

# From Waste to Work: Exploring Social Practices in Urban E-Waste Infrastructure

A practice-based case study on E-waste disposal.



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## **Abstract**

This thesis explores how electronic waste infrastructures influence everyday disposal and work practices, using the case study of the thrift store Het Warenhuis in Leiden, the Netherlands. Within the Netherlands municipalities face spatial, financial and legal difficulties when establishing Circular Craft Centres (CCC). The city of Leiden has adopted a so-called decentralized CCC model by outsourcing E-waste collection to an already existing thrift store. By employing Social Practice Theory, in particular the strands by Shove (2012) and Spaargaren (2003, 2011), this thesis contributes to the understanding of the connectivity of circular infrastructures and households. The study employs a qualitative approach which includes semi-structured interviews with visitors of the thrift store who donated electrical appliances and thrift store workers and participant observations, and document analysis. The findings reveal how the infrastructure of the thrift store lowers thresholds for households in circular practices, while limitations in space, staffing, and regulation hinder reuse and repair activities for the thrift store. By placing these results in the wider discussion about the circular economy and everyday life, this thesis contributes to a more practice-oriented understanding of electronic waste management. It considers the socio-material and spatial dimensions of circular infrastructures and offers practical implications for the design of Circular Craft Centres for other municipalities.

## **Key words**

Social Practice Theory, Systems of Provision, electronic waste, thrift store, socio-material systems, circular infrastructures, circulair ambachtscentum, circular craft centre

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# List of Abbreviations

## Abbreviation Full Term

|                |                                                                                                                                            |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| AEEA           | Afgedankte Elektrische en Elektronische Apparatuur (Discarded Electrical and Electronic Equipment)                                         |
| CCC            | Circular Craft Centre (Circulair Ambachtscentrum)                                                                                          |
| CE             | Circular Economy                                                                                                                           |
| EEE            | Electrical and Electronic Equipment                                                                                                        |
| E-Waste        | Electronic Waste                                                                                                                           |
| ILT            | Inspectie Leefomgeving en Transport (Human Environment and Transport Inspectorate)                                                         |
| SPT            | Social Practice Theory                                                                                                                     |
| SoP            | System of Provision (only include if still referenced)                                                                                     |
| TPB            | Theory of Planned Behaviour                                                                                                                |
| WEEE           | Waste Electrical and Electronic Equipment Directive                                                                                        |
| Stichting OPEN | Stichting Organisatie Producentenverantwoordelijkheid E-waste Nederland (Organisation for Producer Responsibility for E-waste Netherlands) |
| E-appliance    | Electrical appliance                                                                                                                       |

# 1. Introduction

## 1.1 Background & Context

The management of electronic waste (E-waste) presents a pressing challenge in metropolitan regions, with growing concerns over its environmental impacts. As a response to this challenge, the concept of circular economy (CE) has gained traction, emphasizing the importance of extending the lifespan of products and materials (European Commission, 2020). The European Union set a target for member states to collect and treat at least 65% of the weight of newly sold electronic products. However, the Netherlands has struggled to meet this goal, reaching only 43% in 2023 (WEEE Nederland, 2024).

Central to the Dutch circularity policy is the concept of circular ambachtscentra (CAC) (Circular craft centre, CCC), which aims to promote, expand and facilitate R-ladder strategies such as the repair, refurbishment, and reuse of discarded goods within cities (Het Transitieteam Consumptiegoederen, 2018). Rijkswaterstaat (2020) defines circular craft centres as networks, which can be in one location, between services of municipal recycling centres, thrift stores, repair shops and other circular initiatives. In the Netherlands multiple cities and municipalities are aiming to set up their own version of a CCC by combining a municipal recycling centre, repair shop and thrift shop. However, in some of these places, space for this purpose is expensive and scarce because the area is densely populated. Therefore, municipalities have given different interpretations to the tasks and duties that these newly established CCCs must fulfil.

## 1.2 Research problem

Despite the growing enthusiasm for the circular economy as a solution to E-waste challenges, practical implementations, in the form of Circular Craft Centres (CCCs) in densely populated cities, face significant hurdles (Het Transitieteam Consumptiegoederen, 2018). The high cost of space and limited availability of suitable locations, as seen in cities like Amsterdam, hinder the establishment of physical centres dedicated to circular practices. Therefore, multiple cities are exploring strategies that embody circular economy principles in the form of networks without centralized physical locations (Ministerie van Infrastructuur en Waterstaat, 2023). An interesting case in this matter is the municipality of Leiden. As a response towards societal demand for more circularity, Leiden has shifted E-waste collection responsibility from the milieustraat (from now on the municipal recycling centre) to the thrift store Het Warenhuis. At first sight this shift should promote reuse for E-waste but also make the threshold lower for collecting and recycling E-waste in the correct way. While this offers a practical solution for municipalities that lack the resources or do not wish to relocate or renovate their municipal recycling centre, it remains unclear how this shift in the waste infrastructure has influenced the waste practices of residents and the work practices of the thrift store's workforce.

Several studies have focused on household solid and food waste practices and their infrastructures, but specific research on E-waste collection practices remains limited (Belk, 2014; Hennchen, 2019; Munir, 2021; Sezerel & Filimonau, 2023). Perhaps a reason for this is that food waste is often more easily linked to routinised practices because everyone is

confronted with food in their daily life, while the disposal of E-waste is contrary because it only happens several times a year for the average person.

This characteristic of E-waste disposal also influences the choice of theoretical frameworks used in research. The Theory of Planned Behaviour (TPB), developed by Ajzen (1991), states that human behaviour is determined by three important factors: attitudes, subjective norms and perceived behavioural control. According to the TPB, individuals make conscious and rational decisions based on their intentions, which are shaped by their own beliefs and external influences. This model is widely used in environmental psychology and waste management studies to predict recycling behaviour and sustainable actions. However, when the TPB is applied to the disposal of E-waste, it has some limitations. The disposal of E-waste is not as routine as the recycling of food or household waste, because the disposal of electronic waste does not occur frequently and is therefore often a planned action in itself.

This might also explain why E-waste disposal studies (Shevchenko et al., 2019; Aboelmaged, 2020; Nguyen et al., 2023) seem to use Ajzen's theory of planned behaviour rather than alternative options as the disposal of E-waste is often more a planned behaviour and not so much routinised. While most people do not discard electronic devices daily, their decision-making process is often influenced by factors beyond planned intention, such as convenience, infrastructure availability, and product lifecycles. These influencing factors translate very well towards the System of Provision (SoP) as detailed by Fine and Leopold (1993). SoP is a concept used in social science studies that focus on consumption and sustainability to explain how products, services, and resources are made available and consumed in society. SoP gives a foundation for this study to focus less on individual choices and more on how the system influences and constrains those choices. Shove et al. (2012) uses SoP to show how everyday practices are shaped by material and institutional systems. SoP and practice theory are closely connected and complimentary because they use practices as the focus of attention rather than people, societies, social groupings, or sociotechnical systems (Shove & Walker, 2010). With Social Practice Theory (SPT), Shove et al. (2012) emphasise that behaviour is not only an individual choice, but is also shaped by broader social, material and infrastructural contexts. SPT identifies three interrelated elements, namely: materials (infrastructure and tools), competencies (knowledge and skills) and meanings (social norms and cultural expectations) that shape human action. In the case of E-waste disposal, infrastructure (such as thrift stores or municipal recycling centres), public awareness, and convenience play a major role in determining disposal behaviours. While TPB assumes that intention drives behaviour, SPT argues that practice is shaped by systemic conditions. For example, if E-waste collection points are inconveniently located or poorly promoted, even people who want to recycle will ultimately not do so. That is why SPT offers a more comprehensive framework for understanding electronic waste disposal, as it takes into account the interaction between infrastructure, human action and policy, rather than viewing disposal as a purely rational, planned action.

A strong point of Social Practice Theory is that it points to how infrastructures actively shape practices. Shove and Trentmann (2018), for example, state the importance of understanding these infrastructures to address rising energy consumption and envision a future where

infrastructures are designed to minimize carbon-intensive practices. Social practice theory also challenges traditional distinctions between supply and demand by showing that infrastructures and practices mutually shape each other over time. This analysis is important in the context of sustainability and future infrastructure planning, especially given the need to reduce carbon emissions and adapt to new consumption and disposal patterns.

The management and infrastructure of E-waste within the framework of circular economy principles reveal significant gaps in understanding the interaction between infrastructure and practice (Katan & Gram-Hanssen, 2021; Katan, 2023). Although the circular economy promotes sustainable practices, the practical implementation of CCCs in densely populated cities remains underdeveloped due to infrastructural challenges and a gap between theory and practice (Cooke et al., 2021). For example, high costs and scarcity of space in urban areas hinders the founding of new waste collection infrastructures, which is a limiting factor towards the access to e-waste collection points (Lahti et al., 2018). Furthermore, municipalities often interpret national policy in different ways (Halkos & Petrou, 2016), leading to divergent local implementations of CCCs.

Moreover, behaviour theories tend to focus on individual motivations and values, often ignoring the socio-material contexts that shape waste management practices. Research reveals that the design and placement of waste management infrastructure impact household recycling behaviours (Katan & Gram-Hanssen, 2021; Katan, 2023). In addition, Shove (2010) criticizes that policy approaches grounded in models of attitude, behaviour, and choice are too simplistic because they do not consider the interplay between practices, infrastructures, and institutional arrangements that shape environmental outcomes. Understanding the motivations, engagement, and work practices of thrift store employees involved in E-waste collection is under examined. Despite the growing focus on circular economy strategies, the intersection of infrastructure limitations and everyday practices in E-waste management requires further investigation to enhance practical outcomes.

These days frameworks for the CE are essential to sustainability policies. There is, however, an emerging criticism about putting market-based solutions and technical efficiency ahead of the practical social and material realities of circular participation. According to Greene and Hobson (2025) ignoring circularity's social, relational, and infrastructure components is alarming to how the circular economy is understood. This criticism is also applicable to e-waste practices, since structural limitations ingrained in (daily) routines and urban infrastructures influence user behaviours more so than personal intentions. Understanding how circular practices are enacted provides a lens for assessing and improving the effectiveness of CE implementations, such as Leiden's decentralized approach through thrift stores.

Given the significant differences between E-waste collection infrastructures and those for solid or food waste, it might also prove beneficial to examine the socio-material contexts around E-waste disposal practices of households. By analysing real-world examples, such as het Warenhuis in Leiden, we can address this gap and provide a contribution towards a better understanding of the different practices of households and thrift store workers within the SoP for E-waste collection in the Netherlands. These understandings can contribute to

improving E-waste management on a local and practical level but also help to bridge the gap between research and practice in environmental decision-making, ultimately leading to improved strategies for E-waste management that align with the principles of circular economy.

### **1.3 Research Aim**

The aim of this research is to gain insight into the interconnection of waste infrastructure with E-waste disposal practices among Leiden's residents and thrift store employees. By studying the disposal practices of visitors and the work practices of employees in the Leiden case study, we can gain a better understanding of how to improve collection models for cities, ultimately aiming to meet the European Commission's 65% collection target. The findings of this study will be particularly beneficial for knowledge users seeking to improve household E-waste collection efforts.

**Research question: How does the domestic E-appliance collection infrastructure of the thrift store in Leiden shape the disposal practices and work practices and what implications does this have for the further development of CCCs?**

#### **Sub-questions:**

Uptake of a new circular infrastructure:

1. What is the current disposal infrastructure of E-appliances within the Netherlands regarding Circular Craft Centres?
2. What are the disposal practices regarding E-appliances among visitors of the thrift store in Leiden?
3. What are the work practices regarding E-appliances among the workforce of the thrift store in Leiden?

### **1.4 MADE relevancy**

This thesis addresses circularity in urban regions, one of the main themes within the MADE (Metropolitan Analysis, Design and Engineering) master's programme too which this thesis is written. By investigating how urban infrastructures and activities can be redesigned to support the transition to a circular economy at the local level. The research focuses on the collection of E-waste in the city of Leiden and provides a case study of how an existing infrastructure can be used to provide circular services in urban environments with limited space. Although the case study is set in Leiden, the findings are also relevant to other metropolitan regions like Amsterdam, where spatial constraints pose similar challenges.

### **1.5 Readers guide**

The following chapter introduces the theoretical and conceptual framework that guides this study. Chapter 3 describes the methodology, including the case study and data collection. Chapter 4 presents the empirical results, beginning with an overview of the Dutch E-waste infrastructure and zooming in on the case of Leiden. It then explores the disposal practices of thrift store visitors and the work practices of employees. Chapter 5 provides a discussion of these findings through the lens of

the theoretical framework, while also reflecting on the study's limitations, implications, validity and discussing further research. Chapter 6 concludes by answering the main research question and offering recommendations for knowledge users.

## 2. Theoretical & Conceptual Framework

This chapter outlines the theoretical foundation and conceptual lens used to examine disposal & work practices in the context of Leiden's alternative E-waste infrastructure. To make this framework applicable to the case study, section 2.1 introduces two strands within SPT. Spaargaren's (2003, 2011) model is used to understand how actors and systems of provision co-shape practices, while Shove's (2012) model helps break down the practices into materials, meanings, and competences. Section 2.2 focuses specifically on the role of infrastructures, both physical and institutional, in enabling or constraining everyday circular practices. With this foundation section 2.3 presents the conceptual lens for the study, structured around three interconnected dimensions: systems of practice and provision, materialities, and spatialities. These dimensions translate theory into a more practical lens through which the empirical data is analysed and implicated. They help to reveal how households and thrift store workers deal with circular infrastructures, how their actions are shaped by broader systems, and how space and place influence access to and participation in circular practices.

### 2.1 Social practice theory & models

The case study in Leiden shows that there are different approaches possible for designing the E-waste disposal infrastructure. However, it is still unknown how disposal and work practices are affected by different types of infrastructures. To give insight in how infrastructures and people interact we can adopt a Social Practice Theory (SPT) perspective to move beyond dominant approaches that either focus narrowly on individual behaviour or rely solely on systemic interventions to address environmental challenges. According to Spaargaren (2011), these two perspectives have historically shaped environmental policy and theory: one that emphasizes personal responsibility and behaviour change, and another that focuses on top-down technological and infrastructural solutions. The first approach sees individuals as responsible for aligning their consumption with environmental goals. While this perspective has helped raise awareness, it often fails to result in meaningful behavioural change, as awareness alone is a poor predictor of environmental performances (Hargreaves, 2011; Shove, 2010). In contrast, the second approach assumes that people will act sustainably if the right infrastructures, technologies, or regulations are imposed. Although it focuses on systems, it often sidelines the everyday actions and choices of individuals, treating them as passive recipients of change (Spaargaren, 2011). In contrast to these limited views, this study draws on Spaargaren's (2003, 2011) Social Practices Model (Figure 1), which offers a more integrated way of understanding environmental and social change. This model places shared practices, routine forms of behaviour performed by people in specific contexts, at the centre of analysis. It recognizes that both individuals (as knowledgeable and capable agents) and structural conditions (such as infrastructures and regulations) shape practices. Practices are dynamic and situated, formed through ongoing interactions between actors and the systems that surround them.

## *Sustainable Consumption*

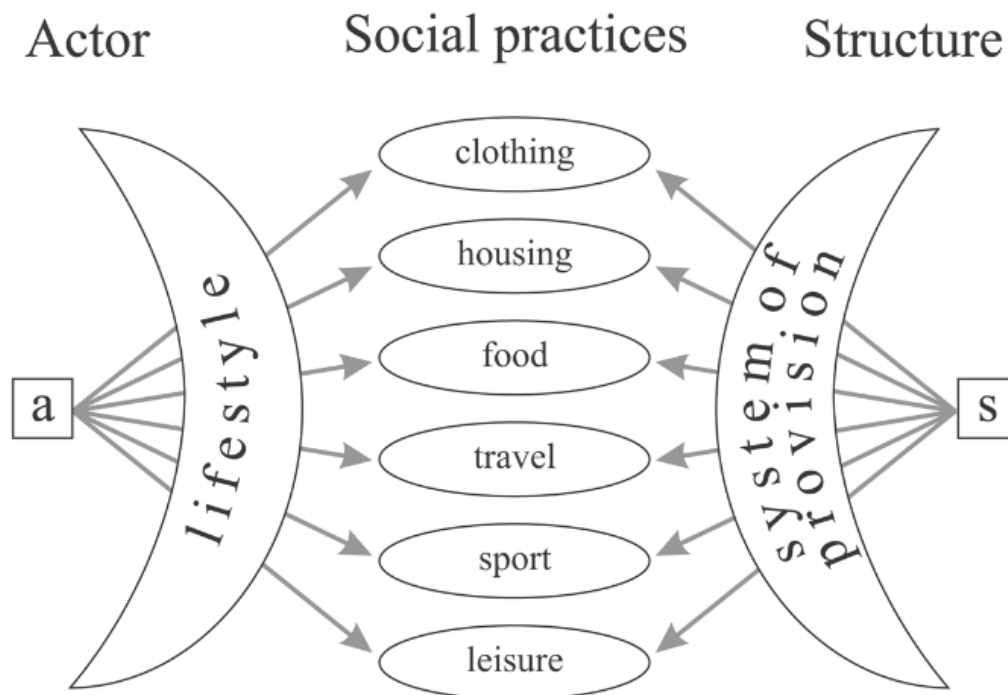


Figure 1, social practice model, source: (Spaargaren, 2003, p. 689)

This theoretical lens is notably useful for understanding everyday circular activities such as reuse, repair, and disposal, especially in the context of E-waste. In this study, both households (as visitors to the thrift store) and store employees are seen as participants in social practices. Their actions are influenced by the materials and infrastructures available to them—such as the design of collection points, policies governing reuse, and the practical limitations of the thrift store itself.

To strengthen the study and make it more practical regarding the case study, it will also draw on the work of Shove and Pantzar (2005) which is later expanded upon by Shove et al. (2012), who offer a more detailed framework for breaking down the internal components of practices. They argue that all social practices are composed of three interrelated elements:

**Materials:** These include objects, tools, infrastructures, and other physical and technological resources that are involved in the performance of a practice.

**Competences:** These refer to the skills, knowledge, and understanding that individuals must have to engage in a practice. Competence allows individuals to perform practices effectively and as expected by their community.

**Meanings:** These are the social and symbolic significances attached to a practice. Meanings shape how practices are understood, valued, and engaged with by individuals and communities.

These elements are continuously changing and always intertwined. For example, decisions about whether to repair or discard an appliance are shaped not only by technical know-how, but also by cultural attitudes toward waste and the availability of repair services. Circular practices emerge, stabilize, and decline depending on how these elements come together—or fail to.

Social practice theory is an approach within social sciences that emphasizes the importance of practices, sequences of activities involving people and the material world, in the formation and transformation of social structures. It provides a framework for understanding how human actions and social structures are interrelated, by focusing on the everyday activities through which people engage with the world around them. Using the SPT approach to study circular consumption practices is in line with criticism made by Greene and Hobson (2025), who argue that consumer acceptance of technological solutions alone is not sufficient by itself to understand circular economy shifts. Greene and Hobson (2025), argue in support for a social-material grounded perspective that focusses on the importance of the material, social, and infrastructure matters of daily life. Their theory highlights how activities like reuse, repair, and disposal are rooted in institutional structures, social norms, and inequality, placing "the everyday" at the focus of circular transition.

By combining Spaargaren's (2003, 2011) model, which emphasizes the interplay between structure and agency, with Shove's SPT, which focuses on the composition of practices, this study develops a practice-oriented conceptual framework. This framework is used to explore the disposal practices of households and work practices of thrift store workers.

The framework is further supported by three interconnected analytical dimensions:

1. Systems of practice and provision
2. Materialities
3. Spatialities

These dimensions are further explained in the section 2.3 and introduce the conceptual lens through which everyday circular consumption is understood and analysed in this study. They are used as a framework for understanding the routines, barriers, and opportunities involved in household and workers' engagement with circular infrastructures.

## **2.2 The role of infrastructures in shaping disposal behaviours**

From a theoretical perspective Shove and Trentmann (2018) view infrastructures as shaping relations between practices, material artifacts, and concepts of service in time and space, while being shaped by established practices. The development of infrastructures is considered a dynamic process intertwined with social practices, challenging traditional distinctions between supply and demand. While from a practical perspective Nguyen et al. (2023) states that individual behaviours are influenced by not only personal characteristics but technical infrastructure and social factors as well. Even when individuals possess positive values and attitudes regarding waste management or sustainable consumption, a lack of external elements such as policy, regulation, technical infrastructure, and social context will lead to a gap between values, attitudes and behaviours. From a systemic perspective, the

rules and resources established by systems of provision shape and influence household waste practices, while simultaneously being shaped and influenced by these practices. The system of provision consists of a socio-material infrastructure, along with its often implicit cultural and policy norms regarding domestic waste (Spaargaren, 2011). For Nguyen et al. (2023) the technical infrastructure encompasses waste management infrastructure, regulations, and knowledge institutions, shaping waste management practices. Infrastructure is considered an essential enabler for waste disposal practices, with social structures embodied in individuals through repeated practices. Rinkinen and Shove (2023) state that attempts to create circular economy policies have largely centred on the lives of objects, with a focus on repair, sharing, and re-use, with the general aim being the efficient handling of matter through systems of provision. This, however, has consequences for how the consumer's role is understood. They make the case for analysing circular economy not by focusing on goods in isolation, and to not overlook longer term trends in demand. Because the problem is that documenting the lifecycle of a product does not reveal the broader status and role of that product in society. Furthermore, Rinkinen and Shove (2023) state that concepts from the fields of material culture and practice provide policy makers with a means of identifying strategies that limit and reduce resource use and environmental impact.

## **2.3 Dimensions of everyday circular consumption within the study**

This chapter introduces the conceptual framework used to understand and analyse everyday circular consumption in this study. It builds on the theoretical basis of Social Practice Theory (SPT), Systems of Provision (SoP) and social-material approaches, translating these into three interconnected dimensions: systems of practice and provision, materiality and spatiality. These themes have been formed from a recent special issue on circular transformations (Greene & Hobson, 2025) and are used here as framework for understanding the routines, barriers, and opportunities involved in household and workers' engagement with circular infrastructures.

Each theme contains a theoretical entry point into the dynamics of everyday circularity, and together, they serve to structure the conceptual framework that informs the empirical research. These dimensions are not mutually exclusive but are closely interlinked and provide a systematic view of how circular practices come about. These dimensions are introduced and defined in the three sections below. The final section (2.3.4) reflects on how these themes function within the research itself, how they shape the questions, guide the data collection and analysis, and inform the interpretation of the findings.

### ***2.3.1 Households as dynamic systems of practice and provision***

This dimension examines how household participation in circularity is shaped by broader infrastructures and institutional arrangements, including how interconnected practices, such as repair, reuse, and disposal, are embedded within daily routines. SPT and SoP together are used to shine a light on how repair and reuse are not merely individual acts but structured by time, income, skills, and access to services (Lane et al., 2025). Importantly, households demonstrate varying needs and capacities regarding repair and maintenance. As Lane et al. (2025) argue, there is a dual imperative: "On the one hand, there is a need for an enhanced service provision industry in repair and maintenance for those who can afford it and, on the

other, a need for forms of support for households to undertake their own repair and maintenance." (Lane et al., 2025, p. 249). There are a few diverse pathways of engagement with repair and maintenance, some oriented around commercial services, others around skill-sharing or life-stage specific arrangements, that highlight the necessity of a flexible and inclusive approach. Perceptions of value, whether monetary, utilitarian, or emotional, often motivate engagement in repair, even when not explicitly framed as efforts to reduce consumption (Lane et al., 2025). Household repair and maintenance are forms of consumption that must be supported with transitions toward product durability and design for repairability (Lane et al., 2025; Schröder et al., 2019).

### ***2.3.2 Materialities of everyday circular practices***

This theme focusses not only on the physical properties of goods but also the ways in which materials circulate, accumulate and transform through everyday practices of use and disposal. It considers how materials (including products, infrastructures, and flows) both shape and are shaped by circular practices. Materialities are central to the formation, maintenance, and disruption of everyday routines. Plastics, appliances, and packaging, for instance, are not just objects but affect household consumption practices (Åberg & Greene, 2025). The use of a socio-material lens sheds light onto how rebound effects can result from circular initiatives. Greene et al. (2025) argue that trying to reduce waste via ways of reuse or higher efficiency can accidentally create new forms of material demand, especially when the underlying social and material systems shaping consumption are disregarded. Shove's material classification of resources, infrastructures, and devices helps to clarify how materialities integrate into and constrain practices. While repair and reuse can contribute to reduced material consumption, they can also result into rebound effects, where savings in one area of consumption enable or encourage spending elsewhere, resulting in more consumption. Many CE policies promote repair and sharing through peer-to-peer platforms, rental services, and repair cafés. These initiatives, however, do not always lead to net reductions in material demand. For instance, clothing rental services, often framed as sustainable alternatives to fast fashion, may increase material throughput due to added transportation, frequent laundering, and packaging waste (Zamani et al., 2017; Monticelli & Costamagna, 2023). The same can happen with regards to shared mobility where models like car-sharing can result in financial savings that can then be redirected towards other forms of consumption (Plepys & Singh, 2019). These examples showcase a broader insight from practice theory: circular consumption practices are very much dependent on how they are integrated into wider systems of provision. Without addressing the underlying structural and institutional drivers of material-intensive lifestyles, CE interventions risk displacing rather than eliminating resource demand (Sonnberger & Gross, 2018; Åberg & Greene, 2025; Mamkhezri & Khezri, 2024). In this light, efforts to promote repair (like offering repair services or teaching repair skills) won't be effective on their own unless they are part of broader, system-level strategies. These strategies need to address the deeper structural barriers that shape people's ability to repair things, including: Socio-economic norms, cultural attitudes or expectations (e.g., the preference for buying new rather than repairing, or associating repair with lower status); Commercial incentives, business models that prioritize selling new products over supporting repair (e.g., planned obsolescence, lack of

spare parts); Infrastructural constraints, physical or institutional limitations (e.g., lack of repair facilities, poor access to tools, zoning laws that restrict informal repair). Repair initiatives have to be integrated into broader systemic changes that tackle the economic, cultural, and logistical structures that currently make repair difficult or undesirable. It is important to take a critical look at how the materials are handled and circulated. Preventing rebound effects is crucial for having a functioning CE.

### ***2.3.3 Spatialities of the dutch E-waste infrastructure***

Where materialities and systems of provision shape households' engagement with circularity, spatial dimensions are equally important in determining where and how circular practices unfold. Spatialities sheds light on the role that physical and digital infrastructure have in shaping access to and participation in circular systems. This includes E-waste collection locations, repair cafés, shared spaces, and online reuse platforms. Spatial arrangements can enable or constrain circular practices depending on proximity, availability, and usability. Research by Åberg and Greene (2025) shows that spatial limitations, such as inconvenient drop-off points or inaccessible reuse services, often limit households' ability to participate in circular systems, despite positive environmental intentions. Tölg and Fuentes (2025) expand on this by explaining how spatial accessibility shapes circular practices, as individuals must navigate infrastructural and service constraints when engaging in repair, maintenance and second-hand exchange. Thus, incorporating spatialities widens the analysis from what is done to where and under what spatial conditions circular practices unfold, bridging local levels with national level planning and policy structures.

### ***2.3.4 Dimensions within the study***

These three dimensions, systems of practice and provision, materialities, and spatialities are interconnected components of the study's conceptual framework. They inform the way the empirical research is structured, from the design of interview questions and observational focus to the interpretation of how residents in Leiden interact with circular systems. Together, they provide a systemic lens that allows the study to move beyond behavioural explanations and instead analyse the structural, spatial, and material conditions under which circularity is enacted in the case study. These themes resurface throughout the study, contributing to understanding how circular engagement is shaped by structural conditions and is embedded in everyday life.

## **2.4 Conceptual Framework**

The conceptual framework is operationalized in the study by combining an analysis of the Dutch E-waste infrastructure with an in-depth exploration of how households engage with circular practices at the local level. The research examines not only the structural dimensions of E-waste collection and reuse systems but also the everyday routines, decisions, and values that shape household participation in circularity. This is complemented by an ethnographic case study of a local thrift store, where workers' routines and operational constraints are analysed to understand how disposal, reuse, repair and resale practices are enacted in practice. By bringing together macro-level infrastructural analysis with micro-level insights from households and E-waste disposal infrastructures, the study demonstrates how systems of provision and everyday social practices exist and how they can be addressed together to

form strategies and implications to guide the circular transition of E-waste. A common theme is that infrastructure can shape practices, and practices can, in turn, shape infrastructure. This will be the foundation of the study and perspective in which the case study will be analysed.

#### **2.4.1 Key Concepts**

The conceptual framework for this study is based on the interaction between actors, practices, and infrastructures within the context of circular consumption. The actors are households which are represented as visitors to the thrift store and the thrift store's workers, who both engage in and shape practices of disposal, repair, and resale. These social practices are situated within broader systems of work and waste management and are enacted through and shaped by infrastructures such as the thrift store itself, the Dutch E-waste collection system, and the relevant policy and environmental regulations. These elements are embedded within the previously outlined dimensions like systems of practice and provision, materialities, and spatialities. Together, they shape and constrain the everyday enactment of circularity and influence the overall effectiveness of Leiden's alternative E-waste disposal model.

The study specifically examines how municipal E-waste collection at thrift stores affects waste disposal practices and work practices. This is structured around the following concepts that will be part of the conceptual framework:

- **Actors:** Households that visit the thrift store and thrift store workers.
- **Social Practices:** The practice of disposing of E-waste by the visitors and the work practices of the thrift store workers.
- **Infrastructure:** The thrift store as E-waste collection site and the store as reseller; the Dutch E-waste collection infrastructure on macro level.

#### **2.4.2 Visual Representation of Conceptual Framework**

As established in the theoretical framework, this study adopts a SPT perspective where social practices serve as the primary unit of analysis. In the context of this thesis, the practice of E-waste handling is central. This practice includes a range of interconnected practices such as reuse, separation, and disposal, each situated within and shaped by daily routines (Shove & Pantzar, 2005; Shove et al, 2012; Spaargaren, 2003, 2011).

With the conceptual framework visualized (see Figure 2), these practices develop from the interaction between knowledgeable and capable agents (households and thrift store staff) on the left side of the diagram, and the broader socio-material systems of provision on the right (Greene & Hobson, 2025; Spaargaren, 2011). How E-waste is handled depends on the routines, capabilities, and lifestyles of different households, as well as the infrastructures and institutional settings they interact with. At the bottom of the framework, the everyday consumption lens indicates that these E-waste practices are not isolated actions but embedded in broader consumption patterns and daily life contexts. It highlights how circular practices, like disposal, separation and reuse are conditioned by underlying materialities, the physical presence and affordances of objects, tools, infrastructures and spatialities (the

accessibility and geographic distribution of circular systems). This lens will be used to guide the discussion of the empirical findings, offering insight into how reuse, disposal, and repair practices are shaped by everyday constraints and routines. It enables a more grounded understanding of how circularity is enacted or limited through the everyday life of households and thrift store workers.

## Framework Handling E-waste

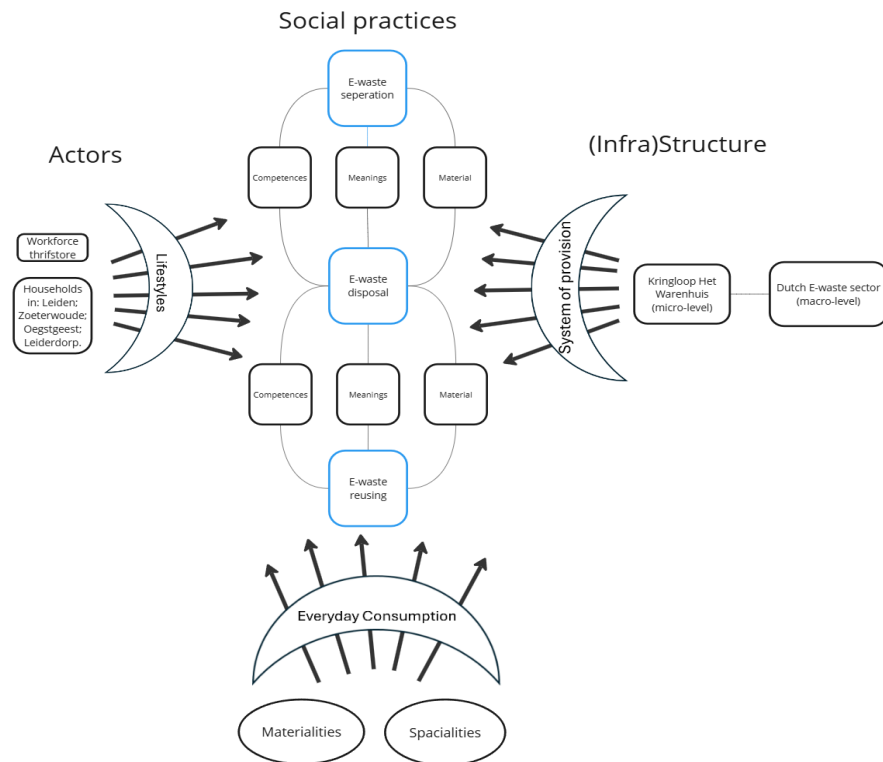


Figure 2, Research framework placed in the wider social practice model of E-waste disposal. Source: (Shove and Pantzar, 2005; Shove et al., 2012; Spaargaren, 2003), edited by the Author 2025.

### 2.4.3 Sub-practices and new perspective

In Figure 2, households draw on competences, materials, and meanings, which are core elements of practices as defined by Shove and Pantzar (2005), to make sense of and act within the E-waste system. Their E-waste engagement is primarily linked to disposal practices, such as sorting, storing, and dropping off used electronics. Therefore, in the analysis, household data is interpreted through recurring themes that emerge across the three SPT elements: materials, meanings and competences.

On the other hand, the workforce at the thrift store engages in a broader range of practices related to E-waste sorting and reuse. Focusing just on disposal and separation would be too limited for capturing the full range of interactions between infrastructures and practices that shape them. Circular engagement does not begin or end with disposal, but it includes decisions around intake, testing, pricing and resale. These practices are later expanded upon with sub-practices that emerged from the first sub-question of this research, which explores

the structure of the Dutch E-waste infrastructure and the specific operations of the thrift store Kringloop Het Warenhuis. Accordingly, the workforce's activities are analysed and presented in the results as separate practices, rather than recurring themes which is done for the households' disposal practices. This distinction reflects the thrift store workers' more complex engagement with the infrastructure, positioning them as both actors besides the households but also a part of the system of provision as they are working for the thrift store. What sets this research apart is its integration of Social Practice Theory with empirical analysis of both household and workforce practices within the context of E-waste. Rather than positioning thrift store workers solely within the system of provision, this study treats them as actors whose work practices can be analysed alongside those of households, contributing towards the understanding of everyday circular engagement. This also reflects Spaargaren's (2003) insight that actors are embedded within systems that both enable and constrain practice and that those systems are themselves shaped through everyday life.

### 3 Research method

To address the research question, this study uses an explorative case study approach. The sub-questions of this study are addressed through qualitative analysis of an empirical case study on the operations of the thrift store Het Warenhuis in Leiden. The case specifically examines the disposal of small consumer electrical appliances (E-appliance) in Leiden, exploring both the infrastructure and everyday waste practices of residents and employees. The methods for data collection include semi-structured interviews with visitors and workers of the thrift store collection service, participant observation, and a literature review. The participant observation involved working at the thrift store Het Warenhuis for several days, allowing for firsthand insights into employee work practices, visitor interactions, and the logistical challenges of E-waste collection and sorting. Additionally, a literature review is carried out to determine what the current disposal infrastructure of E-appliances looks like within the Netherlands. Mixing empirical and secondary data contributes to an elaborate analysis of the problem statement and the research questions (Bryman, 2008).

#### 3.1 Case study and scope

The reason why Leiden is an interesting case is because they have found a new way of creating a CCC within their city by shifting responsibility of the collection of E-waste from the municipal recycling centres to the thrift store. In addition there are also practical reasons for choosing Leiden as a case study. The city is easily accessible by the author which makes followup visits for data acquisition or interviews possible. Furthermore, the management of the thrift store also allowed the author full access to the site. This level of access made sure that the work practices could be better observed and understood providing more empirical insights. Additionally, Leiden is located within the metropolitan area of the Randstad meaning that this case can also be relevant for other metropolitan studies. As part of one of the most densely populated and urbanized areas in the Netherlands (5.816 residents per km<sup>2</sup>) (Vereniging van Nederlandse Gemeenten [VNG], 2023), insights from Leiden may also hold value for understanding circular infrastructure and waste practices in other metropolitan contexts. An partial overview of the waste infrastructure can be seen in Figure 3.

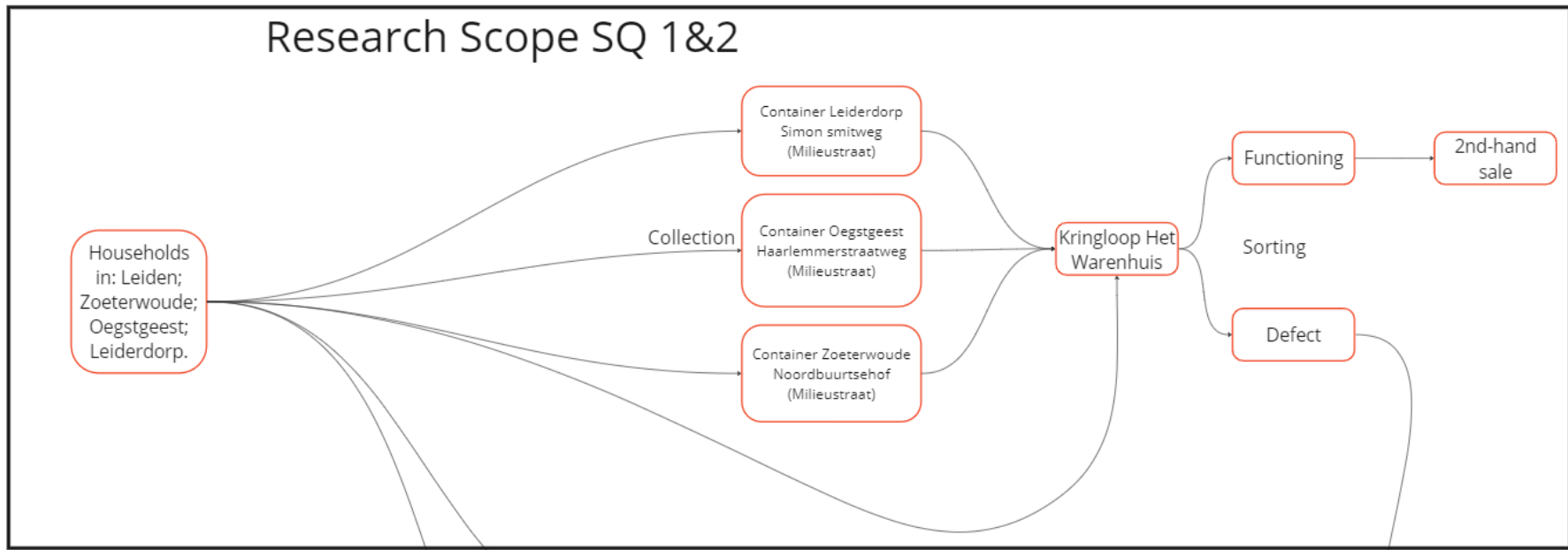


Figure 3, Overview of waste Infrastructure in Leiden

Figure 3 depicts the overall E-waste management infrastructure—from households discarding electronics to collection, sorting, and recycling at the thrift store and beyond. The black border highlights the micro-level scope of Sub-questions 1 and 2, which focus on how households (visitors) dispose of their E-waste and how thrift store employees handle and process it. Meanwhile Figure 3 expands the perspective encompassing the broader Dutch E-waste management infrastructure, including national policies and laws. To propose future changes that could enhance circularity across all stages of the E-waste management system the study should take a holistic view, covering the entirety of Figure 3.

This research focuses on small to medium-sized electronics that are commonly discarded by households and can feasibly be reused or recycled through thrift stores. According to Stichting OPEN's (Stichting OPEN, 2025) classification system of electrical and electronic equipment (EEE):

1. EEE-02 (Screens & Monitors)
  - Examples: TVs, computer monitors, and similar display devices.
  - Relevance: Often still functional or easily repairable, making them prime candidates for second-hand sales or component recovery.
2. EEE-05 (Small Equipment)
  - Examples: Vacuum cleaners, toasters, coffee machines, irons, and other small household appliances.
  - Relevance: These items are frequently discarded yet can be resold, refurbished, or recycled with minimal effort if collected properly.
3. EEE-06 (Small IT & Telecommunication Equipment)
  - Examples: Mobile phones, routers, modems, keyboards, mice, and external hard drives.
  - Relevance: Due to rapid technology turnover, small IT devices represent a significant and growing portion of E-waste, making them a key target for circular economy initiatives.

By narrowing the scope to these categories, the study captures a wide range of commonly discarded consumer electronics that thrift stores are likely to receive. This focus ensures the research addresses both high-volume items (e.g., small appliances) and high-value electronics (e.g., smartphones, monitors), reflecting real-world disposal patterns and circular opportunities.

The stages described in Figure 3 are as follows:

#### Collection

- Containers in specific locations: E-waste is collected from designated collection points at locations like Leiderdorp Simon Smitweg, Oegstgeest Haarlemmerstraatweg, and Zoeterwoude Noordbuurtsehof. These containers are located within the municipal

recycling centres, where visitors can dispose of their E-waste and give it a chance on a second life by placing it in the containers that will go to the thrift store.

### Processing Pathways

Once collected, E-waste is handled based on its condition:

- Kringloop Het Warenhuis: A second-hand store that evaluates whether items can be resold or should be sorted for recycling. Households can also bring their E-waste here directly.
  - Functioning devices: These are sold as second-hand goods.
  - Defective devices: Sent to Stichting OPEN for further sorting, dismantling and recycling.

## 3.2 Data collection

### 3.2.1 *Semi-structured interviews*

To answer Sub-questions two and three, semi-structured interviews were conducted. All interviews were carried out in Dutch by the author and later transcribed in Dutch. Semi-structured interviews were chosen as they allow for a deeper exploration of practices, giving participants the opportunity to reflect on their routines. This approach enables the interviewer to ask open-ended questions, adapt follow-up questions based on responses, and uncover insights that may not emerge in structured interviews.

The interviews are divided into two groups:

1. Thrift store workers: Interviews are 25 to 45 minutes long.
2. Visitors disposing of E-waste: Interviews are 15 to 25 minutes long.

All interviews take place at thrift store Het Warenhuis or, in some cases, at participants' homes.

For the household group, interviewees were approached in person at the thrift store's intake area where they end their disposing practice and hand their E-waste over to the thrift store where the workers start their collecting and sorting practice. In total 10 interviews were conducted with visitors. The interview guide that was used for the visitors can be found in Appendix A.

For thrift store workers, participants are selected based on direct observation of work routines and discussions with the store's director and managers. Priority is given to:

- Employees who worked at the thrift store for more than a year.
- Employees who work with electronics.
- Employees who work in the sorting.
- Employees who work in the collection.

In total six interviews were conducted with thrift store workers. Among them are two working on testing, refurbishing/repairing, and selling of electronic devices; two were all-round staff members involved in and supervising of the operation; one was a maintenance technician; and one was a volunteer mainly working in sorting and assisting in the store. The interview guide that was used for the workers can be found in Appendix B.

This study employs deductive coding as a qualitative data analysis method to systematically analyze semi-structured interviews. Deductive coding, also known as theory-driven coding, uses a predefined coding framework based on existing theories and research. In this case, the coding structure is derived from Social Practice Theory (Shove et al., 2012) and E-waste management frameworks, categorizing responses into Meanings, Materials, and Competences for both households and thrift store workers.

For the thrift store workers, the coding approach is deductive and structured around the predefined sub-practices that emerged of the separation and reuse practice introduced in the conceptual framework. The sub-practices are the result of the first sub-question and are as follows: E-waste Collection, Sorting and Testing, Preparing for Resale, and Repurposing and Refurbishing. For analyzing the interviews and writing the results, the coding program ATLAS.ti 24 is used. Rather than detailing the everyday context in which these practices take place, the analysis focuses on identifying the elements of social practices (Meanings, Materials, and Competences) while also examining the active involvement of thrift store workers. The results chapter for the workers is, for this reason, also organized according to these sub-practices, with each section discussing the associated materials, meanings, and competences. For the thrift store visitors, a hybrid inductive and deductive thematic analysis was applied. Since the visitors engagement was limited to the single overarching practice of E-waste disposal, the specific sub-practices and elements of this activity had not yet been empirically established at the start of the research. Therefore, rather than predefining sub-practices, the analysis focused on identifying recurring themes and patterns within the disposal practice itself, guided by the three elements of Social Practice Theory (Meanings, Materials, and Competences). This approach allowed for a more exploratory understanding of how visitors experience and perform E-waste disposal in the context of the thrift store. The results chapter addressing this sub-question is structured around the three SPT elements, with each section presenting the recurring themes that emerged under each category.

Although this study primarily follows a deductive approach, it also incorporates inductive elements, resulting in a hybrid coding method (Starting with predefined codes but adding new ones if unexpected themes arise). In this study, while the initial coding structure was based on established theoretical concepts in SPT, additional themes were incorporated when interview responses introduced new perspectives or unforeseen challenges in E-waste disposal and work practices.

A coding tree has been developed based on the sub practices and themes of the two practice-based sub-questions and their subcategories (Meanings, Materials, Competences) (Appendix C & D). This coding tree is used to guide qualitative data analysis, ensuring a

structured approach to understanding E-waste disposal behaviours and work practices at the thrift store.

### 3.2.2 Document analysis

For answering the sub question one a combination of grey literature review and observations at the Thrift store het Warenhuis were used. Potential documents to analyse the E-waste infrastructure in the Netherlands were found by searching via Google Scholar, Web of science, Scopus, Circulaire kennis and Circulair ambachtcentrum.

The selection criteria chosen for the document analysis is as follows:

- Year: 2014-2024
- Region: Netherlands
- Electronics
- Municipal recycling centres, Thrift stores and Circulair ambachtcentra
- E-waste collection

The following documents are used to analyse the E-waste infrastructure in the Netherlands with a focus on the collection, sorting, and reuse of E-appliances, and the potential role of CCCs within this system. These documents help identify any relevant trends, policies and possibilities for improvements:

|    | Title                                                                                                                   | Author/Source                                                      | Date          |
|----|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------|
| 1. | <b>E-waste in de Metropoolregio Amsterdam. EEN VERKENNING VAN DE E-WASTE KETEN EN TOEKOMSTIGE LOGISTIEKE SCENARIO'S</b> | Metabolic, Hogeschool van Amsterdam (Vervoordeldonk et al., 2023)  | December 2023 |
| 2. | <b>ONDERZOEK MILIEUSTRAT VAN DE TOEKOMST</b>                                                                            | Modulo Opdrachtgever: Rijkswaterstaat (Modulo, 2022)               | 22 June 2022  |
| 3. | <b>Milieustraten en de circulaire economie</b>                                                                          | Witteveen+Bos Opdrachtgever: Rijkswaterstaat (Witteveen+Bos, 2019) | 19 March 2019 |

### 3.2.3 Observations

To complement the semi-structured interviews and grey literature review, which are used to answer the sub questions, the author engaged in participant observation by working at the thrift store Het Warenhuis on the 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> of February. This approach provided firsthand insights into the daily work practices of employees and the practical challenges of E-waste collection and sorting.

Participant observation was chosen because:

- It allowed for immersion in the work environment, providing deeper insights beyond what interviews alone could capture.
- Employees may act differently in formal interviews compared to their natural work setting. Observation helped identify unspoken behaviours and workplace dynamics.

- It provided a practical understanding of the infrastructure, workflow, and logistical challenges associated with E-waste collection.

This study employed overt participant observation, meaning that all employees were aware of my role as both a temporary worker and a researcher. This ensured ethical transparency while still allowing for natural interactions and observations.

Observations focused on:

#### 1. Sorting & Handling Practices

- How employees distinguish between reusable, repairable, and non-functional E-waste.
- Challenges in categorization.

#### 2. Employee-Visitor Interactions

- How visitors engage with E-waste disposal (e.g., asking for guidance, hesitations, misconceptions).
- Employee communication regarding E-waste policies.

#### 3. Workplace Infrastructure & Workflow

- Storage limitations, safety considerations, and logistical efficiency.
- The impact of space constraints on handling and sorting processes.

During and after each work session, field notes were carefully recorded, capturing interactions, observations, and personal reflections on the daily operations at the thrift store. These observations were later coded and analysed alongside interview data, allowing for the identification of recurring themes, patterns, and potential contradictions between what was said in interviews and what was observed in practice. To ensure a comprehensive understanding, the findings were then cross-referenced with policy documents, assessing whether the practical implementation of E-waste collection and sorting at the thrift store aligned with national and municipal regulations.

While participant observation provided valuable firsthand insights, there were inherent limitations. As a temporary participant, the experience was limited to a short-term perspective, meaning long-term challenges faced by employees may not have been fully encountered. Additionally, the observer effect may have influenced behaviour, as employees were aware of the research role and could have subtly adjusted their actions in response.

## 4. Results

This chapter discusses the empirical findings of the study and is structured around the three sub-questions that guide the research as is mentioned in the theoretical and conceptual framework. The chapter starts with an overview of the current disposal infrastructure of E-appliances in the Netherlands, focusing on the role of municipal recycling centres, the concept of CCCs, and the legal and practical implications of reuse and repair. The chapter then zooms in to the Leiden case study and provides a local perspective on how an alternative collection model is implemented through the thrift store Het Warenhuis. Next, the chapter explores disposal practices among visitors to the thrift store. These findings are organized using SPT into the three elements of practice: materials, competences, and meanings, shedding light on how residents engage with E-waste disposal. The chapter ends by examining the work practices of the thrift stores' workforce, detailing the processes of intake, sorting, testing, pricing, and refurbishment. Each of these sub-practices is analysed through the lens of SPT to understand how infrastructure and workers shape circular practices. Sub-conclusions are provided at the end of each section to synthesize the findings and prepare for the discussion in Chapter 5.

### 4.1 Understanding the infrastructure: The Dutch E-waste system and the role of CCCs?

#### ***4.1.1 What is the current collection and processing structure of E-appliances in the Netherlands?***

The Netherlands manages E-waste through an extended producer responsibility system that coordinates multiple collection pathways. Since 2021, a national producer responsibility organization called Stichting OPEN has been legally charged with organizing E-waste collection and recycling on behalf of all electronics producers and importers (Vervoordeldonk et al., 2023). Consumers can discard end-of-life electrical and electronic appliances via several routes. The route that is most well-known is that of the municipal collection, typically at municipal recycling centres where residents can drop off old appliances. Another is retail take-back (oud-voor-nieuwregeling): electronics retailers are obliged to accept returned E-waste (for example, a one-for-one return when buying a new product, and many shops also have bins for small electronics) (Vervoordeldonk et al., 2023). Some municipalities offer curbside or bulk waste pick-up services for large appliances. Additionally, there are numerous small collection points (for instance, bins in supermarkets or hardware stores for batteries and small devices) and even mail-in or parcel return programs for gadgets (Vervoordeldonk et al., 2023). In the backend, specialized logistics firms and contractors (often working for Stichting OPEN) transport the collected E-waste from these drop-off locations to sorting centres and certified recyclers. During this process, government regulators like the ILT (Inspectie Leefomgeving en Transport) and regional environmental agencies provide oversight to ensure proper handling and compliance (Vervoordeldonk et al., 2023).

The E-waste sector involves several key stakeholders, and the organization as follows: producers fund it, municipalities and retailers collect the waste, and specialized companies carry out transportation, sorting, and final processing under regulatory supervision. Electronics producers and importers finance and guide the system via Stichting OPEN, paying

fees that fund collection and processing (Vervoordeldonk et al., 2023). Municipalities play a role by operating local waste depots (municipal recycling centres) where citizens bring discarded devices. Retailers contribute as collection points (especially for small appliances and in the take back of old equipment upon purchase of new) (Vervoordeldonk et al., 2023). Waste management companies and recyclers are contracted to pick up E-waste from municipal and retail sites, sort it, and process it in compliance with environmental standards. Finally, regulatory agencies (ILT and local environmental agencies) monitor and regulate the recyclers, ensuring that E-waste is treated by approved facilities and not, for example, illegally exported as scrap (Vervoordeldonk et al., 2023). Figure 4 illustrates this structure, showing producers at one end and certified recyclers at the other, with consumers, municipalities, retailers, and logistics firms connecting the chain (Vervoordeldonk et al., 2023).

## STAKEHOLDER-CHAIN DIAGRAM

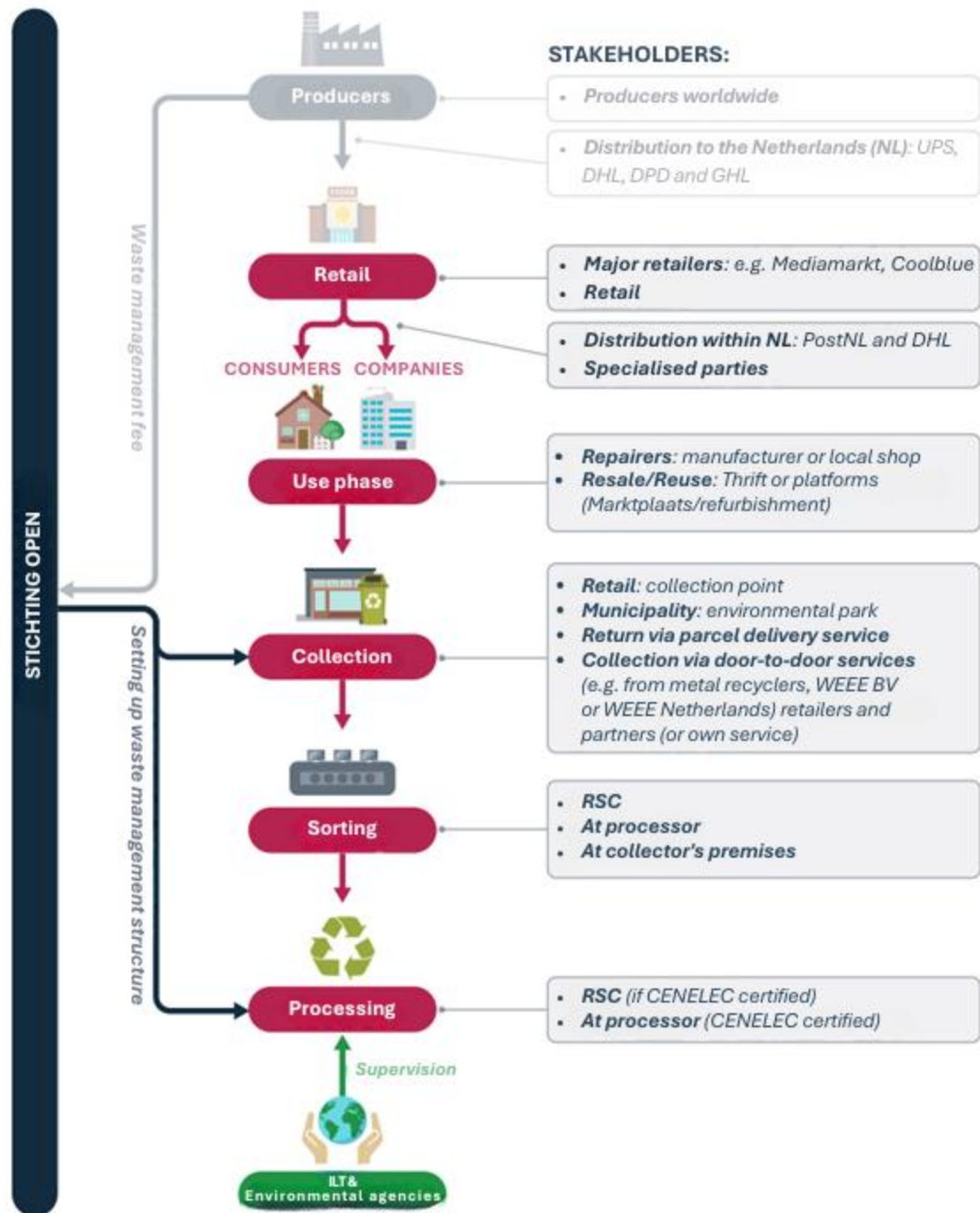


Figure 4, Overview of the roles of different stakeholders in the chain. Source: Translated from (Vervoordeldonk et al., 2023)

### 4.1.2 What is the role of municipal recycling centres within this structure?

Within the E-waste collection system, municipal recycling centres play a pivotal role as accessible drop-off locations for the public. The municipal recycling centres are the places where households can bring a wide range of waste streams and crucially, they serve as a primary channel for collecting household E-waste. In the Netherlands, every municipality is required by law to provide at least one such facility for residents. Since a 1994 regulatory decision, municipalities must be capable of separately collecting a set of 18 different waste

fractions at their municipal recycling centre (Modulo, 2022). A typical municipal recycling centre is organized with multiple containers, each designated for a specific material type. Residents drive in and are guided by staff to sort their items into the correct containers. This source-separated approach at the depot is meant to maximize recycling and safe handling of each waste stream (Modulo, 2022).

Currently municipal recycling centres function mainly as collection and transfer points. They usually do not themselves do final processing of waste but rather gather it in separated form for transport to recyclers or disposal facilities. Many municipal recycling centres have expanded beyond the minimum, some of them now separate 30 or more distinct categories (for instance, collecting things like used carpet, solar panels, edible oil, expanded polystyrene, cork, etc.) (Modulo, 2022). At these municipal recycling centres E-waste is often split into sub-fractions to improve recycling efficiency. A common approach is to segregate by size and type of appliance: for example, Large White Goods (ovens, washing machines, dishwashers) in one area, Cooling Appliances (fridges, air conditioners) in another, Screens (TVs and computer monitors) in another, and Small Electronics/ICT (toasters, clocks, phones, etc.) in bins (Vervoordeldonk et al., 2023). At minimum, E-waste is kept apart from general waste, it is one of the core fractions that all modern municipal recycling centres in the Netherlands accept and isolate. Once collected at a municipal recycling centre, the E-waste is periodically picked up by approved contractors (often arranged through Stichting OPEN or its logistics partners, such as WEEE Nederland or others. (Vervoordeldonk et al., 2023). Those contractors transport the electronics to sorting facilities or directly to specialized recyclers. The role of the people working at the municipal recycling centre is largely to supervise correct drop-off, prevent contamination between streams, and ensure hazardous items (like electronics or batteries) go into the right containers. The municipal recycling centre serves as the stop between citizens and the formal waste processing system, it is where the public hands over their unwanted devices into the regulated chain.

Traditionally, municipal recycling centres have been focused on recycling (material recovery) rather than direct reuse. Citizens bring items they consider “waste,” and those items are shipped off for dismantling and materials processing. However, as the circular economy agenda grows, there is increasing attention on using the municipal recycling centres to capture reusable goods before they become waste. In current practice, some municipal recycling centres collaborate with local thrift organizations, they may have a container or drop-off point where residents can leave items that are still in good condition (including working electronics) so that those can be taken for resale instead of recycled. A study from Witteveen+Bos (2019) found that only about half of the Dutch municipal recycling centres had an on-site container for collecting reusable goods for thrift at that time. Those that do have such partnerships have seen improvements. For instance, in Oss, the municipal recycling centre (Duurzaamheidsplein Oss) added a staffed reuse drop-off point and observed about a 30% increase in the volume of items salvaged for reuse rather than thrown in containers for recycling (Vervoordeldonk et al., 2023). This suggests that the role of municipal recycling centres can evolve from purely waste collection to a broader circular role by intercepting items of value. At present, the extent of E-waste reuse via municipal recycling centres varies: in some towns, the municipal recycling centre might simply collect E-waste for

recycling only, whereas others actively redirect functional electronics to repair/reuse programs. However, in all cases, the municipal recycling centre remains a central place for E-waste collection.

#### ***4.1.3 What are Circular Craft Centres (CCCs) and how do they connect to E-appliances processing?***

Circular Craft Centres (Circulair Ambachtscentra, CAC) are a relatively new concept in the Netherlands that aim to combine waste management with repair and reuse activities under one umbrella. According to Rijkswaterstaat (2020) circular craft centres are networks, which can be in one location, between services of municipal recycling centres, thrift stores, repair shops and other circular initiatives. The concept arose from the national “Transition Agenda for Consumer Goods” (transitieagenda Consumptiegoederen), which is part of the Netherlands broader circular economy policy initiative (Modulo, 2022). The idea was to move beyond seeing municipal recycling centres as end stations for waste and instead transform them into places where items and materials get a change for reuse. Instead of just dropping off waste for recycling or disposal, citizens at a CCC might also drop off goods for reuse, get items repaired, or even shop for second-hand products. In other words, CCCs embody higher steps of the R-ladder, with an emphasis on reuse, repair, refurbishment and creative repurposing of materials (Modulo, 2022).

According to an analysis by Antea Group (2020), the building blocks of a CCCs typically include: (1) a municipal recycling centre as the foundational infrastructure for collecting all sorts of materials; (2) a reuse outlet, such as a thrift store (kringloopwinkel) where usable goods are sold; (3) repair and maker spaces, like repair cafés or workshops where appliances and other items can be fixed or transformed; (4) an educational or training component, for example classrooms or demonstration centres to teach the public about circularity or to train people in repair skills; and (5) a social enterprise element, meaning the centre provides jobs or training opportunities for people (often from vulnerable groups) in activities like repair, refurbishment and recycling (Modulo, 2022). These elements work together to ensure that when someone brings waste to the centre, there is a chance to intercept anything that isn’t truly waste and reroute it to reuse. Likewise, even items that are not reusable might be dismantled on-site to recover parts or materials.

Circular Craft Centres are highly relevant to E-waste because electrical appliances are one of the priority waste streams that benefit from this approach. In the current system, when an appliance is discarded at a municipal recycling centre, it’s likely thrown in a container and later shredded for recycling. In a CCC, that same item would first be evaluated for reusability. The presence of a thrift shop or repair hub on-site means that if the appliance is still working or only needs a minor fix, it can be diverted away from the scrap heap. Those that pass testing can be resold as second-hand products, directly extending the device’s life. Items that are not functional might be sent to a repair café or training workshop where volunteers or trainees practice repairing them. Even if an appliance cannot be saved, the fact that it was assessed in a CCC means sometimes components and parts can be harvested for reuse or for upcycling projects, rather than everything being treated as bulk scrap. Moreover, because a CCC still includes the municipal recycling centre component, all E-waste that truly is waste

continues to go into the proper recycling stream. The municipal recycling centre portion ensures that any E-waste requiring safe disposal is collected and routed to certified E-waste recyclers. Meanwhile, the craft/reuse portion ensures that any device that doesn't need to be recycled yet gets a second chance. The Circular Craft Centre model explicitly tries to change that, embedding reuse and repair into the infrastructure. It is essentially a local circular economy hub, for E-waste and other materials, where citizens can not only drop off their old toaster, but perhaps also browse the shop for a refurbished coffee maker or learn in a workshop how to fix their broken lamp.

#### ***4.1.4 To what extent do CCCs contribute to circular processing of E-appliances?***

Circular Craft Centres have significant potential to improve the circularity of E-waste handling, and early evidence from pilot projects shows they can make a positive impact. The fundamental contribution of CCCs is that they shift the focus from recycling to reuse and repair. In practical terms, this means more electronic devices get a chance at a second life. For example, at the Duurzaamheidsplein Oss, one of the first operational CCCs in the country, the addition of a reuse drop-off points and on-site thrift store has increased the diversion of reusable electronics. Oss reported about a 30% increase in the volume of goods (including E-appliances) captured for reuse once they opened a dedicated intake for potentially reusable items, instead of everything going straight into waste bins (Modulo, 2022). Similarly, another pilot in Meerijstad (Sint-Oedenrode) with a "spullenplein" (materials plaza) saw comparable results in pulling out repairable goods before they became waste (Modulo, 2022). These are concrete indicators that CCCs are managing to rescue devices that would otherwise be scrapped. By doing so, CCCs contribute to circular processing by extending product lifespans which is a direct form of circular economy.

Many CCCs also host or work together with repair cafés and workshops, meaning that community repair events or even professional repair courses are part of the centre. This directly facilitates the repairing of e-devices. As a result, some E-waste never actually enters the "waste" stream at all, it gets fixed and goes back home with the original owner or into second-hand circulation. In addition, even when full reuse isn't possible, CCCs often attempt upcycling or component reuse. Traditional E-waste processing is usually focused on material recovery (metals, plastics, etc.), whereas CCCs aim preserve the product's function or parts of it, which is higher on the circularity ladder (Witteveen+Bos, 2019).

#### 4.1.5 What are the legal aspects of repairing and dismantling E-appliances

Until recently, the reuse of parts from discarded electronic device, commonly referred to as cannibalisation, was not permitted under Dutch waste legislation (Groot & Stoker, 2024). Once a device is discarded and officially classified as AEEA (Afgedankte Elektrische en Elektronische Apparatuur), any manipulation of that device or its components is considered waste processing (verwerking) and falls under strict regulatory requirements (Inspectie Leefomgeving en Transport, 2022). According to the interpretation provided by the Dutch environmental authorities and reflected in guidance documents, reusing components from one device to repair another qualifies as processing, unless the original product is restored in its entirety for the same purpose. Thus, even if the aim is reuse, removing a part from one discarded device to repair another trigger legal obligations.

In October 2024 ministry of infrastructure and water management (2024b) came with the document “Handreiking voortgezet gebruik bij milieustraten Afvalstof of niet-afvalstof” (Guidance on continued use at waste recycling points Waste or non-waste). This document stated that for cannibalising other devices that are classified as AEEA there might be a need to get a CENELEC certification (Formerly known as WEEELABEX). The document refers to a flowchart of the ILT (Figure 5).

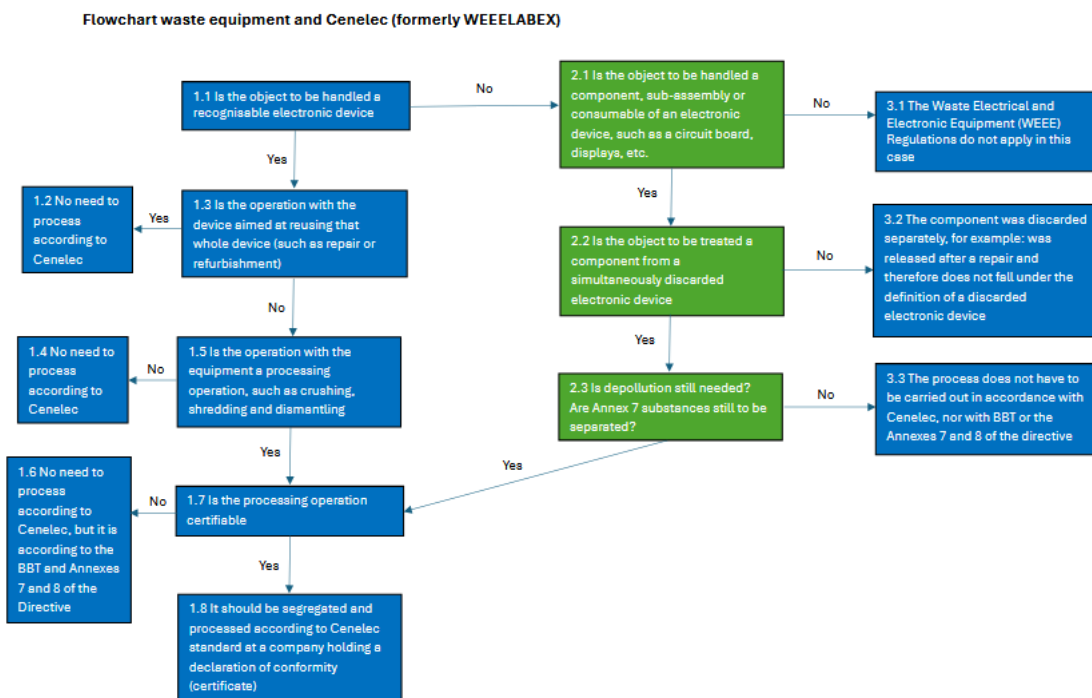


Figure 5, Flowchart WEEE CENELEC. Source: Translated from (Inspectie Leefomgeving en Transport, 2022)

As outlined in Figure 5 (Square 1.3 and 1.5), this action moves the cannibalised donor device out of the “reuse” category and into the category of processing, which requires compliance with certification standards such as CENELEC. These certifications are intended to ensure environmental and health safety in the handling of E-waste but are often prohibitively costly and administratively demanding for smaller actors, such as thrift stores and CCCs. As a result, initiatives such as Foenix in Apeldoorn, which had begun salvaging parts from non-repairable

vacuum cleaners to repair others, were required to dispose of their parts inventory following an inspection by the ILT (Inspectie Leefomgeving en Transport), despite their recognised contribution to circular goals and recent receipt of the Wecycle Award for innovation in reuse (Groot, J. G., & Stoker, C. S., 2024). This presented a contradiction: while the Ministry of Infrastructure and Water Management actively subsidised CCCs to promote reuse and repair, enforcement agencies under the same ministry restricted key practices like part reuse unless certified as full waste processors. However, this stance has begun to evolve. In response to challenges raised by CCCs and the broader reuse sector, ILT now acknowledge that not all processing falls under the certifiable activities listed by CENELEC (Ministerie van Infrastructuur en Waterstaat, 2024a). CENELEC states that specifically, type-0 processing (Figure 6), Manual cannibalization of appliances (no depollution), are not subject to mandatory certification. This is because there currently is no certification for type 0 processing and therefore they do not work within the framework of the WEEE/AEEA Directive.

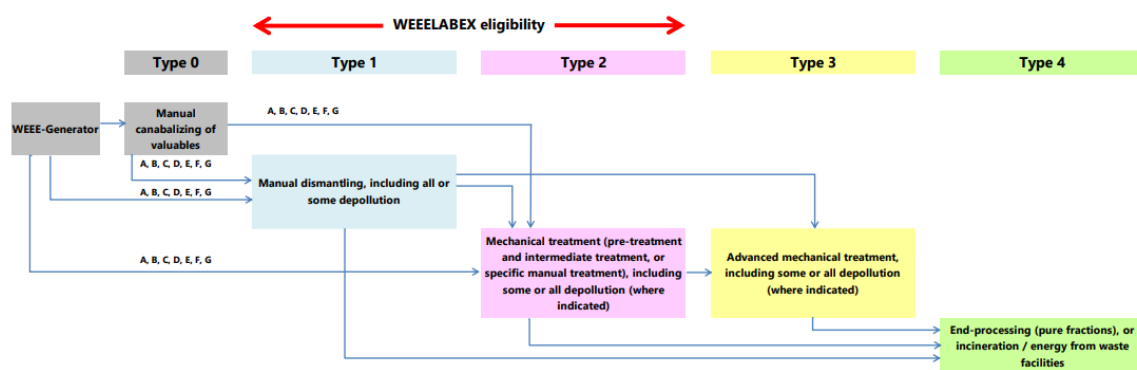


Figure 6, Eligible WEEELABEX treatment types, source: (WEEELABEX, 2017)

On the website of ILT the following is stated:

*“You must be certified if AEEA processing is involved.*

*Processing is often considered to be the case quite quickly. However, not all situations involve a process that can be certified.*

*This applies to so-called Type 0 processing: manual processing without depollution. For processors who only carry out these types of processing activities, it cannot (yet) be expected that they possess a declaration of conformity.*

*Processing activities that do require certification:*

- *Depollution: removal of substances listed in Annex VII of the directive.*
- *Dismantling electric motors from discarded washing machines.*
- *Dismantling parts and metals from old central heating boilers.*
- *Dismantling and destruction (often for safety reasons) of hard drives or other components from discarded computers.*
- *Removal of printed circuit boards from AEEA*

- *Crushing, breaking with a grabber, shredding or cutting of scrap containing AEEA.*” (Ministerie van Infrastructuur en Waterstaat, 2024a).

This means that ILT has indicated it will not enforce certification requirements in such cases, provided that activities remain environmentally sound and in line with the goals of the directive WEEE/AEEA directive. Although there are still limitations for repairing certain E-appliances, cannibalizing older or broken appliances is now allowed for most of them. This takes away uncertainty and opens opportunities for municipalities, thrift stores and other circular initiatives to invest in a CCC where E-waste is included as a resource. In addition to this the Ministry of Infrastructure and Water Management (2025) published the following document in March 2025: *Handreiking juridische aspecten van een Circulair Ambachtscentrum* (Guide to Legal Aspects of a Circular Craft Centre), which outlines key legal considerations for municipalities planning to establish such a center covering topics like zoning and environmental regulations, waste classification, permits, procurement and state aid rules, competition law, and property agreements. This indicates that although the current Dutch law is not suited for setting up CCCs the ministry is now finally facilitating municipalities regarding legal obstacles and is making its first steps to streamline it.

#### **4.1.6 How does the Leiden case study fit in this research?**

Leiden’s case study is the empirical component of this research, serving as a practical example of how a municipality can implement a circular approach to E-waste and what effects that has. Leiden’s situation is noteworthy because the city has pursued a new model for e-waste collection that aligns with the Circular Craft Centre philosophy. In Leiden, the municipal government decided to shift the responsibility for E-waste collection from the traditional municipal recycling centre to the local thrift store (the store is called “Het Warenhuis”). In other words, instead of asking residents to bring their defunct electronics to the city’s municipal recycling centre, the city arranged that residents could bring them directly to the thrift store, which would act as a collection and sorting point. This essentially turns the thrift store into a mini circular center: the thrift can identify incoming electronics for reusability (reselling those that still work or can be repaired) and pass on the rest for recycling. By doing so, Leiden has found an alternative way of creating a CCC within their city, integrating reuse into the infrastructure without building a brand-new facility. The Leiden approach was driven by the city’s circular economy goals and practical considerations, space in Leiden is limited, and establishing a full-scale new CCC site might be difficult. Using the existing thrift store network was a creative solution to promote reuse and improve E-waste collection.

In terms of organizational design, Leiden has essentially implemented a decentralized CCC model. The collaboration between the municipality and Het Warenhuis extends beyond E-waste collection. For example, bicycles that are removed by the municipality from the central station area are transferred to the thrift store’s bicycle depot. These bicycles are photographed, stored for up to 42 days, and if unclaimed are either refurbished and sold or passed on to a scrap metal dealer. The revenue generated from these sales (approximately €26 per bicycle) contributes directly to municipal services such as bicycle parking maintenance (Gemeente Leiden, n.d.). During interviews, employees of the thrift store

confirmed that this bicycle depot constitutes a significant portion of the organization's income.

Het Warenhuis also provides a broad array of collection services to the public. While the official municipal recycling centre in Leiden continues to operate for general waste disposal, access to this facility now requires an appointment, a system that was introduced during the COVID-19 pandemic in 2020 and has remained in place since. In contrast, the thrift store does not require an appointment for drop-offs, offering a more accessible and user-friendly alternative for residents and non-residents alike. The store is open six days a week, from Monday to Saturday, between 08:00 and 16:00.

In addition to in-store drop-offs, the thrift store offers home collection services for residents of Leiden and the surrounding municipalities of Leiderdorp, Zoeterwoude, and Oegstgeest. These services include scheduled pick-ups as well as complete house clearances, both provided at no cost. For individuals who prefer to transport items themselves, the thrift store also offers the use of free loan trailers, further lowering logistical barriers to reuse and responsible disposal.

To make it easier to comprehend, Figure 7 shows a flowchart of how households in Leiden, Zoeterwoude, Oegstgeest and Leiderdorp can dispose of their E-appliances. The section of the flowchart within the research scope is slightly altered from Figure 3. The modification involves the stream of E-appliances deposited in collection containers at the municipal recycling centres, which are subsequently transported to the local thrift store, Het Kringloop Het Warenhuis. In theory, these appliances should be assessed by thrift store workers to determine their potential for resale or reuse. However, findings from both observational research and interviews with employees at Het Warenhuis indicate that the organization lacks sufficient staffing capacity to thoroughly inspect all incoming items from the containers. Moreover, it was noted by workers that placing E-appliances into large collection containers often leads to damage during transport, thereby reducing the likelihood that these items can be effectively reused or refurbished. This resulted in most of the E-appliances disposed in the containers of the municipal recycling centre being directly deemed defect or not useful, as illustrated in Figure 7.

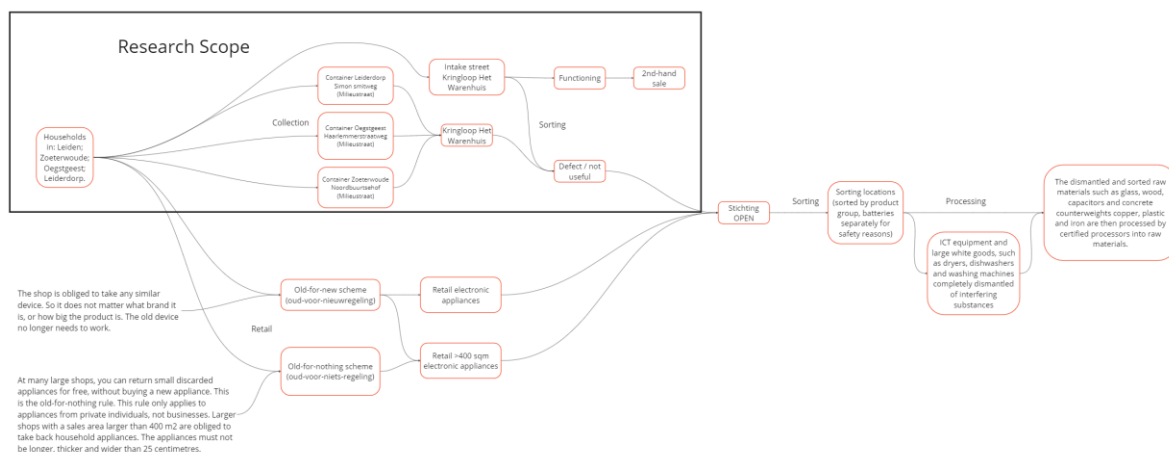


Figure 7

During the observations and interviews insight was gathered about the internal process of the thrift store around the collection and processing of E-appliances. The flowchart in Figure 8 visualizes the internal process used by Kringloop Het Warenhuis to sort, assess, and process E-appliances that are dropped off at their intake street. The process follows the steps from initial intake to eventual resale or recycling, with specific decision points based on the condition of the items.

### **1. Intake and Initial Sorting**

All incoming electrical appliances are first subject to initial sorting. At this stage, they are divided into two main categories:

- **Functioning cart:** When a person brings their E-appliances they are always asked if they are still functioning properly.
- **Defect/not useful cart:** When the person who brings the E-appliance says it's not functioning then the E-appliance always goes to this cart. E-appliances which the thrift store in general doesn't sell are also put in this cart (e.g. vacuum cleaners, gas fired appliances, toothbrushes).

### **2. Double Check by Technical Department**

Both categories are then subjected to a technical double check, where other thrift store workers with more technical knowhow reassess the sorting decisions. This ensures that valuable items are not mistakenly discarded and that broken items are correctly identified.

At this point:

- Items confirmed as defect/not useful are passed on to the recyclers in service of Stichting OPEN, the national organization responsible for processing and recycling E-waste.
- Items considered potentially usable or sellable proceed to the testing phase.

### **3. Testing Phase**

In this phase, selected electrical appliances are tested for functionality:

- If functioning, they proceed to the next stage.
- If defective, they are again deemed not useful and are sent to Stichting OPEN for recycling.

### **4. Cleaning and Pricing**

Functioning items are then:

- Cleaned to ensure they are suitable for resale.
- Priced, with price checks carried out to ensure affordability.

### **5. Sales Pathway**

After pricing, the items are:

1. Placed for sale in the store.
2. If not sold within 1–3 months, the price is lowered.
3. If still not sold after a second price reduction, the item is ultimately removed from the sales floor and sent to Stichting OPEN.

## **6. Final Outcomes**

There are three final outcomes for each item:

- Sold: Items successfully purchased by customers.
- Recycled via Stichting OPEN: Items deemed defective or unsold after extended time in store.
- Re-categorized after double check and testing: In some cases, items may change status during evaluation.

## Cycle of electrical appliances

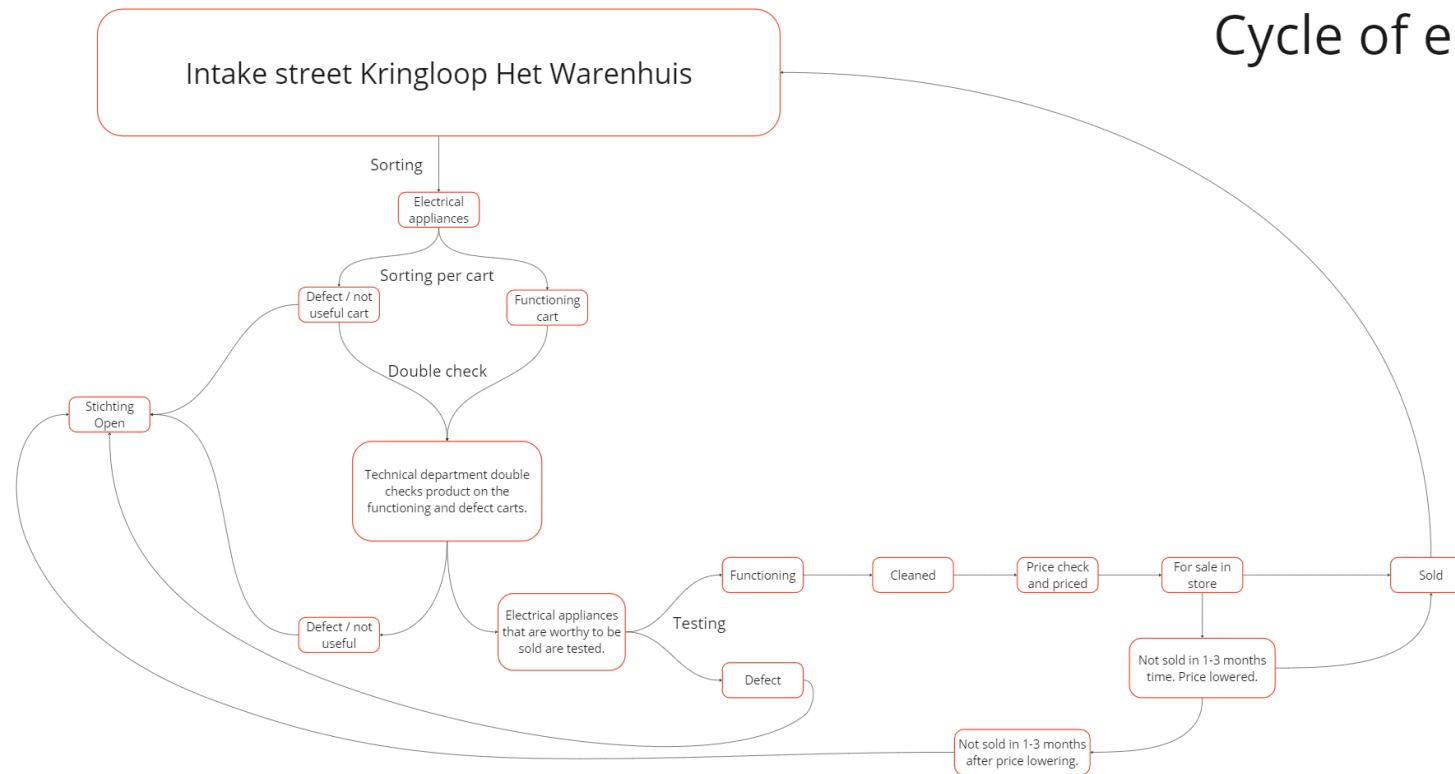


Figure 8, Cycle of electrical appliances in the thrift store Het Warenhuis.

To provide a clearer understanding of the infrastructure used by the thrift store Het Warenhuis, a satellite image (Figure 9) is included in which both the intake street of the thrift store and the Leiden municipal recycling centre are visible. Although these two organizations operate independently and are separate, there is occasional collaboration between them. According to employees of Het Warenhuis, staff from the municipal recycling centre sometimes assist by using power shovels to compress the contents of the containers positioned outside the intake area.

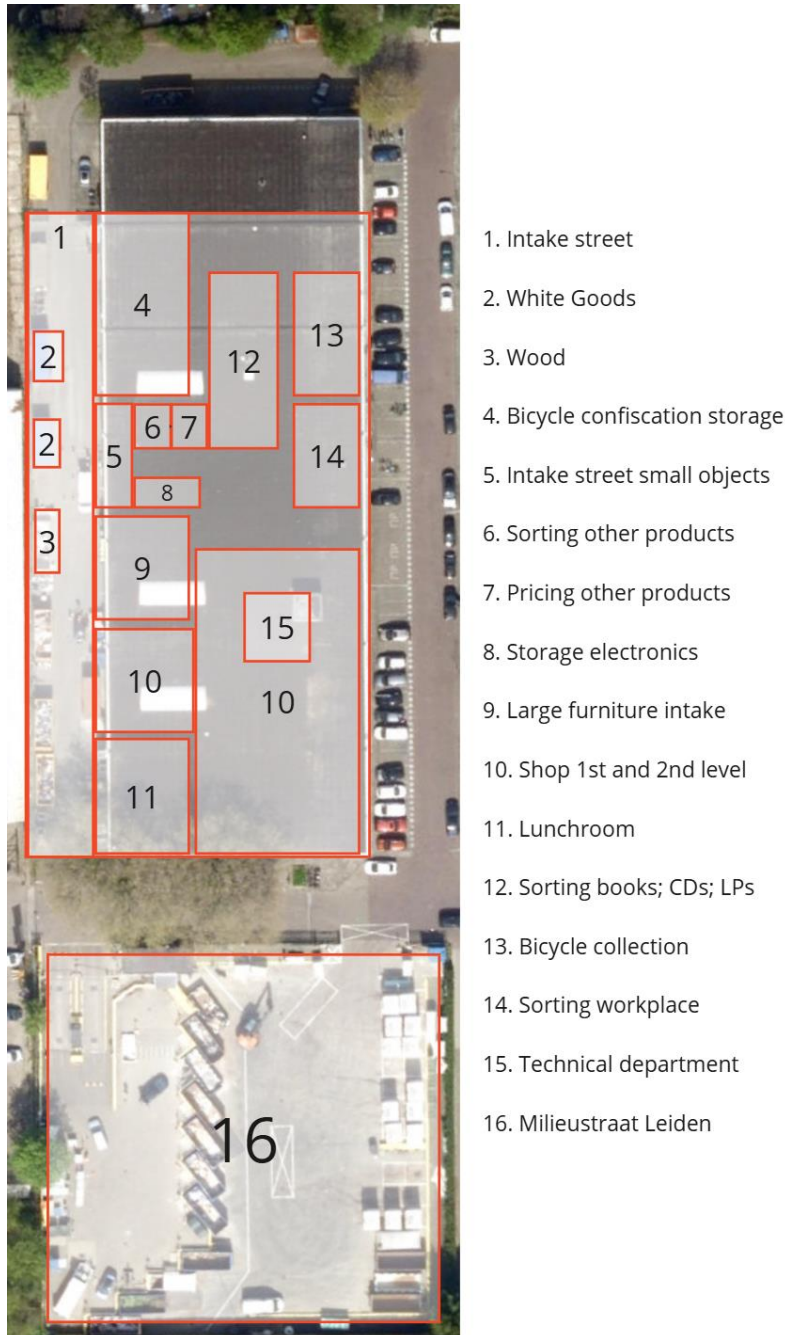


Figure 9, satellite image infrastructure Het Warenhuis and the municipal recycling centre Leiden.

#### **4.1.7 Sub-conclusion**

The current infrastructure for collecting and processing E-waste in the Netherlands is complex and consists of a network of producers, municipalities, retailers, logistics providers and processors, coordinated by the Stichting OPEN. Although this system provides a legal framework for producer responsibility and recycling targets, it is still strongly focused on linear processing and often lacks structural opportunities for reuse and repair. municipal recycling centres play a central role in this system, acting as physical collection points where households can drop off various waste streams, including E-waste. However, the primary function of these municipal recycling centres is to efficiently separate and dispose of waste streams towards certified recyclers. Only a limited number of municipal recycling centres have facilities to intercept reusable goods before they enter waste disposal. Reports show that only about half of the Dutch municipal recycling centres have a container or system for reuse, and that the degree of cooperation with thrift stores varies greatly between municipalities. Circular craft centres (CCCs) have been introduced in this context as a policy tool to transition from a linear to a circular infrastructure. CCCs combine at the local level the functions of municipal recycling centres, recycling shops, repair services and educational initiatives. This creates space for higher steps on the R-ladder, such as reuse, repair and refurbishing, instead of just recycling. Examples from Oss and Meierijstad show that integrating reuse within waste infrastructures leads to significant increases in the number of goods given a second life. At the same time, CCCs face legal constraints, such as strict regulations around dismantling and reusing parts from end-of-life appliances, which has only recently been interpreted more leniently by enforcement agencies.

The Leiden case provides an interesting example of how CCC principles can be applied even without a physically integrated centre. By transferring responsibility for E-waste collection from the environmental street to the thrift shop Het Warenhuis, an alternative, decentralised form of circular E-waste infrastructure was created. This approach is particularly relevant in cities with limited physical space and high land prices. Using existing structures such as thrift shops not only proves practical but also lowers the threshold for residents to offer E-waste correctly. At the same time, the example also shows the limitations of this approach: a lack of staff and physical capacity can lead to reusable goods still going to waste, especially when delivered via the regular containers of municipal recycling centres. The current situation shows that although the formal infrastructure for E-waste in the Netherlands is well organised for recycling, there is still much to be gained in facilitating reuse and repair.

## **4.2 Everyday encounters with E-waste: Insights into household disposal practices**

This section examines how visitors practice disposing of E-appliances at the thrift store Het Warenhuis in Leiden, using Social Practice Theory (SPT) to structure the analysis. Rather than looking at all the processing steps of E-waste and how they are done, as is done with the analysis of the thrift store workers, we look more into why they dispose the way they do. By keeping the themes broad there is more room for different perspectives from all the different interviewees. We analyze each of these aspects through the core SPT elements: materials, competences, and meanings. Direct quotes from participants are used to illustrate findings and give insight into the practice of e-waste disposal via the thrift store.

### **4.2.1 Materials: Physical Aspects of E-Appliance Disposal Practices**

#### **Materials at Home – E-appliances and Storage:**

The disposal practice begins for a lot of people with the gathering of materials of unwanted or outdated items and E-appliances in the home. This often happens during specific periods like vacations or holidays or whenever someone is moving or even immigrating. Many visitors described keeping old electronics in storage (e.g. attics, closets or boxes) until a disposal trip was undertaken. For example, one interviewee kept a dedicated box at home for items destined for the thrift store and only decided to bring them once the box was full: *“Ik heb ook zo’n doosje... van dingetjes waarvan ik denk van nou, dat kan naar de kringloop... op een gegeven moment begint dat vol te raken”* (“I often have a little box at home with stuff I think can go to the thrift store... at a certain point it starts getting full”) (Speaker 1). In this preparing sub-practice, the appliances themselves (ranging from small devices like phones and mixers to larger items like old mini-fridges or DVD players) are a central material element. Their condition varies, some are still functional while others are broken or obsolete. Households often accumulate these items over time, sometimes for weeks or months, before physically removing them, indicating that storage spaces (like an attic or garage) and containers (boxes, bags, etc.) are supporting material infrastructures of the practice at home.

#### **Materials for Transport – Vehicles and Infrastructure:**

Another material element is the means of transport and the drop-off infrastructure itself. Most visitors relied on cars to transport their E-waste to the thrift store’s drop-off point. Having a vehicle with sufficient capacity can shape how and when items are delivered. One interviewee acknowledged being “lucky to have a large car” (Speaker 2) so that transporting even bulky electronics posed “no particular problems” (Speaker 2). In another case, a couple with a small car had to enlist the help of a friend with a larger vehicle to handle a big item (a mini fridge) that wouldn’t fit in their own car. Such examples show that material capacity (car size, availability of a trailer or cart) directly affects the ease of disposal. In a high-rise context, one respondent even used a handcart to move items from his apartment to the parking garage, highlighting how personal equipment (trolleys, lifts) facilitate the material transfer of heavy electronics.

The design of the thrift store’s intake infrastructure also comes into play. The “inleverstraat” (drop-off lane) is a street that allows visitors to drive up and hand over items. Participants appreciated that they could *“gewoon ergens naartoe kan rijden... en het meteen kan*

*achterlaten*” (“just drive somewhere and drop it off immediately”) (Speaker 5) without needing an appointment. The process typically involves cars or bikes. Some visitors timed their visits to avoid congestion, for instance choosing weekday mornings hoping *“dat het niet zo druk is”* (“that it won’t be so busy”) (Speaker 5). Others noted that even if a short queue forms, it moves quickly as *“iedereen heeft wat in dozen staan, dus het is zo uitgeladen”* (“everyone has their things in boxes, so unloading is quick”) (Speaker 4).

A few inconveniences were mentioned, such as navigating the car at the drop-off point while cyclists pass through, highlighting the lack of clarity if you were allowed to skip the queue of cars when arriving by bike yourself. *“Ik weet niet of ik met de fiets wel de rij kan overslaan, want dat lijkt me onduidelijk.”* (“I don’t know if I can skip the line when arriving by bike, because that seems unclear to me.”) (Speaker 9). Another visitor mentioned being hesitant to go by car because he found the surrounding traffic infrastructure chaotic, mentioning: *“Nou ja, ik moest even bij dat andere punt, want Schaardwijk is een metaalwinkel vrij dicht bij de binnenstad. Dus dat is even spannend. En het was vrij zwaar, dus ik moest met de auto. Want anders had ik dit soort dingen gewoon met de fiets kunnen doen. Dus daar ben ik langs gegaan. En dan de weg naar hier. En dat is altijd een beetje spannend. Ik vind het nog steeds wel spannend om hier met de auto te komen, omdat er ook vrij veel fietsverkeer is. Maar ja, met name daar is een plek waar fietsers en auto's elkaar kruisen. Dat vind ik eigenlijk spannend.”* (“Well, I had to go to that other point because Schaardwijk is a metal shop quite close to the city center. So that was a bit nerve-wracking. And it was pretty heavy, so I had to go by car. Otherwise, I could have just taken these kinds of things by bike. So I went there, and then made my way here. And that is always a bit nerve-wracking. I still find it a bit nerve-wracking to come here by car because there are quite a few cyclists. Especially since there’s an area where cyclists and cars cross paths. I actually find that quite nerve-wracking.”) (Speaker 3). This indicates that despite being familiar with the overall process, some visitors find the mixed-use setting between cyclists and cars challenging. Such uncertainties may affect the confidence with which visitors choose their mode of transport, leading to hesitation or delays. Another visitor mentioned the lack of a fully covered bay (meaning staff standing in the rain). The ease of physically handing over items, *“je kan eigenlijk iedere keer wel doorrijden”* (“I’ve practically always been able to drive straight through”) (Speaker 4), lowers the threshold to engage in the practice. One visitor remarked that knowing she can be helped immediately makes it *“makkelijk om even hier naartoe te rijden”*, such that *“de drempel... is dan veel lager”* (“easy to just drive here... the threshold is much lower”) (Speaker 4).

### **Alternative Material Destinations:**

In deciding where materials ultimately go, visitors also considered other drop-off points (retail take-back programs, charity etc.), highlighting a broader material infrastructure for E-waste. A few interviewees collected specific items for designated programs, for instance, one had delivered a box of old tools to a specialized charity depot rather than the thrift store. However, for most electronic appliances, the thrift store functioned as the main accessible outlet. Notably, some donors were not aware of any alternative location for electronics disposal *“Ik weet geen ander punt. In ieder geval niet voor Elektra”* (“I don’t know of another

drop-off point, at least not for electronics”) (Speaker 1), indicating that the thrift store’s intake has effectively become the default local infrastructure for E-waste.

#### **4.2.2 Competences: Knowledge and Skills about E-Waste Disposal**

##### **Sorting and Preparation Skills:**

Competences refer to the practical know-how, skills, and information that practitioners draw on. Visitors demonstrated a tacit competence in sorting which items should be kept, discarded, or donated. Many described periods cleaning up at home, during which they identified electronics that were no longer needed. One visitor explained that some items had been handled and put aside repeatedly over time until she concluded *“als ik het nu geen plekje heb gekregen, dan moet het maar eens een keer weg”* (“if by now I haven’t found a place for it, then at some point it has to go”) (Speaker 4). Knowing when an appliance is “overbodig” (redundant) or ready to let go is an important part of the practice, as is basic testing of functionality. Visitors often knew whether an item still worked or not, and this informed their decisions. For example, one respondent only brings electronics to the thrift if they still function, and if not, he prefers the municipal recycling centre *“als de elektronica goed is, dan breng ik het weg... en als het niet meer doet... dan gaat het of naar de milieustraat of ik lever het bij jullie in”* (“if the electronics are good, I bring them in to the thrift... and if it doesn’t work anymore then it goes either to the municipal recycling centre or I hand it in to you”) (Speaker 2). In practice, the thrift intake is accepting all electronics (even broken), but visitors still looked at an item’s condition and decided upon the most appropriate fate. This demonstrated that visitors are actively thinking about if their E-appliances can be of worth to others. It also demonstrated that not all visitors know about the fact that the municipal recycling centre doesn’t accept E-waste anymore.

Preparation competences also include cleaning and handling data. Some visitors took care to wipe or clean devices before drop-off. A visitor mentioned she gathered the electronics she wanted to dispose of *“bij elkaar gelegd en even schoongemaakt”* (“put them together and gave them a quick clean”) (Speaker 7) before driving to the store. Others felt cleaning was unnecessary because the items were *“meestal... redelijk schoon”* (“mostly clean anyway”) (Speaker 1), but the very consideration of cleanliness shows an awareness of thrift store norms (e.g. not donating excessively dirty goods). In terms of data security, some showed competence in safeguarding personal information. One interviewee noted he would never drop off a computer without first removing or formatting the storage: *“Een computer zal ik niet zo gauw wegbrengen... meestal haal ik het geheugen eruit. En dan breng ik hem naar de Milieustraat. Dat vind ik voor mezelf veiliger”* (“I wouldn’t quickly bring a computer... I usually take out the memory and then take it to the municipal recycling centre. I think that to be safer for myself”) (Speaker 2). In this case the man would in theory still be redirected to the thrift store if he tried to dispose his memory there. This example highlights a gap in visitors’ knowledge. While many have developed a routine for handling their E-waste, some have not updated their thinking process to reflect the current infrastructure. It could also be that the man was opposed to his memory (hard drive) being wiped by someone else than himself or that he didn’t like the idea of his equipment being used by someone else but when asked about he responded negative to these points. This could indicate that some

people are hesitant about bringing their hard drives to the thrift store. When no alternative is given, this might result in people hoarding their old hard drives or they might dispose of their hard drives in regular household waste streams. Another visitor had this exact outcome as he did not know that the thrift store also accepted old computers or parts. *"Een harde schijf of een laptop, ja, dat heb ik eigenlijk in het verleden, heb ik dat wel eens een keer, heb ik een hele grote pc gehad, daar heb ik toen naar, heb ik willen wegbrengen via de gemeente, maar dat ging op een gegeven moment niet en toen wist ik, toen gaven ze geen advies van waar je dat kon brengen. Nou, toen ben ik wel even boos geworden en toen dacht ik, toen bestond geloof ik, wist ik nog niet dat het warenhuis dat ook kon nemen, dus toen heb ik het gewoon maar ergens weggesmeten."*

("A hard drive or a laptop—in the past, when I once had a really big PC, I tried to bring it in through the municipality, but at some point that didn't work out, and I didn't get any advice on where to take it. I got pretty angry then, and I thought, I guess I didn't know that the thrift store could also take it, so I just ended up chucking it somewhere.") (Speaker 9). The visitor recalls having had trouble with getting rid of his computer which resulted in him depositing it not the right way. He acknowledges that since then he has learned that the thrift store also takes in computers and their parts. This could perhaps indicate that over time the access to information about E-waste disposal has been more streamlined within the municipality of Leiden or that people got accustomed to the idea of bringing their old computers to the thrift store. Another visitor stated he would first format any device containing personal data before disposing. This demonstrates a competence in managing digital privacy as part of the disposal practice. Importantly, lack of confidence in this skill can deter people from donating certain electronics at all, e.g. one person admitted he "would not easily" bring devices with personal files to the thrift without wiping them, highlighting how competences (or the absence thereof) effects what gets included in the disposal practice of E-appliances.

### **Logistical and Navigational Know-how:**

Another set of competences revolves around physically delivering the items. Visitors developed strategies to make the transport and drop-off efficient. This includes knowing when and how to go. Many had learned through experience or word-of-mouth that the thrift intake in Leiden is open and usually quick. For instance, one respondent in his twenties knew about the drop-off point because *"mijn vriendin... had dat gehoord van haar vader"* ("my girlfriend had heard about it from her father") (Speaker 6). Others consulted online information: a participant mentioned *"ik heb eventjes de website geraadpleegd... alles [stond] duidelijk beschreven"* ("I quickly checked the website, and everything was clearly described") (Speaker 7). Several interviewees purposely chose a time they expected to be quieter (often weekday mornings). They were generally familiar with the traffic flow; one noted the signage was clear: *"er staat eigenlijk wel duidelijk aangegeven hoe... de afgifte straat in moet rijden"* ("it's clearly indicated how you have to drive into the drop-off lane") (Speaker 6). Another, however, mentioned finding it "nervous" to drive into the site due to crossing bike traffic, though he acknowledged that staff managed the flow well by holding cars when needed. This shows that while the basic competence to navigate the drop-off process is common, individuals vary in comfort level and adapt accordingly (e.g. one person preferred not to go alone when driving in tight spots).

## Misconceptions

Some visitors demonstrated they had trouble distinguishing the municipal recycling centre and thrift store. For instance, one participant stated:

*“Ik kom hier vaker, dus ik weet dat eigenlijk de elektra hier moet worden ingeleverd. En dan weer de niet te gebruiken lampen die moeten dan weer op het wegwerk eiland worden ingeleverd. Het is best nog wel complex. Het is ook heel grappig om te horen dat mensen dan zeggen dan moet je naar de gemeente brengen. En dit is ook van de gemeente. Maar ja, dingetje.” (“I come here often, so I know that electronics are supposed to be handed in here. And then the non-functioning lamps should be handed in at the ‘wegwerk eiland’ [a designated drop-off location]. It’s actually quite complex. It’s also very amusing to hear people say that you should bring them to the municipality. And this is also from the municipality. But, well, it is what it is.”) (Speaker 3).*

This quote illustrates how some visitors continue to mix up the roles of the municipal recycling centre and thrift store. Although the E-waste collection responsibility has shifted from the traditional municipal recycling centre to the thrift store, some individuals still perceive these systems as part of a unified municipal service, while the thrift store is in fact a foundation.

### 4.2.3 Meanings: Motivations, Values and Interpretations of the Practice

#### Environmental and Social Meanings:

The interviews reveal that visitors attach positive meaning to the act of donating E-waste, often framing it as the “right” thing to do in both environmental and social terms. A common motivation is to avoid waste and give items a second life. *“Het woord zegt het al, kringloop”* (“the word says it all Thrift store/circular economy”) (Speaker 3), one respondent said, *“ik vind het zonde om het zomaar weg te gooien”* (“I find it a shame to just throw it away”) (Speaker 3). This sentiment reflects a sustainability mindset: throwing functional or repairable items in the trash is regarded as wasteful or even irresponsible. Instead, bringing electronics to the thrift store is seen as contributing to reuse and resource recovery. Several visitors explicitly hoped that someone else could still benefit from their old appliance. *“Ik hoopte dat ik er andere mensen nog blij mee zou kunnen maken”* (“I hoped I could still make someone else happy with it”) (Speaker 7), explained a visitor about her decision to bring in an old phone and laptop. Similarly, another interviewee noted that if an item is in decent shape such that *“iemand anders daar nog blij mee maken”* (“someone else can still get enjoyment out of it”) (Speaker 1), then it’s important that it be resold or passed on, rather than destroyed. These quotes show that the meaning of charitable contribution is embedded in the practice. The disposing of E-appliances is not only about personal convenience, but also about enabling reuse for the other people’s benefit.

Visitors understand that reusing electronics can reduce the need for new production and lessen waste. *“Dat scheelt... de productie van nieuwe apparaten die weer een hoop [energie] verbruiken”* (“that saves on the production of new devices which would consume a lot”) (Speaker 6) noted one environmentally conscious participant, who therefore concluded *“het lijkt mij wel een duurzame keuze”* (“it seems like a sustainable choice to me”) (Speaker 6). For

some, bringing E-waste to the thrift store is preferable to using the municipal recycling centre precisely because it increases the chances of value recovery. *“Als het hier kan worden ingeleverd, heeft dat mijn voorkeur... bij de Milieustraat weet je zeker dat het geen grondstof meer is”* (“If it can be dropped off here, it has my preference... at the recycling yard you know for sure it’s no longer considered a resource”) (Speaker 3), said one interviewee, expressing the view that the thrift store will try to channel items to reuse or proper recycling, whereas the conventional municipal recycling centre might simply treat it all as garbage. This belief gives the thrift stores drop-off point with a meaning of greater sustainability than the municipal recycling centre in the eyes of the public.

### **Norms and Responsibilities:**

There is also a generational and difference in norms component to these meanings. Older participants recalled how throwing E-appliances in the regular trash has become socially unacceptable over time. *“Ik zie mijn ouders van 90... weleens een mixertje dat kapot is in de gewone vuilnis gooien”* (“I still sometimes see my 90-year-old parents throw a broken mixer in the regular garbage”) (Speaker 5) one woman in her fifties admitted, *“Dat is bij ons... al zo uit het systeem. Dat dóe je niet meer”* (“In our generation that’s already out of the system – you don’t do that anymore”) (Speaker 5). Proper disposal via designated channels (like the thrift or recycling points) is thus seen as a civic responsibility, a learned social norm that “you just don’t” deviate from. This sense of duty is passed down: one interviewee mentioned he taught his children from a young age that usable items should be brought to the thrift store, and he trusts that they do so *“ik ga ervan uit dat ze dat ook doen”* (“I assume they do that as well”) (Speaker 2). Such norms reinforce participation in the practice beyond individual convenience or benefit; people do it because it aligns with what is socially and morally expected in a society that increasingly values waste separation and circular use of goods.

### **Convenience, Decluttering, and Emotional Relief:**

At the same time, very practical meanings, especially the desire to declutter and the convenience of the service (not needing an appointment), strongly influence this practice. Many visitors described the relief of getting rid of stuff that was taking up space. *“Het staat alleen maar in de weg”* (“It was just in the way”) (Speaker 4), said one woman about an old kitchen appliance her mother no longer used. Donating to the thrift store is often linked to making space and cleaning up the house. For some, this comes after a long period of procrastination. One participant laughed that often she would encounter the same old devices during each clean-up and think “I’ll keep it a little longer,” until finally deciding *“nu ga ik het wegbrengen”* (“now I’m going to get rid of it”) (Speaker 1). The act of finally dropping the items off is last step to the cleaning process. A male visitor who was preparing for a home renovation explained that he had systematically cleared out different rooms and set aside bags of items he no longer needed, and *“nu is het echt helemaal mooi schoon leeg”* (“now it’s nicely completely cleared out”) (Speaker 9) after the thrift store collected those bags from his home. Clearly, a primary meaning attached to the practice is household decluttering and cleaning. The thrift store’s service enables this personal goal, which is why several people emphasized how quick and easy the drop-off is for them. Knowing that one can immediately hand things over without hassle made donors more willing to undertake the

trip. *“Je hoeft [alleen maar] een telefoontje te geven... dan kan je het bij ons kwijt”* (“You just have to give a phone call... then they [the thrift] say you can drop it off here”) (Speaker 9) said one respondent to illustrate how convenient the system is, adding *“dat vind ik echt een heel goed systeem”* (“I find that a really good system”) (Speaker 9). A few visitors compared it with the municipal recycling centre where one must make an appointment and wait for an available slot, which can be a deterrent, whereas the thrift intake could be accessed on one’s own schedule. One potential consequence of limiting E-waste collection exclusively to the thrift store is that people, who already visit the thrift store for other reasons, are likely to consolidate all their disposal there. Instead of taking their other items to the municipal recycling centre, they bring everything to the thrift store, since it accepts nearly all items without needing an appointment. As a result, the thrift store ends up receiving a broader range of goods that might otherwise have been disposed of at the municipal recycling centre. This could suggest that people may prefer the convenience of a one-stop shop for their disposal needs.

The convenience meaning is perhaps best captured by a visitor who chose the thrift store over trying to sell her items: the lamp she donated was in fine condition and *“a very nice design lamp”* but selling takes time and *“dan staat die zo lang nog in de weg”* (“then it just stands in the way for so long”) (Speaker 5). *“Om er snel vanaf te zijn, breng ik het dan hier”* (“To get rid of it quickly, I bring it here”) (Speaker 5), she said, *“en dan maak je er iemand anders... nog wel blij mee”* (“and in doing so you also make someone else happy with it”) (Speaker 5). Another important example of why convenience is important comes from this visitor that states: *“Nou, eerlijk gezegd is dat me te lastig. Ik heb wel eens een ding op een marktplaats gezet. En dat is een eindeloze martelgang. Daar heb ik gewoon geen zin in. Kijk, nu, ik breng het weg. Kijk, een marktplaats. Dan krijg je er een paar euro voor. Maar al dat gedoe. En dan die foto's maken en opmeten. Dat is me gewoon te lastig.”* (Well, to be honest, that's too much hassle for me. I've tried putting something on Marktplaats (website for resale comparable to Vinted or Ebay) before. And it's an endless ordeal. I just don't feel like it. Look, now, I'll just get rid of it. Look, a Marktplaats listing, sure, you might get a few euros for it, but all that hassle, taking photos and measuring it, is just too much for me.) (Speaker 1) she makes it clear that reselling it is too much of a hassle for her and she likes the idea of giving it to the thrift store so that the items still get a second life. It is clear that some people prefer their time over the potential money that reselling can give them.

Finally, it is worth noting that once the items are handed over, most visitors do not attach strong personal sentiment to what happens next, their main satisfaction comes from having done their part in getting rid of it the proper way. Several interviewees expressed trust that the thrift store staff will handle the items appropriately, whether by testing, reselling, or responsibly recycling. *“Je geeft het af en ik weet niet wat ze daar verder mee doen”* (“You hand it over and I don’t know what they do with it after that”) (speaker 4), one visitor admitted, and when asked if she was interested to know, she responded *“nee... het is fijn als er iemand anders het kan gebruiken. Maar als ze zeggen... dat is niet waardevol, dan zal het wel op de grote hoop gaan”* (“no, not really... it’s nice if someone else can use it. But if they say it’s not worth anything, then it’ll probably go on the big heap”) (Speaker 4). In other words, once the material has left their possession, the emotional attachment is minimal;

what matters to them is that they acted responsibly and cleared their space. Another participant put it bluntly: *“Het belangrijkste is dat ik er gewoon vanaf ben”* (“The important thing is that I’m just rid of it”) (Speaker 9). For him, whether the thrift store sells the item, gives it away, or even scraps it for parts does not matter much, he even acknowledged that the thrift store might charge a small price *“dat vind ik ook best... die mensen hier, ze hebben er ook werk aan”* (“that’s fine by me; the people here put work into it”) (Speaker 9). This indicates a meaning of relief and transfer of responsibility: the act of dropping off shifts the burden of the object’s fate from the individual to the thrift store and its circular system. Contributors generally seem content with this transfer, as it absolves them of the difficulty of disposing of E-waste properly on their own, while still aligning with their values of not wasting resources.

#### **4.2.4 Observations of visitor disposal practices**

During the interviews it was noticed that although many of the visitors purchased items from the thrift store, they consistently reported not combining their trip to the drop-off point with a visit to the shop. This suggests that, in practice, the roles of donor and customer remain distinct for most visitors. To bridge this gap the thrift store could offer a same-day discount or a free coffee to individuals who bring in E-waste. This might encourage visitors to not only dispose of their items at the intake street of the thrift store but also engage with the retail side of the store. This approach could attract new customers while also rewarding loyal customers at the same time.

Another observation concerns the mix of cyclists and cars in the intake street. One visitor mentioned being uncertain about whether he was allowed to bypass the car queue when arriving by bike. This observation was reinforced by observations made at the intake street, where cyclists often skipped the line and headed directly to the front. Although this did not disrupt the overall process during the observations, as the intake street is only designed to accommodate one visitor being helped by the workers at a time. However, this could potentially lead to chaotic situations when multiple people bypass the line simultaneously and dropping off their items before and leaving before, they can be identified by the workers. While during observation relatively low visitor numbers were involved, it is plausible that during busier periods, such behaviour could contribute to congestion and inefficiency at the intake street.

#### **4.2.5 Sub-conclusion.**

Visitors of Het Warenhuis dispose of their electronic appliances in such a way that there is a mix of practical habits, basic knowledge, and underlying motivations. Many people store broken or unused electronics at home, often in a specific box or area, until they’ve gathered enough to justify a trip. Most visitors use their own cars and appreciate the convenience of being able to drop off items at the thrift store without needing an appointment. In general, they seem to have a good sense of what’s worth donating as they often check whether things still work, sometimes clean them beforehand, and are occasionally aware of data privacy issues, like removing hard drives. That said, not everyone is fully informed, for example, some visitors still don’t know that Het Warenhuis now handles all types of E-waste, even broken devices. The reasons people bring their appliances to the store go beyond just

getting rid of clutter. Many people feel it's the right thing to do for the environment as well as socially, wanting their items to get a second life rather than be thrown away. Showing and taking responsibility, combined with the low threshold of access, makes the thrift store the most logical option for people to bring their items to. It is also noteworthy that most people come just to donate items and don't combine their visit with going through the thrift store itself, this suggests that donation and shopping are seen as separate activities. The way Het Warenhuis is set up makes the process easy and efficient, and while there are some small issues, like unclear signage for cyclists, the system seems to support visitors in making responsible disposal decisions that align well with the goals of a circular economy.

#### **4.3 Behind the scenes of reuse: Work practices and operational realities at the thrift store**

This section examines how thrift store employees of the the thrift store Het Warenhuis engage in various sub-practices to manage E-waste. Using Social Practice Theory, we can analyze these sub-practices by examining their core elements materials, competences, and meanings. The analysis of the thrift store workers practices is focussed on the clear process steps that happen within the thrift store. Based on the first sub-question, interview data and observations, the practices of the thrift store workers can be divided in the following sub-practices: E-waste Collection, Coordination and Training, Sorting and Testing, Preparing for Resale and Repurposing & Refurbishing. Following SPT the practices are made up of: materials, competences, and meanings. Direct quotes from participants are used to illustrate findings and give insight into the work practices of thrift store workers.

##### **4.3.1 E-Waste Collection (Intake)**

One important sub-practice at the thrift store is that of E-waste collection the process of receiving incoming donations at the door, assessing their condition, and sorting them appropriately. The role of someone who works at the intake street involves greeting visitors, asking about the functionality of electronic devices, and making on-the-spot decisions about what can be accepted for reuse. For example, when a visitor brings an electronic appliance, workers inquire if it still works and often the visitor will tell them it's condition. Based on that and the item's state, the workers decide whether to accept the item and how to classify it. One worker explains that even if a device technically functions, they still accept it but classify it as not working or not useful if it's in unsuitable condition *“een vieze frituurpan kan werken maar die hoeven we natuurlijk niet”* (“a dirty deep-fat fryer might work, but of course we don't need that”) (Worker 4). Certain hygiene-related electronics (like electric razors or trimmers) are never resold and are immediately discarded for health reasons.

**Materials:** Thrift store workers operate an intake street (infrastructure) that collects E-waste from the public. This includes a dedicated drop-off area (referred to as the “inname straat” or intake street) and large containers or bins for incoming electronics. The intake street is equipped with tools and items to facilitate the workers. There is a dedicated drop-off door or counter where visitors bring items, and carts or bins designated for specific streams (notably, two carts for electronics, one for working devices and one for non-working/ non-useful E-waste). One worker describes a “hele grote container” (very large container) placed at the intake for bulky electronics like washing machines, refrigerators, and other large appliances. Smaller electronics are all sorted on the two carts for working and non working. When those

carts get full the working cart is placed in storage to be placed in the store when there is room and the non working cart is weighed and will be emptied in IBC containers ready for pickup by Renewi in service of Stichting OPEN. In addition, vehicles and storage space are part of the collection strategy, employees sometimes assist drivers or use trucks to pick up donations, and a warehouse area is used to hold items before processing. These materials enable the intake practice, making it possible to collect and process a high volume of E-waste items from Leiden, Zoeterwoude, Leiderdorp and Oegstgeest.

**Competences:** Workers need several skills to carry out E-waste collection effectively. Intake supervision demands a mix of technical, organizational, and social skills. The workers have to rapidly assess item quality and functionality, using practical knowledge of common goods. For electronics, a basic technical understanding is needed to tell if an item is obviously broken or potentially usable. The workers rely on visitors input but also use their own judgment for instance, deciding that a moldy coffee machine is not worth processing even if technically the visitor didn't label it broken. This judgment comes from experience and training about what the store can resell. Another key competence is communication and customer service. Workers need to ask the right questions and listen, as well as explain policies tactfully when refusing items. One worker provides an example for refusing a fryer full of oil: *"je zegt tegen de klant, ja sorry, neem hem maar terug mee naar huis, maak hem even leeg en dan kan hij ingeleverd worden"* ("you tell the customer, sorry, please take it back home and empty it, then it can be handed in") (Worker 4). Such interactions require diplomacy to maintain a positive relationship with the visitor. She notes that visitors don't always react well to refusals, especially if it means they must make an appointment for a singular item at the municipal recycling centre. Thus, workers at the intake street develop the competence to manage conflict, being firm about guidelines while remaining courteous and helpful (for instance, by informing them of alternative disposal options nearby or by being lenient when needed). During busy periods, multitasking and stress management are essential, workers must keep the line moving, quickly separate different types of goods, and avoid bottlenecks. One worker's experience of extremely busy vacation periods (*"drie weken stress..."*, "three weeks of stress") (Worker 4) underscores the need for endurance and flexibility under pressure.

**Meanings:** The intake practice carries carries strong meanings tied to both environmental sustainability and community service. Many employees see collecting E-waste as contributing to sustainability, by providing a convenient point where items can enter a reuse cycle instead of being discarded as trash. One worker affirms that it's *"liever op één punt en dat het nog uitgezocht kan worden dan gelijk alles op één hoop"* (Worker 6), meaning she prefers having a centralized drop-off (the thrift store) where items get a chance to be sorted and tested, rather than everything being thrown in a heap at the municipal recycling centre. This highlights a shared value: it is *"zonde"* (a shame/waste) to throw away potentially useful electronics without checking for reuse. Being the first gate, intake staff feel responsible for maximizing reuse and for preventing waste. One worker expresses a personal opinion that society should curb excessive consumption and disposal: *"eigenlijk moeten wij terug naar een maatschappij waarin er niet zo ongelooflijk veel gekocht wordt en weggegooid wordt... wat we aan grondstoffen allemaal gebruiken is belachelijk"* ("we really need to go back to a

society where not so much is bought and thrown away... it's absurd how much resources we use") (Worker 4). This belief motivates her to welcome as many items as possible into the reuse stream. At the same time, another meaning is ensuring quality and safety, the thrift store is not a dumping ground for waste, and maintaining a standard (e.g. no hazardous items) upholds the guidelines of the store and the country wide laws on waste. It is also noted that today's thrift shoppers are picky, so putting a torn, unsellable couch in the showroom is not acceptable. Thus, intake workers balance the meaning of providing a low-threshold drop-off point for all kinds of goods, including E-waste with the meaning of selecting goods that fit the reuse purpose. There is also a social meaning: by being the first point of contact, they provide a public service to the community, making it easier for people to act sustainably.

#### **4.3.2 Coordination and Training**

Another sub-practice revealed by interviews is the coordination and training of colleagues and interns. This practice involves organizing daily tasks, ensuring everyone understands their duties, and building the skills of less-experienced workers and interns. It is a human centered practice that keeps the thrift store's operations running smoothly by building a capable and cohesive workforce.

**Materials:** While coordination is largely about people, there are still some material elements that support this practice. One worker references having a separate area in the shop where interns can often practice with making displays. Furthermore, in the canteen there is a separate place for the interns and their supervisors to sit and discuss

**Competences:** Coordination and training call for strong leadership and communication competences. One worker had to adapt to leading a team with diverse abilities. She notes that in previous jobs where she had to supervise she could simply delegate ("*zeggen van ik wil graag dat jij A, B, C doet*") ("saying I would like you to do A, B, C") (Worker 4) and trust tasks would be done, but at the thrift store she often must repeat instructions, monitor progress, and sometimes help redo work. This indicates a competence in patience and reinforcement. Effectively, she acts as a coach, understanding that some colleagues (possibly those with intellectual or learning disabilities, as often present in social enterprise settings) need extra support. She describes the challenge of gauging how much independence to give someone versus when to "not let go" and double-check the work. This showcases a requirement of emotional intelligence, observational skills, and adaptability. This worker is learning to avoid an overly patronizing tone "*wanneer word ik een kleuterjuf...*" ("when do I become a kindergarten teacher") (Worker 4) while still providing the structure some workers require. Treating everyone with respect and adjusting her style to each person's level can be seen as a form of inclusive management. The organization supports her in developing this competence, she mentions that the core team at Het Warenhuis is very helpful, giving her feedback on how she could improve her approach. She has also formally built her training skills by becoming a certified "*leermeester*" (workplace mentor), which qualifies her to supervise interns. She must teach them practical tasks (like sorting, pricing, or other routines) and also evaluate their progress, which draws on teaching and mentoring competences. Communication skills are also important she needs to clearly explain tasks,

give constructive feedback, and sometimes mediate if there are misunderstandings or issues in the team.

**Meanings:** The meanings associated with this sub-practice center on inclusion, and continuous learning. Within the thrift store, there is a strong sense of social inclusion which is described by one worker as a feeling like *“een warm bad”* (“a warm bath”) where *“er is heel veel respect voor alles en iedereen”* (“there is a great deal of respect for everyone and everything”) (Worker 3). This inclusive culture means that part of the job is to foster a supportive team environment. The workers clearly value this, noting that even if someone is “weird” or different, *“je wordt gewoon meegenomen in de groep”* (“you are simply taken along into the group”) (Worker 4). The worker helps ensure every team member, regardless of background or ability, feels included and productive. This gives the work a meaning beyond just managing tasks, it’s about the development of people and thus social value. Training interns, for instance, is meaningful as it contributes to education and helping the community (many thrift shops collaborate with social programs or schools to offer internships to youth or individuals re-entering the workforce). There is also an element of personal achievement and belonging because she mentions receiving plenty of guidance and not being expected to get everything right immediately, which makes her supported. This gives her a feeling of being valued as a leader who is still learning which means her role is seen as important and worth investing in by the organization. In a broader sense, this sub-practice is about inclusive management system, without proper training and coordination, the intake and sorting of electronics (and other goods) could halt. By investing in teaching others, experienced workers ensure the knowledge of the practice is continuously regenerated.

#### **4.3.3 Sorting and Testing**

Once items have been accepted through intake, another sub-practice takes over: the sorting and testing of items. The testing refers to any quality assurance and minor repairs or cleaning done to prepare goods for resale. Together, these activities ensure that only quality goods reach consumers while maximizing the recovery of materials from whatever cannot be sold.

**Materials:** After intake, thrift store workers engage in sorting and testing of E-waste, using various material resources. Key materials include workspaces and tools for examining electronics for example, testing stations with power outlets, light bulbs, or other necessary equipment to verify if devices function. One employee mentions simply putting *“een bolletje erin en test het”* (“putting a bulb in and testing”) (Worker 6) for donated lamps, indicating the use of spare bulbs and electrical sockets as basic tools. There are also containers and bins designated for sorted outcomes: items confirmed as non-functional go into large E-waste bins (like IBC containers destined for recycling), whereas working items move to shelves or carts for pricing. One volunteer notes that incoming electronics *“moet in een stelling liggen en dan gaat dat naar de afdeling die dat onderzoekt”* (“it must be placed on a rack and then it goes to the department that examines electronics”) (Worker 3). This implies shelving and storage infrastructure to hold items during the evaluation process, and a dedicated electronics workshop area with tools like screwdrivers, multimeters, and cleaning supplies to prepare items for resale. To summarise, the infrastructure for separation and the testing

tools or materials required to evaluate the condition of each electronic item are included in the material element for sorting and testing.

**Competences:** Sorting and testing E-waste demands a combination of technical and analytical skills. Workers develop an ability to identify resale potential quickly. As an employee describes, after a while “weet je wel wat klanten wel willen kopen, wat ze niet willen” (“you come to know what customers will buy and what they won’t.”) (Worker 2). This market insight is a competence that guides how items are sorted: anything unlikely to sell is promptly set aside for recycling to save time and space. Technical competences are crucial as well. Staff need basic electrical know-how to test devices (e.g., how to safely power on an appliance, recognize if a device is repairable or truly broken). The worker, who works in the electronics section, uses his electrotechnical knowledge to judge items: he notes that not everyone has that knowledge, so he often double-checks the defect cart because intake workers without electronics expertise might label something as worthless or broken when it’s actually valuable or usable. Thus, part of the skill set is the ability to identify valuable electronics. Specialised competencies, such as IT skills, are used in some situations. For instance, another worker mentioned that he sets up vintage electronics and reinstalls operating systems on older computers, which is an advanced skill that goes beyond simple testing into refurbishment. Even when big repairs are not done, workers must know when an item is beyond help. This involves evaluating physical condition (is it too damaged or missing parts) and compliance (for instance, knowing that due to hygiene rules they cannot resell shaving appliances). In short, the sorting and testing practice relies on competences in evaluation, technical assessment, and market judgment to decide each item’s fate in the thrift store.

**Meanings:** For the workers, the process of sorting and testing has great significance since it directly affects how many things get a “second life” and how much waste is avoided. Workers often see themselves as gatekeepers of reuse in this stage. Successfully rescuing a device that was suspected to be broken and preparing it for sale can be a point of pride. A worker expresses satisfaction in making a customer happy with a second-hand electronic item and notes “dat is uit het milieu, want hij gaat nog even een rondje mee” (“it’s out of the environment (waste stream) because it gets to go another round of use.”) (Worker 2). This underscores the symbolic value: each item sorted into reuse is one less piece of waste and a small environmental win. There is also a sense of duty to maximize reuse. Most of the workers feel it is “jammer” (a shame) when usable things are thrown away by mistake, so they take it upon themselves to pull salvageable items out of the carts when they are mislabeled or could potentially still be of value even if broken. In doing so, they see their work as an “extra bijdrage” (extra contribution) to sustainability by recovering value that others might overlook. On the other hand, sorting out truly non-sellable E-waste for recycling also has meaning, it’s about responsible disposal. Knowing that items placed in the electronics recycling bin will be properly handled (often by specialized facilities or social enterprises) reassures workers that even waste is dealt with ethically. One worker describes, E-waste put in the container is sent to “een groot bedrijf” where people (in this case, workers with disabilities) dismantle the devices to harvest components like “de gouden dingen die erin zitten” (“the gold bits inside”) (Worker 3) for recycling. This knowledge gives workers a

sense that nothing is simply wasted: if they can't reuse it in the shop, it will be recycled or repurposed elsewhere, which aligns with circular economy values. Overall, the meaning attached to sorting and testing is about maximizing the lifecycle of products, every item saved for reuse or properly recycled is a contribution to a larger goal that the thrift store workers value.

#### **4.3.4 Pricing and Display for Resale**

After electronic items are sorted and tested, the ones that are still usable are set through for resale in the store. This stage showcases how workers decide on prices and how products are shelved in the store. These practices are key for making items attractive and accessible to customers. This section looks at how pricing and display decisions are made and how they are influenced.

**Materials:** In the pricing and display sub-practice, the main materials involved are the pricing tools, the retail infrastructure of the thrift store and software like Google Lens, Marktplaats and several price information sites. Workers use materials like price tags and colour coded stickers to mark each item with a price. There are also reference materials or pricing guidelines in some cases (for instance, lists of standard prices for certain goods, or relevant websites with recent sales to check item values). The store layout and shelves are another material component: once priced, items are placed on display in the shop. As one worker explains, his work includes “het sorteren, prijzen en in de winkel leggen” (“sorting, pricing, and then putting items out in the store”) (Worker 3). This indicates that shelf space, display cases, and sections of the store electronics section are materials that enable this practice. For electronics, this includes, power outlets or extension cords on the shop floor to showcase products to customers.

**Competences:** The competence element in pricing is largely about knowledge and judgment of value. Thrift store workers price items so that they sell within a reasonable time while simultaneously ensuring the store receives revenue for its operations. To do this efficiently this requires market awareness, knowing the demand for certain electronics and what customers are willing to pay. As an worker notes, through experience he gained insight into “wat een verkoopsnelheid heeft” (“what has a high turnover rate”) (Worker 2) and focuses his time on those items because the amount of items is otherwise too much for him to handle on his own. Another worker describes similar findings about balancing pricing for computers. He sets them “niet te duur voor hobbyisten” (“not too expensive for hobbyists”) (Worker 5) but high enough that dealers aren't tempted to buy in bulk and resell for profit. This balancing act is a competence developed over time, requiring understanding of both the second-hand market and the thrift store's social goals. Another skill is attention to detail and consistency in pricing. One employee emphasizes that pricing must be done carefully, mistakes in pricing (too high, too low, or mislabeled) can affect fairness and sales. He even mentors school students and volunteers in how to price items correctly, indicating that experienced workers pass on this competence to newcomers. After this step presentation skills are used to attract customers. Knowing how to display electronics in an appealing way (for example, grouping accessories together, ensuring items look clean) can affect their turn

over rate. For pricing and displaying items in the thrift store a mix of valuation skill, product knowledge, presentation skills are key.

**Meanings:** The practice of pricing and displaying used electronics also has to do with fairness and accessibility, things that are often part of the thrift store's mission. For most employees, pricing is also a balancing act. It's about keeping items affordable for customers who have less money to spend while at the same time preventing resellers from taking advantage of the lower prices. A employee explicitly mentions he prices computers deliberately so that hobbyists (individuals who will use the item) can afford them, but resellers (“handelaren”) find it not profitable to grab everything. This reflects a value of equity and anti-waste, the goal is to get the item to someone who will truly use it (extending its life), rather than see it potentially wasted or marked up for pure profit. Workers take pride in making good items available cheaply because it both fulfills a social need and ensures the items get used rather than discarded. Another employee, for example, personally prefers buying second-hand and strongly believes in giving things a second life, a mindset she brings into her work. Sustainability and thrift is part of the meaning of pricing items reasonably, it challenges the notion that one must buy new, by proving that used goods still have value. There is also a sense of accomplishment and purpose when priced items sell and find new homes. Workers note that seeing electronics that have been processed by themselves being sold validates the effort of testing, cleaning and fixing them. Workers find it rewarding that devices are going “voor een tweede leven” (“for a second life”) with a new owner instead of heading to the recycling facility. The pricing practice is tied to the thrift store’s broader social meaning, proceeds often support employment of people with disabilities or other social causes, and workers feel valued and motivated knowing their sales helps sustain these goals. Pricing and display for resale means making reuse viable which is valued in by the workers, bridging environmental aims (reuse, less waste) with social aims (affordability and inclusivity).

#### ***4.3.5 Repurposing and Refurbishment***

Sometimes it happens that items that arrive at the thrift store are not ready for resale but can still be saved through small repairs or by other means of reuse. This section explores how workers give a second life to these products by fixing or repurposing them. Their efforts help reduce the number of items that are thrown away and result in a more circular way of handling electronic waste.

**Materials:** Repurposing and refurbishing electronics involve a variety of materials often overlapping with those used in sorting and testing but extending further into repair. It include tools and spare parts for fixing devices, for example, screwdrivers, replacement cables, and components harvested from other electronics. In practice, bigger electronic repairs at the thrift store is limited, but there are instances of minor refurbishment. One employees role is illustrative: he works with old stuff like vintage VCRs, retro game consoles, and outdated computers. The materials he uses include the old devices that are donated (often donated in defect state) and required older parts or software to refurbish them. He mentions installing updated operating systems on older laptops and upgrading the hardware such as storage (hard drives) or memory (RAM) where needed. The workspace for refurbishment is also a material element. Unsellable materials are sent to be transformed

into new products, one worker described broken ceramics being ground and made into tiles or countertops, and wood scraps laminated into new kitchen tabletops at the Ciruclair Warenhuis. While that transformation happens outside the store, the thrift shop facilitates it by sorting and supplying those materials.

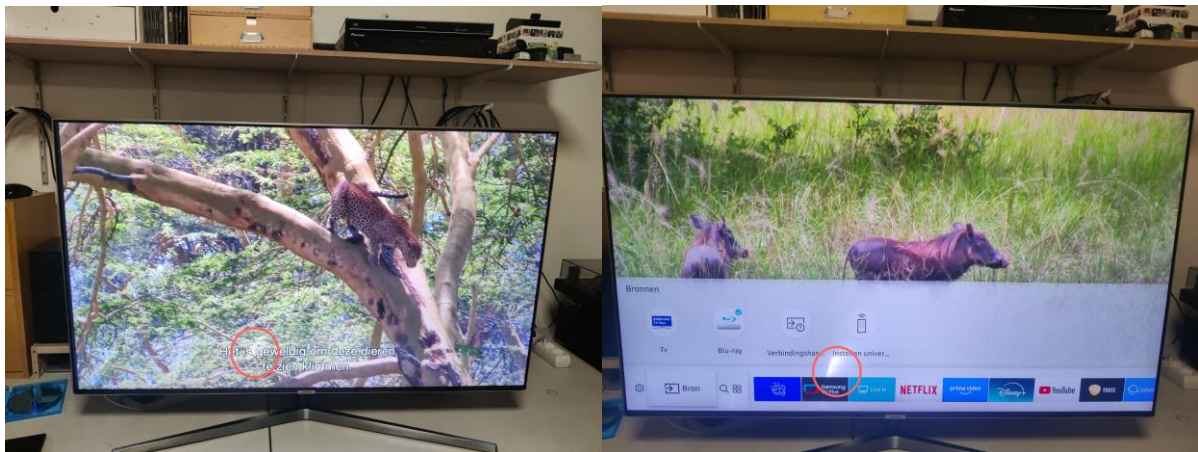
**Competences:** The competences for repurposing and refurbishment are the most specialized in thrift store practices. Workers engaging in this need technical repair skills for example, knowing how to replace a faulty component, reinstall software, or adapt an old device for modern use. The worker, who focuses on retro electronics, demonstrates competences like computer hardware knowledge and software installation, he can set up vintage PCs and laptops that others might not know how to prepare. He also has the competence to identify which items are retro and have value (understanding the retro electronics market) and which modern parts can be used in older systems. There is also a competence in regards to problemsolving and creativity. Refurbishing often requires figuring out how to make something work with limited resources. An example for this is if a donated item is missing its power adapter, in this case workers need to put time into finding a compatible adapter from the spares that they already have collected, if they don't have one they can try other solutions like rewiring other power adapters to make them compatible. Some workers have backgrounds in technical fields, one worker mentions having a technical background and experience in manufacturing cables, which help in understanding electronics, though even he admits modern devices are miniaturized and hard to fix without advanced equipment and therefore often not worth it. Here, learning on the job is crucial. Workers must stay up to date as technology continues to evolve. For example, they must understand which repairs are feasible and that older electronics can occasionally be fixed more easily than newer ones. They must also be aware of the regulations and safety precautions, such as what can and cannot be fixed due to liability concerns. Repairing and reusing electronics requires technical know-how, a basic understanding of what sells, and the capacity for lifelong learning. These are the competences that enable workers to repurpose outdated or broken electronics rather than discarding them.

**Meanings:** The meaning attached to repurposing and refurbishment is strongly aligned with the circular economy. Workers who engage in these practices often have a passion for giving objects a second life. One employee exemplifies this ethic: he resists throwing items away because "je kan het nog opnieuw gebruiken... recyclen is goed, maar het is beter om het opnieuw te gebruiken" ("You can reuse it... recycling is good, but re-use is better") (Worker 5). This belief translates into meaningful work for him, he finds it rewarding to see an old computer go to a new owner for a second life rather than the recycling. The act of reviving retro technology also carries a nostalgic or heritage meaning, preserving older technology (like VCRs or vintage computers) can feel like keeping a bit of history alive for enthusiasts and hobbyists, which adds personal satisfaction for someone like him who is interested in everything that is retro. Furthermore, successful refurbishment is a tangible demonstration of circular economy principles in action, which gives workers pride and a sense of broader impact. When a repaired item is sold, the workers see a direct result of their effort contributing to waste reduction. One anecdote highlighting the circular narrative is when the employee discovered a device (a video capture card) in the store that the thrift store had

sold years ago, now donated back in 2024 with the thrift store's price sticker from 2018 still on it. He was amused by it because this was a moment that illustrated the loop of reuse for him, it reinforced the idea that their work truly keeps items circulating. Another employee is encouraged by knowing that when they can't fix or sell an electronic item, it will be dismantled and its materials will be used in new ways after it is recycled. This ensures them that their effort in sorting it out was not in vain, it still supports the environment and creates jobs (e.g. for people with disabilities who do the disassembly).

#### **4.3.6 Observations of work practices**

During participant observation while shadowing and working alongside workers in the technical department of Het Warenhuis, several key insights emerged regarding the practical challenges of reusing and refurbishing electronic devices. One case involved the intake of a very new Samsung television. This particular model relies on a proprietary One Connect Box system which is an external connection hub that links the television to a power source and signal input via a specialized, non-interchangeable cable. These cables, often specific to the model, are difficult to replace and expensive, with retail prices between €150–€200. The television was donated with both the box and cable included. However, upon testing, a minor screen defect was detected, a subtle but visible discoloration (see Figures 10 and 11).



*Figure 10 & 11, Images of minor some defects of a television in the thrift store.*

Despite the television being largely functional, the worker deemed it unsellable due to concerns that a future customer might be dissatisfied with the defect or that the damage could worsen over time which would result in problems regarding warranty. Although the workers caution is understandable, the decision to discard the unit rather than sell it at a significantly reduced price (e.g., under €50, which would qualify for a limited two-day warranty rather than the standard two weeks) raises questions about balancing reuse potential with risk management. Ultimately, the television was placed in the defective electronics cart for recycling. However, the One Connect cable and box were kept as testing tools for similar models that could possibly be donated in the future. A second Samsung TV, which was very new but did not have a box or cable, was taken out of storage shortly after. Because the cable was model-specific, attempts to test this TV using the cable and box that were attached to it failed because they were incompatible. This case highlights how manufacturer-imposed hardware restrictions can significantly hinder the reuse and

refurbishment efforts at the local level. In this instance, the only option would involve purchasing a new cable, an investment of €150 for a television just to test it. Later during the shift, two vintage KEF Cadenza speakers were tested and cleaned. While still in the testing area, a frequent customer inquired about them and asked to listen to the speaker's sound. After a brief demonstration, he purchased them for €50. This price was decided by the worker referencing recent online sales listings from Germany, where similar models had sold for €150. The employee identified this customer as a regular reseller who visits almost daily to scout speakers for resale online. While resellers contribute to a high turnover rate, their presence might also hurt attracting more casual customers that are looking for quality items with a decent price as they get limited access to valuable items. The handling of tested but non-functional devices was the subject of another observation. These devices were temporarily kept in grey waste containers at the technician department's workspace, which is located in the store's electronics division. According to the worker, customers frequently notice these discarded items and express interest in purchasing them. However, store policy prohibits the sale of broken items, regardless of potential repairability. The rationale behind this rule is to discourage customers from waiting for discarded goods instead of purchasing the tested and priced items on the shelves. The worker said that some of the interested people are hobbyists with repair abilities who are let down by this limitation, particularly when valuable items, such as record players worth several hundred euros, are involved. The current policy shows that there is tension between ensuring responsible sales and maximizing circularity. Ideally, the store would have the capacity to repair all devices in-house, but space and staffing constraints make this unfeasible. One possible solution mentioned by staff would involve offering hobbyists the chance to repair discarded items on-site and then purchase them at a discount. This approach could extend product life cycles while still maintaining any liability boundaries.

#### **4.3.7 Sub-conclusion.**

The work practices of workers at thrift shop Het Warenhuis affect how E-waste is handled in a circular way. Their work follows a clear pathway, from intake and sorting to testing, pricing and sometimes refurbishing devices. Each step contributes to whether an item can be reused or recycled. During intake, workers assess whether an appliance seems usable or defective. The workers rely on information from the people who donate but the workers also use their own experience to make an assessment. This way of working is supported by mutual coordination and supervision of experienced workers who coach trainees and new colleagues (often from social work programmes) and make sure everyone knows what is expected of them. This process helps develop important skills such as communication and cooperation. Workers use available tools during the sorting and testing phase, to assess the appliances for a second time to make sure they work correctly. Sometimes they also make minor repairs. When an item is deemed suitable for resale, it moves on to pricing and is eventually shelved in the store. Here, workers try to strike a balance between affordability for customers and preventing large-scale buying up by dealers. They also pay attention to presentation on the shop floor, appliances are cleaned, tested, and sometimes even plugged in so customers can see that they work as intended. For appliances that require more work, some technically skilled staff try to refurbish them. This is done, for example, by replacing

parts, reinstalling software or finding creative ways to reuse parts, mainly in older computers and laptops. In all these operations, a clear circular attitude is visible among workers. They take pride in extending the lifespan of electronics and experience their work as meaningful. Practical obstacles like time pressure, staff shortages, limited space and a lack of specific tools or technical knowledge to repair specific devices are all limitations for workers. As a result, difficult choices sometimes have to be made, such as disposing of potentially repairable appliances due to safety risks or lack of guarantees. Policy choices and market dynamics also play a role. For instance, broken appliances are deliberately not sold to hobbyists so as not to undermine regular sales. Depending on the product and the worker, the price is sometimes adjusted to respond to demand, especially for products attractive to buyers. These restrictions, together with barriers from manufacturers (such as the use of proprietary parts that make repair difficult), sometimes ensure that otherwise usable electronics still end up in the recycling process. The existing structure allows for much reuse and repair, but it remains a continuous balancing act between what ideally should be and what is practically feasible with the available resources.

## 5. Discussion

This chapter is going to discuss the findings of the case study considering the theoretical framework introduced earlier. The two strands of Social Practice Theory developed by Shove (2012) and Spaargaren (2003, 2011) as well as the dimensions mentioned in the beginning are central. Building on the empirical findings presented in Chapter 4, this discussion tries to improve the understanding of how circular practices are shaped by infrastructural arrangements, competences, material conditions, and social meanings in the specific context of E-waste collection at the thrift store Het Warenhuis in Leiden. The chapter starts with reflecting on how the interaction between households and infrastructures reveals broader dynamics at the boundary between the homes and the intake street. It then explores how work practices at the thrift store question conventional distinctions between users and providers, showing how workers act not only as part of the infrastructure but also as shapers of circular engagement. After this, the chapter addresses how the spatial and material arrangement of the collection infrastructure enables or constrains circular practices, including rebound effects and fundamental barriers. These findings are used to question common assumptions in circular economy discourse, arguing for a more grounded understanding of circularity as how it is practiced in everyday life. The chapter ends by assessing the theoretical findings of the study, reflecting on the validity and limitations of the research, thinking about the effects for both policy and future research.

### 5.1 Overview and Theoretical Framing

The aim of this thesis is to understand how an alternative infrastructure for electronic waste influences both household waste disposal practices and workers' working practices, and what this means for the development of CCCs. Through interviews and observations in the thrift store, the study investigated how social practices are influenced by infrastructures and vice versa. Rather than focusing on individual behaviour or motivation, the research encompasses materials, meanings and competencies surrounding infrastructure and practice. By combining the components of SPT from Spaargaren (2003, 2011) and Shove (2012), an attempt was made to understand how circular practices arise. Spaargaren's model offers a macro perspective because it also emphasises the Dutch E-waste infrastructure. Furthermore, it also emphasises how infrastructures, institutions and social rules shape and limit practices. Shove (2012) focuses on the elements that make up practices, such as meanings, materials and competencies. By bringing these perspectives together, this study looks further than individualistic and behavioural interpretations of circularity and instead explores how practices and infrastructures shape each other. This dual lens proved essential in determining how circular practices such as disposal, separation and reusing are fixed within broader socio-material systems while still being shaped by everyday life.

#### ***5.1.1 Circular Practices and the Home-Infrastructure Boundary***

This thesis draws from emerging critiques in CE research, with in particular those outlined in Greene & Hobson's (2024) recent Special Issue. This issue argues that CE policies have too often reduced consumers to passive 'end users' of technological and market-based solutions. Current policies are insufficient in accounting how circularity is put into practice. This thesis builds on this critique by exploring how circular transformations are enacted at the border of

everyday routines and infrastructural systems, rather than within the boundaries of consumer households alone. By investigating the thrift store visitors and workers at Het Warenhuis, this thesis engages with the core question of Greene and Hobson (2025): What happens when the CE “comes home”?

Unlike some ethnographic approaches that enter the household to observe practices from within (Åberg & Greene, 2025), my research looks at these practices from their endpoint which for disposal is the thrift store intake. I do not follow participants into their homes; instead, I meet them at the moment they are finalising their disposal practices. This approach necessarily limits the analysis to retrospective accounts, asking participants to backtrack through their motivations, habits, and decisions. While this may mean that certain contextual details are missing, it did enable me to have a unique moment for observation namely, where household disposal practices meet institutional collection systems. The thrift store intake street functions as a boundary space between the private domain of the households and the public infrastructure of waste management. Thereby, bridging the roles of the consumer and the system of provision. To enhance the understanding of these intersections, I encourage other researchers working with SPT to also examine how everyday practices unfold not only within the household but also at the point where households interact with infrastructure.

### ***5.1.2 Re-politicizing Practice***

This thesis also addresses some of the ongoing critiques centred around practice-based research that it often overlooks politics and power. As Yates (2022) notes, practice theory tends to foreground routines and material arrangements while not addressing the influences that politics have in the matter of structure. An attempt is made to respond to this critique by showing how everyday circular practices, such as electronic waste disposal, are not just personal choices. It is embedded in and constrained by broader socio-material and political systems. Focusing the research on the thrift store as a site where both individual agency and infrastructural design intersect has indicated that circular actions are shaped by broader decisions about access, spatial design, responsibility and visibility. This reveals how actors both navigate and challenge the structures around them, whether by expressing discomfort with buying second-hand after disposing, or by enacting sorting practices that reflect values of care, cleanliness, or guilt. Furthermore, by analysing the Dutch E-waste infrastructure in this study, it also sheds some light on the political dimensions in how E-waste is handled on a larger scale with for example its repair and waste regulations.

### ***5.1.3 Systems of Practice and Provision***

The Leiden case reveals how the shift from a centralized infrastructure (municipal recycling centre) to a decentralized model (thrift store Het Warenhuis) reshapes the systems of practice and provision. By integrating E-waste collection into the thrift store, the municipality created a new system that helped to increase more direct and frequent interactions with circularity by households, this was indicated by the volume of E-waste the thrift store now had to process. This reconfiguration, however, also introduced new constraints. As the results showed, Het Warenhuis lacked the capacity to sort all the collected items in an effective

manner. This consequently resulted in many potentially reusable devices being disposed as waste to be recycled.

At the moment, the thrift store lacks the capacity to offer on-site repair services to visitors. In Leiden these services are only offered by professionals with repair shops and volunteers operating through community initiatives like Repair Café Leiden (2025). This situation mirrors Lane et al.'s (2025) concept of the “double imperative” in repair and maintenance, making the push for accessible professional repair services for those who can afford it, alongside support for self-repair and community-based alternatives for others. Although Leiden’s decentralized model brings certain circular infrastructure elements closer to the community, it still lacks the resources (funding, skilled personnel, and tools) to fully realize the inclusive ideal of a CCC within the thrift store’s context. The argument could be made that the thrift store and the repair cafés together form a decentralized CCC in Leiden. In practice, however, the repair cafés operate at a minimal scale when compared to the Het Warenhuis. The repair café is active at four locations through Leiden, often located in community centres, but they are open for a combined total of just 10 hours per month (Repair Café Leiden, 2025).

Because of this their capacity falls short of the volume of electronics processed by the thrift store. The main function for these repair cafés is also primarily to serve an educational purpose, teaching basic repair skills to citizens, rather than functioning as a big actor for circular E-waste. Thrift store workers who are often seen as part of the SoP acted as active practitioners themselves. Their competences, autonomy to make decisions, and unspoken knowledge shaped which devices were considered reusable, reinforcing Spaargaren’s (2011) model where agents and systems co-produce practice.

#### ***5.1.4 Materialities and the Rebound Effect***

The findings further demonstrate that material aspects, such as the physical state of donated electronics and the logistics of the collection containers that come from the surrounding municipalities there municipal recycling centres, play a central role in enabling or obstructing reuse. The frequent damage to E-appliances during container transport, as observed at the municipal recycling centres, exemplifies how infrastructures can unintentionally undermine circular goals. As Greene et al. (2025) notes, unless materialities are managed carefully, circular initiatives can produce rebound effects or inefficiencies. Another of these rebound effects comes to the surface because of the limited processing capacity of the thrift store. Many donated E-appliances that come in via the other municipal recycling centres never assessed if they are reuseable due to constraints in capacity. This doesn’t only lead to unnecessary recycling, but it also creates a false sense of circularity to whoever donated their devices with the intention to it being sold at the thrift store as in reality, they are not. Had donors known their items would bypass reuse entirely, they might have opted for more effective circular alternatives, such as gifting directly to others. What donors’ intent to do with the act of disposing their E-appliances at the Thrift store doesn’t align with the actual infrastructural realities. The thrift store reveals the weakness in the CCCs reuse system when capacity is not on par with the input of E-waste. These problems risk undermining public trust in circular infrastructures. E-appliances suitable for reuse are only selected if they are of high quality or easily repairable, this reinforces hidden bottlenecks within the CE framework. As Greene et al. (2025) warn, efforts to promote circularity without deeper intervention in

how products are designed, marketed and disposed of may only shift material consumption rather than reduce it.

#### ***5.1.5 Spatialities and Everyday Access***

Spatiality emerged as a relevant theme that influences circular engagement. The accessibility and low-threshold nature of Het Warenhuis which is open six days a week without the need of appointments is very different from the more bureaucratically managed municipal recycling centre where people are required to make an appointment. This openness from the thrift store contributed to the increased E-waste, affirming Tölg and Fuentes' (2025) finding that spatial conditions deeply shape participation in circular systems. On the other side, spatial arrangements within the store itself imposed limits. Workers reported that storage and testing areas were limited which is leading to simplified sorting and potential misclassification or disposing of devices that could have gone for another round in the cycle. This is in line with what Åberg and Greene (2025) write about spatial infrastructures not only needing to be present, but also usable and scalable in order to support effective circular practices.

Many visitors showed and mentioned a tendency to mentally and emotionally separate disposal from consumption. While CE models often imagine reuse and disposal as sequential and interconnected, the visitors in this study described disposal as the endpoint of a clean-up process, something that they wanted to complete before even considering consuming again. Many explicitly avoided walking into the store after dropping off their goods, fearing they might undo their efforts by taking home new "junk." Interestingly, this reluctance to engage with reuse in the moment of disposal does not stem from a rejection of second-hand goods. Most visitors reported buying from the thrift store on other occasions. Instead, their behaviour suggests that the sequencing of consumption and disposal in everyday life is more complex and less about being intentional circular than CE frameworks often assume.

#### ***5.1.6 Synthesis and Theory Implications***

Studying the moment where households and infrastructures meet each other helped to better understand how routines, values, and infrastructures align, or fail to. As an example, many visitors expressed a strong sense of closure after dropping off their E-waste, describing the act of disposal as the final step in a longer decluttering process. They often refrained from consuming new products from the thrift store immediately after disposal, explaining that acquiring new items would undermine their main goal of cleaning up their house. This shows an emotional gap between throwing away and buying products, which in turn hinders the circular opportunities that thrift stores offer to citizens by collecting and reselling items in the same place. Interestingly, this reluctance does not appear to stem from a rejection of second-hand goods as many participants confirmed that they frequently shop at the thrift store, but from the sequencing and framing of the disposal practice itself. In several cases, visitors noted that they typically purchase something new first, and only afterwards begin thinking about where to dispose of the old item. This behaviour is consistent with the emphasis visitors put on the accessibility and low threshold of the thrift store. They usually drop by unexpectedly and decide on the day itself that they want to go to the intake street to dispose of their belongings. They are looking for a quick and environmentally friendly way to

get rid of unwanted items. This separation of disposal and acquisition highlights how spatial and emotional boundaries are deeply embedded in circular behaviour and why CE infrastructures that physically separate collection and resale may miss opportunities for deeper engagement from the visitors. These takeaways highlight how socio-material dynamics influences participation in circular systems and help explain why infrastructural interventions alone may fall short. Although CE strategies increasingly rely on market mechanisms and consumer acceptance, my findings reinforce that circular participation is not just about having the right services in place. It is also about how those services are integrated into daily life, values, and perceptions of cleaning, consuming, and letting go of items. By observing these dynamics at the threshold where the household meets the system of provision, this thesis answers the provocation of Greene and Hobson (2025): what happens when the circular economy “comes home”? The answer, at least in the context of this thesis, is that circular infrastructures in the form of a CCC can only succeed if they engage with visitors (households) not only after disposal but also already before that step by convincing them to consume via the thrift.

## **5.2 Validity**

The data collected for this research has resulted in a comprehensive overview of the different practices in which visitors and workers partake. The (infra)structure of the thrift store Het Warenhuis has been analysed in detail and has been used as case study. Together they contribute to answering the main research question: How does the domestic E-appliance collection infrastructure of the thrift store in Leiden shape the disposal practices and work practices and what implications does this have for the further development of CCCs? When it comes to the generalizability of the findings, in terms of internal validity, the interview results align with what was observed during fieldwork. Still, it should be mentioned that the number of interviews (especially with workers) is limited. Het Warenhuis has around 150 employees, while only six of them were interviewed for this research. That being said, the three full days of observations, shadowing, and informal conversations helped to build a much fuller picture of how things actually work within the thrift store. These observations also helped in shaping the interviews themselves, allowing the right questions to be asked to the right people. The same can be said for the data gathered from visitors: even though there were only 10 formal interviews, the consistency between what was observed and what was said suggests the data is valid. Speaking of the external validity, the case study of Leiden is quite unique in the way it has shifted responsibility for E-appliance collection from the municipal recycling centre to the thrift store. Not all of the results are relevant for every municipality as not every municipality is at the same stage in terms of their transition towards a circular economy. Municipalities that are still considering a shift from a more traditional municipal recycling centre to a circular model like a CCC, can make use of the findings derived from the Leiden case.

## **5.3 Results**

### ***5.3.1 Current disposal infrastructure***

The results regarding the infrastructure were largely as expected. The E-waste collection and processing system in the Netherlands is complex and involves many different stakeholders

operating at various levels. There is an abundance of documents and reports that describe the sector, and the ones analysed for this sub-question provide a solid understanding of the current situation. The push for a more circular E-waste sector mainly comes from the national government, with municipalities responding by attempting to transform traditional municipal recycling centres into Circular Craft Centres (CCCs). Municipalities that are further along have already tried setting up their own CCCs with varying outcomes, but they all seem to share a similar starting point and goal, the roadmap to the goal is often different. The case of Leiden, which is described in detail, illustrates that they face the same issue as other municipalities: the repair of E-waste is still tightly regulated. However, one unexpected result was the recent publication of new guidelines by ministries and environmental agencies, which show that repair is no longer strictly prohibited and that there are real opportunities emerging in this area. Another surprising finding was that the volume of E-waste is simply too much for Het Warenhuis to manage. The amount of E-waste collected from the containers from nearby municipalities like Oegstgeest, Leiderdorp, and Zoeterwoude is too large, and the quality of the E-waste is often too poor to be effectively reused. Despite being a relatively large operation, the thrift store still lacks the manpower needed to properly process all the incoming E-waste. This highlights just how labour-intensive reuse and repair is especially considering that the future need for trained repair workers hasn't even been factored in yet. With the already current shortages of technical personnel in the Netherlands this could point towards a potential bottleneck in the transition to a more circular E-waste system.

Shove and Trentmann (2018) ideas that infrastructures do not simply serve existing practices but actively shape them align with the findings of the Dutch disposal infrastructure. In regard to E-waste, the Dutch infrastructure, despite being well-developed, is built around recycling rather than reuse or repair. This limits more circular practices that can realistically emerge. The fact that CCCs are often added on top of existing infrastructures rather than replacing or fundamentally reshaping them supports this idea of infrastructural path dependency. However, this isn't true across the board. Some municipalities are actively working to change their waste infrastructure from the ground up, but such changes require significant financial investment and time, these are resources not all municipalities have readily available. Leiden stands out as a municipality that managed to shift part of its infrastructure and responsibilities by transferring E-waste collection from the municipal recycling centre to the thrift store. This shift is not just a relocation of collection infrastructure; it also entails a redistribution of roles and symbolic meanings. The thrift store, a site traditionally associated with donation and resale, is now often recognized by the public as part of the municipal waste system. This shift changes how citizens interact with E-waste disposal because donating electronics to a socially embedded institution differs in meaning and experience from dropping them at a municipal recycling centre. It also reshapes work practices within the thrift store, requiring staff to manage larger volumes, assess usability, and engage more in practices aligned with circular economy goals.

This shift supports more circular outcomes but also raises a question: is it more effective to relocate this responsibility to thrift stores or to integrate municipal recycling centres and thrift operations into a single CCC site? The main difference between these models lies in

their infrastructure. A decentralized model, like the one in Leiden, embeds circular practices into already existing but spatially separate infrastructures, such as the thrift store or repair cafes, which takes on the additional function like municipal E-waste intake and the reparation of devices. This model relies on a distributed network of actors and locations; often repurposing buildings and logistics chains originally designed for different purposes. The result is a more flexible but also fragmented infrastructure, where reuse, recycling, and repair occur across separate sites and organizations. The opposite of this is the centralized CCC model, such as Rotterdam's "De HER" (MilieuPark+, n.d.), which aims to bring these functions into one integrated site, where residents can drop off waste, buy refurbished goods or have them repaired, and learn about circularity in a single visit. These centres are often built with purpose to accommodate sorting, repair workshops, recycling streams, and retail functions under the same roof. As a results, they offer greater logistical efficiency and visibility, but require substantial spatial and financial investment. This makes them less feasible in dense populated, high-cost urban areas, where space is at a premium.

Recent developments suggest that Leiden is moving toward a hybrid form. The municipality is planning a second municipal recycling centre in the form of a "duurzaamheidsplein" (De Waard, 2024), a location seemingly intended to bring multiple circular functions together. This points to a recognition that the current decentralized setup is not sufficient to meet future circularity ambitions. At the same time, fully centralized models remain difficult to implement in spatially constrained cities. That is why municipalities throughout the Netherlands are experimenting with different infrastructural arrangements in an attempt to adapt inherited systems toward circular goals without entirely dismantling them.

This experimentation has led to promising but diverse results, producing a patchwork of localized models with differing levels of integration, efficiency, and public engagement. For instance, while Rotterdam has developed a centralized CCC, Leiden has built circular functions into its existing reuse infrastructure. These differences make it difficult to evaluate CCC effectiveness at the national level. Moreover, as Williams (2022) argues, the transition to circular cities is often constrained by inherited infrastructures and urban forms that were not designed with circularity in mind. Williams (2022) further argues that municipalities must modify these inherited infrastructures by retrofitting, multi-actor collaboration, and spatial innovation rather than beginning from scratch. This further reinforces the need for flexible interpretations of circular economy principles and national support for diverse implementation strategies.

### ***5.3.2 Disposal practices visitors***

The results were largely in line with expectations but also revealed some surprising insights. As expected, visitors had a variety of reasons for bringing their E-devices to Het Warenhuis, such as cleaning up their house, moving house or supporting the idea of reuse. In addition, what became clear is that the accessibility and approachability of Het Warenhuis plays an important role in people's routines. Convenience, especially the fact that no appointment is needed to drop things off, often proved decisive. An unexpected finding was that some visitors still experienced a lack of clarity about the role of the municipal recycling centre. Some mistakenly thought they could still hand in (broken) electronics there, while this

responsibility has now been transferred to the thrift store in Leiden. Another striking outcome was that most visitors did not bother to also visit the shop itself after dropping off their stuff. Their reasoning mainly seemed to be that they came with a specific purpose, to clear out stuff they no longer needed. For many, it then felt contradictory to enter the shop immediately afterwards and possibly take new items home again.

In relation to the theoretical framework, the Social Practice Theory (Shove et al., 2012) provides valuable guidance for considering these routines of visitors not as separate, individual decisions, but as practices composed of the elements of material, meaning and competence. Many visitors were found to have practical skills, such as being able to assess whether old electronics are still usable. But these competences do not arise naturally; they are shaped in part by the infrastructure. For instance, the low threshold of the intake street, which is a drive through, combined with the helpfulness and gratefulness of the workers, makes visitors feel that their contribution is valuable. This not only enables but also encourages and normalises the donation of E-waste.

This contrasts with individually focused models such as the Theory of Planned Behaviour (TPB), in which behaviour is mainly explained from intentions. However, the findings show that even people with the right intentions sometimes fail to achieve sustainable behaviour for example, because of confusion about where they should be, lack of trust in what happens to their belongings, or because of an infrastructure that does not clearly communicate its function. This supports the core of Social Practice Theory, behaviour takes place within socio-material contexts and is not just the result of rational, planned choices.

The results show that infrastructure provides both opportunities and constraints for waste practices. Visitors who did not know quite what Het Warenhuis accepts, or who did not realise that the municipal recycling centre no longer takes E-waste, could dispose of their items incorrectly. Such situations make it clear that behaviour in these practices is determined not only by willingness or awareness, but also by the way infrastructures are communicated, perceived and trusted. Here, the thrift store acts as an infrastructure node that not only provides a logistical solution but also lends social legitimacy to certain forms of disposal. The results underline that fostering circular behaviour is not just about informing individuals, but above all about designing infrastructures that integrate physical, informational and social elements in such a way that sustainable practices become more intuitive, accessible and attractive.

### **5.3.3 Work practices workers**

The results for the work practices of the thrift store workers had some unexpected insights. One of them is that many work practices are of experience-based nature. Workers often rely on intuition from experience to decide whether an item is either worth testing, repairing, or sending for recycling. Another insight is the workload imbalance. Het Warenhuis is quite large for a thrift store but even their workers are overwhelmed by the volume of incoming E-appliances, especially those delivered in containers which come from the municipal recycling centres from surrounding municipalities. There aren't enough workers, and time is limited when going through every item by hand. This highlights that circular systems don't only have

just technical or logistical challenges but also labour-intensive processes that depend on human capacity which can be easily overlooked in policy design.

The results closely align with the principles of Social Practice Theory (SPT). The work practices observed among employees such as intake, sorting, testing, and pricing are not just individual tasks, but clearly structured work practices made up of materials, competences, and meanings. These work practices are depended on experience, rather than standardized work protocols. This means that the practices align with the SPT view where practices are dynamic and shaped by context, rather than being static routines. The infrastructure of Het Warenhuis is important here, not just as a physical setting, but as a social environment that forms what workers can and cannot do. An example for this is that limited staffing and space restrictions influence how thoroughly appliances can be tested or refurbished. This underlines how material limitations affect competences and the practice in general, reinforcing the mutual dependency between infrastructure and behaviour highlighted by Shove et al. (2012).

The research shows that workers at the thrift store play a role in allowing circular practices to take place. Their competences, choices, and routines directly influence what gets reused, repaired, or discarded. These practices are formed not just by individual skill but by the infrastructure and working conditions in which they operate. The findings demonstrate that successful circular systems require investment in human infrastructure as well as physical facilities or legal frameworks. Without sufficient staffing, training, and support, even well-intentioned systems like CCCs will struggle to operate effectively.

#### **5.4 Limitations**

This study gives insights into the infrastructure and practices of E-waste collection at Het Warenhuis. There are however several limitations that should be discussed here as they may affect the reliability and scope of the findings. One limitation is about the standing of the researcher as a temporary worker and observer of the case study. This dual role allowed for close access to everyday operations in Het Warenhuis and also helped with gathering questions to include in the interview guidelines that were used to question the workers. This may have influenced how workers behaved or responded. The possibility that workers adjusted their actions or answers due to being observed may have caused some degree of bias into the findings. For the visitors there was a returning issue with the confusion about the role of Het Warenhuis in E-waste collection. Even though the shift in responsibility from the municipal recycling centre to the thrift store has happened a while ago and thus visitors should have had the time to adapt, some visitors still assumed they were participating in a municipal collection process. This misunderstanding may have affected how they viewed their actions and thus how they responded during interviews. It showcases that clear communication from the municipality influences public understanding. Another approach that could have strengthened the findings would have been to compare two interview groups, one where the function of Het Warenhuis within the E-waste system was clearly explained beforehand to the visitors, and one where it wasn't. This could have offered clearer insights into the competence element of SPT, and while also helping to distinguish

whether gaps in knowledge originated from the lack of individual awareness or from broader communication issues by the municipality.

Another important limitation of this research is because of sampling bias. By locating data collection only at the thrift store Het Warenhuis, the study inherently focuses on households who already participate in E-waste disposal through the correct infrastructure. As a result, the research does not capture the perspectives of households that do not engage with the thrift store as a disposal site. These non-participating households may represent a big share of the population and could hold different values, levels of awareness, or practical challenges regarding E-waste handling. The findings in this study may overrepresent more engaged or environmentally motivated individuals, thereby limiting the generalizability of the results. Understanding why certain groups choose not to use the thrift store could provide essential for developing more inclusive and effective circular infrastructure.

## **5.5 Implications**

With this study some implications for the development of circular E-waste infrastructure and practices around E-waste collection, for local initiatives like Circular Craft Centres (CACs) became clear. One implication is that local solutions like Het Warenhuis have the potential to support circular outcomes. This potential, however, is not being fully utilised. Limited capacity in terms of space and available personnel, combined with legal limitations around repair, means that the system is operating below what it could theoretically achieve. If the conditions remain unchanged, the transition to a more circular E-waste system risks stagnation, more likely so in urban areas where volumes are high. If continuing with a business-as-usual approach this will result in growing inefficiencies in the reuse and repair chain, an increasing backlog of unprocessed E-appliances, and continued dependence on recycling rather than higher value circular strategies like reuse and refurbishment. This could undermine national and EU-level circularity targets and lead to further resource depletion and unnecessary emissions. If the shortage of skilled repair workers is not addressed, then the ability to scale up or sustain circular systems will remain limited.

From a theoretical perspective, these implications align with earlier studies discussed in the framework. As Shove and Trentmann (2018) emphasise, infrastructure and practice are mutually reinforcing. Without adapting infrastructure to enable new practices, sustainable behaviour will struggle to emerge and remain. Practices such as repair, intake, and sorting are still largely shaped and sometimes constrained by inherited infrastructure. As Katan and Gram-Hanssen (2021) also argue, even when there is motivation and intention to act sustainably, individuals and organisations often face structural barriers that prevent circular practices from becoming the norm. The gap between what people intend to do and what they actually do reflects familiar criticisms of behavioural models such as the Theory of Planned Behaviour and other ABC models. Both visitors and employees expressed strong values and motivations consistent with circular principles, but their ability to actually act on them was often found to be limited by infrastructural and institutional constraints. This highlights the relevance of Social Practice Theory, which looks beyond individual attitudes and shows how everyday behaviour is shaped and constrained by the systems and environments in which it takes place. If municipalities really want to work toward a circular

transition in E-waste, promoting reuse alone is not enough. They must also redesign the infrastructure and support systems that make such practices possible. While the case of Leiden shows that small, local innovations can have real impact, it still needs wider structural change because otherwise they risk becoming just an experiment rather than a scalable solution. The smaller municipalities that don't have the financial means to immediately overhaul their E-waste infrastructure, the model currently used in Leiden offers as a useful blueprint. It allows for gradual development toward a full CCC through a more manageable, step-by-step roadmap. The model offers a scalable path for municipalities that don't have the budget for realising new infrastructure. They can start by enhancing existing infrastructures like partnering with thrift stores and gradually build capacity and move toward a full-fledged centralized CCC model when budgets allow.

## **5.6 Follow-up research**

Although several studies have already advocated a shift towards more circular product design with an emphasis on sustainability, reparability and ease of maintenance (Greene et al., 2025; Lane et al., 2025; Schröder et al., 2019), the European Union has taken concrete steps in the right direction by launching regulatory initiatives aimed at supporting the right to repair while improving product standards. This thesis contributes to that discourse by offering understandings into how infrastructures shape and are shaped by the everyday practices of circular consumption. Based on the work of Greene and Hobson (2025), it examines the socio-material dynamics of disposal and reuse at the point where household routines and institutional collection systems intersect. By highlighting practical and systemic barriers to participation, this study emphasizes the need to adapt CCCs to better align everyday consumption. With these insights, I aim to encourage future academics and policy makers that take seriously the everyday realities of circularity and support CCCs in becoming more inclusive, effective, and future proof. There are, however, still several important questions that remain open to further exploration. A central limitation of this study comes forth through the sampling bias as it excludes households that currently don't engage with the thrift stores infrastructure. As a result, future research should consider sampling strategies that include household-level interviews with people in their homes. This is to include underrepresented voices and better understanding barriers that withhold people to participating in circular systems.

During this study it was clear that even a relatively large organisation like the thrift store struggles to process the amount of E-waste collected. Future research could focus on the limits of processing capacity within CCCs and how these organisations can be better supported in performing circular tasks. Another bottleneck that emerged is the shortage of technical workers with repair skills. There is still little insight into how much labour is needed for CCCs to operate on a larger scale. Further research can provide insight into this, including what this means for training, recruitment and policy interventions. Another interesting study would be one to focus on what sort of E-waste is easy to repair and how these repair skills can be taught to empower households.

## 6. Conclusion

This thesis set out to explore how the integration of municipal E-waste collection into the operations of a local thrift store in Leiden shapes both household disposal practices and work practices of staff and what this means for Circular Craft Centres (CCCs). The rationale for this study arises from the European Union's objective to mandate member states to collect at least 65% of the total weight of newly sold electronic equipment (WEEE Netherlands, 2024). Despite this obligation, the Netherlands is struggling to meet this target and has only achieved a collection rate of 43% in 2023 (WEEE Netherlands, 2024). This gap presents a difficulty for policymakers, waste managers and urban planners: How can municipalities improve E-waste collection rates, particularly in densely populated urban environments where the construction of new infrastructure is limited by financial and spatial constraints?

The research problem addressed in this thesis concerns the gap between the ambitions in the field of the circular economy (CE) and the reality in which current infrastructures exist. Even though national policy in the Netherlands (Rijkswaterstaat, 2020) advocates for the development of CCCs, many cities find it difficult to set up such centres due to the high cost of land, limited availability of suitable urban spaces and legalities surrounding those spaces. It is therefore essential to explore decentralised models of the CCC that make use of existing infrastructures, such as thrift stores. The municipality of Leiden is an interesting practical example in this regard, as they have transferred responsibility for the collection of E-waste from the traditional municipal recycling centre to the local thrift store Het Warenhuis.

The central research question posed is: *How does the domestic E-appliance collection infrastructure of the thrift store in Leiden shape the disposal practices and work practices, and what implications does this have for the further development of CCCs?*

This question combines the two main focuses of the study, namely household waste disposal practices (how residents dispose of their E-waste) and working practices (how thrift store employees handle the processing of E-waste), all under the umbrella of an alternative collection infrastructure. The research is based on Social Practice Theory (SPT), which recognises that people's environmental behaviour (such as recycling electronics) is not only a matter of individual choice but is also influenced by the systems and infrastructures in which they live. Through examining the case in Leiden, the research aimed to gain insights that could contribute to the development of circular infrastructure in other urban areas, particularly where setting up a fully-fledged CCC is challenging.

To answer the main research question, three sub-questions were investigated:

1. What is the current disposal infrastructure of E-appliances within the Netherlands regarding Circular Craft Centres?

The study revealed that the existing infrastructure for managing E-waste in the Netherlands is solid in terms of collecting and recycling, but not great at making reuse and repair happen. The Dutch infrastructure for the collection of E-waste is currently operated through an extended producer responsibility system, which is coordinated at the national level by the OPEN foundation. While consumer electronics are widely collected through municipal

recycling centres and retail take-back schemes, it's predominantly linear and focused on recycling rather than reuse. The concept of CCCs was developed to address this limitation, promoting integrated hubs that combine waste collection with repair services and the sale of second-hand items. Pilot projects in Oss and Meierijstad have demonstrated that CCCs have the ability to substantially increase reuse rates. However, CCCs are not yet widespread due to regulatory constraints, especially around the legality of reusing parts from discarded electronics, and infrastructural limitations in densely populated areas. Legal developments, such as recent leniency on Type-0 processing, have begun to address these issues, but many municipalities still lack the resources or political will to invest in fully integrated CCCs. The case of Leiden also revealed limitations. The thrift store faces capacity constraints which are caused by limited available space, which in turn limits the expansion and hiring of extra staff. This means there is a finite processing ability for the current thrift store, which at times results in even reusable or repairable goods being diverted to recycling simply because their volume is too great and their turnover rate too slow. The Netherlands' current infrastructure is effective in collecting and recycling E-waste but falls short on the higher "R-ladder" steps of reuse and refurbishing. CCC initiatives are striving to fill this gap, and decentralized approaches like Leiden's show one adaptable path, though they require careful support (in staffing, space, and policy) to fully realize their circular potential.

## 2. What are the disposal practices regarding E-appliances among visitors of the thrift store in Leiden?

Many people accumulate unused or broken electronics at home. They often store them in attics and garages until a convenient opportunity comes along to clear them out for disposal. Common triggers for a disposal trip include having enough items to make the trip worth it, making space during a move or when cleaning the house, while replacing old devices with new ones is also a frequently mentioned trigger. When they do decide to dispose of electronics, most visitors use personal cars to transport the items to Het Warenhuis, sometimes combining the trip with other errands. The thrift store's accessibility is often mentioned because there is no need for an appointment as well as the central location and the drive-through intake which together encourages proper disposal and lowers the barrier for participation. Interview data revealed that residents often check whether their devices work before disposal and if they do they prefer donating items to a reuse-oriented organization rather than sending them to landfill or generic recycling. Nevertheless, the study also found gaps in awareness as not everyone realizes that the thrift store accepts all types of E-waste. A few visitors were unaware that even broken electronics or certain other categories of electrical appliances could be taken to Het Warenhuis, suggesting ongoing communication is needed to inform the public about the expanded role of the thrift store in E-waste handling. Interestingly, the research observed that most donors do not combine donation and disposal with shopping during the same visit at the thrift store. People arriving with E-waste typically depart after finishing with their disposal practice, rather than entering the thrift shop to browse for new purchases. This suggests that in the visitors' perception, disposal and consuming are separate missions. When visitors come to offload their electronic belongings, they are not in the mindset to take new items home. From the thrift store's

perspective, this represents a missed opportunity to engage donors as customers (a point picked up later in the recommendations).

### 3. What are the work practices regarding E-appliances among the workforce of the thrift store in Leiden?

The work practices of the thrift store workers of Het Warenhuis are structured around the process of intake, sorting, testing, pricing, displaying for resale and in rare occasions refurbishing or repurposing. Workers are experienced through their work to quickly assess the condition of incoming items and make decisions about their viability for reuse. While some minor repairs are done at the thrift store, the capacity to repair is limited. Space constraints, shortages of repair savvy staff, the lack of repairing tools and legal issues around repairing E-waste makes it that many repairable items are still sent for recycling without a chance on a second life. Nonetheless, workers show a commitment to circular ideals. Their work is influenced not only by the physical limitations of the thrift store but also by safety regulations and product liability concerns, which sometimes makes it necessary for the thrift stores management to make conservative decisions regarding what can be resold. From a social perspective the thrift store serves by employing individuals from diverse backgrounds, some of whom face barriers to re-/entering the regular job market. The thrift store's workforce integrates circular practices wherever feasible and has achieved considerable reuse of E-waste through their intake, testing, and refurbishment efforts. Their work has given a second life to many devices that would otherwise have been recycled. The case also illustrates the difficulty between circularity and practical constraints. For example, the current system allows for significant reuse, but it remains a constant balancing act between what should ideally happen (reuse everything and waste nothing) and what is possible with the available resources. This finding underscores that even highly motivated actors need enabling conditions (time, skills, tools and policy support) to maximise circular outcomes.

As for the main research question:

*How does the domestic E-appliance collection infrastructure of the thrift store in Leiden shape the disposal practices and work practices, and what implications does this have for the further development of CCCs?*

Stepping back, the broader implications of this research extend to urban sustainability, CE implementation, and policymaking. Firstly, the Leiden case demonstrates using existing infrastructures to collect and repurpose E-waste is a pragmatic solution to overcome space constraints while still engaging citizens in circular practices. This CCC model can lead to higher reuse rates, thereby reducing the volume of waste sent to recycling. When scaled up, such approaches could help cities progress toward resource efficiency goals. The results also identify that without systemic support; these local solutions have limits. The Leiden thrift store is not being fully utilized due to capacity and regulatory limitations. For instance, the lack of sufficient repair savvy personnel and repair space means that valuable items and materials still end up into the recycling waste stream. When these limitations persist, there is a risk of stagnation in the transition to a more circular E-waste system. In practical terms, a business-as-usual trajectory will not be enough to achieve the European Union's goal of

collecting at least 65% of the total weight of newly sold electronic equipment. In contrast, the study suggests that with the right support, CCC models like the city of Leiden can be utilized as a stepping stone towards a fully optimized centralised CCC can be realised. This thesis points to a need for policymakers to actively bridge the gap between ambition and practice. Municipalities and national agencies must recognize that promoting reuse is not enough, the infrastructure and support systems must be redesigned to make circular practices viable at scale.

The empirical insights in this study show that visitors and workers want to act sustainable but their ability to do so is often limited by the systems in place. In line with SPT, practices and infrastructures shape each other thus, effective changes will come from adjusting those systems and should focus on making the circular option the most convenient and obvious path. This perspective suggests that effective circular policies must address not only infrastructure and regulation but also the everyday consumption in which people engage with E-waste.

The decentralized CCC model of Leiden can serve as a blueprint for other municipalities or densely populated areas that have limited financial budget to otherwise pursue a centralized CCC approach. The model offers a scalable path: start by enhancing existing infrastructures like partnering with thrift stores and gradually build capacity and move toward a full-fledged centralized CCC model when budgets allow. This approach is more attainable for municipalities than large capital projects (e.g. De HER in Rotterdam). In terms of the circular economy implementation at large, the results reinforce emerging views that achieving circularity is as much a social-material challenge as it is a technical or economic one. The study further highlights a missed opportunity in connecting disposal and acquisition practices. If visitors that donated E-waste were encouraged to also become consumers through incentives such as better store design, or targeted marketing than the loop could be further closed, enhancing the economic viability and social reach of thrift-based CCC models.

This thesis has illustrated the opportunities and challenges of rethinking E-waste management through a CE lens. The decentralized approach in Leiden shows that progress toward circularity can be made even in the absence of an ideal E-waste collection infrastructure. The thesis also signals that strategic enhancements should be made to reach the European Union's goal of 65% E-waste collection. Finally, drawing from the research insights, several recommendations are proposed to strengthen circular E-waste handling for the thrift store Het Warenhuis and any other municipalities that decide to copy their model:

- Increase repair and refurbishment capacity: Put a stronger emphasis on repairing E-waste within CCCs and affiliated thrift stores. This involves training existing staff or hiring new employees with skill in repairing electronics. This should be done by allocating dedicated space and time for repair work. Not every device can be repaired and reused, but prioritizing the low-hanging fruit will extend product lifespans and should become a core focus of CCCs. Strengthening repair capacity will help address the current shortage of technical experts and prevent otherwise reusable gadgets from being discarded due to minor faults.

- Improve marketing to highlight price-quality ratio: Many dealers advertise their refurbished electronics through social media (Facebook, Instagram, TikTok), where they capitalise on trends and connect directly with buyers. A common misconception is that thrift items are of lower quality. Actively communicating that many products have been professionally repaired, tested can win the trust of new target groups. It can also be beneficial to compare directly with commercial alternatives: show, for example, that a refurbished €150 laptop is comparable to a new €400 model. This kind of transparent comparison can help consumers justify their purchase choice, especially at a time when sustainability is becoming increasingly important.
- Emphasise social and environmental impact in communication: Making buyers aware of the impact of their purchase can help convince them. Think of visualising the CO<sub>2</sub> savings (e.g. 'This purchase saves as much CO<sub>2</sub> as a flight Amsterdam-Barcelona') or explaining the social added value ('With your purchase, you will support jobs for people with a distance to the labour market'). Making these elements visible can reinforce distinctiveness.
- Encourage donors to become customers: The research shows that many visitors who donate items do not go into the shop afterwards. This is often due to their mindset: they come with the aim of getting rid of stuff and therefore find it contradictory to take home something new immediately afterwards. This is a missed opportunity, both commercially and in reinforcing circular practices. A possible solution is to offer a discount voucher or small incentive on the same day of the donation. This lowers the threshold to look around and can encourage shop visits after donation. It could transform one-way donations into two-way exchanges, where the practice of disposal of an old item is directly linked with picking up a new reused item. In the long term, such practices can foster a culture where citizens view the thrift store not only as a place to discard goods, but also as a primary destination for obtaining quality second-hand products.

By implementing these recommendations, alternative E-waste collection models like Leiden's can enhance their effectiveness and scalability. They address both operational improvements and engagement strategies needed to make circular practices part of the daily life. This thesis conclusion is that moving toward a CE for E-waste in cities requires more insights to how people actually dispose of and handle electronics and that with the right interconnection of infrastructure, education, and policy support, the gap between the Netherlands current 43% collection rate and the EU's 65% target can be closed. The Leiden case exemplifies a transitional pathway for leveraging existing infrastructures to make progress now, while informing of the broader systemic changes necessary for a sustainable, circular urban future.

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# Appendices

## Appendix A

# Interview Guide Visitors

## Structure & Questions

**Because the interview target is dutch this part of the guide will be written in Dutch as well.**

### 1. Introductie

- Stel jezelf en het onderzoek kort voor:
  - "Mijn naam is Maurice Bolle en vanuit mijn studie doe ik een afstudeeronderzoek naar hoe mensen elektronica afgeven bij de kringloopwinkel. Het doel is om te begrijpen hoe dit proces verloopt en hoe het verbeterd kan worden."
- Leg uit hoe het interview zal verlopen:
  - Duur: ongeveer 30-45 minuten.
  - Vrijblijvendheid: "U mag op elk moment stoppen of vragen overslaan."
  - Vertrouwelijkheid: "Uw antwoorden worden anoniem verwerkt."
- Vraag om toestemming:
  - "Is het goed als ik dit gesprek opneem om het later te analyseren?"
  - Introduceer toestemmingsformulier (Informed Consent Form)

---

### 2. Opwarmvragen / info participant

1. Kun je jezelf kort voorstellen (bijvoorbeeld naam, leeftijd, woonachtig en huishoudsamenstelling)?
2. Was u hiervoor al bekend met de inleverstraat?
3. Hoe vaak bezoek je deze kringloopwinkel?
4. Breng je vaak oude elektronica of andere spullen hierheen?

---

#### ▪ Kernvragen

##### a. Wat wordt er gebracht?

1. Wat heeft u vandaag bij u?

- Waarom moet u hiervan af?
- Waarom de keuze om het weg te brengen bij de kringloop? Kapot, hergebruik, opruimen?
- Heeft u een vervangend of nieuw apparaat ervoor gekocht?
- Heeft u het weggebrachte elektra zelf gebruikt? Is het van u?

**b. Waarom de kringloop?**

2. Hoe kwam u tot de keuze om hier uw elektronica weg te brengen?

- Welke andere opties heeft u overwogen? Weggooien, repareren, marktplaats, inleveren bij een winkel?
- Hoe wist u dat u hier uw elektra kon inleveren?
- Waarom de keuze om het vandaag weg te brengen? Op deze (specifieke) tijd?

**c. Het proces**

3. Kunt u vertellen hoe het wegbrengen van je oude elektronica ging? Vanaf huis uit tot hier?

- Reden om het weg te brengen? Begon u met opruimen?
- Heeft u het nog moeten schoonmaken? Was het vies? Accus en batterijen moeten verwijderen?
- Zijn er andere apparaten waarvan u twijfelde het weg te gooien? Heeft u deze mee?
- Heeft u de apparaten opgespaard om maar 1x te hoeven rijden?
- Hoe heb je de elektronica hierheen gebracht?
- Met welk vervoermiddel? Was dat makkelijk?
- Heb je uitdagingen ervaren bij het transporteren van de elektronica, bijvoorbeeld door het gewicht of de grootte?
- Wat vindt u van de informatie (zoals bordjes of instructies) over hoe en waar je de elektronica moest inleveren?
- Heb je hulp nodig gehad van het personeel om je spullen uit te laden?
- Heeft u lang moeten wachten in de rij? Waren de Openingstijden goed?
- Over het algemeen vond u het makkelijk? Was het veel werk?
- Wat vind u de voordelen en nadelen in het algemene proces?
- Hoe gaat u het in de toekomst aanpakken als u weer elektronisch afval heeft?

4. Was u van plan om na het inleveren nog zelf een kijkje te nemen in de kringloopwinkel?
    - Komt u anders wel eens in een kringloop?
  - d. Mening en betekenis.**
  5. Zijn er ooit problemen omtrent privacy met het wegbrengen van uw oude elektra?
    - Gegevensdragers, oude computers, telefoons of harde schijven.
  6. Wat vind je van het afvoeren van elektronica via de kringloopwinkel?
    - Vind je het een duurzame keuze? Waarom wel/niet?
    - Denk je dat het afvoeren van elektronica hier bijdraagt aan een beter milieu? Waarom wel/niet?
  7. Wat weet u over / Bent u geïnteresseerd in, wat er met uw afval gebeurt na het inleveren?
    - Weet u dat al?
    - Maakt het u uit of het wordt verkocht, gerepareerd, weggegooid of gerecycled?
    - Kunt u beschrijven wat u er ongeveer van weet?
    - Vind u het belangrijk om te weten wat er met uw afval gebeurt?
    - Waarom wel/waarom niet?
  9. Wist je dat in Leiden deze kringloopwinkel verantwoordelijk is voor het inzamelen van e-waste in plaats van de milieustraat?
  10. Heb je geprobeerd de elektronica te verkopen of te repareren voordat je het hier bracht?
    - Waarom wel/niet?
- 

#### 4. Reflectieve vragen

- Wat vind je goed aan het proces van elektronica inleveren bij de kringloopwinkel?
  - Wat zou er volgens jou beter kunnen?
  - Denk je dat je in de toekomst opnieuw elektronica hierheen zou brengen? Waarom wel/niet?
- 

#### 5. Afsluiting

- Bedank de deelnemer: "Bedankt voor je tijd en het delen van je ervaringen. Het helpt enorm om meer inzicht te krijgen in hoe we e-waste beter kunnen inzamelen."

- Wat zou u nog meer kwijt willen over afval dat ik nog niet gevraagd heb? Zou je nog iets willen vertellen waar ik nog niets over gevraagd heb?
- Heeft u nog vragen voor mij?
- Heeft u tips voor mijn komende interviews met mensen zoals u?
- Herinner hen aan de vertrouwelijkheid: "Uw antwoorden worden volledig anoniem verwerkt."

## Appendix B

# Interview guide thrift store workers

## Structure & Questions

**Because the interview target is dutch this part of the guide will be written in Dutch as well.**

### 1. Introductie

- Stel jezelf en het onderzoek kort voor:
    - "Mijn naam is Maurice Bolle, en ik doe onderzoek naar de rol van kringloopwinkels in het inzamelen en verwerken van elektronisch afval (e-waste). Het doel is om te begrijpen hoe medewerkers omgaan met e-waste en welke uitdagingen en kansen er zijn."
  - Leg uit hoe het interview zal verlopen:
    - Duur: ongeveer 30-45 minuten.
    - Vrijblijvendheid: "U mag op elk moment stoppen of vragen overslaan."
    - Vertrouwelijkheid: "Uw antwoorden worden anoniem verwerkt."
  - Vraag om toestemming:
    - "Is het goed als ik dit gesprek opneem om het later te analyseren?"
    - Introduceer toestemmingsformulier (Informed Consent Form)
- 

### 2. Opwarmvragen / info participant

5. Kun je jezelf kort voorstellen?
    - Naam
    - Leeftijd
    - Werkervaring en functies
    - Hoe lang werkt u al bij deze kringloopwinkel?
- 

### 3. Kernvragen

#### a. werkzaamheden

1. Kunt u beschrijven wat uw werkzaamheden zijn?
  - Wat is uw rol in het inzamelen en verwerken van e-waste?
  - Hoe vaak werkt u met e-waste?
2. Welke handelingen voert u allemaal uit bij de innamestraat?
  - Waar eindigt uw werkzaamheden.

3. Wat wordt het vaakst afgegeven?
  - En voor elektronica?
4. Wanneer is het op zijn drukst en wanneer op zijn rustigst?
  - Tijden
  - Dagen
  - Periodes (voorjaar, vakanties, slecht weer)
5. Ziet u vaak dezelfde mensen voor bij komen?
6. Kunt u uw werkdag stap voor stap uitleggen aan mij? Van binnenkomst tot aan het verlaten van het pand.

#### **b. Betekenissen**

7. Vindt u dat uw werk bijdraagt aan duurzaamheid of de circulaire economie?
  - Waarom wel of niet?
8. Heeft de verschuiving van verantwoordelijkheid voor de inzameling e-waste van de milieustraat naar de kringloopwinkel uw werk veranderd?
  - Hoe?
9. Voelt u zich gewaardeerd voor het werk dat u hier doet?
  - Waarom wel of niet?
  - Wat specifiek?
10. Wat betekent het voor u persoonlijk om te werken aan de inzameling van elektronisch afval?
11. Wat doet u als u apparaten ontvangt die niet meer gerepareerd kunnen worden?
12. Vind u het zonde/moeilijk wanneer kapotte elektronica moet worden weggegooid? Zonder de kans op reparatie?
13. Hoe gaat u om met materialen die u niet wilt aannemen?
  - Vieze apparaten
  - Kapotte of bolstaande accu of leeglopende batterijen.

#### **B. Materialen (Materials)**

14. Zijn er specifieke dingen (apparaten of extra opslagplaatsen) die u mist om uw werk gemakkelijker te maken?
15. Zijn er uitdagingen met betrekking tot de fysieke ruimte in de winkel voor het sorteren of opslaan van e-waste?

### **C. Competenties (Competences)**

16. Heeft u trainingen gekregen voordat u hier begon met werken?
    - Waar gingen deze trainingen over?
    - Gingen deze trainingen ook over hoe om te gaan met elektronica of veiligheid in het algemeen?
  17. Bent u bekend met de veiligheidsprotocollen voor het omgaan met gevaarlijke materialen in e-waste?
  18. Kent u de wettelijke vereisten, zoals WEEELABEX-certificering, en hoe deze uw werk beïnvloeden?
  19. Is er verandering in de samenwerking tussen collega's sinds bijvoorbeeld het inzamelen van E-waste ook hier gebeurt?
  20. Zijn er vaardigheden die u graag zou willen leren om uw werk beter te kunnen doen?
    - Training over hoe kapotte apparatuur te repareren.
    - Hoe veilig om te gaan met elektronica, accu's, batterijen.
- 

### **4. Reflectieve vragen**

- Wat vindt u goed aan de huidige manier waarop e-waste wordt ingezameld in de kringloopwinkel?
  - Wat zou er volgens u beter kunnen?
  - Hoe ziet u de toekomst van e-waste verwerking in de kringloopwinkel?
- 

### **5. Afsluiting**

- Bedank de deelnemer: "Hartelijk dank voor uw tijd en waardevolle inzichten. Uw bijdrage helpt ons beter te begrijpen hoe e-waste beheer in kringloopwinkels verbeterd kan worden."
- Wat zou u nog meer kwijt willen over afval dat ik nog niet gevraagd heb? Zou je nog iets willen vertellen waar ik nog niets over gevraagd heb?
- Heeft u nog vragen voor mij?
- Herinner hen aan de vertrouwelijkheid: "Uw antwoorden worden volledig anoniem verwerkt."

## **Appendix C**

### **Coding tree thrift store visitors**

- Materials
  - Storage
  - Transport
  - Alternative destinations
- Competences:
  - Sorting
  - Preparation
  - Navigation
  - Misconception
- Meanings
  - Environmental
  - Social
  - Norms and Responsibilities
  - Convenience
  - Decluttering
  - Emotional relief

## **Appendix D**

### **Coding tree thrift store workers**

- E-waste Collection:
  - Meanings
  - Competences
  - Materials
- Sorting and Testing:
  - Meanings
  - Competences
  - Materials
- Pricing and Display for Resale:
  - Meanings
  - Competences
  - Materials
- Repurposing and Limited Refurbishment:
  - Meanings
  - Competences
  - Materials