the product, and throw the product, in this process so many wastes happened, and to reduce the waste and maximize the resource efficiency, circular economy has been introduced. CE concept initially focused on Germany and Japan in the mid 1990s and it has been called as “Waste Management”. (Winans et al., 2017). However, interestingly, China became the world main production hub for electronics and due to this, lots of wastages started to happen in China. Therefore, the Chinese government started to promote the CE everywhere in the country and in today’s world CE is a trending concept everywhere. (Bleischwitz, R. et al. 2022). Businesses are also getting fruitful result by this concept, and it promotes sustainable business practice. In today’s time, climate change is one of the major issues in the world. Now, many organizations have been extended their business internationally and earning profits and recognition, however their production hub is in developing countries. For example, most of the electric products has been manufactured or sourced from China and India, at the same time big apparel manufacture

hub is in China and Bangladesh and most of their customer bases in developed market, such as America, Canada, or EU. However, due to heavy production, the environment has been polluted the most in the developing countries and these countries are in high risk due to climate change, that`s why sustainable business practice is vital part and many MNCs are practicing it as green sustainable management. (Ismail & Hanafiah, 2020).

Waste is something we can describe as unwanted or unusable materials. In the household in the daily basis, there are lots of wastages occurs, such as dry waste, liquid waste, wet waste, E-waste. The authors of this paper mainly focusing on E-waste or electric waste. Electric waste is becoming a viral issue to be solved in today's world. Now everyday rapid innovation is happening, recent technology such as one- or two-years old product is becoming outdated. Consumers are opted to buy the new product every year when a new model release, this is one of the main reasons for generating electronic waste. (Makov & Fitzpatrick, 2021).

In addition to that, electronic waste contains so many hazardous materials which is extremely harmful for the environment. Hence, this paper investigates on the topic narrowing down to mobile phone industry and consumer perception towards e-waste. Because e-waste is one of the rapidly growing solid hazardous wastes, so it is becoming one of relevant issue now and mobile phone has become a daily used electronic product and how it is impacting us and how it is connected to sustainable international business practice, this paper deeply investigates on that as well.

1.1Topic Selection and Problem Formulation:

Smartphone Usage and E-Waste in Denmark: Understanding Consumer Behaviour, Recycling Practices, and the Market for Refurbished Phones.

From last few decades, world has been rapid transformation in technology. The use of electronic products has been increased unprecedentedly. Without electronic device, we cannot think of our day, its literally everywhere, every place. According to Statista, the mobile phone users number stood now more than seven billion and its likely to rise rapidly by the time goes and many people at a time use more than one mobile device. Shockingly Average American Gen Z use their mobile phone more than 7 hours per day, so it is a daily use product and now it considers as a fast electronic device. (Ahmed, 2024). Therefore, Brands come up with new technology and new features with an updated model each year. Consumers are also very exited for the new device. Due to heavy consumption, more waste also occurs, so authors of this paper want to explore the area of E-waste and narrowing down to mobile phone recycling and refurbishment. Recycle and Refurbishment are two important aspects of circular economy, and this paper explores consumer perspective towards the E-waste in mobile industry. After going through brief research, it has been found that, there are quite good numbers of research has been done in this area in the developed markets like Netherlands, the USA, Finland as well as developing markets like India, China, Bangladesh. However, there is a research scarcity specifically in Denmark. It is a developed market, and it has strong economy and people can afford expensive electric devices. A Danish company called Greenmind quoted that Danes are very fond of electric devices and they buy more and more which eventually creates more e-waste but there is very less research has been done about the topic in Denmark. Therefore, the authors found the gap to do further research regarding the topic focusing on Denmark.

Green mind Interview:

GreenMind is a Danish refurbished electronic device selling retailer. They buy and sell second hand electric devices. Denmark is one of the major countries who produces lot of e-wastes. According to GreenMind, average Danes change their phone and TV after 18 months and 2 years respectively adding to that everyone is keeping their old phone to themselves and in todays time only 15-20% of all consumer electronics is being recycled. Therefore, GreenMind has a clear goal

of reducing the e-waste. We have interviewed a staff of GreenMind and we have got few insights regarding e-waste and refurbished phones.

Users can sell their second-hand device to GreenMind directly and depending on the condition, GreenMind fix the amount and buy the devices such as mobiles, laptops. GreenMind has their technicians who works at the backends, they run 15 tests on the second-hand device and repair it before selling it to customers. They give 03 years of service warranty with the device as well. They are offering lucrative deals to consumers to buy refurbish electric devices. However, interviewee discoursed that, only 40 phones are coming to their Aalborg store every month from customers end to sell their phones to GreenMind. Although, they have few more suppliers also, where they get the refurbish phones but still it is very less from the customer ends.

They have noble cause for their business, and they promote sustainable business practice, and they care for the environment as well. According to the interviewee, their goal is to create greater environment significance.

However, interviewee revealed that, many consumers are price sensitive, and they want to have better options within lesser price. He also added, in Copenhagen, consumers care about the environment while buying second hand phones but small cities like Aalborg, they are more concern about the price.

But the issue is companies like Telia, Telenor and Power sell brand new mobile phones almost within the similar price range and that is why GreenMind unable to attract more consumers. The Interviewee said that, if the government reduce tax on selling second hand phones, GreenMind can offer 20-25% lesser price to their consumers. A price comparison of Apple iPhone 14 given among Power (New phone seller). Telia (New phone seller) and GreenMind (Refurbished phone seller given below

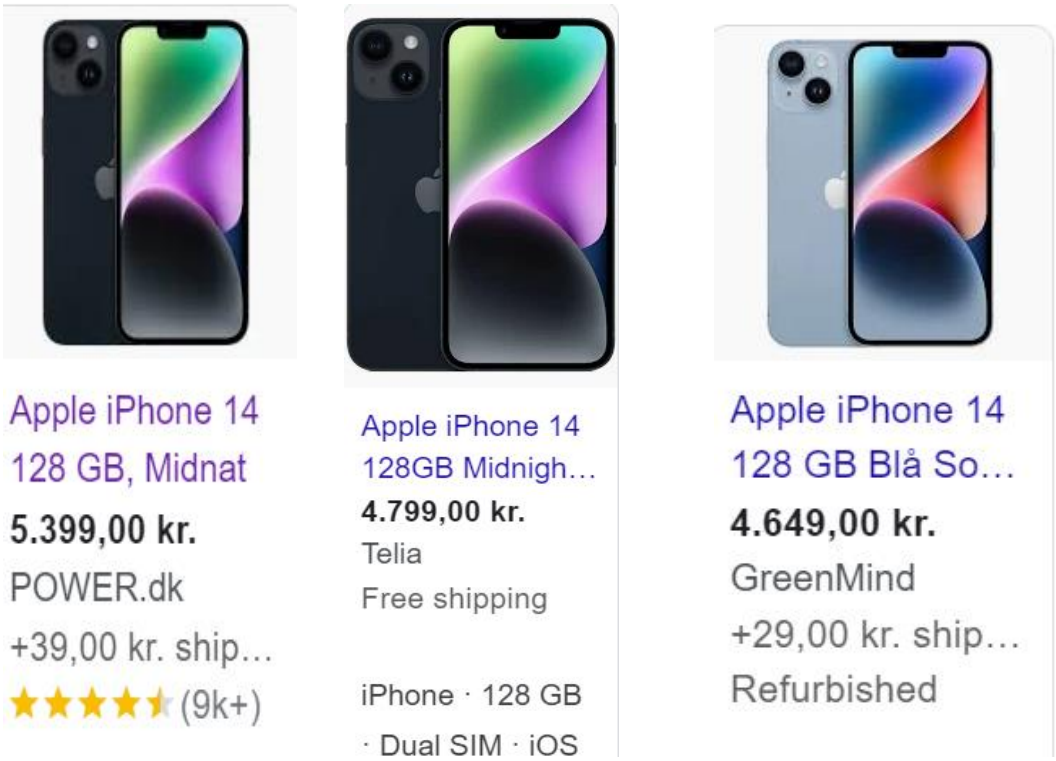

Figure 1: A Comparison of new and refurbished iPhone 14 price.

Denmark is pioneer country to promote sustainability, recycling, circular economy. However, still the recycling of electric devices is not up to the mark. 15 to 20% still is not that much, if we compare the increasing rate of e-waste worldwide and there is not enough research conducted regarding this area in Denmark. Therefore, the authors of the paper focusing on consumer attitude towards E-waste, electronic recycling, and preference for refurbished in Denmark.

Research Questions:

RQ1: Why only few smartphone users recycle their devices in Denmark?

RQ2: What are the reasons most of the consumers buy new phones instead of refurbished phones in Denmark?

Chapter 2: Literature Review

The aim of this section to review the relevant articles related to the topic within the international business field. Therefore, by following the necessary criteria we have studied the current articles to get deep insights about the research area. To establish the understanding, five themes has been identified for the research, it will help us to penetrate the theoretical knowledge. Therefore, short justification has been given below about the themes.

Themes	Aim
1. Rapid growth of E-Waste	To establish a fundamental understanding to know about the E-waste and what is the historical background of it.
2. International Policy and Regulation for E-Waste	To review the international policies and regulation and how it works and what are the aspects of it.
3. Corporate Strategies and Practices for E-Waste Management and EPR	What international brands or MNCs taking the initiatives and how they are practicing the strategies.
4. Consumer Behaviour and Awareness towards E-Waste	To understands the insights of Customers towards the E-waste and recycling of electronic devices.
5. Environmental and Health impacts from E-waste	To get more insights to know how environment are impacting from E-waste pollution and how human health are impacting by it.

Table 1: Thematic Analysis

2.1: Rapid growth of E-Waste

Waste is something which is something unwanted or unusable materials. There are different forms of wastes. However, in this section the focus is solely on electric waste or e-waste. Technology made our life very smooth and in todays time without using electric devices we cannot even operate a single day and because of the accessible and affordable price, almost everyone is owning electronic devices. One interesting fact is there are almost 7 billion people in the world and there are only 4.5 billion toilets available however probable estimates of mobile phone available is 6 billion. (Yu et al., 2021). China and USA together generated 21.6 MT, approximately 29 kg in USA and 5 kg in China per person. It is the fastest growing waste in the world. E-waste from mobile phone in India increased eighteen times in 2020. Consumer demand for the new model of smartphones is high and due to high obsolescence rate of smartphones, e-waste specially from mobile phone increased a lot. Not only phones but also the electronic accessories such as headphone, chargers Bluetooth devices have short life span which creates e-waste. Average lifespan of computer has been dropped by 50% in the recent years. (Yu et al., 2021). Another issue is the rapid innovation and low recycling rate of device. For example, for new model of mobile phones, companies introduce new chargers, therefore the old charger becomes useless without even being damaged. In many education campaigns, electronic device such as laptop has been provided to students which is good, but it also can create e-waste. (Attia et al., 2021). According to World Economic Forum, 62 billion kilograms has been produced in 2022 and it is projected to hit more than 80 billion kg in 2030. However, only 22% is being recycled. (Wood, 2024). Contrast to that, the worth of discarded electronic devices are 62 billion USD each year, yet only one fifth of e-waste is being recycled each year. (Shahabuddin et al., 2022).

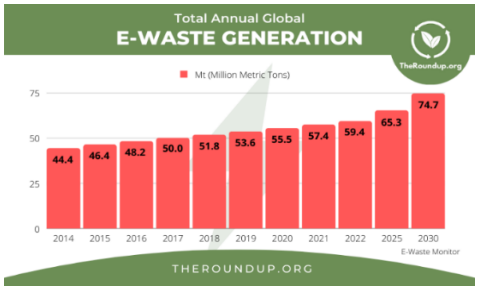

Figure 2: Yearly E-waste generation (source: theroundup.org)

A survey has been conducted by e-waste recycling organization Echo in New Zealand about e-waste recycling by the owner of different businesses. The result was shocking, in a developed nation like New Zealand, half of the business owner, did not recycled e-waste in 2023. In addition to that, 45% of the business owners do not know, how to recycle e-waste and 35% do not have the time to do it. However, this is one of the fastest growing solid wastes in the world. Echo CEO Patrick Moynahan pointed out that the results mirrored the unsustainable practices commonly observed among business owners in New Zealand. (Reporters, 2024). It shows that, people simply don't know how dangerous consequence the world is facing due to the improper management of e-waste.

2.1.1: E-waste in EU

Electronic waste is increasing worldwide, EU is no exception from that. EU is also a major contributor for the electronic waste in the world. The statistics says that 85% of electronic consumption has been increased in last decade in the EU region. In addition to that, the biggest consumers of electronic goods are from well developed nation such as Germany, the Netherlands, Denmark, and France. Per person consumption of electronic devices are 35 kg in the Netherlands and 30 kg in Denmark. (Parajuly et al., 2020). However, in 2021, 4.9 million tonnes of e-waste were recorded, marking a 3.9% increase compared to 2020 which is not enough. Consumption of electronic devices are increasing and in Europe average lifespan of a smartphone is 2-3 years, after that some parts of the smartphone cannot be repaired or go through improper disposal, which is extremely harmful for environment, last of the electronic waste still go through illegal disposal and illegal export. Fanny Rateau, Programme Manager at ECOS – Environmental Coalition on Standards, said*: "Our electronics consumption keeps increasing without any consideration for our planet's capacity. E-waste is piling up – not being reused, not being repaired. The embedded precious metals will not find their way back into the ground. On average, every person in the EU adds more than 16kg of electronic waste to Europe's e-waste mountain every year [5] – but the WEEE Directive is too weak to limit the environmental damage. It must be rapidly revamped to match the scale of the problem and ensure that we live within our means."*

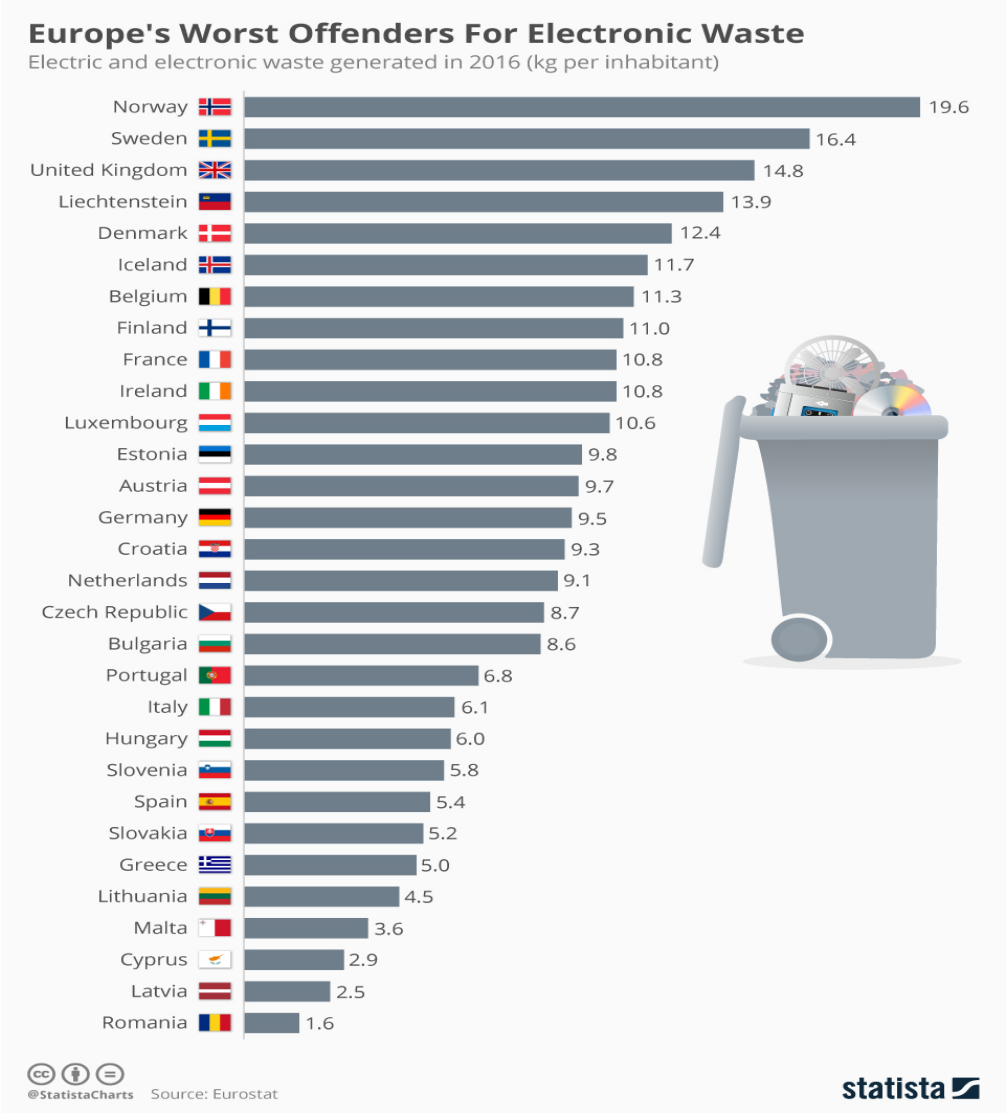

Figure 3: EU top E-waste offenders (Source: Statista, eurostat)

It is evident that, if we compare with other continent, EU in a better position and has a better take on e-waste management policy. However, it is still not enough to tackle the environment. EU is one of the major consumers of electronic devices as well. in 2021, almost every EU member has been failed to achieve the e-waste collection target which is alarming. WEEE has different strategies to tackle e-waste threats such a collection of 4 kg e-waste per person. The problem is relying with the strict implementation of the regulation and proper execution. (Patil & Ramakrishna, 2020).

Overall, EU is showing progress slowly, still EU needs to create more awareness, recycling options, financial incentives, strict regulation to mitigate the problem.

2.1.2: E-Waste from Mobile phone

Mobile phone is the most popular electric device in the world. Almost each and everyone use mobile phones and now a very good percentage among them use more than one mobile phones. Mobile phone basically for calling but because of technological advancement there are lot of features available now in this small device, it becomes a blessing for people. However, there are lot of problems arise because of mobile phones. In today's time smartphones has short lifespan and every year new models are released in the market with better features within affordable prices. Due to this, customers are switching the mobile phones frequently and this is another major reason for e-waste generation. (Sarath et al., 2015). According to UN expert, there are 62 million of mobile phones and devices has been dumped in just one year and it is expected to touch three times than the current situation within 2030. Many consumers tend to keep their mobile phone rather than recycle it. 5.3 billion mobile phones became waste in 2022. (Mantovani, 2024). Pascal Leroy, Director General of the WEEE Forum said *"Smartphones are one of the electronic products of highest concern for us,"* Most of the used cell phones haven't been recycled. This occurs when households and businesses leave cell phones in drawers, closets, cupboards, or garages instead of taking them in for repair or recycling. According to one survey which has been done for more than 8000 families, it shows that, 46% of the households think of potential use of the device in the future.

5.3 billion cell phones to become waste in 2022. Source: (MATTEUCCI, 2022)

EU are trying to implement some laws to mitigate the issue. In 2024, EU implements standard charger port policy for upcoming all smartphones, this move expected of annual savings of 200 million of EURO and it can cut very good amount of e-waste every year. (Stelzer & Bouix, 2024). The EU's Directorate-General for Environment revealed an alarming statistic, only 5% mobile phones are being recycled in EU, it states that more than more than 700 million unused mobile phones are sitting idle in European households. However, mobile phone components have valuable materials which can reduce the need for mining. According to a survey which is conducted by Nevis Security revealed that 20% of the respondents switch their phones every year which resulted plethora of e-waste each year. Therefore, it creates negative impacts on environment as well as on health. A good e-waste management system for mobile phones must need now.

2.2: International Policy and Regulation for E-Waste

The fast growth of e-waste is increasing the concern worldwide. Therefore, the world leaders have came together to implement policies and regulations to protect our planet. There was humongous growth happened in 1970s in 1980s in the electronic industry, which increased the concern also at that time. The Basel Convention treaty signed in May 1992 in Switzerland. (Amos et al., 2024). Over 180 countries came together for this treaty. The main purpose of this treaty was to prohibit the illegal export of electronic waste from developed countries to developing countries and implement regulatory system in cases of e-waste transboundary movements. (Amos et al., 2024). But the problem still is there, a report suggests that from EU to developing nations more than 350000 metric tonnes of e-waste illegally export every year. (N. Perkins et al., 2014). The electric goods made with different materials, and it contains so many toxic elements as well. A legal export can happen to developing nations if the electronic goods can be recycled or refurbished. However, the export is happening under false pretence. Many of the exported electronic products are non-functional and it is being exported to not so developed Asian or African countries and the main alarming part is these countries do not have the proper technological infrastructure to do proper recycling and these non-functional products have just been thrown to landfills and it increase the pollution. (Breivik et al., 2015).

2.2.1: Policies and Regulations of EU

In 1993s, EU introduced WSR which basically prohibited the export to developing nations. After a decade, ROHS has been introduced. The purpose of ROHS is bring an adoption of sustainable design and packaging to reduce the waste and replace the hazardous materials to eco-friendly materials. Addition to that, increasing recycling rate also one of the major aims of ROHS. In 2012, another regulation has been introduced also to create uniformity among the member countries and create a sustainable structure for collection, recycling and recovering and this enforced separate collection for EEE which creates higher recycling rate. The WEEE gives the instruction to the member states to create strong sites and design for the recycling and prescribed to adoption of EPR (extended producer responsibly) so that, producers are also take the responsibility for recycling

from end-users. However, still the recycle rate is way less than the creation of e-waste. (Patil & Ramakrishna, 2020).

2.2.2: Policies and Regulations of Asia:

Asian structure is very complex. The reason behind that is the economic situation of Asian countries are very different from one another. The economic condition, production ability, infrastructures are the key points for this differentiation. China is the biggest electronics manufacturer in Asia, at the same time China generates the biggest e-waste in Asia. In this continent, many countries facing the issue of illegal imports of e-waste. The main electronics manufacturer countries such as China, South Korea, Japan, India in Asia developed their e-waste legislation to regulate e-waste management. China used to be a dumping ground for e-waste from develop nations like USA, but it became problematic to handle so much of electric waste, that is why China imposed ban for import e-waste. China developed standardized e-waste management process all over the country and introduced provincial management program. In the year 2012, China also introduced EPR law like EU nations. (Patil & Ramakrishna, 2020).

Japan has two types of legislation for the E-waste management. First one is for the promotion for utilizing the resources and second one is for recycling. The acronym of the laws are LPUS and LRHA which means Law for the Promotion of Effective Utilization of Resources and Law for the Recycling of Specified Kinds of Home Appliances. LPUS is for voluntary participation for recycling however, LRHA conducts stricter policy like high tax imposed to buy new computers and consumers who want to recycle their used computers, they will get a financial incentive.

Korean government has different system such as waste deposit refund system where consumers deposit their used electronic products and get incentive from the government. The Taiwan government introduced 4-1 recycling program where government collect fees from manufacturers and retailers for the recycling program. Singapore government imposed strict regulation on movements of hazardous wastes and materials.

India also introduced polices to control the e-waste issue. They introduced incentive options to private sector to help them recycling the e-waste. A separate network called ICTE also established in village level to control the problem.

Asia is a diverse continent and due to difference in infrastructure, economy. Different countries developed different type of policies. However, Asian countries still remain one of the main suffers from E-waste. (Patil & Ramakrishna, 2020).

2.2.3: Policies and Regulations of Americas:

North and South America both produces huge level of e-waste. But if we compare the North America produces higher portion of e-wastes because of high income they have the higher purchasing power. Unfortunately, USA does not have a federal law to monitoring e-waste. Some states have policies, but it is also lacking uniformity. Due to this, so many illegal exports happen from USA to countries like Mexico, Africa and China. To prevent the issue, USA does not have any strong rules and regulation. However, they some basic approach towards E-waste management. Canada also lacking national legislation for e-waste management, some states have their local policies. Countries like Bolivia, Chilli, Mexico have the e-waste management legislation and EPR principle. Lack of strong policies in North America increases the illegal smuggling of e-waste materials and it is impacting the environment badly. (Patil & Ramakrishna, 2020).

2.2.4: Policies and Regulations of Oceania:

Australia and New Zealand fall under this territory. However, Australia has a separate e-waste management legislation in their country. The Product Stewardship Act (2011) specially they have for television and computer recycling. New Zealand and other island nations are following the framework of Australia. They have enforced the producer responsibility act in the country. Addition to that, they have some generic laws related to environment protection from the e-waste materials. Pacific region countries have collaborated with EU for hazardous management act. (Patil & Ramakrishna, 2020).

2.2.5: Policies and Regulations of Africa:

Many African nations are underdeveloped economically compared to other regions. There are heavy imports of e-waste happens in this region from developed nations. Many dangerous e-waste components come in this region illegally. African nations do not have financial ability to adopt

advanced technological process. They follow crude recycling process and they do not have strong policies as well. Only few countries like Nigeria, Ghana, Kenya have e-waste legislation. South Africa is the only country where the policies and regulations are better compared to other African countries. African nations consume less e-products compare to other continents however it is evident that African nations are getting most harmed due to the e-waste. (Patil & Ramakrishna, 2020).

2.3: Corporate Strategies and Practices for E-Waste Management and EPR:

E-waste is a global concern now. It is adding extra pressure on climate and degrading the nature. The reasons for e-waste are many and so many stakeholders are directly or indirectly responsible for the rapid growth of e-waste. EPR is a term that is commonly used in the e-waste management topic. EPR means extended producer responsibility. It promotes to manufacture renewable ecofriendly recyclable products and take the responsibility for recycling the product from consumer ends as well. (Faibil et al., 2022). Producers take full responsibility for collecting e-waste, remanufacture, transport and disposal treatment. EPR has shown a very good implementation in countries such as Germany, Denmark, Japan. However, in developing nations it is hard to implement EPR due to availability of original producers, most of the electronics are being exported to developing countries from developed nations. The world is going through a transition phase from liner economy to circular economy for resource utilization. Therefore, various ways have been explored to mitigate the problem of managing e-waste, that is why EPR has been introduced. Scholars have been contributed a lot theoretically and practically to improve EPR faculties. For example, Ribeiro and Kruglianskas (2020) suggested that incorporating the principles of regulatory bodies and government agencies into the decision-making process fosters positive working relationships and collaborations among stakeholders, thereby improving the successful adoption of EPR policies by producers. They conducted a study in Dutch EPR system, and they found out that, a good collaboration among major stakeholders is very important to carry out an effective EPR system. One study shown that in India, consumers are price sensitive, and they are always looking for affordable gadgets and one of the popular electric product brands is Boat and they are taking the responsibility for responsible disposal, and they are collaborating with

Namo eWaste management Ltd. Namo is a reputed recycling brand and they have collaborated with many brands and they have recycled 7 million of kgs e-waste in India in the year 2023. It shows that a good brand initiative can have very good impact on recycling e-waste.

2.3.1: Apple Initiative towards E-waste

Apple is one of the leading brands in the electric market focusing on mobile phones, laptops, and related electric accessories. It is one of the most popular brands among consumers. They got their popularity throughout the years. Apple is very famous for changing the market dynamics. For instance, they used to be different devices for phone calls, camera and listening music and Apple came up with the idea of one device with all features and it was instant hit in early 2000s. Big brands have vital role to play for CSR activities, resource efficiency and environmental protection. Apple has one important goal which is carbon neutral by 2030 and their product will have zero impact on the environment, and it will be part of circular economy completely. An estimate use of iPhone is three to four years, and every year is new and updated version is releasing in the market which led to e-waste pollution. Apple is investing in R&D continuously to find out more efficient ways to recycle and they got one outcome in 2018 which is Daisy, a robot which helps to dissemble old smartphone and extract the valuable materials from the device and the work rate is significant which is 200 iPhones per hour. Another good initiative has been seen while iPhone 12 launched, they removed power brick and wire headphones from the packaging and it helped them for their sustainable business practice, it helped them 70% more products at a time which is helpful for environment as well. But some experts criticise Apple brand and called their activities greenwashing. For example, they charge 19 pounds for compatible power brick and 39 pounds for charger which eventually bad for new consumers and they are ending up buying more and more electronic accessories. (Awasthi et al., 2019)

2.3.2: Samsung Electronics initiative towards E-waste:

Samsung is another popular electronic brand, they have multiple product lines in the electronic industry, they have television, smartphones with different ranges of price targeting different segment of consumers, monitors, refrigerators. They also have mission towards environment. There is a saying in Samsung, planet comes first while designing the product. They bring the innovation while manufacturing their products. For instance, they said, they promote recyclable materials for their production. They have four sustainable fundamental ways for sustainability and those are sustainable materials, they are using recyclable plastics in their production, and they have a mission to use 50% recyclable plastics within 2030. Addition to that energy efficiency, they promise to be 70% energy efficient by 2030 and they have more than 500 energies plus certified products. In United States, they have already matched 100% renewable energy and they have strong focus to match it worldwide too. Samsung electronics are doing responsible recycling since 2012 and they take the responsibility for recycling and stats shows that they recycle 100 million pounds of e-waste on average each year. They have more than 1700 e-waste drop-off location in USA under the Samsung RE+ program and they claim that they have the largest e-waste recycling program in the tech sector. They have 96% of operational recycling rate and they also offer repairable and refurbish products to consumers which contributes to reduce e-waste as well as economically viable for example they sell certified renewed phone. They have used 33000 metric tons of recycled plastic from consumer ends into their production in 2021. (Sirisawat et al., 2015).

2.3.3: IBM initiatives towards E-waste

IBM is one of the largest companies of IT products in the world. They have their operation more than 170 countries. They provide hardware and software products to their customers. They are in part of product take back activities since late 1980s from Europe. In 2022, they processed more than 12000 MT end life product waste from more than 60 countries which is called PELM activities. IBM has their GARS (Global Asset Recovery Service) to deal with collecting and recycling end life products. They have introduced different types of programs for betterment of environment and to deal with e-waste management such as product take back program,

Cryptographic coprocessor card return program, Printer supplies return program. They are also directly involved with reselling refurbish products and they promote it. (Dua et al., 2020).

2.3.4: Dell Technologies towards E-waste:

Dell Technologies are also very popular brand. They are also known for IT related products such as computers, laptops, printers, camera, and software. They also have their sustainable technology goals. They promote resell, recycle, donate policies and they are also concern about protecting the sensitive information. They are focusing on circular product design, and they are committed to sustainable business practice aim for the future as well, they are committed to reuse or recycle one MT e-waste on every MT product sell of the company. They are focusing on 100% recyclable packaging, and they will use more than half of their materials which is sources from recycled materials. In past they also signed one agreement with UN for developing sustainable e-waste management model in developing countries in Africa and Asia. (Vishwakarma et al., 2022).

2.4: Consumer Behaviour and Awareness towards E-Waste

Humans are updating themselves and adopting with newness every moment. Businesses are inventing now and than to offer something new and provide solution to many problems. Technological products become very popular among consumer due to its problem-solving ability. Adding to that, the world comes closer because of technology and electronic products like computer, laptop, printer, smartphones made the life easy for the consumers. However, consumers and human beings are affecting heavily due to the electronic products and waste of electronic products. There are lots of electric brand available in the world and for example many Chinese brands offer many electronic products within extremely low price. Therefore, consumers can afford electric product very easily. For instance, people can buy a mobile phone under 10 US dollar. Consumers are also equally responsible for the existence of e-waste knowingly or unknowingly. According to Circular Economy, Environment and Energy, Treatment and Recovery 45% of young people have never recycled a phone and 38% disposed their mobile phones in general waste stream. In this survey, it has been shown that GenZ are more likely to fascinate with new updated device

and ignorant towards e-waste issue. There are many reasons for the consumers reluctant or unaware about the e-waste problem. (Islam et al., 2021).

2.4.1: End-users knowledge about E-waste

Mature consumers have some knowledge about the e-waste issue, and they know that it has negative impact on the environment. However, there are large portion of consumers do not consider e-waste as harmful and they do not recycle the product properly. Even they were unaware that, there are many laws have been introduced in developed as well as developing countries related to e-waste. Lack of awareness is one of the major reasons for this, many consumers are unclear about their role and their responsibility to mitigate the problem. Many consumers do not even recycle their old device which they are not using anymore. There also social pressure plays a huge role. If we compare a develop country Denmark or Norway, where everything is organized and there is a culture we can see towards recycling. On the other hand, if we look at India or Bangladesh, the culture is totally different, large number of people do not have the basic knowledge about e-waste recycling. Therefore, we can see the eye-catching difference in e-waste recycle percentage among developed and developing countries. There are lots of recycling programs been launched in several countries but there is not so much of promotion around it. The familiarity of recycling and collection system is limited. Most of the consumers who want to recycle the electric device, they often use general waste stream and because of that data for many e-waste materials go missing from the database. Sometimes, in many cities people wants to recycle and they have the awareness however the collection point for the e-waste is limited. For example, one IT hub in the world is in Bengaluru India. Over there so many young people go for IT related jobs and studies, and they are educated and aware about the e-waste problem but the recycling management over there is not up to the mark. Therefore, lack of a good infrastructure also a good reason for demotivation of end users to recycle the products. Many consumers do not recycle their old electric products at all, those can be mobile phones, DVD players, laptops, printers especially mobile phones from last 15-20 years and keep the old devices in a drawer, experts call it as “drawers of doom” and the reason for the reluctant behaviour can be several such as nostalgic feelings of the old device, privacy concern and lack of awareness and many more. Giving proper knowledge to consumer is extremely important, without high number of consumer participation, other stakeholders such as

manufacturers, government, environmentalist can not speed up the proper e-waste management. (Nassani et al., 2023).

2.4.2: Consumer Behaviour towards Electronic products and E-waste

Smartphones are everywhere. Without using smartphones and other electronic devices consumers can not spend a day. Consumer behaviour factors influence by different factors such as economical condition, needs, purchasing power as well as cultural and social factor. For instance, having a latest iPhone model become a social status for many people in Indian sub-continent. A study shows that, GenZ in India are taking loans to buy the new model of iPhone apart from they are already owing functional phones. The Hawkins, Best and Coney Model explained consumer behaviour into two parts which is external and internal. External is more of demographic attribute and internal is personal attributes. (Sharma et al., 2022).

Lifespan is another good reason for consumers are changing their phone rapidly. Sometimes, consumers are willing to use the smartphone for longer duration, but it has been seen that after few years the phone became unusable. Maybe everything is fine, but battery is not working properly and replacing the battery can cost a lot to the consumers and desire to having new model also another reason with better look and feel as well as updated features. Additionally, electric product industry is very competitive and because of that the price are also becoming very affordable to buy new phones every year for consumers which is also leading for increasing e-waste. (Halim et al., 2021).

2.5: Environmental and Health impacts from E-waste

Electrical items have hazardous materials and due to improper treatment of e-waste, it can produce toxic materials which are extremely harmful for environment and human health. E-waste contains mercury, lead, dioxin, and many more dangerous substances. There are a lot of e-waste sites have been built over the years for recycling. However, it has been seen that, poor infrastructure, and improper practices such as dumping on land or water, landfilling with regular wastes created lot of problem and it impacted the environment and public health badly and this kind of activities are hazardous because it impacts air, soil, dust, and water. Addition to that, the people who are living nearby the e-waste, their life get heavily impacted by this. These toxic substances can damage human health significantly and these substances can travel far via water and air. For example, for dismantle e-waste component, open air burning or acid bath technique has been used for reducing the recycling time and it is being considered as extremely harmful for the environment and another shocking factor is big multinational electric brands and developed countries exported e-waste to developing countries and the fact is these countries are most vulnerable and they are in the high risk of polluted environment and climate change crisis and most of the labours who are working in these sites, they are not using any protection for their safety and child labours are also bring used as worker in these dangerous sites and study said that children are stand at the most vulnerable position because of thee-waste pollution. The chemical composition of e-waste can be different it depends on the discarded electric items. Many discarded items contain different types of materials such as iron(fu), aluminium (Al), copper (Cu) including with different types of ceramic and plastic materials. Wrong E-waste treatment can damage lot of things such as landfills, groundwater, air atmosphere. One study in Sweden revealed that, 55 recycling site workers along with 10 officers worked in formal recycling plants and shockingly it has been found that, more than 20 toxic elements have been found inside their bodies after having some medical check up. Environment friendly recycling or management system for e-waste barely available in the world. Due to this, everything around us falling in danger. Government, NGOs and electronic brands are taking initiatives but still we all are far behind for a sustainable practice and e-waste are increase multiple times more than the recycling rates and in the name of recycling, a poor treatment is also destroying the environment and human health. (Rajesh et al., 2022).

Working condition of e-waste recycling workers in Nigeria. Source: Geneva Environment Network

2.5.1: Informal recycle of E-waste:

Another name of informal recycling is backyard recycling. This is one of the unscientific ways of recycling. There are a lot of activities must follow in e-waste management such as transportation, dismantling, refurbishment, repairing, segregating, processing however more than 80% recycling is happing in improper manner in developing nations. E-waste recycling sector plays a critical part to reduce environmental pollution and risk but due to bad treatment of e-waste recycling, it is increasing the health and environment issue more. Additionally, e-waste producing countries export to underdeveloped nations where proper facilities are not available or proper sites have not been implemented due to negligence or bad economic situation. It is a fact that, proper recycling facilities are costly for the developing nations. In these nations, it has been seen that e-waste scraps sold to slums and local poor people buy these in bulk and put it in their backyard and they dismantle manually in an unhygienic manner to find out precious metals from it. The major informal e-waste recycling sports are in China and India, Ghana. These countries hold highest amount of e-waste scarp. Crude and unscientific recycling polluted the air atmosphere by releasing dioxin and furans which eventually inhaled by human being and create human hazard after that uncontrolled dumping polluted the soil lithosphere and it got worsen by improper shredding and open burning.

Open acid leaching affects hydrosphere and all of these directly impacting the surrounding environment and health of living beings. According to WHO dioxins were found in human milk, blood plasma and hair. It has been consumed from air, water, and foods. Guiyu, one of the major e-waste hubs in the world located in China, over there, higher blood Pb and Cd level found as well as lower phycological ability found in children. Newborn babies DNA are also getting affected by e-waste and mothers are also facing a lot of health issues. Youngsters are also no exception from the negative impact of e-waste. People are suffering from kidney problem, brain disorder, neurological damage, lungs damage. A study shown that, people in Bangladesh having massing lungs problem due to extremely dirty air atmosphere. Harmful materials like lead, mercury, chromium from e-waste causing many diseases and those are associated with exposure to certain elements. For instance, nickel can cause skin damage and asthma. Antimony exposure can lead to skin irritation, hair loss, lung and heart damage, and fertility problems. (Annamalai, 2015).

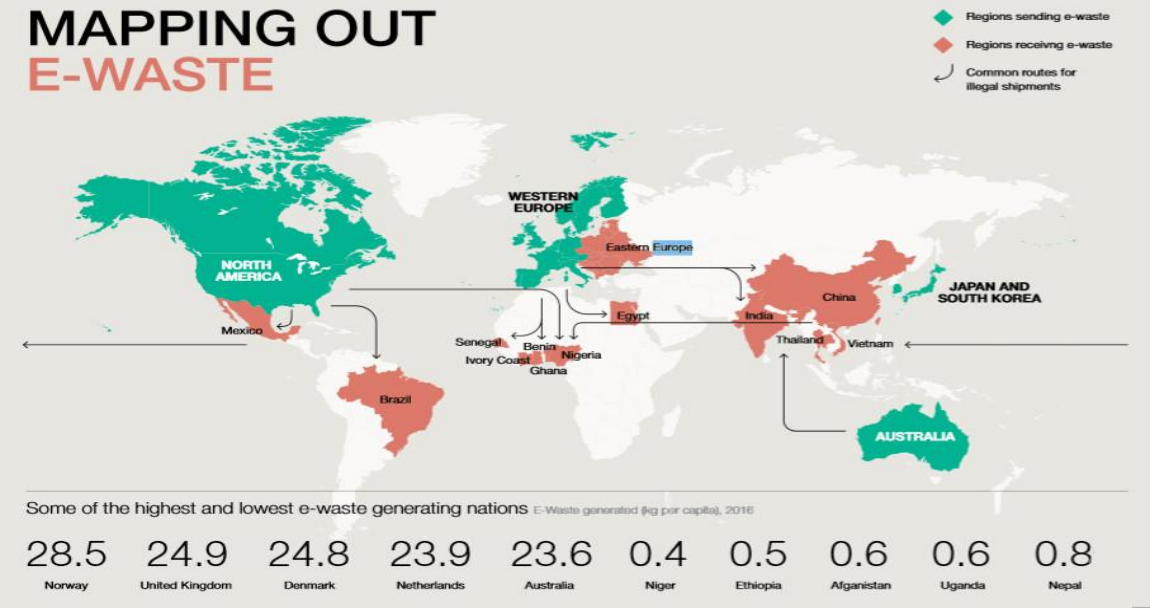

Figure 4: Mapping out E-waste Source: Geneva Environment Network

The problems associated with e-waste are alarming. It is causing harm to environment and health and e-waste producing nations are exporting e-waste to poor countries which is becoming one of the major causes of pollution to these countries and they do not have proper management to tackle it.

2.6: Conceptual Framework

A conceptual framework has been developed based on the literature review study and the relationship among variables have been given below:

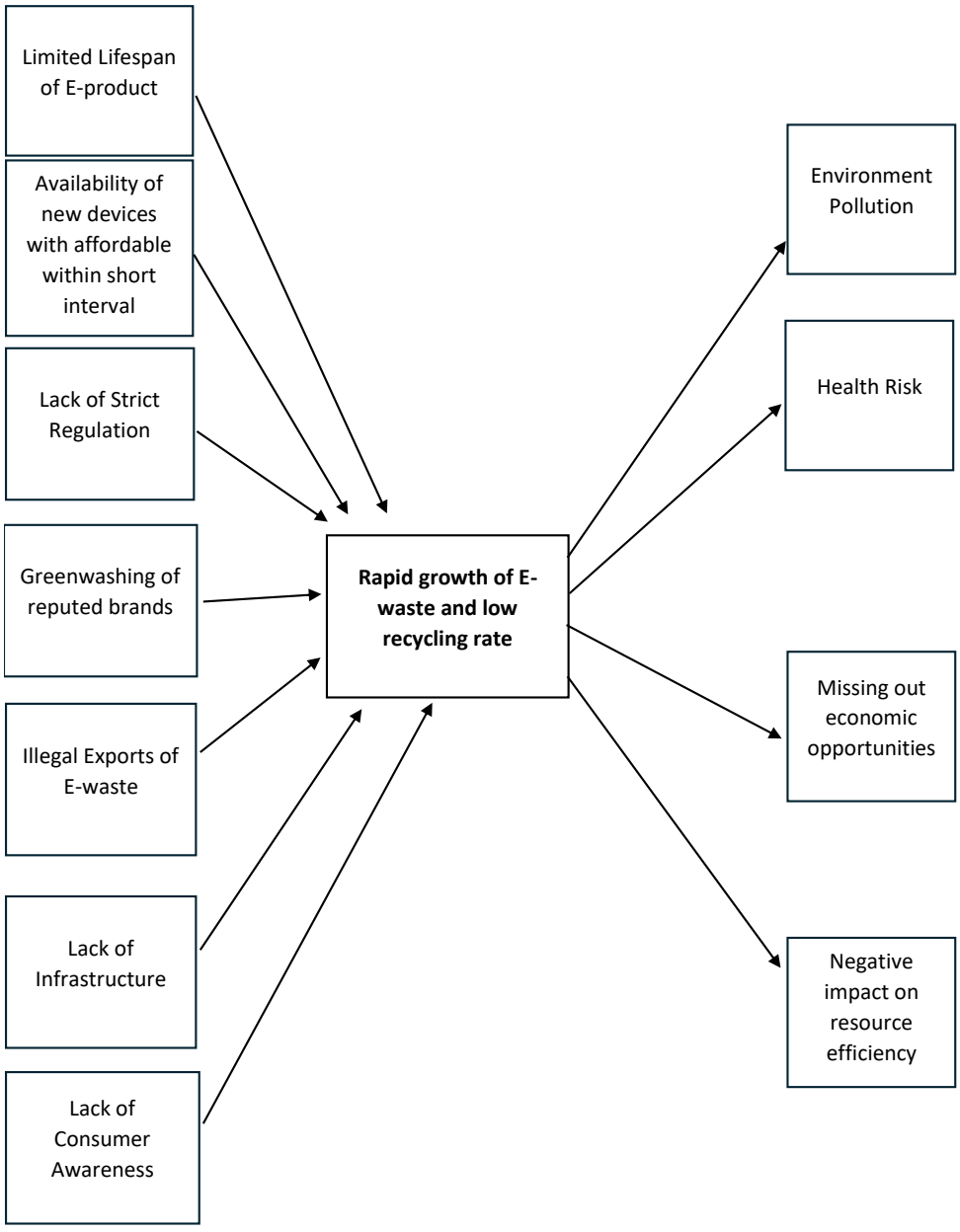

Figure 5: Conceptual Framework of Literature Review

(self-sourced)

After study the literature review, it has been evident that, there are so many reasons which generating the e-waste. The reasons, Consequence and impacts have been given below:

Reasons:

- The lifespan of an electric product is maximum of 3-4 years. Commonly used product like mobile phone has 1.5 to 2 years of lifespan, after that, it starts having problem in different parts and people buy new devices which eventually increase e-waste.
- In every six months new devices have been launched in the market with affordable prices. Consumers get new features, new technology and used device becomes backdated. Consumers buy new products, and which creates e-waste.
- There are regulations for e-waste and WEEE, DOHS are working to make better solution to mitigate the problem but still the recycling rates are relatively low even in the developed nations and E-waste is increasing 3-5 times more than the recycling rates of e-waste.
- Electronic brands are introducing new programs to promote recycling. They are doing campaigns for sustainable business practice. However, they are the one who are launching e-products within interval of few months with aggressive promotion to buy the new devices. It is falling under "Greenwashing" of brands.
- Developed countries are in the top as e-waste producing nations. However, there are transboundary movement of e-waste to developing countries are continuously happening and due to the bad infrastructure landfills are filling with e-waste in those countries but not proper e-waste recycling happening over there.
- A well-defined structure needed for recycling sites to speed up the recycling and for safety. However, more than 80% of recycling sites are not sustainable and well structured.
- Many consumers are unaware about the e-waste and how it can impact negatively, and many consumers do not know how to recycle it in a proper way and that is why it leads to e-waste.

Consequences:

- Environment are impacting negatively due to the e-waste. Starting from air, soil, water everything is getting harmed due to the e-waste.
- Human health is getting affected due to the e-waste. People are facing serious diseases like kidney problems, brain disorder, lungs damage and children are also in greater risk from e-waste pollution and many e-waste sites do not have the health safety protection for the workers.
- E-waste worth billion of dollars. However, there is not that much of focus in the sector. Approximately only 20% of e-waste is being recycled every year, therefore, economic opportunity is not being utilized properly in this sector.
- World is going through climate crisis and resource scarcity. Due to billions of e-products and e-wastes are having negative impact on the resource efficiency.

It is evident that recycling rate of e-waste not up to the mark and e-waste is increasing rapidly. Smartphones are one of the reasons for the e-waste. Billons of phones is being used everyday by consumers and people can do almost everything with smartphones, that is why the usages of smartphones are increasing day by day. Scandinavian countries are on the top for producing e-waste and because of the strong economy, Scandinavian consumers can afford luxurious e-products. E-waste is a big problem and directly or indirectly many stakeholders are related to e-waste. Electronic products are being made in huge scale for the consumers and to fulfill their needs and improve their life via technological advancement. For instances, AI features are gradually introducing in mobile phones which makes the consumer life easy. However, there is always opportunity cost for everything, e-waste is creating so many obstacles and having huge negative impacts in the world.

Therefore, to understand the consumer point of view regarding e-waste and refurbish smartphones in Denmark, a Scandinavian country, two hypotheses have been developed.

H1. Most of the consumers are not recycling their phones even after knowing e-waste concept in Denmark.

H2. Consumers are preferring to buy new phones over refurbish phones in Denmark.

Chapter 3: Methodology

Research methodology is the most important chapter, which helps to understand the most possible and suitable ways to answer the research questions that it intends to design (Asenahabi, 2019). Two research questions were designed as follows to study "research title.".

RQ1: **Why only few mobile phone users recycle their devices in Denmark?**

RQ2: **What are the reasons most of the consumers buy new phones instead of refurbished phones in Denmark?**

The framework that is used for the methodology development of the study can be presented as follows (Haque, 2022);

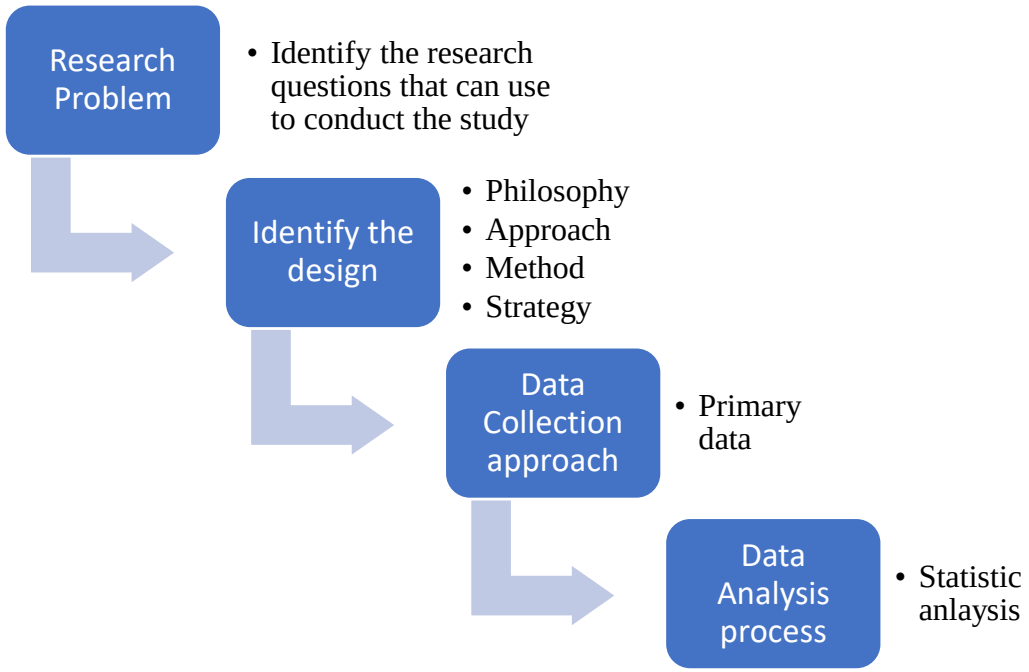

Figure 6: Research methodology framework based on (Haque, 2022)

3.1 Research Design

Research design plays an important role as it explains the methods that can be used to find the answers to the research questions (Singh, 2014). This section covers the research philosophy, research approach, research method, and research strategy.

3.1.1 Research philosophy

Research philosophy covers the research paradigm, which is the basis of research philosophy. The research paradigm is the basic set of information, assumptions, beliefs, values, and techniques that can be used to start with the research questions of the study and carry out the study (Saliya, 2023). Ontology, epistemology, and axiology are the three main research paradigms discussed in the literature (Gannon, et al., 2022). Ontology discusses the assumptions related to the nature of reality; epistemology discusses the valid knowledge and available knowledge in the field; and values and aims are discussed in the axiology of the research (Saliya, 2023). By considering the importance of three research paradigms, this section discusses all three aspects.

Ontology

Ontology explains the reality and how researchers view the reality related to the subject area of the study (Gannon et al., 2022). According to Kivunja and Kuyini (2017), ontology philosophy explains the underlined assumptions and beliefs related to the subject area by considering the nature of reality. What is the nature of the situation that the study covers, and how is reality constructed? The two most common parts of ontology are objectivism and constructionism (Tubey et al., 2015). The researcher used existing theories in the field of electric waste recycling to conduct this study and understand the reality related to the study. Hence, the researchers discussed the disposal behavior of the customers, customer awareness, consumer decisions, mobile phone waste management, and decision-making tools for national e-waste recycling policy to understand the objectivism of the study and reality.

Epistemology

Epistemology is another paradigm that is covered in the research. Available knowledge and valid knowledge in the subject area discussed in epistemology (Saliya, 2023). This explains the way that the study can find the truth related to the research problem (Gannon et al., 2022). There are four

different methods explained in epistemology related to the knowledge gathered for a study named intuitive knowledge, authoritative knowledge, logical knowledge, and empirical knowledge. Authoritative knowledge is the way of gathering data for this research, as the researchers used a few phone companies, relevant books, research articles, and conference papers to gather the relevant knowledge (Kivunja & Kuyini, 2017).

Research Philosophy, which explains the world that comes under epistemology, can be described as positivism, pragmatism, and post-positivism. Positivism is considered the pure method of understanding the groundwork of the subject and problem area. It explained the view of the researcher in a measurable way. Hence, the hypotheses and different variables related to the subject area are explained within the study. The research philosophy that was used to conduct this study was positivism, which conducted the study using existing variables related to the two research problems and developed relevant hypotheses using previous studies.

Axiology

According to Kivunja & Kuyini (2017), axiology refers to the researcher's or research team's understanding of values and the role of research. In this investigation, the research team focuses on recycling electronic devices, especially those related to smartphones. It focused on collecting data from users. The researcher first considers the cultural values of the Danish people. According to Shuter et al. (2016), Danish people value the corporation, trust, and security. Therefore, the research team has to build up a connection with the elements of the sample. The project team is open and willing to answer the participants' inquiries before and after data collection through email, phone, and WhatsApp.

3.1.2 Research approach

Inductive reasoning is bottom-up reasoning. The inductive research approach links with qualitative data-based studies as it leads to developing theories and relevant hypotheses for the study (Barrett & Younas, 2024). The deductive reach approach is another type that explains the research process of the study. A deductive research approach is considered a top-down approach. Deductive reasoning, which links with the quantitative approach, can be used to test for hypotheses (Barrett & Younas, 2024). When considering previous literature, most of the studies that try to examine consumer behaviour and perceptions related to electronic device recycling focus on a deductive

research approach. (Yahya, et al. 2022; Yahya, et al., 2021). This study followed the deductive research approach as it was based on identified variables through the previous studies.

3.1.3 Research Method

The research method explains the type of data used within the study to carry out the study and answer the research questions. As explained in previous sections, the researcher used primary data to answer the research questions. According to Daniel (2016), research methods that can be used to develop effective research designs can be categorized as qualitative, quantitative, or mixed methods. The research questions focus on answering why only a few mobile phone users recycle their devices in Denmark. And what are the reasons most consumers buy new phones instead of refurbished phones in Denmark? Through the literature review, the researchers identified a comprehensive set of problems and causes why only a few users engage with recycling their phone devices and identified the causes why phone users go for new phones over refurbished phones in Denmark (Rajesh et al., 2022; Sharma et al., 2022). Hence, the researcher answers the two questions using primary data gathered using identified variables. Hence, quantitative data were the main research method of the study associated with the primary data collection.

3.1.4 Research Strategy

Research strategy explains the plan for research related to data collection and analysis (Saunders et al., 2012). The research strategies that can be used to explain the overall strategy are survey, action theory, ground theory, case study, action research, and experiment (Singh, 2014). The survey strategy was used because it helped collect a larger sample size. Also, it saves the time and cost that are allocated for overall research.

3.1.5 Time Horizon

The researcher collected the primary data only once. Hence, the data could not represent consumer behavior over time. According to Saunders et al. (2012), there are two types of time horizons related to the data collection process of the study named cross-sectional and longitudinal. As the data in this study represents consumer perception and behavior over a specific period, the time horizon is cross-sectional.

3.2 Data Collection Approach

Primary Data Collection

As explained in the research design, the researcher used primary data sources to collect the data to answer the research problem. However, the researcher used secondary data sources to conduct the study as well. The survey was conducted using a questionnaire. The total number of questions included in the questionnaire was 20, and the last question focused on identifying the status of the customer, either Danish or international. This is because the researcher focused on both international and local people to collect the data. All the questions were in the questionnaire in a closed-ended format. Hence, the researchers could maintain the selected research method for the study.

The researcher created the survey questionnaire using Google Forms and distributed the link through email, WhatsApp, Facebook groups, and church contacts (to mainly study the elderly people's awareness about smartphone usage and e-waste).

Secondary Data Collection

The secondary data was used to develop a suitable framework for the study and identify the research gap in the field (Khanday & Khanam, 2019). The researcher used sources such as google scholars, scopus, proquest to collect journal articles, conference papers, and thesis reports to gather information related to phone and other electronic device recycling from an academic perspective. Then we collected suitable information from recently published articles as the team can identify most recent practices and consumer behaviour (Igwenagu, 2016). Articles that were published most recently were used to critically analyze them to develop the literature review. The first research team is well aware of the objectives of the study. Then, it was developed into five themes that can be used to accomplish the objectives of the study. Those five themes were the rapid growth of e-waste; international policy and regulation for e-waste; corporate strategies and practices for e-waste management and EPR; consumer behavior and awareness towards e-waste; and environmental and health impacts from e-waste. then collected suitable information from recently published articles. Based on all the information grabbed, the researcher critically analyzed the information and presented it within the literature review. All the information identified from the

existing literature leads to the development of the conceptual framework. According to the conceptual framework of the limited life span of e-products, availability of new devices at an affordable price within a short interval, lack of strict regulation, greenwashing of reputed brands, illegal exports of e-waste, lack of infrastructure, and lack of consumer awareness, the researcher identified that all these factors impact the rapid growth of e-waste and the low recycling rate. In addition, it has been found that the rapid growth of e-waste and low recycling rates have a significant impact on environmental pollution, health risks, missing out economic opportunities, and a negative impact on resource efficiency.

3.3 Population and Sample

The population of the study is not limited to the young generation. The researchers tried to connect with individuals in different age groups, as awareness among different age groups about e-waste is important. Hence, the sample is random and consists of students, working crowds, professionals, and retired people from Copenhagen, Aalborg, Frederikshavn, Vejle, and Kalundborg. The population of the study was the number of people who have mobile phones in Denmark. According to Statista (2024), 5.31 million Danish citizens and 0.65 million foreigners. Hence, the population of Denmark is 5.96 million (statista, 2024). The population covered Danish citizens (70%) and also internationals (30%) who hold PR or resident permits in Denmark. Internationals who reside in Denmark also can easily afford an iPhones or other smart phones here since they have Civil Registration System (CPR) number, so phone companies offer them new devices. The sample size of the study was 384, which covers the above categories. However, the research team was not able to collect 384 answer sheets due to less response rate and limited time, and the sample size of the study was 216.

3.4 Data Analysis Process

The primary data of the study was quantitative, which can reveal the customer's perception of e-waste. The data collected from the questionnaire was used to answer the research questions. The question items in the questionnaire and their compatibility are most important to conducting the study. The researcher highly considered the validity of the question items, which measure the ability of question items to measure what they intend to design for (Sürücü & Maslakci, 2020). The research team examined the previous questionnaire, which was used to collect data related to

the same subject area and expertise view, to understand the relevancy of question items. The demographic factors that can be used to explain the customers who participated in this study were resented using the graphical format. This reveals the ability of the researcher to generate fair results, which can be applied to predicting the population.

After finalizing the data collection, the researcher filtered the data for missing data. The descriptive analysis was used to examine the individuals' answers related to each question. Also, the researcher provided bar chats for each question to graphically represent the answers of the participants. The researcher used Microsoft Excel, and SPSS to conduct the data analysis process for the study.

3.5 Chapter Summary

This research was specially designed to answer two research questions named Why do only a few mobile phone users recycle their devices in Denmark? And what are the reasons most consumers buy new phones instead of refurbished phones in Denmark? The research was conducted to identify Danish consumer behavior related to phone recycling and using refurbished phones rather than purchasing new phones. Hence, primary data collection is essential to identify and understand consumer perceptions correctly. Hence, the researcher followed the deductive research approach over the inductive research approach. The researcher considered objectivism through ontology. Therefore, the existing theories and models were considered in this section as they lead to finding the current reality in the subject area. The epistemology paradigm tries to find available and valid knowledge related to e-waste recycling. Hence, the researcher followed the positivism philosophy, which helps to understand the groundwork in the field and build up the framework for the study. Axiology leads the researcher to understand the cultural value of the Danish environment and develop its research and data collection according to that. As the population size was large, the researcher employed a survey strategy to collect the data. The researcher collected the data from the sample, which represents Danish citizens as well as foreigners reside in Denmark. because foreigners in Denmark also have the capability to purchase branded phones. The questionnaire consisted of closed-ended questions that could measure the perceptions of the participants in numerical terms. Hence, the data analysis was conducted using statistical methods such as descriptive. The software, called Microsoft Excel, and SPSS, were used to conduct the analysis.

Chapter 4 Analysis and Discussion

4.1 Introduction

This study investigates the two main areas of concern namely, the use of smartphones and the disposal of e-waste in Denmark as highlighted by the two research questions. RQ01: Investigating the factors that influence smartphone owners' non-recycling of their mobile phone: Recycling options, awareness, data security/privacy, and regulatory structures will be explored, and analysis will be conducted to check the influence of the factors identified above on smartphone users' recycling decisions. RQ02: Subsequently, we examine the drivers of why consumers chose new over refurbished phones, with a focus on: the latest technology desire, perceived quality of refurbished phones, warranty and after-sale services, as well as the availability of monthly payment and interest options for the new phones. The findings of this study therefore seek to extend understanding of consumer behavior in relation to ways of increasing recyclability figures and the overall acknowledgement of sustainability.

4.2 RQ01: Why only few mobile phone users recycle their devices in Denmark?

The issue of electronic waste (e-waste) is a growing environmental concern, and the recycling of mobile smartphones is a critical component of mitigating this problem (Tojo & Manomaivibool, 2011a). In Denmark, despite high rates of smartphone ownership and environmental awareness, only a small fraction of users actively recycles their devices (Hill, Dall, & Anderson, 2014). This research seeks to explore the factors influencing the recycling behavior of mobile phone users in Denmark. The dependent variable in this study is the recycling behavior of smartphone users. The independent variables include the availability and accessibility of recycling options, awareness of recycling programs and e-waste issues, concerns about data security and privacy, and the impact of regulatory policies on electronic device recycling. Understanding these factors is essential to developing strategies that encourage more sustainable disposal practices among consumers.

4.2.1 Smart phone users recycling behavior.

4.2.1.1 Considering the purchase of a refurbished phone instead of a new phone for your next upgrade.

Type of responses	Count	Percentage %
Very Likely	19	8.8
Likely	23	10.6
Neutral	77	35.6
Unlikely	59	27.3
Very Unlikely	38	17.6
Total	**216**	**100.0**

Table 2: purchase of a refurbished phone.

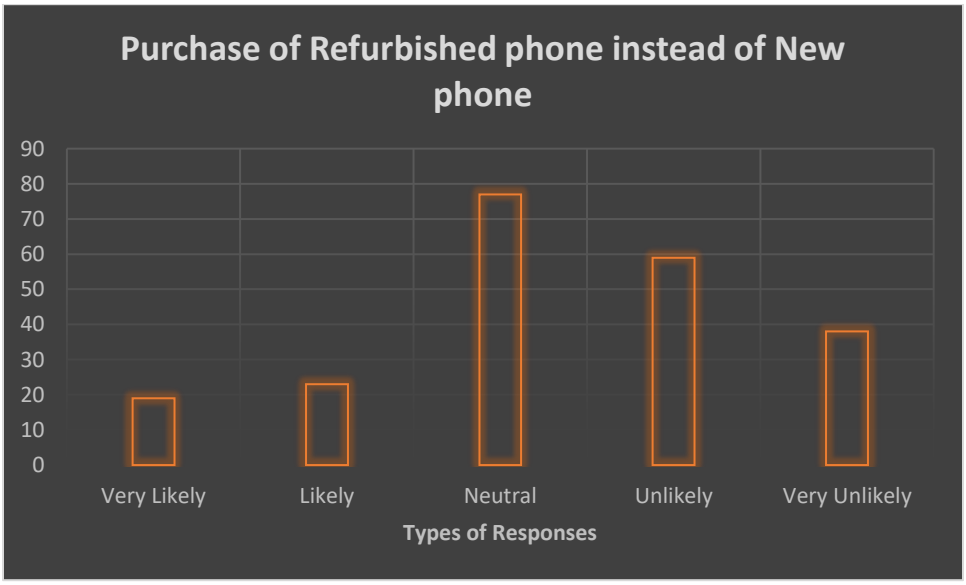

Figure 7: purchase of a refurbished phone.

The analysis of the dependent variable, "Smartphone users' recycling behavior," is critical to understanding why only a few mobile phone users recycle their devices in Denmark. The survey question "How likely are you to consider purchasing a refurbished phone instead of a new phone for your next upgrade?" provides insight into this behavior. Out of 216 respondents, the data reveals that only 8.8% are "Very likely" to purchase a refurbished phone, while 10.6% are "Likely." A considerable proportion, 35.6%, remains "Neutral," suggesting uncertainty or

ambivalence towards refurbished phones. Conversely, 27.3% are "Unlikely," and 17.6% are "Very Unlikely" to consider this option.

This distribution indicates a mixed attitude towards refurbished phones, with a substantial portion of users hesitant to embrace them. The low percentages of those "Very Likely" and "Likely" to purchase refurbished phones highlight the challenge in shifting consumer behavior towards more sustainable practices. This hesitancy aligns with findings in the literature, which suggest that perceptions of quality, reliability, and warranty coverage significantly influence consumer decisions regarding refurbished electronics (Yu et al., 2021; Harwood & Garry, 2020).

In Denmark, a country noted for its environmental consciousness, the reluctance to purchase refurbished phones can be partly attributed to concerns over quality and reliability, as well as the availability of desired models (Patil & Ramakrishna, 2020). Additionally, the presence of robust warranties and support for new phones further skews consumer preference towards new devices, as indicated by the literature (Garcia et al., 2021). The financial aspect also plays a role; if the perceived savings from buying a refurbished phone are not substantial, consumers are less inclined to opt for this choice (Shahabuddin et al., 2022).

The significant percentage of neutral responses suggests a potential for shifting attitudes if proper incentives and assurances are provided. Increasing awareness about the benefits of refurbished phones, coupled with guarantees of quality and reliable after-sales support, could tilt consumer preferences. Additionally, enhancing the visibility and attractiveness of recycling programs through better communication and financial incentives could address some of the barriers identified in the literature (Winans et al., 2017).

Therefore, the analysis underscores the need for targeted initiatives to promote the acceptance of refurbished phones among mobile phone users in Denmark. Addressing concerns about quality, reliability, and warranty coverage through clear communication and robust policies could significantly enhance recycling behaviors. By bridging the gap between environmental awareness and actual recycling practices, Denmark can further its sustainability goals and reduce e-waste effectively (Bleischwitz et al., 2022).

4.2.2 Recycling Options

4.2.2.1 Considering recycling your current mobile phone when upgrading to a new one

Type of responses	Count	Percentage %
Very Likely	44	20.3
Likely	50	23.1
Neutral	76	35.1
Unlikely	33	15.2
Very Unlikely	13	6.01
Total	**216**	**100**

Table 3: recycling the current mobile phones.

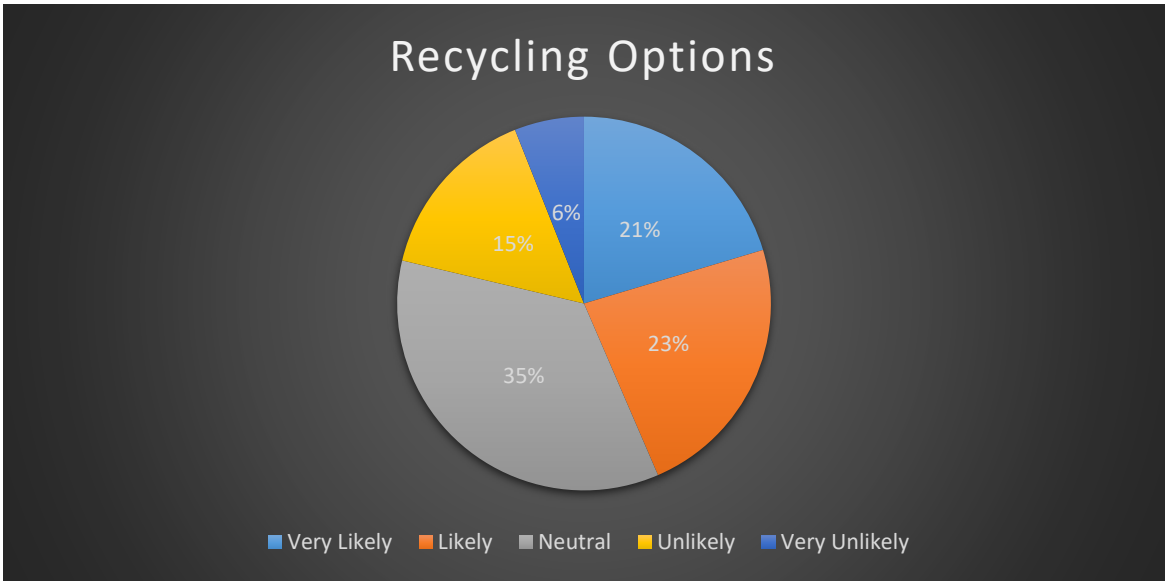

Figure 8: recycling the current mobile phone.

The question "How likely are you to recycle your current mobile phone when you upgrade to a new one?" aims to gauge the intention of individuals regarding the recycling of their old mobile phones. Understanding these intentions is crucial for developing strategies to enhance recycling rates, reduce electronic waste, and promote environmental sustainability (Larsen et al., 2010). In the context of Denmark, analyzing the responses to the question about the likelihood of recycling a current mobile phone when upgrading to a new one provides valuable insights into smartphone users' recycling behavior. The data shows that 20.3% of respondents are "Very likely" and 23.1% are "Likely" to recycle their phones, combining to 43.4%. This suggests that nearly half of Danish

smartphone users have a strong predisposition towards recycling, likely influenced by Denmark's well-established recycling culture and supportive infrastructure in general. However, the 35.1% of respondents who are "Neutral" indicate a significant portion of the population that might be undecided or insufficiently informed about the benefits and processes of recycling (Riisgaard, Mosgaard and Zacho, 2016). This neutrality represents a critical target for awareness campaigns and educational initiatives aimed at highlighting the environmental impact of electronic waste and the convenience of available recycling options. Additionally, the 21.2% who are "Unlikely" or "Very Unlikely" to recycle highlight existing barriers such as lack of incentives, perceived inconvenience, or skepticism about the effectiveness of recycling programs. In Denmark, where sustainability is a key societal value, addressing these barriers through enhanced transparency in the recycling process, better accessibility to recycling facilities, and attractive incentives like trade-in programs or discounts on new devices can significantly improve recycling rates. These efforts can convert neutral and unlikely recyclers into active participants, aligning with Denmark's broader environmental goals and reducing electronic waste (Zacho, Bundgaard and Mosgaard, 2018). The current findings underscore the importance of targeted strategies to bolster recycling behaviors among Danish smartphone users, leveraging the country's strong environmental ethos and advanced waste management systems (Zacho, Bundgaard and Mosgaard, 2018).

The literature on e-waste management and consumer behavior provides valuable insights into this trend. Studies have shown that the convenience and availability of recycling options play a pivotal role in influencing recycling behavior (Magnier and Mugge, 2022). For instance, (Kalia, Zia and Mladenović, 2021) emphasize that ease of access to recycling facilities and clear information about recycling processes are crucial determinants of recycling rates. In Denmark, despite its strong environmental policies, the perceived inconvenience or lack of accessible recycling options may deter users from recycling their devices (Magnier and Mugge, 2022).

Furthermore, the economic incentives associated with recycling options significantly impact user behavior. According to Shi et al. (2020), financial incentives, such as buy-back programs or discounts on new purchases, can enhance recycling rates. The relatively lower percentages of respondents who are "Unlikely" or "Very Unlikely" to recycle (21% combined) suggest that current incentives might not be compelling enough to motivate all segments of the population. This is consistent with findings from studies in other European countries, which indicate that

attractive financial incentives can bridge the gap between environmental awareness and actual recycling practices (Magnier and Mugge, 2022).

Additionally, psychological factors, such as attachment to devices and concerns about data security, also play a role in recycling decisions. Users who are emotionally attached to their devices or worry about data privacy are less likely to recycle (Nnorom, Ohakwe and Osibanjo, 2009). These factors could explain the significant portion of users who are neutral or unlikely to recycle, as they may need stronger reassurances about data protection and emotional detachment strategies.

The analysis indicates that the recycling options available to mobile phone users in Denmark Negatively impact their recycling behavior. The mixed responses reflect barriers related to convenience, economic incentives, and psychological factors. Addressing these barriers through improved recycling facilities, better financial incentives, and robust data security measures could enhance recycling rates, aligning consumer behavior with Denmark's environmental goals and reducing e-waste effectively (Sassanelli et al., 2019).

The correlation between "Smartphone users recycling behavior" (DV1) and "Recycling Options" (IV1) indicates how likely individuals are to recycle their smartphones based on their attitudes towards recycling options. In the scenario, a positive correlation between the two values suggests that as the likelihood of individuals considering recycling options increases, their propensity to recycle their smartphones also tends to increase (Magnier and Mugge, 2022). Conversely, a negative correlation would imply that as the likelihood of considering recycling options decreases, the likelihood of recycling smartphones decreases.

4.2.3 Awareness of Recycling and/or E-waste

4.2.3.1 Awareness of E-waste

Type of responses	Count	Percentage %
Yes	103	47.7
No	80	37.0
Maybe	33	15.3
Total	**216**	**100.0**

Table 4: Awareness of E-waste.

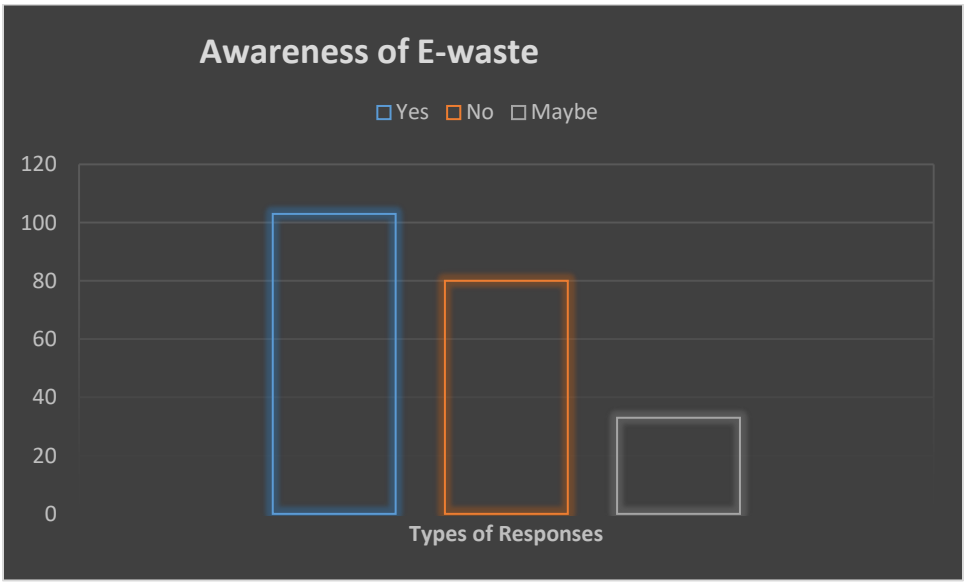

Figure 9: Awareness of E-waste.

Age * AwarenessEwaste Crosstabulation

Count

		AwarenessEwaste			Total
		Maybe	No	Yes	
Age	18-24	12	26	16	54
	18-25	0	1	0	1
	24-34	16	27	52	95
	24-35	0	1	0	1
	35-44	4	15	22	41
	35-45	0	0	1	1
	45-54	1	6	11	18
	55 and above	0	3	2	5
Total		33	79	104	216

Table 5: Awareness of E-waste.

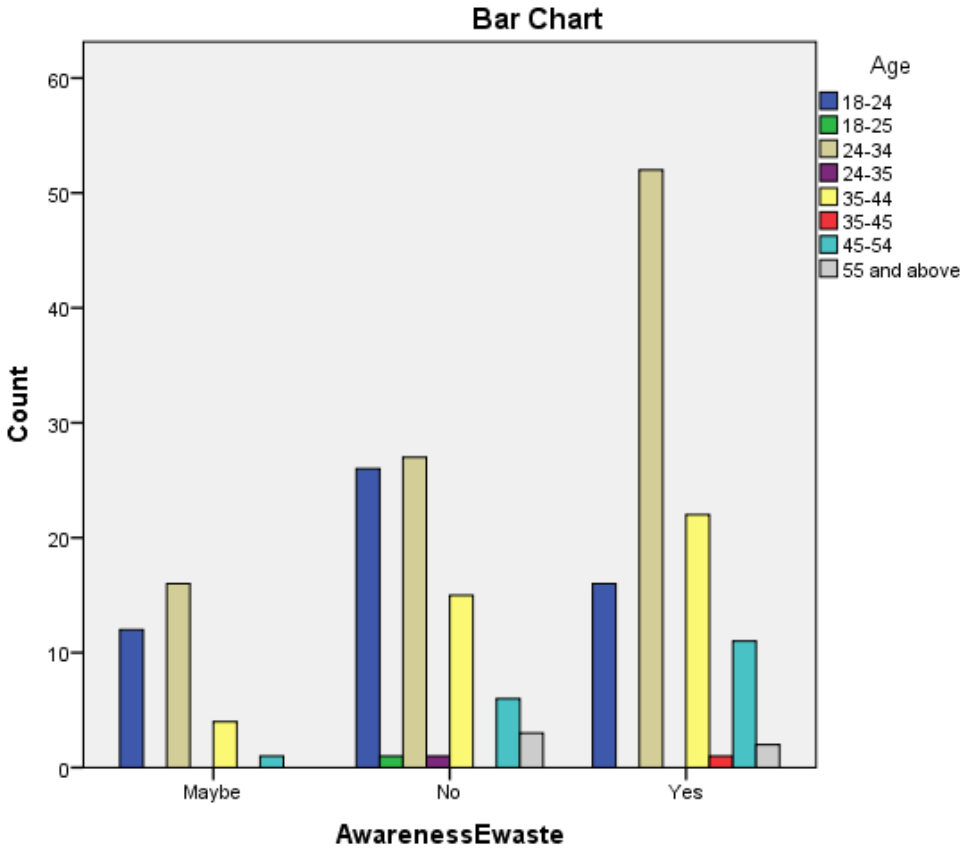

Figure 10: Awareness of E-waste

The charts shows that 48% from the respondents are aware of e-waste. The young citizens who are from the age group of 24-34 are the highest count who have knowledge about e-waste. The youngest age group, 18-24 has no much awareness about e-waste and they don't feel e-waste as an important factor to know. 18-24 age group should be given awareness of e-waste and sustainability as they are the generation to take of environment in future.

4.2.3.2 Awareness of Recycling

Type of responses	Count	Percentage %
Yes	125	57.8
No	55	25.4
Maybe	36	16.6
Total	**216**	**100.0**

Table 6: Awareness of Recycling.

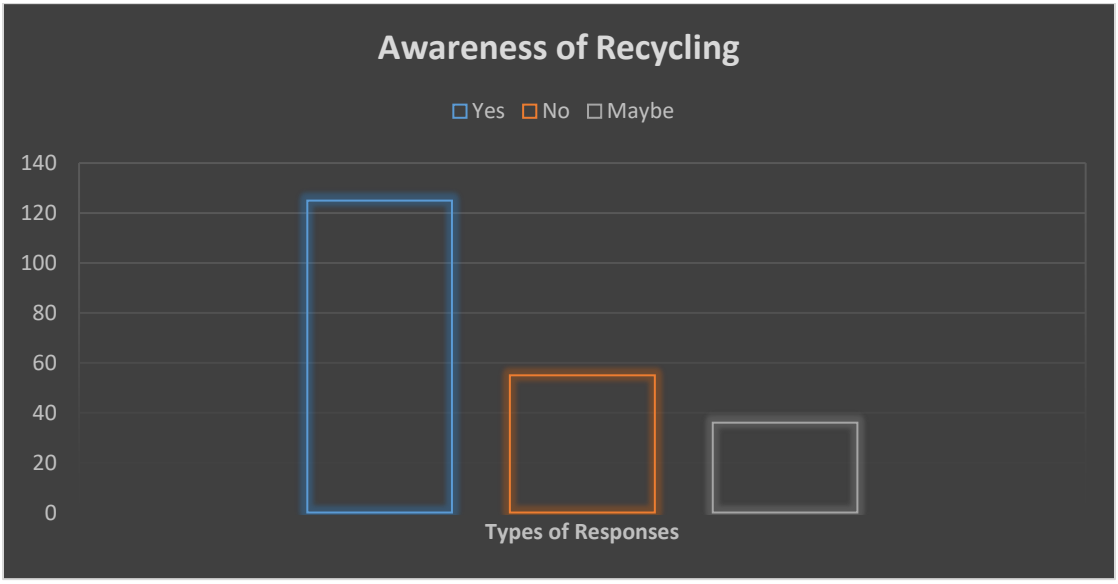

Figure 11: Awareness of Recycling

Education * AwarenessElectricrecycle Crosstabulation

Count

		AwarenessElectricrecycle			Total
		Maybe	No	Yes	
Education	College degree	18	25	57	100
	Complicated Bachelor of business administration	0	1	0	1
	High school or equivalent	11	8	17	36
	Kort videregående uddannelse	0	0	1	1
	Less than high school	0	2	0	2
	Master	0	0	1	1
	Masters	0	0	1	1
	Msc.Nursing	0	1	0	1
	PhD	0	0	1	1
	Post-graduate degree	7	17	46	70
	Some college	0	1	0	1
	Vocational education	0	1	0	1
Total		36	56	124	216

Figure 12: Awareness of Recycling based on education

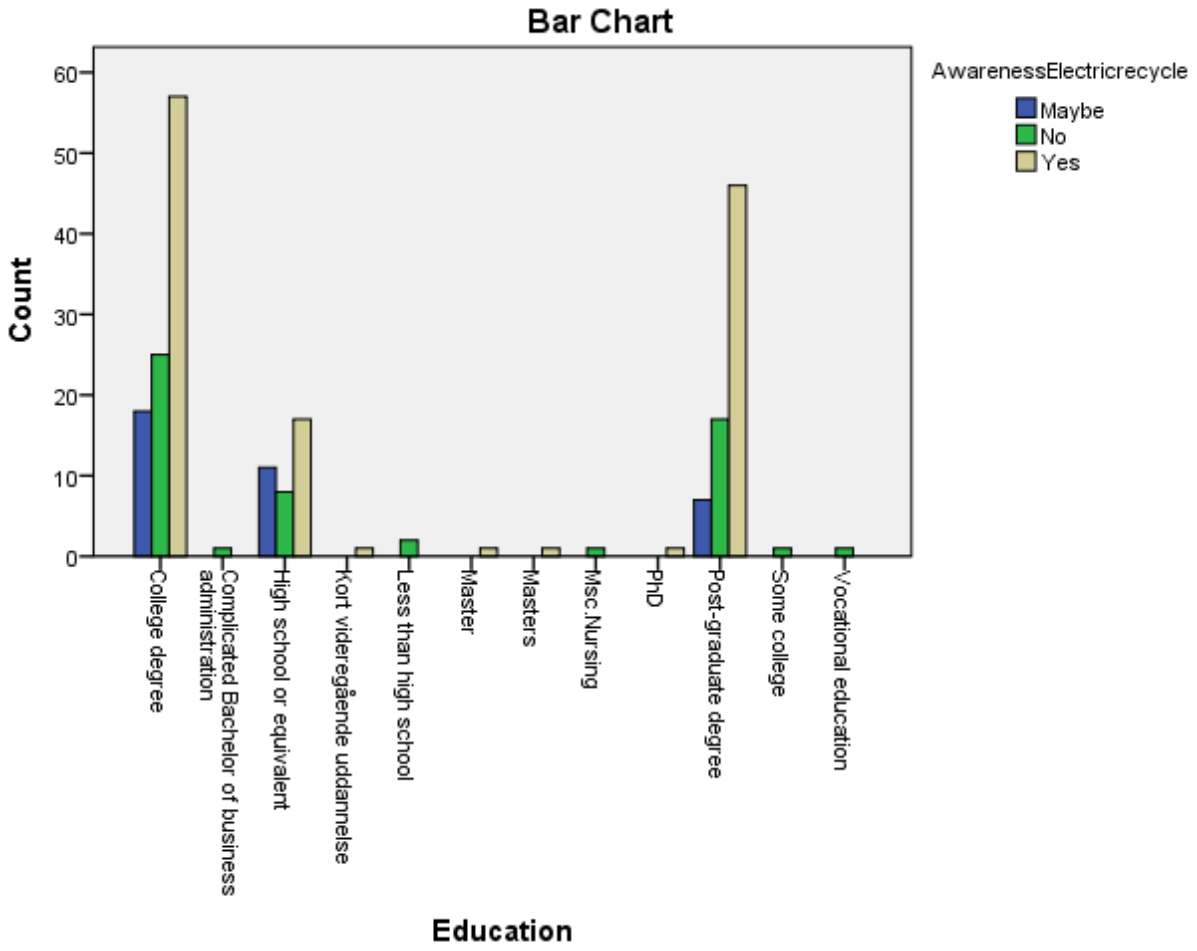

Figure 13: Awareness of Recycling based on education.

The charts explain that most of the respondents with higher educational qualifications are aware about electric recycling. This indicates that education plays a major role in giving awareness.

Out of 216 respondents, 57.8% (125) were aware of electric recycling, 25.4% (55) were not, and 16.6% (36) were uncertain. These findings highlight a significant knowledge gap. Literature indicates that awareness and knowledge are critical in driving environmentally responsible behaviors (Parajuly, Habib and Liu, 2017). Despite Denmark's robust environmental policies, the lack of awareness among a substantial portion of the population indicates a need for more effective educational outreach and public information campaigns (Ádám et al., 2021)

4.2.3.3 Considering the environmental impact when purchasing a new mobile phone

Type of responses	Count	Percentage
Yes	38	17.60
No	131	60.64
Maybe	47	21.80
Total	**216**	**100**

Table 7: Environment Consideration while purchasing a new phone.

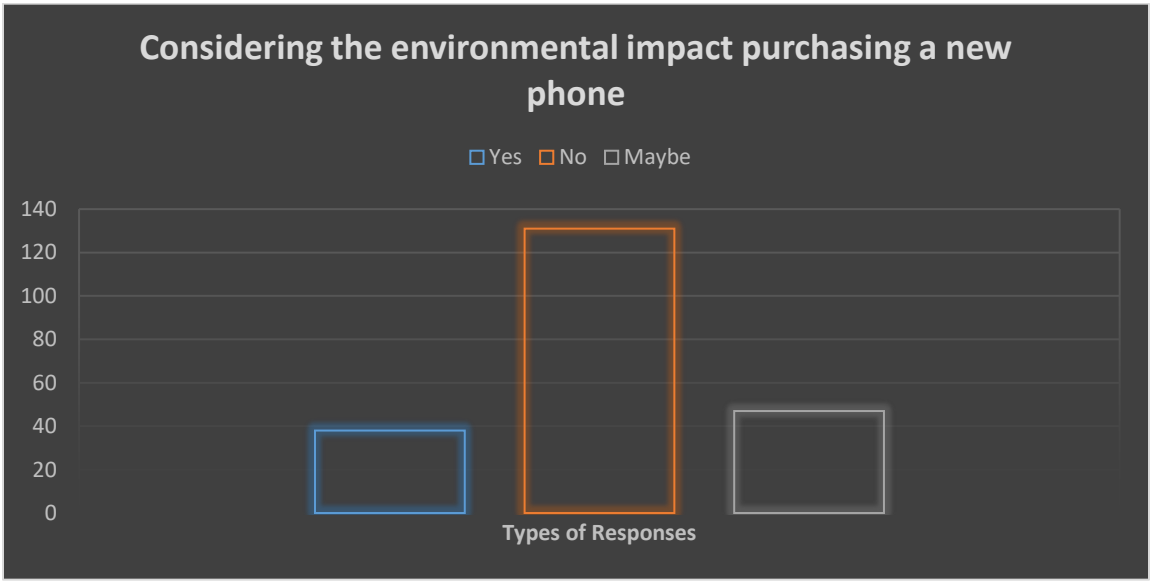

Figure 14: Environment Consideration while purchasing a new phone.

Only 17.6% (38) of respondents always consider the environment when purchasing a new mobile phone, while 60.6% (131) do not, and 21.8% (47) sometimes do. This suggests that environmental considerations are not a primary factor for most users when buying new devices. According to (Christensen et al., 2007), consumer behavior models show that environmental considerations are often secondary to factors such as price and brand loyalty. The low priority given to environmental impact in purchasing decisions is a barrier to recycling, as users who do not prioritize sustainability in buying new phones are less likely to recycle old ones (Christensen et al., 2007).

Education * Envimpactpurchasenewphone Crosstabulation

Count

		Envimpactpurchasenewphone					Total
		Always	Never	Often	Rarely	Sometimes	
Education	College degree	6	10	12	41	31	100
	Complicated Bachelor of business administration	0	0	0	1	0	1
	High school or equivalent	3	3	5	11	14	36
	Kort videregående uddannelse	0	1	0	0	0	1
	Less than high school	0	0	0	2	0	2
	Master	0	1	0	0	0	1
	Masters	0	0	0	1	0	1
	Msc.Nursing	0	0	0	0	1	1
	PhD	0	0	0	0	1	1
	Post-graduate degree	5	11	12	20	22	70
	Some college	0	0	0	0	1	1
	Vocational education	0	1	0	0	0	1
Total		14	27	29	76	70	216

Table 8: Environment Consideration while purchasing a new phone based on education.

The education plays a vital role in recycling awareness and implementing recycling. Though they aware about recycling, they don't think about it seriously when purchasing a new phone. Most of the respondents do not think about environmental impact and 70 respondents are not sure about their thoughts. To enhance the awareness of environmental impact, the companies can implement strategies like financial incentives or discounts for recycled phone.

4.2.3.4 Considering recycling old phones if incentivized or financially rewarded

Type of responses	Count	Percentage
Yes	125	57.90
No	14	6.48
Maybe	77	35.64
Total	**216**	**100**

Table 9: Considering recycling old phones based on financial incentives.

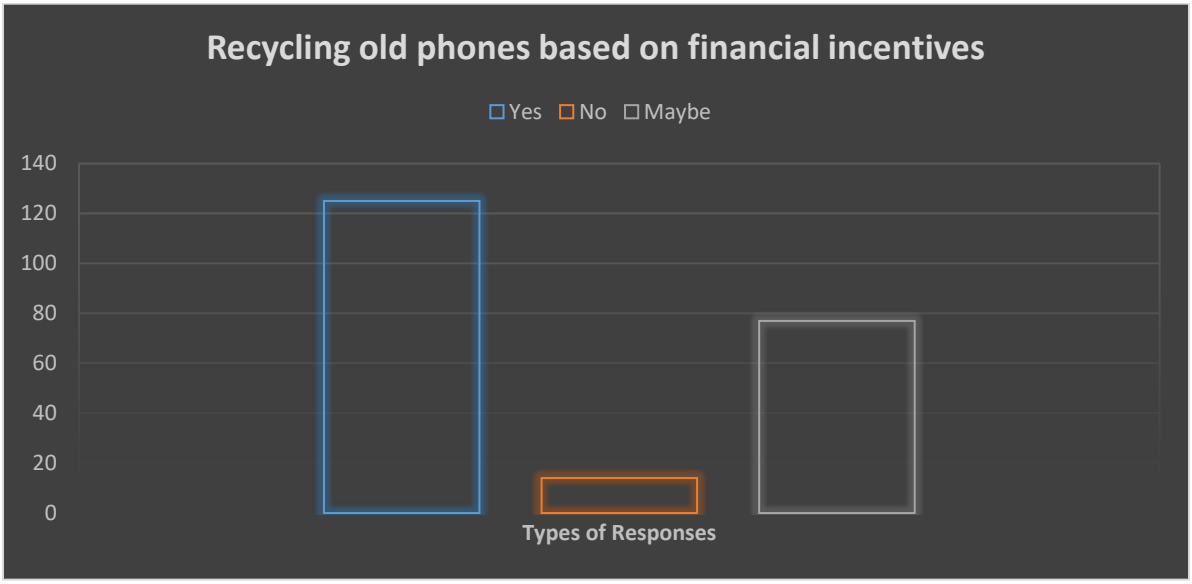

Figure 15: Considering recycling old phones based on financial incentives.

A significant 57.9% (125) of respondents indicated they would recycle their old phones if given financial incentives, while 6.5% (14) would not, and 35.6% (77) were unsure. Financial incentives are known to be effective motivators for recycling behavior (Shi et al., 2020). This finding aligns with the literature, suggesting that economic benefits can substantially increase recycling rates. In Denmark, enhancing financial incentives could bridge the gap between environmental awareness and actual recycling practices (Riisgaard, Mosgaard and Zacho, 2016).

MonthlyIncome * Recycleonincentive Crosstabulation

Count

		Recycleonincentive			Total
		Maybe	No	Yes	
MonthlyIncome	11000-20000 DKK	26	7	26	59
	21000-30000 DKK	11	3	20	34
	31000 DKK & Above	10	1	25	36
	5000-10000 DKK	30	3	54	87
Total		77	14	125	216

Table 10: Considering recycling old phones based on financial incentives and income.

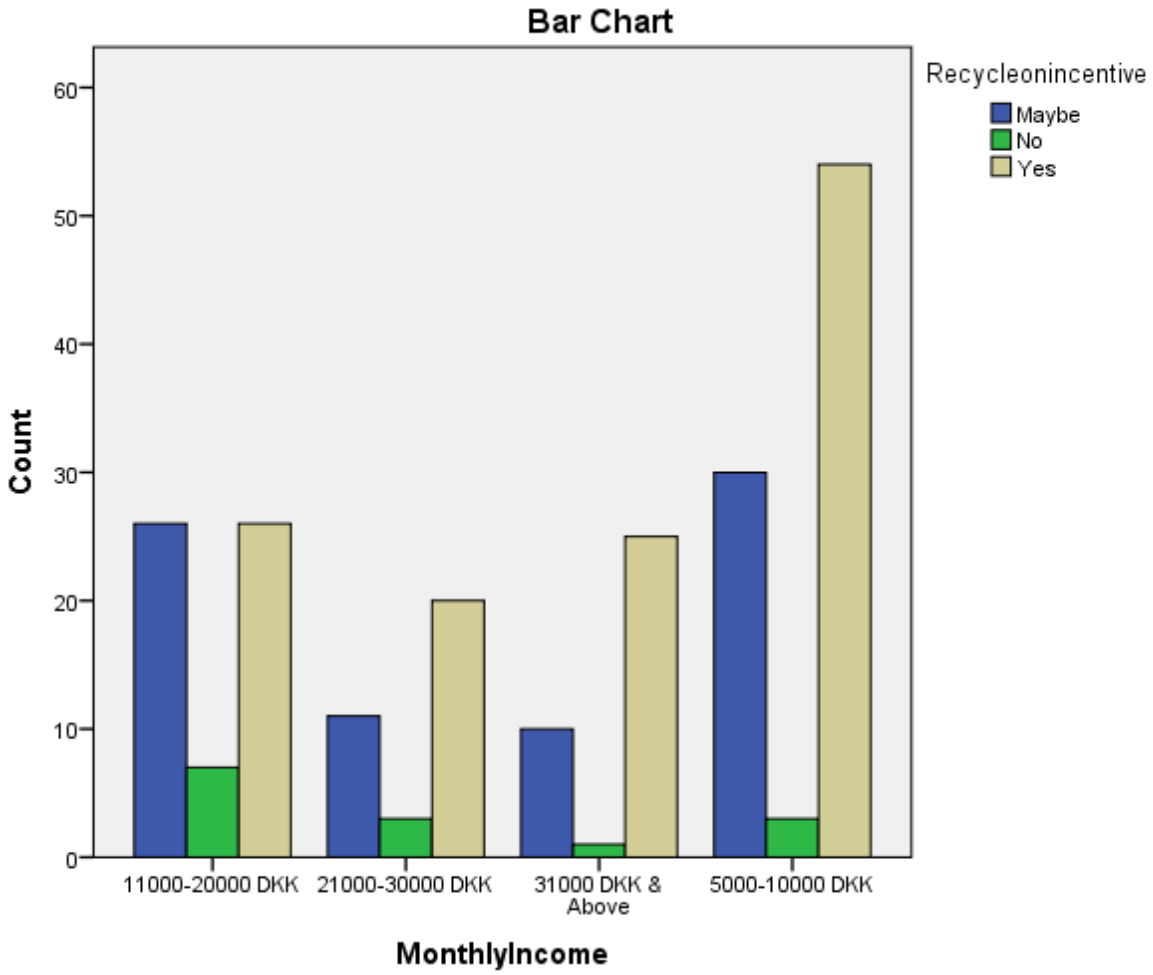

Figure 16: Considering recycling old phones based on financial incentives and income.

Financial incentives has been motivated people to recycle phones. The lowest income group has higher number of respondents who are willing to recycle if there are any financial incentive is

provided. This point revealed that the companies can collect more phones for recycle based on financial incentives.

4.3.3.5 Considering environmental impact

Type of responses	Count	Percentage %
Always	14	6.50
Often	29	13.42
Sometimes	70	32.40
Rarely	76	35.18
Never	27	12.5
Total	**216**	**100**

Table 11: Considering environmental impact.

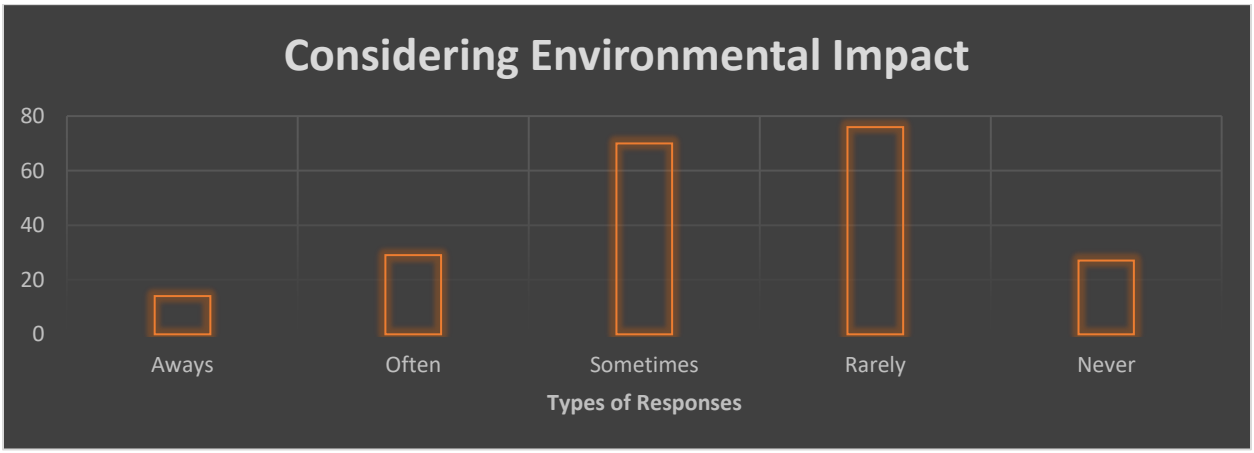

Figure 17: Considering environmental impact.

Only 6.5% (14) of respondents always consider the environmental impact when deciding what to do with their old mobile phones, 13.4% (29) often do, 32.4% (70) sometimes do, 35.2% (76) rarely do, and 12.5% (27) never do. This distribution indicates that environmental considerations are not consistently factored into decisions about phone disposal (Yu et al., 2021). The literature highlights that consistent environmental messaging and education are essential to instill sustainable behaviors (Baxter and Gram-Hanssen, 2016). The infrequency with which users consider environmental impacts suggests a need for stronger and more consistent educational initiatives (Patil and Ramakrishna, 2023).

Evaluation

The analysis of recycling options reveals several key barriers to the recycling behavior of mobile phone users in Denmark. Despite a moderate level of awareness about e-waste and electric recycling, the actual consideration of environmental factors in purchasing and disposing of phones is low (Patil and Ramakrishna, 2023). Financial incentives appear to be a significant motivator for recycling, yet the overall convenience and accessibility of recycling options seem inadequate (Yu et al., 2021). The neutral and negative responses to recycling likelihood when upgrading highlight the need for more user-friendly and well-promoted recycling programs (Yu et al., 2021).

Addressing these issues requires a multifaceted approach: enhancing educational outreach to increase awareness, providing attractive financial incentives, improving the convenience of recycling facilities, and ensuring robust data security measures to alleviate privacy concerns. By implementing these strategies, Denmark can better align its environmental policies with the recycling behaviors of its citizens, thus reducing e-waste and promoting sustainable practices in the electronics sector (Patil and Ramakrishna, 2023).

4.2.4 Concerns about data Security and Privacy

4.2.4.1 Factors influencing the decision to recycle or not recycle your mobile phone

Type of responses (IV3)	Count	Percentage %
Lack of convenient recycling options	73	16.48
Concerns about data security/privacy	80	18.05
Desire to keep the device as a backup	101	22.10
Lack of awareness about recycling prog	64	14.44
Perception that the device still has value	49	11.06
Emotional attachment with the device	39	8.80
Regulatory factor: no strict recycling policy for electric dev	30	6.77
other	7	1.58
Total	**443**	**100**

Table 12: Reasons for the decision to recycle or not recycle the phone.

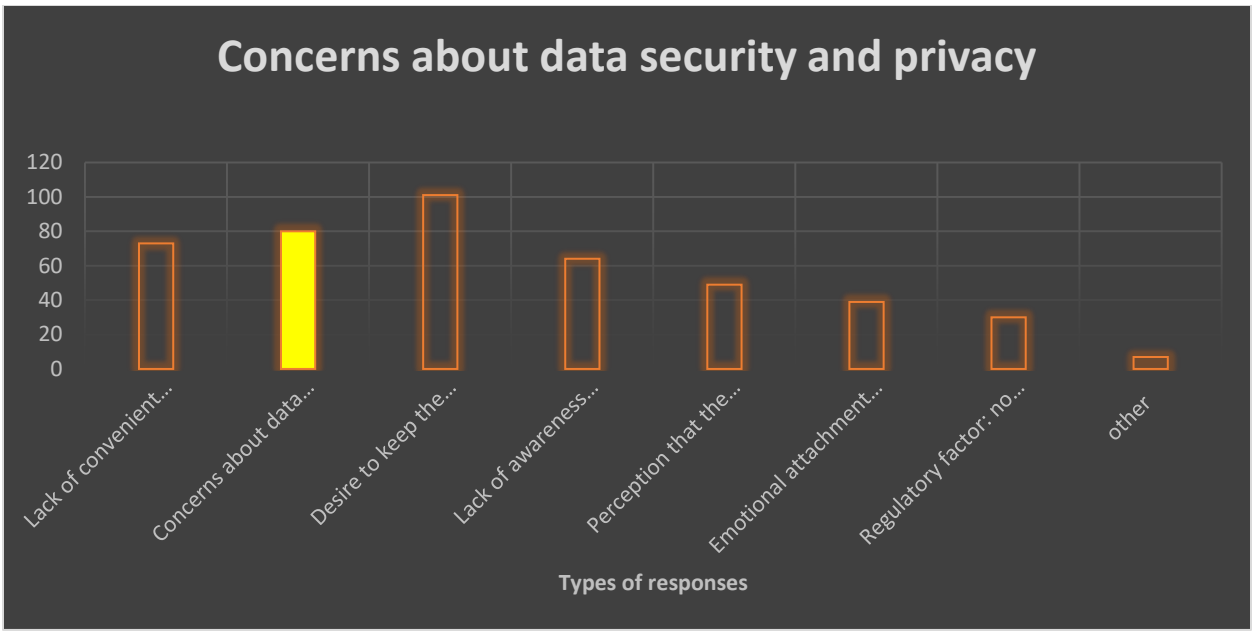

Figure 18:Data Security Consideration.

The analysis of Factors influencing the decision to recycle or not recycle mobile phones reveals significant insights, particularly when examining the independent variable of concerns about data security and privacy. According to the survey, 18.05 % identified concerns about data security and privacy as a primary factor influencing their decision to recycle or not recycle their mobile phones. This concern ranked second only to the desire to keep the device as a backup, which was indicated by 22.10 %.

The prominence of data security and privacy concerns reflects a critical barrier to recycling behavior among smartphone users. Literature indicates that fears surrounding personal data being compromised during the recycling process significantly hinder e-waste management efforts (Canning, 2006). In Denmark, a country with high digital literacy, these concerns are particularly acute. Users are often wary of the potential for identity theft or unauthorized access to personal information even after attempts to wipe their devices clean (Prabhu N and Majhi, 2022).

This apprehension is not unfounded. Studies have shown that residual data can often be retrieved from supposedly erased devices, contributing to the reluctance to recycle (Yu et al., 2021). Furthermore, the general mistrust in the security measures provided by recycling programs exacerbates this issue. As such, improving public confidence in the data protection protocols of recycling facilities is crucial.

Other significant factors influencing recycling behavior include the desire to keep the device as a backup (22.10%), lack of convenient recycling options (16.48%), and lack of awareness about recycling programs (16.44%). The perception that the device still holds value (22.7%), emotional attachment to the device (11.06%), and regulatory factors (6.77%) were also notable but less prevalent.

To address these concerns, it is imperative to focus on robust educational initiatives that inform consumers about secure data deletion methods and the stringent data protection measures employed by recycling facilities. Promoting transparency in how data is handled during the recycling process can mitigate fears and encourage more users to recycle their devices (Yu et al., 2021). Additionally, offering services that guarantee secure data destruction before recycling can enhance users' confidence.

The findings from this survey are consistent with broader European studies where data privacy is a growing concern. (Eurostat, 2023) reports that data security issues are a deterrent to recycling across many EU countries. In Denmark, aligning environmental consciousness with effective recycling practices necessitates a multifaceted approach, including technological solutions for secure data erasure and comprehensive public awareness campaigns (Thylstrup, 2019).

Concerns about data security and privacy negatively affect the recycling behavior of mobile phone users in Denmark. Addressing these concerns through targeted educational initiatives, robust data protection measures, and transparent recycling processes is essential. By enhancing user confidence in the safety and security of recycling programs, Denmark can better align its high levels of environmental consciousness with effective recycling practices. This approach is critical for improving the recycling rates among mobile phone users and tackling the broader challenge of e-waste management (Thylstrup, 2019).

4.2.5 Recycling policy for electric Devices

4.2.5.1 Factors influencing the decision to recycle or not recycle your mobile phone

Type of responses	Count	Percentage %
Lack of convenient recycling options	73	16.48
Concerns about data security; privacy	80	18.05
Desire to keep the device as a backup	101	22.10
Lack of awareness about recycling prog	64	14.44
The perception that the device still has value	49	11.06
Emotional attachment with the device	39	8.80
Regulatory factor: no strict recycling policy for electric dev	30	6.77
other	7	1.58
Total	443	100

Table 13: Reasons for the decision to recycle or not recycle the phone.

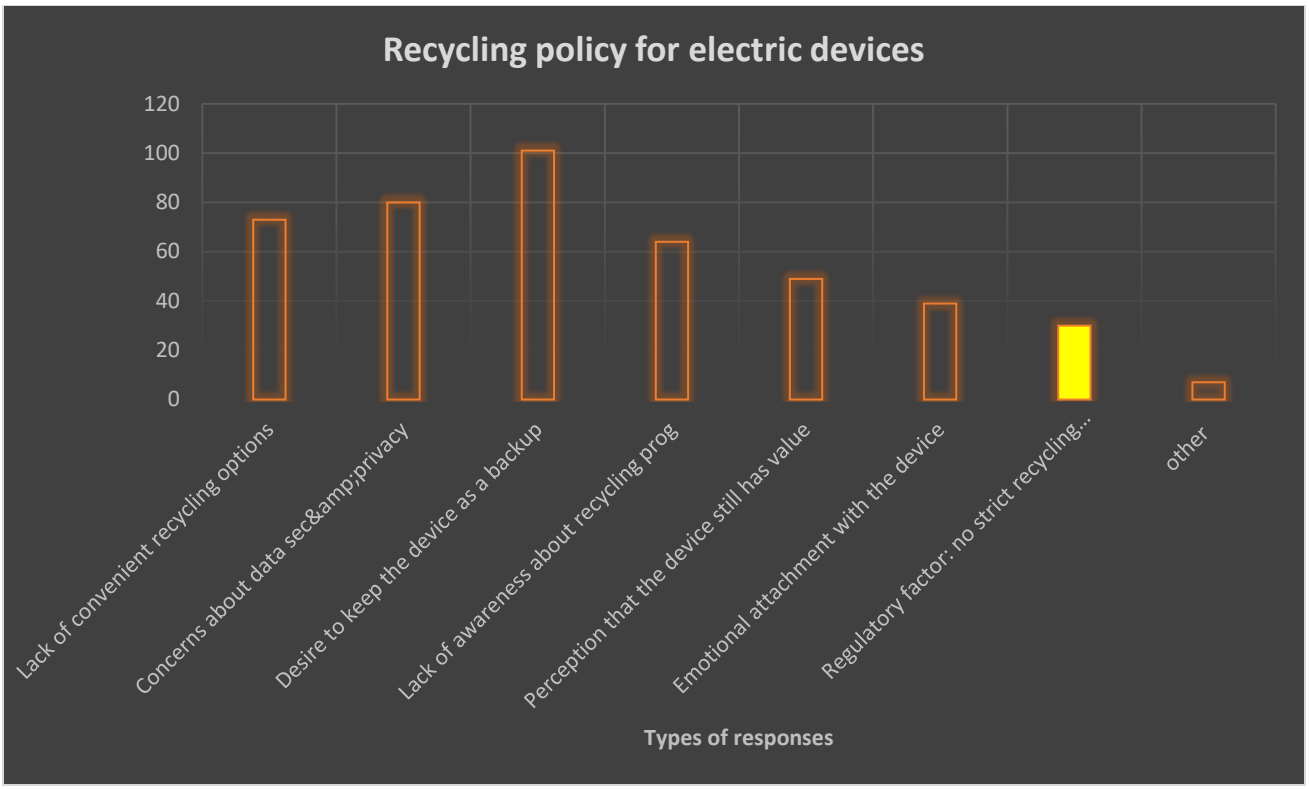

Figure 19: Recycling policies for electronics.

The analysis of regulatory factors influencing the decision to recycle or not recycle mobile phones reveals that 6.77% of respondents cite the absence of strict recycling policies for electronic devices as a significant consideration. This suggests that regulatory frameworks play a crucial role in shaping individuals' recycling behaviors. The lack of clear guidelines or mandates may contribute to uncertainty and disincentives recycling efforts among consumers. Policymakers and authorities may need to prioritize the development and enforcement of comprehensive recycling policies to promote responsible e-waste management and enhance environmental sustainability in Denmark (Tojo and Manomaivibool, 2011).

Regulatory Factors and Their Impact

The regulatory environment for electronic waste (e-waste) management is a critical determinant of consumer behavior regarding recycling. Denmark, despite its progressive stance on environmental issues, appears to lack strict policies specifically targeting the recycling of electronic devices. The survey results indicate that this regulatory shortfall is a barrier to effective e-waste management. Literature supports this finding, highlighting that robust regulatory frameworks are essential for enhancing recycling rates (Kreuzer et al., 2013).

In countries with stringent recycling policies, consumers are more likely to engage in proper e-waste disposal practices due to clear guidelines and the availability of well-established recycling infrastructure. For instance, in Germany and Sweden, strict e-waste regulations have significantly improved recycling rates (Kreuzer et al., 2013). The lack of similar rigor in Denmark's policies might contribute to the relatively low motivation among consumers to recycle their mobile phones (Tojo and Manomaivibool, 2011).

Evaluating the Regulatory Landscape in Denmark

Denmark has general waste management regulations that include electronic waste, but these may not be specific or stringent enough to compel consumers to recycle their electronic devices regularly (Topping, Dalby and Skov, 2016). The current regulatory framework does not seem to provide sufficient incentives or enforcement mechanisms to encourage recycling. This gap is evident in the responses indicating that more than one-tenth of the participants view the lack of strict recycling policies as a hindrance (Topping, Dalby and Skov, 2016).

A comparison with literature shows that countries with comprehensive e-waste policies often include elements such as mandatory recycling targets, extended producer responsibility (EPR), and consumer awareness campaigns (Richter and Koppejan, 2016). These elements ensure that all stakeholders, including manufacturers, consumers, and recyclers, are engaged in the recycling process. The absence of such stringent measures in Denmark means that consumers may not feel a regulatory push to recycle their mobile phones (Richter and Koppejan, 2016).

Addressing the Regulatory Gap

To enhance smartphone recycling behavior in Denmark, it is crucial to strengthen the regulatory framework governing electronic waste. Implementing stricter recycling policies, such as mandatory recycling targets and enhanced producer responsibility, can create a more structured and incentivized recycling ecosystem. Moreover, regulatory measures should include comprehensive consumer education campaigns to raise awareness about the importance and benefits of recycling electronic devices (Kreuzer et al., 2013).

The lack of strict recycling policies for electronic devices in Denmark negatively impacts the recycling behavior of mobile phone users. Strengthening these regulations could significantly improve recycling rates by providing clear guidelines, incentives, and enforcement mechanisms.

Aligning Denmark's policies with those of countries that have successfully managed e-waste through robust regulations could enhance consumer participation in recycling programs. This regulatory approach is essential for addressing the broader challenge of e-waste management and promoting sustainable practices among smartphone users (Kreuzer et al., 2013).

4.3 Relationship between Independent Variables and Smartphone Users' Recycling Behavior

Independent Variable	Dependent Variable: Smartphone Users' Recycling Behavior
Recycling Options	The respondents are willing to recycle their old phones
	The companies/ government has to push citizens for recycling as it is a moderate relationship
	Perception of device value and desire for backups decrease recycling.
Awareness of Recycling and/or E-waste	Higher awareness correlates with increased recycling rates.
	Lack of knowledge about e-waste results in lower recycling participation.
Concerns about Data Security/Privacy	High concerns about data security/privacy deter users from recycling.
Regulatory Factors: Recycling Policy for Electric Devices	Awareness of policies and incentives can enhance recycling behavior.
	Lack of awareness about policies leads to lower recycling participation.

Table 14: Relationship between Independent Variables and Smartphone Users' Recycling Behavior.

This chart provides a clear visual representation of how each independent variable impacts the dependent variable, highlighting the factors that influence smartphone users' recycling behavior in Denmark.

4.4 RQ02: What are the reasons most of the consumers buy new phones instead of refurbished phones in Denmark?

To address the research question "What are the reasons most consumers buy new phones instead of refurbished phones in Denmark?", the study examines consumer preferences (dependent variable) through several independent variables: The need to possess the latest technology or model, impressions of the quality of the refurbished phones, opportunity to purchase a warrantied item as well as acquire the newest technological models under a monthly instalment system. Thus, by identifying and examining these factors the research will contribute to unveiling the major motives that lead Danish consumers to prefer to purchase new phones instead of refurbished ones, as well as discuss possible recommendations for increasing the latter's consumption aiming at implementing circular economy principles.

4.4.1 Consumer preference to new phone instead refurbished phone

4.4.1.1 Preference between brand new and refurbished phones

Types of responses	Count	Percentage %
Brand new phone	188	87.0
Refurbished phone	28	13.0
Total	**216**	**100**

Table 15: Preference between brand new and refurbished phones.

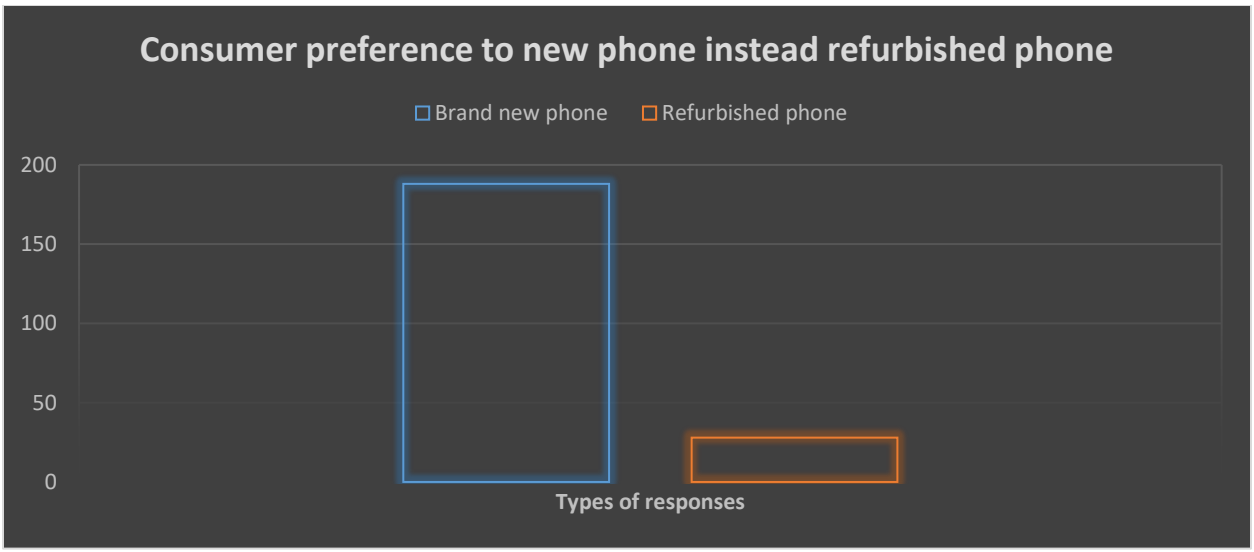

Figure 20: Preference between brand new and refurbished phones.

The data presented in the chart regarding consumer preference for new phones versus refurbished phones offers valuable insights into the dynamics influencing purchasing decisions in Denmark. Initially, it's notable that a majority of respondents, approximately 87.0%, expressed a preference for brand new phones over refurbished ones. This strong inclination towards new devices suggests a prevailing consumer sentiment favoring the perceived benefits of new technology. Such a preference aligns with the findings of previous research indicating that consumers often prioritize newness and the latest features when purchasing smartphones (Watson et al., 2017). However, the survey also reveals that a notable minority, comprising 13.0% of respondents, are open to considering refurbished phones. This indicates a niche market for refurbished devices, which may appeal to consumers seeking cost-effective options or those concerned about the environmental impact of electronic waste. The willingness to consider refurbished phones could be attributed to factors such as price sensitivity or a growing awareness of sustainability issues (Türkeli et al., 2019). Despite this openness, the data suggests that the majority still perceive new phones as the preferable choice, highlighting the enduring appeal of novelty and perceived reliability associated with new devices (Zink et al., 2014).

Occupation * Refurbishorbrandnew Crosstabulation

Count

		Refurbishorbrandnew			Total
			Brand New phone	Refurbished phone	
Occupation	Employed full-time	1	87	9	97
	Employed part-time	0	25	0	25
	Others	0	1	0	1
	Retired	0	2	2	4
	Self-employed	0	10	3	13
	Student	3	52	11	66
	Unemployed	0	7	3	10
Total		4	184	28	216

Table 16: Smartphone preference based on occupation.

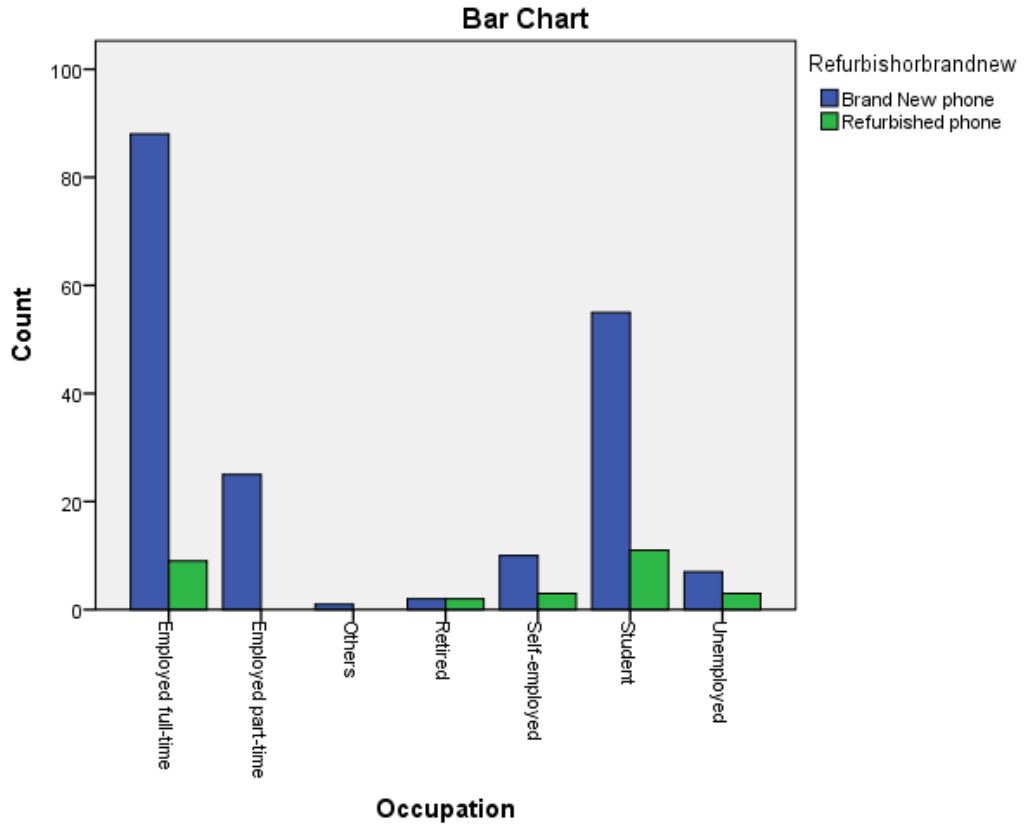

Figure 21: Smartphone preference based on occupation.

The majority of respondents prefer for brand new phone. The highest number of respondents are students who like to purchase refurbished phones. This is mainly due to the financials.

4.4.1.2 Likelihood of considering a refurbished phone for next upgrade

Types of responses	Count	Percentage %
Very Likely	19	8.8
Likely	23	10.7
Neutral	77	35.6
Unlikely	59	27.3
Very Unlikely	38	17.60
Total	216	100

Table 17: Consumer preference for smartphones on next upgrade.

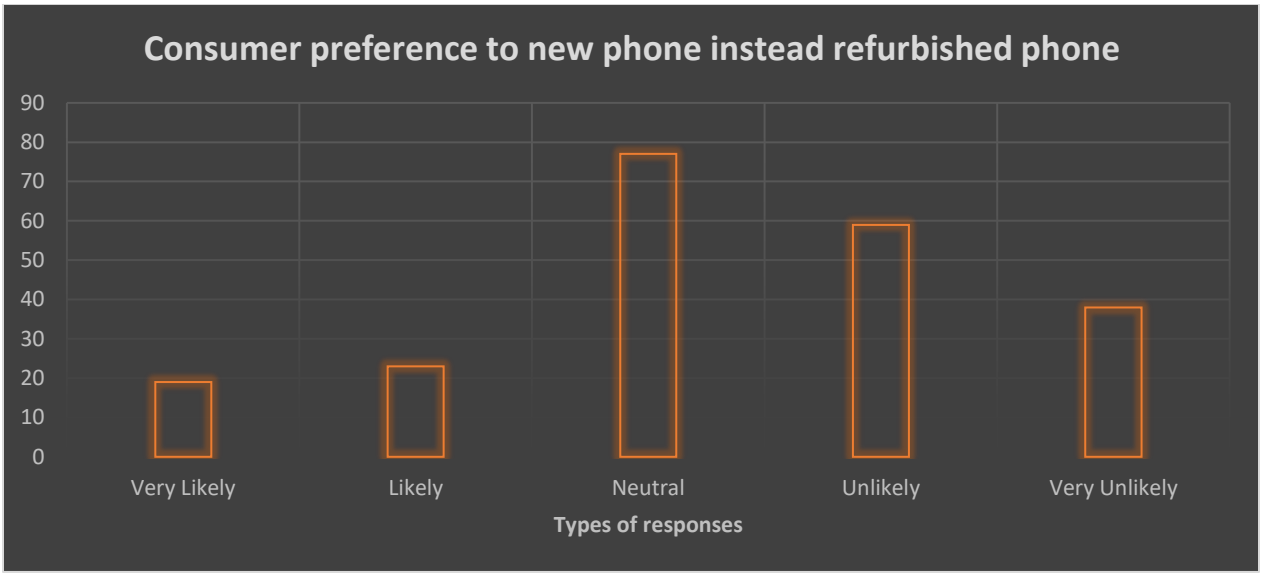

Figure 22: Consumer preference for smartphones.

Further analysis of respondents' likelihood to purchase refurbished phones for their next upgrade reveals a more nuanced perspective. While a portion (approximately 19.5%) express some degree of willingness, ranging from 'Very likely' to 'Likely,' a substantial proportion remains neutral or skeptical. Specifically, 35.6% of respondents feel neutral, while 44.9% express reluctance, ranging

from 'Unlikely' to 'Very Unlikely.' This distribution underscores the challenge of shifting consumer perceptions and overcoming ingrained biases towards refurbished products (Bieser et al., 2022). the data underscores the dominance of consumer preference for new phones in Denmark, with a majority opting for the latest technology and features. While there exists a minority open to considering refurbished options, significant barriers remain in terms of perceived value, trust, and stigma associated with second-hand devices. Future efforts to promote refurbished phones may benefit from targeted marketing strategies emphasizing cost savings, environmental benefits, and quality assurance measures to address consumer concerns and enhance acceptance in the market (Bieser et al., 2022).

4.4.2 Desire to the latest technology/model

4.4.2.1 Importance of having the latest model when purchasing a new phone

Types of responses	Count	Percentage %
Extremely Important	27	12.5
Important	59	27.31
Neutral	76	35.18
Not Important	35	16.20
Not at all Important	19	8.8
Total	216	100

Table 18: Importance of having the latest model.

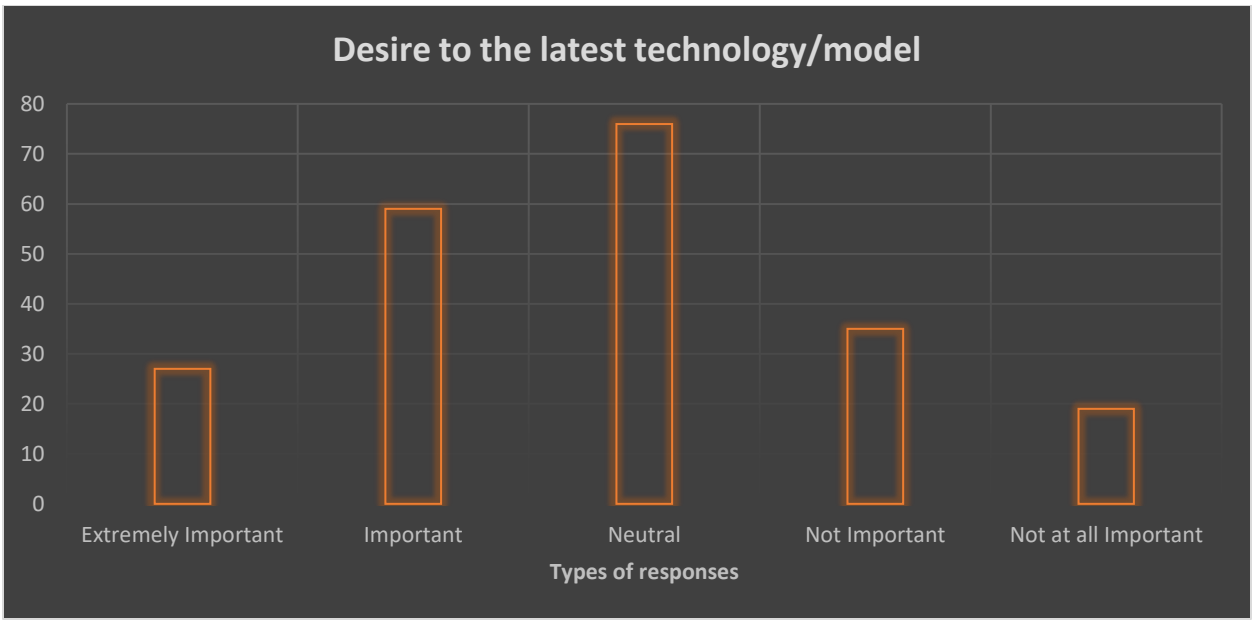

Figure 23: Importance of having the latest model.

The data presented in the chart regarding the importance consumers place on having the latest technology/model when purchasing a new phone offers significant insights into their buying behavior and sheds light on the reasons why most consumers in Denmark opt for new phones over refurbished ones.

Firstly, a substantial proportion of respondents, approximately 39.81%, indicated that having the latest model is either extremely important or important to them. This finding underscores the influence of the desire for the latest technology on consumer decision-making regarding smartphone purchases. This aligns with previous research highlighting the strong association between consumer preferences and the desire for technological innovation and novelty (Bieser et al., 2022). The emphasis on the latest model suggests that for many consumers, the allure of cutting-edge features, improved performance, and enhanced user experiences outweighs considerations such as cost savings or sustainability (Tojo and Manomaivibool, 2011).

Conversely, a notable portion of respondents, comprising 51.39%, expressed varying degrees of indifference towards having the latest model when purchasing a new phone, ranging from neutral to not at all important. This suggests a segment of the market less driven by the need for the latest technology and more concerned with other factors such as affordability, practicality, or personal preferences (Bieser et al., 2022). While the desire for the latest technology is a significant driver

of consumer behavior, it is not the sole determinant, as evidenced by the diversity of responses in the survey.

Age * Latestmodelofnewphone Crosstabulation

Count

		Latestmodelofnewphone					Total
		Extremely Important	Important	Neutral	Not at all Important	Not Important	
Age	18-24	6	11	26	3	8	54
	18-25	0	0	1	0	0	1
	24-34	9	27	34	9	17	96
	35-44	10	18	6	4	3	41
	35-45	0	0	1	0	0	1
	45-54	2	2	6	2	6	18
	55 and above	0	1	2	1	1	5
Total		27	59	76	19	35	216

Table 19: Importance of having the latest model based on age.

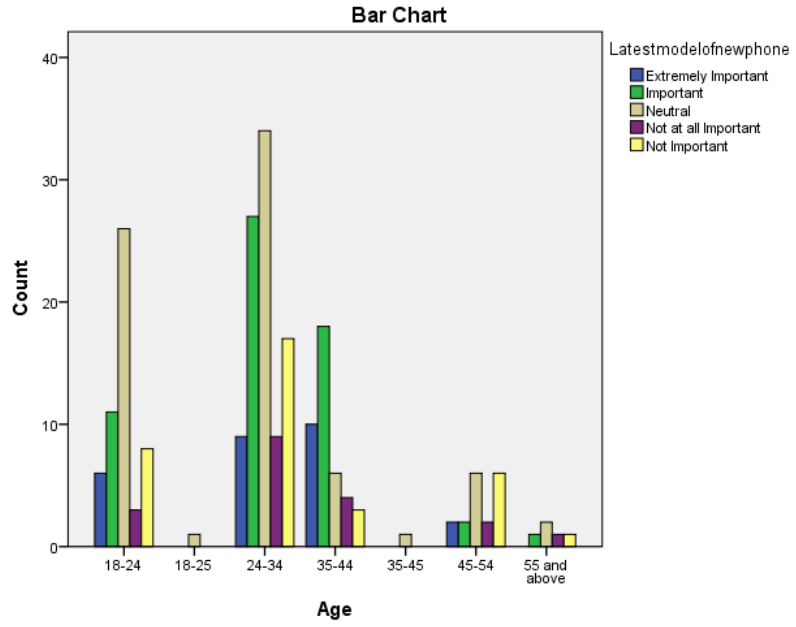

Figure 24: Importance of having the latest model based on age.

The latest model is important for the age group between 24-34 and 35-44. Most of the people in this age group are earning and they try to purchase best value for money.

When examining the relationship between the importance of having the latest model and consumer preference for new phones over refurbished ones, it becomes apparent that the desire for the latest technology plays a pivotal role in shaping consumer preferences (Ting et al., 2019). The strong emphasis on the latest model among a significant portion of respondents aligns with the prevailing preference for new phones, as evidenced by the earlier analysis. This suggests that the appeal of new phones extends beyond their physical condition or price point to encompass the intrinsic value associated with possessing the latest technological advancements (Tojo and Manomaivibool, 2011). The data highlights the significant influence of the desire for the latest technology/model on consumer preferences for new phones over refurbished ones in Denmark. While a segment of the market may prioritize other factors, such as cost or sustainability, the appeal of the latest model remains a dominant driver of consumer behavior in the smartphone market (Tojo and Manomaivibool, 2011).

4.4.3 Refurbished phone quality

4.4.3.1 Factors influencing the decision to buy a new phone instead of a refurbished one

Types of responses (IV6)	Count	Percentage%
Desire for the latest technology/features	96	22.53
Concerns about the quality and reliability of refurbished phones	125	29.34
Prefer the warranty and support offered with new phones	83	19.48
The perceived amount of money saved on buying a used phone is not considered substantial	38	8.92
Lack of availability of refurbished options for desired models	33	7.74
Phone companies offer affordable monthly payment option to buy a new phone (eg Telia	36	8.45
Other	15	3.52
Total	426	100

Table 20: Influencing factors on buying a new phone.

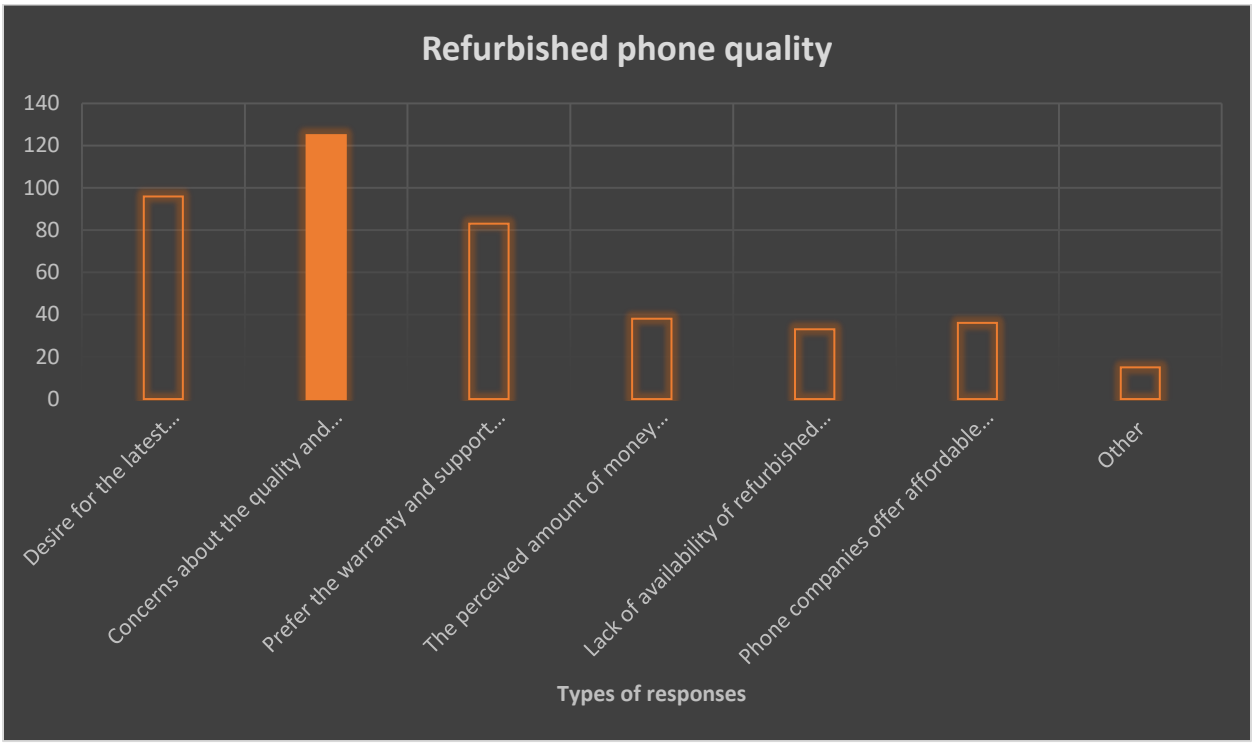

Figure 25: Quality of Refurbished Phones.

The data presented in the chart regarding the factors influencing consumers' decisions to buy new phones instead of refurbished ones provides valuable insights into the perceptions and concerns surrounding refurbished phone quality. Notably, the most prevalent factor cited by respondents, with approximately 29.34% selecting it, is concerns about the quality and reliability of refurbished phones. This finding underscores a significant barrier to the adoption of refurbished phones among consumers in Denmark.

The high percentage of respondents expressing concerns about refurbished phone quality aligns with existing literature highlighting consumer skepticism towards the reliability and performance of refurbished devices (Türkeli et al., 2019). Refurbished phones are often perceived as being of inferior quality or potentially prone to technical issues, contributing to apprehensions among consumers. Such concerns can be attributed to factors such as the uncertainty surrounding the refurbishment process, the potential for hidden defects, and the perceived risk of receiving a subpar product (Martela, 2019).

This apprehension regarding refurbished phone quality serves as a key determinant influencing consumer preferences for new phones over refurbished ones. Despite potential cost savings, warranty offerings, or affordability of monthly payment options, the perceived risks associated with refurbished phones outweigh these benefits for many consumers. This underscores the significance of trust and confidence in the quality of the product, as well as the importance of addressing consumer apprehensions through transparent refurbishment processes and quality assurance measures (Martela, 2019).

Efforts to promote refurbished phones as viable alternatives to new ones must address these concerns by enhancing consumer trust and confidence in refurbished phone quality. Providing clear information about the refurbishment process, offering comprehensive warranties and support, and ensuring rigorous quality control measures can help alleviate consumer concerns and enhance the appeal of refurbished devices (Tojo and Manomaivibool, 2011). By addressing the perceived quality and reliability issues associated with refurbished phones, stakeholders in the smartphone industry can better meet consumer needs and preferences, ultimately fostering greater acceptance of refurbished options in the market (Martela, 2019).

4.4.4 Warranty & after-sales support

4.4.4.1 Factors influencing the decision to buy a new phone instead of a refurbished one

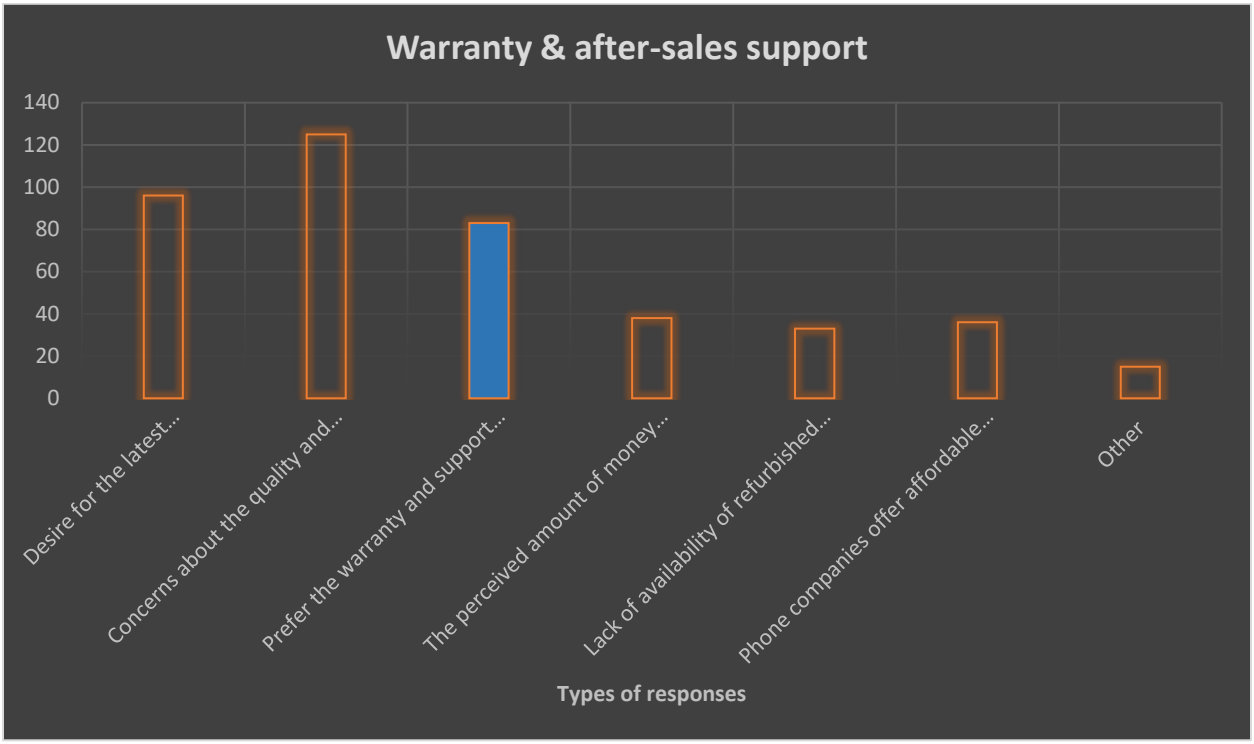

Figure 26: Warranty and After Sales Support.

Consider the same figure under 4.4.3.1 Factors influencing the decision to buy a new phone instead of a refurbished one, the data presented in the chart regarding the factors influencing consumers' decisions to buy new phones instead of refurbished ones sheds light on the significance of warranty and after-sales support as determinants of consumer preferences. Notably, approximately 19.48% of respondents cited a preference for the warranty and support offered with new phones as a factor influencing their decision-making (Larsen et al., 2010). This finding underscores the importance of post-purchase reassurance and protection in shaping consumer choices in the smartphone market (Martela, 2019).

In Denmark, mobile phone retailers typically offer warranties and after-sales support packages to accompany new phone purchases. These warranties often cover defects in materials or workmanship for a specified period, providing consumers with peace of mind and recourse in the

event of product malfunctions or failures. Additionally, after-sales support services, such as customer helplines, repair centers, and software updates, contribute to the overall perceived value of new phones and enhance the ownership experience for consumers (Martela, 2019).

The emphasis on warranty and support in influencing consumer preferences aligns with previous research highlighting the significance of after-sales service quality in consumer decision-making (Tojo and Manomaivibool, 2011). Consumers prioritize the assurance of reliable support and assistance throughout the product lifecycle, particularly given the rapid pace of technological advancements and the complexity of modern smartphones. The availability of robust warranty and support offerings thus serves as a compelling incentive for consumers to opt for new phones over refurbished ones, mitigating concerns about potential risks and uncertainties associated with refurbished devices (Tojo and Manomaivibool, 2011).

The data underscores the importance of warranty and after-sales support as influential factors shaping consumer preferences for new phones over refurbished ones in Denmark. The provision of comprehensive warranty packages and responsive after-sales support services enhances consumer confidence and reinforces the perceived value proposition of new phones, contributing to their continued dominance in the market (Martela, 2019).

4.4.5 Option to buy new phone on monthly payments with phone companies

4.4.5.1 Factors influencing the decision to buy a new phone instead of a refurbished one

Consider the same figure Under Consider the same figure under 4.4.3.1 the data presented in the chart highlights the significance of the option to buy new phones on monthly payments with phone companies as a factor influencing consumers' decisions to purchase new phones instead of refurbished ones. Approximately 8.45% of respondents cited this option as a factor influencing their decision-making. This finding suggests that the availability of affordable monthly payment plans offered by phone companies plays a role in shaping consumer preferences in the Danish smartphone market (Shi et al., 2020).

In Denmark, mobile phone operators such as Telia, Telenor, and others offer various payment options for purchasing new phones, including installment plans that allow consumers to spread the cost of the device over time. These monthly payment plans provide consumers with greater flexibility and affordability, making it easier for them to access the latest smartphone models without having to pay the full upfront cost. Additionally, these plans often include bundled services such as mobile data, calling minutes, and text messages, further enhancing their value proposition (Shi et al., 2020).

The availability of affordable monthly payment options addresses one of the primary barriers to purchasing new phones – the high upfront cost. Research suggests that cost considerations significantly influence consumer decisions in the smartphone market, with affordability being a key determinant of purchasing behavior (Shi et al., 2020). By offering installment plans, phone companies cater to consumers' financial constraints and enable them to affordably upgrade to new phones, thereby stimulating demand for new devices (Yu et al., 2021).

Moreover, the availability of monthly payment options aligns with the broader trend of shifting consumer preferences towards subscription-based models and pay-as-you-go services in the telecommunications industry (OECD, 2021). These flexible payment arrangements resonate with consumers seeking cost-effective solutions and align with their changing consumption patterns and preferences (Yu et al., 2021).

The option to buy new phones on monthly payments with phone companies emerges as a significant factor influencing consumer preferences for new phones over refurbished ones in Denmark. By offering affordable and convenient payment options, phone companies facilitate access to the latest smartphone technology, driving consumer adoption and preference for new devices (Yu et al., 2021).

4.5 Relationship between Independent Variables and Consumer Preference to New Phones

Independent Variable	Dependent Variable: Consumer Preference to New Phone vs. Refurbished Phone
Desire for the Latest Technology/Model	Strong desire for the latest features leads to a preference for new phones.
	Indifference or low importance of latest technology may not deter from new phones.
Refurbished Phone Quality	Concerns about quality and reliability increase preference for new phones.
	Lack of trust in refurbished phones' performance deters their purchase.
Warranty & After-Sales Support	Preference for comprehensive warranty and support drives new phone purchases.
	Insufficient warranty on refurbished phones deters their purchase.
Option to Buy New Phone on Monthly Payments	Easy and affordable payment plans for new phones increase their attractiveness.
	Financial flexibility provided by installment plans reduces appeal of refurbished phones.

Table 21: Relationship between Independent Variables and Consumer Preference to New Phones

This table highlights the significant factors influencing why most consumers in Denmark prefer to buy new phones over refurbished ones, illustrating how each independent variable affects this preference.

4.6 The Theoretical contribution

The theoretical contribution of this research lies in its alignment with existing literature on consumer behavior towards smartphone recycling and the adoption of refurbished phones, particularly within the context of Denmark. By synthesizing findings from the analysis with relevant scholarly works, this study enhances our understanding of the factors influencing consumer decisions in the realm of e-waste management and circular economy principles. Firstly, the findings corroborate previous research indicating that concerns about data security and privacy, accessibility of recycling options, and perceived value of old devices influence smartphone recycling behavior (Bischof, 2019; Rautela et al., 2021). This underscores the importance of addressing these barriers through targeted interventions such as improving data protection measures, enhancing recycling infrastructure, and promoting the residual value of used devices. Secondly, the research sheds light on the reasons why consumers prefer new phones over refurbished ones, highlighting factors such as perceived quality and reliability, availability of warranty and support, and financial considerations (Bischof, 2019; Rautela et al., 2021). By elucidating these preferences, the study contributes to the discourse on sustainable consumption and circular economy initiatives by identifying areas for improvement, such as enhancing the quality assurance of refurbished products and expanding warranty services for refurbished devices. Moreover, the analysis underscores the role of awareness and education in shaping consumer behavior towards e-waste management (Winans et al., 2017). The findings reveal a lack of awareness about recycling programs and e-waste issues among Danish consumers, highlighting the need for comprehensive public education campaigns and corporate initiatives to promote sustainable practices and increase recycling rates. Additionally, the research emphasizes the importance of regulatory factors, such as recycling policies for electric devices, in driving consumer behavior and advancing circular economy objectives (Reporters, 2024). By identifying gaps in policy implementation and consumer awareness, the study provides insights for policymakers and stakeholders to develop effective strategies for promoting e-waste recycling and sustainable consumption practices (Brown and Knudsen, 2013).

The theoretical contribution of this research lies in its synthesis of empirical findings with existing literature, offering valuable insights into the complex dynamics of consumer behavior towards smartphone recycling and refurbished phone adoption in Denmark. By addressing key barriers and

identifying opportunities for intervention, the study contributes to the advancement of sustainable e-waste management practices and the promotion of circular economy principles.

4.7 Practical Contribution

The research on consumers' perspectives towards electronic waste, specifically focusing on recycling and refurbished mobile phones in Denmark, has several practical implications. Understanding these implications is essential for policymakers, businesses, and environmental organizations aiming to foster a sustainable and circular economy. Here are some key practical implications, broken down into relevant subtopics:

Enhancing Consumer Awareness and Education

Public Awareness Campaigns: To encourage more Danish consumers to recycle their mobile phones, comprehensive awareness campaigns are necessary. These campaigns could educate consumers on the environmental impact of e-waste and the benefits of recycling and using refurbished phones. Collaborating with popular media channels and social media influencers could help in reaching a wider audience (Riisgaard, Mosgaard and Zacho, 2016).

School and University Programs: In Denmark, an organization that aligns with the initiative to integrate e-waste management topics into school curriculums and university programs is the "Danish Outdoor Council" (Friluftsrådet, 2024). While not exclusively focused on e-waste management, the Danish Outdoor Council works towards environmental education and sustainability practices, including waste management. They offer educational programs and materials aimed at schools and universities, promoting outdoor activities, environmental awareness, and sustainable behaviors. Through their initiatives, they could incorporate modules or workshops on e-waste management, educating students about the importance of responsible disposal of electronic devices and the environmental impacts of improper handling. (Kevin van Langen et al., 2021).

Improving Accessibility and Convenience of Recycling Services

Recycling Collection Points: Establishing more convenient and accessible e-waste collection points across Denmark can increase recycling rates. Supermarkets, electronic stores, and public spaces can serve as drop-off points, making it easier for consumers to recycle their old devices (Larsen et al., 2010).

Incentive Programs: Implementing incentive programs where consumers receive discounts or rewards for recycling their old phones could encourage more participation. For example, telecom companies could offer a discount on the purchase of a new phone or service plan in exchange for an old device (Abbott, Nandeibam and O'Shea, 2017).

Promoting the Market for Refurbished Phones

Source: Self

Quality Assurance Standards: Developing and promoting strict quality assurance standards for refurbished phones can help build consumer trust. Danish regulatory bodies (Danish Environmental Protection Agency, Danish Business Authority, and Danish Energy Agency) could certify refurbishes, ensuring that refurbished phones meet high standards of functionality and reliability. (Watson et al., 2017).

Marketing and Perception: Changing the perception that refurbished phones are inferior to new ones is crucial. Marketing campaigns highlighting the quality, cost-effectiveness, and environmental benefits of refurbished phones can attract more consumers. Testimonials and case studies of satisfied users can also enhance credibility (Watson et al., 2017).

Subsidies and Tax Breaks: Providing subsidies and tax incentives to companies involved in the recycling and refurbishment of electronic devices can stimulate the growth of these industries. For example, offering tax breaks to refurbishing businesses or subsidies for research into better recycling technologies (Moscateli et al., 2023).

Creating International Business Opportunity for Refurbished Phones

Since it is easy for consumers in Denmark to purchase high-end smartphones like iPhones, consumers have been known to switch devices every two to three years (according to our study). Instead of these phones remaining in a drawer, they should have been sold to secondhand stores or telecom providers who push monthly payments for new devices, requiring a minimum six-month subscription with them. These used devices should then be brought together and exported to developing markets. Flagship phones like iPhone, Samsung, One Plus have a huge market demand in countries like India, Bangladesh, Sri Lanka but these countries have very price sensitive markets. Therefore, creating a business opportunity by export, JV, FDI, subsidiaries, franchise can be an excellent solution to capture that market and if the government provides subsidy to refurbished electronics businesses, companies will able to offer second hand flagship phones in cheaper price, therefore, customers will be more attracted towards second hand phone, which will help to reduce the demand for buying new phones.

What should users do with their old device.

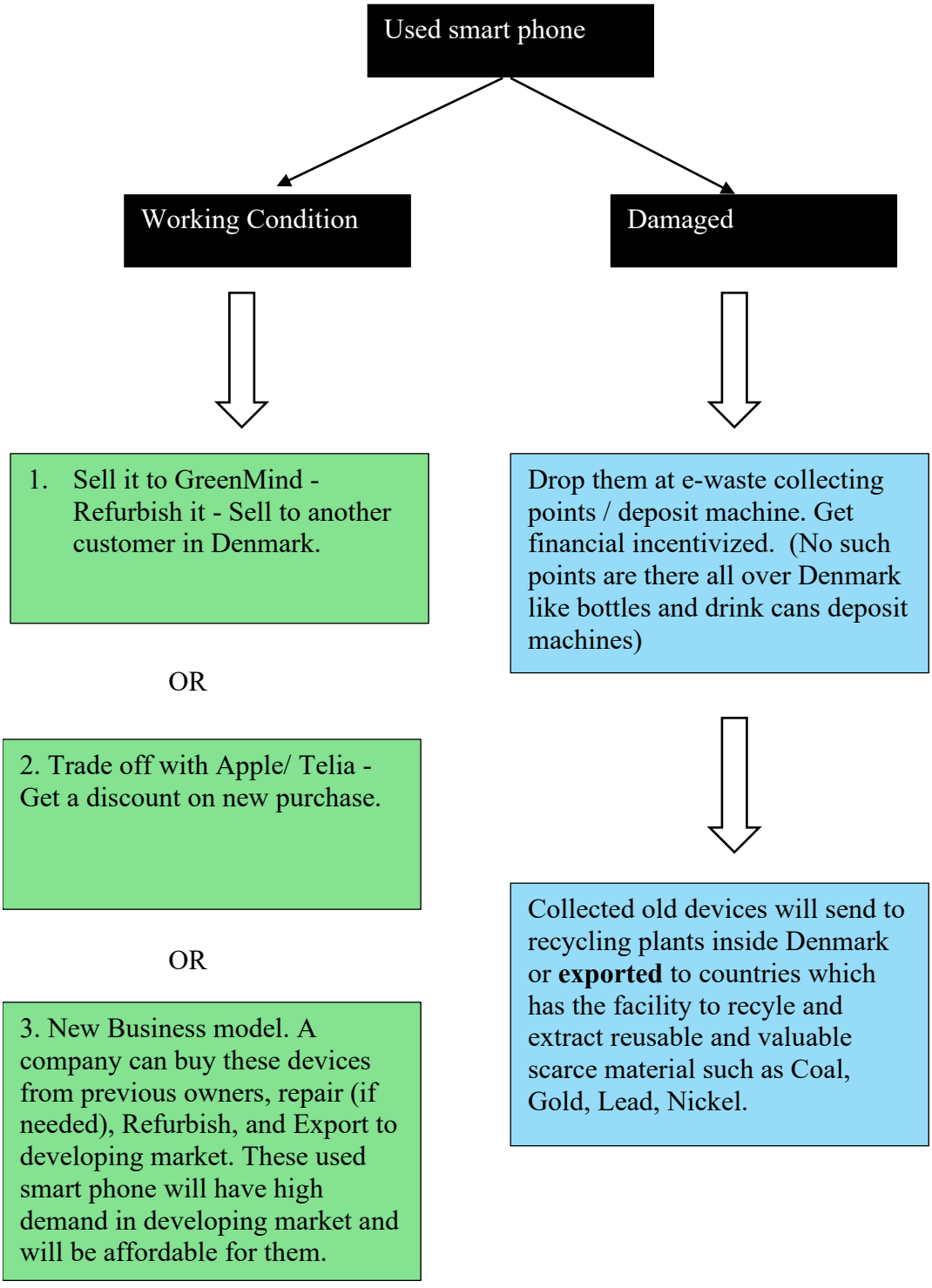

Figure 27: International Business opportunities from old smartphone devices.

Chapter 5: Conclusion, Limitations, and Future research

In the last section of our paper, we want to draw a conclusion on our findings by providing a fundamental answer to our research question. Furthermore, we want to describe the limitations this paper had to deal with that needed to be taken into account, and lastly, we want to point out how future research can use the findings of this paper in order to increase the amount of research in the context our paper conducted, and what possible topics future research could try to cover.

5.1 Conclusion

This research delves deeply into the relatively unexplored domain of smartphone recycling and consumer preferences for new versus refurbished phones in Denmark, shedding light on critical factors shaping these behaviors (Kevin van Langen et al., 2021).It identifies several key variables influencing recycling behavior, including limited availability and convenience of recycling options, insufficient awareness and understanding of recycling processes and e-waste implications, prevalent concerns about data security and privacy, and the effects of existing regulatory frameworks on recycling practices. The study also explores why Danish consumers predominantly opt for new phones over refurbished ones, emphasizing factors such as the strong desire for the latest technological advancements, perceived quality and reliability issues associated with refurbished phones, the significance of warranty and after-sales support, and the allure of flexible payment plans for new devices offered by phone companies (Tojo and Manomaivibool, 2011). Despite Denmark's robust economy and high rate of electronic device consumption, which contributes to e-waste generation, the research reveals a paradoxically low rate of smartphone recycling. This issue is further compounded by the tendency of many Danes to retain their old devices as backups, thereby preventing these devices from re-entering the recycling stream (Bischof, 2019; Rautela et al., 2021). To mitigate these challenges, the study proposes comprehensive policy interventions aimed at enhancing the recycling infrastructure, such as implementing more stringent and user-friendly recycling schemes, and fostering extensive educational campaigns to elevate public awareness about the environmental and economic benefits of recycling and using refurbished phones. Moreover, it suggests that retailers and carriers should adopt strategies to make recycling more convenient and appealing, such as providing clear

information about recycling processes, ensuring data security, and offering incentives for recycling. By promoting the perceived quality and reliability of refurbished phones through warranties and detailed inspections, and by highlighting their environmental benefits, businesses can shift consumer attitudes. By implementing these multifaceted recommendations, Denmark has the potential to advance towards a circular economy, reduce e-waste, and cultivate a more sustainable consumer culture in the mobile phone market. This research not only addresses a crucial gap in the existing literature but also offers practical, actionable insights for policymakers, businesses, and consumers, paving the way for a more environmentally responsible approach to electronic device consumption and disposal (Winans et al., 2017).

The analysis of smartphone recycling behavior among mobile phone users in Denmark reveals a complex interplay of factors influencing recycling decisions. The data indicates that although a small portion of users are inclined to recycle their devices, a majority remain neutral or unlikely to participate in recycling (Moscateli et al., 2023).The primary barriers identified include concerns about data security and privacy, lack of awareness about recycling programs, and insufficient convenient recycling options. Many users perceive their old devices still have value or prefer to keep them as backups, further reducing recycling rates. The survey highlights that while a middle range of respondents are aware of reselling or trading options, a notable portion lacks this knowledge, indicating a gap in consumer education. Regulatory factors, such as recycling policies, also play a crucial role; awareness and accessibility of these policies can enhance recycling behavior (Dalhammar et al., 2021). The findings suggest that improving data security measures, increasing public awareness and education, and providing more convenient recycling options are essential to encouraging sustainable practices. By addressing these issues through comprehensive policy interventions and corporate strategies, Denmark can better manage e-waste, promote a circular economy, and foster environmentally responsible consumer behavior (Kevin van Langen et al., 2021). The analysis reveals that Danish consumers overwhelmingly prefer new phones to refurbished ones, driven by a combination of technological desires, quality perceptions, warranty concerns, and financial flexibility (Winans et al., 2017). A strong desire for the latest technology contributes to the preference for new phones, while indifference to technology does not substantially sway consumers towards refurbished options. Quality and reliability concerns regarding refurbished phones further deter their purchase, reinforcing the appeal of new phones perceived as more dependable (Wood, 2024). Comprehensive warranties and after-sales support

available with new phones play a critical role in consumer decisions, as consumers don't know that refurbished phones comes with a warranty (Bleischwitz et al., 2022). Additionally, the option to buy new phones through affordable monthly payment plans provides financial flexibility, making new phones more accessible and reducing the appeal of refurbished alternatives. Addressing these factors—improving the quality and availability of refurbished phones, enhancing warranty and support, and promoting consumer education on the benefits of refurbished devices—could shift consumer preferences and support the adoption of more sustainable practices, thereby reducing electronic waste and aligning with circular economy principles (Bleischwitz et al., 2022).

5.2 Limitations

Conducting research on the limited recycling behavior of mobile phone users in Denmark and the reasons behind consumers' preference for new phones over refurbished ones entails several intricate limitations. Firstly, accessing comprehensive and accurate data regarding the recycling practices of mobile phone users may pose a challenge due to the privacy protocols surrounding individual consumer data. Obtaining detailed insights into the disposal habits of users, particularly concerning high-value devices like mobile phones, might require cooperation from manufacturers or service providers, which could be restricted due to proprietary concerns or legal constraints. Secondly, understanding the complexities of consumer decision-making regarding phone purchases involves navigating a myriad of factors, including economic considerations, technological preferences, environmental awareness, and social influences. Pinpointing the precise drivers behind consumers' choices requires meticulous data collection and analysis, which may be hindered by the subjective nature of consumer preferences and the limitations of survey methodologies in capturing nuanced motivations (Bleischwitz et al., 2022).

Moreover, the cultural and societal context of Denmark adds another layer of complexity to the research. Danish consumers' attitudes towards technology, sustainability, and consumerism are shaped by a unique combination of factors, including environmental policies, socio-economic status, cultural norms, and technological infrastructure. These contextual elements influence consumer behaviors in ways that may not be immediately apparent, necessitating a thorough exploration of the socio-cultural landscape to interpret research findings accurately. Additionally,

the availability and accessibility of refurbished phone options in Denmark could impact consumers' purchasing decisions. Understanding the dynamics of the refurbished phone market, including factors such as product availability, pricing strategies, and consumer perceptions, requires access to industry data and market insights, which may be proprietary or restricted (Makov & Fitzpatrick, 2021).

Furthermore, conducting research on consumer behavior necessitates careful consideration of methodological limitations, such as sample bias, survey design flaws, and response biases. Ensuring the representativeness of the study sample, minimizing non-response rates, and mitigating biases through rigorous data analysis techniques are essential steps in enhancing the validity and reliability of research findings. Additionally, interpreting survey responses and qualitative data requires a nuanced understanding of cultural nuances, linguistic nuances, and contextual cues, which may be challenging to capture accurately, especially in cross-cultural research contexts. Addressing these limitations demands a multidisciplinary approach, incorporating insights from sociology, psychology, economics, environmental science, and marketing to provide a comprehensive understanding of consumer behavior and recycling practices in Denmark.

5.3 Future Research

Future research aiming to understand why only a few mobile phone users recycle their devices in Denmark and exploring the reasons behind consumers' preference for new phones over refurbished ones should delve into several areas to deepen our understanding and address existing gaps comprehensively. Firstly, longitudinal studies tracking the entire lifecycle of mobile phones, from purchase to disposal, would provide invaluable insights into users' behaviors, motivations, and attitudes over time. By capturing data at multiple points along the product lifecycle, researchers can identify critical junctures where interventions or incentives could encourage recycling behavior and promote sustainable consumption practices (Tojo and Manomaivibool, 2011).

Additionally, qualitative research methodologies such as in-depth interviews, focus groups, and ethnographic studies can offer richer insights into the underlying drivers shaping consumer

decisions. These approaches allow researchers to explore the nuanced factors influencing recycling behavior and purchasing preferences, including social influences, cultural norms, and psychological motivations. Moreover, incorporating participatory research methods that involve stakeholders such as consumers, manufacturers, policymakers, and environmental organizations can foster co-creation of knowledge and collaborative problem-solving, leading to more contextually relevant and actionable findings (Sapiezynski et al., 2019).

Furthermore, future research should examine the role of policy interventions, industry initiatives, and consumer education programs in promoting sustainable practices in the mobile phone industry. Comparative studies evaluating the effectiveness of different policy frameworks, such as Extended Producer Responsibility (EPR) schemes, deposit-refund systems, or tax incentives, across different geographical contexts can provide valuable lessons for policymakers and industry stakeholders. Moreover, assessing the impact of educational campaigns, awareness-raising efforts, and behavioral interventions on consumer attitudes and behaviors towards recycling and refurbished products can inform the design of more targeted and impactful interventions in the future (CEPS, 2013).Moreover, given the increasing importance of digital literacy and data privacy concerns in the mobile phone ecosystem, future research should also explore the intersectionality between data security, privacy, and sustainable consumption practices (The, Macarthur and Stald, 2008). Understanding how consumers perceive and navigate these complex issues when making purchasing decisions can help tailor messaging, product design, and policy interventions to better align with consumer values and preferences (The, Macarthur and Stald, 2008).

Finally, interdisciplinary research collaborations that integrate insights from fields such as environmental science, sociology, psychology, economics, and design can provide holistic perspectives on the complex socio-technical systems shaping consumer behavior and environmental outcomes in the mobile phone industry. By fostering interdisciplinary dialogue and collaboration, future research endeavors can generate innovative solutions and transformative insights to address the pressing challenges of electronic waste management and sustainable consumption in Denmark and beyond (Constantiou, Damsgaard and Knutsen, 2016).

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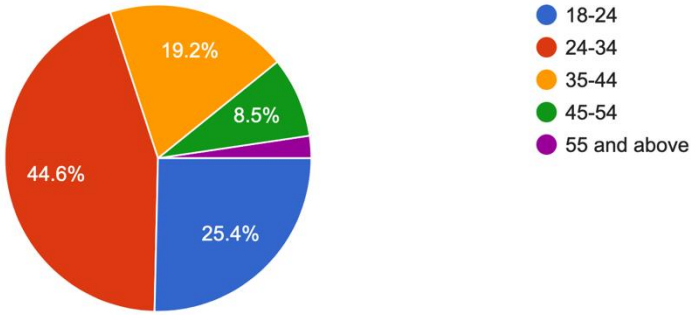
Appendix

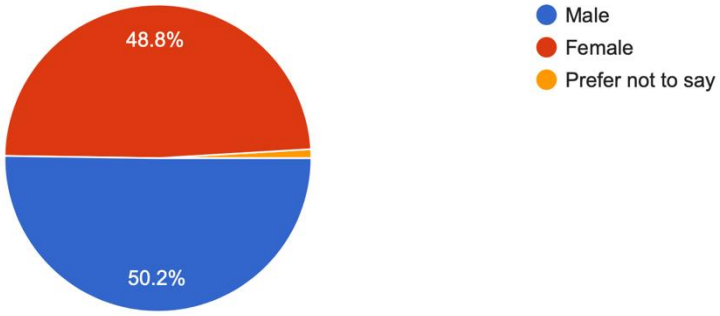
What is your age group?

213 responses



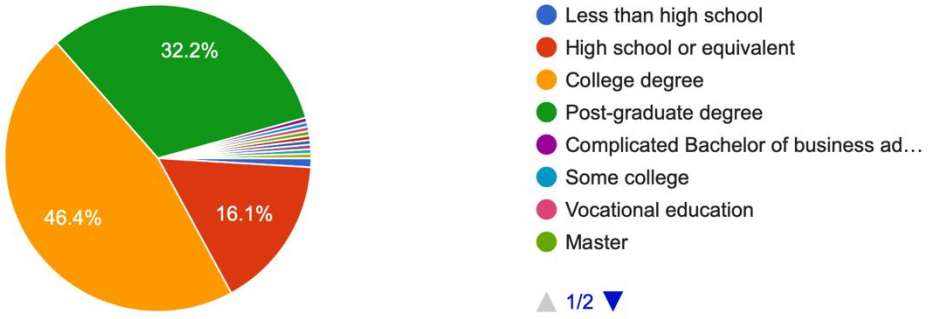
What is your gender?

213 responses



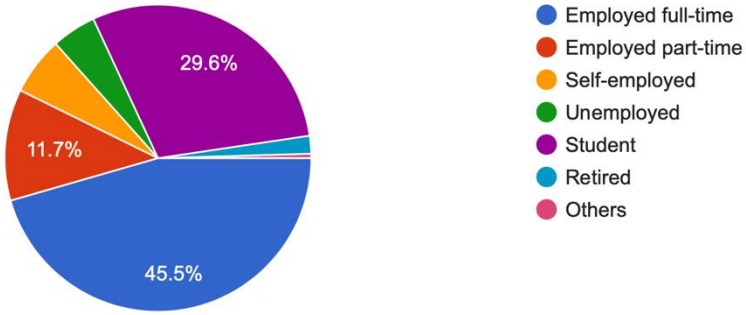
What is your highest level of education?

211 responses



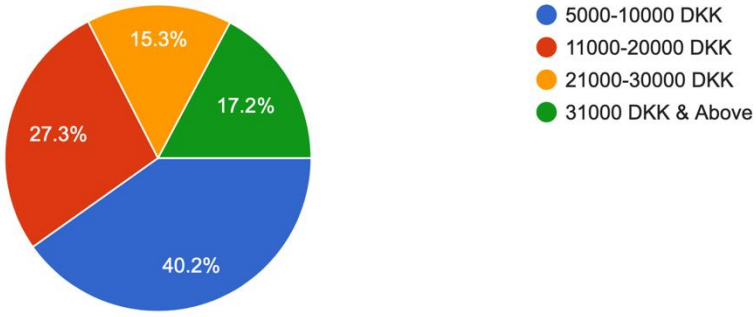
What is your current occupation?

213 responses



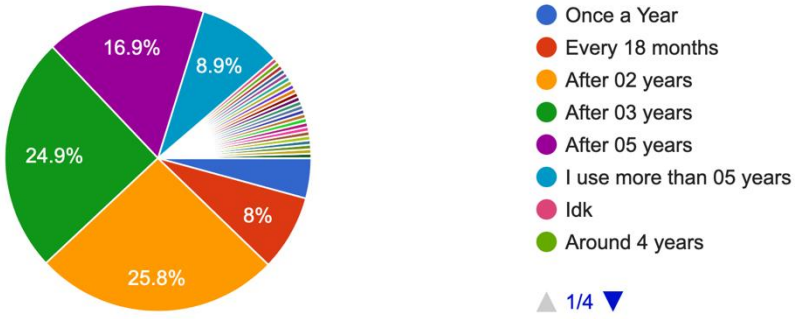
What is your approximate monthly household income after SKAT?

209 responses



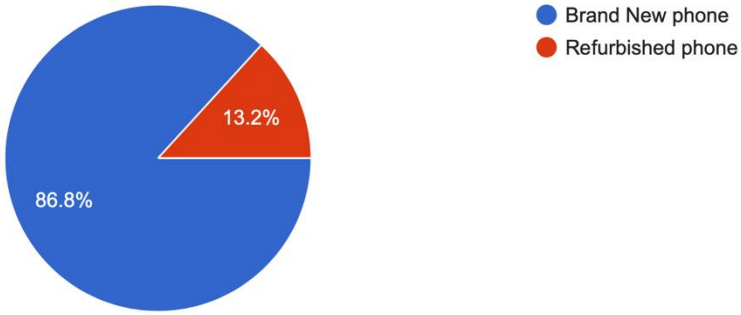
How often do you upgrade your mobile phone?

213 responses



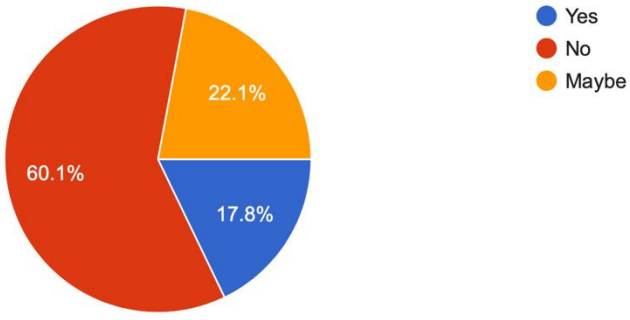
Do you prefer brand new phone or refurbished phone (Second hand phone)?

212 responses



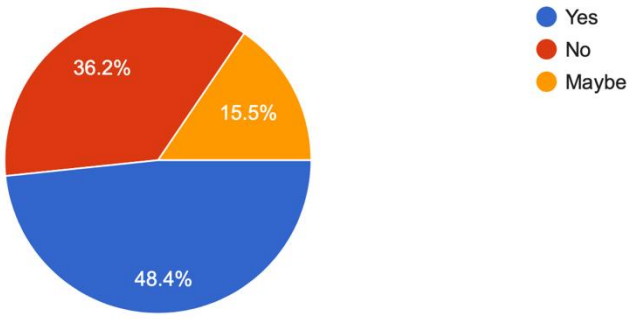
Do you consider about environment when you purchase a new mobile phone?

213 responses



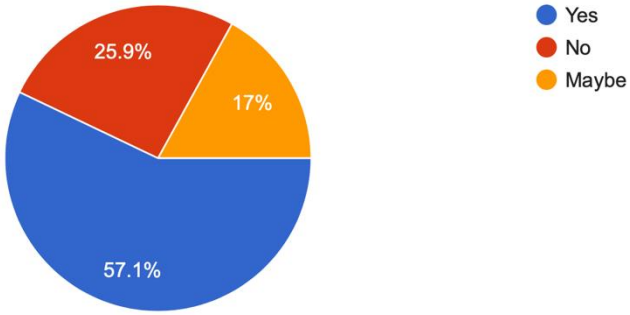
Do you know about e-waste?

213 responses



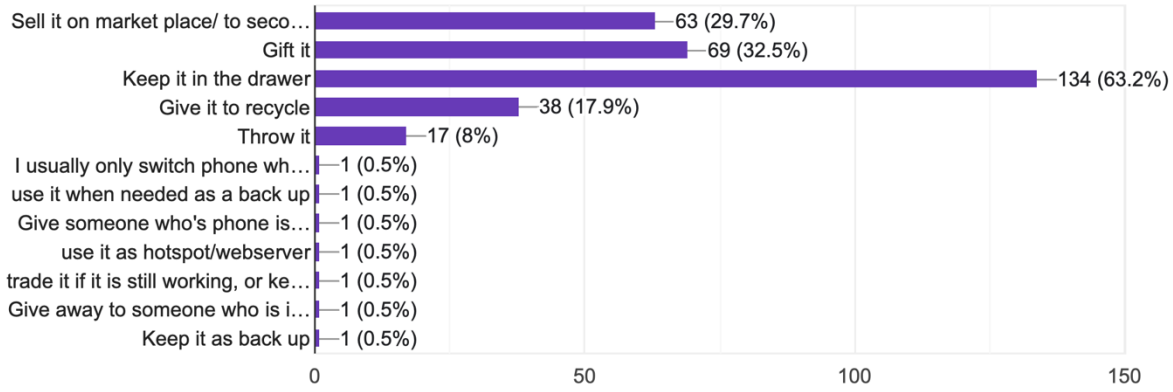
Do you aware about electric recycling?

212 responses



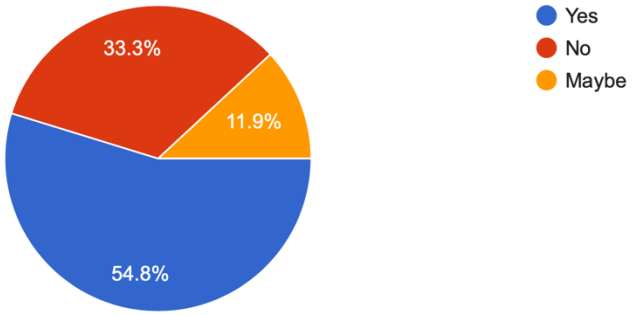
What do you do with your old phone?

212 responses



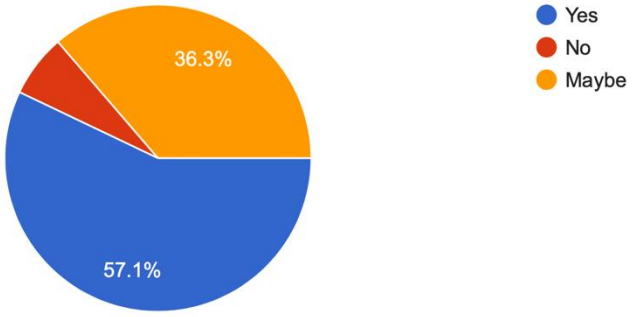
Do you know you can resell your used phone to second hand shops like Greenmind? Or trade off your old device with Telia / apple and get a discount on your new purchase?

210 responses



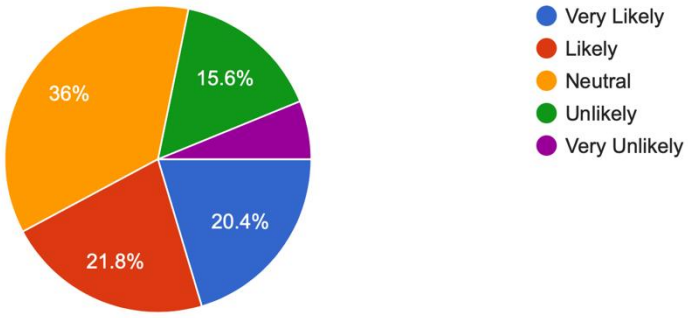
Will you recycle your unused old phones if you are incentiviced or given financial benefits?

212 responses



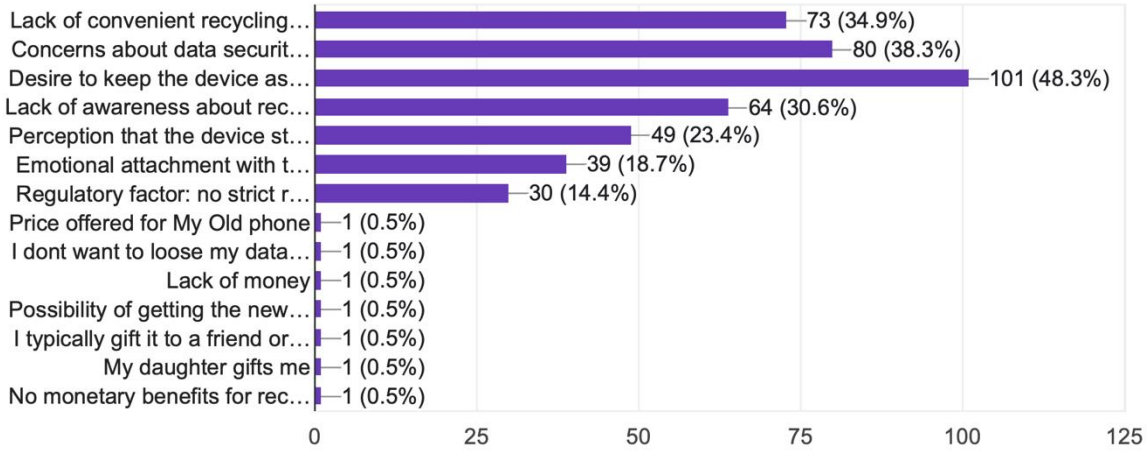
How likely are you to recycle your current mobile phone when you upgrade to a new one?

211 responses



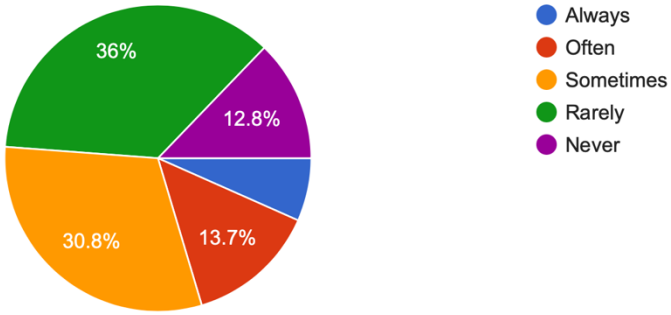
What factors influence your decision to recycle or not recycle your mobile phone? (Select all that apply)

209 responses



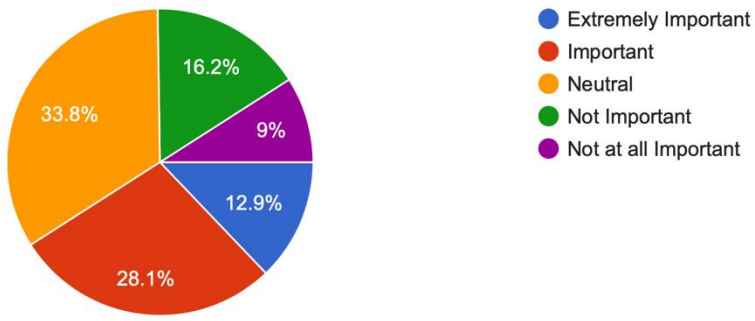
How often do you consider environmental impact when deciding what to do with your old mobile phone?

211 responses



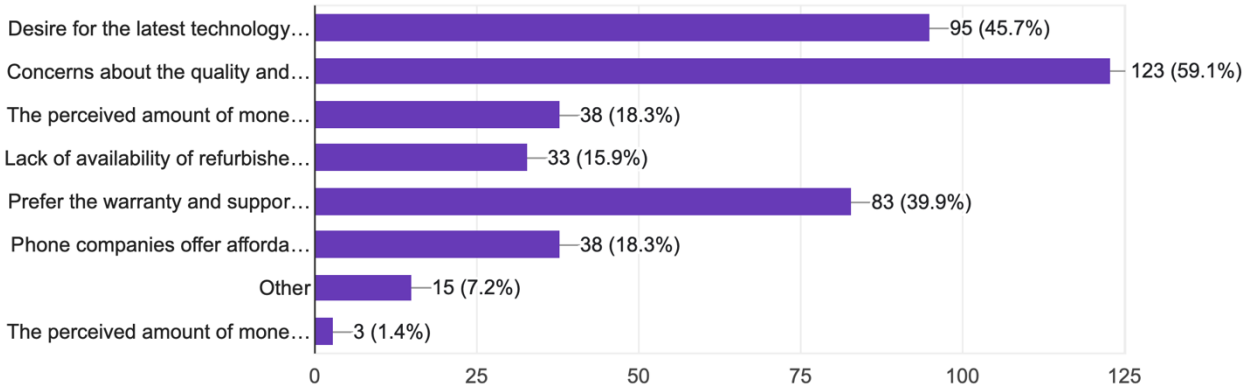
When purchasing a new phone, how important is it for you to have the latest model?

210 responses



What factors influence your decision to buy a new phone instead of a refurbished one? (Select all that apply)

208 responses



How likely are you to consider purchasing a refurbished phone instead of new phone for your next upgrade?

211 responses