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# OPTIMISING KPN'S TRADE-IN PROGRAM TO INCREASE RETURN RATES OF HIBERNATING PHONES

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July, 2025

# COLOPHON

Optimising KPN's trade-in program to
increase return rates of hibernating phones

**Master Thesis**
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# Preface

Dear Reader,

Welcome to the report of my graduation project, “Optimising KPN’s trade-in program to increase return rates of hibernating phones”. This report presents the final project of my Master’s degree in Strategic Product Design at the Faculty of Industrial Design Engineering, Delft University of Technology. I began my graduation project in February 2025 and completed it in July 2025. This project was conducted in collaboration with KPN.

Over the last five months I have conducted extensive research and field work, focussing on behavioural change in order to create a design strategy for KPN. I encountered significant challenges in changing consumer behaviour, particularly due to emotional barriers and scepticism around data privacy. These factors make it difficult to encourage users to return their smartphones, even when they understand the benefits. Additionally, most current practices remain heavily financially driven, which can limit their effectiveness in promoting lasting sustainable behaviour. This complexity inspired me to explore new approaches that balance financial incentives with trust and emotional engagement.

Before starting this project, I was determined to become a sustainable designer contributing to the circular economy. My goal was to help reduce waste and raise consumer awareness about the impact of their choices. This project offered a valuable opportunity to develop skills in designing for behavioural change that supports a more sustainable future.

I would like to express my gratitude to my academic supervisors, Ruth and Matthijs, for their valuable feedback, guidance, and support throughout this project. To my chair, Ruth, thank you for giving me the confidence to take on academic challenges and for the engaging conversations that made the process more enjoyable. To my mentor, Matthijs, thank you for the inspiring sparring sessions and for encouraging me to think outside the box, your enthusiasm and creative thinking were invaluable. I also want to thank my company mentor, Marlin, for helping me navigate challenges, connecting me with the right people, and making me feel welcome at KPN. our insights into KPN’s current innovations sparked my enthusiasm for the wide range of possibilities that sustainable practices can bring. At the same time, it gave me a deeper understanding of how difficult it is to change mindsets when implementing sustainability within large organisations.

I am grateful to everyone who contributed to this project, especially for the support and expertise of my fellow students, colleagues, and the experts at KPN who provided valuable insights throughout the project.

Lastly, thanks to my family, friends, and Teun for your excitement, advice and patience during this process.

I’m proud of the work I’ve done during this project and hope you find this thesis interesting. If you’d like to talk about my research, please don’t hesitate to get in touch!

Fien

# Executive summary

The growing problem of electronic waste and smartphone hibernation presents a critical challenge to sustainability efforts in the telecom industry, particularly due to the loss of critical raw materials. While many consumers express environmental concerns, their behaviour often does not reflect these concerns, especially when it comes to returning old smartphones. This graduation project explores how to bridge the gap between consumer intention and sustainable action, with a specific focus on improving KPN’s trade-in system.

The project shows that many consumers keep unused smartphones at home, often due to emotional attachment, concerns about data security, and unclear or inconvenient return processes. Although trade-in programs are available, participation remains low because consumers see little value in them and the systems lack visibility. Additionally, the current systems are focused mainly on short-term financial gain, without creating meaningful or lasting improvements in return habits. To address these challenges, the project uses a strategic product design approach that improves the return experience by increasing convenience, trust, and clarity.

Through extensive market, empirical and consumer research, including literature reviews, surveys and expert interviews, the project highlights a significant “attitude–behaviour gap.” To close this gap, a multifaceted design strategy has been created.  Focusing on making divestment intuitive, trustworthy, and rewarding.

The final design strategy is delivered as a technical roadmap and presents three horizons:

**Horizon 1** introduces a rebranded return program, including optimised return and repair logistics. The program focuses on accessibility, emotional reassurance, and increased visibility through physical touch points and media channels.

**Horizon 2** uses AI and customer data to personalise customer journeys, providing real-time insights, feedback, personalised nudging and tangible impact to encourage sustainable actions at key moments.

**Horizon 3** proposes a shift from an ownership toward an access-based model in which KPN gets ownership of devices. This shift is able to provide fully managed device lifecycles and ensure end-of-life returns. This access-based model is can provide circular use cycles through refurbishment and recycling.

This multifaceted strategy supports sustainable operations and aligns with KPN’s sustainability goals. By shifting mindsets and facilitating habit formation, it contributes to long-term behavioural change and an industry transformation. The strategy encourages consumers to see smartphone return not as a barrier, but as a meaningful and socially responsible action, motivating higher return rates, reduced e-waste, and a more circular economy.

# Terminology

## List of abbreviations

| | |
|---|---|
| **BER** | Beyond economic repair |
| **CE** | Circular economy |
| **WEEE** | Waste Electrical and Electronic Equipment |
| **AI** | Artificial Intelligence |
| **ANOVA** | Analysis of Variance |
| **SPSS** | Statistical Package for the Social Sciences |
| **KPI** | Key Performance Indicator |
| **EPR** | Extended Producer Responsibility |



## List of definitions

**Hibernating phone**
An unused smartphone that is kept inactive and stored away instead of being recycled, resold, or returned.

**Smartphone**
a mobile phone with advanced features that enable communication, internet access, and running applications.

**Device**
a (smart)phone that a user owns or uses to communicate and perform various tasks.

**Sustainable return behaviour**
A consumer's willingness to return devices using environmentally friendly methods that help reduce negative environmental impact.

**Positive behaviour**
Positive behaviour is the desired action of returning devices responsibly to support sustainability and social goals.

**Cloud technology**
Cloud technology provides services like storage and software over the internet, allowing remote access without using local hardware.

**Data transfer**
The process of securely and efficiently moving data from one device to another.

**Notification fatigue**
When users become overwhelmed or desensitised due to receiving too many notifications, leading them to ignore or disable them altogether

# Table of contents

# 01

# 1. INTRODUCTION

## 1.0 Introduction

This chapter introduces the context, goals, and structure of the graduation project. It presents the problem of smartphone hibernation and the challenges for sustainability within the telecom industry. The chapter defines the scope of the project, presents the design approach, and explains KPN's role. It also explains why the project is relevant, highlighting the need for behavioural change, the circular economy, and KPN's ambition to reduce e-waste through better return strategies. These elements present a starting point for the project and provide the basis for the research and design directions.

## 1.1 Project information

### 1.1.1 Problem definition

Many people keep old smartphones at home, often as backups or simply because they do not know how to dispose of them. Only 33,4% of old (smart)phones are being returned (Wilson et al., 2017). These (smart)phones end up forgotten in drawers, even though they still hold valuable materials that could be reused. This leads to wasted resources and adds to environmental problems.

Current systems for collecting and processing old devices are not working as well as they should. Consumers often feel unmotivated to return old (smart)phones while the process is not always clear, easy, or secure. Concerns about data safety and a lack of good incentives are common barriers (Ylä-Mella et al., 2022).

This issue impacts multiple stakeholders. Consumers seek a simple and secure way to dispose of their old devices, while recycling companies need a steady supply of used devices to recover valuable materials. At the same time, companies such as KPN aim to enhance their sustainability efforts and reduce waste.However, the effectiveness of KPN's current trade-in programme is limited, due to a secondary step in the online platform, which reduces both efficiency and convenience, leading to fewer devices being handed in.

This graduation project aims to address the challenge of closing the gap between people holding onto their old phones and the systems designed to collect and reuse them. Without better solutions, we miss the chance to reduce waste, save resources, and help create a more sustainable future.

### 1. 1.2 Problem statement

For this graduation project the following statement has been created:

*Despite growing awareness of the environmental impact of electronic waste and the potential of recycling, many consumers still keep old smartphones rather than returning them for reuse. Barriers such as concerns over data security, unclear processes, and lack of incentives contribute to low participation in recycling programs. Existing systems are inefficient, making it harder for consumers to return their devices and reducing the effectiveness of recycling efforts.*

### 1.1.3 Project goal

The initial project brief for this graduation project stated the following project goal:

*Design a system to understand consumer behaviour and develop practical solutions that encourage more people to return their old devices. The aim is to improve the recycle and/or trade-in process, increase device returns, and create value for all stakeholders, including KPN, its clients, and partners. This will be conducted by exploring what drives consumer decisions and looking at opportunities to secure a USP for KPN.*

The graduation project brief has been included in Appendix A. Section 4.2 includes a revised problem goal, that derived from key findings from research. This has resulted into a problem definition leading to a design brief for the develop and deliver phase of this project. This Design brief is a result from the research conducted.

## 1.1.4 Scope

This project is scoped within the Dutch telecom market. This project focusses on the Dutch consumer, however does take examples from other European telecom markets and consumer segments.

### Increasing smartphone returns

This project focuses on the return of used smartphones, which are classified into two main categories:

1. Smartphones Within Economic Repair
2. Smartphones Beyond Economic Repair (BER)

Smartphones Within Economic Repair are devices that are either still under warranty, no longer under warranty but still worth repairing, suitable for reuse, or ideal for refurbishment and future use. Smartphones Beyond Economic Repair, which are not financially viable to restore, still hold material value and can contribute to resource recovery and limiting the use of critical raw materials.

The scope of the project involves creating and/or improving processes and strategies to ensure these devices are returned, handled properly, and their value is recovered effectively. The goal of KPN is to increase return rates from 5% to 20% by 2030

### Creating a strategy

The goal for this graduation thesis is to support KPN in designing a strategy for increasing smartphone returns to minimise e-waste by improving reuse and return systems and optimise the use of critical raw materials through recycling.

This will be done by stimulating the consumer to rethink their smartphone purchase, use and disposal behaviour. By changing return behaviour KPN is able to increase active collection of e-waste and in particular smartphones. Material studies, product design and brand strategies have been excluded from the scope of this project, the focus lies with designing a strategy for behavioural change.

### Designing for the future

This project aims to develop a forward-thinking strategy focused on long-term implementation and sustainable impact. The project explores current markets, consumer segments, trends, and relevant research. These insights create a foundation for well-rounded, future-oriented strategies based on today's needs while anticipating future challenges.



## 1.1.5 Approach

This graduation project follows a Double Diamond approach, consisting of two main phases: **RESEARCH** and **DESIGN**.

The first diamond, **RESEARCH**, includes extensive literature and market research, supported by expert interviews and consumer research. These insights are brought together during the problem definition stage.  During this stage core challenges will be defined and a design brief will be created

The second diamond, **DESIGN**, focuses on developing the design strategy. This is an iterative design process in which each concept will be tested and validated. This validation will be done by user testing of the target segment defined in this project.

The process ends with a solution strategy, this solution will be iterated and validated based on research and design implementations to ensure long-term success.

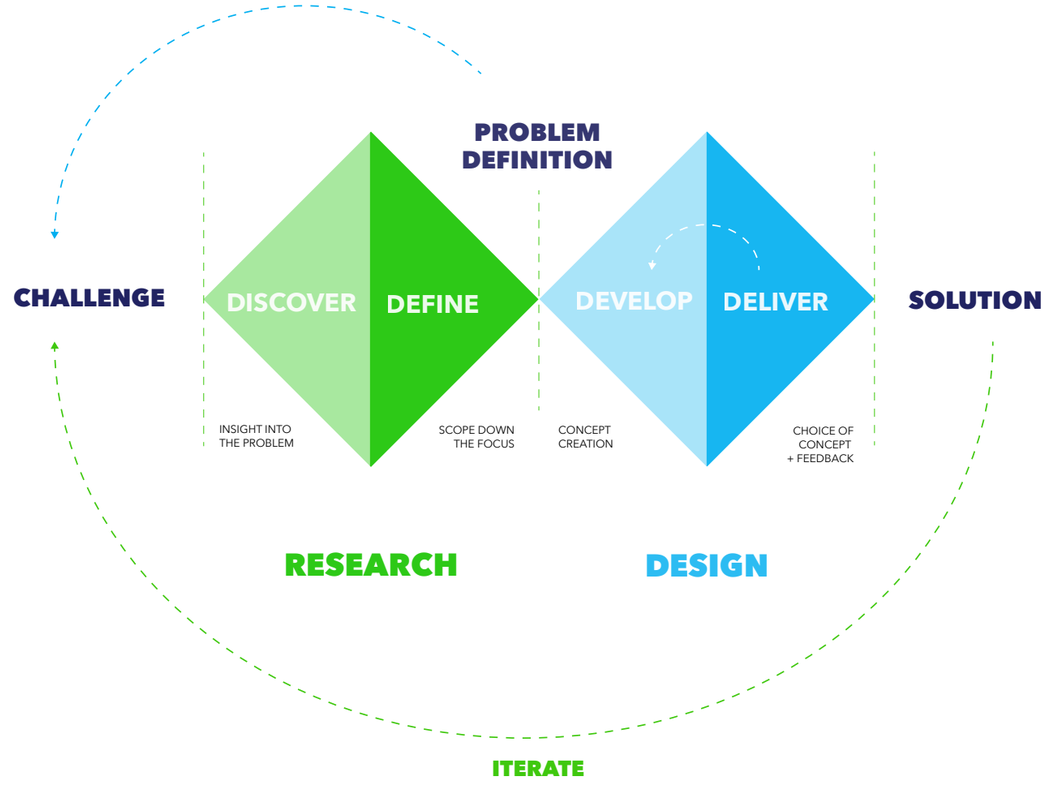



*Figure 1.1:  Double-diamond method*

## 1.1.6 Reading Guide

The report consists of 10 chapters. The first four chapters discuss the research phase. Chapter one discusses the project context, introducing the problem statement and the company. Chapter two presents a literature review, highlighting key insights from relevant theories. Chapter three presents market, empirical, and consumer research, using both qualitative and quantitative methods to provide new insights within the project context. Chapter four brings together the main findings and develops a project brief outlining the design requirements.

Chapters five through eight cover the design phase of the project. Chapter five presents the design process including co-creative sessions with both company and consumer. Chapter six presents and discusses the concept strategy in detail, incorporating critical insights for future optimisations. These optimisations are explored further in chapter seven through validation. Chapter eight focuses on optimising the concepts and offers recommendations for further research and development.
Finally, chapters nine and ten present the discussion and conclusion.

This report makes a distinction between key takeaways and critical insights, as presented in Figure 1.2.

**Key takeaways:**
Describe the most valuable insights from the research. These insights are based on research findings and form the foundation for design decisions.

**Critical insights:**
Discuss my interpretation of the research findings, offering a critical perspective on what is presented. It reflects my view on what works, what doesn't, and what could be improved. In some cases, the insights are actionable, outlining what I would or would not adopt based on the research. These reflections help connect theory to practice and guide design decisions throughout the project.

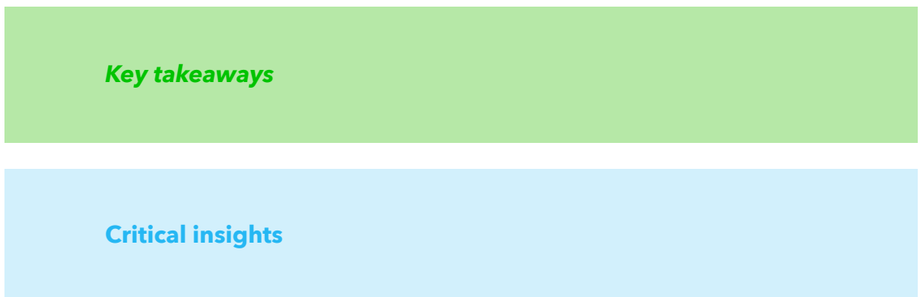



*Figure 1.2: Representation key takeaways and critical insights within the report*



# 1.2 Project context

This section introduces the company within this graduation project, KPN. Focussing most on KPN's current practises and their sustainable positioning. It serves to highlight current and future opportunities for circular innovation and implementation within the trade-in system, focussing on hibernating smartphones.

## 1.2.1 Company insights

### Koninklijke KPN N.V.

Founded on June 1, 1881, KPN was the first Dutch telecom network (then called NBTM) and was established following the first phone call in the Netherlands. In the years that followed, KPN, played an influential role in the creation, innovation, and maintenance of the Dutch phone network. It later introduced internet, Wi-Fi, and 5G. Since 1881, KPN's goal has been to connect the Dutch population. Now, in 2025, KPN is the leading telecommunications and IT service provider in the Netherlands. It offers fixed and mobile telephony, internet, and television services to both consumers and business customers. KPN also provides cloud, security, and data solutions for businesses and government organisations.

KPN defines three main brand values shown in figure 1.3.


*Figure 1.3: Brand values KPN*

These brand values can be taken into account when designing for KPN and their customers.

### Organisational overview

KPN operates according to their Connect, Activate & Grow strategy, KPN is building on growth, exploring the digital transformation and focusing more on customers. KPN does this by offering customers the best services and ultimate convenience.


*Figure 1.4: Strategic missions KPN*

*Currently KPN is focussing on 5 main topics:*

- Network
- Innovation
- Sustainability
- Safety
- Connecting society

These themes are reflected in many different parts of the organisation. KPN differentiates between the business and consumer markets, focuses on wholesale services, and considers customer interaction and sustainability as two of its most important strategic priorities. Figure 1.5 illustrates a part of the organisation where smartphone services are of importance.

The scope of the project is outlined within this figure and shows a project focus within consumer Mobile operations. Consumer touch points, are included within this figure while they could help understand customer journeys and provide valuable insights that contribute to creating the final design strategy.

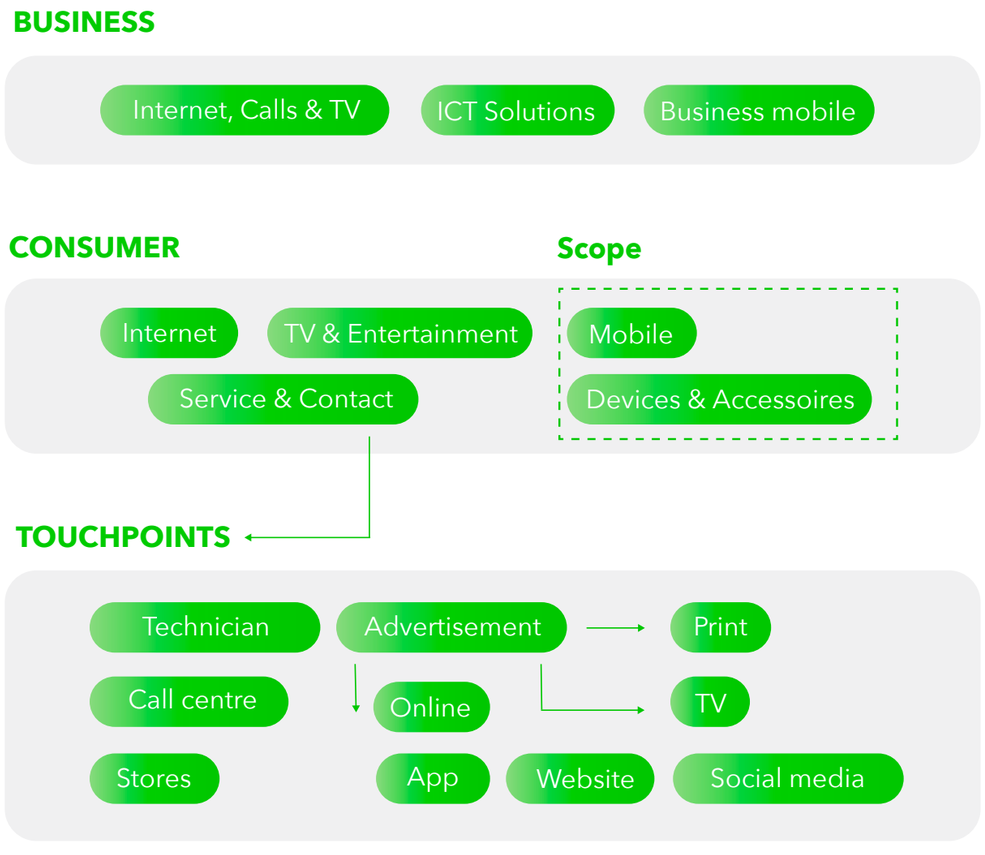



*Figure 1.5: Organisational overview - Mobile operations and scope*



## Sustainability at KPN

KPN was proclaimed as most sustainable in the telecom industry in 2024 (in the Netherlands). They focus a lot on implementing circular practices while minimising their CO2 footprint and including the SDG's. The ESG Manifesto gives an overview on KPN's focus areas which are:

1. **Sustainable**
2. **Inclusive**
3. **Responsible**

KPN places sustainability at the core of its business strategy, aiming to create long-term value for society, customers, and stakeholders. The company is committed to achieving net-zero emissions, promoting circularity, and advancing digital inclusion, all while ensuring strong network reliability and data security. KPN sees sustainability not just as a responsibility, but as a driver for the future.

Circularity plays a crucial role in KPN's approach. The company promotes the reuse and recycling of network equipment and consumer devices, both in-home and mobile. It also works to reduce the use of critical raw materials through stronger cooperation with suppliers, aiming to make its supply chain more transparent and sustainable.

In addition to environmentally sustainable practices, KPN is highly invested in inclusion and diversity. It does this by offering accessible services for vulnerable groups and supporting initiatives such as the "KPN Mooiste Contact Fonds", which helps connect people who are socially isolated.

Security and reliability are also key priorities. KPN positions itself as a trusted provider in an increasingly digital world, with a focus on AI, data safety, and online protection, especially for youth.

KPN includes sustainability goals in how the company is managed and led. By making sustainability part of its overall strategy, daily operations, and company culture, KPN shows their attitude towards making a positive impact. This approach makes KPN a strong example of how a digital company can grow in a responsible and future-focused way.

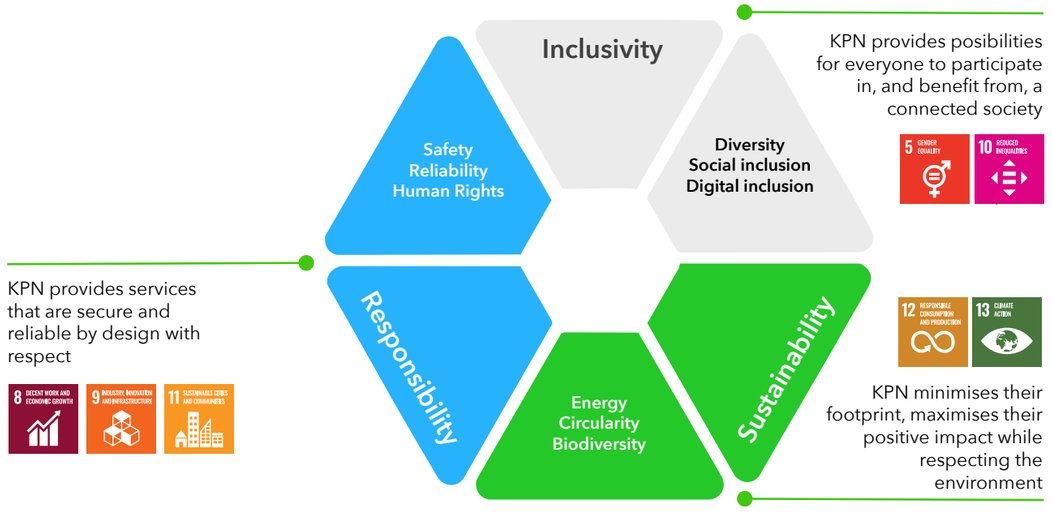



*Figure 1.6: ESG Manifesto (KPN, 2024)*

Consumers generally view KPN as a trustworthy and responsible brand, especially in terms of sustainability. It's consistently rated the most sustainable telecom provider in the Netherlands, thanks to its use of 100% green electricity, climate-neutral operations, and clear goals for net-zero emissions by 2040. KPN's efforts in recycling, energy reduction, and digital inclusion strengthen its image and build consumer trust.

**Critical insights:** Even though KPN's efforts towards sustainable practises, and their ESG Manifesto offer a great foundation for a circular economy, they fail to implement this vision throughout the company. Their annual report (2024) shows great targets but lacks actionable approaches towards reaching these targets.

Many aspects of KPN operations remain commercially driven. While sustainable practices are said to be a priority, they often take a back seat when profitability is at stake or costs become too high. This creates several barriers from a sustainability perspective. For example, in-store device collection faces significant hesitation due to security concerns, making circular practices harder to realise in practice. KPN should prioritise and embrace these sustainable implementations.

KPN should therefore not only say that they are sustainable but  make it visible and actionable within daily operations and for consumers.

### Partners

Within this graduation project and this project scope KPN partner Recommerce is defined. This is a current partner of KPN, managing their trade-in system.

re!commerce

Recommerce is one of the leading organisations in Europe when it comes to the buyback, refurbishment, and resale of electronic devices. Since 2009, the company has processed millions of smartphones and other electronic products, giving them a second life through high-quality, automated and sustainable methods. Recommerce combines innovation with circular economy principles to help reduce electronic waste on a large scale.



## 1.2.2 Challenges

This graduation project identifies several initial challenges. Current issues include consumer concerns regarding data security, a lack of clear incentives, and logistical inefficiencies in the return process. KPN has defined the following challenges within their current system:

- Consumer behaviour towards returns of hibernating phones
- Security and legislation issues for in store returns and collection
- Low return rates of old devices

### Consumer behaviour towards returns of hibernating phones

Smartphone hibernation is a common practise for most consumers. The challenge that arrises is changing these behaviours of passive consumers, while these hibernating smartphones still hold financial and/or environmental value. Barriers that arise are; data security, lack of convenience and lack of incentives for the consumer.

### Security and legislation issues for in store returns and collection

KPN is working towards in store returns, mainly targeting hibernating smartphones without financial value, also known as devices beyond economic repair. These devices will be processed through recycling and still hold critical raw materials. Challenges that arise are; employee safety when storing phones in stores, security issues and partner negotiations.

### Low return rates of old devices

One of the major challenges in e-waste management is aligning consumer behaviour with return policies. Despite growing awareness, return rates for electronic waste remain low, which can negatively impact KPN's reputation and positioning. Companies that sell electronic devices are required to collect and recycle the same amount of the products they sell, as described in regulations such as the WEEE Directive. This requirement brings several challenges: optimising complex logistics networks, ensuring compliance with various legal frameworks, and developing efficient return systems both within the company and with external partners. Addressing these challenges is essential for meeting legal obligations and supporting a sustainable and reliable brand image.

# 02

# 2. LITERATURE REVIEW

## 2.0 Introduction

This chapter reviews existing theories and research relevant to understanding consumer behaviour and the factors influencing the return of hibernating smartphones. It explores behavioural barriers, motivations, and systemic challenges identified in previous studies, providing a foundation for developing effective design strategies. The goal is to gain insight into how consumer behaviour can be influenced and what strategies KPN could adopt to increase return rates and start adding sustainable impact.

## 2.1 Literature research

Understanding behavioural change in the hibernating phone context.

***What to find in this section:***


### 2.1.1 Circular economy

Smartphones are highly embedded into people's daily lives (Rizos et al., 2019); however, so is electronic waste (WEEE). Over half of smartphone users use their phones for two years. After these two years, the model becomes obsolete, and the consumer is in need of a newer model (Ylä-Mella et al., 2022). WEEE is becoming a growing problem due to the fast release of new products and features.

#### Premature obsolescence

Planned obsolescence is a strategy implemented by manufacturers to deliberately shorten smartphone lifetimes, causing consumers to replace their devices even more frequently (Barros & Dimla, 2021).

This planned obsolescence can be implemented through hardware, by designing smartphones and components that are difficult to replace or repair. By increasing the difficulty of repair, manufacturers increase the risk that consumers may further damage their devices or find it impossible to replace components. Obsolescence through software is implemented by slowing down the device with each update while also making apps incompatible with this new software. This makes the operating system less functional, causing consumers to replace their device. (Barros & Dimla, 2021).

Lastly, obsolescence is stimulated by introducing models with improved features, leaving the consumer wanting the newest models. The practice of planned obsolescence plays a major role in the growth of electronic waste, as it encourages frequent smartphone replacements, leading to more devices being discarded.

In order to tackle this obsolescence the EU has implemented regulations, focusing on improving product lifetime, repairability, transparency towards consumers and

supporting the shift towards a circular economy. These include the following directives:

- Ecodesign for Sustainable Products Regulation (ESPR) (European Commission, 2024)
- Right to Repair Directive (European Parliament, 2024)

These directives include regulations for product durability, reliability, reusability, upgradability, repairability, and recyclability. These directives prohibit both hardware and software obsolescence. ESPR focusses on increasing lifespans by prohibiting software that slows down smartphones and making sure components will only fail when they are actually obsolete (European Commission, 2024). The Right to Repair Directive focusses on improved access to repair services and information, while making repairs more affordable (European Parliament, 2024).

Although KPN, as a telecom provider, does not have direct influence on how companies design for obsolescence, they do have an obligation to participate in sustainable practices. They should therefore comply with the directives by promoting extended lifecycles and repairability.

### Circular Economy (CE) practices

When talking about sustainable practices, the circular economy is an essential part. Mapping and improving resource management is crucial when looking at traditional waste streams. The closed-loop economy and 'Design to Redesign' (Murray et al., 2015) is a great way to ensure sustainable practices for the future and make sure resource efficiency, recycling, and designing products for longevity and minimal ecological impact are prioritised. It is key that people take responsibility for the products and services they use while looking beyond use and also focusing on discarding their materials (Gardetti, 2019). This statement involves multiple stakeholders, such as designers, manufacturers, distributors, and consumers.

According to Rizos et al., smartphone end-of-life is not properly collected and recycled within the EU. Additionally, end-of-life can be postponed, as smartphones can have multiple lives through repair, refurbishment, reuse, and reselling.

In the context of smartphones, Rizos et al. (2019) propose the following value chain in the circular economy model shown in Figure 2.1.


*Figure 2.1: Value chain in a circular economy (Rizos et al., 2019)*

In order for the CE cycle to optimise efficiency, it is crucial for products to be placed back into the loop. Policy can help ensure the re-entry of these products. The collection rates for smartphones is researched to be below 5% according to the European Commission (2023). These policy recommendations include; financial incentives, increasing the use of postal services, establishing partnerships between take-back operators and increasing awareness among consumers on the environmental impact of not handing in WEEE properly.



***Key takeaways***

Smartphones are typically **replaced every two years**, due to planned obsolescence, contributing to e-waste. The Circular Economy (CE) promotes waste reduction through reuse, repair, and recycling, but smartphone end-of-life is poorly managed in the EU, with **collection rates under 5%.** Extending device lifespan and improving take-back programs are key to promoting sustainability. KPN needs to comply with regulations by promoting extended lifecycles and repairability.

## 2.1.2 Hibernation of phones

A hibernating mobile phone is a device that is no longer in active use but remains stored by its owner instead of being recycled or resold. This behaviour poses a challenge to electronic waste recovery, as it delays the return of valuable materials like gold, silver, and palladium into the system (Inghels & Bahlmann, 2020). Over time, as these phones remain unused, their worth decreases, making it harder to recover their materials efficiently. As a result, the demand for newly mined raw materials increases, adding pressure to environmental resources (Wilson et al., 2017).

Many consumers replace their mobile phones due to factors such as outdated technology, reduced functionality, or the availability of newer models (Ylä-Mella et al., 2015). However, instead of disposing of their old devices, they often keep them as backups or for sentimental reasons (Wilson et al., 2017). Another key reason is a lack of awareness regarding recycling options. Research has shown that in some cases, phones are kept in storage for a longer period than they were actually used (Inghels & Bahlmann, 2020). Studies conducted in the EU, in countries such as the UK, the

Netherlands, and Finland, show  that more than half of consumers hold onto their old phones, instead of handing them in for recycling.

A study by Wilson et al. (2017) shows that students keep their old smartphones for multiple reasons. Many keep them as spare phones, thinking they might need a backup in the future, however most of these devices remain untouched.

Additionally, Poppelaars et al. (2020) applied divestment theory to explain why people struggle to part with old devices. Emotional attachment to a smartphone, concerns about data security, and a lack of clear and convenient disposal options all contribute to delayed returns. The reality of hibernation is that these smartphones are unused and untouched for years. People often intend to return their devices but hesitate due to uncertainty or the belief that their old phone still holds value.

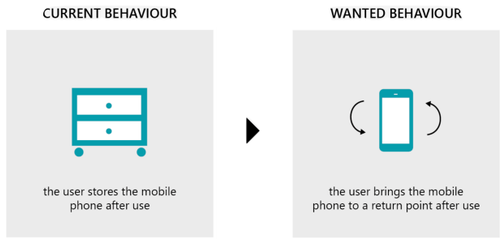



*Figure 2.2: Current and wanted consumer behaviour by Poppelaars et al. (2020)*

Minimising smartphone hibernation is essential for ensuring sustainable consumer practises and conserving natural resources. Many smartphone users do not realise the environmental impact of hibernation, and without the correct incentives or accessible and convenient recycling systems, it is unlikely that these consumers will take action (Inghels & Bahlmann, 2020). Increasing awareness and offering financial rewards for recycling could encourage more people to return unused smartphones, ensuring that valuable materials are recovered and reused rather than wasted.

***Key takeaways***

Many consumers keep old phones instead of recycling them, delaying the recovery of valuable materials. **This smartphone hibernation often happens when people get a new device**. Since most phone purchases replace older ones, this adds more devices into circulation.

Divesting old phones is difficult due to data security concerns and unclear disposal options, creating **mental barriers.** A lack of awareness about environmental impacts also contributes to unused phones being stored for years.



## 2.1.3 Consumer behaviour

In this section theories based on consumer behaviour will be discussed. Theories have been placed in the context of phone hibernation behaviour.

### Theory of planned behaviour

The theory of planned behaviour (TPB) is a well known theory created by Icek Ajzen (1991), which can be has been visualised in figure 2.3. With this theory Ajzen attempted to predict human behaviour. TBP assumes social influences drive behaviour.

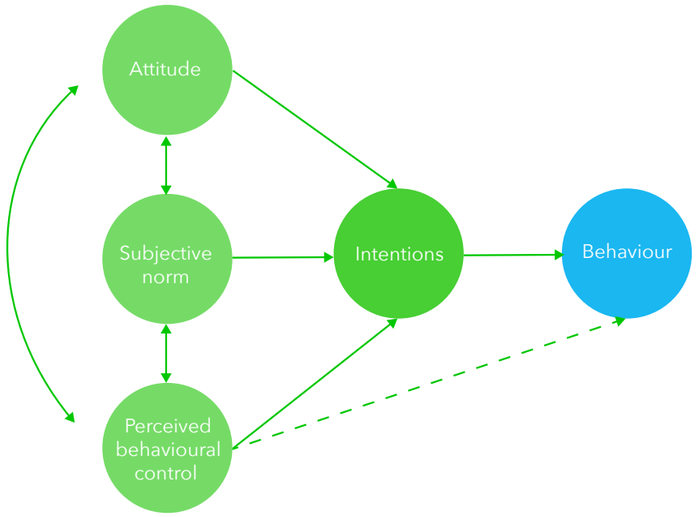



*Figure 2.3: Theory of planned behaviour (Ajzen, 1991)*

The TPB explains how human behaviour is influenced by their intention towards that behaviour. This intention formed by three factors. These factors being: Attitude (internal motivation), subjective norm (external motivation) and perceived behavioural control (a person's belief in their ability to carry out certain behaviour).

Saari et al. (2021) discuss how the TPB relates to sustainable actions. Their study shows that understanding environmental issues and risks has influence on people's attitudes, which will influence their intentions and actions. This preferred positive TPB model is illustrated in figure 2.4. However, challenges like high costs and lack of infrastructure can make it harder for consumers to act upon these behavioural intentions, this can be seen in figure 2.5, showing the current state of TPB.

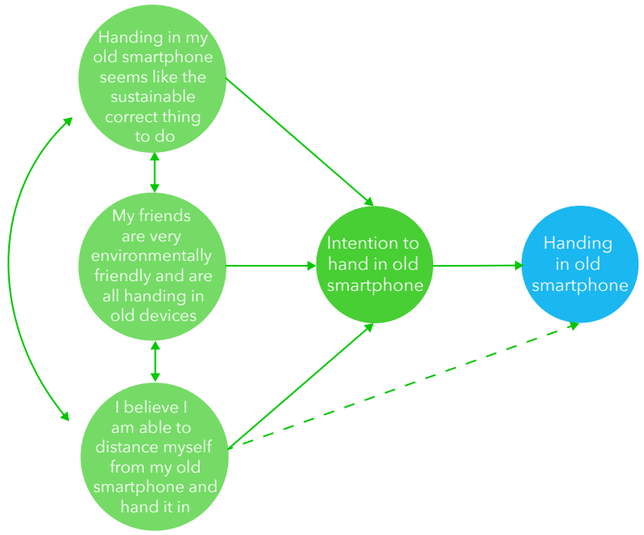



*Figure 2.4: TPB ideal behaviour example*

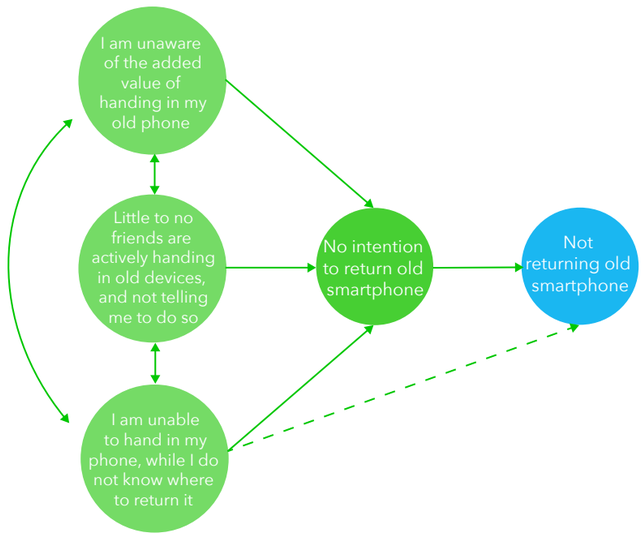



*Figure 2.5: TPB current behaviour example*

Ylä-Mella et al. (2015) confirm this lack of intention and action while results of the study show that awareness among consumers of the importance and existence of waste recovery system is high. It can be concluded that although knowledge is present and awareness is high, it does not result in positive behaviour towards recycling and re-use of smartphones.



## Attitude-behaviour gap

A study by Boulstridge and Carrigan (2000) highlights the attitude-behaviour gap in consumerism. It was found that while consumers claim to support environmental issues,  their actual buying decisions do not reflect this.

Similarly, quantitative research by Ratay and Mohnen (2022) on smartphone returns in Germany, identifies a clear disconnect between environmental awareness and actual return behaviour. While many consumers acknowledge the sustainability benefits of returning unused and hibernating smartphones, their actions are primarily driven by financial incentives and convenience rather than environmental considerations.

This attitude-behaviour gap is clearly shown in the low participation rates in smartphone return programs, despite widespread environmental concern. The study found that cash rewards were much more effective in getting people to return phones, and only 18.4% of those who said they would return a phone actually clicked the link to do so (Ratay & Mohnen, 2022).

Additionally, a study by Whitley et al. (2016) found that while most college students had a positive attitude toward sustainability, their behaviours were inconsistent. This is confirmed by the survey results of Wilson et al. (2017). They found that students keep their old smartphones for various reasons; many hold onto them as a spare phone, believing they might need a backup, yet most of these devices remain untouched. This shows that many students support environmental initiatives but lack a clear understanding of specific sustainable actions, leading to an "attitude-behaviour gap."

This gap between what people say and what they do is a major barrier to sustainable smartphone recycling. Understanding this gap is key to creating programs that encourage real change.

***Key takeaways***

A clear gap between environmental awareness and actual behaviour can be concluded. Current return programs present barriers that refer consumers from actually acting upon their sustainable intentions. It is key to understand these barriers.

**Incentives (often financial) and added convenienc**e are proven to be more effective than environmental concerns. The system should **promote clear, sustainable behaviours** by combining internal motivation and social norms to encourage returning behaviour of hibernating phones.

## Fogg Behaviour Model

A well-known and highly used theory within consumer behaviour studies is the Fogg Behavioural Model (FBM). This model was created by dr. B.J. Fogg (2009). FBM explains human actions as a result of three key factors; motivation, ability, and triggers.

An example on how to apply the FBM within the smartphone collection behaviour context is given in figure 2.6. This figure represents a group of smartphone users in the FBM. The preferred outcome for collection of phones, is both groups appearing in the trigger zone that leads to positive trigger to action.

A smartphone user, as mentioned in section 2.1.2, tends to store their phone as back-up or is in need of more convenience in order to hand in their phone.

Physically, consumers should be able to hand in their phones, while the required methods are already in place. Their perceived behaviour does not always match this physical ability. The motivation in this example is lacking, this motivation can highly vary among consumers. The motivation for emotional detachment is highly related to environmental knowledge and subjective norm. Sparked motivation, could lead positive intention and behaviour, as mentioned in TPB. The influence of subjective norms encourages individuals to participate, as they avoid social rejection at all cost and want to be level with their peers and be part of a collective effort

When sparking motivation fails, or consumers find themselves having low motivation, convenience can become the deciding factor in turning an intended action into a successful behaviour. Return programs have been put into place by multiple organisations and providers. An example of such a return program is the trade-in program of KPN. Where they offer discounts and financial benefits for consumers purchasing a new phone. Despite their efforts, they have failed to facilitate and motivate consumers to return hibernating phones, while the majority of consumers still store one or more phones in drawers at home.

This issue can be addressed by adding an element of simplicity. When the process of handing in a device is made simple and effortless, users may still take action despite lacking strong motivation. Ease of use plays a crucial role in decision-making and action. This is confirmed by the study of Ylä-Mella et al. (2015), in which they discuss the five elementary components of convenience in order to achieve high collection rates of WEEE. The components include; **(1)** knowledge requirements, **(2)** proximity to the collection point, **(3)** opportunity to drop-off materials, **(4)** inducement of the collection point (e.g. desirability or availability of services), and **(5)** ease of the process.

Currently, these five components do not add to the collection of hibernating phones. For some consumers, some of these components are missing, for other consumers the components do not exist. Meaning that all components of convenience have a negative outcome.

Consumer attitudes and motivation to engage in sustainable behaviour vary across different groups, and well-designed triggers can help close this gap, leading to greater participation and engagement.

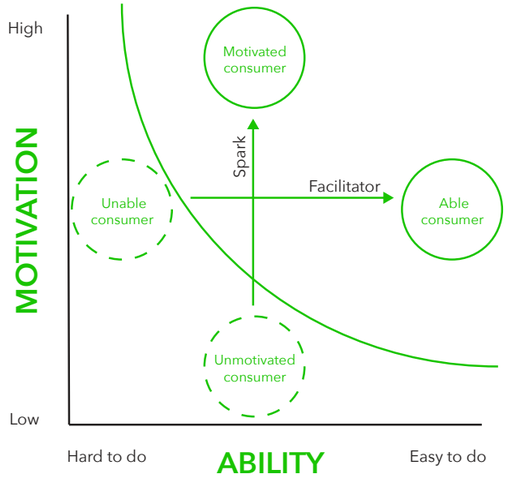



*Figure 2.6: FOGG model using trigger*

***Key takeaways***

Despite existing return programs, motivation to hand in hibernating smartphones is often low. Boosting motivation and **simplifying the process** can increase participation.

The design should prioritise **convenience and accessibility.** Effective triggers can bridge the gap between intention and action, while reducing emotional attachment and ensuring ease of return.

Thinking about **when these triggers are presented** can have an effect on participation, this should not only be presented during the purchase of a new phone.

## 2.1.4 Behavioural change

### SHIFT Framework

The SHIFT framework, created by White et al. (2019) is a framework explaining behavioural change. This framework focusses on pro-environmental behaviours of consumers. The contradiction between what consumers say about sustainable practices and their actions, is a great challenge for companies and policy makers when looking at sustainable consumption (White et al., 2019).

White et al. proposes five factors for shifting consumer behaviour towards pro-environmental behaviour. These factors include the application of ; social influence, habit formation, individual self, feelings and cognition and tangibility (figure 2.7).

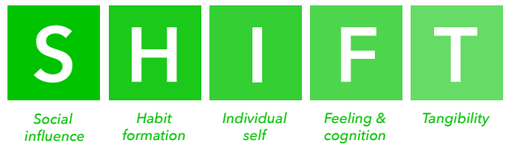



*Figure 2.7: Five factors for shifting consumer behaviour*

The majority of consumers show positive attitudes towards sustainable behaviours, they however do not act upon these attitudes. White et al. (2019) mention that positive emotions can have a positive effect on eco-friendly behaviours. These emotions can derive from multiple factors in the SHIFT framework. Figure 2.8, illustrates an implemented SHIFT framework of behavioural change strategies in the context of the hibernating smartphone problem.

***Key takeaways***

The framework reveals behavioural change opportunities. Beyond altruism, consumers may be driven by **"warm glow"**; the personal satisfaction from acting sustainably.

To turn intention into action, **clear knowledge and tangible impact are essential**, helping consumers form informed attitudes.

The solution should **prioritise environmental impact** over financial gains. While financial rewards can act as short-term triggers, they are unlikely to stimulate lasting behaviour change. Instead, the design should focus on **long-term strategies that ensure sustainable habits** and behavioural shifts.

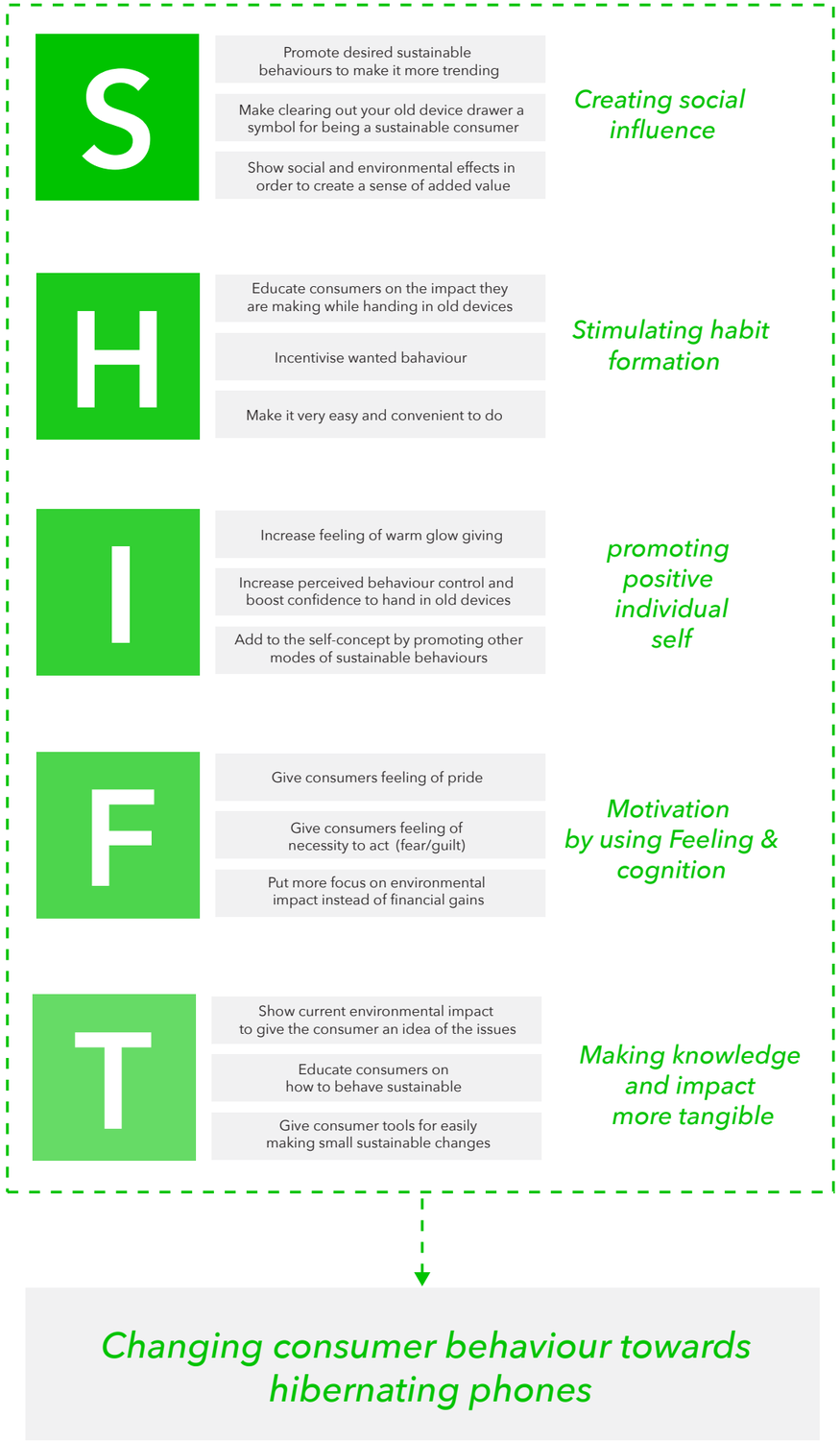



*Figure 2.8: Implemented shift framework*

## Designing for divestment

Previous chapters have briefly discussed the role of emotional attachment toward hibernating phones. To better understand and design for this attachment, this chapter will focus on strategies for facilitating the process of detachment, what trigger consumers need to successfully do so, and how they eventually dispose of the hibernating phone.

The study of Poppelaars et al. (2020) shows a cognitive model, depicting the divestment process (Figure 2.9).

The divestment theory proposes different processes of divestment and distinguishes, detachment (emotional distancing) and disposition (physical distancing).
The empirical study of Poppelaars et al. (2020) shows interesting results from data. Being able to create an overview of factors that shape the divestment process and add to the design of a strategy. Table 2.1 shows these main factors. This table shows multiple types of compensation. Financial compensation, currently being provided within the trade-in system, technological compensation, which could be provided through offering extra storage and psychological compensation possibly provided through social value.

Table 2.1: Main factors relating to divestment methods (Poppelaars et al., 2020)

| Main Factor | Description |
|---|---|
| Awareness of collection solutions | User knowledge on the existence of collection options and how they work |
| Understandable collection solutions | Easy to understand messaging on the benefits and the procedure to follow to reduce uncertainties |
| Reversing physical condition | Postponing divestment by extending the product use cycle through software refreshment or through hardware repair and refurbishment |
| Financial compensation | Perceived and actual monetary value in exchange for divesting the device through the collection solutions |
| Technological compensation | Perceived and actual engineering value in exchange for divesting the device through the collection solutions |
| Psychological compensation | Perceived and actual moral, relational (with phone, community, brand, telecom provider) and symbolic award to users in exchange for divesting the device through the collection solutions |
| Effortless collection | Unburdening users from the hassle of collection through omnichannel, available and accessible collection infrastructures |
| Freedom of choice | Leaving decision-making possibilities open for users |

These factors have been translated into ten design principles. These design principles can be seen in Figure 2.10. Within the theory of divestment, Poppelaars et al. (2020) distinguish users and artefacts. The artefact in this study is the hibernating phone, the users can be defined as consumers of KPN with the focus on consumers with hibernating phones at home.

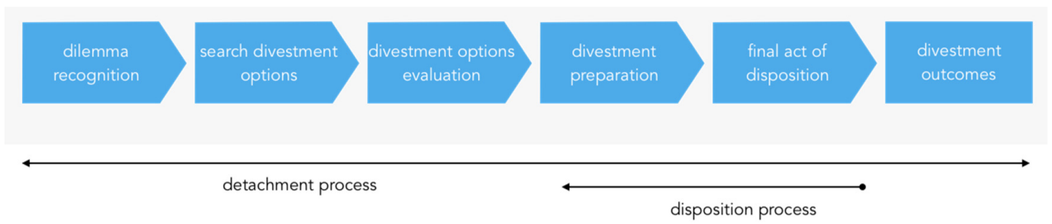



*Figure 2.9: Cognitive model of the divestment process (Poppelaars et al., 2020)*

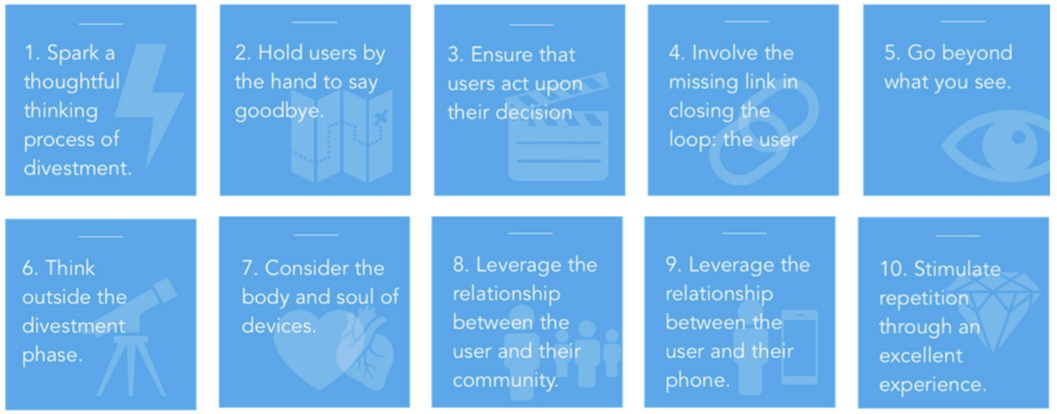



*Figure 2.10: Designing for Divestment, Design principles (Poppelaars et al., 2020)*

In the context of hibernating phones, these ten principles have be applied (figure 2.12). This overview discusses design needs for divestment and consumer view towards certain steps within the divestment process. These applied principles are able to create a strong foundation for detachment and disposition.

Figure 2.11 presents an overview created based on the extending product life through reuse overview from WRAP (2017) explaining the disposition options, integrated into the divestment process consumers go through. This gives insight into the options presented when consumers eventually decide to de-hibernate their old smartphones.

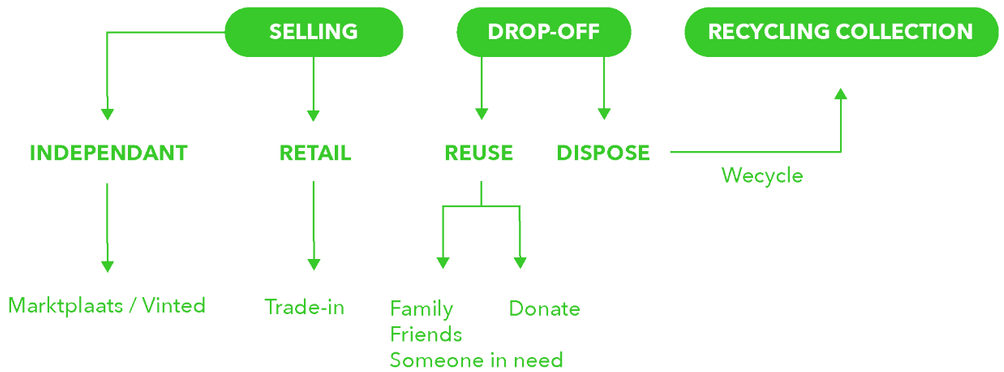



*Figure 2.11: Disposition options within the divestment model* (WRAP (2017))

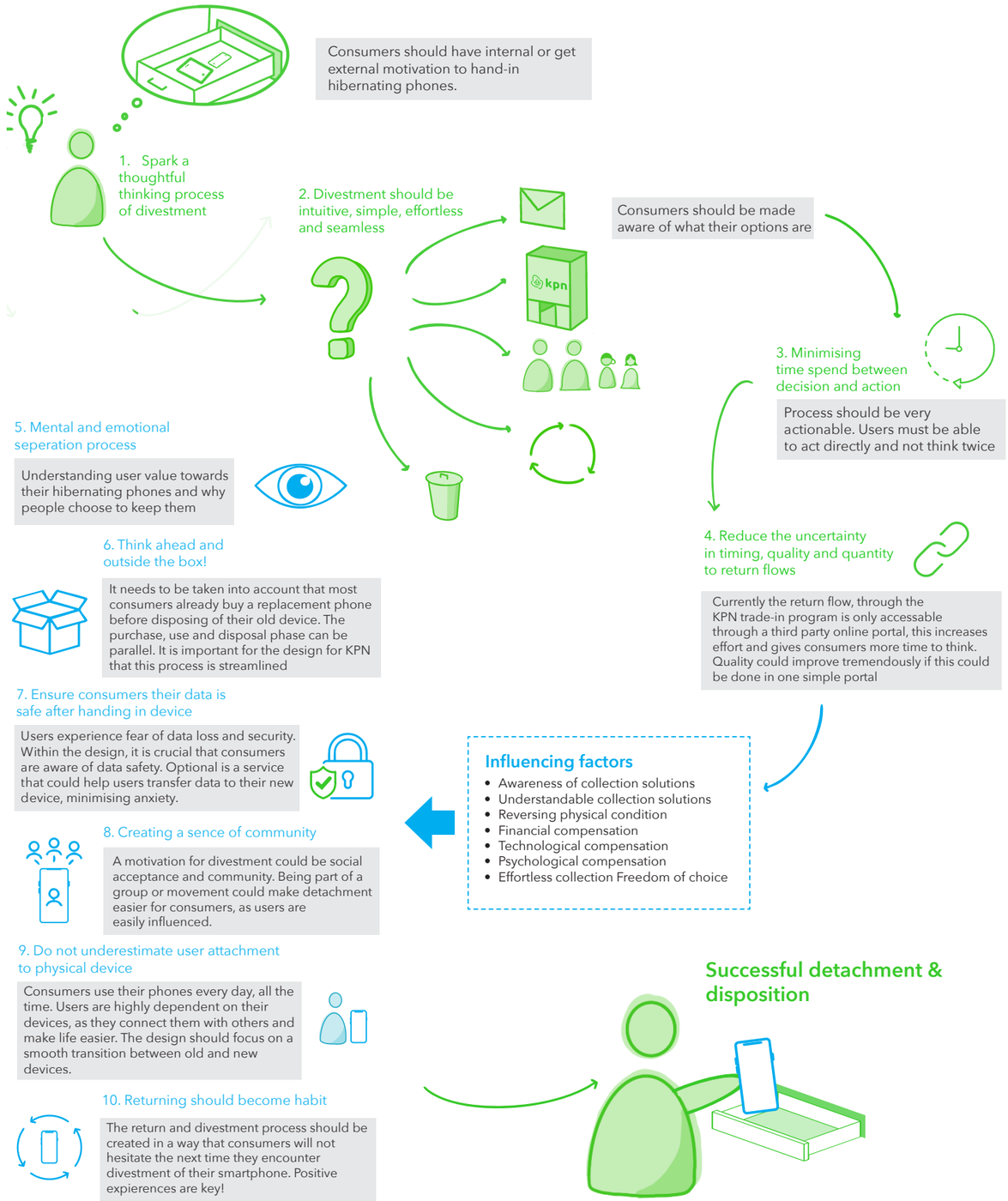



*Figure 2.12: Divestment journey for consumers with hibernating phones*



***Key takeaways***

Successful divestment processes are able to **facilitate emotional detachment** and therefore is able to increase return rates

Facilitation is done through the use of influencing factors. It is important to note that divestment exists parallel to purchase and use. Ease of return is an important factor while time spend on decision making can limit divestment behaviour.
Most important is to provide quality and convenience, in order to **minimise "think-twice" behaviour.**

**Problem recognition typically occurs during phone replacement**, when the current device still holds financial value. However, it's harder to trigger this problem recognition for phones beyond economic repair, usually only recognised by those aware of environmental impacts. The solution should address and **stimulate problem recognition** for both types of phones.

## 2.2 Conclusions

When addressing the issue of hibernating phones, it is important to consider both short-term actions and long-term behavioural change. In the short term, there is a clear need to reduce the growing environmental impact of smartphone hibernation and comply with circular economy targets and directives. At the same time, consumers, who are motivated but lack ability, show intention to act if these barriers were removed. These consumers present short term opportunities to increase the number of returns.

However, long-term change requires more than convenience facilitation. Emotional attachment, subjective norms, and low perceived urgency of handing in hibernating phones are present in current consumer behaviour.  These are much more difficult to shift. Lasting behavioural change for smartphone divestment requires more than facilitating trade-in programs. It involves insights into the underlying reasons why people hesitate to let go of their devices. Emotional attachment, uncertainty about data security, and keeping smartphones as a backup are key barriers. In order to stimulate the divestment process, principles for designing for divestment should be integrated into the customer journey.

In the short term, the opportunity lies in making divestment easy, effortless, and emotionally comfortable. Consumers are more likely to act when the process is simple, the benefit is clearly communicated, and the risk feels low. In the long term, the challenge is to shift behaviour by shifting consumer views on returning their smartphone not as a loss, but as a responsible action that aligns with consumer values and norms.

## 2.3 Research Questions

The main research question is defined as:

***How can the trade-in system of KPN be improved to increase the collection of 'hibernating smartphones' ?***

This can be translated into the following design challenge for this graduation project:

*" Enhance the trade-in service of KPN for increased collection of hibernating smartphones, through behavioural change and consumer engagement "*

RQ1: How do consumers experience the divestment process?

a. Do consumers see hibernating phones as a problem in the first place
b. How do consumers dispose of their hibernating phones (Selling (independent / retail), Drop-off (Reuse / dispose), Recycling collection)

**Method:** Consumer survey
**Results:** Quantitative data analysis (3.3.2)

RQ2: Does environmental awareness have a significant influence on return behaviour?

a. Is there an attitude-behaviour gap between being environmentally conscious and handing in old smartphone for reuse or recycling?
b. What impact does environmental knowledge have on behavioural intention

**Method:** Consumer survey
**Results:** Quantitative data analysis (3.3.2)

RQ3: What drives people to SHIFT their behaviour towards a more sustainable approach?

a. What is needed to shift behaviour from hibernation to collection

**Method:** Consumer survey & literature review
**Results:** Quantitative data analysis (3.3.2) & section 2.1

RQ4: What are (future) consumer needs in order for the divestment process to be successful?

**Method:** Consumer research & survey
**Results:** Persona's and target segment (3.3.4)

RQ5: How does the current system facilitate users in returning current and old devices?

**Method:** Expert interviews & journey mapping
**Results:** QL data analysis (3.2.2) & (3.3.3)

RQ6: Are consumers satisfied with current solutions for returning smartphones?

**Method:** Combining key insights from KPN Market insight report on purchasing phone subscriptions, the Recommerce barometer report and conducting a consumer survey and multiple expert interviews.
**Results:** Sections 3.1 + 3.2.3

RQ7: What are (future) consumer needs in order for the divestment process to be successful?

**Method:** Combining key insights from the consumer survey  and expert interviews.
**Results:** Sections 3.3.2 + 3.2.2

RQ8: Which design principles should be included when designing a trade-in strategy for KPN in order to enhance collection?

**Method:** Combining key insights from entire research phase in order to create design principles for concept and design phase of the project.
**Results:** Design goal, concept and final design

# 03

# 2. DISCOVER

## 3.0 Introduction

This section presents the market research, empirical research, and consumer behaviour studies conducted to provide a clear understanding of the challenges surrounding smartphone returns. It includes qualitative insights from expert interviews and journey mapping, as well as quantitative and qualitative data gathered through consumer surveys. Together, these findings offer practical, user-focused perspectives that complement the theoretical framework and identify key barriers and opportunities for the design strategy.

The goal of this chapter is to collect actionable insights from market data, empirical studies, and consumer feedback to inform the development of effective and user-friendly design solutions.

## 3.1 Market research

Understanding market trends and drivers for improved trade-in systems.

**What to find in this section:**

## 3.1.1 Trend analysis

### Introduction

The smartphone industry is presenting several important trends that are changing the way we use and think about our smartphones. This section looks at key developments, such as the rise of hibernating phones, growing acceptance of phone refurbishment, and efforts to reduce e-waste. There's also a strong movement towards a circular economy, which focuses on reusing and recycling materials. At the same time, consumers are becoming more focused on cost-effectiveness, taking both environmental and financial factors into account. By understanding these trends, we can better understand how the industry will evolve and what it means for the future. This will help shape design choices and principles.

### DEPEST analysis

Table 3.1: DEPEST Trend analysis

| Demographic | Technological | Political |
|---|---|---|
| **Youth Acceptance:** A survey revealed that 70% of Dutch teenagers are open to receiving a refurbished phone instead of a new one, showing a growing acceptance among Dutch Youth (Emerce, 2024)<br><br>**Parental Support:** Approximately 72% of Dutch parents are considering buying refurbished phones for their children, reflecting a growing acceptance of refurbished technology. (Emerce, 2024) | **Advancements in Refurbishment Processes:** Improved technologies in repair processes have improved the quality and reliability of refurbished smartphones, making them more appealing to consumers. (Kryvinska et al., 2023)<br><br>**5G Dominance:** 5G-enabled devices led trade-ins leading iPhone 13 to be the most traded in device in 2024.<br><br>**AI integration:** For refurbishment this helps automate, optimise, and enhance the diagnosis during repair, pricing, logistics, and resale. | **Implementation of Extended Producer Responsibility (EPR) Policies:** Making manufacturers and retailers responsible for end-of-life management. This allows to shift focus to sustainable design and waste reduction while placing the financial burden on producers and retailers. (SAP, n.d.)<br><br>**Free Disposal of Electronic Waste in the EU:** The WEEE directive provides consumers to be able to return used electronic and electrical items free of charge, aiming to enhance recycling and reuse of products and materials. (European Commission, 2023) |
| **Ecological** | **Social** | **Economic** |
| **Environmental Awareness:** Globally, over 70% of consumers are willing to pay more for environmentally friendly phones, highlighting a strong preference for sustainable options. (GSMA, 2025)<br><br>**E-Waste Reduction:** The increasing popularity of refurbished smartphones adds to reducing electronic waste, aligning with global sustainability goals. | **Rise of the Circular Economy:** Consumers, especially younger generations, are moving away from a "buy new" mentality and start embracing reuse, refurbish, recycle. Many prefer trade-ins to extend device lifespans. (Vaquero, 2024)<br><br>**Ethics and Transparency:** Consumers increasingly expect transparency in how trade-in values are calculated and whether old devices are responsibly recycled or resold. (Yu et al., 2024) | **Cost-Effectiveness:** Refurbished smartphones offer a budget-friendly alternative to new devices, attracting cost-conscious consumers, especially during economic downturns.<br><br>**Market Growth:** The global market for refurbished smartphones expanded to 309 million units in 2023 and is projected to reach over 431 million units by 2027. (Vodaphone, 2024) |



## 3.1.2 Technological analysis

### Introduction

This analysis explores how developments in AI and cloud technology can improve the customer journey, reduce barriers when changing devices, and encourage trade-in behaviour among consumers. Highlighted in particular is the barrier of data transfer when changing devices or brands, and how new solutions can lower or even eliminate this barrier.

### AI in customer journeys

The introduction of AI brings many new possibilities for technology. In the competitive telecom market, where customers have many providers to choose from, AI offers KPN the chance to deliver more personalised, predictive, and intuitive experiences to optimise customer journeys. Telecom providers collect high amounts of customer data (usage patterns, preferences, network usage, etc.). Through AI-driven data analysis, they are able to provide personalised experiences. This data could give insights into device lifecycles and could promote repairs and therefore minimise obsolescence. It can inform the customer at a suitable and effective time and remind them to return their smartphone. This personalisation can be implemented in the MijnKPN app. This could increase both loyalty and customer satisfaction (Nielsen et al., 2023).

Additionally, AI could help KPN to predict customer behaviours surrounding churning and returning. AI is able to identify grading behaviours when grading old device and is able to base financial compensation surrounding this data. AI could also be able to predict churn behaviour, in which KPN is able to offer benefits for customers to stay. This proactive approach increases service quality and prevents customer frustration. In addition, AI models can predict when an individual customer may need a subscription upgrade or a new device based on prior behaviour.

### Predictive AI VS Generative AI

Predictive artificial intelligence is able to facilitate companies in the decision-making process. Through machine learning algorithms AI is able to analyse patterns in collected data (Bwf, 2025). These patterns are able to give insights and predict future outcomes. Generative AI models are trained with the use of raw data. They use the

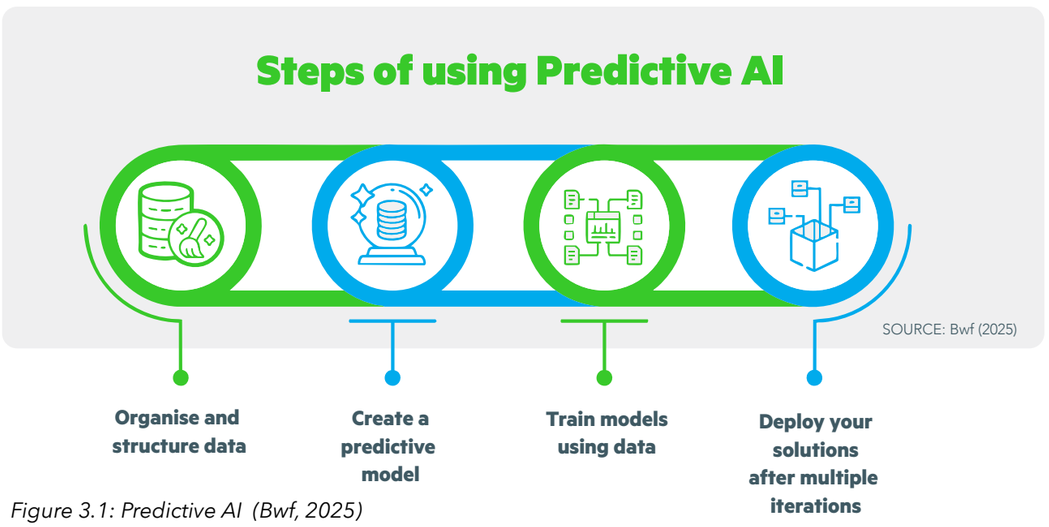



*Figure 3.1: Predictive AI (Bwf, 2025)*

patterns and connections found in that data to understand user inputs and produce new content. The difference between these two types of AI is mostly found in their purpose and output (Caballar, 2025).

As mentioned in previous paragraph, KPN could use predictive AI to explore future outcomes based on collected data. This requires some technical implementation within existing structures. Figure 3.1 explains the steps of using predictive AI.

### Cloud technology

Cloud storage is currently hybrid, a part of our data is stored on our smartphones, while other data is kept in the cloud. This makes it harder for consumers to fully understand where their data is actually stored. As a result, the process of changing devices or ecosystems becomes even more confusing. At the same time, consumers use various devices, such as smartphones, tablets, laptops and smart TVs. This makes centralised storage in the cloud more logical than local storage on each individual device, especially when these devices operate within the same ecosystem.

An increasing amount of data is being stored in the cloud, which suggests that both the market and technology are gradually moving towards a cloud-based future. Hybrid storage, for now, will still be used for offline use, cost and control considerations, including privacy and cloud storage fees. Opportunities for KPN, who is already operating in the cloud field, would be streamlining their services for data portability. This has been initiated through the Data Transfer Initiative by Google, providing cloud interactions between different ecosystems. While this initiative has sparked regulation it has mainly been developed to improve customer experiences.

### Data transfer

Data transfer is a common barrier in customer journeys, especially for personal content like contacts, photos, and videos stored on devices or brand-specific ecosystems (iCloud, Google Drive). In-app data can also be difficult to transfer correctly. While most producers ease data transfer during new device setup within the same ecosystem, switching between ecosystems (e.g., Android to iOS) remains challenging due to compatibility issues (Accent, 2022).

Producers and third-party developers offer apps like Samsung Smart Switch, Apple's Move to iOS, Google's Switch to Android, and Huawei Phone Clone to simplify transfer. However, barriers remain while some apps do not support full data transfer, causing some types of data to still be manually transferred.

Data transfer difficulties may slow smartphone upgrades and impact return behaviour. It is assumed that AI, improved apps, and cloud technology will reduce these barriers in the coming years. Technological advances, alongside legislation on planned obsolescence, will help secure data and create smoother device transitions.

**Critical insights:** KPN should put focus on lowering barriers when changing devices, particularly when it comes to switching ecosystems. KPN already supports customers with online and in-store data transfer tools, including step-by-step guides for both Android and iOS users. KPN also promotes the use of eSIM, which removes the need for physical SIM cards, making switching devices or providers simpler and faster. KPN will not be competing in the cloud sector, while big manufacturers have very established cloud facilities.

## 3.1.3 Conclusion

When researching the market, it is important to understand the industry's playing field. While more players are involved, the ones mentioned here are the most influential. These players can be seen as competitors, but they also offer potential for industry collaboration, as many are working toward the same goal: minimising e-waste and optimising returns. To address this challenge, KPN could explore partnerships with organisations that are typically seen as competitors.

These market findings show a clear opportunity for the project. The growing acceptance of refurbished phones indicates a shift in consumer mindsets, but trust and transparency remain barriers. Future systems should not only **guarantee quality** but also clearly communicate how that quality is ensured. This highlights the importance of integrating standardised quality labels and designing simple, transparent customer journeys.

AI implementations provide opportunities to improve the customer journey by making every interaction more personal, proactive, and seamless. These systems ensure **the right action or message triggers the customer at the right time.** This not only boosts satisfaction but also leads to loyalty and provides customer value.

# 3.2 Empirical research

Exploring the field and gaining insights into current operations.

**What to find in this section:**
*2.4.1 Mystery shopping*
*2.4.2 Expert interviews*
*2.4.3 Current trade-in systems*

## 3.2.1 Mystery shopping

For this empirical research, fieldwork was conducted in the form of mystery shopping. This took place in Rotterdam city center, where multiple telecom providers have stores located in close proximity to one another. The research included visits to three different stores: KPN, VodafoneZiggo, and Odido. The objective was to explore whether and how trade-in options are communicated, either through employee interactions or promotional materials in the store. Additionally, the research assesses how smartphones and other devices are presented in the store, as well as the level of customer service provided during the visits.

### Communication at KPN

When arriving at the KPN store, customers are greeted by window displays mainly promoting KPN's "Combivoordeel" and entertainment offers such as Disney+ and Netflix. During entering, a digital display allows customers to indicate the reason for their visit.

Inside, various smartphone brands are showcased, with Apple taking up the most space. All devices on display are available for hands-on testing. However, no visible information about trade-in options is presented at these displays or through in-store promotional materials. Further into the store, accessories, tablets, and smartwatches are displayed. Some of these include limited trade-in information, though it is not easily noticeable without specifically searching for it.

When approached by an employee to discuss the selected topic, available subscription options were explained, including sim-only and device bundle plans. The conversation discussed smartphone models, pricing, and data packages, but trade-in was not mentioned at any point. When asking about trade-in possibilities, the employee advised selling the device through third-party platforms like Marktplaats, suggesting this would offer better value, as KPN allegedly collects part of the profit from trade-ins. Trade-in of tablets or smartwatches was not offered as an option. The conversation concluded with the suggestion to consider the options for subscription before making a decision.

**Critical insights:** Mystery shopping at KPN revealed a clear gap in visibility and employee engagement. The digital display presented is not welcoming, especially when employees are not occupied during entering the store. Additionally, in-store promotion of trade-in is minimal, and staff are poorly trained, often directing customers to sell their devices elsewhere.

To enable successful in-store returns, KPN must improve both its promotional materials and employee training. Trade-in options should be clearly visible at first glance, removing the need for customers to search for information. Instead, customers should be actively encouraged to take advantage of the offer without hesitation.

In sum, the experience was underwhelming, with clear room for improvement in both customer service and the communication of trade-in options.


*Figure 3.2: Trade-in visualisation In-store displays*

### Competitor communication

When arriving at both VodafoneZiggo and Odido, no employees approached or offered any assistance. Additionally, there were no digital displays or tools available to submit customer questions.

At VodafoneZiggo, a wide range of products was displayed. The Ziggo section featured experience-oriented setups, allowing customers to engage with entertainment services. In contrast, the Vodafone section felt less engaging. Promotional materials were limited, and no visible trade-in information was provided. Only after an extended search was a rotating display found mentioning their "Extra Inruilvoordeel" promotion. However, no employee interaction took place due to a lack of proactive service.

A similar experience was observed at Odido, where no visible trade-in information or promotional content was presented. One noticeable difference compared to the other providers is that Odido does not offer TV or internet services for home use, focusing solely on mobile products and services.

**Critical insights:** Competitors show a clear lack of customer service, resulting in a poor sense of convenience. Customers are expected to take the lead in asking questions and creating their own in-store experience. As a customer you must actively take charge in asking questions and creating an in-store experience. Both providers show very little to no information using promotion and employees had not been able to provide information at the time of the visit. These visits highlight difficulties for customers and not only demotivate but provide difficulty when exploring perceived behavioural control.

***Key takeaways***
To improve in-store success, KPN must focus on **optimising customer** service by ensuring **active employee engagement** and **clear communication** about the benefits and process of trade-in. Customers should be presented with trade-in options as soon as they enter the store, supported by clear and accessible information that **encourages** them to consider it as a serious option. If not proactively presented, customers are unlikely to start the divestment process, simply because they **remain unaware of the available possibilities.**

## 3.2.2 Expert interviews

### Introduction

This section presents a qualitative research study in the form of expert interviews. These interviews were conducted in a semi-structured format and used for triangulation. The interview questions were designed to address multiple research questions and to gain deeper insight into expert perspectives on the current market and processes. The findings offer an understanding of organisational practices and industry challenges. They highlight both limitations and opportunities, helping to identify possibilities for designing effective trade-in program strategies.

Three experts were selected for this study based on their diverse areas of expertise. Expert 1 specialises in trade-in programs and recycling, Expert 2 has in-depth knowledge of the telecom market, and Expert 3 focuses on designing for divestment and consumer behaviour related to hibernating phones. The group consisted of two male and one female participant, with ages ranging from 30 to 55.

A semi-structured interview guide was developed to ensure consistency across interviews. However, due to the varying nature of each expert's background, the discussions often took a more conversational form. This allowed for deeper insights into each area of expertise. All experts provided informed consent for recording and transcription of the interviews. The interview guide and consent form are included in Appendix B1 & B2.

### Research questions

RQ3: What drives people to SHIFT their behaviour towards a more sustainable approach?

- What is needed to shift behaviour from hibernating to collection

RQ5: Are consumers satisfied with current solutions for returning smartphones?

RQ6: What are (future) consumer needs in order for the divestment process to be successful?

### Methodology

The methodology for this study included creating a interview guide, developing and sending consent forms. Interviewing and transcribing these interviews in order to be able to create clusters of the findings. These clusters give insights into main themes and help finding similarities and differences. These insight eventually result in a thematic map which help conclude the findings into opportunities.

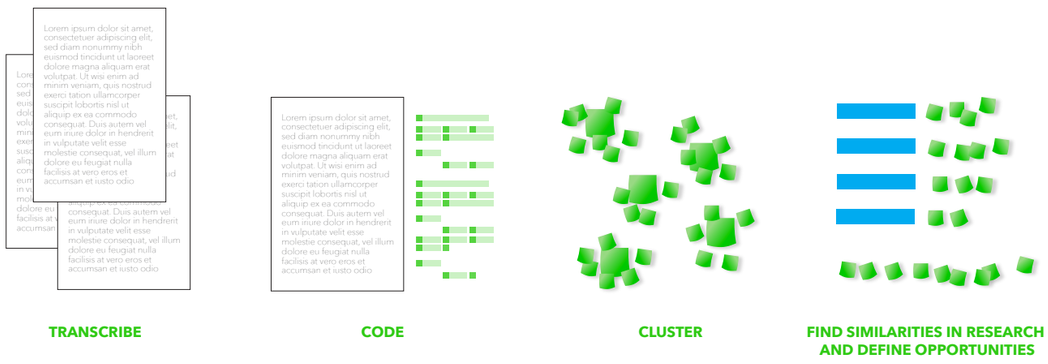



*Figure 3.3: Methodology overview*

### Clustering

Once the interviews were transcribed, the content was analysed using codes, each combining a key insight with a quote from the expert. These codes were then grouped into categories to highlight the main insights. The categories have been organised into themes in a thematic map that reflects the core findings from the expert interviews. The created thematic map is shown in Figure 3.4.

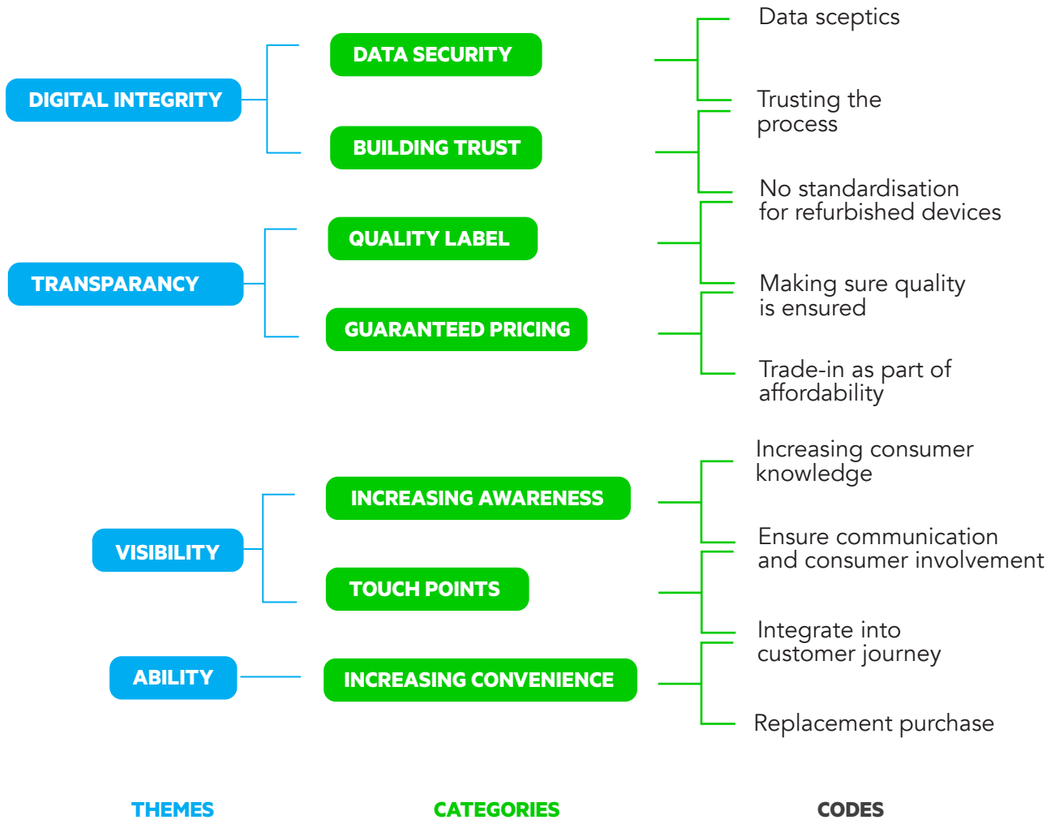



*Figure 3.4: Thematic map of interview insights*

## Results

The thematic map presents key expert insights and findings. The results are presented through the main themes and are supported by quotes.

The expert insights highlight several key themes that influence the success of trade-in systems. **Digital integrity** remains the most significant challenge, including concerns around **trust** and **data security**. This results in barriers for consumers to participate in the trade-in program.

*"I do think people still experience some uncertainty about the process itself; like what exactly happens to their device."*

*- Expert 2*

*"Consumers have to put their device in the envelope and just send away €500. They'll have to wait and see. Will it actually arrive? Who's the company behind it?"*

*- Expert 1*

***Critical insights:*** *Trust and transparency are essential for the strategy to be successful. This can be linked to divestment principles 5 & 7.*

While KPN is generally seen as trustworthy, building and maintaining this trust is essential for encouraging participation in the trade-in programme. Transparent processes and clear communication can strengthen confidence and engagement.

*"We enjoy working with parties like KPN, which already have a large customer base that trusts KPN, and often also trust the partner that KPN has chosen."*

*- Expert 1*

***Critical insights:*** *KPN could strengthen its credibility by clearly communicating its partnerships and the reasons behind choosing them. In addition, new partnerships to support other areas of the organisation could be further explored to deliver both direct and indirect benefits to its trade-in system.*

Experts also emphasise the importance of **visibility**. Increased visibility online, in-stores and in advertisement could lead to increased returns. When consumers are constantly confronted with the option of trade-in and the positive impact it has they will constantly be reminded that their devices are still hibernating. This could move, at least some, consumers.

*"You can see that this creates awareness among customers and users, making them more likely to think, "What is my device still worth? I'm not using it, what can I still get for it?""*

*- Expert 1*

***Critical insights:*** *Mystery shopping at KPN and competitors revealed a clear gap in visibility and employee engagement. Online, the trade-in option is equally hard to find, requiring users to actively search for it rather than encountering it naturally in the customer journey.*

Similarly, **affordability** is important for increasing attraction towards refurbished smartphones, with guaranteed pricing and **product standardisation** playing a key role.

*"We often add extra promotions, and you really see the numbers go up. When customers receive a bonus on top of their trade-in value, that's when they start to take action."*

*- Expert 2*



*"We're also trying to influence the European Parliament with legislation to create uniformity and build trust in the refurbished segment."*

*- Expert 1*

***Critical insights:*** *Uniformity is essential when offering refurbished devices. Customers need to trust quality labels and clearly understand whether a device is genuinely refurbished or simply reused, to avoid confusion and build confidence in the offering.*

**Consumer involvement** is an important outcome when looking at motivating consumers. Engaging consumers through education, interaction, and simplified processes stimulates behavioural change. Experts discussed a **growing willingness to participate**, driven by increasing **awareness of the residual value** of smartphones, indicating that as knowledge improves, so does motivation.

***Key takeaways***

Expert insights conclude key opportunities: **increase transparency to build trust, increase visibility** and focus on touch points to keep trade-in top-of-mind, and prioritise **quality and reliability** of refurbished smartphones to increase sales.

Use **consumer involvement** to get more insights into needs, wants and consumer pain points in order to optimise customer journeys.

Lastly, connect **trade-in to the moment of new purchase** to use momentum for action.

*"But in the end, it's also important that our entire store team, our retail salesforce, simply has a conversation with the customers about it (trade-in)."*

*- Expert 2*

*"You need to co-create with your consumers—see what fits their needs best and work with them to find out what works well at this moment."*

*- Expert 3*

Lastly, it is important to note that buying a new smartphone is often **a replacement purchase**. It offers the opportunity to implement moments in the customer journey where trade-in is presented.

*"The transaction happens where new purchases are made, because when someone buys something new, they probably still have something old!"*

*- Expert 1*

*"Your phone is, for the most part, a replacement purchase. That's why the connection between the new and old phone is so important."*

*- Expert 3*

*"One key aspect is linking the moment of purchase with the moment of disposal."*

*- Expert 3*

***Critical insights:*** *A key challenge with replacement purchases is that consumers prefer to receive their new device before returning the old one, giving them time to think twice about divesting. As a result, many never return their old phones.*

## 3.2.3 Current trade-in systems

### Trade-in at KPN

KPN offers a trade-in program for consumers. Devices can be traded in either during the purchase of a new phone or separately, without a new purchase. To stimulate returns, KPN provides extra trade-in offers. Consumers are able to find the trade-in program online, they are presented with a page directly connected to recommerce, where they can finalise their return.

For customers purchasing a new device, they would find the trade-in option in the payment portal. Previously, the process would redirect users away from their purchase, causing confusion and inconvenience. KPN is now integrating the trade-in option directly into the checkout process, which is argued to make trade-in easier for consumers by improving the overall user experience. According to Recommerce, this implementation has led to increased returns for other telecom providers. However, it remains uncertain whether this will be the case. Although this new integration may improve visibility, embedding it directly into the customer journey, this does not necessarily result in a shift from intention to behaviour.

In addition to trade-ins, KPN also offers a wide range of refurbished devices in stock. However, they currently do not sell “exotic” models. Figure 3.5 shows the information presented to consumers outside of the payment portal.

**Recycle together with Recommerce**

Trading in your phone with us? Then it goes through our partner Recommerce. They are experts in refurbishing and recycling devices. This way, you can be sure that your old phone is properly taken care of.

Usually, you receive a nice amount back for your phone. Is your phone too old or damaged? Then you won’t receive money for it. You can still hand it in for recycling.

Discover what we do for a sustainable world.

*Figure 3.5: KPN communication towards consumers*

**Critical insights:** KPN and its competitors offer extra trade-in deals, giving consumers up to €200 to buy the latest iPhone. While this boosts sales, it undermines sustainability by encouraging unnecessary replacements of perfectly working devices. Though these devices could enter the refurbishment market, this outcome is not guaranteed. KPN and the telecom market should move away from these extra promotions in order to increase product lifetime and improve sustainable behaviour of their customers.



### Recommerce available applications

Recommerce has implemented different applications within the apps and websites of its partners. One example is a tile within the Coolblue app, which shows the current trade-in value of a customer’s device based on their previous purchase at Coolblue. While most consumers choose retailers based on price, Coolblue does not offer direct phone subscriptions—this presents an opportunity for KPN to position itself as a key access point.

At Orange Belgium, Recommerce has integrated a drop-ship model. In this way Orange does not need to spend high initial or logistic costs for refurbished devices they are selling. They stock only the most popular models, while less common ones are ordered via Recommerce’s drop-ship system and shipped directly to the consumer. This allows for sales of all models presented on the market. While this means KPN cannot generate purchase revenue from these less common models, it can still attract more consumers to the KPN platform, increasing visibility and engagement.

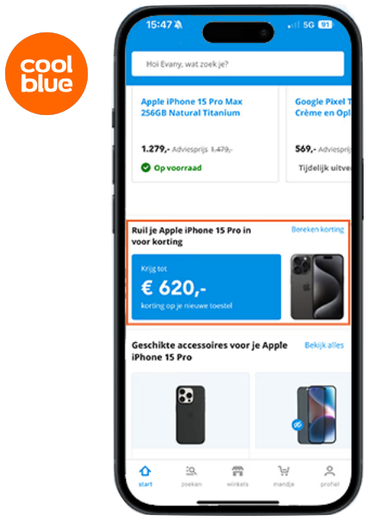



*Figure 3.6: Recommerce integrated tile*

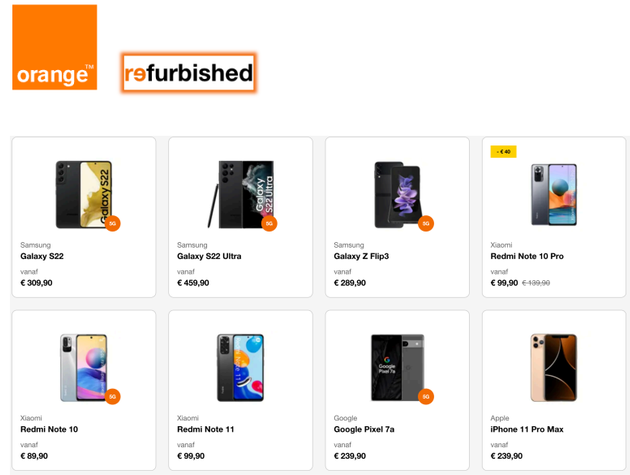



*Figure 3.7: Recommerce drop-ship integration*

**Critical insights:** Recommerce provides applications proven to increase return rates. These applications, especially drop-shipping, may impact KPN’s sales. Drop-shipping is a ideal solution for exotic models to be sold without KPN having to invest in them. However, these models are sold by Recommerce, which is why KPN has not yet implemented this. To act sustainably and unlock the full potential of the refurbished market, KPN should consider implementing these applications.

### Trade-in front-runner: Swisscom

When discussing trade-in programs, Swisscom is often mentioned. Not only because they were one of the first to implement this, but also because of their continued success. Since starting in 2014, Swisscom has consistently innovated, supported by consumer engagement and data collected over the years. Their customers are loyal to the program, with many having traded in three or four phones by now. They have come to understand how the system works and appreciate the benefits, showing that the program effectively meets customer needs.

Swisscom offers ultimate comfort by only asking one question during the trade-in process: "What is the state of your phone?". They are aware of the number of discrepancies and can base their offer on that data, which highly increases the ease of use for customers.  After receiving an offer, customers can choose a direct discount on their monthly subscription or donate the phone, even if it is damaged or has little financial value. All donations go to a well-known charity, where the impact is measured in meals provided, making the result more tangible for users.

Even though barriers remain, Swisscom has proven over the past 11 years to be trustworthy, transparent, and safe. By asking only one question, the process offers convenience and ease, ensuring that customers are not overwhelmed. Additionally, customers may have experienced multiple successful and satisfactory trade-in processes and are able to share these experiences to reinforce the subjective norm. To increase the number of devices returned, Swisscom also offers the trade-in program to non-customers, expanding access and participation.

**Critical insights:**
KPN plans to add a charity option to its trade-in program, linked to its own "Mooiste Contact Fonds." However, this may raise consumer scepticism. Choosing an independent, well-known charity that consumers already trust could strengthen credibility and engagement.

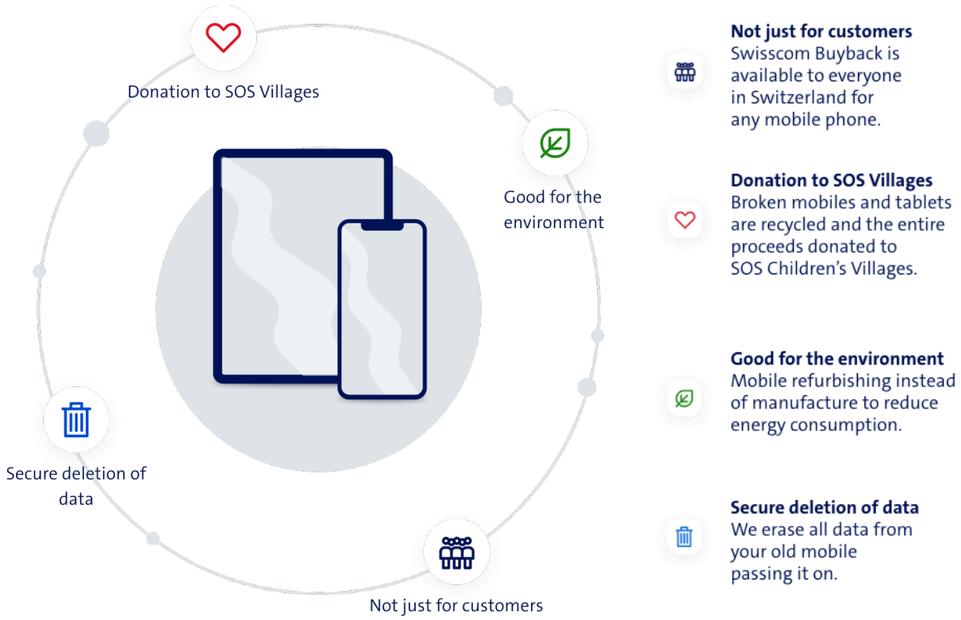



*Figure 3.8: Swisscom trade-in process (Swisscom, n.d.)*

## 3.2.4 Conclusion

The empirical study shows a clear problem: current trade-in options are not clearly communicated, especially in-store. Many customers are not aware that the option exists. This option is not presented by either visual elements or employees. Online, the trade-in option is shown at checkout, but if no new purchase is made, consumers will not see it unless they actively search for it.

The expert interviews helped answer two key research questions:

1. What are (future) consumer needs for the divestment process to be successful?
2. Are consumers satisfied with the current solutions for returning smartphones?

Interviews with experts confirm these insights: trust, clarity, and convenience are missing. Trade-in needs to feel like a natural part of the purchase process. If customers know what to do, see the benefit, and trust the process, they are more likely to act.

Lastly, the interviews made it clear that the process of return is not just operational, but highly dependent on behavioural factors. To shift consumer behaviour, consistent communication and customer journey integrations are needed. Trade-in must become a normal part of the overall experience to be successful.

These insights show that KPN's current approach treats trade-in as a secondary feature. To increase returns, KPN has to ensure the process is easy to find, easy to use, and feels valuable to consumers.

# 3.3 Consumer research

Understanding consumers and their needs to create a strategy for the most suitable target segment.

**What to find in this section:**



## 3.3.0 Introduction

In order to design for divestment and implement a return strategy for hibernating phones, it is crucial to understand KPN's consumers. This section will highlight consumer segments as well as the types of consumers within these segments. This will ensure the strategy effectively reaches its target group.

## 3.3.1 Consumer segments

Consumer behaviour and the divestment process are very complex. Both behaviour and the divestment process vary for each individual consumer. For a company like KPN, which has a very large consumer base, many different types of consumers exist.

To better understand the types of consumers KPN targets, consumer segmentation should be applied. By identifying consumers with varying values and needs, a clear understanding of consumer behaviour within the context of hibernating phones can be established. A frequently used method for segmenting consumer groups is the study by Verplanken (2017). According to him, sustainable behaviour can be mapped onto axes, as shown in Figure 3.9.

Verplanken (2017) argues that consumers show sustainable behavioural intentions based on their opportunity to act and motivation to act. This can be connected to TPB and FBM.



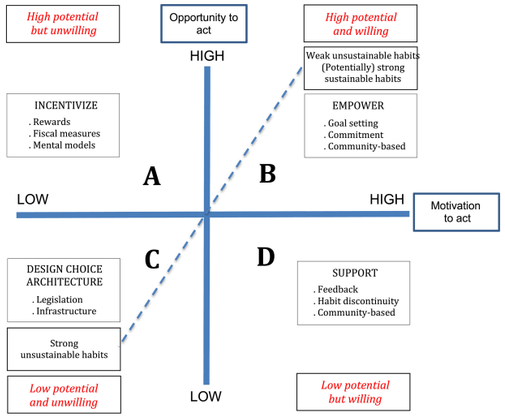



*Figure 3.9: Verplanken segmentation (2017)*

Verplanken (2017), defines four factors of segmentation, being; high potential, low potential, willing and unwilling. These ability and motivation factors can be applied to four consumer segments based on AMTA & IPSOS (2020). These consumer segments are: the committed recyclers, aspirational recyclers, indifferent recyclers, and disconnected recyclers. Overlapping the FBM with the segmentation model results in a matrix, offering a clearer understanding of consumer behaviour for each segment. As can be seen in figure 3.10, facilitators and sparks are added in order to illustrate possible segmentation shifts.

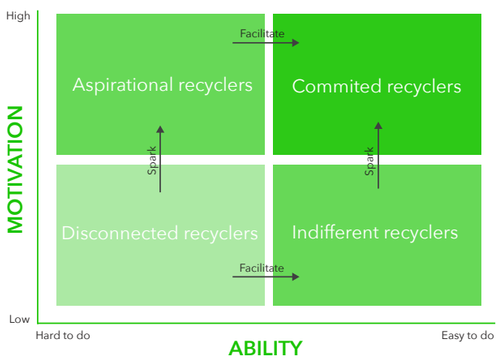



*Figure 3.10: Consumer groups and segmentation shifts*

Figure 3.11 presents each segments' motivation and ability towards returns of hibernating phones and argues consumer values towards environmental impact.

These motivation factors and levels of ability have been derived from the theory of Verplanken (2017), and the study by AMTA & IPSOS (2020) serves as an example of consumer values and intentions.

Committed recyclers are consumers already participating with the trade-in program as they are able and motivated.

When comparing the study by Verplanken (2017) and the TPB of Ajzen (1991), an attitude-behaviour gap presents itself regarding the segment of aspirational recyclers. According to Fogg's model, they are a segment that needs to be facilitated. Their motivation is high, the solution should focus on making the action easier (improving ability). As concluded from segmentation theory, aspirational recyclers can be classified as segment D. By providing convenience, trust, and transparency, this segment can be shifted toward being committed recyclers. Examples of facilitation can be: clear instructions, easy collection, and transparency on what happens with their phone when they return it. Satisfying this segment can also have a positive impact on their surrounding and potentially influence indifferent recyclers.

Indifferent recyclers, who show little to no motivation, do have the potential to shift behaviour. They present perceived behavioural control, but have no intentions to act accordingly. To spark this segment, segment A, towards becoming committed recyclers, incentives are needed. This group will not act upon environmental beliefs but does value financial gain.

Lastly, it can be assumed that the disconnected recyclers segment is a very difficult segment to reach. Their lack of environmental knowledge, motivation, and ability results in a segment with little to no potential for positive environmental behaviour. This segment is therefore  not targeted within this project's strategy.

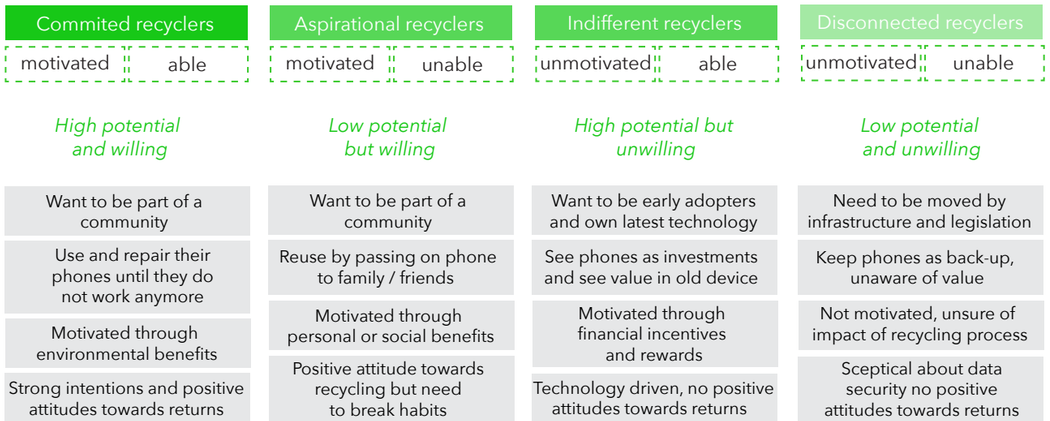



*Figure 3.11: Explanation consumer segments*

**Critical insights:** Short-term, aspirational recyclers have the most potential, while motivation is already there. In the long-term, when designing for behavioural change, indifferent and disconnected recyclers should be taken into account while these segments need more nudging and motivation needs to be sparked. All segments will be targeted over time.

***Key takeaways***

Consumer segmentation helps identify different consumer types and their needs. To encourage sustainable return behaviour, a design strategy must both **support and motivate these segments.**

The strategy should also **address the emotional barriers** in the divestment process, as emotional attachment can prevent consumers from turning intention into action (TPB). These barriers can be overcome by providing **a sense of community** and / or social benefits.

# 3.3.2 Consumer survey

## Introduction

This section presents a quantitative research study, in the form of a consumer survey. This survey has been created to answer multiple research questions and gain more insight into consumer behaviours. It provides up-to-date data, not present in current studies or market research. It creates an opportunity to gain insights into sustainable knowledge and behaviours, as well as the number of consumers hibernating their smartphones and/or using trade-in systems. It also offers insight into KPN customers' level of awareness of the existence of the trade-in programme.

## Research questions implemented within the survey

The research questions that have been implemented within the survey are the following:

RQ1: How do consumers experience the divestment process?

- Do consumers see hibernating phones as a problem in the first place
- How do consumers dispose of their hibernating phones (Selling (independent / retail), Drop-off (Reuse / dispose), Recycling collection)

RQ2: Does environmental awareness have a significant influence on return behaviour?

RQ3: What drives people to SHIFT their behaviour towards a more sustainable approach?

- What is needed to shift behaviour from hibernating to collection

RQ5: Are consumers satisfied with current solutions for returning smartphones?

RQ6: What are (future) consumer needs in order for the divestment process to be successful?

## Methodology

The methodology for this study included the development of a survey based on the previously defined research questions these can be found in Appendix C. The aim was to gain insight into current consumer behaviour focussing on smartphone purchasing, use, and disposal. The survey consists of four themes: divestment, attitude, facilitation, and satisfaction. Questions were formulated and organised into logical paths to ensure a smooth and intuitive experience for participants.

The survey was distributed through personal networks, KPN channels, and LinkedIn. After a two-week response period, the data collection phase moved towards the data analysis phase. A total of 198 participants responded to the survey (N = 198), making up the data set used in the analysis. The analysis consists of two parts: direct interpretation of survey responses and comparative statistical analysis using SPSS. The outcomes will provide valuable insights and opportunities that can be used when creating the design requirements for this project. An overview of the methodology used is illustrated in figure 3.12.

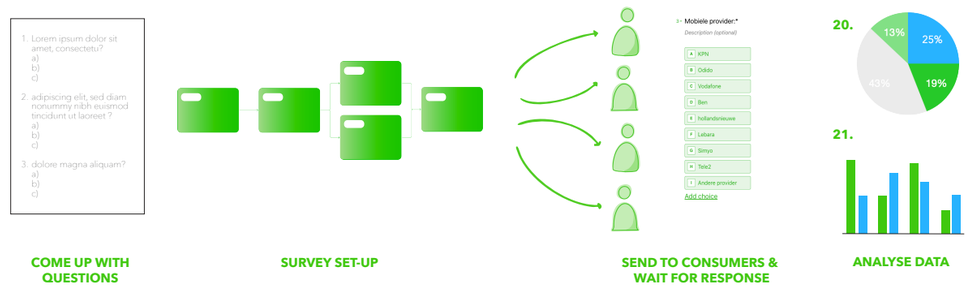



*Figure 3.12: Quantitative data methodology*

## Results

### 1. Survey results

As mentioned in the methodology, results have been generated with the use of quantitative data analysis. First, the direct interpretation of responses from the survey data will be discussed. The full dataset can be found in Appendix C. The survey reveals that while awareness surrounding the concept of trade-in is relatively high, actual participation, shown in figure 3.13, remains low. This gap suggests that although consumers recognise trade-in, barriers such as convenience, trust, or perceived value might be preventing action. This highlights the need for solutions that not only inform but also simplify and incentivise the return process.

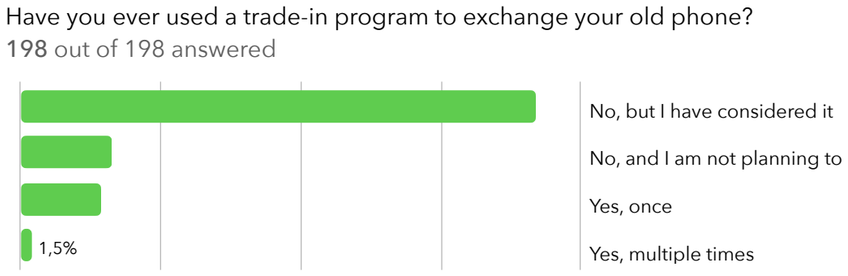



*Figure 3.13: Frequency of participation in trade-in programs among survey respondents (n = 198)*

Surprisingly, many participants do not see hibernating phones or the lack of recycling and reuse as a problem (see figure 3.14), while rating their own sustainability choices quite positively, with an average score of 7.0 (M=7, SD = 1.37) on a 10-point scale. Additionally, 89.7% say they are aware of the environmental impact of e-waste, which further emphasises this contradiction.

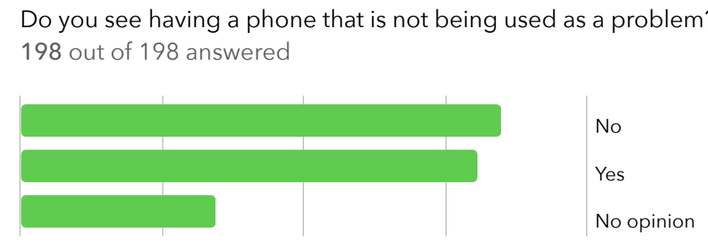



*Figure 3.14: Consumer awareness and perception of the impact of smartphone hibernation (n = 198)*

Over 75% of respondents reported having hibernating smartphones at home, primarily kept as backups or due to a perceived low trade-in value (figure 3.15). Many participants expressed dissatisfaction with the financial compensation offered or uncertainty about where to dispose of their devices, indicating significant barriers to returning their devices.

Additionally, reasons for keeping devices include emotional attachment and concerns about data security. These psychological barriers need to be addressed in order to create an effective trade-in strategy. For example, ensuring data security and offering emotional reassurance could increase consumer willingness to detach from their devices.



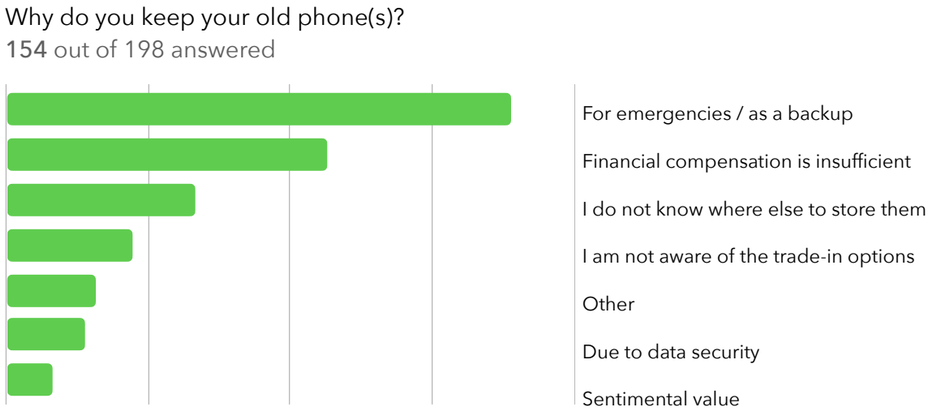



*Figure 3.15: Reasons for keeping old phones among survey respondents (n = 154)*

Due to high hibernation numbers, an opportunity for collection programs can be indicated. This provides the relevance of targeting consumers who may be unaware or hesitant to return devices. This opportunity is also seen in the willingness and attitude towards making sustainable purchasing choices. Consumers say they try to buy sustainably, but this doesn't always match their actions. Financial concerns and convenience often matter more than environmental issues (figure 3.16) presenting an attitude-behaviour gap.

Financial rewards and easy return processes are the strongest motivators for participating in trade-in programs (figure 3.16). This supports the idea that removing barriers and offering clear benefits are key for a successful behavioural shift from device hibernation to collection. However, 85% of respondents said they would recycle devices beyond repair without financial rewards, and 87.5% would donate their old devices to charity even if they still have value. This highlights a strong willingness to participate without financial incentives, indicating that factors beyond money influence sustainable behaviour.

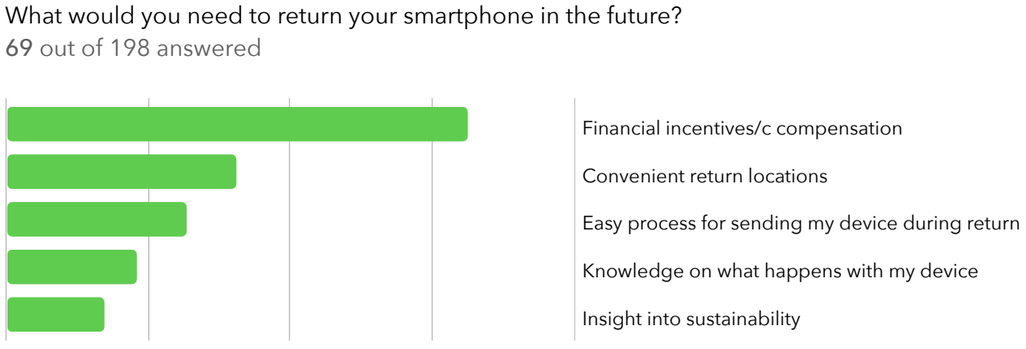



*Figure 3.16: Reasons for not returning phones among survey respondents (n = 69)*

Lastly, results show that 81% of survey respondents bought new devices, while only 12% bought refurbished phones, suggesting that most consumers still prefer new devices. However, market research shows strong acceptance of refurbished phones among Dutch youth and parents, with positive attitudes increasing. The gap between these attitudes and actual purchases is likely due to quality concerns, highlighting potential opportunities if these issues are resolved.

## 2. Quantitative data analysis

Secondly, a comparative statistical analysis using SPSS has been executed. Relations in SPSS have been set up in the data analysis plan, which can be seen in Appendix D1 & D2, in addition to the results. This plan includes hypotheses formulated based on previous literature and assumptions from initial field research. The hypotheses have been analysed and the results have been added in table 3.2.

Table 3.2 Statistical analysis results

| Hypothesis | Result |
|---|---|
| **H1:** Consumers who consider sustainability important (V11) are more likely to trade in their phone (V24). | F(3,177) =1.23, p= .30<br>No significant relationship was found between the participants importance rating and their likeliness to trade in their phone. The null-hypotheses cannot be rejected. |
| **H2:** Consumers who value sustainability (V11) are more likely to choose a used device (V6). | F(2,178) =1.77, p= .173<br>No significant relationship could be established between participants' sustainability value ratings and their likelihood of choosing a used device. The null hypothesis cannot be rejected. |
| **H3:** Higher knowledge of environmental impact (V12) is associated with more sustainable behaviour (V11). | r(181) = .46, p< .001,<br>V11: M = 7, sd = 1.37 , V12: M = 4.9 , sd = 2.76<br>A moderate positive correlation between V12 and V11 is found. |
| **H4:** Consumers who value sustainability (V11) are less likely to keep old phones at home (V19). | F(3,177) = .696, p = .556<br>No significant relationship was found between participants' sustainability value ratings and their likelihood of keeping old phones at home. Therefore, the null hypothesis cannot be rejected. |
| **H5:** Consumers who are aware of the existence of the trade-in programme (V22) are more likely to participate in the trade-in system (V24). | $\chi^2(9, N = 182) = 54.88, p < .001$.<br>A significant association between V22 and V24 can be established. The percentage of people willing to participate was higher amongst the group that was not yet aware of the existence of the program indicating the importance of awareness. |
| **H6:** The clarity of the trade-in process (V35) influences overall satisfaction (V43). | r(182) = .95, p< .001  V35: M = 3.2, sd = 1.11 , V43: M = 3.15, sd = 0.77<br>A very strong positive correlation between V35 and V43 is found indicating the importance of the clarity of the trade-in process on customer satisfaction. |
| **H7:** Higher knowledge of environmental impact (V12) is associated with greater awareness of the current problem (V16). | F(2,187) = 10.47, p< .001<br>Participants who viewed the issue as a problem (Yes = 1) had higher knowledge ratings on average than those who did not (No = 2) or were unsure (Maybe = 3), suggesting a positive relationship between knowledge and problem recognition. |
| **H8:** The type of provider (V3) is associated with awareness of trade-in programmes (V22). | $\chi^2(14, N = 181) = 8.61, p = .86$<br>No signification association between V22 and V24 can be established. The percentage of people willing to participate was higher amongst the group that was not yet aware of the existence of the program indicating the importance of awareness. |
| **H9:** Age (V1) influences the likelihood of making sustainable choices (V11). | r(181) = .095, p = .202<br>A very weak positive correlation is found. No significant relationship was found. The null hypothesis cannot be rejected. |
| **H10:** Willingness (V23) is related to consumers' reasons for keeping devices (V26). | F(7,174)= 2.779, p = .009<br>Participants who kept their phone as a backup reported the highest willingness to act (M = 5.00), while those who were unaware of trade-in programmes (M = 1.67) or believed the return value was too low (M = 1.50) reported the lowest willingness. This suggests that informational and financial barriers may reduce willingness. |



## 3. Conclusion

These results point to a clear attitude–behaviour gap. Although the survey shows many consumers want to act sustainably, such as returning their phones, their actual behaviour does not align, with many respondents failing to do so. The survey identifies key barriers, including a lack of knowledge about trade-in programs and the need for financial incentives.

Using SPSS, relationships between variables were explored, but most hypotheses were insignificant, indicating no clear relationships. It was expected that more variables would be related and provide clearer insights, but this may have been limited by the small sample size.

The findings highlight key challenges: increasing trade-in participation will require not only better incentives but also clearer communication, simpler logistics, and more visible environmental benefits. Results suggest a link between environmental knowledge and sustainable choices as well as awareness of hibernating phones. The survey also shows that consumers are willing to recycle or donate devices even without financial incentives.

## 4. Recommendations

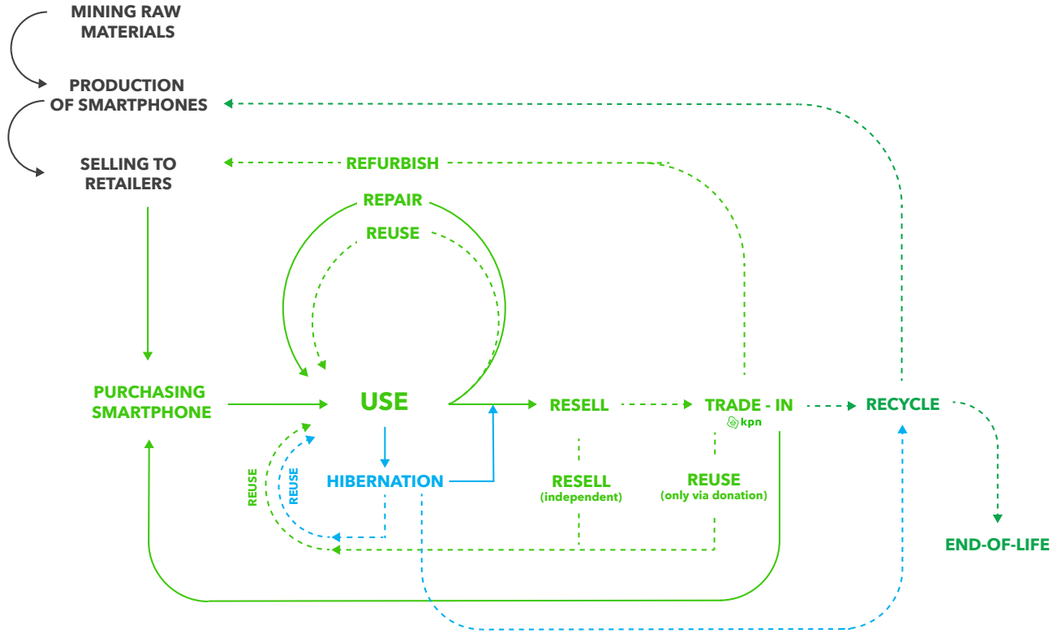
- *Expand sample size*
  The current survey included a limited sample size. It is recommended distribute the survey among a larger and more diverse sample to receive a better representation of all consumer segments.
- *Testing incentives in person*
  The current data is based on what people say they would do, future research should test incentives and convenience in real-life settings. This will show how effective the current system actually is in motivating returns.
- *Research trade-in participants*
  Although few participants have used trade-in programs, it is recommended to study their experiences in more detail. Testing the challenges and benefits consumers face can reveal barriers to returning devices and provide valuable feedback to improve the programs.
- *Improve communication strategies*
  Data privacy concerns and emotional attachment are barriers to trading in devices. It is recommended to test communication strategies that highlight data protection and environmental benefits to build trust and stimulate returns.

**Critical insights:** The survey aimed to explore customer experiences with the trade-in program, but only 26 of 198 respondents had used it, limiting insights. Additionally, the sample was mostly peers and acquaintances, leading to bias and limited diversity. As a result, findings may not fully represent broader consumer behaviour or motivations.

## 3.3.3 Customer Journeys

### Customer journey integrated into the circular economy model

In order to get an insight into the customer journey in comparison to the circular economy figure 3.17 has been created. Consumers make use of either the linear economy (take, make, use, dispose) or the circular economy, previously mentioned in section 2.1.1. Within the figure the concept of hibernating smartphones has been added as well as different disposition options previously mentioned in section 2.1.4. This addition provides a more complete view of the different cycles a smartphone may go through with its original owner and/or a secondary user before eventually reaching the recycling or end-of-life phase.




**REUSE** is defined as:
donating to someone in need, family or friends

**RESELL** is defined as:
Trade-in or independent (eg marktplaats)

*Figure 3.17: Customer journey integrated into the circular economy model*



### Customer journey of the current trade-in system

When a customer starts thinking about getting a new phone, the process usually begins with deciding what they need. They might consider which model they want, how much storage it should have, and which features are important to them. For KPN customers, there are two main ways to make a purchase: in-store or online.

#### In-store experience

In a KPN store, customers see promotional materials like advertisements, flyers, and banners. Some of these include information about the trade-in program, often with QR codes that link to more details. Customers can also try out different phones and ask employees for help with choosing a device, picking a subscription, or understanding how the trade-in program works. However, trade-in options are not always explained clearly or brought up by in-store employees. Even though banners and QR codes are visible, they are not always noticed or used.
If the trade-in process is offered, customers can fill out a digital form with information about their old device. After going home, they are expected to remove all personal data and send the phone to Recommerce, KPN's trade-in partner.

#### Online experience

When shopping online, customers can browse a digital catalog with detailed information about each model. After choosing a smartphone and, if needed, a subscription, they are presented with the trade-in option at the end of the ordering process. If they decide to join, they need to fill out the form, clear their smartphone of any data, and send it to Recommerce.

Whether customers buy online or in store, the trade-in process continues the same way. Recommerce checks if the device's condition matches the description provided. If it does, the customer receives the promised financial reward. If there are differences, a new offer is made. Customers can then choose to accept the new offer and still get a reward, or decline it and have their device sent back. Figure 3.18 provides a visual representation of this customer journey. This overview presents the purchasing process, the introduction of the trade-in program, and the divestment process.

***Key takeaways***

The customer journey map highlights where customers drop out of the trade-in process, showing **critical moments where they are lost**. This illustrates the need for clear in-store communication. **Applying the ten divestment design principles is needed to make the process easier**. Minimising the time between decision and action is important, as consumers often change their minds after leaving the store.

A common barrier is the **delay between receiving a new phone and disposing of the old one**, due to concerns about safe data transfer. The map also provides insight into KPN touch points during the trade-in journey.

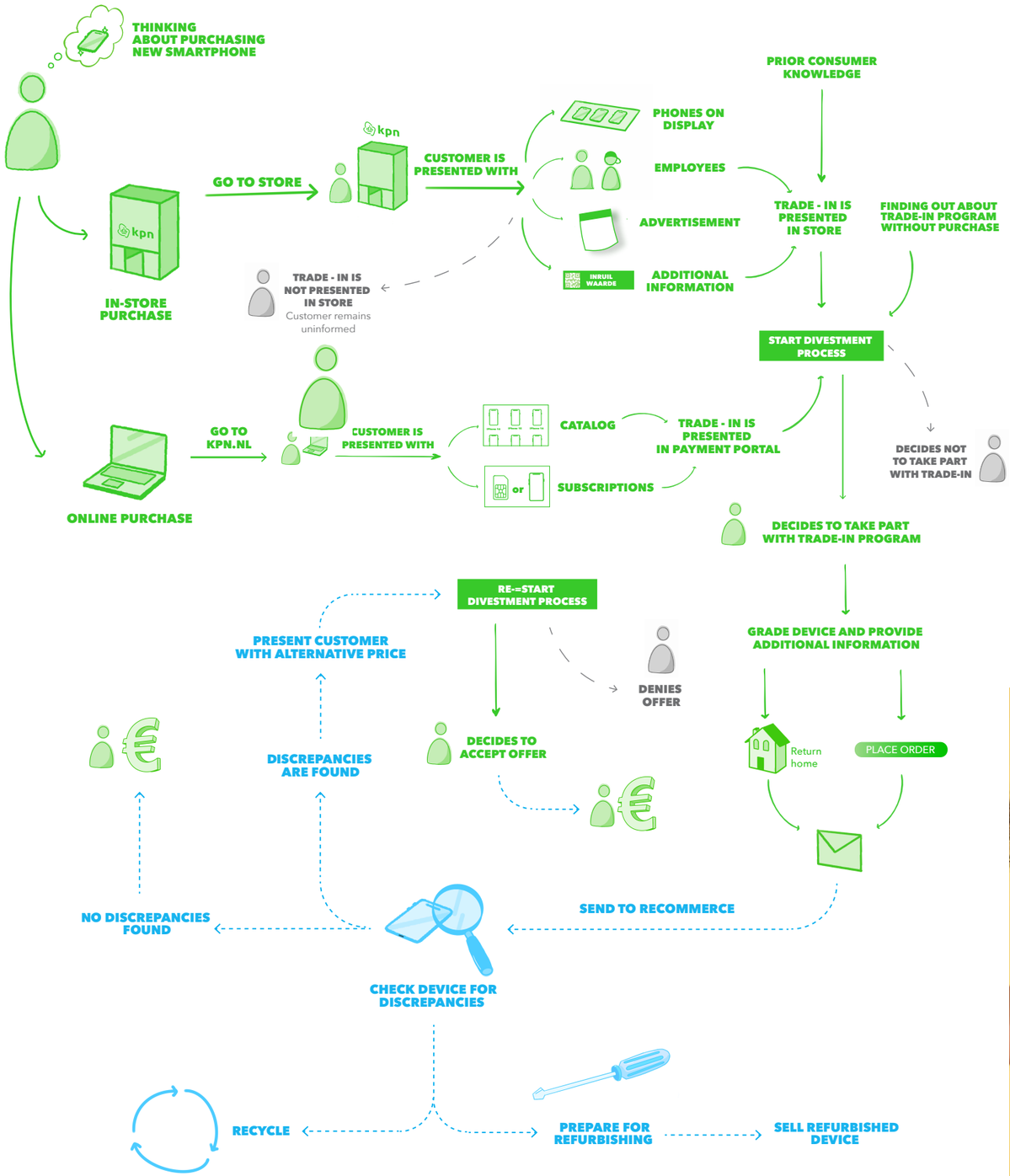



*Figure 3.18: Customer journey of the current trade-in program*



# 3.3.4 Persona's

## Introduction

This section presents a set of personas developed to provide deeper insight into the market and to create a link between the previously defined consumer segments and individual consumer characteristics. These personas provide clear examples that bring consumer segments to life, helping to show potential motivations, needs, sustainable efforts and behaviours within each group.

## Reason for use

The personas are created using a combination of generational characteristics, consumer survey insights, market and trend research, and existing KPN persona profiles. These existing profiles have been refined and expanded to reflect current developments, with a particular focus on the role of sustainability and consumer attitudes towards it. Instead of creating definitive profiles, these personas are used as exploratory tools. They help the interpretation of consumer segments by adding personal insights and context, and serve as a base for identifying opportunities and defining a target segment for this project.

## Choice of profiles

The persona's are divided, mainly by generation, and highlight different lifestyles, ages, goals and fears. The personas created are:

| | |
|---|---|
| Gen Alpha: | Yara |
| Gen Z: | Amir & Sophie |
| Millenials: | Denise & Jasper |
| Gen x: | Mo |
| Boomer: | Angelique |

All generations are taken into account while KPN provides service to the entire population. Therefore it is important to include as much diversity as possible. These other personas can be seen in Appendix E.


**Age:** 10
**Location:** Breda
**Occupation:** Primary school student
**Life Status:** Lives with mother and little sister

### ABOUT

Yara is a social 10-year-old who loves all things trendy. She's excited about starting high school next year and is eager to fit in with her friends. She recently got her first phone, a refurbished model, however she wishes she had the newest one like her friends. Her mom says it's too expensive, which frustrates her, but she's slowly getting used to it.

Yara spends most of her free time on TikTok and Snapchat, staying up to date with trends and texting with friends. She needs to hand over her phone before bed, which she finds very frustrating, while she believes she is old and responsible enough. She loves dressing up, experimenting with hairstyles, and watching beauty tutorials online. She's very social and always wants to be included, sometimes feeling left out if she doesn't have the latest gadgets or fashion.

### PURCHASING MOTIVATIONS

- Trendy & Cool
- Aesthetic appeal
- Price
- Brand popularity
- Convenience

### GOALS

- Make lots of friends when she starts high school
- Convince her mom to get her a newer phone
- Gain more followers on TikTok and Snapchat
- Improve her makeup and fashion skills

### FEARS

- Feeling left out if she doesn't have the same things as her friends
- Not making friends easily in high school
- Losing access to social media or her phone

### SUSTAINABILITY EFFORTS

Yara knows about sustainability, as her mom talks about things like reusing and recycling, but she doesn't actively think about it yet. She doesn't mind having a refurbished phone, but she wishes it looked newer.

### HOBBIES

- Watching TikTok and Snapchat stories
- Trying out new hairstyles and makeup looks
- Hanging out with friends and making fun videos
- Shopping with mom and Lola

*Figure 3.19: Persona of Gen Alpha*

## 3.3.5 Target segment

### Introduction
This sections combines findings of the consumer research. It translates the created personas into consumer segments in order to provide a better understanding of the types of consumers operating in each segment. This section will also elaborate on the choice of the target segment and how this choice has been made.

### Personas towards consumer segments
In previous sections, different consumer segments and personas have been created. Figure 3.20 places personas into segments in order to give insights into their attitudes and behaviour as well as their needs for shifting these behaviours. It shows what segments are in need of facilitation and what segments are in need of increased motivation through sparks.

### Choice of target segment
The most promising target segment identified, for short-term implementations, are the aspirational recyclers. These consumers align well with KPN's sustainability values. They care about doing the right thing and have an existing willingness to participate in the trade-in program. Additionally they have a high ability to change. Connecting this segment to consumer behaviour, they show a positive attitude and positive subjective norm, feeling they have an obligation to recycle or reuse, resulting in positive intention. This intention however does not result in positive behaviour.

The choice not to include the indifferent or disconnected recyclers was made because this group is a lot harder to influence into action. While those segments should not be ignored, they require a lot more convincing. Indifferent recyclers are in need of convincing sparks of motivation, which often translates to financial incentives.

Disconnected recyclers, on the other hand, may not be ready for any behaviour change at this point. This group will likely change when the majority of consumers have changed their behaviour over time and programs have evolved.
Indifferent and disconnected recyclers, will be targeted for long-term implementations.

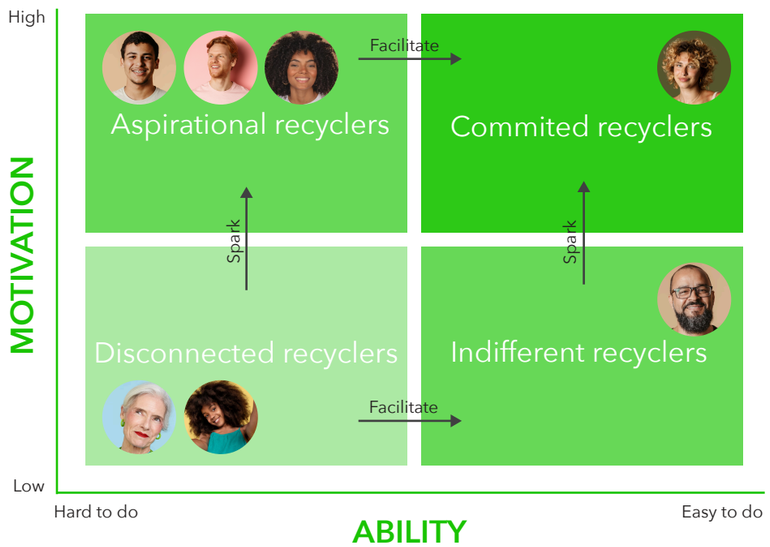



*Figure 3.20 Personas divided into segments*



## 3.3.6 Conclusion

This consumer research confirms a clear attitude–behaviour gap. Awareness of trade-in is relatively high, while actual participation is low. Many consumers still keep old devices at home due to inconvenience, low perceived value, or lack of clarity. The consumer segment analysis shows "aspirational recyclers" as the most promising target group for increasing returns.

These consumers are motivated but need facilitation to boost their ability. Survey results and persona development highlight that clear communication, ease of use, and trust are key to turning intention into action. By focusing on aspirational recyclers who hold strong environmental values and a willingness to act, KPN can provide an easy and transparent program that converts motivation into increased smartphone returns. Positive experiences from this group can influence others and demonstrate the convenience and value of the trade-in program.

While targeting all segments may not be feasible currently, prioritising aspirational recyclers offers the best chance for lasting behavioural change. In contrast, indifferent recyclers may respond to financial incentives, but such tactics are unlikely to produce sustained behaviour shifts.

# 04

# 2. DEFINE | DESIGN BRIEF

## 4.0 Introduction

This section brings together the key insights from the research into a clear design brief. It is based on the main findings, challenges, and opportunities identified throughout the study. The section includes, a future vision and mission,  a revised problem statement, a design goal, and a set of design requirements. Together, these requirements provide direction for creating solutions that support a shift in smartphone return behaviour.

## 4.1 Vision and mission statement

**Future vision**
Imagining a future in which every smartphone is returned, reused, or recycled as part of responsible consumer behaviour. Returning a device is no longer seen as a task, but a meaningful action that reflects trust, transparency, and sustainable behaviour. Making circularity intuitive and rewarding, and setting a new standard for sustainable behaviour in the telecom sector.

**Mission**
Create the most reliable, accessible, convenient return program for smartphones. By removing practical and emotional barriers, motivating consumers to act on their sustainable intentions with confidence and ease. Through clarity, inclusivity, and user-centred design, supporting the shift from hibernating smartphones to lasting returns, promoting circular behaviour that benefit both people and the planet.

## 4.2 Revised problem statement

Although trade-in programmes are currently available, a large number of smartphones remain unused. Smartphone hibernation is not caused due to a lack of access but by behavioural barriers such as emotional attachment, low perceived urgency, uncertainty about data security, and the belief that backup phones might still be useful. Even consumers with sustainable intentions often fail to act due to a lack of perceived value, trust, and convenience in the return process.

The challenge of this project is to bridge the attitude-behaviour gap. Encouraging divestment by implementing a design strategy that removes barriers, ensures trust, and focusses on positioning detachment as something positive, valuable, and aligned with personal values and norms.

The design strategy should focus on creating a return experience that is emotionally reassuring, increases perceived behavioural control and ability, promotes internal motivation. By addressing both practical and mental barriers, smartphone divestment is able to become a consumer habit that will increase the number of returned devices.

Challenges and opportunities have been defined through research and analysis of KPN's current context. These form the foundation for the design direction. The goal is to develop a concept that addresses key barriers and supports KPN in promoting circular behaviour through a visible, trustworthy, and user-centred approach.

### Challenges

**Low perceived urgency**

As can be concluded from the consumer survey, a lot of consumers do not acknowledge the hibernation of smartphones as a real problem. This results in low perceived urgency.

**Time between receiving and disposing**

Currently, a lot of time remains between decision and action. When receiving a new phone, the older one still holds a lot of data. The time between transferring this data to the new divide and wiping the old device clean is still very long.

**Financially driven motivation**

The current trade-in implementation is mainly financially driven. While this could encourage participation for short-term change this will not ensure long-term behavioural change.

**Lack of transparency in the process**

A lack of transparency can lead to consumers being sceptic about the disposition and detachment phase of the divestment process. They question their data security and rather keep their expensive device than loosing or damaging it.

**Lack of perceived ability**

Research shows that even if awareness on the impact of hibernating phones and/or the trade-in system is present, this does not always result into action. This is because a remaining insecurity in either the process or the outcome is still present in consumers.

### Opportunities

**Turn existing motivation into action**

By targeting a consumer segment with existing motivation, steps can be made towards increasing the number of returns. By facilitating these consumers with ease of use, convenient collection and transparent processing, short-term solutions can be realised.

**Linking the moment of purchase with the moment of disposal**

By acknowledging the moment of replacement also being a moment of possible disposal, KPN is able to minimise the time spend between decision and action. Making sure phones will not be placed in hibernation, but tackle the problem before unsustainable behaviour occurs.

**Creating a value driven experience**

Shifting motivational sparks from financial towards value driven experiences. This allows consumers to focus on value of acting upon sustainable behaviour instead of financial gains. This could provide consumers with feelings of warm glow giving. Emotional barriers could be removed by providing insights into both social and environmental impact. This implementation allows for long-term behavioural change.

**Increase visibility**

By constantly confronting consumers with the problem and impact hibernating phones have, consumers will become more aware each time. Trade-in should become a staple when discussing telecom and sustainable behaviour. By increasing visibility, KPN is able to increase return rates and gather valuable data, which can optimise their systems.



**Ensuring (digital) integrity**

Integrity presents a key opportunity for KPN to strengthen its brand image, communicate its values, and build consumer trust. By applying transparent practices, KPN can reduce uncertainty around the trade-in process. As trust grows, consumers are more likely to overcome doubts and follow through on their intentions.

## 4.3 Design goal

The goal is to enhance KPN's trade-in service to increase the collection of hibernating smartphones. The design should ensure a successful divestment process by removing physical and emotional barriers and providing an easy and value-driven experience. This will ensure long-term behavioural change.

Essentially, this aims to create a closed-loop experience for KPN customers: when they think of getting a new phone, they automatically think of returning the old one.

This goal supports KPN's sustainability objectives by reducing e-waste and extending device lifecycles, while also engaging consumers in KPN's green journey.

## 4.4 Added value

### Value for KPN

- Increased return rates and supporting compliance.
- Increased amount of refurbished smartphones for growing demand and reducing production of new phones, resulting in a reduction in the need for CRM.
- Improving brand image and customer loyalty to make it easier to introduce new services and reduce churn behaviour. For KPN, this helps acceptance of circular initiatives and strengthens long-term growth.
- Creating a competitive advantage due to a USP.

### Value for consumers

- Simplicity and peace of mind
- Emotional and social reward
- Convenience
- Triggers for decluttering
- Contribution to a sustainable future

# 4.5 Design requirements

The strategy should focus on short and long-term design goals.

*Table 4.1; Design requirements*

| nr. | Design requirement |
|---|---|
| 1 | Encourage sustainable behaviour by making the design visible, relevant, and personally rewarding. |
| 2 | Make returns as effortless as possible by integrating them into familiar physical and digital touch points. |
| 3 | Provide support and reassurance at key moments to help users feel confident and in control. |
| 4 | Clearly explain what happens to the returned device, including how data is handled and impact is made. |
| 5 | Build trust by clearly communicating how users' personal data is securely removed before reuse or recycling. |
| 6 | Ensure return options are visible in everyday customer interactions, not hidden in reports. |
| 7 | Use timely triggers (e.g., after upgrades or contract changes) to nudge users toward returning devices. |
| 8 | Help users act quickly and reduce "think-twice" behaviour through timely communication and incentives. |
| 9 | Link sustainable action to immediate value such as credits, loyalty points, or trade-in rewards. |
| 10 | Use understandable language, inclusive visuals, and relatable examples to reach all customer segments. |
| 11 | Change behaviours over time by integrating return actions into regular customer touch points, leading to habit formation |
| 12 | Position KPN as a frontrunner in sustainability and circularity to differentiate from competitors. |
| 13 | The design should address both short- and long-term impact. |
| 14 | The design should support KPN's goal to increase return rates |
| 15 | Show both the environmental impact and the personal value of returning devices. |
| 16 | Align circular initiatives with brand values to build trust and encourage long-term engagement. |
| 17 | Let users see the positive effect of their actions, such as emissions saved or devices reused. |
| 18 | Ensure solutions are flexible and inclusive to serve today's users and future market needs. |

Short-term solutions include triggering and facilitating aspirational recyclers by innovating the existing system while shifting it from a financially driven to a value-driven experience. More concrete solutions can be implemented here, and existing tangible barriers can be removed quite easily.

For long-term innovation, a strategic roadmap is proposed. This will serve as a guide for KPN to move towards a system that supports behavioural change and the overall attitude towards hibernating phones and recycling. This roadmap will include the future vision and will be used to communicate behaviour shifts in all consumer segments.





# 05

# DISCOVER

## 5.0 Introduction

This chapter presents the process of developing the design strategy, translating research insights into design directions, starting idea generation. It focused on generating ideas, exploring possible solutions, and creating concepts. Through ideation, co-creation and feedback sessions with KPN, a strategy was created to stimulate behavioural change and support the transition of the telecom industry toward circularity. The chapter explains how the concepts were iterated and why certain design decisions were made, explaining key challenges and opportunities identified throughout the process.

# 5.1 Designing concepts

## 5.1.1 Design approach

In the development phase, ideas have been transformed into concepts based on the conducted research and the defined design requirements. This phase started with ideation, where ideas were generated and possible solutions to the problem were explored. This provided a strong foundation and clear design direction for further concept development.

Co-creation sessions have been used to involve consumers and KPN in the design process, and ensuring that the concept aligned with both user needs and KPN's goals. These sessions helped gathering practical insights and provide perspectives beyond research insights.
From these insights, an initial concept was developed and presented to KPN. Feedback gathered from these sessions led to further iterations of the concept, resulting in the final design of the project.

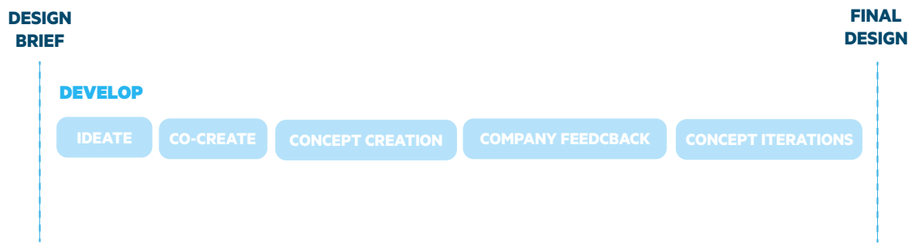



*Figure 5.1: Design approach*

## 5.1.2 Ideation

The first step towards concept creation focused on brainstorming and ideation. During this phase, the design requirements have been taken into account, and key takeaways have been used to argue design choices. Brainstorming has been conducted in two different ways;

- **Individually**, through short design sprints. Exploring a range of ideas, from practical and actionable concepts to completely out-of-the-box ones. This was done to boost creative thinking. Future-oriented solutions were explored individually, focusing on creative solutions to stimulate return behaviour.

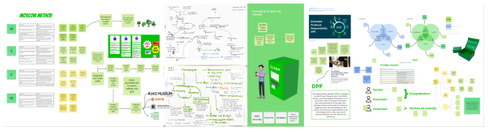


*Figure 5.2: Individual brainstorm sessions*

- **Brainstorm sessions with design students** have been held to help push the boundaries of the ideation phase and explore broader perspectives. During brainstorming, the "how to..." method was used to gain insight into ways to motivate or activate consumers and explore how to increase consumer convenience. Following this method, participants were asked to design a solution for the year 2035 that would stimulate return behaviour. (Appendix F)

*Figure 5.3: Student brainstorm session*

These exercises generated consumer insights and design principles that were integrated into the development of the final concept.

The aim during this phase was to develop a concept for the future of trade-in systems. When taking desirability and feasibility into account, it became clear that developing a single concept for such a complex phenomenon would be a challenge. This was further confirmed during brainstorming sessions with students, where it became clear that identifying a single solution or concept to address the problem was challenging. Behavioural change is achieved gradually and in stages. Consumers need time to adapt to new systems and practices. Unfortunately, habits cannot be formed through a single solution.

This realisation led to the decision to design a strategy built up of multiple concepts. From this, the idea emerged to create a roadmap consisting of concepts that would guide consumers step by step through the process of behavioural change and habit formation.

## 5.1.3 Co-creation session

In addition to the ideation phase, a co-creation session has been conducted in order to get more insight into KPN's views and goals towards an improved trade-in system. These sessions have been held in the early stages of the concept creation phase to ensure feasibility, viability, and desirability for KPN and its customers.

During the co-creation session, key takeaways from the research were presented, followed by the question of how KPN could respond to these findings. The main themes that emerged were increasing visibility, improving convenience, and raising awareness.

The session started with an introduction to initial concepts. Followed by a discussion on what should be communicated in a campaign to raise awareness of the current issue. Participants were also asked how the visibility of such a campaign could be ensured, both in-store and online. Co-creation then shifted to the current system, identifying the moments when customers experience barriers and exploring how these barriers could be reduced or eliminated.
In addition, the future vision was discussed, focusing on how KPN could ensure that every device is returned. (Appendix F)

### The sessions led to the following insights:

- The main barrier for consumers is concern about data security.
- Most people are unaware of the environmental impact of hibernating phones.
- Not all consumers are motivated by sustainability; some are influenced by social or financial factors, and this must be taken into account.
- Increasing visibility raises internal challenges, as it involves many different departments within the organisation.
- Most consumers are unaware of the return option, awareness is the first behavioural step.

These considerations have been taken into account during the concept creation phase.

**Critical insights:** In the first two stages, I explored many design directions using sketches, mind maps, "how to" exercises, and other creative methods. The biggest challenge was designing for a future where technology is advancing rapidly. This made it difficult to push boundaries, while a lot remains unknown. However, provided the opportunity to create novel ideas that broadened my perspective. As a result, I developed multiple concepts.

## 5.1.4 Concept creation

Given that behavioural change requires time, the strategy was divided into three Horizons over a ten-year period. This timeframe allows for both systemic changes and practical steps to help meet compliance goals within a few years.

Research shows recurring key takeaways. Firstly, awareness and knowledge must be created among consumers. People need to become aware of the problem, which will lead to action. This awareness and knowledge will provide insight into the value a device holds, not only financial value but also ecological and material values. As a result, consumer ability and motivation to act will grow. To support this ability and motivation, it is essential to ensure visibility, convenience, and trust and transparency.

These factors form the core focus of Horizon 1.

In order to ensure these factors, multiple small strategies were created. These strategies focused on devices that still hold financial value and those that are beyond economic repair. The strategy was designed to maximise visibility. Examples included an in-store green desk for return and repair, return boxes, app implementations, and collection days to gather devices that are beyond economic repair. Collection days could be organised in collaboration with municipalities or school programmes to educate children on e-waste. In addition, a campaign was created to communicate these concepts and raise awareness. Horizon 1 presents a multi-action concept to achieve the desired outcome.
For Horizon 2, it is crucial to identify the specific points in the current process where consumers are confronted with barriers. By understanding these barriers, effective solutions can be designed to address them. Some of these barriers have already been identified through consumer research. During these so-called “think-twice” moments, effective triggers must be provided to help consumers turn intention into the desired behaviour. In Horizon 2, the strategy will focus on presenting the right triggers at the right time. These will be linked to factors such as subjective norms, tangible impact, warm-glow giving.

For Horizon 3, it was necessary to return to the original scope: increasing the number of returned smartphones. The aim is to raise this percentage from 5% to 20% by 2030. By 2035, this number must grow even more significantly.

The suggested approach is to move from ownership model to a leasing structure. In this structure, the return of devices becomes a built-in part of the process, transforming it from a voluntary action into a common practise. This common practise, while mandatory, is able to benefit habit formation.

The initial concept for Horizon 3 involved a leasing platform. With this structure devices can be offered at a reasonable price, made possible because they can be leased for a second, and in some cases even a third, life cycle. To maintain a sense of control for the customer, they are given the option to pay the remaining value and keep the device. If they choose not to, the device enters the 'refurbish-lease' programme, ensuring it is given a guaranteed second life through leasing, but this time at an even lower monthly cost.

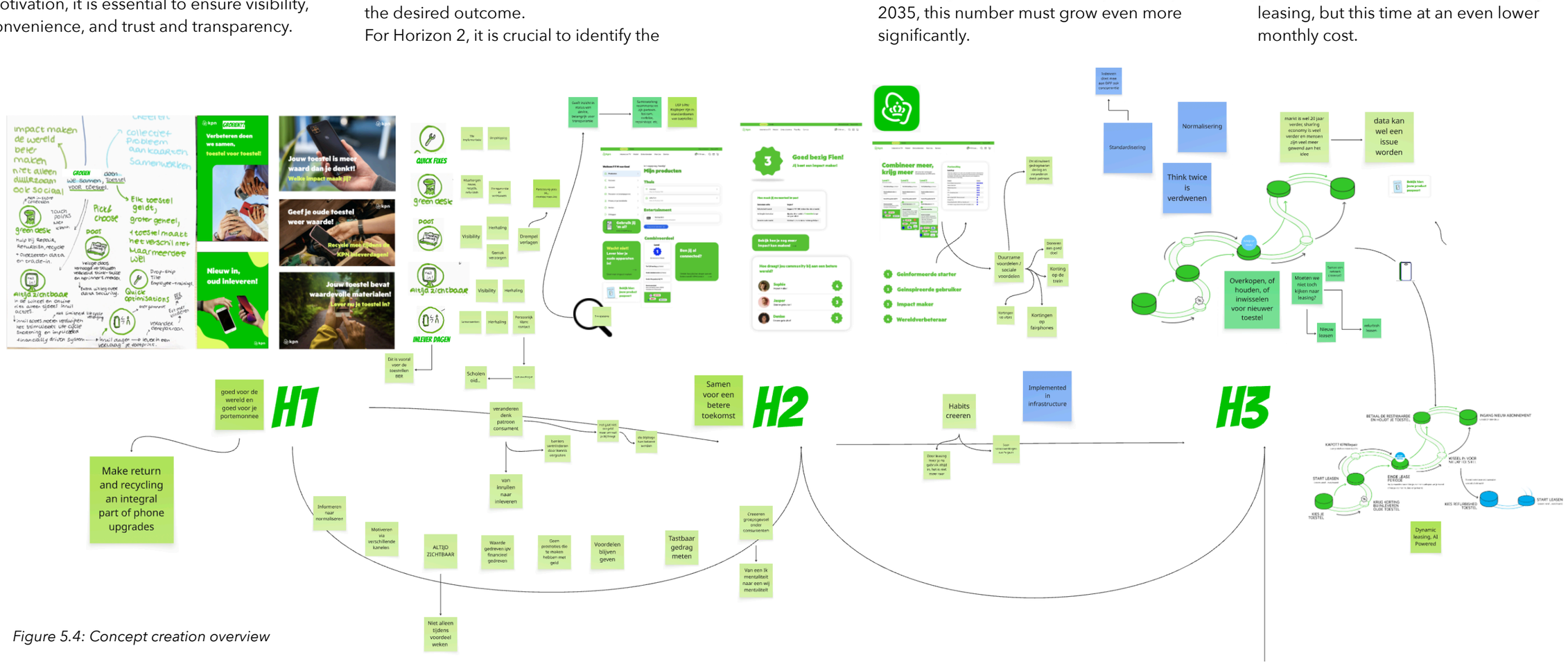



*Figure 5.4: Concept creation overview*

**Critical insights:** During this phase, I struggled with the scale of the project. I had to let go of the idea that a single concept could solve everything. This realisation helped me focus on starting small, designing individual parts that could grow into something more impactful. Eventually, this led to the development of multifaceted concepts designed to reduce barriers and address the industry-wide problem more effectively.

I also realised that I lacked sufficient input from the company regarding consumer behaviour and past implementations. Learning from their previous challenges and mistakes was essential. To address this, I organised two feedback sessions to identify weaknesses in the concepts and gain insights directly from experience.

## 5.1.5 Feedback sessions

The goal of the sessions was to explore the future vision created and get actionable insights into KPN operations and past implementations.

During both sessions the topic and concepts were introduced first. This was done so the participants were able to give extensive feedback. During these sessions paper and pens were provided to stimulate creative participation. In total 3 participants took part in these sessions. The sessions led to the following insights:

- A separate system is needed for devices that are beyond economic repair.

### Horizon 1

- KPN previously offered a repair service; however, due to its high operational costs and higher prices compared to independent repair shops, it was rarely used by customers.
- A single campaign is not sufficient to ensure lasting behavioural change.
- Collaborations with government or educational institutions can be challenging while KPN is a commercial company.

### Horizon 2

- Rapid technological advancements, especially in artificial intelligence, offer new opportunities for optimising customer journeys and providing personalised triggers.

### Horizon 3

- For sustainability to be effective, change is needed across the entire telecom sector. If only KPN introduces sustainable practices, competitors may continue offering financial incentives, leading consumers to switch providers for financial reasons.
- Leasing remains a sensitive topic within KPN due to a previously failed implementation.
- Leasing offers opportunities but should be part of a larger concept, not the concept itself. Boundaries can be pushed further within this ten year timeframe.

**Critical insights:** While iterating the concepts for the final design, it became clear that designing for the future, while also integrating systems for in-store returns regarding devices BER require two separate approaches. As a result, the decision was made not to focus on BER devices in this phase. The proposed final design may encourage consumers to return hibernating phones, while awareness and knowledge increase, but this cannot be confirmed with certainty. Further research and design strategies are needed to validate this potential outcome.



## 5.1.6 Concept iteration

For Horizon one, the initially designed campaign was iterated. During concept development, Horizon One consisted of various elements, which made its goal unclear. Additionally, the campaign was temporary, which was not the intended purpose of this concept. As a result, the concept was iterated into a complete rebranding of the trade-in program, focusing only on elements with long-term potential. This led to a three-facet concept focusing on rebranding, returns, and repairs, implemented within the customer journey.

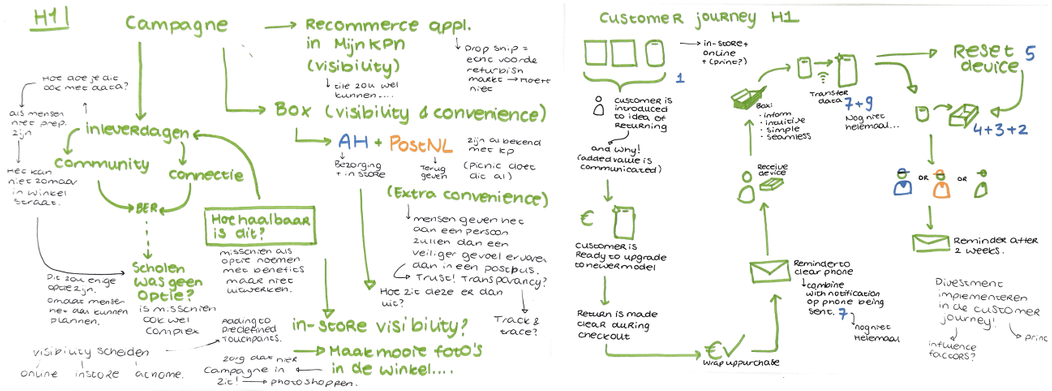



*Figure 5.5: Iteration Horizon 1*

The feedback sessions, showed a lack of technological innovation in Horizon 2. While the core elements of the strategy helped remove barriers, there was potential to do more within this horizon. As a result, technological advancements were explored and integrated, allowing consumers to see, predict, and act upon product lifecycles. This addition supports the extension of device lifespans, stimulating sustainable behaviour and reducing e-waste.

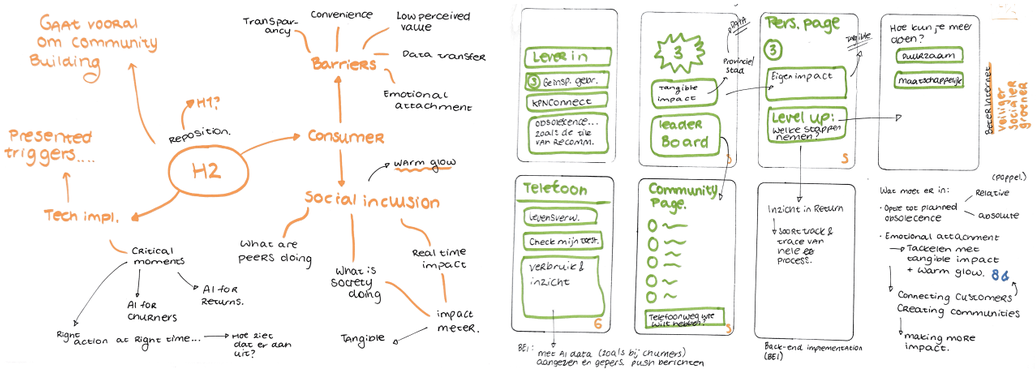



*Figure 5.6: Iteration Horizon 2*

When designing for Horizon 3, it became apparent that in order to design for lasting behavioural change, It is essential that the attitude toward sustainable practices and e-waste in the telecom industry changes. By designing a strategy that is transformative for both consumer and the industry KPN could be a key player and create an USP. Additionally, KPN should strive for industry-wide cooperation and collaboration with competitors.

# 06

# CONCEPTS

## 6.0 Introduction

This chapter presents the final design strategy developed to increase smartphone returns and reduce e-waste within the telecom industry. It introduces different sections containing a roadmap and different horizons, each containing concepts designed to support behavioural change and systemic shifts. These concepts are multifaceted providing solutions to different consumer needs and barriers. By combining communication, technology, and customer journeys, the strategy is able to shift KPN towards a more circular and sustainable future. The chapter presents how each horizon contributes to this future vision.

## 6.1 Roadmap

### Time-pacing

The time-pacing for this strategy is divided into three Horizons: 2027, 2030, and 2035. A 10-year period has been chosen to allow for extensive data collection and gaining behavioural insights. This allows for tracking changes in smartphone usage, return habits, and device lifecycles, with the goal of gradually shifting mindsets towards sustainable, cooperative behaviour. The timeframe supports KPN's long-term vision and enables AI-driven analysis of user behaviour.

### Multifaceted concepts

Behavioural change strategies require multiple elements, as no single solution can address the complexity involved. Consumers benefit from gradual, subtle shifts over time. Even if one segment appears ready, this alone won't ensure long-term success. Achieving lasting change means easing all consumers into the process step by step.

The proposed concepts aim to remove key barriers through different interventions, improving attitudes and behaviour around product return and divestment.

### Tactical roadmap

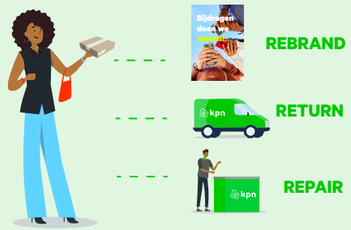
The tactical roadmap translates insights from prior market and consumer research, company values, and technological developments into three multifaceted concepts. These will be explained in the following sections. See Figure 6.0 on the next page for an overview.

### Divestment principles & influencing factors

Concepts have been created based on the design principles for divestment. The concepts in Horizons 1,2, and 3 show which influencing factors and/or design principles apply for that particular element of the concept. These insights have been added to provide a better understanding of why certain choices have been made.

**Influencing factors:**
Reversing physical condition
Awareness of collection solutions

kpn

| | Horizon 0 | Horizon 1 | Horizon 2 | Horizon 3 |
|---|---|---|---|---|
| | 2025 Predevelopment for increasing returns | Changing mindsets → 2027 Rebranding trade-in program to return program while optimising sustainable processes | 2030 Moving from awareness to acceptance, building a better future together | 2035 Transforming the telecom industry from an ownership to an access based model |
| **USER** Value proposition | Understanding consumer needs and barriers in order to design for divestment and behavioural change | The strategy motivates consumers for return but primarily facilitates convenience | Getting insights into lifecycles motivates sustainable practises, shifting consumer behaviour | Shift to an acces based model and not owning a device is normalised |
| Consumer segments | Motivated / Unable / Able / Unmotivated | Motivated / Unable / Able / Unmotivated — Commited recyclers, Aspirational recyclers — *spark motivation and add customer segment* | Motivated / Unable / Able / Unmotivated — Commited recyclers, Aspirational recyclers, Indifferent recyclers — *spark motivation, facilitate ability and add customer segment* | Motivated / Unable / Able / Unmotivated — Commited recyclers, Aspirational recyclers, Indifferent recyclers, Disonnected recyclers |
| Removed barriers | | lack of perceived ability; lack of awareness of the issue and its impact | transparency into processes; lack of trust | data transfer; data security |
| Added value | being able to co-create with KPN; able to return during check-out | shifting from financial to value-driven; enabling problem recognition; changing consumer mindsets | building a community; insights into lifecycle & repairs; tangible impact is shown | shared costs between consumers; no large upfront investment; access to added services linked to smartphone use |
| **TRENDS** | integration of AI in operations<br>increased environmental awareness<br>acceptance of refurbished devices<br>policies against planned obsolescence | e-waste reduction through reuse and refurbish<br>younger generations want to make a positive impact<br>cross-industry collaborations | personalisation in systems<br>consumers increasingly expect transparency<br>right to repair directive<br>wanting to be part of a community | access based models<br>sharing economy<br>generative and predictive AI<br>maximising product lifespans |
| **CONCEPT** | *scope 2: Recommerce integration in payment portal*  |   |   |   |
| **DEVELOPMENT OF STRATEGY** | **Design rebranding stragety and prepare operational logistics** *design & collaborate*<br>• Create rebranding proposal<br>• Connect with potential partners for collaboration negotiations<br>• Prepare return logistics and packaging<br>• Start development of repair service<br>• Co-creation with consumers to get insights into barriers | **Launch rebranding and optimise return & repair journeys** *optimise visibility & connect with consumers*<br>Launch rebranding and market new return & repair services<br>Collect customer data → Use data to optimise journey<br>Develop predictive AI model | **Data collection and introducing predictive AI** *developing & integrating new app features*<br>Keep return program and information visible<br>Optimise return & repair services based on data<br>Use data in predictive AI models<br>Collect nudging data from notification clicks<br>Develop dynamic pricing strategy | **Shift to new model, iterate, monitor** *developing access based model & dynamic pricing strategy*<br>Launch access based model<br>Keep iterating the model<br>Monitor customer satisfaction<br>Industry-wide cooperation for building circular telecom industry |
| **TECHNOLOGY** | return portal by recommerce<br>available software for checking returned smartphones<br>available applications by recommerce for drop-shipping or trade-in value | integrated return portal during checkout<br>timely notifications to prepare for data transfer<br>track & trace package and process<br>in app and online application for booking repairs | personalised nudging with AI models<br>data generation through selfcheck application<br>lifecycle analysis with customer use data<br>tangible impact shown using real-time data | predictive AI integration for estimating lifecycles<br>customer data for estimating subscription duration<br>data storage fully in cloud for seamless data transfer<br>real-time data for pricing strategy calculations |
| **COMPANY** Added value | co-creating with consumers; getting to know customer pains & gains | maintaining sustainable positioning; optimising processes and reducing costs | creating brand loyalty; be compliant while extending product lifecycles | minimising churn behaviour; having an USP and being industry leader; maintain the same profit margin as before |
| Estimated return rate | **5% returns** | **15% returns** | **30% returns** | **80% returns** |
| Potential partners | re!commerce | postnl, ah, The Phone Lab, re!commerce | The Phone Lab, re!commerce | SAMSUNG, vodafone, hollands nieuwe. |

## FUTURE VISION

Imagining a future in which every smartphone is returned, reused, or recycled as part responsible consumer behaviour. Returning a device is no longer seen as a task, but a meaningful action that reflects trust, transparency, and sustainable behaviour. Making circularity intuitive and rewarding, and setting a new standard for sustainable behaviour in the telecom sector.

**Legend**

- timeline
- ..... leads to ....
- - - - - connected to


**F.F.M. van Gool**
An access-based design strategy to extend product lifecycles and facilitate sustainable return behaviour

Master thesis | Strategic Product design | 10-07-2025

**Supervisors**
Prof. Dr. Ir. R. (Ruth) Mugge
MSc. M.J.J. (Matthijs) Buijs
M. (Marlin) Kamminga

# 6.2 Horizon 1

## 6.2.1 Introduction

This section explores how KPN can activate behavioural change by raising awareness, removing return barriers, and promoting repair. The goal is to prepare consumers for more sustainable habits by making the first steps simple and accessible.

Horizon 1 focuses on three elements: rebranding, returning, and repairing. Rebranding builds awareness and motivation. Returning removes practical and emotional barriers. Repairing extends product use and aligns with future regulation. Together, these steps form foundation for a more circular customer mindset.


*Figure 6.1: Rebranding strategy*

## 6.2.2 Rebranding

Rebranding aims on shifting consumer mindsets. The current trade-in system is heavily driven by financial incentives. This strategy reframes it as a value-based "return program" to build awareness, turn intention into action, and promote shared responsibility in reducing e-waste (Saari et al., 2021).

In Horizon 1, consumers still receive money for valuable devices, but this is no longer the core message. Instead, the focus is on showing that every return counts. According to the SHIFT framework (White et al., 2019), making sustainable actions socially desirable increases engagement. By positioning the program as a collective effort, aspirational recyclers are motivated by shared values rather than rewards.

The lead word "Bijdragen," chosen through co-creation, reflects this shift. It highlights impact through collective action, supported by informative visuals that show individual contribution (Figure 6.2).

This rebranding is not a campaign. It is a permanent shift in communication. Integrated across all touch points, including in-store displays at key decision moments, it builds lasting recognition and encourages sustainable habits.

The rebranding aligns with KPN's Connect, Activate, Grow mission:

- **Connect** by encouraging joint responsibility
- **Activate** through visible triggers to return devices
- **Grow** toward a shared, sustainable future

Visibility and problem recognition are essential to move consumers from awareness to action. Rebranding functions as a long-term behavioural trigger.

### Rebranding approach

The rebranding requires consistent visibility across key touch points. This approach focuses on three channels: print, online, and in-store. Each plays a role in building awareness and encouraging action.

1. **Print**
   Flyers, posters, and billboards increase visibility in public spaces and help reach audiences who are less active online. The rebranding strategy will be communicated to existing customers through direct mail, strengthening the message through personal communication.

2. **(Social) Media**
   Platforms like TikTok and Instagram engage younger users through visual content. TV, radio, and the KPN website help promote awareness and stimulate participation.

3. **In-store**
   Mystery shopping revealed that information about the return program is hard to notice in store. This should be improved by placing clear and visible information in-store, especially near areas where devices are tested. Seeing the return program regularly can help motivate action later in the customer journey.

This strategy clearly presents the return program using multiple channels. Public media grabs attention, while in-store and digital touch points reinforce the message and drive customer action.

**Critical insights:** Professional marketers bring expertise in tone, timing and channel selection, which is crucial for shaping this rebranding into something that clearly connects with consumers. This rebranding is a starting point and still requires review and refinement.

**Influencing factor:**
Awareness of collection solutions




*Figure 6.2: Rebranding strategy*

### 6.2.3 Returning

The optimised return system focuses on increasing visibility and convenience, and offers timely triggers that help improve consumer return patterns. Through rebranding, consumers will already be more familiar with the issue. Problem recognition has taken place, which sparks interest.

It then becomes important to guide consumers through the return process. As highlighted in research, it is essential to recognise that when a new device is purchased, a used one is often left behind (Poppelaars, 2020). During the ideation phase, "think-twice" moments have been identified. Based on these findings, a return box has been introduced, creating an in-home touchpoint for KPN and its return system.

#### Integrating returns into the customer journey

Return options are first introduced in the order portal. When ordering a new smartphone, the return option will be presented. After the purchase, a communication chain begins. Customers typically receive updates on the delivery status of their order, and this provides an opportunity for KPN to step in and help them prepare for data transfer and device handover.


Notifications will be sent via the app and by email, combining delivery updates with guidance on preparing the current device. These messages will include links to KPN's transfer guides, especially useful when switching to a different ecosystem.

These notifications and triggers help start the thought process around data preparation and following through with the return, including for devices that no longer hold economic value. When data-related barriers are minimised, think-twice behaviour is likely to decrease during the sending phase of the process.

#### Designing a seamless return experience

To optimise the returns, it is important the process is seamless and intuitive. A return box has been developed to support this part of the process. The new device is delivered by KPN through PostNL, and the same box is used to return the old device. The box features a clear "Stuur mij terug!" trigger and instructions to help users through the process.

Research confirms that convenience is one of the most important drivers of return behaviour. Ylä-Mella et al. (2015) show that easy access and low effort strongly influence consumer participation in e-waste programs. This is confirmed by the consumer survey results, where many respondents mentioned time spend and effort needed as barriers.

In addition, it tackles barriers such as fear of damage or loss during shipping, uncertainty about which packaging to use for the return, and confusion about how or where to send the device. According to divestment principles, it is important for consumers to know what their options are. The box offers a safe and clear way to return their device. Consumers do not need to arrange or pay for the return themselves, while the return box is included with a pre-paid shipping label.

To make the process as seamless and accessible as possible, KPN is partnering with trusted companies such as Albert Heijn and PostNL. Existing collaborations with these organisations make implementation possible within two years. This implementation increases the number of available return points.



Additionally, these cross-industry collaborations provide KPN the opportunity to outsource logistics to partners who already have these processes in place, optimising the performance of the system.

Consumers can return the package to delivery staff or in-store, adding convenience and a personal touch that builds trust. This assures customers their device is handled with care and offers more security than dropping it in a mailbox. They also receive a track and trace code for full transparency throughout the return process.


A customer journey has been created to provide a clearer understanding of the process.

#### Added value for consumers

Horizon 1 is able to add value to consumers through 2 main factors:

1. Building awareness and increasing knowledge
2. Facilitating ability

By increasing visibility, consumers can recognise the problem and become aware of the impact of hibernating phones and growing e-waste. With this awareness, they can form an attitude toward the issue and act accordingly. The return and repair process requires little to no effort from the consumer and is designed to be simple and intuitive. Clear communication from KPN helps consumers understand how the process works, building trust and transparency. As a result, initial barriers to returning devices are decreased, and consumers may even be motivated to take an extra step in returning hibernating phones.

**Critical insights:** The return system has the potential to influence consumer behaviour over time, but its long-term impact depends on how consistently and meaningfully users engage with it. Elements like the return box and notifications may improve return rates and satisfaction in the short term, but their actual effectiveness in driving lasting behavioural change requires further evaluation. Ongoing tracking and testing are needed to understand whether these features support habit formation or if their impact fades over time.

**Influencing factor:**
Understandable collection solutions


*Figure 6.3: Return box example*

## Customer journey return

This concept will minimise think-twice behaviour that is currently seen in the trade-in system. It increases ability and perceived behavioural control to increase the number of smartphones returned into the system

**Critical insights:** While visibility, convenience, and ability are improved, data transfer and security remain unresolved. The concept relies on future technological advancements, which are beyond KPN's control and cannot guarantee the removal of barriers at this stage. These challenges will be addressed in later horizons.

Survey results also show that keeping a device as a backup is a key reason for not returning it. The assumption is that increased problem awareness will help users weigh the need for a backup against the positive impact of returning a device.

**Influencing factor:**
Effortless collection


*Figure 6.4: Return journey*

## 6.2.4 Repairing

Repairs are not a direct part of the return process, but they do help raise awareness around the use and disposal of devices. Repairs extend the lifespan of smartphones, and this is something KPN should actively support. While encouraging longer product lifecycles may not bring immediate commercial benefits, it can contribute significantly to KPN's brand image. A strong sustainability reputation can build trust, attracts conscious consumers, supports adoption of circular services and strengthen brand differentiation.

In the past, in-store repairs were unprofitable and were rarely used, leading KPN to discontinue them. To still offer quick and accessible service, a partnership is recommended. The Phone Lab, the highest-rated repair service in the Netherlands, allows KPN to offer quality repairs without bearing operational costs. This strategy supports behavioural change and encourages new habits.

By collaborating with other companies in the return and repair phases of this strategy, the message of working together for a better future is further reinforced. The consumer cannot do it alone, and neither can KPN. It requires collective effort. This is not just about individual organisations, but about shared responsibility across the entire industry.

**Critical insights:**
KPN should validate whether in-store repair logistics and payment handling improve customer experience or mainly add operational complexity. Further user testing is needed to assess if this model meets convenience expectations.

**Influencing factor:**
Reversing physical condition



### Customer journey repair

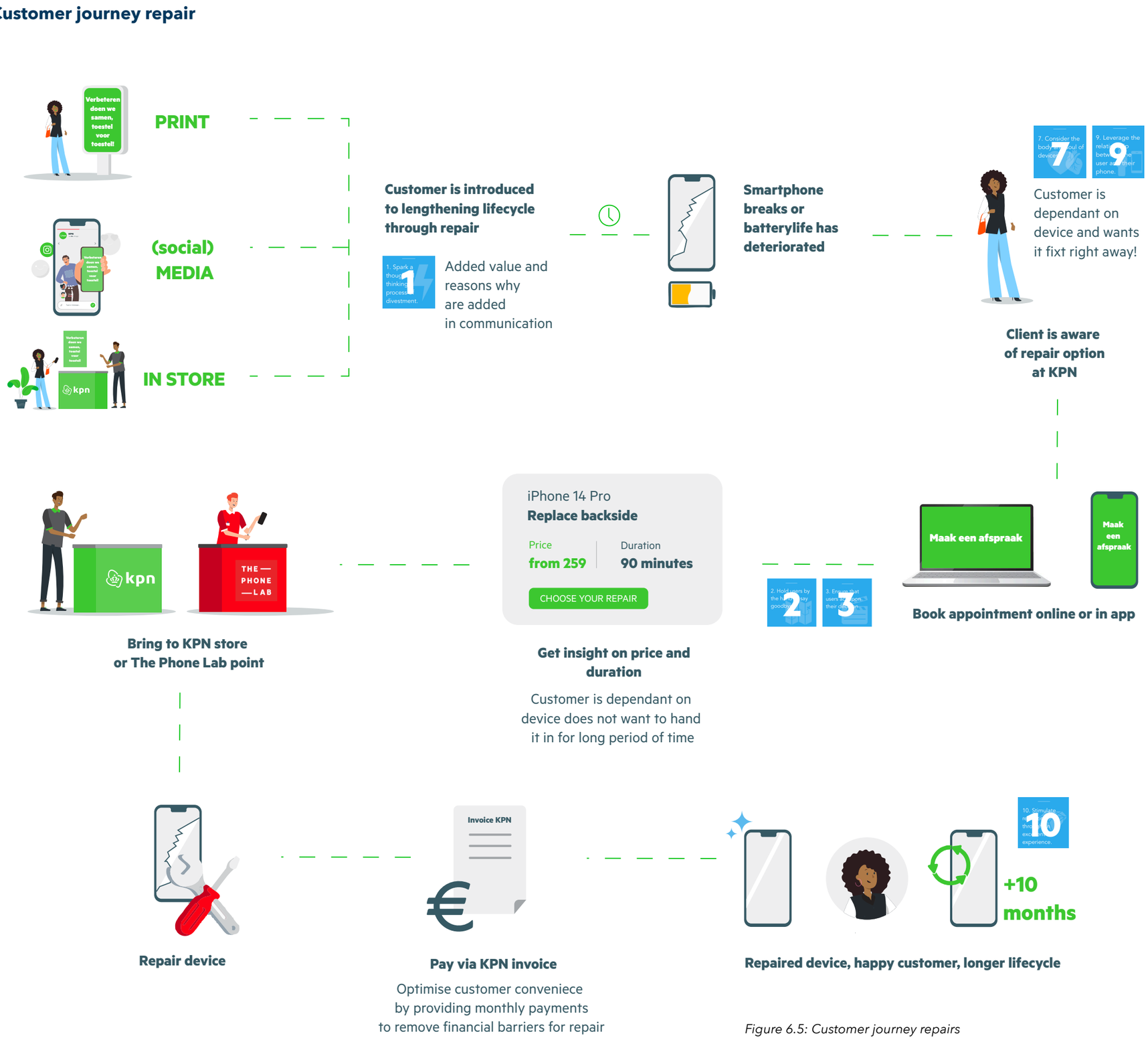



*Figure 6.5: Customer journey repairs*

# 6.3 Horizon 2

### Introduction

This section explores how KPN can encourage consumers to take more sustainable and socially responsible actions through digital engagement. The goal is to help turn intention into action by making personal impact visible, rewarding positive behaviour, and creating a sense of community. Indifferent recyclers should be motivated within this horizon.

To support this, KPN will introduce a data-driven feature within the existing MijnKPN app. This feature gives consumers real-time insight into their usage, device condition, and environmental or social impact. It also allows them to connect with friends and family, strengthening motivation through social interaction.

The app provides transparency and timely triggers, helping consumers see how small actions like returning a device or donating data can contribute to real impact. By making this visible, KPN encourages more responsible behaviour.

Figure 6.6 shows the app's home screen and highlights key design elements, which are discussed in this section. Click below for the interface.

**GO TO APP**

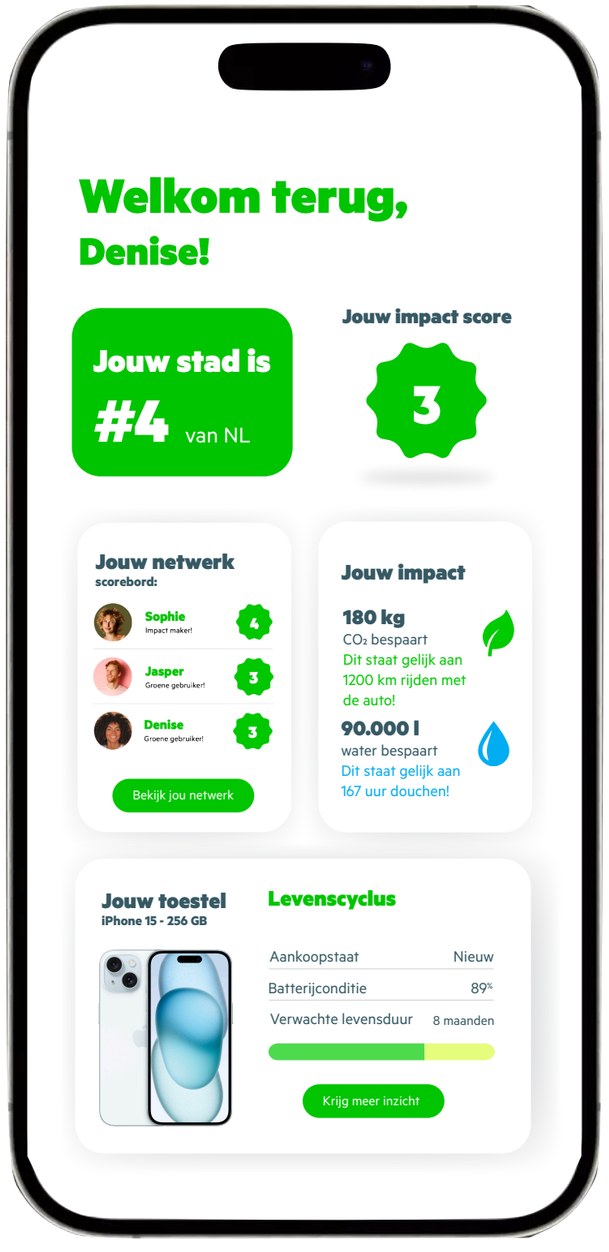



*Figure 6.6: Homescreen overview*

### Encouraging sustainable and social behaviour through tangible impact

To help turn intention into action, tangible impact can trigger consumers to show more sustainable or social behaviour, leading to warm glow. In addition consumers are rewarded with points. These points are earned by contributing to people and planet.

Points can be earned through a variety of actions. These actions should not be limited to financially driven activities, such as purchasing a refurbished device or donating mobile data, as not all consumers may be in a position to participate in that way. Instead, points should be awarded based on the social and sustainable value contributed by the consumer.

While not all consumers are driven by sustainability, consumers are also able to earn points by donating to charities or social initiatives. This element focuses on positive behaviour.

By making impact tangible and visible, consumers are made aware of how their behaviour can benefit or harm their environment. This builds on the awareness created in Horizon 1, helping turn intention into action and increasing return rates.

Expanding this system throughout KPN's entire consumer market, including TV and internet services, could strengthen its effect. This would create an ecosystem where consumers can track their total impact, with returns like modems and TV boxes potentially integrated into the reward system.

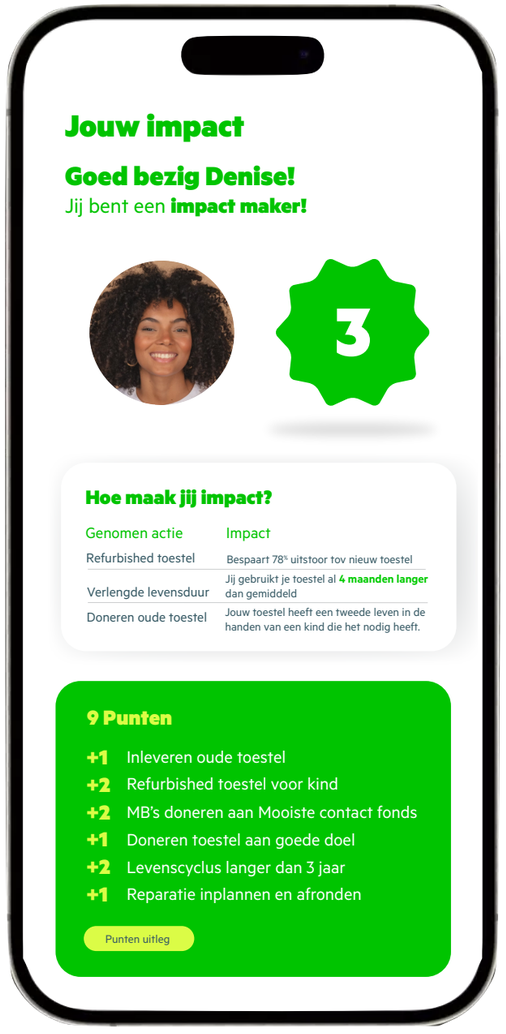



*Figure 6.7: Insight into impact*

**Critical insights:** It needs to be tested if these points are earned frequently enough to keep the implementation desirable and viable.

**Influencing factor:**
Psychological compensation

## Rewarding consumers with value

In Horizon 2, KPN will shift from financial incentives to a value-driven approach that benefits consumers, society, and the environment. Rewards will encourage repair, reuse, refurbishment, and donations, helping change customers' financially focused mindset (Ratay & Mohnen, 2022).

KPN will focus on rewards that stimulate repair, reuse, and refurbishment, and will introduce donation plans that support social impact. Depending on their level, customers can choose the type of reward they prefer and decide whether they want to contribute to social and/or sustainable impact. Although discounts on repairs may still be seen as financially motivated, they directly support circularity by extending product lifecycles. This step is essential, as repairs are often avoided due to high costs.

Financial compensation will still be offered since device ownership remains with consumers. When devices have high value, customers expect more than points; otherwise, they may sell to third parties, risking regulatory compliance.

This approach rewards positive choices and encourages lasting behaviour change. By reinforcing and recognising responsible actions, it helps shift consumer mindsets over time and opens opportunities to transform the industry.

**Critical insights:** User testing should explore whether the rewards are appealing and whether users feel motivated to earn points. If the rewards lack relevance or perceived value, users are unlikely to engage with the system. It should also be tested whether a fully value-driven reward model is realistic in practice, or if this is an idealistic assumption.

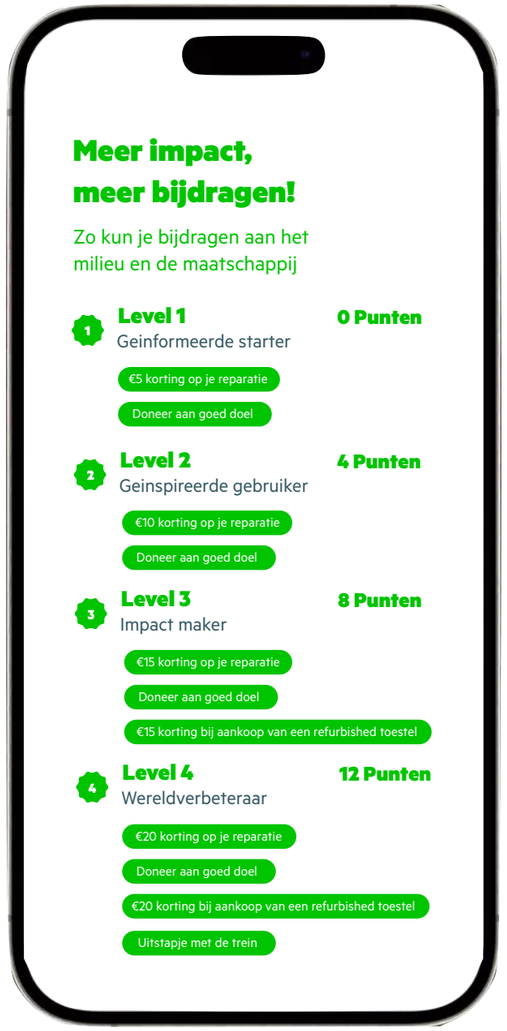



*Figure 6.8: Reward system*

**Influencing factors:**
Psychological compensation
Freedom of choice

## Understanding smartphone lifecycles

For both KPN and its customers, getting insight into a smartphone's lifecycle is essential. Customers will receive access to insights, including:

- The type of user they are
- Their expected device lifecycle
- Battery condition of the device
- Number of repairs execute

These insights come from multiple data sources. As mentioned in the technological market analysis, AI is commonly used to understand customer behaviour by analysing data such as network activity, prior device usage, and repair history. To make this system effective, KPN will need to collect extensive data over time to build accurate predictive models. These models can determine the best time for customers to return their phones, supporting longer device lifecycles through refurbishment or repair.

Within the first three years, if bought in new state, customers are encouraged to return phones while they are still in good condition for reuse. Devices returned after this period are harder to refurbish due to wear and limited software support. After three years, KPN promotes repair services to extend device life, supporting customer satisfaction and sustainability in the telecom industry.

To reduce uncertainty around when and how devices should be returned, KPN will implement timely personalised triggers. These triggers will appear via app tiles, phone notifications (figure 6.9), and personalised emails that link directly to the return page, removing the need for consumers to search for it themselves. According to the Fogg Behaviour Model (2009), well-timed triggers can turn intention into action, especially when user ability is high. Notifications that feel helpful can bridge this behavioural gap.

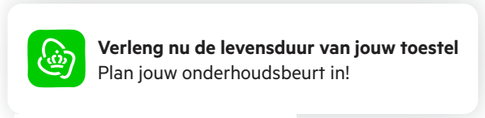



*Figure 6.9: App notifications*

Alongside this, KPN allows users to check and scan their own devices, giving them control over assessing their smartphone's condition. This builds trust and adds transparency to the Recommerce process.

This supports the findings of Inghels & Bahlmann (2020), highlighting that concerns about uncertainty around the returns are key barriers. These concerns reflect a lack of trust, which can affect willingness to engage with digital return systems.


*Figure 6.10: Lifecycle insights*

By tracking device lifecycles and combining it with predictive models and personalised communication, KPN aims to support customer decision-making, encourage responsible behaviour, and promote longer device use.


*Figure 6.11: KPN Selfcheck*

**Critical insights:** Will these insights and triggers actually move consumers to take action, or will they simply provide optional information for those who are already interested? Is it realistic to assume that committed, aspirational, and indifferent recyclers will all engage with this feature, or will it mainly appeal to committed recyclers only?

**Influencing factors:**
Reversing physical condition
Awareness of collection solutions
Understandable collection solutions
Effortless collection


### Encouraging action through social connection

The community page in the app shows how others are behaving to encourage users to take similar actions, based on the principle of subjective norm (Ajzen, 1991). Users can choose to add friends and family themselves, making sustainable behaviour more visible and personally relevant.

As users complete actions, others can respond with likes. This encourages the behaviour and creates a feeling of warm glow, making users feel good about what they have done. Over time, this can support long-term behaviour change, as users continue to feel encouraged and supported.

By connecting consumers through this community, it becomes clear that they are working together toward a shared goal. To reinforce this idea, a ranking of cities has been added. This shows how different cities are performing and helps users feel part of something bigger. It also supports the belief that every action and every smartphone counts. Real-time data is included to show the tangible impact being made, further strengthening this sense of purpose.

This city ranking may also spark a sense of friendly competition between communities, which can help increase motivation and lead to more positive results.




*Figure 6.12: Community page*

**Critical insights:** Do consumers actually want to share their progress and scores, or is this more of a nice-to-have feature? Is it something they will realistically use, or does it risk being ignored in practice?

**Influencing factor:**
Psychological compensation


### Added value for consumers

Consumers want tools that are simple, relevant, and help them make better decisions without extra effort. This app adds value by offering benefits that fit into their daily lives.

The interface provides clarity by showing real-time data usage and an estimate of their smartphone's lifecycle. This helps users manage usage more effectively and avoid unnecessary costs or upgrades. It also gives insight into the positive impact they can make, such as extending their phone's life or renewing its battery.

Using data models, the app translates these actions into tangible effects like $CO_2$ savings or social impact, making individual choices feel meaningful and rewarding.

By delivering data-driven nudges at the right moments, the app makes sustainable choices easier by reducing the effort and thought needed to act. It brings relevant information, return options, and personalised tips together in one place, saving time and adding convenience. While not all consumers are motivated by sustainability, the design also appeals to those who value control, trust, community, or simply doing the right thing. It supports all these motivations in a practical and accessible way.

Finally, the app creates a sense of connection by linking users with friends and family, adding a social element that encourages responsible behaviour through interaction. These features support consumers in making better sustainability and social impact decisions. The app helps KPN shift from a "good for the environment and your wallet" mindset to a "together for a better future" mentality in Horizon 2.

# 6.4 Horizon 3

### Introduction

To optimise long-term value, KPN lead the transformation of the telecom industry towards circularity. Horizon 3 focuses on shifting both consumer and industry mindsets by ensuring new habits and designing intuitive systems that guide behaviour for all consumer segments.

As the most sustainable provider in the Dutch telecom sector, KPN can initiate this transformation and showcase its growth and courage in Horizon 3. Additionally, industry-wide collaboration is key to creating this circular transformation.

This section explores how KPN can ensure that smartphones are returned and reused, which is essential for achieving circularity. This could be achieved by shifting from consumer ownership to an access-based model. The access-based model simplifies the customer experience, supports sustainable behaviour, and enables KPN to manage lifecycles through ownership.

### Designing intuitive systems and creating habits

Behavioural change starts with facilitating ease and ability (Fogg, 2009). KPN strives to build systems that encourage desirable behaviour without needing conscious effort. By offering digital services that are seamlessly integrated into daily life, new habits can form naturally. Research shows that making returns easy (Ylä-Mella et al., 2015) and providing the right triggers at the right time (Poppelaars et al., 2020) bridges the gap between intention and action. Removing practical barriers improves participation in return programs.

Transforming mindsets at a scale as big as KPN's customer base requires more than just behavioural change. KPN should focus on influencing the entire industry by setting new standards for transparency, sustainability, and data usage. This includes developing a strategy that will contribute to the shared responsibility of smartphones and their lifecycles.

The shift towards an access-based model supports this shared responsibility strategy. By removing the distinction between One-time payment options and handheld subscriptions, consumers are presented with a single option. While the access-based model may appear to limit freedom of choice at first, it can actually improve the sense of control by reducing complexity and decision fatigue. This aligns with insights from the SHIFT framework (White et al., 2019), which highlights that simplification and reassurance are key for creating sustainable behaviour. This approach ensures the return of devices by removing ownership-based plans, thereby supporting circularity and more sustainable usage.

Table 6.1 provides more insight into this strategic shift.

**Critical insights:** While the model promotes habit formation and shared responsibility, removing ownership may feel restrictive to some users. The perceived loss of choice could impact adoption unless the benefits are clearly communicated, and making sure customers still feel in control.



Table 6.1: Shifting from ownership based models to an access-based model

| Principle | One-Time Payment at Purchase | Handheld subscription (Ownership) | Future Access-based model (KPN Ownership) |
|---|---|---|---|
| Ownership | Consumer owns device | Consumer owns device, monthly payments are made | KPN owns device |
| Flexibility | High: only tied to sim-only plan | Moderate: while consumers are tied to contracts | High: flexible pricing offers flexible subscription durations |
| Device Lifecycle Management | None: ends at sale | Poor: returns are not guaranteed | A fully managed product lifecycle |
| End-of-Life Returns | Low return rates: price unclear, effort too high | Low return rates: price unclear, effort too high | Guaranteed: clear value + penalties if device is not returned |
| Financial Structure | Pay the full amount of the device, high initial investment | Pay the full amount of the device, high monthly costs | Pay for part of the device depending on use duration, lower monthly costs, divided costs |
| Sustainability | Short life cycles, e-waste, smartphone | Short life cycles, new device purchased after subscription | Circular economy ensured through multiple lifecycles and |
| Customer journey | Complex: buy, sell/ trade-in/ hibernate | Hard: pay off device, new subscription, sell/ trade-in/ | Simple: access only, fully managed |

This strategy provides more than a change in ownership. It can change the way KPN creates value, builds customer relationships through added services, and manages smartphone lifecycles to their full potential.

Both existing models show disadvantages. In the One-time payment model, the customer owns the smartphone. That puts all responsibility on them and often leads to devices not being returned.

In the handheld subscription model, the customer pays monthly but still has full ownership of the device. Resulting in the same problems: no guaranteed return, no guaranteed reuse, and no management of device lifecycles. The new model changes that.

When KPN becomes the owner of these devices:

- Customers receive simple and flexible access without the challenges of ownership.
- Devices are returned as part of the standard process, supported by clear incentives and well-defined penalties.
- KPN gets full control over the device lifecycle, ensuring refurbishment and recycling.
- The result is lower costs, less waste, and longer, more valuable customer relationships.

This repositions KPN from being a telecom provider to a full lifecycle manager. It offers customer convenience and sustainability in a way that current models can not.

### Data transfer, cloud implementations, and AI models

The proposed access-based model relies on technological innovation and offers a data-driven service that provides consumers with insights into pricing, device lifecycles, and service options.

In 2025, data storage is hybrid, some data is stored in the cloud, but most is kept on the device itself. This creates confusion and raises concerns when users need to transfer data during device returns, which creates a significant barrier to participation. Both the technological trend analysis and survey responses highlight ongoing concerns about data security, which must be addressed to ensure adoption of the model.

By 2035, this barrier is expected to disappear. Advances in cloud technology will likely replace the need for local storage, with smartphones serving as hubs that connect to and interact with cloud-based content in real time. This means apps, settings, and personal data will be stored remotely and accessed instantly when needed, regardless of the device being used. As a result, all user data will be automatically available through the cloud, removing the need for manual transfers and easing concerns about lost data. This shift will reduce mental effort and increase user confidence in using the system.

**Critical insights:** Full reliance on cloud storage assumes stable internet access and strong data security, which may not be guaranteed for all users. This is relevant for KPN, as they are the ones providing the data services needed to support this system.

Technological innovations are key for systemic change. As data collection improves, KPN can make informed decisions to enhance infrastructure, customer journeys, and smartphone lifecycle management.

Predictive AI models within the access-based model, use data from Horizon 2 to analyse lifecycle durations and smartphone usage patterns via MijnKPN profiles. This data helps predict subscription duration, monthly costs, repair needs, and return timing, making the system more efficient, personalised, and sustainable.

Built on behavioural, usage, and interaction data collected from 2030 to 2035, these models grow more accurate over time. As consumers enter second or third subscription cycles between Horizon 2 and 3, KPN can analyse behaviour more precisely. Based on this data, the models will predict the following:

- **Subscription duration:**
  To predict individual subscription duration, prior user data is required. The model uses this to estimate each customer's smartphone lifecycle and offer a personalised plan. Monthly costs adjust if actual use is longer or shorter than expected, lower for extended use, higher for shorter. If the subscription ends early, remaining costs must be covered. Pricing depends on lifecycle length and device value.
- **Moment of exchange:**
  Similar to Horizon 2, AI models will predict the optimal time to exchange devices. This timing benefits both consumers, by offering the best value for their subscription, and KPN, by maximising the refurbished market. Repairs can also be anticipated to support full product lifecycles.
- **Refurbish lifecycles**
  After the first use cycle, the device is returned and its condition assessed to estimate a second lifecycle. The device then enters the refurbishment market, where consumers can view its expected lifespan and condition.



AI can accurately predict the remaining lifespan after the initial cycle. Using this data, a second use cycle through refurbishment is ensured, adding value and promoting circular business models. These insights form the foundation of the access-based model.


**Critical insights:** Prediction is difficult, or even impossible, for new users. Additionally, differences in refurbishment quality should be considered to avoid unfairness or dissatisfaction with product quality.

## 6.4.1 Strategy integration

The approach to creating this industry transformation is to create and integrate an access-based model for KPN's smartphone subscriptions. This section will explain this model, the business model behind it, and the benefits it will provide to both KPN and their customers. Lastly, a pricing strategy is presented.

### Access model strategy

As part of the telecom transformation, mindsets need to be shifted from owning smartphones to smartphones becoming part of a collective system, creating shared responsibility between the company and consumer. Figure 6.13 shows how the model fits into the customer journey. Customers choose a new or refurbished smartphone and select a data subscription. The access-based model provides services like repairs, returns, and replacements into the pricing. Optional insurance covers damage or theft, providing added peace of mind for a monthly fee.

At the end of the predicted subscription time, customers can either pay the residual value to keep their device longer or exchange it for a newer model. Devices always return to KPN as the legal owner, either for refurbishment or recycling after their full lifespan. This model allows KPN to offer low prices while complying with return regulations, aiming for an estimated 80% return rate despite loss, damage, or theft.

Customers only decide on their smartphone type and data plan, without worrying about selling, returning, or repairing devices, this is managed seamlessly by KPN. Divestment is made simple and intuitive with one clear option, increasing transparency and trust.

Barriers to divestment are reduced by removing data transfer issues through full cloud storage and by allowing KPN to determine the return timing, making collection effortless for both parties.

The model promotes lifecycle extension by including a refurbishment cycle, letting consumers choose affordable, functional refurbished smartphones. This benefits the environment and adds a social dimension by increasing smartphone accessibility. After a second lifecycle, devices are assessed for possible reuse in a third cycle or sent for recycling.

**Influencing factor:**
Effortless collection

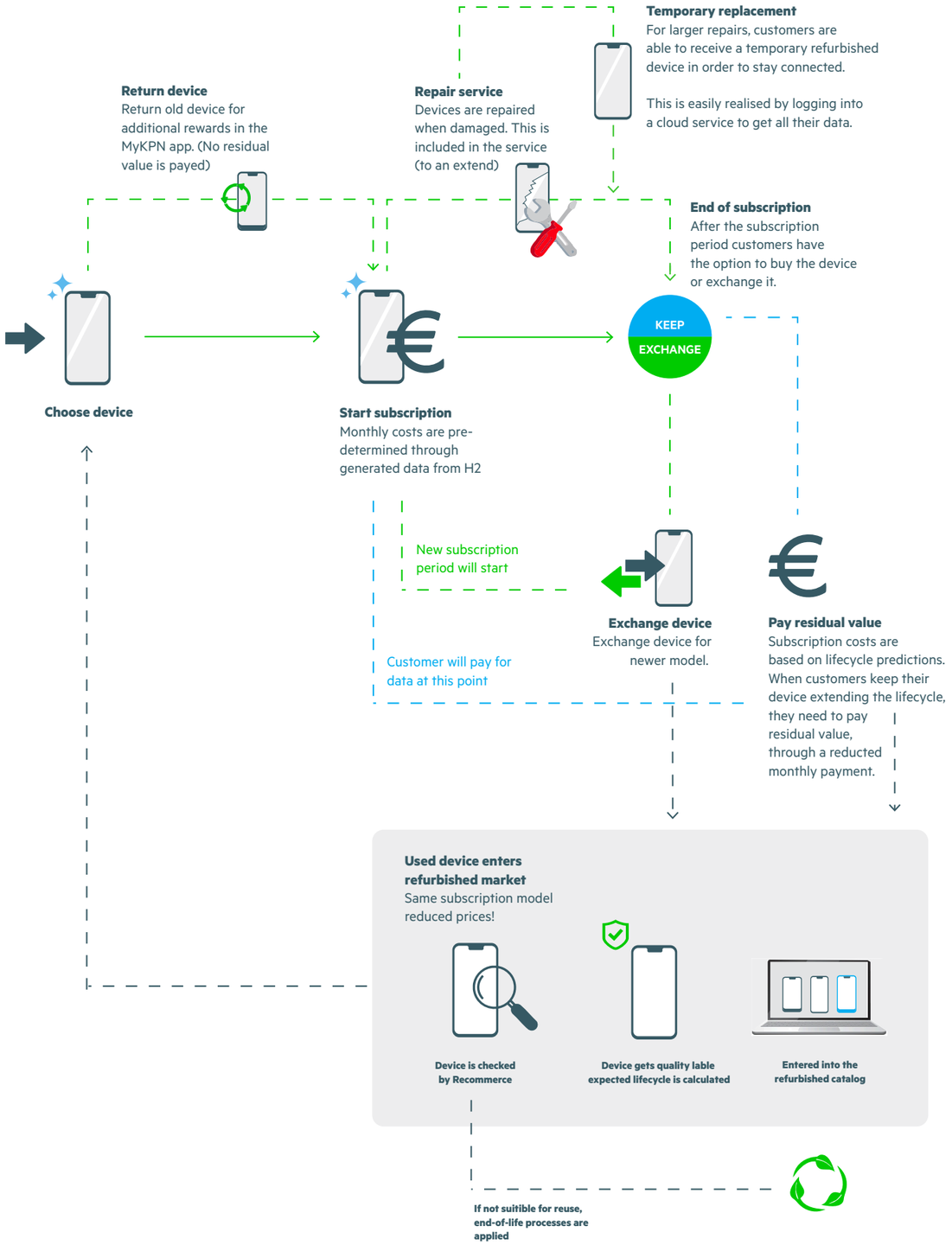



*Figure 6.13: Access-based model implementation*



## 6.4.2 Business model

Consumer adoption is crucial to the success of this strategy, which will be done by shifting mindsets from ownership to service and sustainability. The model presents added value to attract and engage consumers, which is why KPN should lead the market in this transition.

### Added value for consumers

- **Access to added services linked to smartphone use**

  As shown in figure 6.13, the access-based model includes built-in service options. In the current ownership model, consumers are responsible for returns and repairs, often leading to extra costs, inconvenience, or disposal. The access model removes this responsibility by offering a seamless experience where KPN handles returns, repairs, replacements, and optional insurance.

- **No large upfront investment for consumers**

In the ownership model, some customers make a one-time payment at purchase, facing a high initial investment, while others pay off their phone over 24 months. In the access-based model, KPN makes the initial investment, providing financial relief for customers by taking responsibility for the device.

To keep the model financially viable, KPN charges the residual value of the device in case of theft or loss, unless they have an insurance policy. Repairs are covered but come with a small or large service fee, depending on the type of repair. This supports customers financially and encourages device care.

- **A fully managed product lifecycle**

With a fully managed product lifecycle, customers always have a working device, receive upgrades when needed, and never have to worry about repairs or reselling. At the end of the contract, the device is returned through a simple process. KPN supports the customer throughout the entire lifecycle.

- **Guaranteed circular practices**

The model offers financial value while ensuring sustainability. Consumers are able to contribute using minimal effort, and impact is measured through lifecycle duration, making their contribution tangible and motivating.

- **Cost sharing**

Device and service costs are shared between customers. This design strategy estimates two users per smartphone. The first user pays more as they receive a new device, the pricing is dependent on use duration. . The second user pays less for a refurbished phone, while the device may have some previous use marks.

Due to cost sharing, KPN can offer the competitive and low prices. To support this claim, a pricing strategy has been developed to show how the flexible pricing model works. With 80% of devices suitable for refurbishment, and cost-sharing in place, KPN can offer the best market price.

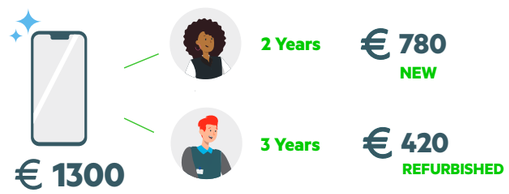



*Figure 6.14: Sharing costs*

Critical insights: Some users may see service fees or repair costs as hidden charges rather than added value. Trust in refurbishment quality is key, and if expectations are not met, satisfaction may drop. Without clear communication, the model risks being perceived as more costly over time, especially by short-term users.

## Sustainability benefits

The rapid growth of e-waste and declining availability of critical raw materials have led to EU regulations promoting circular business models. At the same time, consumers need convenient, transparent, and trustworthy processes. Return is not yet standard in many industries, and although access-based models are growing, consumers still face challenges, especially with smartphones that hold strong emotional value.

KPN will implement the access-based model as the mainstream approach in the telecom industry, replacing current ownership models. Instead of waiting for regulations to be implemented, KPN should anticipate upcoming legislation and be fully prepared when new regulations come into effect. This approach not only creates a more effective business model but also strengthens KPN's ESG commitments.

By prioritising access over ownership, KPN can design services that make products more durable, repairable, and recyclable, contributing to a circular economy. This shift also supports stronger digital and logistical infrastructure and makes products and services more accessible, encouraging smarter resource use and less waste.

This strategy helps KPN maintain a strong market position while preparing consumers for sustainable return and repair practices. Horizon 2 builds momentum for the innovations and systemic changes introduced in Horizon 3.

## Reasons for competitors to join the telecom transformation

There are several reasons for competitors to join the telecom transformation. First, regulatory compliance is becoming more important while governments introduce stricter sustainability rules. These rules apply not only to product returns but also to extending product lifespans (European Commission, 2024).

Second, consumer attitudes are shifting toward the sharing economy and access-based models. This shift pressures the industry to adapt. While KPN gains a competitive advantage, competitors risk losing customers due to pricing, added services, or transparency and will likely follow KPN's lead.

Lastly, the transformation is expected to be financially beneficial over time. Circular models can lower costs, improve customer satisfaction, and create new revenue streams, making access-based models both disruptive and profitable.

Critical insights: To ensure returns, the option to keep devices must be minimised. An access-based model allows this by removing ownership and integrating returns into the service. While this shift requires consumer adjustment, it offers clear benefits in return, such as lower costs and added services.

For the circular model to succeed, this shift in ownership must be accepted and embraced. It enables KPN to lead in sustainability while maintaining financial viability.

If successful, the industry could be transformed and competitors will follow.



## Benefits for KPN

For KPN, being the first to shift from an ownership model to an access-based model presents both risks and a USP. Consumers are likely to be attracted to the lower pricing, which could lead to significant positive churn toward KPN, especially since cost is one of the main drivers in consumer decision-making.

Additionally, KPN can maximise compliance with regulations on sustainable product use and e-waste. This is possible because return is integrated into the system through systemic change. Implementing the access-based model creates a win-win situation for KPN and supports the transformation of the telecom industry.

Lastly, KPN has the opportunity to shift consumer behaviour by redefining how people access and use devices. By removing the barriers of ownership and making return and reuse the norm, KPN leads customers toward more sustainable habits. Consumers will follow when the better choice is also the easiest one.

It might seem that this concept is mainly based on financial efficiency, but the real added value is in the impact it creates. By taking control of the full device lifecycle, KPN reduces e-waste, minimises material use, and makes responsible use and extended lifecycles the new normal.

## Pricing strategy

This pricing is based on the latest iPhone 16 at KPN. The calculation uses current market prices, though these can be easily adjusted in the future.

Table 6.2 shows an example of this flexible pricing strategy based on 500.000 purchased devices. As can be seen, this results in a significantly lower monthly cost compared to the ownership-based pricing model. A more extensive insight into how costs have been calculated, what percentages have been used and how the selling price for KPN has been established.

GO TO SPREADSHEET

Table 6.2: Pricing strategy

| **Lifecycle duration** | **2 years** | **3 years** | **4 years** | **5 years** |
|---|---|---|---|---|
| **Current pricing** | | | | |
| One-time payment | € 51,21 | € 34,14 | € 25,60 | € 20,48 |
| Handheld subscription | € 40,00 | € - | € - | € - |
| **Acces-based model pricing** | | | | |
| TCO New device | **€ 29,88** | **€ 24,68** | **€ 21,86** | **€ 20,27** |
| | | | | |
| **Residual lifecycle duration** | | **3 years** | **2 years** | **1 years** |
| TCO Refurbished device | | **€ 11,39** | **€ 10,21** | **€ 9,56** |

# 07

# VALIDATE

## 7.0 Introduction

This section presents user testing conducted to assess how consumers and KPN from KPN experience the proposed concepts. Consumers explored an app prototype and shared their thoughts on the access-based model, while KPN experts reviewed the ideas for feasibility and viability. These sessions provided valuable feedback to optimise the design strategy and make recommendations for future research. For this chapter user testing plan was created. This plan can be seen in Appendix G.

## 7.1 User testing

### 7.1.1 Testing with consumers

To assess desirability from the consumer's perspective, a test was conducted with ten existing KPN customers from a diverse age range (table 7.1) (n = 10). The goal was to validate whether users find the proposed app features and the introduced access model useful, motivating, and engaging in promoting sustainable behaviour.

*Table 7.1: Participant information*

| Participant | Age | Gender |
|---|---|---|
| P1 | 28 | F |
| P2 | 21 | F |
| P3 | 20 | F |
| P4 | 21 | F |
| P5 | 23 | M |
| P6 | 59 | M |
| P7 | 61 | F |
| P8 | 60 | M |
| P9 | 31 | M |
| P10 | 34 | M |

To test Horizon 2, an interactive prototype of the app interface was developed. This gave participants a sense of what the app will look and feel like. They took part in semi-structured interviews combined with a usability test, explored the interface, and shared their impressions of the concept.

For Horizon 3, the concept was introduced and its details explained. Participants could ask questions and openly share their thoughts and reactions throughout the conversation. Questions about giving up ownership were asked, and the most apparent risks and opportunities were discussed.

This approach provided useful insights into user preferences, expectations, and behaviours. It helped assess the overall desirability of the concept and revealed areas for further improvement and exploration.

All participants were open to using these concepts. However, their needs and priorities varied based on personal preferences and financial situations.

#### Horizon 2

##### Test insights

- The lifecycle section was seen as the most relevant and useful feature. Participants valued insights like battery health and device usage duration, which gave them a sense of control and helped with decisions about upgrades or repairs.
- Personal impact scores caught attention but lacked clarity. Many users did not understand what the numbers meant or how they were calculated. Users wanted to see how their own actions affected their impact.

  **P3:** "Impact scores aren't very clear. The scale is vague, but everything in green stands out."
- Visual hierarchy was important. Users noticed the top two elements first, making content in that area more visible. Elements in green also stood out more.

  **P1:** "The 'Lifecycle' section should be moved to the top, as this is what the focus should be on."
- Although the community features and leaderboard were clearly visible, most participants were not interested in using them. They did not find sharing personal progress relevant and preferred to keep their actions and impact private.

  **P5:** "I would enjoy this, but I'm not sure my friends would use it. If not I would not use it myself either. However, people are competitive, I believe if people decide to participate it could work."

**P9:** "I prefer to keep my activity to myself, so I wouldn't use this."

- The point system was expected to have little impact. Users felt they might use it at first but would likely forget about it over time, especially if it was not presented often enough.

**P4:** "Points are currently tied to actions like returning a device, which only happens every 2 to 5 years. This makes the system feel slow and less motivating."

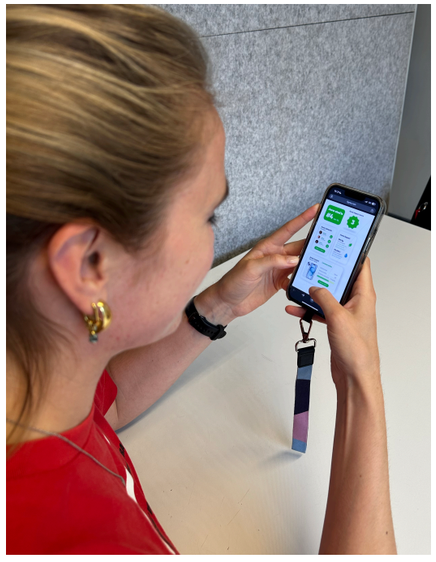


*Figure 7.1: User testing Horizon 2*

### Concept adjustments

- Make lifecycle data more visible and show how using a device longer supports sustainability and saves money. Add simple, practical tips on battery care, safe charging, software updates, and knowing when repairs are needed.
- Explain how impact is calculated using clear, relatable metrics like $CO_2$ saved or device lifespan. Include comparison tools such as "better than 70% of users" to help users understand their performance in context. Place the lifecycle information higher on the page. Use clear design, strong visuals, and consistent, simple language to make it easy to understand and notice.
- Reconsider offering only value-driven incentives. While most consumers are financially motivated, introducing more frequent ways to earn points could boost engagement.

### Further research

- Could the self-check application increase data scepticism, or could it help overcome barriers related to trust and transparency?

**Critical insights:** This insight was unexpected and only became clear after testing with consumers.

**P7:** "I do have some concerns about privacy with "Check your device." It kind of implies that it will also read other data."

- When are triggers most effective, and when should notifications be shown to encourage user action?
- What specific data is required to optimise predictive AI opportunities? Is this data already available to KPN, or would it require active consumer consent or access to personal and private information?

**Critical insights:** This was discussed during the testing session with KPN. Details remain unclear, but feasibility has been established.

## Horizon 3

### Test insights

- Users responded positively to the access-based model when it was positioned as a cost-saving and convenient service.



**P10:** "As Efficiency as a Service becomes the norm, ownership loses its value."

- Most participants were willing to give up ownership if it resulted in reduced monthly costs, easier repairs, or increased peace of mind. However, long contracts raised concerns.

**P6:** "I think a 4 year subscription is really long. I would prefer 2 years with a moment to evaluate."

- Some participants expressed concerns about being less careful with a phone they don't own, a risk known as moral hazard.

**P5:** "Moral hazard is a real and important risk in this access-based model, where reduced ownership can lead to less responsible use."

- Financial factors had a greater effect than sustainability. Even though participants appreciated the environmental benefits, most made decisions based on cost, flexibility, and simplicity of the added service.

**P8:** "I'm a consumer who is financially driven, but I see sustainability as a nice added benefit within this model."

- Consumers' financial situation had an impact on the willingness to pay monthly fees within the access-based model. Students prefer high initial investments while they do not have a steady income yet.

### Concept adjustments

- Allow consumers to end their contract early, as long as they cover the remaining value of their predicted use duration of the device. This provides clear flexibility and empowers users with more control over their commitment.
- Be transparent about user responsibilities and additional costs for damages. Incorporate light tracking or diagnostics to encourage accountability and minimise moral hazard.

### Further research

- Research on consumer behaviour and moral hazard should be done to determine whether this would pose a problem for the concept.

**Critical insights:** This moral hazard risks the concept's viability; if high, it could raise costs and undermine financial feasibility.

- Test whether participants in a larger sample would be open to monthly payments, as the participant sample is biased due to a high number of student participants.
- Explore ways to increase user flexibility while maintaining revenue. Focus on additions that offer choice without reducing profitability or increasing service costs.

## 7.1.2 Testing with KPN

To validate the concepts from a company perspective, a collaborative session was held with three experienced KPN professionals: a Product Owner, an AI Architect, and a Sustainability Specialist (n=3). The session began with an introduction to the main challenges and presented the concepts to ensure an open, co-creative discussion.

Together, the experts developed an assumption map, highlighting key uncertainties and providing perspectives. Through a dot-voting exercise, experts helped prioritise the most influential assumptions for the validation.

The session provided valuable insights into company expectations and priorities, leading to useful adjustments to the concept and highlighting areas for further testing and development.

*Figure 7.2: Validation session with experts at KPN*

### Main insights

- Most consumers remain uninterested in sustainability, and motivation may be low.
- Rewards are very interesting, however, is it realistic to opt for fully value-driven rewards? Could you combine it with the current “combi-voordeel” structure?
- Most technical implementations are feasible, especially within the 10 year time frame.
- Leaderboard does not seam viable and brings privacy issues along with it.

### Concept adjustments

- Combining value-driven rewards with current “combi-voordeel” structure. To make earning points more frequent and motivating consumers with multiple drivers.
- Removing the leaderboard since it is not viable or desirable.
- Making impact more tangible for consumers to understand: “Driving 1200 km”.

### Unknown factors

- Is KPN able to maintain logistics and refurbishment partnerships at scale?
- Does the access model generate enough revenue to cover the costs of returns, repairs, and refurbishments and remain profitable?
- Do users understand and trust sustainability metrics such as $CO_2$ saved and water saved?
- Will smooth returns and easy repairs encourage users to comply with the model?
- Will customers engage more and churn less if their impact is both visible and rewarding?

**Critical insights:** Due to its expert-driven approach, the session produced insights not directly comparable with consumer testing. The emphasis was more on viability and feasibility than on desirability.

### Product owner:

“I do not see customers using the leaderboard, nor do I think this will be possible due to privacy.”

### Product owner:

“This concept gets me thinking about new possibilities. I like implementing value-driven rewards.”

### Sustainability specialist:

“I question if the general public can grasp what 61 kg CO2 means; I would make it more tangible.”

### AI Architect:

“Predicting human behaviour remains highly complex; however, with a large customer base, it becomes possible to identify patterns and incorporate these into predictive models.”





# 08

# DELIVER

## 8.0 Introduction

This section presents optimisations made to the design strategy based on user testing, expert feedback, technical feasibility, and viability considerations. The optimisations focus on enhancing usability, motivation, and sustainability across the three horizons, preparing the concepts for finalisation and future development. This section also provides concept specific recommendations.

# 8.1 Optimising concepts

This section presents the optimisation and finalisation of the multifaceted strategy. It outlines key improvements based on user insights, technical feasibility, viability, desirability and strategic considerations. The goal is to enhance the overall user experience, address concerns, and strengthen the strategy's effectiveness across three horizons.

## 8.1.1 Horizon 1

### Including information on data transfer

To reduce barriers surrounding data transfer and security during the return process, the concept has been optimised by integrating KPN's existing transfer assistance more visibly throughout the customer journey. The integration is applied at key touch points, including checkout, follow-up emails, and materials inside the return box.

Many users are unaware these resources exist or would not look for them on their own. Making them more visible and accessible can lower concerns and make returning a device feel easier and safer. Promoting and marketing a "receive, reset and return strategy. "

This implementation can be simply added in correspondence through clickable links or QR codes, redirecting consumers to the page needed. An example is given below.

**TRANSFER ASSISTANCE**

## 8.1.2 Horizon 2

### Visual adjustments

Lifecycles should be the main focus in Horizon 2 and must be communicated in a way that immediately captures attention. This change is based on user testing, which showed that consumers tend to focus on the top area first. By prioritising visibility and placement, the concept better supports awareness and understanding of product lifecycles (figure 8.1).

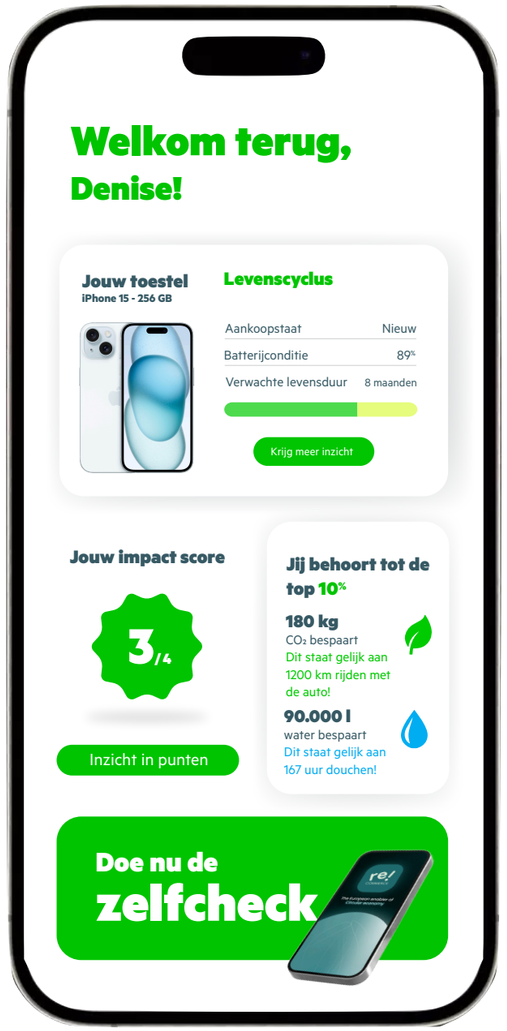



*Figure 8.1: App adjustments through user test*



### Communicating impact

Figure 8.1 shows that a scale has been added to the impact score (e.g. 3 out of 4) to help consumers understand what the number represents. User testing revealed a need for more context, so a participation percentage is now also shown. This helps users better interpret their score and understand how actively they are contributing.

Additionally, the leaderboard and community feature for sharing impact with others has been removed due to privacy concerns and lack of desirability.

### Receiving rewards

In the optimised concept, the existing Combivoordeel integration will be merged with the value-driven point system to create a combined and more engaging experience. This optimisation allows users to earn points more frequently, not just through financial activity but also through positive actions that reflect personal values.

As a result, earning points becomes less dependent on spending. Additional ways to earn points will be introduced to increase engagement and frequency of use. These actions are also focus on socially beneficial behaviours, making the system more inclusive and flexible.

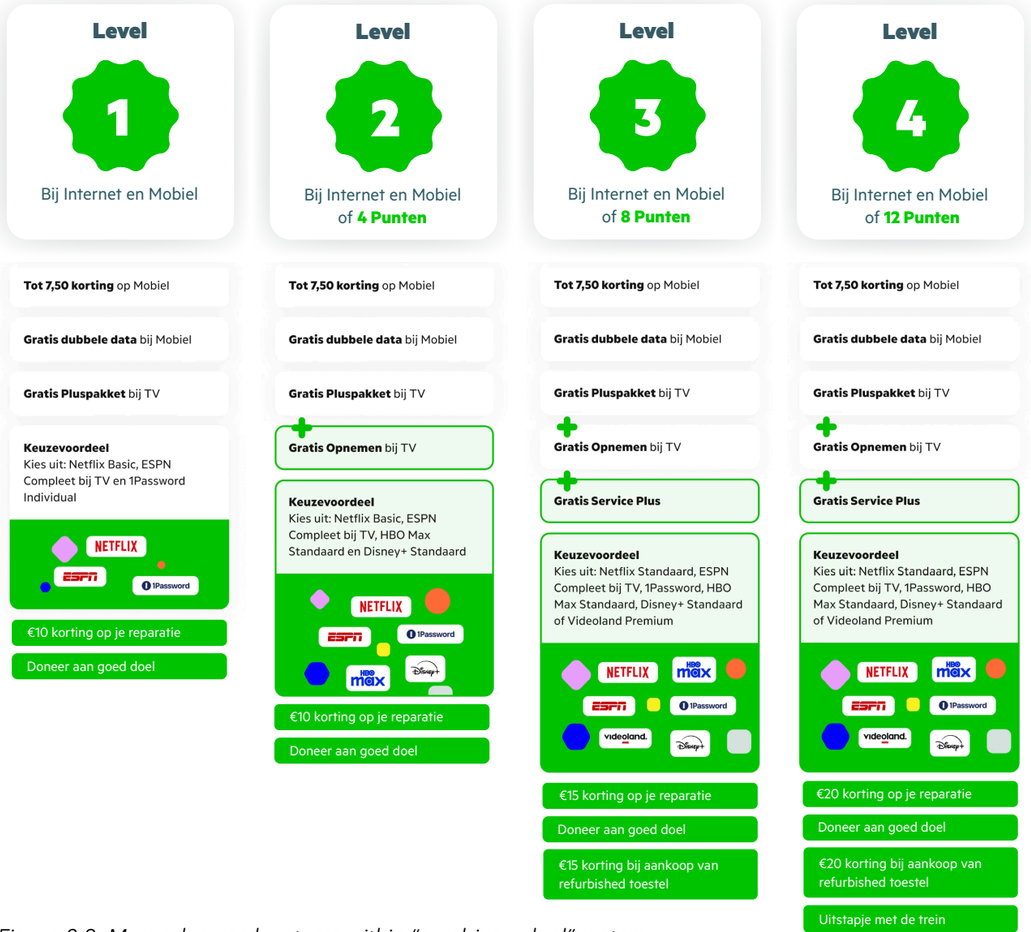



*Figure 8.2: Merged reward systems within "combivoordeel" system*

### Technical implementations

To improve the concept, personalised nudging is expanded with practical tips on device care such as battery maintenance, safe charging and software updates. These help users extend their device lifespan with minimal effort.

The self-check feature should be clearly explained, highlighting that it only uses basic device data. Clear and simple messaging will reduce scepticism and build user trust.

## 8.1.3 Horizon 3

Optimising for 2035 presents challenges due to the uncertainty and dependency on future technical innovations. This horizon depends on systems and behaviours that are still in development but show strong potential. At this stage, it is not yet possible to make fully informed optimisation choices. Instead, Horizon 3 presents strategic directions and principles for long-term development, with relevant considerations that allow flexibility as technologies and user expectations change.

### Feasibility considerations

Even though Horizon 3 has been tested with experts from KPN, the technical feasibility of implementing predictive AI and personalised user experiences needs further validation through real-world testing. The concept is highly dependant on accessing and processing large volumes of user data, such as device usage patterns, repair histories, and behavioural signals. This data is key for providing accurate predictions and timely triggers. Potential challenges include data privacy limitations, integration with current systems, and keeping the system fast and reliable when expanded. Iterations on both AI models and system integrations are needed to keep optimising the system and provide a feasible concept.

### Viability considerations

The transition to an access-based model presents multiple business challenges. KPN must carefully manage repair and refurbishment costs to keep the model financially viable while offering competitive pricing to remain attractive for customers.

Strong logistics and refurbishment partners are key to handling more devices and making the system work. It must give customers enough freedom while keeping KPN's revenue steady. KPI's (Key Performance Indicators) should be used to track how well the access-based model performs. Finally, adapting to regulatory changes and positioning KPN as a leader in circular telecom practices will require strategic investments and ongoing market analysis.

### Desirability considerations

Despite its user-centred design, several consumer-related factors may still impact adoption and satisfaction. User testing showed that the added value of certain services was unclear, especially when cost-related information was not transparent.

To adopt the model with confidence, consumers need clear information about data security, environmental impact, and how the model affects their experience and responsibilities. Behavioural triggers must be strategically timed and personalised to motivate action without causing notification fatigue or privacy concerns.Consumer preferences vary across segments, especially in terms of financial ability, attitudes toward ownership, and environmental values. The system must be flexible enough to address these differences, providing personalised communication and support to ensure acceptance.

**Critical insights:** Recommendations are needed to provide further explanation on these considerations.



# 8.2 Final strategy

The final optimisations form an integration strategy that communicates the problem of hibernating phones by shifting mindsets and creating habits. The multifaceted strategy, focusses on increasing motivation and ability using integrated processes, personalised nudging and predictive AI. These elements allow for gradual behavioural change that turns intention into action.

It aims to transform the telecom industry from an ownership to an access-based model repositioning the telecom industry from a linear to a circular economy. Consumers are triggered by offering rewards, simplicity and knowledge on lifecycle expansion, making the customer experience more convenient. Optimal lifecycle durations are calculated and integrated into a predictive model to remove barriers and streamline operations.

The final strategy addresses most design requirements, previously presented in section 4.5. Most unmet requirements have not failed to be added but might not cover the requirement fully or just parts of it. As this is a multifaceted strategy, requirements are fulfilled across the full roadmap rather than within each individual concept. The final design strategy is illustrated in figure 8.3 on the following page. Section 8.3 provides recommendations to address the remaining design requirements, along with additional insights for further research and development.

Table 8.1: Design requirements

| nr. | Design requirement | |
|---|---|---|
| 1 | Encourage sustainable behaviour by making the design visible, relevant, and personally rewarding. | |
| 2 | Make returns as effortless as possible by integrating them into familiar physical and digital touch points. | |
| 3 | Provide support and reassurance at key moments to help users feel confident and in control. | |
| 4 | Clearly explain what happens to the returned device, including how data is handled and impact is made. | |
| 5 | Build trust by clearly communicating how users' personal data is securely removed before reuse or recycling. | |
| 6 | Ensure return options are visible in everyday customer interactions, not hidden in reports. | |
| 7 | Use timely triggers (e.g., after upgrades or contract changes) to nudge users toward returning devices. | |
| 8 | Help users act quickly and reduce "think-twice" behaviour through timely communication and incentives. | |
| 9 | Link sustainable action to immediate value such as credits, loyalty points, or trade-in rewards. | |
| 10 | Use understandable language, inclusive visuals, and relatable examples to reach all customer segments. | |
| 11 | Change behaviours over time by integrating return actions into regular customer touch points, leading to habit formation | |
| 12 | Position KPN as a frontrunner in sustainability and circularity to differentiate from competitors. | |
| 13 | The design should address both short- and long-term impact. | |
| 14 | The design should support KPN's goal to increase return rates. | |
| 15 | Show both the environmental impact and the personal value of returning devices. | |
| 16 | Align circular initiatives with brand values to build trust and encourage long-term engagement. | |
| 17 | Let users see the positive effect of their actions, such as emissions saved or devices reused. | |
| 18 | Ensure solutions are flexible and inclusive to serve today's users and future market needs. | |

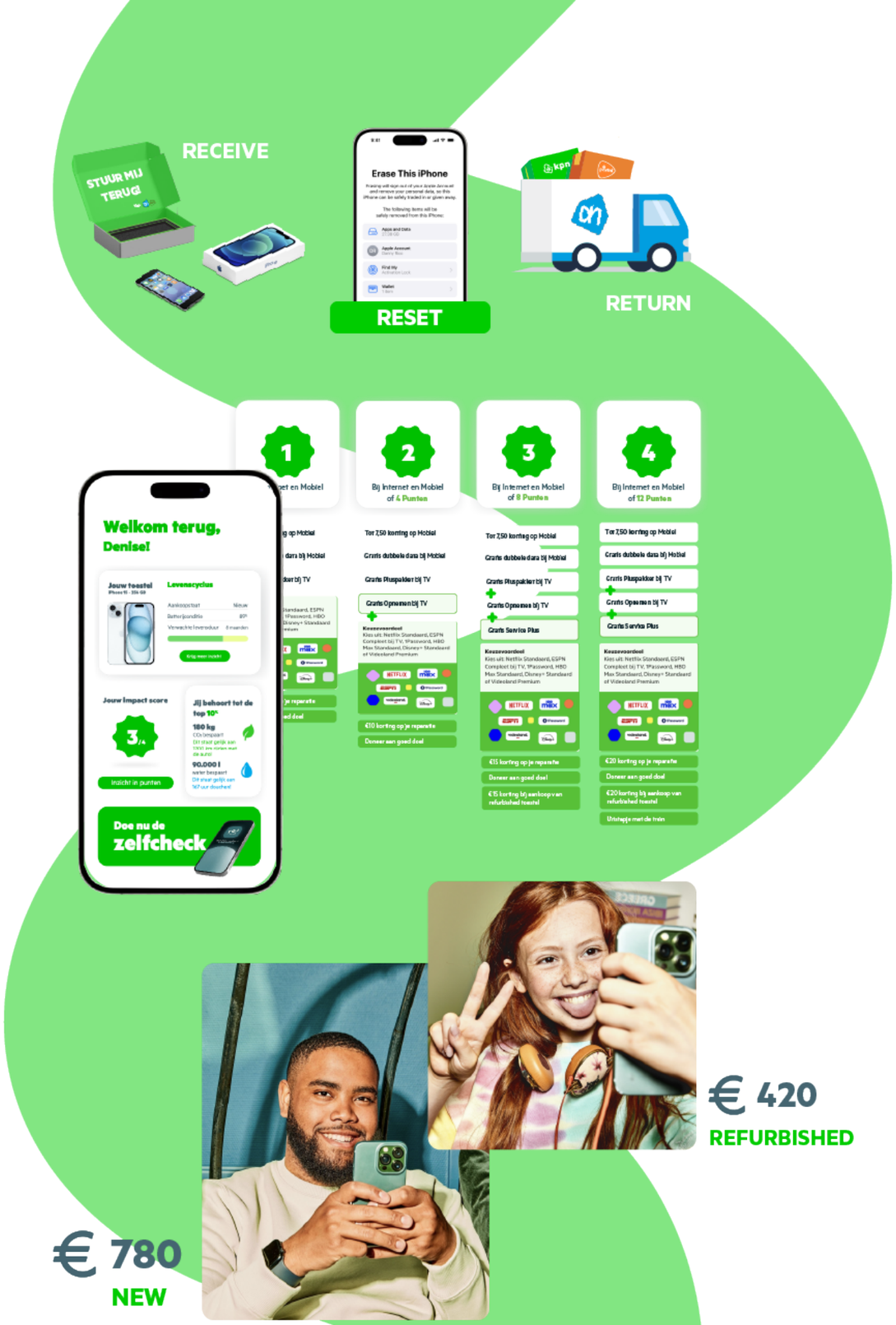



*Figure 8.3: Final strategy overview*



# 8.3 Recommendations

*for further concept optimisation and research*

As mentioned in section 7.2, the strategy does not fully meet all design requirements. Some barriers to the process of divestment remain, and improvements are needed to ensure a smooth and trustworthy return experience. To address these challenges and strengthen the strategy, a series of recommendations is presented this section. These focus on further optimisation, user engagement, and system development across short- and long-term horizons.

The return program should support users throughout all stages of the return process. Starting from awareness and decision-making to the actual return, repair, and eventual replacement or upgrade of their devices.

## 8.3.1 Horizon 1

In Horizon 1, the goal is to help committed and aspirational recyclers overcome early barriers, such as lack of awareness, low perceived ability, and concerns around data security. Although the return process supports ability, divestment remains difficult if data security and transfer concerns are not resolved.

1. **Optimising messaging strategies to influence sustainable consumer behaviour**
   It is recommended for KPN to investigate which awareness and messaging strategies are most effective at shifting consumer attitudes. This should be done through collaboration with marketing experts, who should provide actionable and lasting campaign ideas. Additionally, KPN should A/B test different campaign tones (emotional, informational, and incentive-driven) to find the most effective approach, in moving consumers towards action.

2. **Investigate consumer trust and barriers in at-home return experiences**
   Further investigation on how customers experience the convenience of at-home device return services in relation to concerns about privacy, data security, and logistical reliability should be done. The research should identify which design elements, such as tracking packages, trust in partners and secure packaging through the return box, effectively enhance user trust and encourage adoption of the return program. These insights will support improvements to the return process and reduce hesitation among consumers.

3. **Track system performance**
   KPN should define and track key performance indicators (KPI's), to measure the effectiveness of the return system and related partnerships. Metrics such as return rates, drop-off points, and user engagement are essential to identify friction early and improve the system over time. Particular attention should be paid to moments where hesitation occurs, especially around data security, so that targeted improvements can be made based on actual user behaviour.

4. **Explore how repair pricing affects user decisions**
   KPN should assess how different repair price points influence users' willingness to choose repair over replacement. This research should identify what users consider a fair and acceptable repair cost, and at what point the price becomes too high for them to choose repair over getting a new device. The study should also explore whether users perceive repair as a valuable service or as an inconvenience. Insights from this research can help KPN set pricing that encourages repair while maintaining customer satisfaction.

## 8.3.2 Horizon 2

In Horizon 2, the focus is on boosting return motivation by addressing barriers related to transparency and trust. The strategy targets three customer segments: committed, aspirational, and indifferent recyclers, aiming to increase motivation by providing insights into lifecycle extension, practical tips, the self-check feature, and opportunities to earn points and rewards.

1. **Understand consumer trust in the self-check feature**
   KPN should evaluate how consumers perceive the self-check feature and whether it builds or reduces trust. Focus areas include data privacy concerns, added value, and ease of use. This can be assessed through testing and should focus on how the feature is presented in the app, what language or design elements help build trust, and whether users understand what data is being accessed. Based on the findings, KPN can refine the feature's design and communication to improve clarity and strengthen user confidence.

2. **Optimise notification timing for increased engagement**
   KPN should test different approaches to notification timing and frequency to find the right balance between encouraging action (such as returning or repairing a device) and avoiding notification fatigue. Experiments can help determine the most effective times of day, time between reminders, and the situations in which users are most responsive. Surveys can also help KPN understand how users feel about the number and frequency of notifications, as well as how much control they would like to have.

3. **Test engagement with lifecycle extension features**
   KPN should explore whether consumers are willing to engage with the in-app features designed to support longer device use. Research should assess how consumers respond to different types of guidance, how they prefer to receive it, and whether it influences behaviour over time. The current strategy assumes that the lifecycle tab adds value and will be used regularly, but this needs to be validated. If the feature is rarely used or not seen as useful, the concept should be redesigned or simplified to better fit user needs.

4. **Motivating consumer segments to increase recycling participation**
   It is recommended that KPN conduct behavioural research to understand what motivates or limits participation among different consumer segments, especially indifferent and aspirational recyclers. In-app behavioural tracking can provide insights into real usage patterns and decision-making moments. This will help identify effective triggers and barriers, allowing KPN to design targeted strategies that match the motivations of each segment and make the return process more engaging and relevant.



## 8.3.3 Horizon 3

In Horizon 3, the goal is to support the transition to an access-based model for all customer segments. This includes offering flexible contracts, clear responsibilities, and integrated services such as repair and return. To make the model work, KPN must focus on clear communication, reliable data handling, and a straightforward user experience that builds trust and encourages long-term use.

1. **Evaluate consumer response to flexible contract options**
   Early contract exits were mentioned during user testing as an important factor in making the model feel fair and adaptable. Building on these insights, KPN should research how consumers respond to early contract exit options, such as paying a fixed fee or the remaining value of the device. Surveys can reveal whether these options increase trust and reduce hesitation to join the model. The study should also test which pricing structures are easiest to understand and perceived as most fair.

   Additionally, it should assess whether offering flexible contracts affects the risk of customer churn or the financial viability of the access-based concept.

2. **Clarify damage and loss expectations**
   KPN should develop a clear policy for situations where a device is returned damaged, lost, or stolen, and test how well consumers understand and accept it. Consumer feedback should be gathered to identify any confusing terms or unclear responsibilities. To strengthen trust and provide additional reassurance, KPN could also explore offering optional insurance to cover repair or replacement costs. This research will help ensure expectations are transparent, reduce fear of hidden charges, and increase confidence in the model.

3. **Encourage responsible use and limit moral hazards**
   KPN should research whether repair and replacement coverage leads to reduced care or increased misuse. To reduce the risk of moral hazards within the access-based model, KPN should define and communicate clear usage expectations as part of the service agreement. Research should test whether explaining the environmental and financial impact of careless use increases consumer responsibility.

4. **Develop Integrated Tracking and Diagnostic Tools to Support Circular Use**
   KPN should invest in the development of lightweight, privacy-conscious tracking and diagnostic tools that can monitor device condition, usage patterns, and potential misuse throughout the contract period. These tools can provide early indicators of damage, wear, or non-compliant behaviour, helping KPN proactively manage repair needs and reduce long-term costs. The data can also support fair end-of-contract assessments and inform user feedback, strengthening transparency and trust in the access-based model. Development should prioritise user consent, clear communication, and minimal performance impact to ensure acceptance and compliance.

# 09

# DISCUSSION

## 9.0 Introduction

This discussion addresses key limitations of the graduation project and provides recommendations for further development and research. For each limitation, a recommendation is provided to address it, along with additional future directions. Survey and concept-specific recommendations, presented in sections 3.3.2 and 8.3 will not be addressed in this section, but must be seen as equally important.

This graduation project provides a clear understanding of consumer behaviour around smartphone divestment and proposes a strategic roadmap to increase the collection of hibernating smartphones. Future research and strategy refinement can build on the insights and concepts presented in this project. Additionally, the research methods used and results provide a foundation for future, more extensive studies within KPN and the wider telecom sector. The final design strategy, presented in section 8.2 provides an overview of the key concepts and design decisions developed throughout the project. The tactical roadmap presented in section 6.1, serves as an implementation plan for this strategy.

### Consumer testing and implementation

A key limitation within this project is the lack of large-scale, real-world testing. While user testing provided valuable qualitative insights into Horizon 2 and 3, the long-term effectiveness and scalability of these solutions remain uncertain. Therefore, it is recommended that KPN sets up a test panel and conducts additional large-scale A/B testing online to gather real market insights. This approach will allow KPN to collect accurate data on user engagement, operational challenges, and financial viability, ensuring iterative improvements before full implementation of the strategy.

### Consumer acceptance and behavioural change

The shift from ownership to an access-based model, as introduced in Horizon 3, requires a fundamental behavioural change. Although research shows growing support for sustainable practices, some consumers may hesitate to give up ownership or fear losing control over their devices. Future research should explore these psychological barriers in more detail, and effective touch points and incentives should be explored. Clear communication strategies and employee training programs are essential to support this transition and build customer trust.

### Operational and logistical challenges

The proposed access-based model requires strong partnerships and infrastructure for refurbishment, repair, and return logistics. Currently, the feasibility and costs of these operations are not fully assessed. KPN should focus on mapping these costs and logistics in order to ensure efficient operation systems. Future work could include a more detailed Total cost of ownership (TCO) analysis and negotiating seamless collaborations to optimise these processes and ensure smooth customer experiences.

### Ensuring the effectiveness of predictive AI models

A key limitation of the current strategy is the reliance on predictive AI models without clear ways to track their accuracy over time. These models are used to predict consumer behaviour and identify the best moments to trigger consumers, but their actual performance must be closely monitored. While consumer habits and market conditions continue to change, the models may become less effective without regular review and adjustments.

### Assessing the desirability of key features

Current concepts assume that most consumers will find the provided features and implementations desirable. Elements such as rewards, lifecycle duration, and impact scores are designed to motivate behaviour, but the desirability may differ among consumer segments. Further testing is needed to determine whether these features are relevant to consumers who are not already motivated by sustainability. To improve the concepts, future development should focus on testing which features consumers value and implementing these insights into the strategy.

### Business model innovation

The strategy has a lot of potential, but detailed economic analysis is missing. Future research should focus on creating a viable business model for the access-based service, including revenue, pricing, and financial risks. Finding a balance between affordable prices for consumers and profits for KPN is essential.

### Lack of external expert validation

Although the concepts have been tested with experts from KPN, the project could benefit from external expert validation to ensure its assumptions and strategies are realistic and achievable. Involving industry specialists and stakeholders early on can help identify potential challenges and risks.

# 10

# CONCLUSION

This graduation project explored how KPN can optimise its trade-in system to increase the return rates of hibernating smartphones. The objective was to encourage sustainable consumer behaviour through a strategic design approach. This section summarises the key research findings in relation to the initial research questions and concludes the proposed strategy

## Addressing the research questions

### RQ1: How do consumers experience the divestment process?

Consumers experience the divestment process as emotionally and practically difficult. Many keep their old smartphones due to emotional attachment, security concerns, or the perception that the return process is inconvenient. Hibernating devices are not seen as a problem by most users.

### RQ2: Does environmental awareness have a significant influence on return behaviour?

Environmental awareness does have an impact on behavioural intention, but it rarely leads to action. A clear attitude–behaviour gap exists. Consumers often claim to care about sustainability but are more influenced by convenience and financial incentives when making return decisions.

### RQ3: What drives people to SHIFT their behaviour towards a more sustainable approach?

Behavioural change is driven by a combination of motivation, ability, and effective triggers. The strategy uses personalised nudging, tangible impact feedback, and emotional reassurance to move users from intention to action. Social influence and ease of use also contribute significantly to this shift.

### RQ4: What are (future) consumer needs in order for the divestment process to be successful?

Consumers need simple, trustworthy, and emotionally comfortable return experiences. Future systems must clearly communicate value, guarantee data security, and reduce decision time. Emotional support and feedback about the positive impact of returns are essential.

### RQ5: How does the current system facilitate users in returning current and old devices?

The current system lacks visibility and integration, and does not sufficiently engage consumers, resulting in low participation or no participation at all. It is not sufficiently integrated in the customer journey and fails to overcome barriers on data safety. This reduces the perceived value of the program.

### RQ6: Are consumers satisfied with current solutions for returning smartphones?

Most consumers are unaware of return programs or view it as untrustworthy and inconvenient. Even those who are aware often feel the compensation is not worth the effort. As a result, only a few users have positive experiences that encourage them to return devices repeatedly.

### RQ7: What are (future) consumer needs in order for the divestment process to be successful?

Consumers need visible, low-effort return processes. They need clear information about data protection and transparency on what happens to returned phones. Divestment should be intuitive, emotionally supportive, and seamlessly embedded in the customer journeys. This is ensured by using an access-based model.

### RQ8: Which design principles should be included when designing a trade-in strategy for KPN in order to enhance collection?

The design integrates principles such as convenience, emotional detachment, immediate action, habit formation, and visible rewards. These principles were applied in the creation of a roadmap that reduces friction and promotes lasting behaviour change.



## Overall conclusion

The graduation project concludes that to significantly increase the return of hibernating phones, KPN must go beyond improving trade-in logistics and address the behavioural, emotional, and psychological aspects of consumer decision-making. The proposed strategy is structured around three horizons.

Horizon 1 introduces a rebranded return experience with integrated return and repair logistics, improved visibility, and emotional reassurance, focusing on making returns simple and trustworthy.

Horizon 2 uses AI to deliver personalised insights, reward sustainable behaviour, and support lifecycle extension by helping consumers make informed decisions about repair, reuse, and timely return.

Horizon 3 proposes a transition to an access-based ownership model, where KPN retains ownership of devices to ensure full lifecycle management, maximise reuse, and eliminate the end-of-life loss of valuable materials.

This multifaceted strategy bridges the gap between intention and action by providing consumers with clarity, convenience, and motivation to participate. It supports KPN's goal to increase return rates and strengthens their position as a sustainability leader in the telecom industry. This graduation project highlights that when companies align user needs with system design and emotional engagement, they can effectively promote more sustainable behaviour.
The goal of this project was not to deliver a finished product, but to outline a clear strategy for future development.

# 11

# PERSONAL REFLECTION

At the beginning of this project, I envisioned tackling a project that focused on creating meaningful impact. I came across a topic that aligned with my interest in circular design and the transition to a circular economy. This has always been something I have been passionate about during my studies, and the project felt like the right opportunity to explore that interest while also gaining experience in the professional field, at KPN.

I was curious about how I would approach a project of this size on my own. I did not feel confident with my writing skills and was hesitant to begin with the literature review. Research was not something I considered a strong skill, and I was not sure if I could structure the process well or present convincing arguments.

Looking back, those doubts turned out to be unnecessary. I learned a lot during the process, especially about making decisions independently and trusting my own judgement. One of my main learning goals was to build confidence in writing. I forces myself to stay on track and avoid procrastination, and I am proud to say that I have succeeded. That gave me more control and helped me improve academically, while also enjoying the process.

This was the first time I worked on something this large and complex. The scale of the project made the process feel more challenging. It needed a different level of commitment and decision-making, and sometimes, I doubted whether I was making the right choices. But throughout this process, I learned to trust myself more. I realised that not everything needs to be figured out from the start or be perfect right away. What mattered was staying open to learning and taking responsibility for each step. Even on days when things felt unclear, as long as I made progress, the day was still meaningful. That shift in mindset helped me grow, not just as a designer, but also as a researcher. I have gained independence within this project and at the same time learned to ask for help more.

Outside of the academic work, I really enjoyed talking about the topic with friends and family. Almost everyone responded with something like, “Oh no, I’m guilty of keeping my old phones in a drawer.” It was a funny but clear reminder of how common the problem is, and in a way, it confirmed what I was researching. These conversations often turned into discussions about the potential for reuse and their willingness to hand in devices, as well as the hesitations I had come across in my research, now showing up in real life.

I especially remember conversations with my parents. I managed to spark their interest and motivation, especially when we talked about trade-in systems. At one point, my dad texted me that he was offered the option to hand in his old watch. He said he considered it but much rather give it to me or my siblings instead. The fun part for me was that he had actually thought about it, which showed a small but meaningful shift in mindset.

In the end, I am very proud of what I have achieved. I have reached my learning goals to the best of my ability. I explored how decisions are made within a corporate context, contributed to a sustainable telecom solution, and became more confident in both research and writing. I’m proud of the growth I’ve experienced and feel better prepared for what comes next.

# 12

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# 13

# APPENDICES

# Appendix A: Project Brief

DESIGN FOR our future

TU Delft

**Personal Project Brief – IDE Master Graduation Project**

**Problem Definition**

*What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.*
*(max 200 words)*

Many people keep old smartphones at home, often as backups or just because they do not know what else to do with them. Only 33,4 % of old phones are being returned (Wilson et al., 2017). These phones end up forgotten in drawers, even though they still hold valuable materials that could be reused. This leads to wasted resources and adds to environmental problems.

The current systems for collecting and processing old devices are not working as well as they could. Consumers often feel unmotivated to hand in their old phones because the process isn't always clear, easy, or secure. Concerns about data safety and a lack of good incentives are common barriers (Ylä-Mella et al., 2022).

This issue impacts multiple groups. Consumers seek a simple and secure way to dispose of their old phones, recycling companies need a steady supply of used devices to recover valuable materials, and companies like KPN aim to enhance their sustainability efforts and reduce waste. However, the effectiveness of KPN's trade-in programme is limited by a secondary step in the online platform, which reduces both efficiency and convenience, leading to fewer devices being handed in. The challenge is to close the gap between people holding onto their old phones and the systems designed to collect and reuse them. Without better solutions, we miss the chance to reduce waste, save resources, and help create a more sustainable future.

**Assignment**

*This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:*

Design a system to understand consumer behaviour and develop practical solutions that encourage more people to return their old devices. The aim is to improve the recycle and/or trade-in process, increase device returns, and create value for all stakeholders, including KPN, its clients, and partners. This will be conducted by exploring what drives consumer decisions and looking at opportunities to secure a USP for KPN.

*Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)*

Research phase [Week 1-6]
- Analysing consumer behaviour (Interviews and/or data analysis)
- Market research, understanding user needs and pain points.
- Industry analysis, focussing on trends, challenges, and emerging technologies.
- Identify gaps and opportunities

Concept development [Week 6-13]
- Create value proposition for stakeholders
- Using methods such as Design Thinking and the Delft Design Guide to generate ideas - Collect data on consumer perspective on the strategy.

Feasibility study [Week 13-18]
- Focus on desirability, viability and feasibility [through a user testing]
- Look at implementation strategy
- Cost structures

The goal is to deliver a clear concept or a strategic roadmap for long-term, sustainable telecom solutions.

# Personal Project Brief – IDE Master Graduation Project

**Name student** Fien van Gool **Student number** 4772547

## PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

**Project title** Designing a sustainable system for consumer-based smartphone collection and processing

*Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.*

### Introduction

*Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)*

This project for KPN focuses on giving old devices a new purpose. Currently, most smartphones are left forgotten in drawers at home, also known as " the hibernating smartphone" (Wilson et al., 2017). People often keep them as backup phones or with other intentions, but in reality, they're rarely touched again.

The domain of this project focusses on the connection between hibernating smartphones, consumer behaviour, and circular economy. In collaboration with KPN, I will be exploring how to motivate consumers to hand in their old devices. The goal of this project is to increase the number of smartphones returned through KPN services, with the ultimate aim of becoming more circular. The focus of this research will include behavioural change, promoting sustainability among consumers, and exploring efficient ways to process devices and their materials.

Key stakeholders within this project are KPN, KPN clients, third parties, processing companies, and sellers of refurbished devices. Each with their unique interests. Currently KPN is working on multiple projects to enhance their sustainable impact. One of these initiatives is the trade-in program. This trade-in program offers consumers to hand in their old devices and in return get discounts on new smartphones. However, this trade-in program is not yet optimally developed and does not yet serve a desired outcome for KPN. This presents great challenges and opportinities for this graduation project.

This project is driven by legislation on the collection and recycling of Waste of Electrical and Electronic Equipment (WEEE). Therefore, there will be a focus on expanding KPN's recycling and/or trade-in programme in order to comply with national regulations on the collection of devices, in particular smartphones. However, challenges include changing behaviours of passive consumers, establish data security, and optimising logistic complexities, while keeping the current and strict legislation into account. By focussing on these opportunities and limitations, this project aims to create a solution that balances stakeholder interests while reducing environmental impact.

➔ *space available for images / figures on next page*



### Project planning and key moments

*To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting**, **mid-term evaluation meeting**, **green light meeting** and **graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).*

*Make sure to attach the full plan to this project brief.*
*The four key moment dates must be filled in below*

**Kick off meeting** 18-02-2025

**Mid-term evaluation** 15-04-2025

**Green light meeting** 15-06-2025

**Graduation ceremony** 07-07-2025

*In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project*

| | |
|---|---|
| Part of project scheduled part-time | |
| For how many project weeks | |
| Number of project days per week | |

Comments:

### Motivation and personal ambitions

*Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).*

*Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.*
*(200 words max)*

I wish to start this project because I am excited to explore how projects within a corporate environment operate and understand how decisions are made. Within this graduation project I want to contribute to a more sustainable approach to the use of telecom devices. This aligns with my personal interest in creating solutions that balance innovative strategies and environmental responsibility.

Through this project, I hope to use and structure all tools and knowledge I have gathered during the MSc programme, electives, and extra-curricular activities. While I have used various methods in my studies, these were often initiated by others. I now want to learn how to independently create organised and valid research, taking full responsibility for each step of the process. Research is not my strong suit, but I will focus on ensuring that the research is thorough, so the outcome is evidence-based and no wrong conclusions are drawn. This is crucial for the viability and feasibility of the project, as well as for expanding my skills in creating correct and solid arguments.

I look forward to working alone on this project, while this will challenge me to make decisions independently. This is something I find difficult but wish to improve. I also aim to improve my writing skills and develop a structured approach to research and concept development. Finally, I am excited to learn from the market, understanding consumer behaviour and industry trends, and translating these insights into actionable and sustainable solutions. This project will help me grow both personally and professionally.

# Appendix B: Expert interviews

## B1: Interview guide

**Graduation project:** Enhancing the trade-in system of KPN for increased collection of hibernating smartphones through behavioural change and circular design methods

**Interview Guide Template**

**Research topics:** Consumer market insights, circular design, behavioural change, hibernating phones, challenges.
**Interview goal:** Understand current trade-in systems, journey of customer during use, current circular approaches, consumer communication and intervention of behaviours and how to change these behaviours.
**Planned date:** dd-04-2025
**Method:** Teams video call, Dutch while all participants are Dutch speaking

**Checklist for start**

- Werkt het opname systeem?
- Open de interview guide en zorg dat deze (geprint) klaar ligt
- Leg pen en papier klaar
- Controleer of de consent form al getekend is

1. **Persoonlijke introductie**

   Hallo,
   Ik ben Fien een studente van de masteropleiding Strategic Product Design aan de TU Delft. Momenteel ben ik bezig met het afronden van mijn studie met een afstudeeropdracht bij KPN.

2. **Consent form**

   Voordat we beginnen, controleer ik graag of u akkoord gaat met het opnemen van dit gesprek en of het geoorloofd is om notities te maken. Eerder heb ik u een consent form gestuurd met alle informatie, en zeker zijn dat alles akkoord is en de form is getekend. Dit is nodig vanuit de 'Human Research Ethics Committee' van de TU Delft om zo zeker te zijn dat alles volgens de juiste, ethische richtlijnen verloopt. Zoals beschreven in de consent form zou ik dit gesprek graag opnemen, uitwerken en gebruiken om bepaalde aannames en conclusies te onderbouwen. Deze zullen hoogstwaarschijnlijk gepresenteerd worden als anonieme citaten of argumentaties. De verzamelde bestanden, betreffende een opname, transcript en conclusies staan op een beveiligde map op het KPN netwerk en zullen na het verloop van dit project worden verwijderd.
   Als u hiermee akkoord gaat, zou ik graag nu de opname starten.
   **Start opname**

3. **Introductie afstudeerproject**

   Momenteel ben ik bezig met een afstudeerproject binnen KPN dat zich focust op het verbeteren van de trade-in service voor een verhoogde inzameling van "Hibernating phones", doormiddel van gedragsverandering en consumentenbetrokkenheid. Met het verbeteren van het systeem hopen we duurzaamheidsimpact en het gebruik van grondstoffen te verlagen. Uit voorgaand onderzoek is duidelijk geworden dat het geoptimaliseerde systeem, makkelijk en toegankelijk moet zijn voor klanten. Vaak mist er kennis over duurzaamheid bij de klant waardoor klanten niet doorhebben dat hun apparatuur zowel financieel als met betrekking tot grondstoffen veel waarde kan hebben. Ook blijkt er uit onderzoek dat consumenten vaak emotioneel verbonden zijn aan hun oude toestel. Het nieuwe systeem zal zich dan ook focussen op verbeterd inlevergedrag.

4. **Introductie expert [naam] [bedrijf]**

I. Zou u een korte introductie willen geven uzelf?
II. Zou u een korte introductie willen geven over [bedrijf] ?
III. Zou u de connectie tussen [bedrijf] en KPN introduceren?
IV. Zou u uitleg kunnen geven over de service/producten die jullie bieden?
V. Wat is de visie/missie van uw bedrijf en kunt deze verder verklaren?

**Thema 1: Inzichten consumentenmarkt**

I. Kunt u uw consumentenmarkt kort beschrijven?
II. Tegen welke problemen lopen jullie klanten het meest op?

*Mogelijke vervolg vragen (probes)*

III. Hoe lossen jullie algemene problemen met klanten op?
IV. Wat zijn eigenschappen van uw consumenten?
V. Zien jullie milieubewustzijn onder jullie consumenten?
VI. Wat zijn volgens u de grootste drempels voor consumenten om hun mobiele telefoon in te leveren?
VII. Wat is het meest voorkomende consumentengedrag die u onder uw consumenten ziet verschijnen?
VIII. Hoe ervaart u gedragsverandering onder consumenten met oog op circulariteit?

**Thema 2: Circulariteit**

I. Hoe draagt [bedrijf] bij aan een betere wereld?
II. Wat zijn jullie duurzaamheidsoverwegingen?

*Mogelijke vervolg vragen (probes)*

III. Wat zijn circulaire implementaties binnen [bedrijf]?
IV. Hoe denkt u dit nog te kunnen verbeteren?
V. Vind u dat er genoeg kennis is over impact van e-waste?
VI. Vind u dat er genoeg kennis is over de voordelen van circulaire ontwerp strategieën?
VII. Ziet u een correlatie tussen kennis en duurzaam gedrag(sverandering)?
VIII. Kunt u een aantal positieve en negatieve voorbeelden geven van de huidige markt met zicht op circulariteit?
IX. Waar ziet u kansen voor verbetering?

**Thema 3: Uitdagingen**

I. Zijn er uitdagingen binnen het systeem waar jullie als [bedrijf] tegenaanlopen?
II. Kunt u het proces uitleggen waar klanten doorheen gaan (journey) en per stap de uitdagingen uitleggen?

*Mogelijke vervolg vragen (probes)*

III. Zijn er (inter)nationale initiatieven om het probleem van de hibernating phones sneller/makkelijker aan te pakken?
IV. Wat is volgens u de grootste reden dat e-waste reuse, refurbish en recycling lastig is voor velen?
V. Zijn er specifieke toepassingen doe jullie doen om deze last te ontnemen?
VI. Wat belemmert de "gewone consument" om toch hun telefoon in te leveren?

---

**5. Toekomstvisie**

Afsluitend ben ik erg geïnteresseerd in uw visie op de toekomst van de hibernating phone en de systemen die er nodig zijn om dit te voorkomen en het inleverproces gemakkelijker en aantrekkelijker te maken.

---

**6. Afsluiting**

Dankuwel voor uw deelname en antwoorden! Mocht u in het vervolg aanvullende vragen hebben over mijn onderzoek, data veiligheid, consent form of heeft u nog andere op- of aanvullingen neem graag contact op!

**Main RQ: How can the trade-in system of KPN be improved to increase the collection of 'hibernating smartphones' ?**

*SQ1: How do consumers experience the divestment process?* Integrated into survey

a. Do consumers see hibernating phones as a problem in the first place
b. How do consumers dispose of their hibernating phones (Selling (independent / retail), Drop-off (Reuse / dispose), Recycling collection)

*SQ2: Does environmental awareness have a significant influence on return behaviour?* Integrated into survey

*SQ3: What drives people to SHIFT their behaviour towards a more sustainable approach?*

a. What is needed to shift behaviour from hibernating to collection Integrated into survey + interview

*SQ4: How does the current system facilitate users in returning current and old devices?* Integrated into interview

*SQ5: Are consumers satisfied with current solutions for returning smartphones?* Integrated into survey + interview

*SQ6: What are (future) consumer needs in order for the divestment process to be successful?*

Integrated into survey + interview



# B2: Consent form

**Designing a sustainable system for consumer-based smartphone collection and processing**
**Contact persoon:** Fien van Gool

---

## Consent form.

U wordt uitgenodigd om deel te nemen, als expert, aan het afstudeerproject:

*Designing a sustainable system for consumer-based smartphone collection and processing*

Dit onderzoek wordt uitgevoerd door Fien van Gool van de TU Delft, in samenwerking met KPN als onderdeel van een afstudeerproject van de MSc – Strategic Product Design - studie in Industrial Design Engineering.

Het doel van dit individuele interview is om kennis op te doen over huidig consumentengedrag en de trade-in markt als een geheel. Het interview zal 15-30 minuten duren. Uw antwoorden zullen binnen het project gebruikt worden om inzicht te geven en argumenten te onderbouwen omtrent KPN's consumentenmarkt en hun partners en om een beeld te scheppen van toekomstige processen. U wordt gevraagd een aantal vragen via Microsoft teams gesprek te beantwoorden.

We doen ons best om het risico van databreuk bij onlineactiviteiten te minimaliseren door uw antwoorden vertrouwelijk te houden. Opnames en notities zullen in een vergrendelde map op een externe schijf worden opgeslagen en data zal na afloop van het interview worden geanonimiseerd.

Het interview zal worden opgenomen en na afloop worden verwerkt in een transcript. Citaties en opmerkingen kunnen binnen het afstudeerverslag worden verwerkt. Dit verslag wordt na afloop van het project gepubliceerd in de 'education repository' van de TU Delft (https://repository.tudelft.nl/). Alle documentatie binnen het verslag zal worden geanonimiseerd.

U neemt volledig vrijwillig deel aan dit onderzoek, u kunt zich elk moment terugtrekken, hiervoor is geen uitleg nodig. U heeft beschikking vragen over te slaan of onbeantwoord te laten. Na afloop van het onderzoek zullen alle opnames en notities worden verwijderd.

Ik geef toestemming voor het gebruik van foto's van mijn deelname:
(selecteer wat voor u van toepassing is)

- waarin ik herkenbaar ben in publicaties en presentaties over het project.
- waarin ik niet herkenbaar ben in publicaties en presentaties over het project.
- alleen voor data-analyse en niet voor publicaties en presentaties over het project

# Appendix C: Survey Results

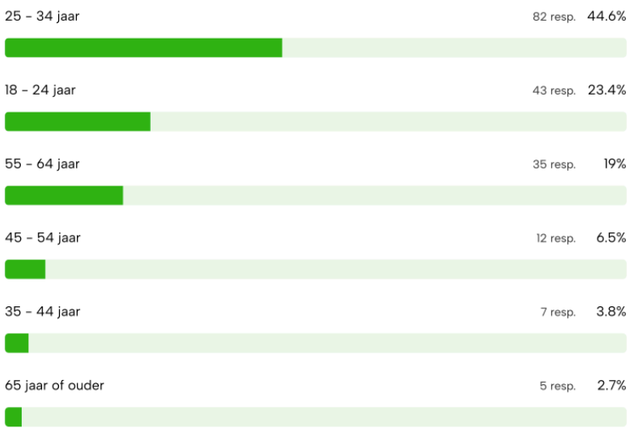
kpn

## Afstudeeronderzoek trade-in

184 responses

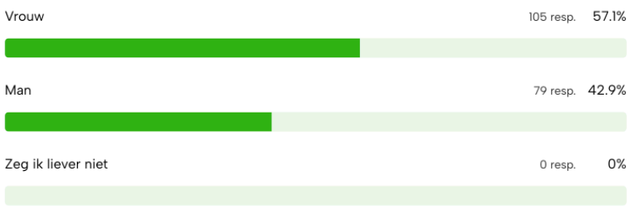
Leeftijd:

184 out of 184 answered




Geslacht:

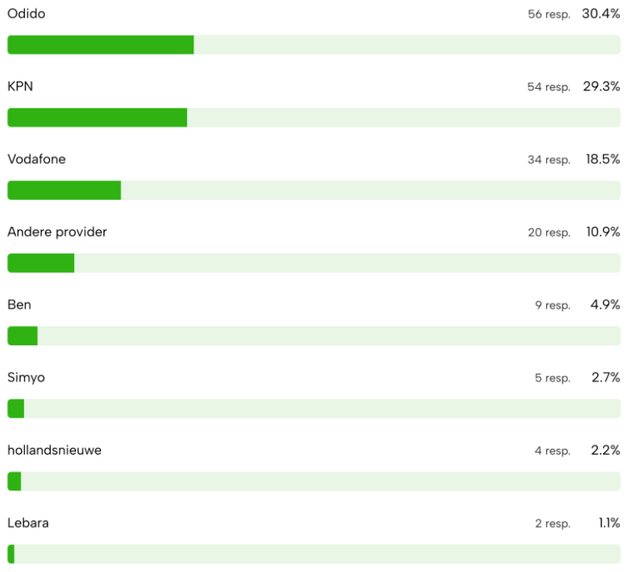
184 out of 184 answered




Mobiele provider:

184 out of 184 answered






Type abonnement:

184 out of 184 answered


Welke merk telefoon gebruik je momenteel?

184 out of 184 answered

# Appendix D: Data analysis using SPSS

## D1: Data analysis plan

### Research questions:

*SV1: How do consumers experience the divestment process?*

a. Do consumers see hibernating phones as a problem in the first place
b. How do consumers dispose of their hibernating phones (Selling (independent / retail), Drop-off (Reuse / dispose), Recycling collection)

*SV2: Does environmental awareness have a significant influence on return behaviour?*

*SV3: What drives people to SHIFT their behaviour towards a more sustainable approach?*

a. What is needed to shift behaviour from hibernating to collection

*SV5: Are consumers satisfied with current solutions for returning smartphones?*

*SV6: What are (future) consumer needs for the divestment process to be successful?*

**For this survey, I divided the questions into four topics:**

- T1: Divestment
- T2: Attitude
- T3: Facilitation
- T4: Satisfaction

### Survey Set-up

**01: Sensitising Questions**

Questions: 1 to 10

- Personal questions (age, gender)
- Questions about current mobile phone usage
- Questions about the most recent mobile purchase

**T1: Divestment**

Questions: 17 to 24

- Do people see it as a problem?
- Current behaviour
- What is needed to change behaviour?
- What should the system offer?

**T2: Attitude**

Questions: 11 to 16

- Attitudes, behaviours, and awareness regarding sustainability

**T3: Facilitation**

Questions: 25 to 34

- Ease of use of the trade-in process, clarity, and pricing

**T4: Satisfaction**

Questions: 35 to 43

- Satisfaction with the process and likelihood of recommendation



### What do I want to know from the data?

| Comparison | Why Valuable? |
|---|---|
| V11 (sustainable choice) vs. V21 (motivation to trade-in) | Measures whether sustainable attitudes influence behaviour |
| V12 (knowledge of environmental impact) vs. V16 (testing that knowledge) | Measures whether people are truly aware or just think they are |
| V12 (knowledge of environmental impact) vs. V20 (current behaviour) | Examines whether more knowledge leads to less hibernation behaviour |
| V41 (satisfaction with compensation) vs. V42 (price perceived as fair?) | Validates whether price perception affects satisfaction |
| V11 (sustainable choice) vs. V24 (trade-in programme participation) | Tests if sustainable attitudes align with actual trade-in behaviour |
| V22 (awareness) vs. V3 (provider) | Assesses whether provider affects awareness levels |
| V37/V38 vs. V43 (overall satisfaction) | Helps optimise the customer journey |
| V12 (knowledge of environmental impact) vs. V24 (trade-in participation) | Evaluates behavioural change based on attitude |
| V26 (reason to keep phone) vs. V27 (price perception) | Tests if price perception affects hibernation behaviour |
| V11 (sustainable choice) vs. V1 (age) | Checks if age influences sustainable choices |
| V12 (knowledge of environmental impact) vs. V1 (age) | Checks if age affects environmental knowledge |
| V3 (provider) vs. V24 (trade-in participation) | Assesses whether provider influences participation |
| V4 (type of subscription) vs. V24 (trade-in participation) | Looks at whether subscription type affects trade-in participation |
| V11 (sustainable choice) vs. V6 (device condition) | Checks whether sustainable choices lead to refurbished or reused devices |
| V5 (device brand) vs. V6 (device condition) | Examines correlation between brand and device condition |
| V23 (knowledge of recycling) vs. V28 (motivation for trade-in) | Assesses if recycling knowledge is reflected in motivation |
| V26 (reason for not using trade-in) vs. V28 (motivation for trade-in) | Identifies correlation between reasons for non-participation and motivation to engage |
| V30 (charity with value) vs. V31 (charity without value) | Assesses attitudes towards charity and gives insight into consumer financial choices |

### Hypotheses

1. H1: Consumenten die duurzaamheid belangrijk vinden (V11) leveren hun telefoon vaker in (V24)
2. H2: Consumenten die duurzaamheid belangrijk vinden (V11) nemen sneller een eerder gebruikt toestel (V6)
3. H3: Hogere kennis over milieu-impact (V12) hangt samen met duurzamer gedrag (V11)
4. H4: Duurzame keuzes (V11) hangt samen met disposal van hibernating phones (V19)
5. H5: Consumenten die bewust zijn van het bestaan van het trade-in programma (V22) nemen ook sneller deel aan het trade-in systeem (V24).
6. H6: De duidelijkheid van het proces (V35) beïnvloedt de algemene tevredenheid (V43)

# D2: Hypotheses and results

## H1: Consumers who consider sustainability important (V11) are more likely to trade in their phone (V24).

| **Comparison** | **V11 (importance of sustainability) × V24 (trade-in behavior)** |
|---|---|
| **$H_0$:** | There is no relationship between valuing sustainability and actually trading in phones |
| **$H_1$:** | Consumers who value sustainability (V11) are more likely to trade in their phones (V24). |
| **Test used** | One way ANOVA |
| **Conclusion** | Cannot say with certainty that a real relationship exists. |

**ANOVA**

V11

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 7,025 | 3 | 2,342 | 1,230 | ,300 |
| Within Groups | 336,953 | 177 | 1,904 | | |
| Total | 343,978 | 180 | | | |

**ANOVA Effect Sizes[a,b]**

| | | Point Estimate | 95% Confidence Interval Lower | 95% Confidence Interval Upper |
|---|---|---|---|---|
| V11 | Eta-squared | ,020 | ,000 | ,063 |
| | Epsilon-squared | ,004 | -,017 | ,047 |
| | Omega-squared Fixed-effect | ,004 | -,017 | ,047 |
| | Omega-squared Random-effect | ,001 | -,006 | ,016 |

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

b. Negative but less biased estimates are retained, not rounded to zero.

**Case Processing Summary**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| V24 * V11 | 181 | 99,5% | 1 | 0,5% | 182 | 100,0% |



**Report**

V24

| V11 | Mean | N | Std. Deviation |
|---|---|---|---|
| 3 | 3,33 | 3 | ,577 |
| 4 | 3,20 | 5 | ,447 |
| 5 | 2,73 | 22 | ,767 |
| 6 | 3,00 | 23 | ,603 |
| 7 | 2,93 | 58 | ,746 |
| 8 | 2,88 | 50 | ,799 |
| 9 | 2,72 | 18 | 1,018 |
| 10 | 2,00 | 2 | 1,414 |
| Total | 2,88 | 181 | ,777 |

## H2: Consumers who value sustainability (V11) are more likely to choose a used device (V6).

| **Comparison** | **V11 (importance of sustainability) × V6 (acceptance of used phones)** |
|---|---|
| **$H_0$:** | There is no relationship between sustainability attitudes and openness to refurbished devices. |
| **$H_1$:** | Consumers who value sustainability (V11) are more likely to choose a previously used device (V6). |
| **Test used** | One way ANOVA |
| **Conclusion** | Cannot say with certainty that a real relationship exists. |

**ANOVA**

V11

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 6,718 | 2 | 3,359 | 1,773 | ,173 |
| Within Groups | 337,260 | 178 | 1,895 | | |
| Total | 343,978 | 180 | | | |

**ANOVA Effect Sizes[a,b]**

| | | Point Estimate | 95% Confidence Interval Lower | 95% Confidence Interval Upper |
|---|---|---|---|---|
| V11 | Eta-squared | ,020 | ,000 | ,069 |
| | Epsilon-squared | ,009 | -,011 | ,058 |
| | Omega-squared Fixed-effect | ,008 | -,011 | ,058 |
| | Omega-squared Random-effect | ,004 | -,006 | ,030 |

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

b. Negative but less biased estimates are retained, not rounded to zero.

**Case Processing Summary**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| V6 * V11 | 181 | 99,5% | 1 | 0,5% | 182 | 100,0% |

**Report**

V6

| V11 | Mean | N | Std. Deviation |
|---|---|---|---|
| 3 | 1,67 | 3 | 1,155 |
| 4 | 1,40 | 5 | ,894 |
| 5 | 1,27 | 22 | ,631 |
| 6 | 1,22 | 23 | ,518 |
| 7 | 1,24 | 58 | ,572 |
| 8 | 1,28 | 50 | ,573 |
| 9 | 1,22 | 18 | ,548 |
| 10 | 1,50 | 2 | ,707 |
| Total | 1,27 | 181 | ,583 |

## H3: Higher knowledge of environmental impact (V12) is associated with more sustainable behaviour (V11).

| | |
|---|---|
| **Comparison** | **V12 (knowledge of environmental impact) × V11 (importance of sustainability)** |
| **$H_0$:** | There is no relationship between environmental knowledge and sustainable choices. |
| **$H_1$:** | Higher knowledge about environmental impact (V12) is associated with more sustainable behavior (V11). |
| **Test used** | Pearson Correlation (bivariate) |
| **Conclusion** | A significant relationship was found. |

**Correlations**

| | | V11 | V12 |
|---|---|---|---|
| V11 | Pearson Correlation | 1 | ,463** |
| | Sig. (2-tailed) | | <,001 |
| | N | 181 | 181 |
| V12 | Pearson Correlation | ,463** | 1 |
| | Sig. (2-tailed) | <,001 | |
| | N | 181 | 181 |

**. Correlation is significant at the 0.01 level (2-tailed).



## H4: Consumers who value sustainability (V11) are less likely to keep old phones at home (V19).

| | |
|---|---|
| **Comparison** | **V11 (importance of sustainability) × V19 (disposal of unused phones)** |
| **$H_0$:** | There is no relationship between sustainable choices and how consumers deal with hibernating phones. |
| **$H_1$:** | Sustainable behavior (V11) is associated with the disposal of hibernating phones (V19). |
| **Test used** | One way ANOVA |
| **Conclusion** | Cannot say with certainty that a real relationship exists. |

**ANOVA**

V11

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 4,008 | 3 | 1,336 | ,696 | ,556 |
| Within Groups | 339,970 | 177 | 1,921 | | |
| Total | 343,978 | 180 | | | |

**ANOVA Effect Sizes[a,b]**

| | | Point Estimate | 95% Confidence Interval Lower | Upper |
|---|---|---|---|---|
| V11 | Eta-squared | ,012 | ,000 | ,045 |
| | Epsilon-squared | -,005 | -,017 | ,028 |
| | Omega-squared Fixed-effect | -,005 | -,017 | ,028 |
| | Omega-squared Random-effect | -,002 | -,006 | ,010 |

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

b. Negative but less biased estimates are retained, not rounded to zero.

**Case Processing Summary**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| V19 * V11 | 181 | 99,5% | 1 | 0,5% | 182 | 100,0% |

**Report**

V19

| V11 | Mean | N | Std. Deviation |
|---|---|---|---|
| 3 | 2,33 | 3 | 1,528 |
| 4 | 2,80 | 5 | 1,304 |
| 5 | 2,64 | 22 | 1,136 |
| 6 | 2,96 | 23 | 1,224 |
| 7 | 2,48 | 58 | 1,246 |
| 8 | 2,60 | 50 | 1,278 |
| 9 | 2,33 | 18 | 1,237 |
| 10 | 1,50 | 2 | ,707 |
| Total | 2,57 | 181 | 1,234 |

## H5: Consumers who are aware of the existence of the trade-in programme (V22) are more likely to participate in the trade-in system (V24).

| **Comparison** | **V22 (awareness of trade-in programme) × V24 (trade-in participation)** |
|---|---|
| **$H_0$:** | Awareness of the trade-in programme does not affect participation. |
| **$H_1$:** | Consumers who are aware of the trade-in programme (V22) are more likely to participate in it (V24). |
| **Test used** | Chi-square test |
| **Conclusion** | A significant relationship was found. |

**Case Processing Summary**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Valid | | Missing | | Total | |
| | N | Percent | N | Percent | N | Percent |
| V22 * V24 | 182 | 100,0% | 0 | 0,0% | 182 | 100,0% |

**V22 * V24 Crosstabulation**

| | | | V24 | | | | |
|---|---|---|---|---|---|---|---|
| | | | Ja, een keer | Ja, meerdere keren | Nee, maar ik overweeg het | Nee, overweeg niet | Total |
| V22 | 0 | Count | 0 | 0 | 1 | 0 | 1 |
| | | % within V22 | 0,0% | 0,0% | 100,0% | 0,0% | 100,0% |
| | | % within V24 | 0,0% | 0,0% | 0,8% | 0,0% | 0,5% |
| | Ja | Count | 21 | 3 | 93 | 16 | 133 |
| | | % within V22 | 15,8% | 2,3% | 69,9% | 12,0% | 100,0% |
| | | % within V24 | 100,0% | 75,0% | 69,9% | 66,7% | 73,1% |
| | Nee | Count | 0 | 0 | 39 | 8 | 47 |
| | | % within V22 | 0,0% | 0,0% | 83,0% | 17,0% | 100,0% |
| | | % within V24 | 0,0% | 0,0% | 29,3% | 33,3% | 25,8% |
| | 8 | Count | 0 | 1 | 0 | 0 | 1 |
| | | % within V22 | 0,0% | 100,0% | 0,0% | 0,0% | 100,0% |
| | | % within V24 | 0,0% | 25,0% | 0,0% | 0,0% | 0,5% |
| Total | | Count | 21 | 4 | 133 | 24 | 182 |
| | | % within V22 | 11,5% | 2,2% | 73,1% | 13,2% | 100,0% |
| | | % within V24 | 100,0% | 100,0% | 100,0% | 100,0% | 100,0% |

**Chi-Square Tests**

| | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 54,880[a] | 9 | <,001 |
| Likelihood Ratio | 24,449 | 9 | ,004 |
| Linear-by-Linear Association | 1,113 | 1 | ,291 |
| N of Valid Cases | 182 | | |

a. 10 cells (62,5%) have expected count less than 5. The minimum expected count is ,02.



## H6: The clarity of the trade-in process (V35) influences overall satisfaction (V43).

| **Comparison** | **V35 (clarity of the process) × V43 (overall satisfaction)** |
|---|---|
| **$H_0$:** | The clarity of the trade-in process has no influence on overall satisfaction. |
| **$H_1$:** | The clarity of the process (V35) influences overall satisfaction (V43). |
| **Test used** | Pearson Correlation (bivariate) |
| **Conclusion** | A significant relationship was found. |

**Correlations**

| | | V35 | V43 |
|---|---|---|---|
| V35 | Pearson Correlation | 1 | ,946** |
| | Sig. (2-tailed) | | <,001 |
| | N | 182 | 182 |
| V43 | Pearson Correlation | ,946** | 1 |
| | Sig. (2-tailed) | <,001 | |
| | N | 182 | 182 |

**. Correlation is significant at the 0.01 level (2-tailed).

## H7: Higher knowledge of environmental impact (V12) is associated with greater awareness of the current problem (V16).

| **Comparison** | **V12 (knowledge of environmental impact) × V16 (view on problem)** |
|---|---|
| **$H_0$:** | Perceived knowledge is not related to actual knowledge. |
| **$H_1$:** | Consumers with higher environmental knowledge (V12) also perform better on knowledge tests (V16). |
| **Test used** | One way ANOVA |
| **Conclusion** | A significant relationship was found. |

**ANOVA**

V12

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 116,600 | 2 | 58,300 | 10,473 | <,001 |
| Within Groups | 990,847 | 178 | 5,567 | | |
| Total | 1107,448 | 180 | | | |

**ANOVA Effect Sizes[a]**

| | | Point Estimate | 95% Confidence Interval Lower | Upper |
|---|---|---|---|---|
| V12 | Eta-squared | ,105 | ,031 | ,189 |
| | Epsilon-squared | ,095 | ,020 | ,180 |
| | Omega-squared Fixed-effect | ,095 | ,020 | ,179 |
| | Omega-squared Random-effect | ,050 | ,010 | ,098 |

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

**Case Processing Summary**

| | Cases Included N | Included Percent | Excluded N | Excluded Percent | Total N | Total Percent |
|---|---|---|---|---|---|---|
| V16 * V12 | 181 | 99,5% | 1 | 0,5% | 182 | 100,0% |

**Report**

V16

| V12 | Mean | N | Std. Deviation |
|---|---|---|---|
| 0 | 1,86 | 7 | ,690 |
| 1 | 2,17 | 6 | ,408 |
| 2 | 2,09 | 22 | ,526 |
| 3 | 1,91 | 23 | ,793 |
| 4 | 2,00 | 21 | ,775 |
| 5 | 1,64 | 22 | ,727 |
| 6 | 1,61 | 28 | ,737 |
| 7 | 1,47 | 19 | ,612 |
| 8 | 1,89 | 19 | ,809 |
| 9 | 1,27 | 11 | ,467 |
| 10 | 1,00 | 3 | ,000 |
| Total | 1,77 | 181 | ,724 |

**H8: The type of provider (V3) is associated with awareness of trade-in programmes (V22).**

| **Comparison** | **V3 (Provider) × V22 (awareness of trade-in programme)** |
|---|---|
| **$H_0$:** | Awareness of the trade-in program is not affected by provider. |
| **$H_1$:** | Provider (V3) influences consumer awareness of the trade-in program (V22). Provider (V3) influences consumer awareness of the trade-in program (V22). |
| **Test used** | Chi-Square test |
| **Conclusion** | Cannot say with certainty that a real relationship exists. |



**Case Processing Summary**

| | Cases Valid N | Valid Percent | Missing N | Missing Percent | Total N | Total Percent |
|---|---|---|---|---|---|---|
| V3 * V22 | 181 | 99,5% | 1 | 0,5% | 182 | 100,0% |

**V3 * V22 Crosstabulation**

| | | | V22 0 | Ja | Nee | Total |
|---|---|---|---|---|---|---|
| V3 | KPN | Count | 0 | 37 | 16 | 53 |
| | | % within V3 | 0,0% | 69,8% | 30,2% | 100,0% |
| | | % within V22 | 0,0% | 27,8% | 34,0% | 29,3% |
| | Odido | Count | 1 | 39 | 14 | 54 |
| | | % within V3 | 1,9% | 72,2% | 25,9% | 100,0% |
| | | % within V22 | 100,0% | 29,3% | 29,8% | 29,8% |
| | Vodafone | Count | 0 | 24 | 10 | 34 |
| | | % within V3 | 0,0% | 70,6% | 29,4% | 100,0% |
| | | % within V22 | 0,0% | 18,0% | 21,3% | 18,8% |
| | Ben | Count | 0 | 9 | 0 | 9 |
| | | % within V3 | 0,0% | 100,0% | 0,0% | 100,0% |
| | | % within V22 | 0,0% | 6,8% | 0,0% | 5,0% |
| | hollandsnieuwe | Count | 0 | 2 | 2 | 4 |
| | | % within V3 | 0,0% | 50,0% | 50,0% | 100,0% |
| | | % within V22 | 0,0% | 1,5% | 4,3% | 2,2% |
| | Lebara | Count | 0 | 2 | 0 | 2 |
| | | % within V3 | 0,0% | 100,0% | 0,0% | 100,0% |
| | | % within V22 | 0,0% | 1,5% | 0,0% | 1,1% |
| | Simyo | Count | 0 | 4 | 1 | 5 |
| | | % within V3 | 0,0% | 80,0% | 20,0% | 100,0% |
| | | % within V22 | 0,0% | 3,0% | 2,1% | 2,8% |
| | Anders | Count | 0 | 16 | 4 | 20 |
| | | % within V3 | 0,0% | 80,0% | 20,0% | 100,0% |
| | | % within V22 | 0,0% | 12,0% | 8,5% | 11,0% |
| Total | | Count | 1 | 133 | 47 | 181 |
| | | % within V3 | 0,6% | 73,5% | 26,0% | 100,0% |
| | | % within V22 | 100,0% | 100,0% | 100,0% | 100,0% |

**Chi-Square Tests**

| | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 8,605[a] | 14 | ,855 |
| Likelihood Ratio | 11,271 | 14 | ,665 |
| Linear-by-Linear Association | ,898 | 1 | ,343 |
| N of Valid Cases | 181 | | |

a. 15 cells (62,5%) have expected count less than 5. The minimum expected count is ,01.

## H9: Age (V1) influences the likelihood of making sustainable choices (V11).

| | |
|---|---|
| **Comparison** | **V1 (Age) × V11 (importance of sustainability)** |
| **$H_0$:** | Age does not influence sustainable decision-making. |
| **$H_1$:** | Age (V1) affects how sustainably consumers behave (V11). |
| **Test used** | Spearman's rank correlation |
| **Conclusion** | Cannot say with certainty that a real relationship exists. |

**Correlations**

| | | | V1 | V11 |
|---|---|---|---|---|
| Spearman's rho | V1 | Correlation Coefficient | 1,000 | ,057 |
| | | Sig. (2-tailed) | . | ,448 |
| | | N | 181 | 181 |
| | V11 | Correlation Coefficient | ,057 | 1,000 |
| | | Sig. (2-tailed) | ,448 | . |
| | | N | 181 | 181 |

## H10: The level of willingness to participate (V23) has no impact on the reason for not participating (V26)

| | |
|---|---|
| **Comparison** | **V26 (reason for keeping phones) × V27 (price perception)** |
| **$H_0$:** | Willingness does not influence why consumers keep old phones. |
| **$H_1$:** | Willingness (V23) is related to consumers' reasons for keeping devices (V26). |
| **Test used** | One way ANOVA |
| **Conclusion** | A significant relationship was found. |

**ANOVA**

V23

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 68,491 | 7 | 9,784 | 2,779 | ,009 |
| Within Groups | 612,701 | 174 | 3,521 | | |
| Total | 681,192 | 181 | | | |

**ANOVA Effect Sizes[a,b]**

| | | Point Estimate | 95% Confidence Interval Lower | Upper |
|---|---|---|---|---|
| V23 | Eta-squared | ,101 | ,007 | ,157 |
| | Epsilon-squared | ,064 | -,033 | ,123 |
| | Omega-squared Fixed-effect | ,064 | -,033 | ,123 |
| | Omega-squared Random-effect | ,010 | -,005 | ,020 |

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

b. Negative but less biased estimates are retained, not rounded to zero.



**Case Processing Summary**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| V26 * V23 | 182 | 100,0% | 0 | 0,0% | 182 | 100,0% |

**Report**

V26

| V23 | Mean | N | Std. Deviation |
|---|---|---|---|
| 1 | 1,50 | 2 | ,707 |
| 2 | 5,00 | 4 | 1,414 |
| 3 | 2,75 | 4 | 1,500 |
| 4 | 1,67 | 6 | 1,033 |
| 5 | 3,22 | 9 | 1,563 |
| 6 | 3,12 | 25 | 1,922 |
| 7 | 2,90 | 29 | 2,093 |
| 8 | 3,09 | 55 | 2,075 |
| 9 | 2,26 | 27 | 1,973 |
| 10 | 2,05 | 21 | 2,355 |
| Total | 2,80 | 182 | 2,040 |

# Appendix E: Personas


**Age:** 15
**Location:** Rotterdam
**Occupation:** High school student
**Life Status:** Lives with parents and two siblings

## ABOUT

Amir, a 15-year-old high school student from Rotterdam with Moroccan-Dutch roots, is passionate about football and spends much of his time playing with friends or his local team. While social, he values his privacy online and is careful about what he shares. At home, he's close to his family but enjoys his own space to unwind, often retreating to his room to play videogames with friends, do some homework or catch up on his favourite football matches. Online he mostly watches Youtube video's about his favourite football players, but he does own Snapchat, instagram and TikTok accounts.

## PURCHASING MOTIVATIONS

- Price
- Functionality
- Trendy & Cool
- Brand reputation
- Online reviews

## HOBBIES

- Playing and watching football
- Gaming with friends online
- Following his favourite football teams
- Spending time on social media

## GOALS

- Improve his football skills and possibly join a competitive team
- Keep a low online profile while maintaining a positive digital presence
- Focus on his studies, with an eye towards university or a career in sports management or media
- Build stronger connections with friends while maintaining his privacy

## FEARS

- Having his online privacy compromised
- Being left out by friends at school and online
- Not reaching his potential in football
- Losing touch with his family as he gets older

## SUSTAINABILITY EFFORTS

Amir is somewhat aware of sustainability but doesn't actively make choices based on it. However, he does:

- Recycles
- Eco-Friendly Brands: Not a primary concern yet, but he may choose more sustainable options if they align with his lifestyle, like eco-friendly sneakers or reusable water bottles.

His focus remains on practical, immediate needs, with sustainability taking a backseat for now.


**Age:** 38
**Location:** Breda
**Occupation:** Marketing team lead for beverage company
**Life Status:** Single, mother of two (Yara, 10; Lola, 7)

## ABOUT

Denise is a hardworking single mother balancing her career and raising her two daughters in Breda. She's practical, budget-conscious, and always thinking ahead to provide stability for her family. Her days are busy with work and parenting, but she makes time for small moments—baking with her girls, weekend outings, or unwinding with a crime novel. Though her focus is on her children, she dreams to make a big trip with them one day and create lasting memories.

## PURCHASING MOTIVATIONS

- Price
- Family needs
- Durability
- Convenience
- Sustainability

## HOBBIES

- Reading crime novels and thrillers
- Watching series after the kids go to bed
- Going on weekend outings with her daughters
- Catching up with friends over coffee

## GOALS

- Provide a stable and happy home for her daughters
- Advance in her career for financial security and flexibility
- Take her daughters on a holiday abroad for new experiences
- Find more time for self-care
- Buy a house (now renting)

## FEARS

- Financial instability affecting her children's future
- Not being able to provide enough opportunities for her daughters
- Feeling overwhelmed and burnt out from balancing everything alone

## SUSTAINABILITY EFFORTS

Denise is not deeply sustainability-focused but makes practical eco-friendly choices when they fit her budget and lifestyle.

- Reducing Food Waste
- Recycling & Reusing
- Buying Second-Hand
- Energy Saving
- Eco-Friendly Transport


**Age:** 23
**Location:** Utrecht
**Occupation:** Student
**Life Status:** Single, living with 2 roommates

## ABOUT

Sophie is an environmental science student who loves creativity and music. Growing up in a small Dutch town, she developed a strong connection to nature through weekends spent hiking with her parents. Now living in the city, she enjoys DIY projects like making candles and up-cycling furniture with her roommates. Sophie is a vegetarian and enjoys cooking plant-based meals. In her free time, she loves exploring the city, attending local gigs, and staying active. She's friendly, sociable, and always open to try new things, whether it's a new recipe or a different hobby.

## PURCHASING MOTIVATIONS

- Sustainability
- Price
- Brand ethics
- Convenience
- Social influence

## HOBBIES

- DIY projects
- Cooking budget-friendly vegetarian meals with friends
- Joining student gatherings to interact with more students
- Exploring second-hand and vintage shops in Utrecht

## GOALS

- Secure an internship in urban sustainability before graduation
- Find affordable ways to live a fully zero-waste lifestyle as a student
- Travel across Europe by train on a student budget
- Join a university-led sustainability initiative in order to motivate and educate others

## FEARS

- Struggling to find a job in sustainability after graduation
- Climate change worsening within his lifetime
- Balancing studies, social life, and personal projects without burnout

## SUSTAINABILITY EFFORTS

Sophie is very environmentally friendly, she does not mind spending a bit more on sustainable items, but it must fit her student budget. Her main efforts are:

- Minimal Waste Lifestyle
- DIY Projects
- Plant-Based Eating
- Eco-Friendly Fashion
- Reusable Items
- Supporting Local & Ethical Brands


**Age:** 34
**Location:** Amsterdam
**Occupation:** Financial Analyst
**Life Status:** In a relationship, no children

## ABOUT

Jasper is a financial analyst living in Amsterdam, where he enjoys the vibrant city life. Weekends are spent cycling through the streets, discovering new cafés with his girlfriend, and attending festivals with friends. He loves his freedom without children, the flexibility to travel, either by train or flights for further adventures. Jasper thrives on the balance between a demanding career and the simple pleasures of life. A true millennial, he's always on the lookout for new experiences, whether that's trying out the latest trends, going to pop-up events, or catching up with friends over coffee.

## PURCHASING MOTIVATIONS

- Price
- Functionality
- Aesthetically pleasing
- Convenience
- Sustainability

## HOBBIES

- Cycling around Amsterdam and nearby areas
- Attending music festivals and live events with friends
- Exploring new cafés and coffee spots
- Following trends in finance and digital innovation
- Socialising and meeting up with friends

## GOALS

- Advance in his career while maintaining flexibility for personal growth
- Stay healthy and active by cycling and often running
- Travel frequently with his girlfriend, discovering new cities and cultures
- Build long-term financial security and have fun along the way

## FEARS

- Losing his work-life balance due to career pressure
- Missing out on experiences, especially in the digital age where everything is moving so fast
- The rising cost of living impacting his ability to enjoy life

## SUSTAINABILITY EFFORTS

Jasper reduces his environmental impact as much as possible but will not trade his luxury lifestyle for a more sustainable one. He tries to be conscious where he can by:

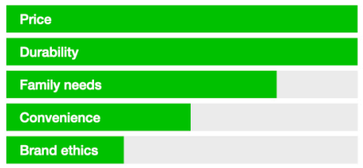
- Commuting by bike
- Supporting eco-friendly cafés and local businesses
- Using reusable coffee cups and water bottles
- Choosing sustainable travel, such as trains where possible.


**Age:** 56
**Location:** Rotterdam
**Occupation:** Logistics Manager at a shipping company
**Life Status:** Married, father of three (Amir, 15; Yasmina, 17; Karim, 19)

## ABOUT

Mo (short for Mohamed) is a hardworking family man and logistics manager in Rotterdam. Born in Morocco, he moved to the Netherlands in his twenties to build a better future for his family. Over the years, he worked his way up from an entry-level position to becoming a logistics manager at a shipping company in Rotterdam's busy port. He values stability, responsibility, and tradition, and encourages his children to respect both their Moroccan and Dutch roots. While he respects sustainability efforts, Mo prioritises financial security and efficiency in his day-to-day life.

## PURCHASING MOTIVATIONS




## HOBBIES

- Watching football (big Feyenoord supporter)
- Gardening and maintaining his backyard
- Hosting family barbecues on weekends
- Following global news and discussing politics

## GOALS

- Ensure his children have stable and successful careers
- Retire comfortably with his wife and possibly spend more time in Morocco
- Stay active and healthy as he ages
- Invest for long-term financial security
- Keep spending as much time with family now his children are starting to move out

## FEARS

- The rising cost of living affecting his family's future
- His children struggling in an uncertain job market
- Losing his sense of purpose after retirement
- Not being able to adapt to ever changing technologies

## SUSTAINABILITY EFFORTS

Mo views sustainability in a practical and financial sense, rather than strong environmental ideals. However, he does incorporate certain sustainable practices into his daily life:

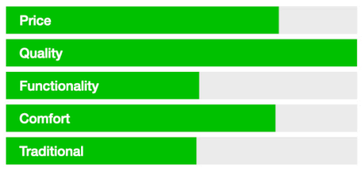
- Energy Efficiency
- Waste Reduction
- Supporting Local Products
- Growing his own produce in his garden
- Durable Purchases


**Age:** 74
**Location:** Rural area near Groningen
**Occupation:** Retired Artist and Art Teacher
**Life Status:** Widowed, grandmother of three

## ABOUT

Angelique is a 74-year-old retired artist and former art teacher, living in a quiet village. Throughout her life, she has had a deep passion for creativity and is inspired by nature. Now, as a grandmother of three, she enjoys spending time with her grandchildren, often teaching them how to paint. Though her mobility has slowed a bit, Angelique remains active by walking. She struggles with technology but cherishes face-to-face interactions. In retirement, Angelique continues to embrace new hobbies, create art, tries FaceTiming family and enjoying walks in nature.

## PURCHASING MOTIVATIONS




## HOBBIES

- Painting, especially landscapes and nature scenes
- Socialising at local community centres
- Spending quality time with her grandchildren
- Find new ways to get creative

## GOALS

- Stay physically active and engaged through social interactions and walking
- Share her passion for art with her grandchildren and community
- Explore new creative hobbies and continue making art
- Preserve her independence and live life at her own pace

## FEARS

- Losing her independence and not being able to care for herself
- Not being able to continue creating art due to physical limitations
- Falling behind with technology and losing touch with family digitally

## SUSTAINABILITY EFFORTS

While Angelique doesn't consciously make sustainable choices, she does live a simple, minimal life. Her environmental awareness is limited, however she does contribute in her own way.

- Uses old materials for art projects
- Limited awareness of recycling or eco-friendly products
- Prefers walking short distances, but not actively mindful of carbon footprint

# Appendix F: Co-creation in Design phase

## F1: Brainstorm sessions with design students

### Session approach:

**Introduction (5 min)**
Make participants feel comfortable and at ease, and have a chat to sensitise them

**Project scope (10 min)**
Explain the scope of the project and give background information on the problem statement

Needed: Laptop with slides

"**How to..**" **excercise (6 x 90 sec)**
Stimulate creativity by facilitating a short excercise while getting insight on the following topics:

- **Connect**
- **Ensure transparency**
- **Spark motivation**
- **Reward**

Needed: A4 papers and pens

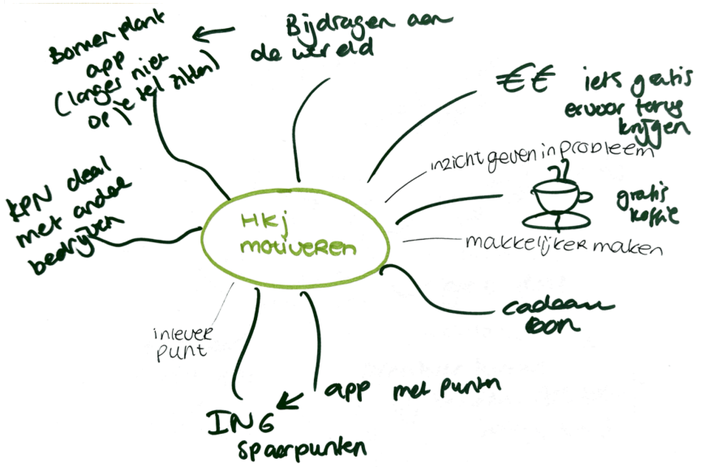
**Designing for 2035 (10 min)**
Asking the following question: "If you could design anything for 2035, this can be novel, what would you design to solve this problem?"

Needed: A4 papers and pens

**Explaining concepts and discussion opportunities (15 min)**
Participants explain their concept and further discussion will follow in order to see the full potential of what has been created.

**End of session (5 min)**
Thank participants for helping and designing.

**The created sketches have been added below; these have given insights into three main topics.**





2035 | SAMENWERKING MET VEEL ELEKTRONISCHE BEDRIJVEN

- JBL
- Nokia
- Samsung
- LG
- Batterijen
- Dyson
- Stofzuigers

Je hebt wel 100 huishoudelijke dingen in je kast

APP  met levels:

- Je krijgt punten per product
- Je kan tegen je vrienden spelen!
- alle grote Bedrijven doen mee en je kunt punten verzamelen bij alle product wat je inlevert
- Je krijgt cashback of nieuw product na lang

# F2: Co-creation sessions with KPN

### Session approach:

**Introduction (5 min)**
Make participants feel comfortable and at ease, and have a chat to sensitise them

**Project scope (10 min)**
Explain the scope of the project and give background information on the problem statement

**Designing for customer journeys (15 min)**
Asking the following questions:

1. "If you could improve anything within the customer journey, what would you improve?
2. "What are the main barriers for customers and how can we solve these?"

Needed: A4 papers and pens

**Explaining concepts and discussion opportunities (10 min)**
Participants explain their concept and further discussion will follow in order to see the full potential of what has been created.

**End of session (5 min)**

*Limited time was available here, the session was slightly cut short.*




# Appendix G: User testing

## G1: User testing plan

- **Feasibility** – Can we build this?
- **Viability** – Should we build this (will it sustain a business)?
- **Desirability** – Do users want this?

### Testing with consumers
*Desirability*

**Horizon 2 - Desirability Test –** Do users want this app experience?
**Goal**: Validate whether users find the app features useful, motivating, and engaging for sustainable behaviour.

*Participants:*
- Existing KPN customers (diverse age)
- (n=10)

*Methods:*
- Semi-structured interviews
- Usability test with interface prototype

*Test setup:*
- Page set-up:
  - Home screen with impact statistics and lifecycle information
  - Self-check tool for their phone
  - Gamification elements (points, titles, rewards)
  - Community board and city ranking
- Questions:
  - "What's the first thing that catches your attention?"
  - "Would you return to this app regularly?"
  - "Does seeing your impact motivate you?"
  - "How helpful do you find these lifecycle or impact insights?"
  - "Would you share progress with friends or respond to others?"
  - "Do you believe the point system is frequent enough?"

*Indicators for desirability:*
- Users understand the system and feel encouraged by it
- Signs of "warm glow" or pride when seeing impact scores
- Positive feedback on social/community integration
- Strong interest in tracking rewards/repair options

*Additional questions:*

- "How do you currently decide when to upgrade your phone?"
- "Do you track data usage or battery life?"
- "Would you use this app integration regularly?"
- "Would this make you more or less loyal to KPN?"
- "Anything unclear or confusing?"

**Horizon 3 - Desirability Test –** Do people want this access-based model?
**Goal**: Understand if consumers are open to shifting from ownership to an access-based model

*Participants:*

- Existing KPN customers (diverse age)
- (n=10)

*Method:*

- **Semi-structured interviews**

*Test set-up:*

- First ask general questions:
  - "Would you give up ownership of your device to KPN"
  - "Would you give up ownership for reduced monthly costs?"
  - "Would you give up ownership  for added services?"
  - "Would you give up ownership in order to reduce initial investment?"
- Show them the new access-based journey (device selection → subscription → automated return/repair → lifecycle extension).
- Questions:
  - "What's your first reaction to this model?"
  - "How do you feel about not owning your device?"
  - "Would this model make your life easier or harder?"
  - "Which part would you find most useful or concerning?"
  - "What part of the model would motivate you most?" (Price, service, conveinence)

*Indicators for desirability:*

- Expressed preference for convenience and simplicity
- Positive emotional response to circularity or "service, not ownership"
- Minimal confusion about lifecycle and return flow

*Additional questions:*

- "What's most valuable to you about this service?"
- "How would you describe this offer to a friend?"
- "Would you pay €X/month for this?"
- "Which features matter most to you?"

*Test Output*

- Customer acceptance: willingness to switch
- Pricing sensitivity analysis
- Friction maps: where confusion or resistance appears



# G2: Testing session with KPN

## Testing with KPN

*Feasibility & Viability*

### Test planning - 1.5 Hours

| Time | Task |
|---|---|
| 5 min | Welcome and introduction to session |
| 10 min | Introduction to Horizon 2 and prototype testing |
| 10 min | Assumption mapping + dot-voting risks |
| 10 min | MoSCoW Method |
| 5 min | Additional questions |
| 5 min | *Short break* |
| 10 min | Introduction H3 |
| 10 min | Assumption mapping + dot-voting risks |
| 5 min | Additional questions |
| 10 min | Viability questions (interview style) Horizon 2 and Horizon 3 |
| 10 min | Additional feedback |
| 5 min | Wrap up and thanking participants |

**Horizon 2 - Feasibility Test –** Can KPN build and maintain this app integration?
**Goal**: Test whether this app integration is technically and operationally feasible.

*Participants:*

- KPN product owner, AI Architect, and sustainability experts
- Partner (Recommerce)
- (n=4)

*Methods:*

- Feasibility mapping workshop
- Interview questions

*Feasibility questions:*

- "Can we collect reliable real-time lifecycle/battery data from devices?"
- "Do we have the data models to estimate environmental/social impact?"
- "Is the reward system (tiered, action-based) maintainable and secure?"
- "Is the reward frequency enough to keep consumers interested?"
- "How do we moderate and protect community features?"

*Feasibility risks:*

- Inability to access key usage/device data across platforms
- Complex reward validation for donations or impact actions
- App bloat from too many features in one place
- Legal/privacy issues with community scoring/ranking

**Discussion Guide:**

- What data sources do we need to:
  - Track lifecycle usage?
  - Calculate the environmental impact?
  - Validate actions for points?
- What tools do we need to moderate or gamify a community?
- What privacy regulations affect leaderboard/public rankings?
- Can we integrate impact data into the existing MijnKPN app without bloat?

*Use Post-its for:*

- Assumptions
- Dependencies
- Known unknowns

**Horizon 3 - Feasibility Test –** Can we create and maintain this access-based model?
**Goal**: Assess technical and operational ability to implement the model, especially around predictive AI, repair logistics, and customer data integration.

*Participants:*

- KPN product owner, AI Architect, and sustainability experts
- Partner (Recommerce)
- (n=4)

*Method:*

- Assumption mapping sessions

*Feasibility questions:*

- "What systems or infrastructure would need to change for this model?"
- "Can we accurately predict lifecycle duration based on usage data?"
- "What challenges do we foresee in device return enforcement?"
- "Are cloud-based, ID-less smartphones feasible by 2030–2035?"

*Feasibility risks:*

- Complex integrations between stakeholders
- Data privacy barriers with predictive modelling
- Logistical cost/risk in collecting and refurbishing at scale

**Discussion Guide:**

- What infrastructure is needed to guarantee returns?
- How do we track usage for lifecycle-based pricing?
- What happens if someone refuses to return the phone?
- How do we integrate with repair/refurb partners at scale?
- What AI models do we need to predict lifecycle and price?



Use the assumption map to map:

- Feasible now / Feasible later / Not feasible / Unknown

**Horizon 2 - Viability Test –** Can this experience provide business value?
**Goal**: Validate whether the app integration supports long-term customer engagement and will lead to a value shift.

*Participants:*

- KPN product owner, AI Architect, and sustainability experts
- Partner Recommerce (Online)
- (n=4)

*Method:*

- Value proposition testing

*Viability questions:*

- "Would this make you more loyal to KPN?"
- "Does this system feel trustworthy and rewarding?"
- "Would you make returns or repairs throught this app?"
- "Do you trust the partners within this service?"
- "Would you be motivated to act through the personalised nudging?"
- "Do you see the benefits of KPN as a sustainability leader?"
- "Would you switch plans or products based on your app insights?"

*The concept is considered viable if there is a:*

- Clear increase in perceived brand trust and affinity
- Behavioural shift from wanting financial rewards towards motivation to value/impact motivation
- Readiness to accept point-based, non-financial rewards
- Willingness to take positive action (repair, donate, extend use) when nudged

With users or business stakeholders:

- "Would this make you stay longer with KPN?"
- "Would you prefer this to financial rewards?"
- "Does this help KPN stand out from competitors?"
- "Could this reduce the need for frequent upgrades?"

**Horizon 3 - Viability Test –** Should we move from an ownership-based model to an access-based model?
**Goal**: Evaluate potential profitability, market adoption, and business model oportunities

*Participants:*

- KPN product owner, AI Architect, and sustainability experts
- Partner (Recommerce)
- (n=4)

*Method*

- Present the lifecycle-based pricing model

- Simulate customer decisions (buy now, repair, or return?)
- Compare with the current KPN pricing structures

*Validity questions:*
- "Would you be willing to pay a flexible monthly fee for access?"
- "What value do you see in included repairs and upgrades?"
- "Would you trust KPN to manage your device lifecycle?"
- "What monthly cost feels fair for this level of service?"

*The concept is considered viable if there is a(n):*
- Willingness to subscribe over own
- Acceptance of AI-based pricing connected to device use
- No major resistance to residual value payment

*Additional validity questions*
- "What % of customers are ready to adopt this by 2030?"
- "What lifetime value increase does this model generate?"
- "What new revenue streams (refurb, insurance) does this unlock?"
- "How does KPN market this without sounding like they are removing freedom?"

## Assumptions for test

**User Assumptions - H2**
- Users want insights into their environmental and social impact.
- Users understand and trust sustainability metrics (e.g. $CO_2$ saved, water saved).
- Users will be motivated by gamification, such as points, ranks, and city leaderboards.
- Users are willing to share progress publicly or within a social network.
- Users value being rewarded for sustainable actions even if rewards are not financial.

**Technology Assumptions - H2**
- KPN can access real-time or historical smartphone usage data, such as battery condition, repairs, or lifecycle status.
- KPN can integrate multiple APIs (for donations, repair bookings, tracking returned devices).
- The app can support community features like a city ranking or social feed securely and at scale.

**Business Assumptions - H2**
- Customers will engage more and churn less if impact is made visible and rewarded.
- KPN's investment in gamification and data models will lead to a measurable return in user retention or satisfaction.
- Rewarding impact (instead of just financial savings) will shift customer mindset from transactional to value-driven.

**Behavioral Assumptions - H2**
- "Warm glow" effect (emotional reward) will increase user action (e.g., repair, donate, return).
- Positive reinforcement from points and ranks will sustain engagement over time.
- Users will act on nudges sent via the app, e.g., to return a device or extend its use.



**User Assumptions - H3**
- Users are willing to give up ownership of their smartphone in exchange for access, convenience, and service.
- Users trust KPN to manage their devices, handle repairs, and protect their data.
- There is no significant emotional resistance to returning a phone at the end of a contract.
- Customers will see value in flexibility, lifecycle extension, and lower monthly payments.

**Technology Assumptions - H3**
- Full cloud-based data storage will be mature and mainstream by 2035, eliminating data transfer friction.
- AI models can accurately predict lifecycle, usage patterns, and ideal exchange moments.
- Predictive pricing can be automated and personalized without causing confusion or perceived unfairness.

**Business Assumptions - H3**
- The access model is financially sustainable: returns, repairs, and refurbishments don't outweigh revenue.
- KPN can maintain logistics and refurbishment partnerships at scale.
- Refurbished phones will retain enough market value to support the business model.
- Regulatory trends (EU and ESG) will favor or enforce access-based or circular models.

**Behavioral Assumptions - H3**
- Frictionless return and low-hassle repairs will encourage users to comply with the model.
- Lifecycle-based pricing and automated exchanges will feel fair and transparent.
- Users will not abuse the system (e.g., neglect returns, damage devices on purpose, avoid payment).

## Results


*Figure G1: Assumption map - KPN testing*