

Circular Kitchen Appliances

Designing an oven to enable refurbishment

Graduation Report

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by Lisa Hoogeveen

ATAG
BENELUX

 **TU**Delft

Thesis Title

Circular Kitchen Appliances:
Designing an oven to enable refurbishment

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EXECUTIVE SUMMARY

The Dutch government wants to be circular in 2050. The industry of kitchens and kitchen appliances needs new innovative models of practice to reduce its environmental footprint. As kitchen appliance manufacturer, ATAG Benelux is investing in innovation to create more sustainable and circular business propositions. In a circular economy products and materials have to 'loop' back into the system after they lost value, but ATAG's current system is linear, bringing the appliances to the customer and not returning them.

The aim of this thesis is to explore how ATAG can use design to contribute to a circular economy. It is a collaboration between ATAG Benelux and Delft University of Technology. This thesis focuses on the user, their behavior, and their attitudes towards Product Service Systems (PSS's) and Refurbishment as they play a big role in business models.

As a case study, the combi-steam oven is used to explore PSS's. The user's attitude towards refurbishment and circular PSS's is explored through in-depth interviews. The results reveal several challenges in acceptance for different types of ownership of ovens and show that for the target group of ATAG a system of buy-back is most suitable. The context of retaining value for refurbishment was researched through literature, interviews, and creative sessions. This shows different directions for design to benefit the refurbishment process.

The recommended circular business proposition is for ATAG to take back appliances after a use cycle. ATAG Benelux can refurbish its products to save materials and resources. For refurbishment it is important that products retain their value as long as possible.

The final design consists of return incentives for users and the Care Assistant. This human centered design stimulates product care, which is a type of sustainable use and handling. The design will influence the user's behavior in a sustainable way to retain more value, enable efficient refurbishment and a second life cycle. The product care is needed to have a longer product life, or to take back an appliance that is in a better state (than it would be if product care had not been stimulated). With a buy-back system, users are stimulated to return the appliances, rather than let the appliance end up in recycling or worse.

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GLOSSARY

ATAG = In this report this sometimes refers to the company and sometimes to the brand. 'ATAG Benelux' always refers to the company. And sometimes is explicitly clarified that it refers to the brand. Otherwise from the context should be clear which one is meant.

PSS = Product-Service System

RQ = Research question

NK market = New Kitchen market.

B2B = Business to Business

B2C = Business to Consumer

PPU = Pay-per-use

1 Introduction

This chapter elaborates on the goal and main research questions of this research. It covers the problem definition, the assignment and the approach.

1.1 | PROBLEM DEFINITION

The industry of kitchens and kitchen appliances is in need of new innovative models of practice to reduce its environmental footprint. Circular business models can significantly reduce the environmental impact if a product is used for a longer period of time. Now kitchen appliances are only sold to consumers in a linear manner, with no trace of where they end up. There is a need to bring a new way of owning kitchen appliances to the consumers.

Kitchen appliance manufacturer ATAG Benelux wants to investigate possibilities for a Circular Economy. Their innovation strategy has been defined into the direction of more sustainable and circular business propositions and they want to comply with the government's ambition to be circular in 2050.

Scientists identified product-service systems (PSS) to have the potential to create value for users in a less resource-intensive way. However, a PSS should result in longer product lifetime and a resource-efficient system to be sustainable. The current products and logistical system of ATAG are not designed for a circular approach. A PSS for kitchen appliances is very new, and the market (consumers, retailers, etc) might not be ready for it. The system needs to be designed with its users in mind and to influence the user's behaviour in a sustainable way.

Therefore, this project will explore how ATAG can accomplish their more sustainable business strategy.

1.2 | ASSIGNMENT

"Develop a solution to make kitchen appliances for the circular economy. Do a case study with one of the products of ATAG and develop a suitable PSS with a proposed redesign of the product. The user acceptance of the model should be validated."

This project aims to answer the questions:

RQ1: How can design be used for ATAG Benelux to create a circular business proposition?

RQ2: How will users experience this circular business proposition?

RQ3: How can design be used to stimulate sustainable use and handling?

1.3 | APPROACH

To tackle this problem structurally an approach is formulated.

DIVERGING-CONVERGING

In the approach, I use the principle of the double diamond. It uses diverging and converging which are typical to a design process. Diverging is where you try to generate many insights/ideas/concepts and then you converge towards one (or some) solution(s). It is also an iterative process, where design and research are parallel to each other, and therefore in doing research one can also diverge and converge. Deliverables/results from the separate phases also should not be fixed; they can be altered and iterated on after new insights. Figure 1.1 shows a visual representation of the design process.

PROCESS PHASES

In phase 1, one product is selected to use as basis for this project, based on the analysis of ATAG Benelux and the possible business proposition. In Phase 2, I explore the user perceptions of this product in differ-

ent archetypical PSS's, to see how viable they are from user perspective. In phase 3 many ideas are created with the input from the first two phases and be converged into concepts. Phase 4 is where I evaluate the concepts and develop one redesign.

Phase 1 | Exploration

RQ: What product would be suitable as case study for ATAG to develop a circular Product Service System? Methods: Literature study, Brand analysis, ATAG and Circular Economy/PSS's, Competitor analysis, Sustainable behaviour.

Results: Criteria for the circular design, a kitchen appliance for a case study, PSS scenarios to research users' attitudes, target group.

Phase 2 | User Research

RQ1: What Circular business proposition would be suitable? For the ATAG brand, for customer satisfaction, for acceptance and for positive environmental impact.

RQ2: What are user's perceptions of alternative consumption models (PSS's).

Methods: Interviews with five hypothetical scenarios. Talk to stakeholders.

Results: User's attitudes towards PSS's, criteria for the circular design, a circular business proposition.

Phase 3 | Ideation

RQ1: What is the interaction between user and the design in this circular business proposition?

RQ2: How can design stimulate sustainable use and handling?

RQ3: How to create added value for this Circular business proposition for the users?

Methods: Co-creation, brainstorm sessions, creative facilitation, etc.

Results: Three concepts of a redesign of a kitchen appliance within a circular business proposition.

Phase 4 | Develop

Goal: Choose one concept, evaluate, and iterate on it.

Methods: Expert sessions, user tests, prototyping.

Results: Design of a kitchen appliance within a circular business proposition.

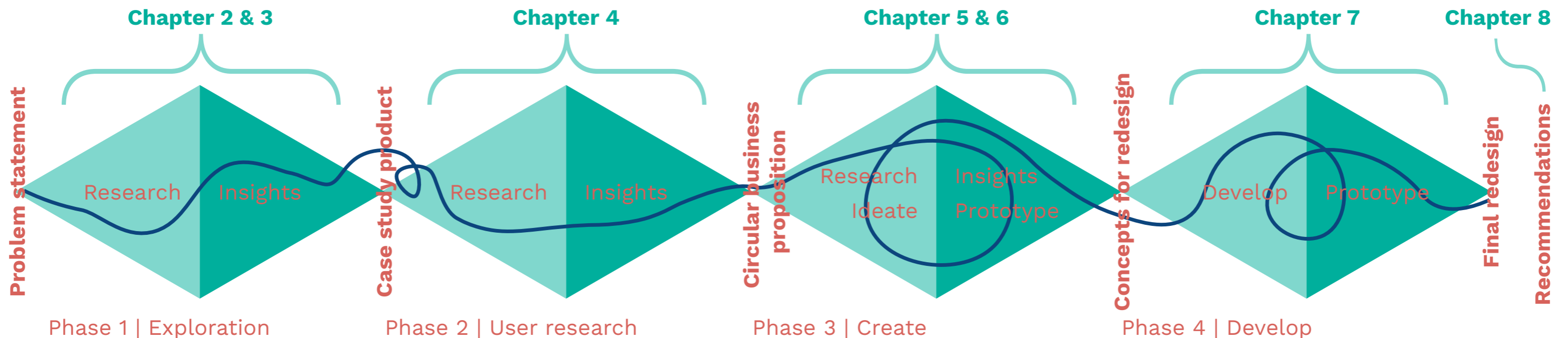


Figure 1.1 | visual representation of design approach, based on the double diamond principle, with phases, iterations in design process (blue line), interim results and reading guides.

1.4 | REQUIREMENTS AND WISHES

Through the project, a list of requirements is composed. This page shows the first block. The requirements are numbered and divided into requirements (numbered R1.1) and wishes (numbered 'W1.1'). Requirements are concrete and must be met by the design. Wishes should be met as best as possible. These are used for evaluation and decision making among acceptable solutions.

'Design' here is defined as intervention or solution. It might be a product, a service, a system, or something else.

Starting requirements

- R1.1** The design must fit as contributing part in a circular economy*.
- R1.2** The design must be less resource intensive than the conventional kitchen appliance.
- R1.3** It must be viable for ATAG Benelux to be or to become the supplier of the design or a key partner within the new product ecosystem.

Starting wishes

- W1.1** It is desirable that the design influences the user's behaviour to a more sustainable behaviour*.
- W1.2** The design should be desirable for potential users*.

* = Are defined in the analysis

2

Company introduction

This graduation project is executed in collaboration with the company ATAG Benelux. This chapter introduces the company, what they do and what they are about. Also the brand ATAG is discussed, resulting into requirements and wishes for this project.

2.1 | COMPANY ATAG BENELUX

To solve the challenge posed in the introduction, we must first understand the context in which this sustainable business proposition will be developed and implemented.

COMPANY STRUCTURE

ATAG Benelux is a leading supplier of kitchen appliances. The sale of kitchen appliances is done through kitchen retail, electronics retail, online retail and the kitchen industry. ATAG Benelux has over 450 employees and is based in Duiven. ATAG Benelux also has a branch in Denderhoutem (Belgium), with approximately 45 employees. Appendix A.2 shows an overview of company structure with department and tasks of ATAG Benelux.

CORPORATE HISTORY AND STRUCTURE

ATAG Benelux sells kitchen appliances. In 2018, ATAG Benelux was acquired by the Chinese Hisense Group. This is a multinational company with annual turnover of over EUR 16 billion. With 80.000 people employed and represented in 130 countries.

MARKETS OF ATAG BENELUX

ATAG Benelux does not sell their products directly to consumers. This goes through other customers on three different markets: replace, new kitchen (NK) and projects (and then there is the Belgian market, which is counted separately in figure 2.2).

The Replace market is mainly B2B via electronic retail and online players. Consumers can go here to buy single appliances to replace a broken one or get an upgrade.

In the New Kitchen (NK) market ATAG sells mainly to kitchen retailers (B2B). This is where homeowners buy an entire kitchen, with often multiple appliances. Projects market is B2B. Here ATAG works together with kitchenproducers like Bruynzeel or Keller. They also work together with investors, housing associa-

tions, holiday parks and estate managers. The users in this market are the tenants in the rental homes. They do not own or choose the kitchen. ATAG offers various service packages for the owner (most likely the landlord), where for example he can buy all service for 10 years, called Service op Maat (SoM). For maintenance or repair users (most likely the tenants) can directly contact ATAG.

At the start of this project corporate (Hisense Group) has expressed that ATAG Benelux should not go into leasing or anything similar, having an 'extended balance' per product. However, the company can go around this, by cooperating with a third party which would enable a PSS around the products of ATAG.

COMPETENCE CENTERS

ATAG Benelux sells a wide range of kitchen appliances, but specifically has R&D knowledge and competences for the product categories: gas hob, induction cooking hob, extraction hood, hood-in-hob and oven. The other products are developed in other branches of the Hisense Group.

BRANDS OF ATAG BENELUX

ATAG Benelux currently sells five brands (figure 2.1). The kitchen appliance brands are ATAG, Pelgrim and ETNA. The brands have a high brand awareness in the Benelux. ETNA is the budget brand for price aware consumers. Pelgrim is the decent brand for modal incomes. ATAG is the premium brand for users who have the ability and desire to invest in premium products for their more luxurious kitchens. Appendices A.3, A.4 and A.5 show information on these three brands, their vision, market, and product portfolio.



ATAG
we love to cook



Pelgrim
mooi makkelijk



ETNA[®]
KEUKENAPPARATUUR



Hisense



ASKO
Inspired by Scandinavia

Figure 2.1 | ATAG Benelux sells appliances of five brands. The kitchen appliance brands are ATAG, Pelgrim and ETNA.

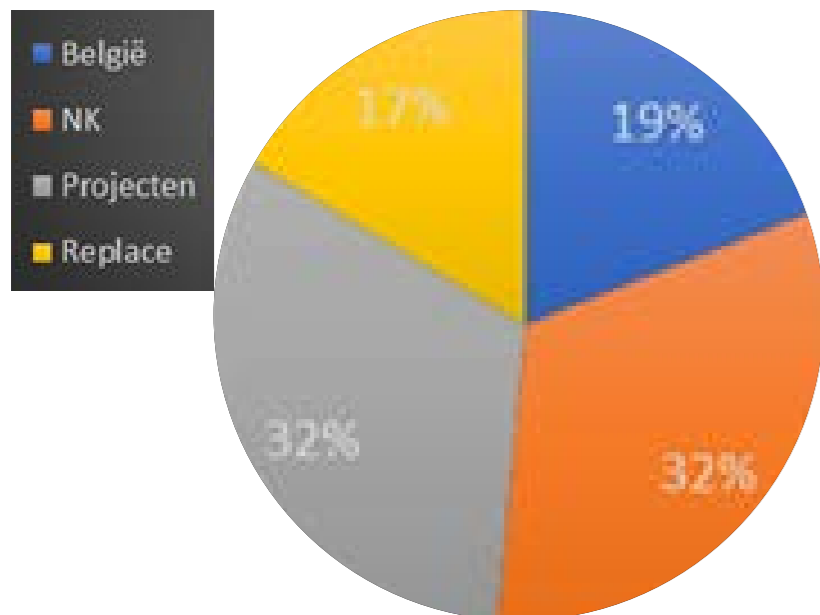


Figure 2.2 | Distribution of turnover of Brand **ATAG**, in the first twelve weeks of 2020.

2.2 | BRAND ATAG

ATAG will be the brand for circular products, this is defined in the company's business strategy. This chapter explains the brands values, market and product portfolio.

PREMIUM

ATAG is the premium brand, consists of two design lines, and is targeted towards people with above average income with a kitchen budget of at least 12k EUR. The brand focuses on three different types of cooks: the social cook, the pleasure seeker and the Semi-pro. Their personas can be found in appendix A.7. Figure 2.3 shows a summary of what that ATAG brand stands for.

MARKET & PRODUCTS

Figure 2.2 shows on what markets the brand ATAG sells. The replace market is the smallest. The premium products are more bought when users buy an entire new kitchen (NK). Out of the three kitchen brands, ATAG is also the largest brand in the projects market. This may have to do with the fact ATAG wants to have their premium brand in rental homes for people to get to know the brand, and because it has a more quality-image. ATAG has a special product line for the project market, based on a more cost-effective productplatform. Appendix A.4 shows the distribution in turnover in the brands Pelgrim and ETNA.

The product portfolio also reflects that ATAG is a premium brand and mainly working on the NK market (and not the replace market): all their products are built-in products, there is no stand-alone furnace or microwave, except for large American-style fridges. Also the more exclusive products, like the combination gas and induction hob, the 3-in-1 oven, the downdraft extraction hood and the wine chiller are what distinguishes the brand ATAG to be premium. Find the product portfolios of the three kitchen brands in Appendix A.5.



Figure 2.3 | Overviewposter of the brand ATAG

2.2 | CHAPTER CONCLUSION

The R&D department ATAG Benelux is the competence center for gas stoves and extraction hoods, and together with other competence centers they also work on induction cooking and ovens. The design will be based on one of these product categories and serve as a casestudy, possibly extendable to other product categories. Chapter 3.6 shows which product is chosen and why.

The brand ATAG will be the circular brand. The brand mission does not directly reflect that they want to be sustainable or circular; they want to provide the best products and services to help their users fulfil their need for kitchen appliances. Therefore the circular design should offer other benefits to users relating to the cooking experience.

The next chapter is about the circular economy and circular business propositions. And in chapter 4, I explore user's attitudes towards these circular business propositions, to find the most suitable one for ATAG.

Requirement

R2.1 The design must be viable on either the NK (New Kitchen) market or the projects market, in the Benelux.

R2.2 The design must fit the brand ATAG, which means the design must improve the full cooking experience of the user or the full functionality of the oven.

Wishes

W2.1 The design should be desirable for users with an above average income, who have the ability and desire to invest in premium products for their more luxurious kitchens. (Rewrite of W1.2)

W2.2 The design should be desirable for cooking enthusiasts, who love to experiment with cooking and sharing the passion for cooking with friends. (Rewrite of W1.2)



Figure 2.4 | Stockimage of Idris, the semi-pro persona of ATAG

3

Circular business propositions

This chapter presents existing strategies and theories that can have an impact on circular kitchen appliances. Theories from circular economy and PSS are discussed and used to evaluate ATAG's activities. Finally, some insight are given regarding circular business propositions and a case study product is chosen for development of a design.

3.1 | INTRODUCTION

With an understanding of ATAG and its context as a company, this chapter goes into what circular business propositions can be identified to be suitable for ATAG Benelux.

First, chapter 3.2 goes into what the Circular Economy entails and what strategies there are. Then, this chapter looks into what the current projects towards circular economy are. Not only can we learn from these projects, but the business propositions can fit the current activities. Also the (linear) journey that appliances currently go through from manufacturing to End of Life is evaluated to find opportunities.

From the circular economy theories, refurbishment is identified as potential business proposition, as elaborated on in chapter 3.4. Product-Service Systems also offer environmental potential.

This chapter concludes with a set of five circular business propositions and more requirements.

In chapter 4, the user's attitudes towards these circular business propositions will be explored, to find the most suitable one for ATAG.

3.2 | CIRCULAR STRATEGIES

Kirchherr, Reike & Hekkert (2017) gave an extensive, literature review-based definition of the circular economy:

The circular economy is “an economic system that replaces the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/ distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers.”

One can simplify this to: Circular Economy is about cycling materials through different life cycles to save value.

BUTTERFLY DIAGRAM

The Butterfly Diagram (Figure 3.1) of The Ellen MacArthur Foundation visualizes the principles of circling materials back into the supply chain. These circles, or ‘loops’ are a key concept of the circular economy through which materials and resources flow from one use cycle to another. In relation with the Butterfly Diagram is often referred to ‘the power of the inner loop’. This means that the closer you stay with the user, the more value saved.

ATAG is a product manufacturer. Refurbishment and remanufacturing are circular strategies that typically fit a product manufacturer (Red in figure 3.1). This does not exclude that ATAG can take responsibility on what other chainpartners do. ATAG can also play a role in facilitating reuse, maintenance and collection (green cycles in figure 3.1).

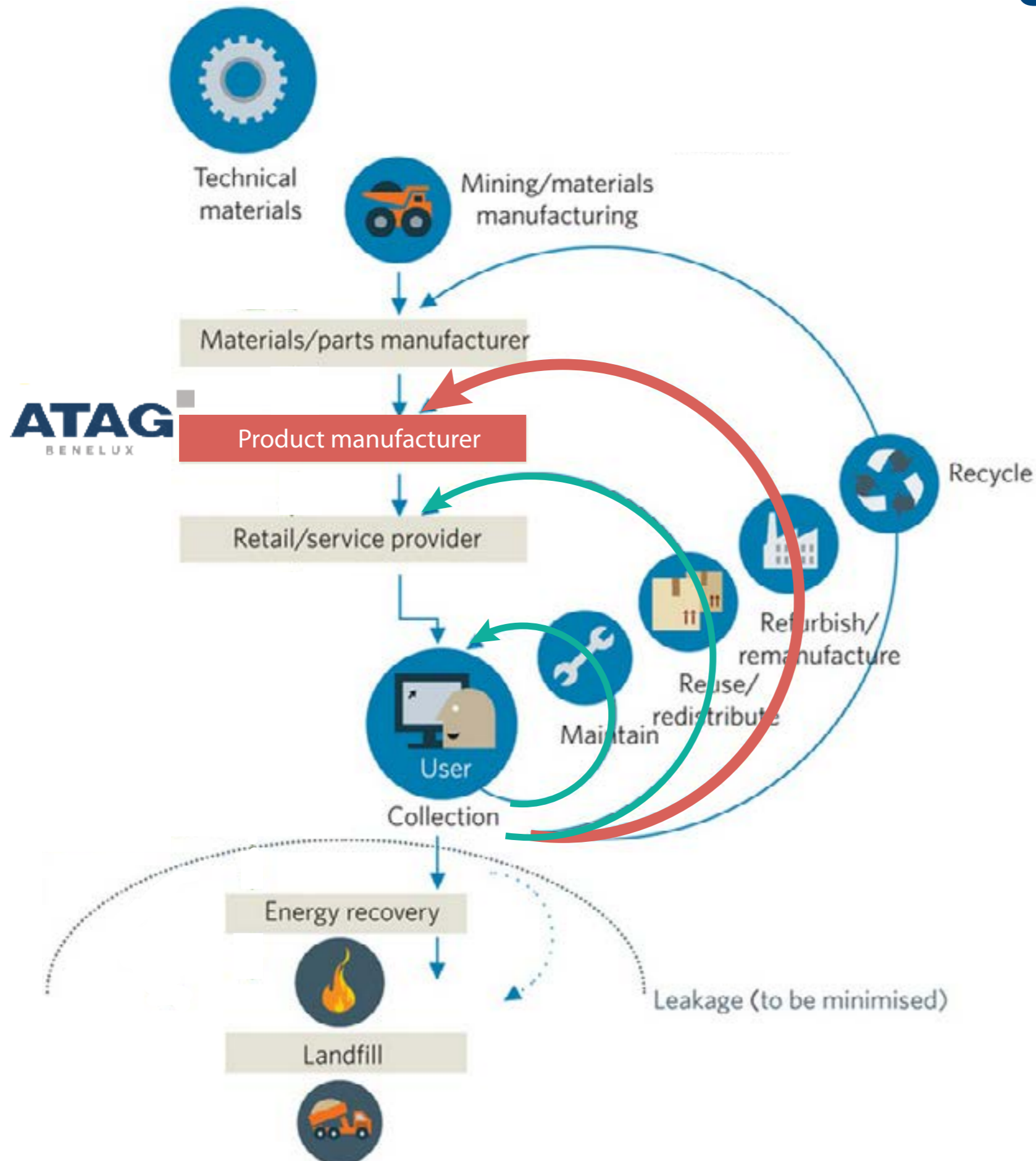


Figure 3.1 | Technological cycle of the butterfly diagram, with ATAG marked as product manufacturer. RED = Refurbishment is as circular strategy directly connected to the product manufacturer. GREEN = Cycles that the product manufacturer ATAG can facilitate that save more value.

VALUE HILL AND CIRCULAR STRATEGIES (10 R'S)

The Value Hill visualises the value embodied in a product (Achterberg, Hinfelaar, and Bocken, 2016). In the pre-use stage by manufacturing, distribution and retail the product. After use, the value is destroyed. This is represented in the shape of a hill as shown in figure 3.3. In a circular economy, the value after use is kept as high as possible for as long as possible through circular strategies. Vermeulen, Witjes, & Reike, (2014) ranked these strategies and then referred to as the levels of circularity: 10 R's. This is a range of 10 circular strategies ranked from most value retained to less (Figure 3.4).



Figure 3.3 | The value hill in a linear economy and a circular economy (courtesy of Achterberg et al., 2016)



Figure 3.4 | Levels of circularity, based on Vermeulen, W., Witjes, S., & Reike, D. (2014).



Figure 3.4 | HAN students disassembling an oven for their project.

ATAG'S CIRCULAR AMBITION

ATAG Benelux wants to investigate more possibilities for Circular Economy, because their innovation strategy has been defined into the direction of more sustainable and circular business propositions. They want to comply with the government's ambition to be circular in 2050, which is why they closely cooperate in this field with suppliers, clients, universities, and others.

CIRCULAR PROJECTS AT ATAG

Circular kitchen

ATAG Benelux works together with universities, kitchen suppliers, and housing corporations on a circular kitchen project for social housing (CIK). In this project they already created a few prototypes together with TU Delft and Chalmers university. In the user insights studies of CIK, the Chalmers University identified four research themes for circular home appliances (CIK, 2019). The research themes are:

- Extend the lifetime of appliances.
- Ownership vs Access: business models.
- Design for Sustainable user behaviour.
- Resource sharing: Systems perspective.

Circular Products

In 2018 ATAG Benelux started the project of Circular Products, which this graduation assignment is part of. Together with students they investigate possibilities to implement Circular products in the market. Already quite some ideas have been developed to make the products more sustainable. Also new business models based on different types of ownership are explored. In developing the right circular products for end consumers, ATAG believes we must design and market these products and the systems around them in a way that consumers will accept.

Plan for lease of kitchen appliances

In the start of 2020, the innovation manager and a salesmanager of ATAG did a CIRCO workshop. This resulted in the idea for an access model (lease) for kitchen appliances. ATAG remains owner during life cycle and determines the moment of return/exchange.

This will be targeted to investors and housing corporations who rent to middle-income tenants. They also pitched it to the board and got permission to set up a pilot.

HAN Master Circular Economy, and graduate students

Parallel to this graduation thesis, two students of HAN university were looking into how to set up Circular Business Unit around the lease and buy-back (Appendix B.1 shows a summary of insights from this project). And as part of their master's programme, another group of students worked on the analyses of current products and how to design for the circular economy. In 2019, the first group made analysis and redesign recommendations. In 2020 a new group continued that. The students of the HAN did an LCA as part of their analysis. ATAG Innovation manager is building on that.

APPLIANCE JOURNEY

To define suitable future circular strategies for ATAG the current appliance journey is mapped out. It is important to understand the journey that this appliance goes through from production to the end of its life cycle. What happens exactly after the appliance is sold is unclear, but during discussions, several scenarios were identified, one more likely than the others.

This appliance journey shows that there are already ways users reuse their appliances. Kitchen retailers as well as ATAG offer warranty and repair. Appliances can also change owner by being sold second hand, or when a house is sold to new owners. This also means that the user disposing of the appliance does not have to be the one who purchased it originally.

The reason why users dispose of their appliances is not entirely clear, but from the market numbers in previous chapter can be concluded that most of the times the entire kitchen is redone. This means multiple appliances are disposed of at once, when all or most appliances still function well.

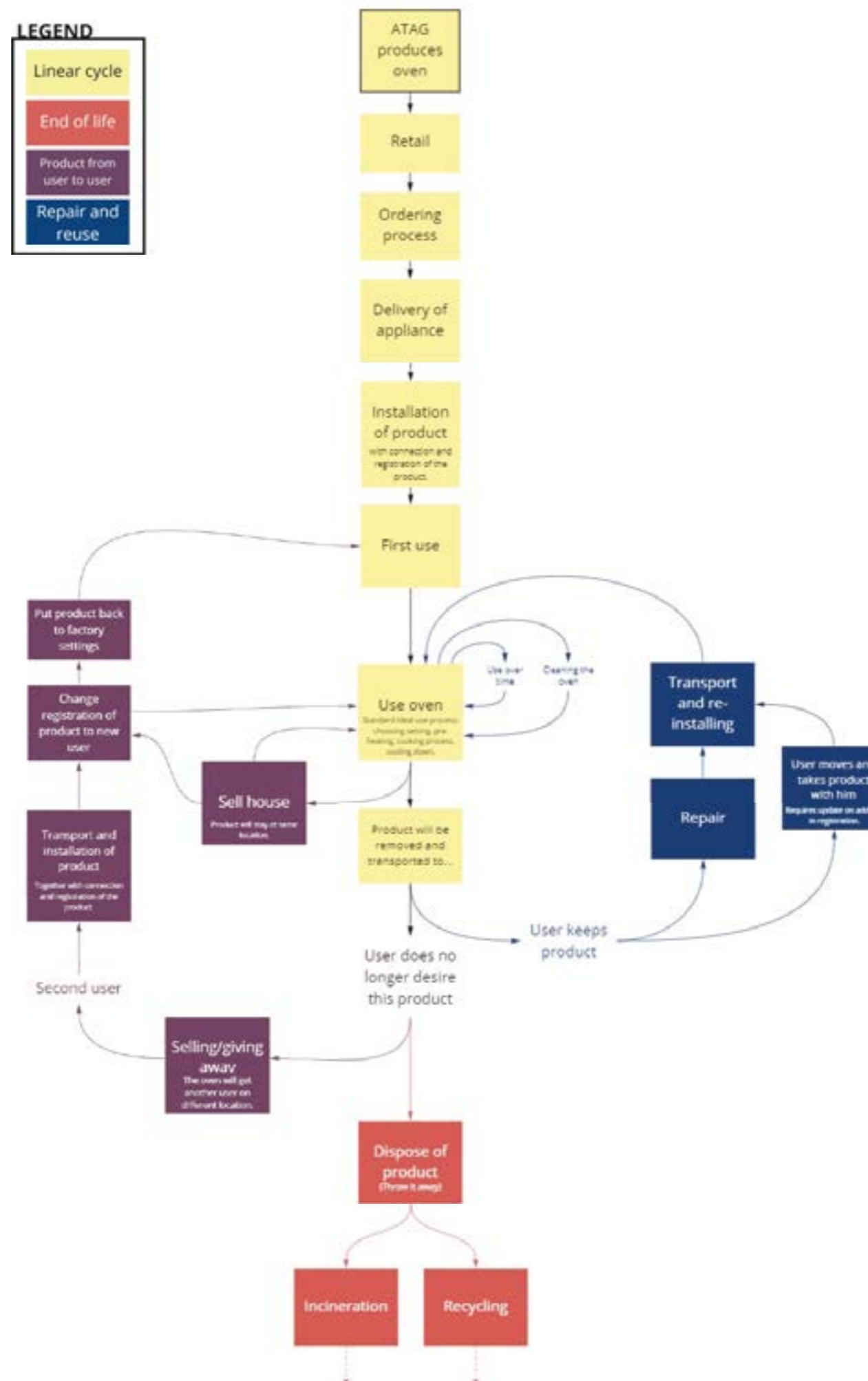


Figure 3.5 | Current appliance journey mapped out

KEY INSIGHTS

Circular economy is an important part of ATAG's innovation strategy to be future proof. Circular economy is about circling materials back into the system. Different theories visualise it in different ways with different strategies: The power of the inner loop, keeping as much to the top of the value hill or choosing one of the toplevels of circularity, they all are about maintaining value of products or materials.

Refurbishment as circular strategy

Refurbishment is a suitable circular strategy for ATAG. As product manufacturer it fits most with the core business. Next to that, Refuse and Reduce do not provide business opportunity for appliance manufacturer. Re-use and Repair are already possible in the current supply chain. So the larger 'win' for circular economy is in Refurbishment.

Technical product life

Extending the life of kitchen appliances is one of the research themes identified in CIK. ATAG is exploring modular design for extending the lifetime of appliances. However, if appliances are disposed of before the end of the technical life, this is lost unless the appliances go into another use cycle.

Modular design

Modular design for easier disassemble and reassembly of appliances is an important requirement to be able to repair and refurbish appliances. The electronics and software are the weak part in appliances limit the product life and refurbishment of kitchen appliances. Smart and preventative maintenance can help restore the material value of appliances.

Business models and users

ATAG is exploring business models with different types of ownership. They are involving stakeholders, like housing corporations and construction companies. There are legal issues like rent regulations with lease and food safety regulations with refurbishment. Warranty on the cleaning is necessary to comply with legal standards.

There is a need for determining the user's attitude towards these alternative business models and different ways of consumption. Next to that, sustainable behaviour can benefit the environmental impact. Careful handling and long use periods can be stimulated by lowering the lease price when appliances are in use longer. And attachment with the product can motivate users.

Requirements

R3.1 The design must prevent appliances from going to recycling or energy recovery, by utilizing the circular strategy Reuse, Repair or Refurbish.

Wishes

W3.1 It is desirable that the design encourages reuse or repair.

W3.2 It is desirable that the design enables multiple use cycles for the appliance.

3.3 | REFURBISHMENT

Refurbishment can be applied to regain value from products that have been used. Refurbishment does not require complete dismantling of products, which preserves a high amount of the value that went in the production of the product. This is a promising strategy to reduce waste.

Definition

Refurbishment is returning a used product to a satisfactory working condition by rebuilding or repairing major components that are close to failure, even when there are no reported or apparent faults in those components (Bakker, Hollander, Hinte, & Zijlstra, 2014).

CONSUMER ACCEPTANCE

Figure 3.6 shows that consumers go through different steps in the decision-making process. Van Weelden et al. (2016) mapped out the main factors that influence consumer acceptance of refurbished mobile phones. They show that first a product is not taken into consideration because of a lack of awareness and a misunderstanding of what refurbishment entails. In addition, refurbished products can be rejected because of a negative trade-off between perceived risks and benefits. Personal, contextual, and product-related factors influence consumers' assessment of these risks and benefits.

In chapter 4, the user's attitude towards a refurbished oven and four other circular business propositions is investigated. The results from that research show the barriers and the risk-benefit evaluation that go into the decision-making process. Chapter 5 goes more into the technical implications of refurbishment of the appliance.

Wishes

W3.3 It is desirable that the design stimulates users to treat their products with care. (Rewrite of W1.1)

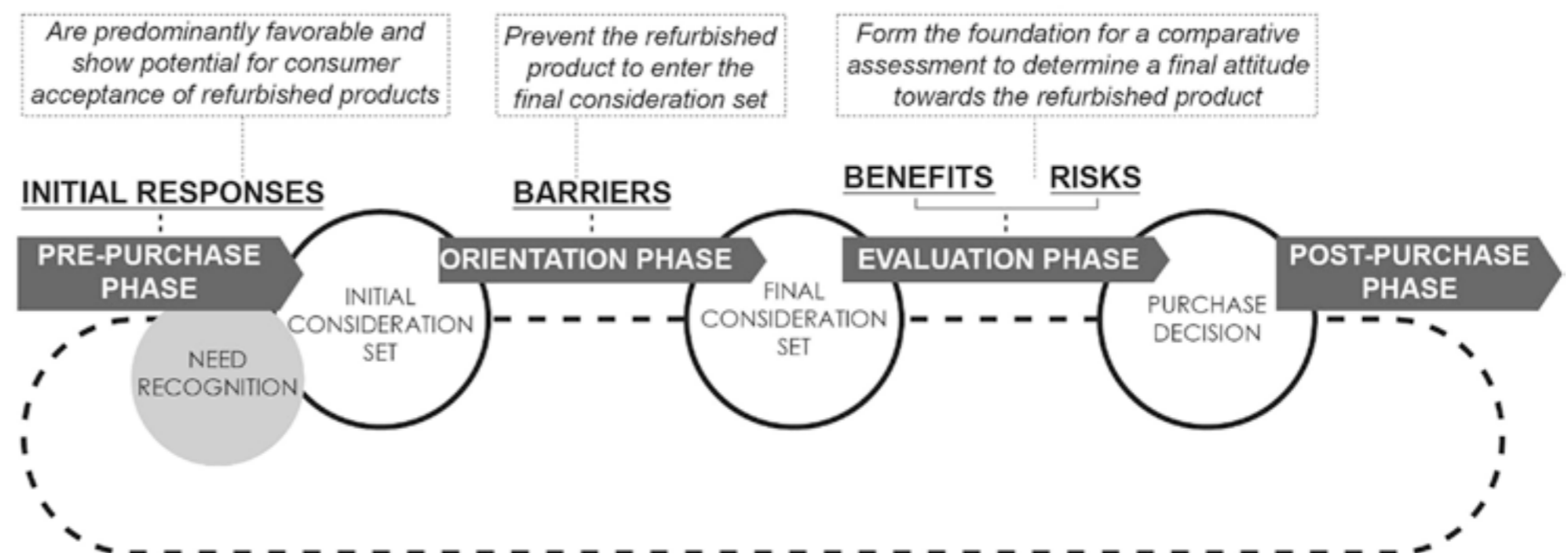


Fig. 3.6 | Model of the consumer decision-making-process showing the main factors influencing consumer acceptance of refurbished mobile phones. (Van Weelden et al., 2016)

Circular Economy Archetypical Business Models
(Bakker et al. 2014)

The classic long life model

The hybrid model

The gap exploiter

The access model

the performance model

3.4 | PRODUCT-SERVICE SYSTEMS

Circular economy is about more than regaining material value from a used product. Businesses need to be able to maintain control of the flow of materials and products and generate profit from them over time. Bakker et al. (2014) proposes five archetypical business models (to the left). Business models like the access model and the performance model revolve mainly around offering service rather than a product. For a product manufacturer this could also be a product-service systems (PSS).

PSS are argued to be a promising models towards a Circular Economy, because a PSS has the potential to be less resource-intensive than products. Since the mid-1990s, researchers working on sustainability and business looked at PSS. They argued that PSS can be used to easier fulfil the user’s needs with a significantly lower impact.

DEFINITION

Tukker and Tischner (2006) defined a product-service system (PSS) as:

‘a mix of tangible products and intangible services designed and combined so that they are jointly capable of fulfilling final customer needs’.

Use Oriented PSS

In use-oriented PSS the product is still central, but the ownership is with the service provider. Examples are leasing or renting.

Result Oriented PSS

Result-oriented PSSs the service is central; the focus is on the result or the function that the product provides. It is no longer about the product.

Moving a business model from product oriented to result oriented can be challenging. The more result-oriented, the more/bigger barriers there are and the bigger the challenges, but result oriented PSS also have a higher environmental potential.

CIRCULAR ECONOMY

Business models based on selling products have the incentive to sell more, they generate profit only by increasing turnover and market share. Business models that focus on offering services have different incentive: When companies are paid for the offered service, the material products used to offer that service become cost factors. The incentive here will be to extend the product life, create resource-efficient products, and do more resource saving activities. This shows that with PSS, companies could contribute to minimizing material flows in the economy while maximizing service output or user satisfaction. (Tukker, 2015)

TYPES OF PSS

Tukker (2004) identified eight PSS archetypes that can be classified into three main categories: product-oriented, use-oriented, and result-oriented (figure 3.7).

Product Oriented PSS

Product-oriented PSSs have a large product component where the user has ownership of the product. Only a few services are added to the product.

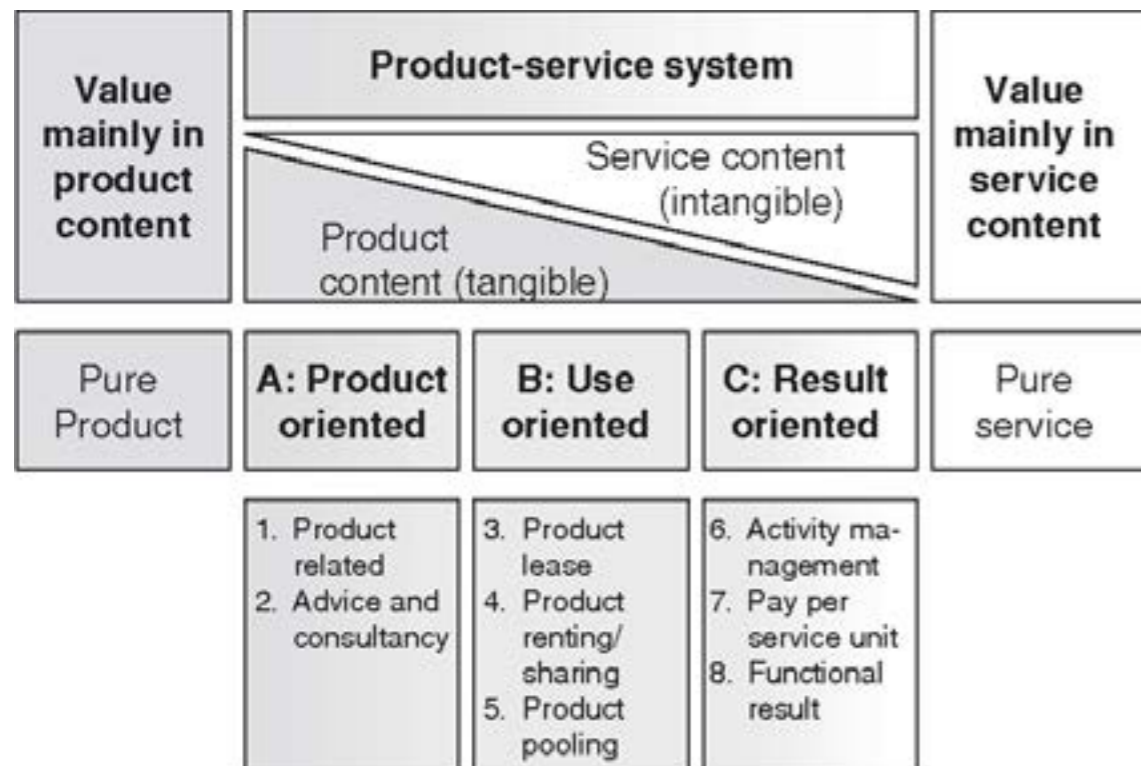


Fig. 3.7 | The Product-service system archetypes by Tukker (2004)

More specific in the efforts towards a circular economy, PSS can help companies to maintain control of the flow of materials and products. They also offer the potential to generate profit from materials and products over time with longer financial transactions. (Gaziulusoy & Twomey, 2014)

Limitations

There are also limitations to PSS. As explained, PSS have the potential to be environmentally beneficial, but not all PSS are so. PSS could also generate unwanted rebound effect, like users who do not treat their products with care, creating a shorter product life, than when it would have been their own property. PSS are also difficult to implement. They are complex to design, test implement and bring to the mainstream. This has to do with cultural barriers like customer's habits, corporate barriers like how a company's organization works, and there are regulative frameworks who form the regulative barriers. (Diehl & Christiaans, 2015)

CONSUMERS

For consumers, the benefits of PSS are that there is no investment/running cost needed, thus a lower financial commitment. Shared use makes products affordable and provides access for consumers with a lower income. Vice versa it can also result in a higher quality for the same price. In addition to that, the flexible services can deliver value through new functionalities better connected to the customer needs. (Diehl & Christiaans, 2015)

The consumer attitudes towards PSS's vary per product category and consumption model. For consumers, there is value in ownership and different PSS's have different levels of ownership. Ownership gives users the control and easy access that they want. Owning products is also a way to express oneself, thus consumers like possessing new, 'in fashion' products. (Tukker, 2015)

PSS'S AT ATAG

ATAG does quite well on Product Oriented service:

Warranty (8 years), maintain and repair. In their showroom they also provide service to customers to find the right appliance. However, this is mostly done by the retailers who are more in direct contact with consumers.

KEY INSIGHTS

To have a successful, sustainable and circular PSS, the system and the product should be designed and developed together. For that, another set of requirements is derived from this chapter.

Users need to be able to understand and use the new system with different types of ownership. In chapter 4, I investigate the user's attitude towards four circular business propositions based on PSS's.

Requirements

R3.2 The design must give ATAG the opportunity to gain control of the flow of materials and products.

R3.3 The design must add value to the user through service.

Wishes

W3.4 It is desirable that the design creates a closer relationship between ATAG and their customers.

3.5 | SELECTING PSS'S

This chapter describes the method of selecting the comprehensive set of four PSS's to research by answering the following relevant research questions:

What PSS's can be offered in kitchen appliances?

What PSS can be offered by ATAG and should be used to research user attitudes?

METHOD

The PSS archetypes by Tukker (2004) show how a different product-service-ratio creates a different value proposition (figure 3.7). I used it as a tool to explore the different possibilities for PSS's in kitchen appliances. Then, a comprehensive set of four PSS's is selected with three selection criteria:

1. There should be an opportunity for an intervention that ATAG can fulfil (based on R1.3), which excludes C2C interventions.
2. The PSS provides a private appliance to users for their own kitchen. (based on W2.1 and W2.2), because this is deemed more suitable for the target group of ATAG.
3. The set of selected PSSs should cover a wide range from Use Oriented PSS to Function Oriented.

RESULT

Using the archetypes resulted in a wide range of PSS's differentiating on the amount of service and level of dematerialisation. Appendix D.2 shows the results of that exploration. Four PSS's are now selected to be researched on user's attitudes. These are: private lease (Use Oriented), lease through the housing (Use Oriented), pay-per-use (Function Oriented) and subscription to meal service (Function Oriented). The latter one was added to be able to think out of the box, connecting the appliance with the oven.

In chapter 4, I investigate the user's attitude towards a refurbished appliance and these four circular business propositions based on PSS's.

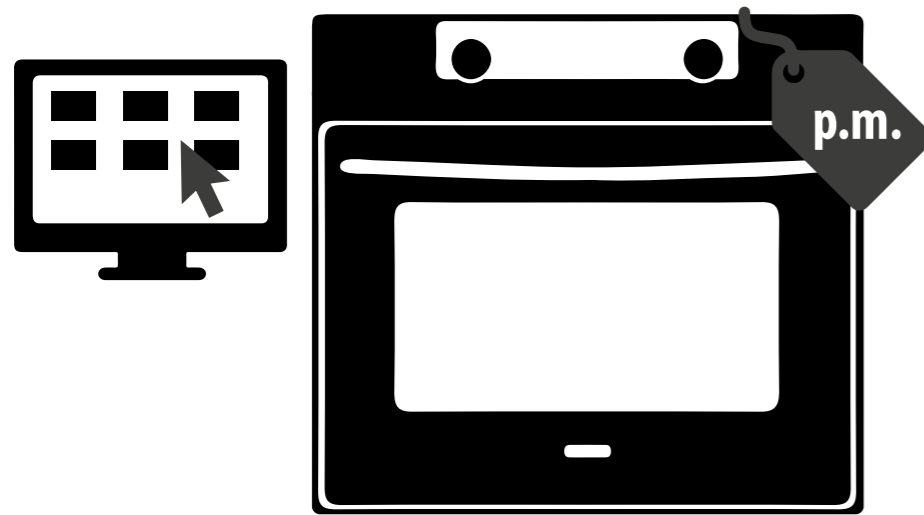


Fig. 3.8 | Private lease appliance. A Use Oriented PSS.



Fig. 3.9 | Appliance lease through housing. A Use Oriented PSS.

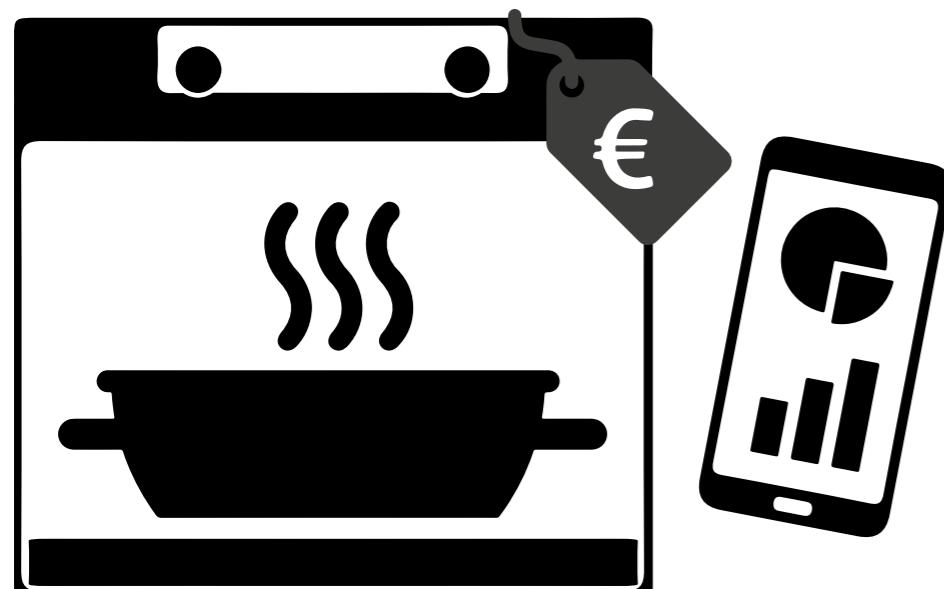


Fig. 3.10 | Pay-Per-Use appliance. A Function Oriented PSS

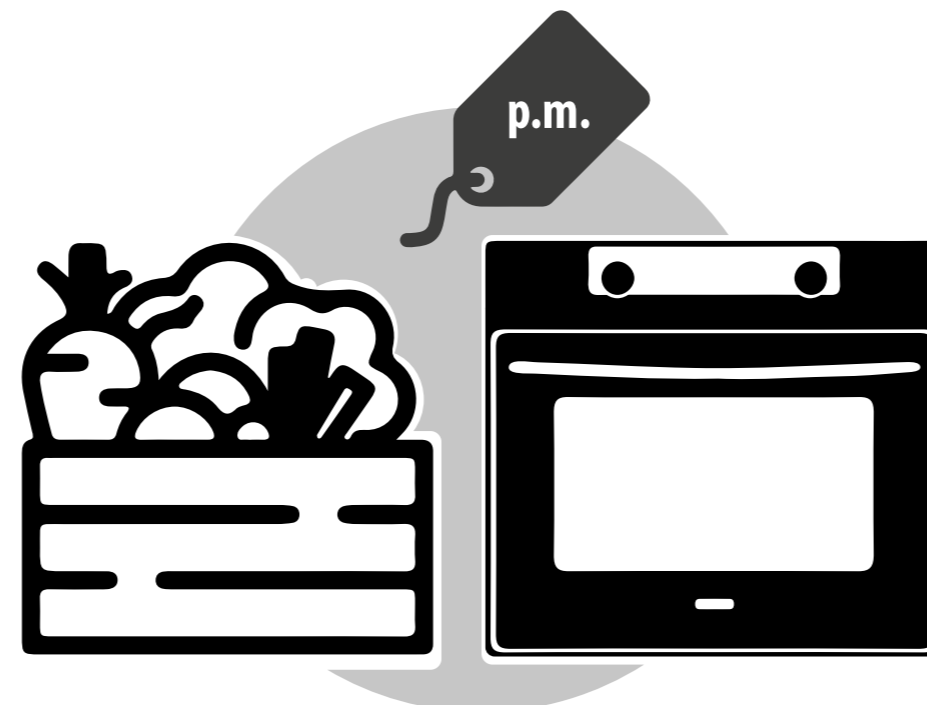


Fig. 3.11 | Subscription to meal service. A Function Oriented PSS.

3.6 | SELECTING A CASE STUDY

To enable interviewees to imagine the scenarios presented, it is best to pick one product category, because the interactions are different, and the attitude of a PSS depends on the product category (Tukker, 2015).

The relevant research question:

What product should be used as case study?

METHOD

First selection is based on the knowledge available at ATAG. ATAG Benelux is the competence center for the induction cooking hob, oven, extraction hood, and gas stove. Since a gas stove is unlikely to be part of a circular economy, I limit this project to the first three product categories.

Secondly, Tukker and Tischner (2006) identified characteristics of products for which a PSS typically will work. These are: the product is expensive, it is technically advanced, it requires maintenance and repair, is easy to transport, is infrequently used and not heavily influenced by trends. I score the three product categories relatively to each other on these characteristics in Appendix C.2.

Finally, because the this project is for the Master 's programme Design for Interaction, I rank the product categories on how interesting the use interaction is, which provides opportunities for redesign.

RESULT

The oven scores best on the characteristics of products for which a PSS typically will work, the induction cooking hob is second, and the extraction hood third. The difference is small.

The interaction of an extraction hood is minimum, because it is not very visible in a kitchen, and there is not many different usages for it.

In comparison to the induction cooking hob, the oven is a more controlled cooking space, where the user

can select many different settings and just leave it there. Usage of the oven is more complex with more options and the cleaning of it is more difficult.

The oven is therefore selected as case study for this project. The oven from the MAGNA design style is very suitable for redesign, also because it has an all-touchscreen interface, and the design team is currently working on a redesign for a new generation MAGNA ovens.

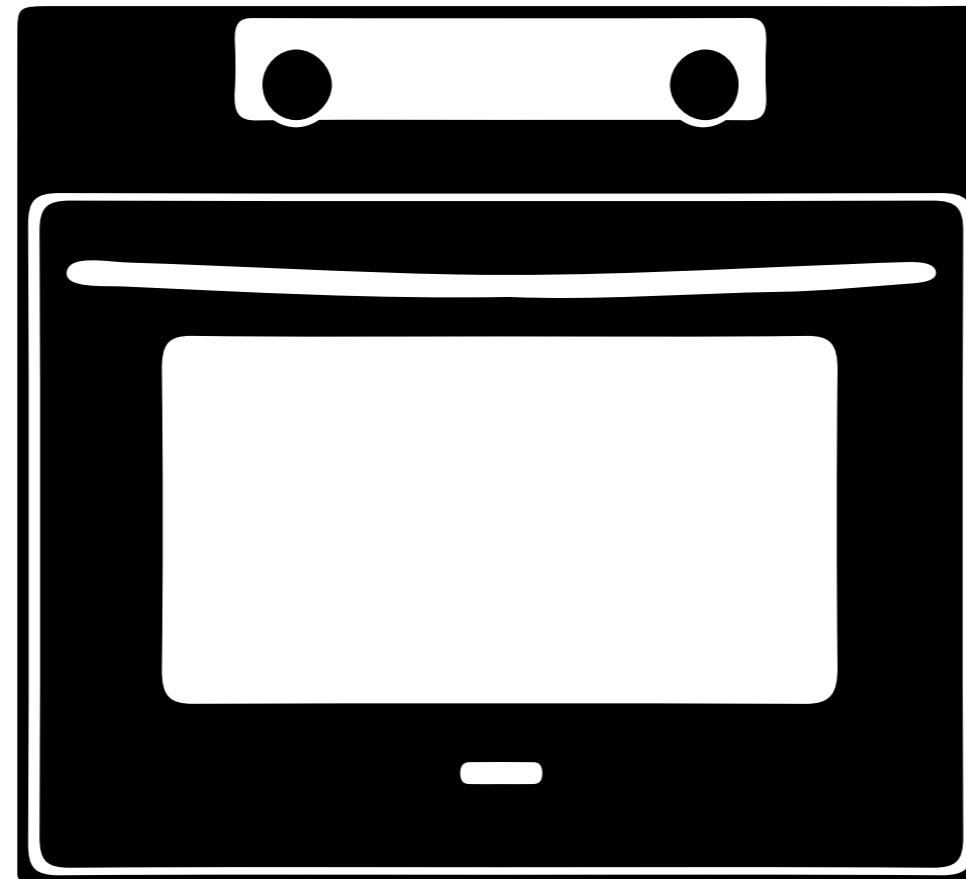
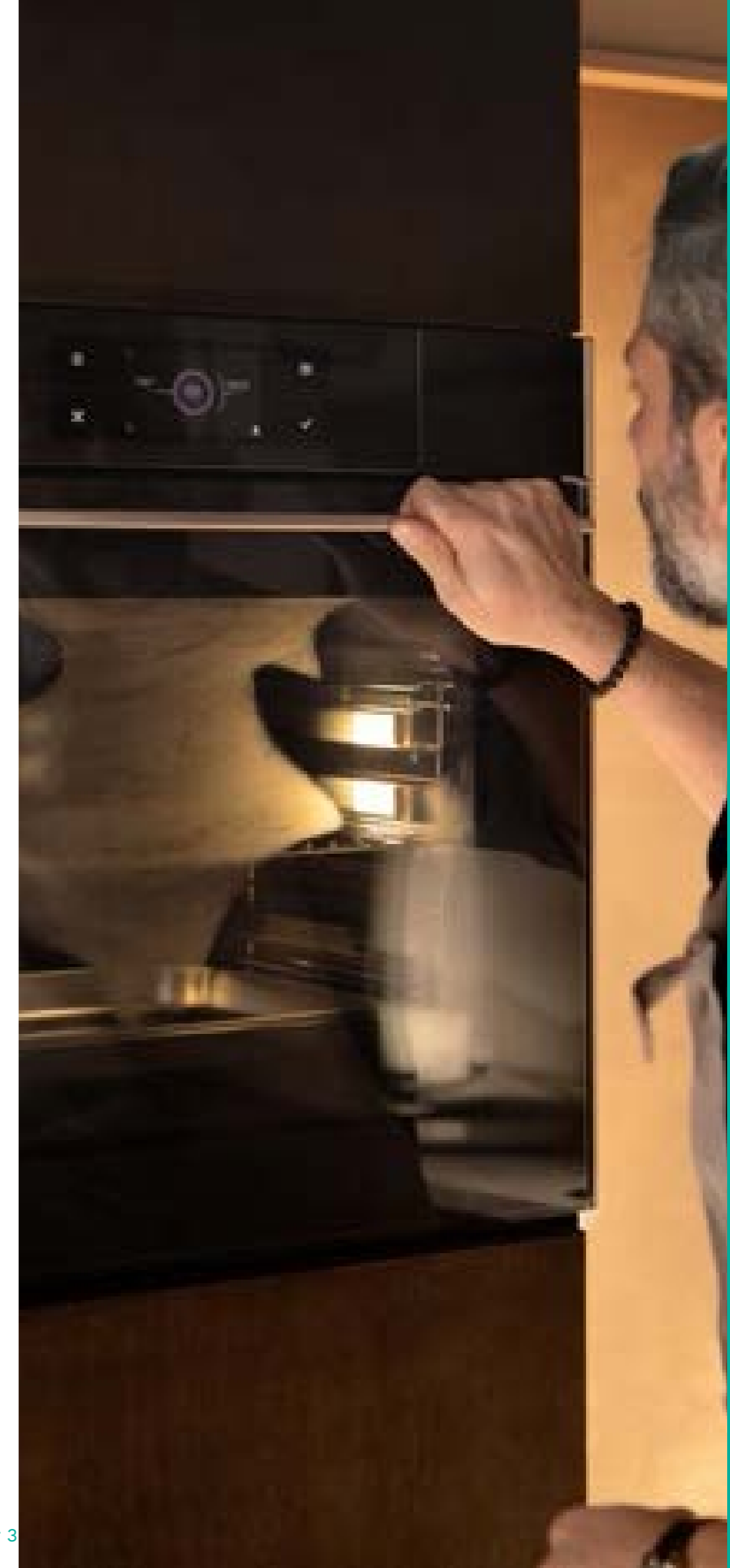


Fig. 3.12 | The oven is chosen as case study in this project



3.7 | CHAPTER CONCLUSION

This chapter has looked into circular economy and business strategies for it. A case study product and five circular business propositions have been selected to be researched in the next chapter.

The oven is chosen to be the case study of this graduation project. Having a specific product benefits finding concrete barriers and risks and benefits in user research, and it gives direction to design. The ovens of the MAGNA design are a good basis for a redesign, with its all-touchscreen interface.

Possible PSSs for ATAG to offer around kitchen appliances are private lease (Use Oriented), lease through the housing (Use Oriented), pay-per-use (Function Oriented) and subscription to meal service (Function Oriented).

Offering PSS's gives ATAG the opportunity to have a circular business model. In this case, at the heart of the business model being circular, is refurbishment of the appliances that come back. Refurbishment is not a PSS, but it is a circular strategy that captures the value of an appliance that cannot be used as it is anymore.

In chapter 4, these circular business propositions will be researched, exploring the user's attitudes towards these. This is to be done with a qualitative approach.

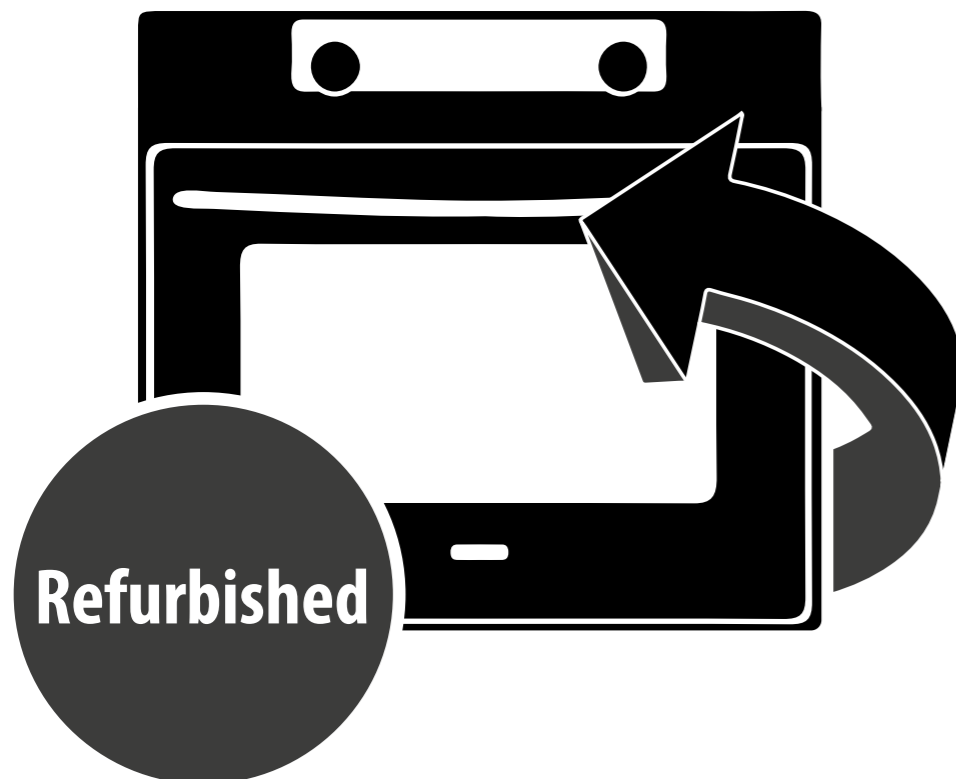


Fig. 3.13 | Visualisation of a refurbished oven

4

User research

This chapter describes the qualitative research to explore users' attitudes towards five circular business propositions. The results from that research show the barriers and the risk-benefit evaluation that go into the decision-making process of those. The chapter concludes with one selected to be developed further.

4.1 | PURPOSE AND METHODOLOGY

One major challenge in implementing a circular business model is the public's attitude towards these newer business models. To understand which circular approach would be best for ATAG, qualitative research has been done to determine what the target market's attitudes towards different models are.

4.1.1 | QUALITATIVE APPROACH

A qualitative approach fits this explorative objective of the study: To explore the user attitudes. Similar to Armstrong et al. (2015) and Edbring, Lehner & Mont (2016). There is potential to later validate the findings of the explorative study, by doing an additional quantitative analysis, like Lang (2018). However, in the scope of this graduation research, the qualitative research is more important, to understand the user's attitudes and design for user acceptance.

In-depth interviews

The user's attitudes are researched through in-depth interviews. In-depth interviews are also often used to explore user attitudes. In-depth interviews is also an example of an open approach. An open approach is favourable over a close-ended method (e.g. questionnaires), because it allows exploration grounded in factors brought up by participants (Rexfelt & Ornäs, 2009). Focus groups would be favourable to research the user's acceptance, like Armstrong et al. (2015) and Rexfelt & Ornäs (2009). However, the individual way of the in-depth interview seemed more suitable for distant research, taking the current corona-measures into account. The interviews were done through online video calls.

RESEARCH QUESTIONS

1 | Which alternative mode of consumption has potential for future implementation in ovens of the brand ATAG?

1.a | What are the attitudes of users in the ATAG target group towards alternative modes of consumption?

1.b | What are the drivers and barriers in their choice for alternative modes of consumption?

1.c | What risks and benefits do people perceive?

1.d | What is the difference in user attitude for home renters and home-owners?

1.e | What pricing strategy would be suitable/have most potential?

4.1.2 | SCENARIOS

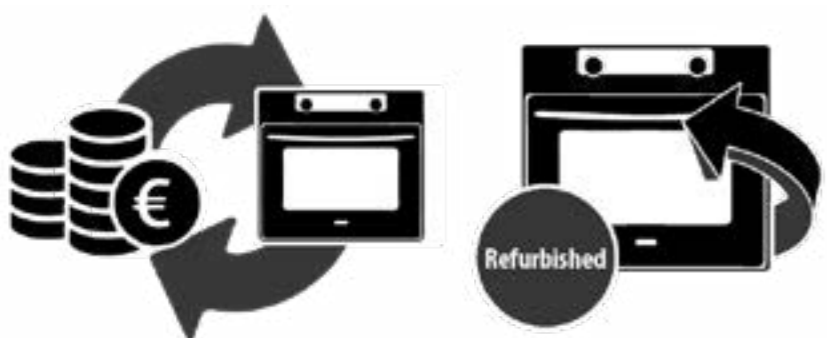
The study focuses on refurbishment (Product), private lease (Use Oriented), lease through the housing (Use Oriented), pay-per-use (Function Oriented) and subscription to meal service (Function Oriented).

In developing the scenarios, a blended scenario was also discussed. This would mean a lease of the appliance, with pay-per-use for certain less used functions. It is decided to keep that one to the side and

bring it as primary input into the interviews, to be able to make a clear distinction on the attitudes to the two separate principles. Below you can find the final scenarios, with visual and descriptions. These slides served as material during the interviews, which is why they are in Dutch. A sixth slide showed the title and visual of all five, for the part in the interview where the scenarios are compared.

In the development of the scenarios, I tried to keep the descriptions short, and present the scenarios as retail concepts, like in an advertisement, but staying neutral on benefits. The descriptions use only moderate specificity to allow participants in the evolution of the idea based on their own needs and habits.

1. Refurbishment

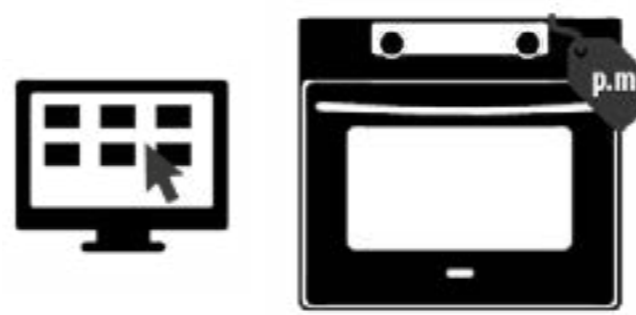


U kunt uw oven terug verkopen aan de fabrikant. De prijs die er voor uw oven betaald wordt hangt af van een aantal factoren. Onder andere de originele aankoopprijs en de leeftijd van de oven. Het terugkoopbedrag kan ook korting voor een nieuwe oven zijn.

Bij de aankoop van een nieuwe premium inbouwoven, kunt u kiezen voor een refurbished oven.

Een refurbished oven is een gebruikte oven, die is ingezameld, gerestaureerd, gereinigd, geüpdatet en opnieuw verkocht door een professioneel bedrijf.


2. Private lease oven



Lease een premium inbouwoven en betaal een periodiek bedrag. Installatie, reparatie en onderhoud is inbegrepen, dus geen onverwachte kosten. De prijs hangt af van de duur van de lease en het type oven. Als de oven helemaal kapot gaat, krijgt u een nieuwe. De oude wordt dan meegenomen.

Het kan hierbij ook gaan om een refurbished oven.


3. Lease via huisvesting



Bij de huur van je woning zit ook de lease van een premium inbouwoven. Je betaalt hier een periodiek bedrag voor. Installatie, reparatie en onderhoud is inbegrepen, dus geen onverwachte kosten. Als de oven helemaal kapot gaat, krijgt u een nieuwe. De oude wordt dan meegenomen.

Het kan hierbij ook gaan om een refurbished oven.

4. Betaal-per-gebruik oven



Per keer dat je de premium inbouwoven gebruikt, betaal je een bedrag. Installatie, reparatie en onderhoud is inbegrepen, dus geen onverwachte kosten. Als de oven helemaal kapot gaat, krijgt u een nieuwe.

De prijs per gebruik is afhankelijk van de gebruikte functie en de duur van het gebruik.

Krijg inzicht in je gebruik via een app. Hiermee kun je ook de betalingen regelen.

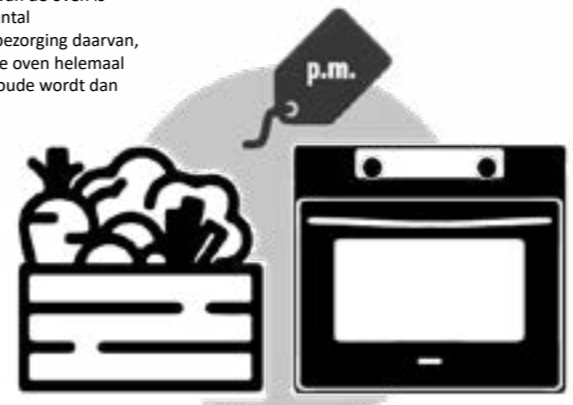
Het kan hierbij ook gaan om een refurbished oven.

5. Abonnement op maaltijd


Betaal een periodiek bedrag voor zowel een premium inbouwoven als een boodschappenservice.

Installatie, reparatie en onderhoud van de oven is inbegrepen, evenals een bepaald aantal maaltijdboxen met recepten en de bezorging daarvan, dus geen onverwachte kosten. Als de oven helemaal kapot gaat, krijgt u een nieuwe. De oude wordt dan meegenomen.


Het kan hierbij ook gaan om een refurbished oven.




1. Refurbishment




2. Private lease



3. Lease via huisvesting



4. Betaal-per-gebruik



5. Abonnement op maaltijd




Figure 4.1 | Scenarios with visual and description

Figure 4.1.f | Slide used for interview part where scenarios are compared

4.1.3 | PARTICIPANTS

For this research, I aimed to recruit participants that are within the target group of ATAG. Based on talks with the supervisors and other documents provided by ATAG, I created this list of characteristics that determine whether someone is in the target group of ATAG:

Targeted participants	How this was achieved/defined
Identify themselves as Cooking enthusiast. (relate with 'I love to cook')	The social media post was aimed for cooking enthusiast.
Dutch and living in The Netherlands.	All communication was in Dutch.
Above average income.	The average annual income for the year 2018 was €29.500 (CBS, 2019).
Home-owner, or the more expensive rental homes.	In 2019, the maximum rent for social housing was €720 (woonbond, 2019) and the average rent was €775 (gemiddelden.nl, n.d.). In discussions, over €900 rent seemed a good estimate for a higher-segment rental home.
Have kitchen appliances of ATAG or a direct competitors (Miele, Gaggenau, Neff or Siemens) in their kitchen.	These last two characteristics were abandoned because they were deemed non-essential.
Home-owners: Preferably should have been looking at kitchens before.	

4.1.4 | PROCEDURE

- Recruit participants through online questionnaire.
- Plan interviews. Let them accept consent and terms and conditions.
- Exercises/sensitizing questions in an online questionnaire. Questions include the concepts, which are explained here with visualised scenarios.
- Have semi-structured in-depth interviews.

Recruit participants

Participants are recruited through a selection-survey. To call for respondents, this survey was shared alongside a descriptive text and an image to attract attention. It was posted on the personal social media page of the researcher and the company page of the company. For the purpose of obtaining participants who are in the target group of ATAG, the post called for people who like cooking and find good kitchen appliances important. It was decided to not mention sustainability or circular economy, because that would attract different participants with different attitudes towards kitchen appliances. In a second re-post it

was decided to add that tenants in the private rental sector were still needed.

Plan interviews

In the selection survey, respondents were asked for important values around cooking, about their current kitchen appliances, their housing situation and annual income and contact details for planning in the interview. Within some days after they filled in the questionnaire, the respondents got an email with more information on the research including confidentiality of the data and the purpose of the study. In the email was also the consent form for them to sign, and a proposed date and time for the interview.



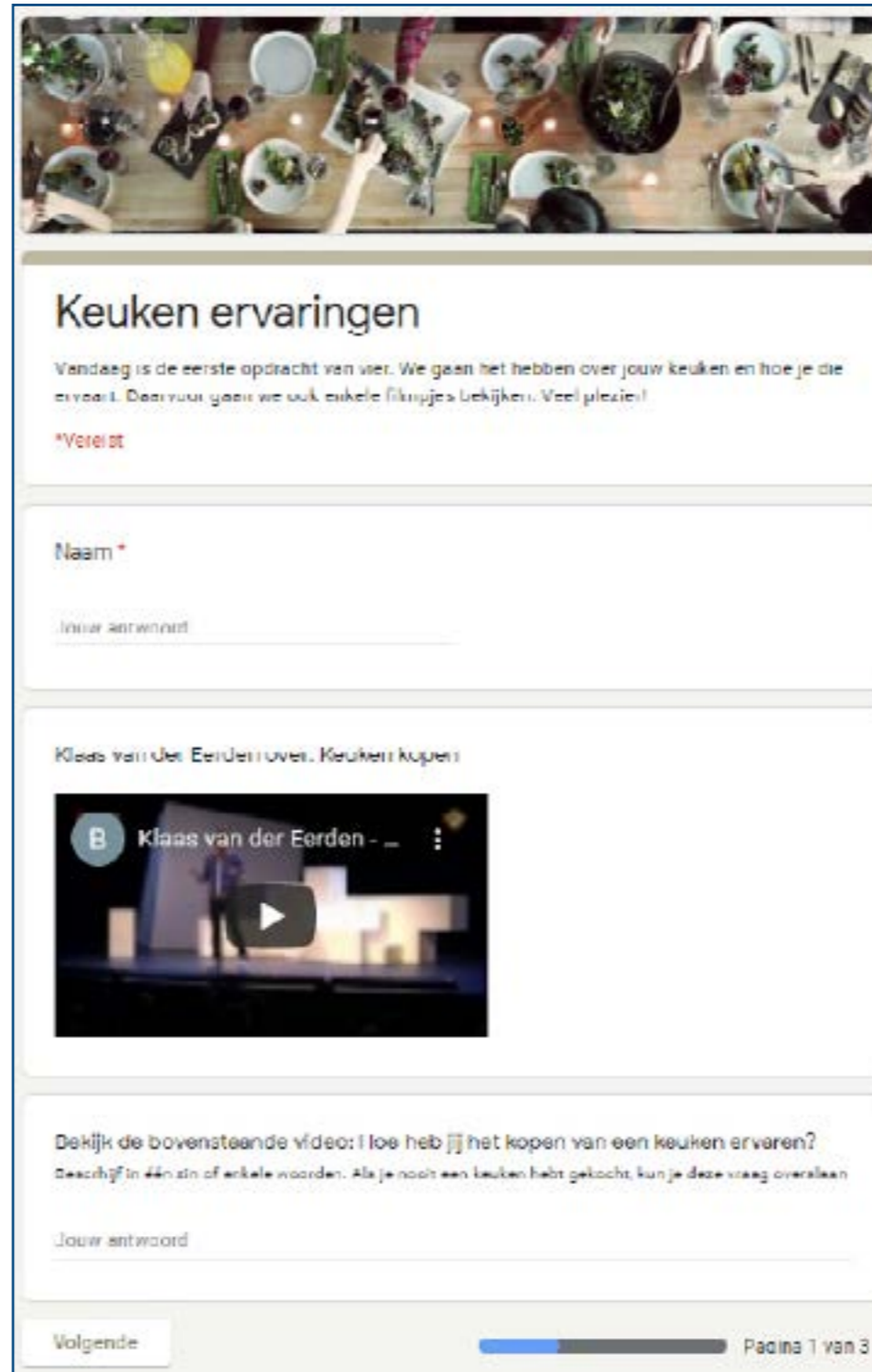
Figure 4.2 | Social media posts recruiting for participants

Pilots

Before the study was executed, two pilots were done with friends who are close to the target audience. This resulted mainly in adjustments in the sensitizing questions, interview guide and the communication emails to the participants.

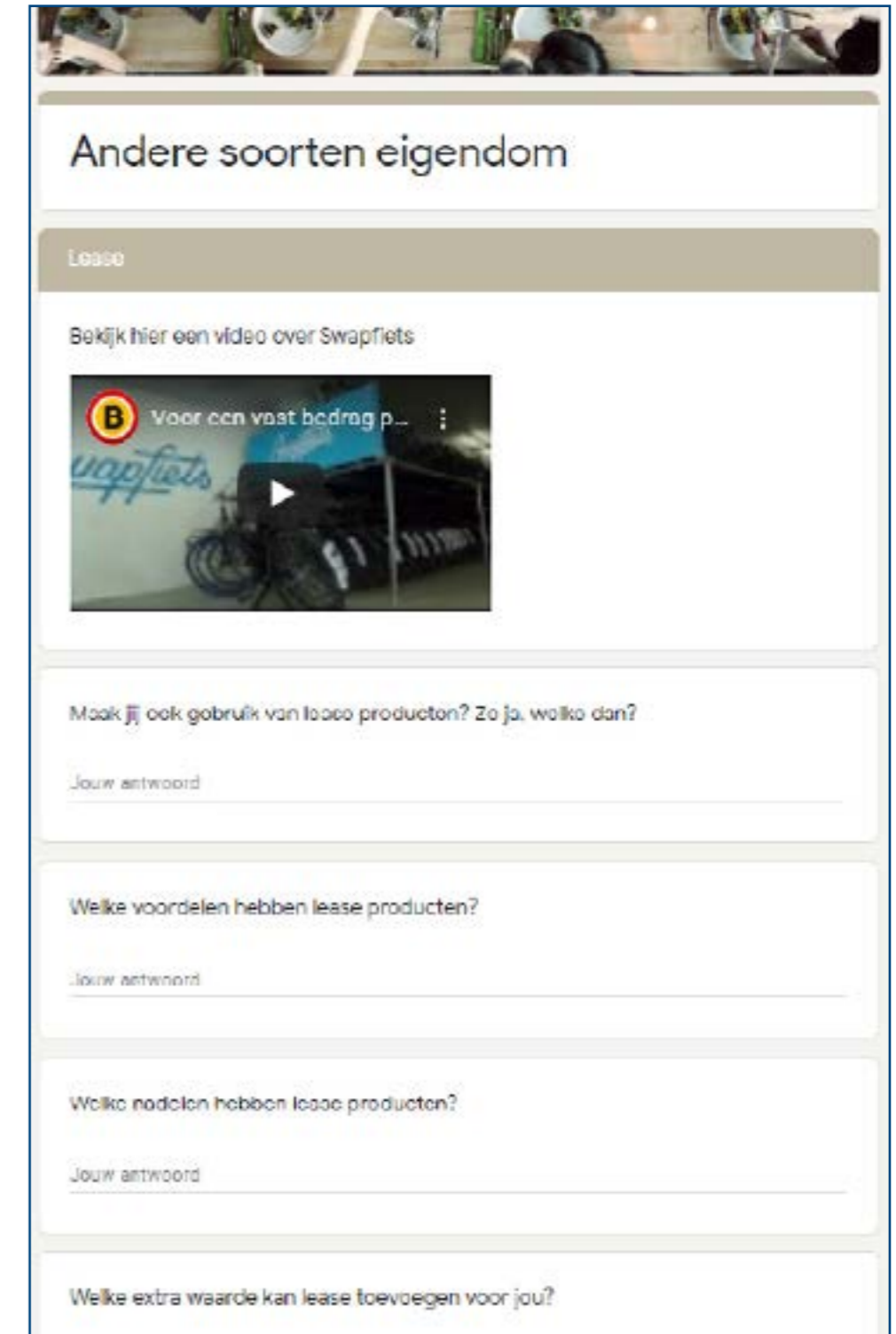
Exercises/sensitizing questionnaires.

In the week before the interview, the participants got four digital questionnaires they had to fill out. These were designed to trigger prior experiences to facilitate the expression of underlying motivations later in the interview. The first questionnaire was about kitchen experiences: asking about their current kitchen, and showing a video of IKEA's concept of the future kitchen. The second questionnaire went more into their oven and kitchen appliances. The third questionnaire was about the end of life of their kitchen appliances and they watched a video of Circular Kitchen. The fourth and last questionnaire was about different types of ownership. Participants were asked to watch videos of refurbished phones (Leap), lease bikes (Swapfiets) and pay-per-use elevator (Mitsubishi) and after each video there were some questions.



The screenshot shows a digital questionnaire titled "Keuken ervaringen". At the top is a header image of a dining table with food. Below the header, the title "Keuken ervaringen" is displayed. The introductory text reads: "Vandaag is de eerste opdracht van vier. We gaan het hebben over jouw keuken en hoe je die er voor is. Daarvoor gaan we ook enkele filmpjes bekijken. Veel plezier!" followed by a red asterisk and the word "Verplicht". There is a text input field for "Naam *". Below that is a video player showing a presentation slide titled "Klaas van der Eerden over: Keukens kopen". The video player has a play button and a progress bar. Below the video, there is a question: "Bekijk de bovenstaande video: Hoe heb jij het kopen van een keuken ervaren? Beschrijf in 400 stin of enkele woorden. Als je nooit een keuken hebt gekocht, kun je deze vraag overslaan." followed by a text input field for "Jouw antwoord". At the bottom, there is a "Volgende" button and a progress indicator showing "Pagina 1 van 3".

Fig 4.3 | Screenshot of part of sensitizing questionnaire #1



The screenshot shows a digital questionnaire titled "Andere soorten eigendom". At the top is a header image of a dining table with food. Below the header, the title "Andere soorten eigendom" is displayed. There is a section for "Lease" with a video player showing a video about Swapfiets. Below the video, there is a question: "Maak jij ook gebruik van lease producten? Zo ja, welke dan?" followed by a text input field for "Jouw antwoord". Below that is another question: "Welke voordelen hebben lease producten?" followed by a text input field for "Jouw antwoord". Below that is a third question: "Welke nadelen hebben lease producten?" followed by a text input field for "Jouw antwoord". At the bottom, there is a final question: "Welke extra waarde kan lease toevoegen voor jou?" followed by a text input field for "Jouw antwoord".

Fig 4.4 | Screenshot of part of sensitizing questionnaire #4



Fig 4.5 | Interview with Jess&Daniel (H4)



Fig 4.6 | Interview with shared screen, with Chloe (E3)

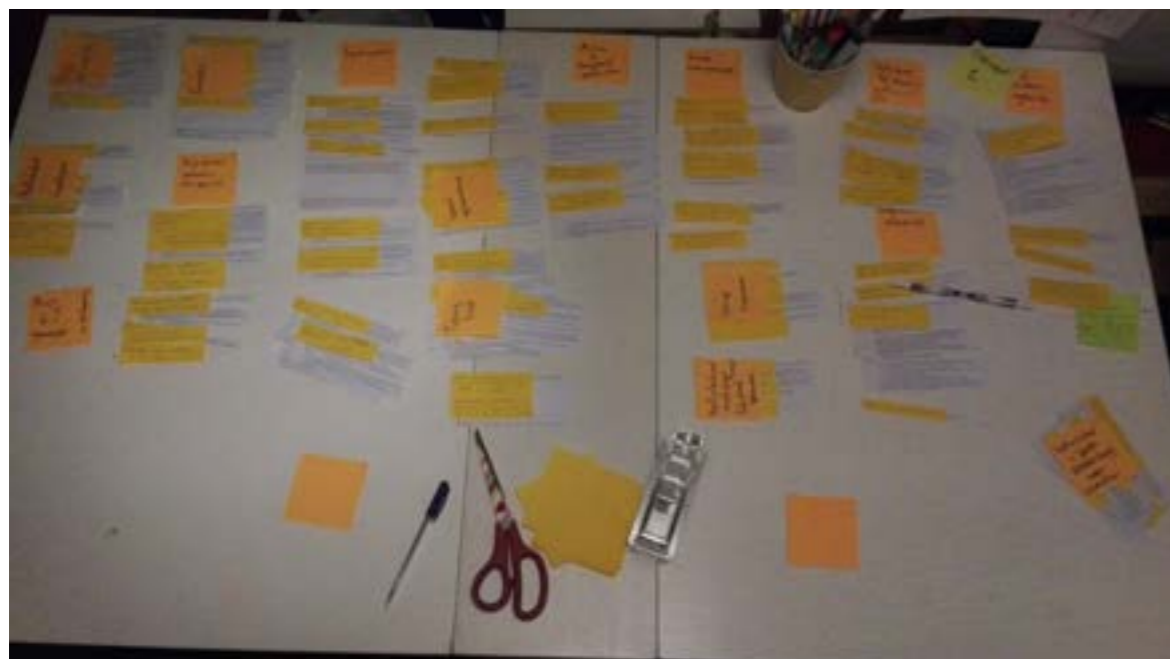


Fig 4.7 | Data analysis with coded parts of transcripts on the table

Semi-structured in-depth interviews

Based on literature synthesis and the research objectives, an interview guide was developed. This interview guide acted as flexible framework to perform individual semi-structured interviews of approximately one hour. The interviews were all executed through video call, where participant and researcher could see each other, and the researcher could share her screen to show visual aid for the questions in the interview. The conversation started with a check of the consent form and an introduction about the procedure after which participants could ask questions. The actual interview started with a question about participants' experience from the preparation exercises. The main part of the interview covered the five scenarios one by one. The researcher shared her screen, showing the scenario they were talking about at that moment. Per scenario the interview covered issues regarding personal beliefs about that scenario, how use of the product might change, motivations to purchase or not, possible changes that would make the presented scenario more attractive, and pricing strategies of the scenario. After the five scenarios, participants were asked to compare them and rank them on which one is most to least realistic, and which one they would consider to not at all. The interview concluded with a discussion on whether some scenarios can be combined into one.

Data analysis

The interviews were recorded, transcribed and analyzed using thematic analysis. This analysis approach fitted the open and explorative character for this study and provided a structure for discovering patterns and generating insights (Weelden, Mugge & Bakker, 2016). The interview transcripts were first organized by scenario discussion, allowing the researcher to identify how themes were being discussed in reference to the different types of PSS explored. To uncover similarities, themes and categories in the data, the transcripts were cut into fragments according to individual topics, coded and then grouped according to overarching themes. This process was executed in several multiday workshops, comparing topics, re-reading and grouping themes.

4.2 | RESULTS

4.2.1 | PARTICIPANTS

This study had twelve participants. Appendix D.1 shows all participants. For anonymization in this report, the participants were given a code, a fictional name and a fake profile picture. The letter in the code shows their living situation, based on the Dutch words 'huurder' and 'eigenaar'. In this study participated 4 renters (H1-4) and 8 home-owners (E1-8)

Most interviews were done individually, except for Jess&Daniel (H4), which was a couple counted as one participant. Carmen (E1) and Celine (E4) were in one interview together as well, but did not know each other. All participants live in The Netherlands and were Dutch, with exception of Peter (E5) who is Belgian. In the selection-survey, respondents could select their annual income. Most participants had an annual income of over €40k. Peter (E5) and Max (H2) have an income of €20-30k, and Jess&Daniel (H4) have an income of €30-40k.

During recruiting it turned out difficult to find participants who rent and have an income over €40k. So both these factors were taken more flexibly for the renter. In the selection-survey, respondents could select whether they live in a owner-occupied house, in a rental home under €700p.m., in a rental home €700-€900 p.m. or in a rental home over €900 p.m.



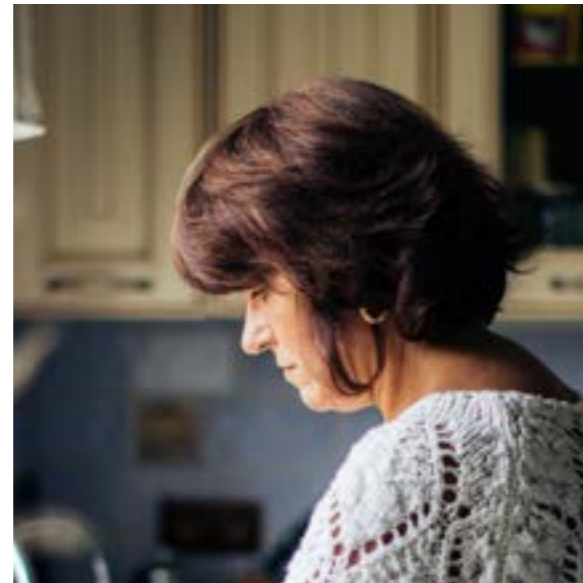
Ella [H3]



🏠 Huurwoning, >900e p.m.

Keuken zat al in de woning, maar oven niet.

🔥 ivm huurhuis geen dure oven
🔥 Gebruikt de oven 1x per week. En de magnetronfunctie 5x per week.
3jr oude combimagnetron van Samsung.



Celine [E4]



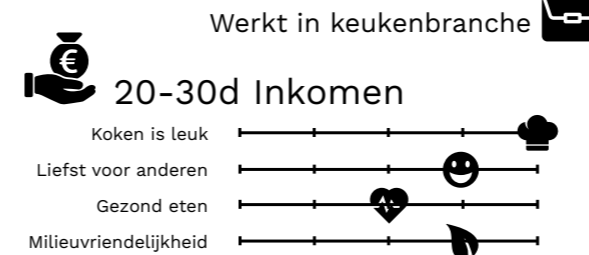
🏠 Koopwoning

Keuken is handgemaakt en naar eigen wensen ingericht. Wil graag logische route en alles op een vaste plek. Zit graag aan de eettafel in de keuken voor natafelen of krant lezen.

🔥 Oven is eenvoudig en gezond
🔥 Gebruikt de oven 5x p.wk.
Celine gebruikt haar 5jr ouder oven dagelijks. Gezin met twee kids, die soms wel, soms niet, soms met vriendjes thuis komen eten, dus moet heel flexibel zijn.



Peter [E5]



🏠 Koopwoning

Heeft keuken zelf ontworpen en de nieuwste apparaten erin geplaatst voor goedkoper dan winkelprijs. Doet alles graag in de keuken, van simpel koken tot uitgebreid experimenteren.

🔥 Wil de nieuwste snufjes
🔥 Gebruikt de oven 3x p.wk.
Wil graag de nieuwste technologieën hebben in zijn apparatuur. Een oven moet gebruiksgemak en ontelbare mogelijkheden bevatten. Peter gebruikt de oven voor allerlei dingen: van gastronomisch koken tot iets makkelijk bakken. Oven is 2jr oud.

Fig 4.8 | Three out of the twelve participants with fictional name and fake profile picture

4.2.2 | REFURBISHMENT

This page shows the perceived barriers, benefits and risks perceived by participants for a refurbished oven. Here are the strongest insights:

Financial benefit vs performance risk

The most important consideration is the financial benefit vs. the performance risk and financial risk. Refurbished products are perceived to have a shorter product life, which can result in having to buy a new one sooner than expected.

Lack of newness

Another strong result was that a refurbished oven is never a new oven. Some participants want the newest oven, with the newest functions.

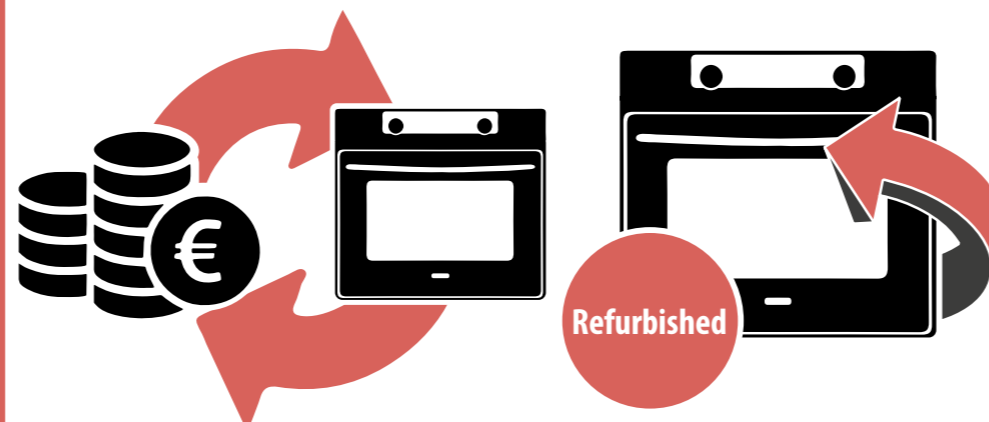
Environmental benefit

During the part in the interview where participants were asked to compare the scenarios, the environmental benefit came out stronger than in the main part. So when comparing the scenarios, only the refurbished oven was perceived as better for the environment.

Hygiene

Hygiene was expected to be a barrier, but participants seem to have a good understanding with refurbishment and trust that that would not be an issue.

Refurbishment



Use

All participants expect that their use of a refurbished oven would not be any different in relation to any other oven.



Barriers

Lack of thrill of newness

Refurbished ovens will not have the newest functionalities that are on the market. Some users want the newest oven to get new functionalities, or because the previous purchase was a long time ago.

Visual appearance

Design can be outdated and not match the current trends.



Benefits Risks

Financial benefit

Users expect that a refurbished oven is cheaper than a new one.

Performance benefit

One would be able to get a better oven for the budget.

Better than second-hand

Refurbished oven has higher performance than second-hand products and the professional company will also offer services like installing and warranty.

Environmental benefit

Refurbishment means reuse of materials and resources. This is perceived as better for the environment and reducing the waste of material. Refurbishment is therefore also perceived to be for idealistic people.

Absence of undesired features

Some participants expressed to not need the newest functionalities. They like to have an oven with simple functions.

Performance risk

Refurbished is perceived as inferior functionality or short lifetime. Participants mention that the refurbished oven needs to have similar functionalities to a new oven. It should perform as well as the new one. Also, the lifetime should be as long, or a similar lifetime should be ensured by the company.

Financial risk

Price should be in proportion to the extended shorter lifetime. That is why participants want to pay less for a refurbished oven than the new one. If the oven needs to be replaced earlier than expected, this ends up being more expensive, creating a financial risk.

Environmental risk

One participant mentioned that because it is an older appliance, the oven might be less energy-efficient than a new oven. This is impossible to compare for users. So they want the company to assess whether refurbishment actually creates an environmental benefit or not.





Factors influencing risk-benefit perception

Personal Contextual

Familiarity with 'refurbishment'

All participants know about refurbished products in other product categories. Those are mainly phones, but also laptops and headphones are mentioned. The experience with those refurbished product in other categories influence the attitude towards refurbishment of ovens. Some participants also compare refurbished products to second-hand.

Living situation



For the purchase/budget of an oven, people take into account how long they will be living in their current home. If expected to live somewhere only for a few years, budget for an oven is lower.

Ability to assess

Participants want to be able to assess for themselves what the risks and benefits are.

Warranty and service

Warranty is required for a refurbished oven. It helps to ensure performance and lifetime of the oven. Service/warranty should also include that spare parts are available for a while after purchase. Some participants want the warranty period to be as long as the warranty of a new product, but most participants expect it to be shorter, varying from one-third to the full length of the original warranty period.



Price

For a refurbished oven, participants would pay 75% of the price of the same oven new.



Information provision

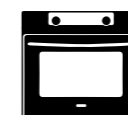
Brand image

Brand-connected refurbishment creates more trust in the refurbishment process and is expected to offer better service.

New to market

Some participants want to read/hear other people's experiences by reading reviews and be able to compare offers before purchasing. This way they can assess the risks.

Product-related



Use history

Some participants mention they want to know the age of the oven. This way they feel enabled to assess the performance risk themselves. For this they not only want the age, but also want to know how many hours it has been used, similar to the mileage of a second-hand car.

Product appearance

The oven should not have visual defects or scratches. Some also say they are okay with some scratches, but would like to see the oven before purchasing so they can assess whether the scratches are acceptable or not.

Warranty

For the risk-benefit perception, people want to have security that the oven will function for the period that they want it to. Warranty is essential for the company to show trust in its refurbishment process.

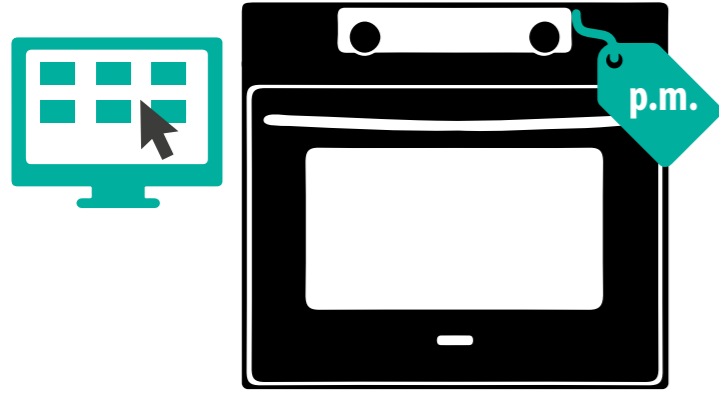
Use history

People also want to be able to assess for themselves. So they want to know the age and use history of the product, or have knowledge on all dents and scratches on the oven.

Price

Participants want to pay around 75% of the price of a new oven.

Private lease



Use

Most participants expect that their use of a private lease oven would not be any different in relation to any other oven.



Barriers

Desire for ownership

Participants recognise that with lease they would not be the owner of the products. Ownership has a value on its own. One participant expressed particularly that owning the product is not a requirement.

Standardisation

With lease a more standardised oven would be on offer, and personalisation or customisation options are expected to be limited. Functionality is very important in choosing an oven and some are essential to certain target groups, like disabled users.

Burden of payment

When paying in once, the payment is done, and there is no need to think about it anymore.

Distrust in company/dependency on company

A lease contract makes users more dependant on a company. A good customer relationship and trust in the lease provider is a requirement for success.



Benefits Risks



Flexibility

Lease is generally for shorter term, therefore it becomes easier to change oven when kitchen preferences or household compositions change, e.g. due to (growing up) children.

Short term

Leasing can be used when living somewhere only for a short period of time or to replace a broken oven when a move is coming up in the near future. The lease oven, however, would not be taken along to the next house. It would also be favourable to have a lease without minimum contract time. Or one year would be okay, because rental homes most of the time also have a minimum of one year.

Newness

After around five years, when a new appliance is launched to the market, it is possible to switch. That way users can always have the newest appliance.

Low burden of ownership

In lease, a defect to the oven would not necessarily be the problem of the user, more of the company. This results in less stress. However, it also results in a lower sense of responsibility, which is why participants expect they or others might misuse leased ovens more.

Guaranteed performance

with lease users have the security of having a working oven available for the full length of the lease period.

Financial benefit

The monthly price and included service and maintenance results in clear costs of ownership. Users also do not have to come up with the whole sum to pay in once. So users who do not have the money at the moment can still purchase an oven. Users may want to keep some savings for unforeseen circumstances or for vacation. Also it can help finish the kitchen after an already expensive move/remodelling. However some participants consider the price of an oven to be too small to not be able to pay it in once.

Financial risk

Lease is over time more expensive than buying in once. Some participants find it irresponsible: Lease is not for people who live economical or treat their appliance with care. If you cannot afford it, you should not purchase it, especially not through lease. One participant also said she would lose control over her expenses. Some others point out that there is a risk in having fixed monthly rates when financial situation is not stable (like when you might lose your job). With lease users also feel like they pay collectively for the service, so there is a risk of paying for others who do not treat their appliances with care. The contract should include something like a fair-use policy.

Performance risk

When preferences change, you are stuck with the lease contract you have.

Risk of decreasing value of the house

Lease contracts on kitchens (appliances) can decrease the value of the house, because new owners might not want the lease contract.

Responsibility/accountability

If something is wrong with the appliance, users would less likely try to fix the problem themselves, because they are afraid to make the problem worse or lose the warranty on the product.

Social risk

The mechanic could tell the user off that they have not been using/maintaining the oven correctly. Also a few participants say they would use the oven with more care, because you give it back to the company.

Environmental risk

Because lease tends to attract more misuse, one participant mentions this creates more waste.



Factors influencing risk-benefit perception

Personal Contextual

Familiarity with lease

Private lease is known from cars, but is also associated with bikes, phones and central heating of a house.

Living situation



When considering purchasing an oven, the housing situation is taken into account and the possibility of taking products to the next house. Most users do not plan to take their oven to the next house, especially because they do not know about availability of an oven in the next house.

Financial stability

The user's personal financial stability is important for being able to pay the fixed monthly rate or not being able to pay full price in once.

Warranty and service

With an oven the benefit of service and maintenance is considered small, because users clean the oven themselves already to keep the daily use hygienic, other maintenance is not deemed necessary (not like a washing machine or coffee machine), ovens do not break or require maintenance that often (not like dishwashers). If an oven breaks down, it is not a big problem (not like fridge/freezers or dishwashers). Also, having to let a mechanic in your house once a year can be a burden, especially if the perceived benefit of the maintenance itself is small.

Price

Six participants find 10-15 euros per month a good price, talking about a 1000euro oven, with a product life of 10 years. Two participants say 30 euros per month would be a reasonable price. Others have a different way of reasoning: to have the whole oven paid in 3, 4 or 15 years.

Financial assessment

Costs have to be clear so they can be compared.

Lease period

The period of the lease is in some cases briefly mentioned and 5 years is a reasonable period. Longer than that, it is more beneficial to buy the oven, shorter than that the oven would barely be paid for, or be too expensive. Users also like to know what happens after the lease period.



4.2.3 | PRIVATE LEASE

Lease is expensive

The strongest considerations here are about finances. Almost all participants said that lease is expensive.

Maintenance is not added value

The added benefit of maintenance is very limited for an oven, because an oven does not require much maintenance, other than the daily cleaning.

Short term

The strongest benefits of lease are related to the fact that it is short term and you can be more flexible with it. This can be questioned, when you are talking about ovens that are part of a kitchen or house which are not for short term either.

Always newest oven

This also resulted in the noticed opportunity to always have the newest type of oven with the newest functionalities.

4.2.4 | LEASE THROUGH HOUSING

Monthly payment

Lease through housing made more sense to participants than private lease. This can be because a built-in oven is seen as part of the kitchen, part of the house. If the costs for it are also part of the rent with the same monthly payment, this makes more sense.

Decision maker

However, it is unclear here who the decision maker is. Normally the landlord decides, but to some participants this scenario automatically implies that the tenant will have a say in which appliance is chosen.

Lease through housing



Use

The use of the oven is dependent on the functionality of the oven. Having an oven that does not match personal preferences can make cooking and baking less fun or pleasurable and participants then expect to use the oven less frequently. Most participants expect that their use of the oven would not be any different, with the exception for one who said she might be more sloppy with the oven, or one who said she might clean the oven more, because it belongs to someone else.



Tenant vs landlord

Conflict in decision making

The landlord is in general the one deciding what kitchen and what appliances are placed in the rental home. Some participants say it is the landlord's responsibility to make sure there is a kitchen, so it should not be through a lease contract or in the service costs. The kitchen and the appliances should be included in the rent, and the landlord should also arrange the replacements of the appliances.

In some cases the tenants get a say in what goes into the kitchen, when it is being renovated/replaced. With an additional payment the tenant can pick more expensive appliances.

Asking permission

In other cases, tenants can go to the landlord to ask for an upgrade or for permission to arrange an upgrade themselves. This however is an extra threshold for the tenants, and it might result in conflict if the landlord does not agree.

Tenants getting their own oven

Some participants also say they would not just replace the oven that is already in the apartment, because through rent, you pay for everything in the apartment, and you do not want to add your own appliance if you already pay for one.

Attitudes towards being able to choose an oven

Choice

Most participants expect to not be offered a choice in what type of oven they have in their rental home. Some others expect to have a choice in what oven as soon as when the scenario is read. The fact that they have a say in what type of appliance is placed in their kitchen is perceived as a benefit.

Barriers

of being offered a choice



Logistical barriers

How do you arrange different models of appliances in one package deal? A landlord most of the times has more houses, or (a) whole building(s). They choose one type of oven for all the houses.

Financial risks for landlord

Rent-term is most of the times shorter than the lifetime of the oven. The next tenant can decide to have something else.

Low added market value.

Having a choice for oven/kitchen would not be taken into consideration when looking for a rental home.



Benefits

of being offered a choice

Different interests between users and landlords

Landlords often choose based on price rather than functionality. Tenants however would like a say in the decision making, because they will be the users of the appliances. Some participants expect that the oven that is in the rental home, does/will not match their wishes and needs for an oven. This is also expressed by Peter (E5), he said that as a kitchen retailer he sometimes has to 'mediate' between the tenant and the landlord, because their preferences differ so much.

Sense of ownership

Tenants are less careful with kitchen appliances, unless it is their own property. Giving a choice for what appliances they get to use might create a sense of ownership and responsibility.

Some options

Having a few options is already perceived favourable by the participants. The difference between the options has to be clear. In price and functionality. And some would like the option to choose a different size.

Risks

of being offered a choice



Risk for opt-out

Participants say they would like to be able to opt out of the lease through housing. An argument for it would be that they can have more control over their own expenses. However, if tenants can choose to not have a lease oven at all, most tenants will likely buy/use an oven of their own. If you only give them the option between basic and luxury oven, they will not add their own oven to it. Because they are already paying for the one.

Functional risk for users

Users with specific preferences or needs for ovens and kitchen appliances want to choose their own appliances anyway and do not want to get limited options.

Choice

Having a choice is a strong benefit of this scenario, but some participants did not deem it realistic. During the interviews, this topic was explored more, that is why there is a separate page on the attitude towards being able to choose an oven.

The next two pages show the other insights about user's attitude towards this scenario.



Other Drivers

Recessed oven comes with the house

Lease through housing connects the oven more with the house. It makes more sense to arrange a recessed oven through the landlord. If tenants arrange their own oven, they will most likely go for a freestanding oven instead. A recessed oven is expensive to buy for a limited period or for someone else's property, but it is favourable, because it is easier to clean.



Other Benefits

No financial change for the tenant

Tenants already have a monthly payment and the kitchen is often already included, because tenants already pay indirectly for the kitchen. Sometimes also through depreciation in the service costs. Participants expect to have the lease costs in the service costs of the contract.

Financial benefit

Renting a house is often temporary. Investing in a new oven can be expensive and a lease is more flexible, for the short-term. Moving can be expensive already. And it is unsure whether there will be an oven in the next house or not. This way the costs (of ownership) are spread over the years that the oven is actually in use and not just for the person placing it and using it for the first few years. Therefore it is an interesting concept for shared kitchens where tenants come and go, and everyone stays for a different period of time.

Guaranteed performance

Similar to private lease, users have the security of having a working oven available for the full length of the lease period.

Transparency

Lease through housing can create more transparency about where the money goes that the tenant pays for the rental home.

Sense of responsibility

One participant expressed to feel responsible for her rental home. If the oven is part of the agreement for the house, she would feel more responsible for the oven as well.

Performance/hygiene benefit

Participants would like it if the oven is checked when moving into a new home.



Other Barriers

System change

Apart from the fact that a lease oven is new, it is also not the current way of practice to have the costs of the kitchen or appliances in the service costs. This requires a mind-set change for both landlords and tenants. Also the way tenants agreements are made need to change.



Other Risks

Financial risk for landlord

If the payment for the oven goes through lease in the service costs, the landlord will have less unexpected expenses of replacing a broken/insufficient existing oven, but it also creates a smaller turnover on the rent of the house.

Financial risk for tenants

Lease through housing might result in a high price of the rental home. The price of the oven should be in proportion to the rent itself. Some participants also express that lease can mean having to pay for other's misuse of the appliances.



Factors influencing risk-benefit perception

Personal Contextual

Decision maker

Who is the person that creates the lease contract? Who is leasing here?

Familiarity with lease and rent

Lease through housing is compared to the central heating of a rental home; there is a boiler in the house, and it has to be checked and maintained every year, but the bills go to the landlord.

Living situation

When talking about rental homes, it is most of the time on a more shorter term. Therefore here also the previous and next homes are taken into consideration. If those houses are not including an oven one might have bought one already. However some participants also express they would not take an oven with when moving into a new home. It is deemed positive for shared houses and temporary living so you can share the costs of the oven over time with the other tenants.

Personal preferences

Some find an oven essential to a kitchen, others do not. The latter argues that a laundry machine is more essential to a home and therefore more suitable for a PPS.



Trust and relationship with landlord

Price

Most home-owners expect to pay the same price for the lease through housing, as they would for the private lease oven. Most renters expect to pay less. This is likely to result from expecting a limited amount of options.



Financial assessment

Here it is important that the price is in proportion to the rent. And that the service costs are clearly communicated.

Legal (for landlords)

If the costs for the oven are in the service costs, does that mean tenants can ask for it to be taken out of the home?

Accountability

Which repairs and maintenance tasks are done without extra fine?



4.2.5 | PAY-PER-USE

Use would change

This scenario would change the use of an oven the strongest.

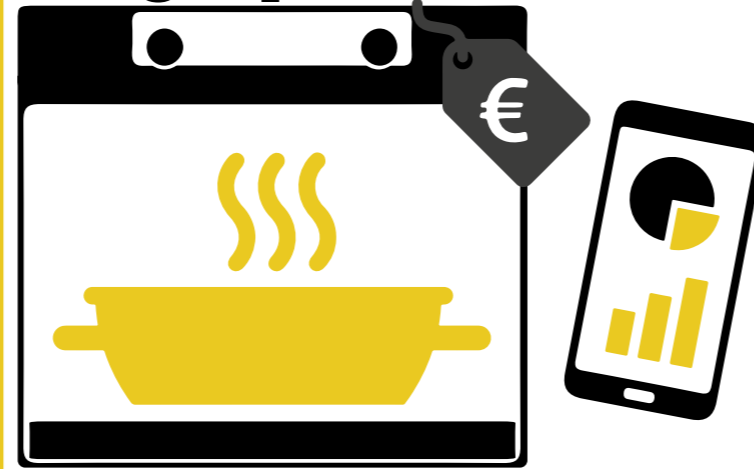
Pressure

Participants expressed that with a PPU system, they would have less fun cooking/baking, or it would be a hassle. Having to pay for your use puts pressure on the fact that you have to use the appliance correct and efficient.

Insight in use

Insight into your own use would be nice. Most participants want to know more about their energy use and the costs of that.

Pay-per-use



Use would change



Most participants expect to use a PPU oven less than they would a regular one. The oven becomes more of a luxury product if you have to pay per use. Only two participants say the usage of the oven would likely not change (E2, E6). The fact that there is a payment with each use seems to have more effect than if the participants would have insights into their energy usage. Besides the fact that the use of the oven would be discouraged, other ways of preparing food would be used, such as cooking in the pan, heated by gas.

Energy costs

To have the PPU-system cover the energy costs does not sound realistic/doable, but it would make PPU more complete, to cover the full price of use.

Washing machine is better

A washing machine would be better suitable for this, because that does not need to be done at a certain time, it is less frequently used, is less stressful and does not have to be fun.

Barriers



Price assessment

It is difficult to say what the price would be of a PPU system. Also if the prices were set, it seems impossible to expect in advance how much the total use will cost. The costs have to be communicated in a clear way, so users are able to assess the financial risks and benefits. A PPU oven is hard, or even impossible to compare to one that you just purchase.

Unfamiliar/foreign

It feels strange to have to pay for the use of a device that is already inside your own home.

Burden of payment

Most participants call PPU a lot of fuss. Which can create extra stress around the cooking process which can already be stressful and has to be done at a certain time. It would feel annoying, uneasy, and confronting, and make users feel unhappy and it would take the fun/pleasure out of the cooking/baking with the oven.

Habits

The change in habit of having an appliance free to use is a large change

Burden of decision making

Every use results in a transaction and therefore has to be decided about every time. When purchasing an appliance, you only have to make a big decision once.



Benefits Risks



Gaining insight into own usage

Participants do like being able to get insights about their usage. This is mostly related to energy use and the costs of that energy. On the other hand, some participants simply do not want to know more about their own usage.

The more data, the more fuss.

Control over your bills

Having to pay for the use means you have control over how much you have to pay. This way you can save on this when you have less money. This can also be seen as negative: that people with less money would not use the oven.

Financial benefit

People who do not eat or cook a lot at home have the advantage of having access to an oven without having to pay for it when not used. It is also beneficial for shared kitchens, to have access to a premium oven without having to pay the full price.

Fair

Paying for what you use seems fair to some participants.

Financial risk

For people who use their oven a lot, this might result into a more expensive oven. Every use is a payment, so people might choose not to use the oven at all.

Lack of freedom

People feel less freedom, because every use is paid for separately. You cannot make mistakes anymore.

Loss of control over finances

Some participants would lose control over their expenses. The additional app is essential for a PPU-system to work, otherwise one might lose track of their own expenses. Being able to put in a maximum amount with warnings if you go over it, would help gain control again.

Risk of giving up privacy

With PPU the company has to know when and how exactly you are using the oven.

Social risk

One can become obsessed with having to use the oven as economically as possible, and therefore there is a chance others in the same household use the oven wrong. This may cause conflict.



Factors influencing risk-benefit perception

Contextual

Price



The price of the use of the oven has to be in proportion with what goes into it. Otherwise the use of the oven is more expensive than the bread that goes in, or it is cheaper to order at the bakery than to have homemade cake. During the interview participants found it hard to imagine a price here, but some managed to say a price: Per use the price should be no higher than €2,-

4.2.6 | SUBSCRIPTION TO MEAL

Here most attitudes connect to either the grocery service, or the (lease) oven.

Recipes as manual

The strongest benefit of this concept is that you can get recipes and have a subscription to meal boxes that help you get to know your new oven and all its functionalities.

Subscription to meal



Use

Besides the recipes that are prescribed by the grocery service, the oven would not be used differently.



Benefits

related to grocery service

Benefits of a food box service like HelloFresh: Eating **healthy and varied** without having to think about what to cook. It is seen as fun, easy with an element of **surprise**, that you try something you normally would not eat. Suitable for when you eat most of the time at home and have a predictable week schedule, like **young families**.

Meals in the oven

This subscription only makes sense if the groceries result in a meal that has to be prepared in the oven that you get with it.

Barriers



Inconvenience of incomplete package

Groceries and an oven so not form a complete package to create a meal. Other kitchen appliances are also needed.

Long term vs short term

The combination of the long term purchase (oven) and the normally short-term decisions (meals) is undesirable and feels strange. It might make more sense if the oven would also be PPU, so one would pay per meal.

Barrier of meal service

If it does not match the preferences of the household, in variety, taste and amount of fresh products.

Risks

related to grocery service



Quality risk

Having a grocery service results in that users cannot pick the best of every product, as they would be able to in the grocery store

Financial risk

The risk of paying too much, especially since you are dependent on one supplier and cannot look where the best discounts are.

Lack of freedom

In how to prepare the meal; in the oven or not? Follow the recipe or do it your own way. In deciding what to eat last minute or change your mind.

Lack of control

In picking your own groceries, being able to take from the back or pick the best discounts. Doing groceries can be fun.



Benefits Risks

related to the oven related to the oven



Financial benefit

All benefits of lease, like kitchen is lower in investment and payment is done in fixed monthly rates.

All risks of lease, and more specifically:

Lack of freedom in what oven to have

It still should fit the design of the kitchen and the preferences of the user.



Benefits

of mealservice tailored to the oven

Functional benefit

You can get to know your oven better, through the use of the recipes that go alongside the grocery service. It is seen as a way to learn all the functionalities and use the oven to its optimum. The recipe functions almost as a manual for the oven.

Financial benefit

The combination of oven and grocery service should have some discount with it.

Easy and healthy

It combines two qualities of the grocery service and the oven: easy and healthy. Having the combination facilitates that even stronger.



Factors influencing risk-benefit perception

Personal Contextual

Familiarity with the grocery service

Most participants compared it with a meal box like HelloFresh.

Unpredictability of life vs subscription

Having a subscription to a meal service assumes that you can plan meals some days in advance. Some participants only know short before cooking how many people will be eating dinner at home, so they need to be flexible in their meal planning. This also counts for the oven: What if you go on holiday for a period of time? Is the oven taken out of the house?

Price

It is hard to give a suitable price for this

Meal with oven or oven with meal

Subscription to meal combines two major elements: groceries and the oven. It can be interpreted two ways: the oven is the main deal or the grocery service is the main deal, and the other is the element. How you interpret this subscription strongly seems to influence what the attitudes are.



4.2.7 | COMPARING THE SCENARIOS

Realistic

Figure 4.2 (Left) shows the order in which the participants perceived the scenarios as realistic. Generally participants deemed the Product Oriented scenarios more realistic, and the Function Oriented scenarios less realistic.

Notably, participants seemed to easily understand scenarios 1 (refurbishment) and 2 (private lease) during the interviews. Scenario 3 (Lease through housing) and 5 (Subscription to meal) require an extra stakeholder/business partner for implementation which affects how realistic the scenarios are perceived. Scenario 4 (Pay-per-use) was perceived as least realistic.

Interest

Figure 4.3 (Right) shows the order in which the participants would consider the scenarios. Participants show most interest in scenario 1 (refurbishment). Some participants clearly express they would not consider any of the PSS's and would only consider buying the oven and therefore having full ownership of it.

Second in place here is scenario 2 (private lease). After that the scenarios 3 (lease through housing), 4 (pay-per-use) and 5 (subscription to meal) receive lowest interest. Because scenario 3 is only suitable for when renting a home, some home-owners put this last.

Note here that the participants were asked to only rank the discussed scenarios. Some expressed to have low interest in all scenarios, but gave an order of interest anyway. So the level of interest per scenario is not measured, only how they are compared to each other.

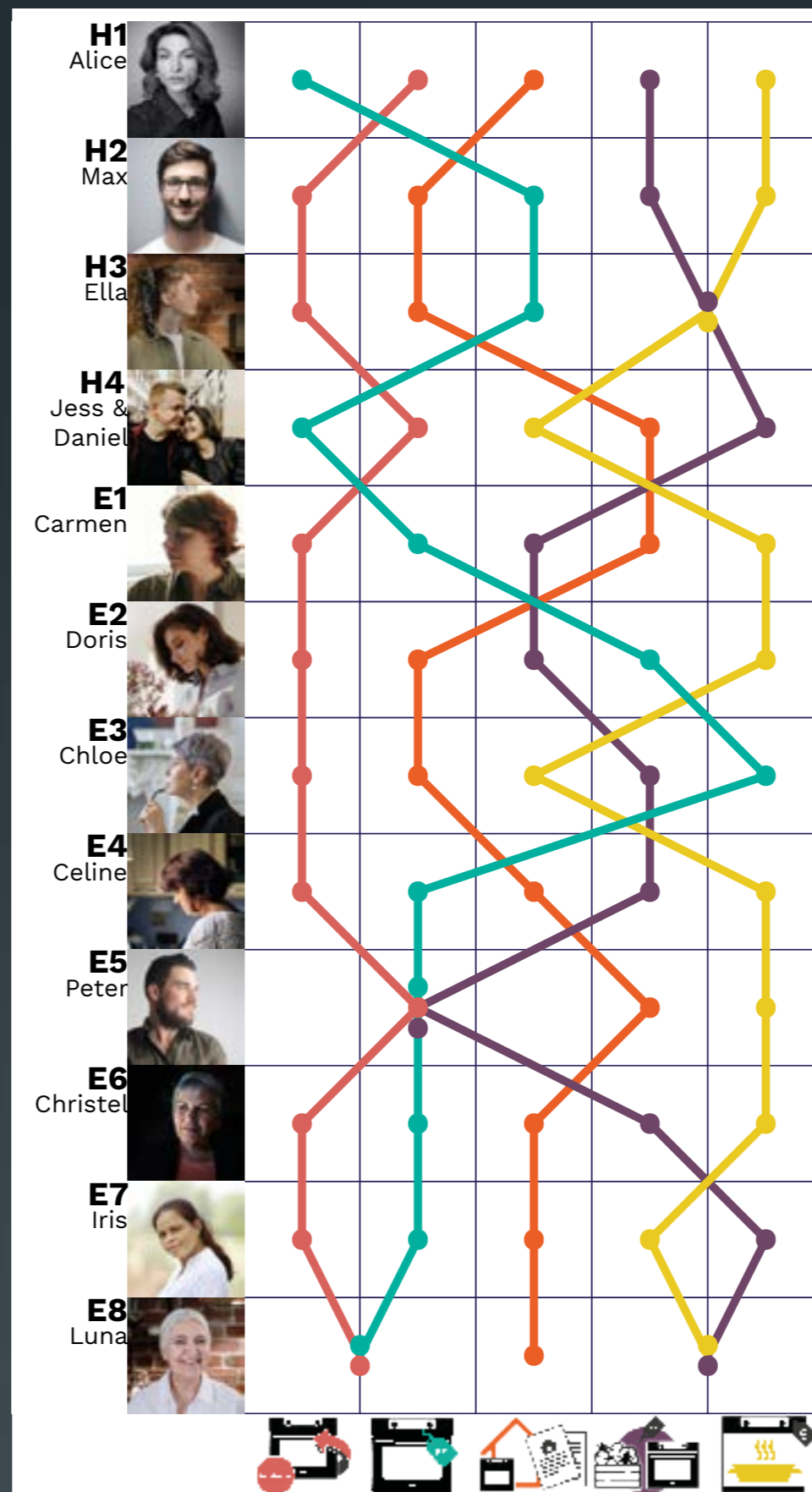


Fig 4.2 | How realistic each scenario is perceived in relation to the other scenarios per participant

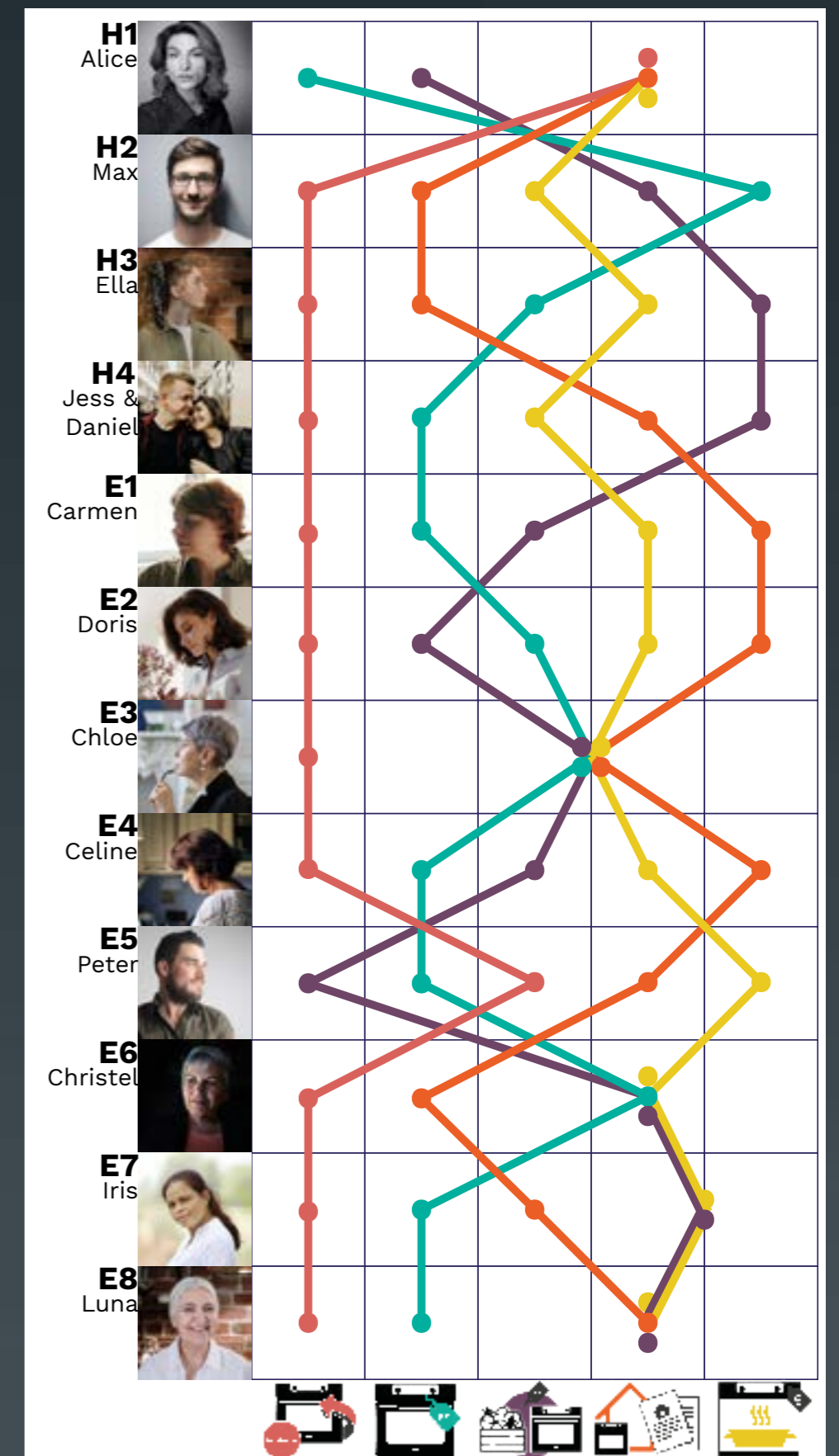


Fig 4.3 | Participant interest in scenarios in relation to the other scenarios per participant

Lease basic oven + PPU certain functions
+ Lower financial risk: Easier to have a luxurious kitchen without having to buy the unknown, expensive functions. It takes away the risk of paying for a function you do not know what to do with
+ Financial benefit: It would make the lease cheaper
+ If some functions are more damaging to your oven
- Negative aspects of lease and PPU combined
- Difficult payment system results in more stress and less control over monthly costs

Lease refurbished oven
+ Interesting combi. You have guaranteed a functioning oven, which eliminates the performance risk of the refurbished oven
- If you want private lease to be able to have the newest oven, you do not want to get a refurbished one
- Refurbishment is for lower budget users, whereas lease is more for the higher budget users

PPU through housing
+ It is not your oven, so you do not have to pay for it, unless you use it. More control over your costs.
+ The idea of PPU in studiobuildings is widely known and accepted for laundry

Meal + PPU oven
You pay for the meal: groceries and preparing it in the oven. You only need to do the work of following the recipe. However, this does make it difficult what you do with the oven outside of the specific meal

Lease a PPU-oven to another business
The company/organisation can lease the oven and they receive money per use by their customers. Suitable for an organisation like a Ronald McDonald-house
+ When it is used a lot, the organisation makes a profit

Lease oven for low fixed rate, and PPU
Like greenwheels, you have to pay monthly, and per km.
+ Purchase is cheaper

4.2.8 OTHER RESULTS

Price vs function vs environment

During the interviews, costs and functionality seemed to be the strongest considerations for purchasing any oven. Costs always have to be in proportion with the benefits you get for it. Environment is barely a factor when people buy an oven.

Benefit of ownership

Ownership is a benefit that was challenged during this research, but was held onto by at least four participants, who explicitly said they would rather buy and own an oven than use the other PSS's. This shows again that ownership is an important benefit to users.

Combinations

This page shows the combinations of scenarios that also were discussed during the interview, either brought up by the participant or the researcher.

4.3 | SCENARIO CHOICE

For this project, one scenario has to be chosen for further development and designing an intervention.

SELECTION CRITERIA

The five scenarios are evaluated through a sets of criteria. The criteria are based on discussions with the supervisors. There are four groups of criteria, representing the stakeholders of this project: ATAG, the environment, the user and me, the designer. You can find the full evaluation of them in appendix D.3.

ATAG criteria

- 1.a. Business potential: Is it a financially viable scenario?
- 1.b. Brand: Does it fit the brand? 'We love to cook'
- 1.c. Market: Not too niche. Scenario should be 'main-stream' enough to have a large potential market.
- 1.d. Viable: Fitting with the company activities?
- 1.e. Current activities: Is it in line with their other circular projects?

Environment criteria

- 2.a. Behavior: Does the scenario stimulate sustainable behavior?
- 2.b. Circular economy: In systems, potential for others to follow and join in this scenario.
- 2.c. Material flow: Does this enable ATAG to keep control over its materials and resources?
- 2.d. Product life: Extending the lifetime of the product (materials)
- 2.e. Logistics: environmental impact of the system.

User criteria

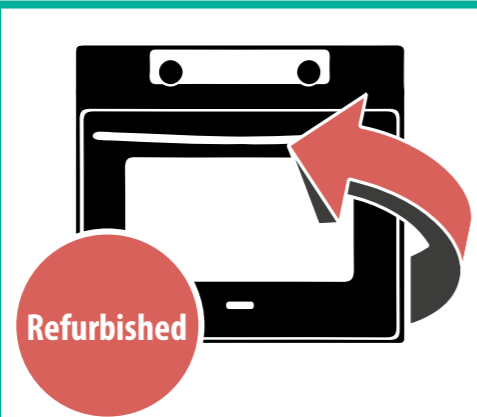
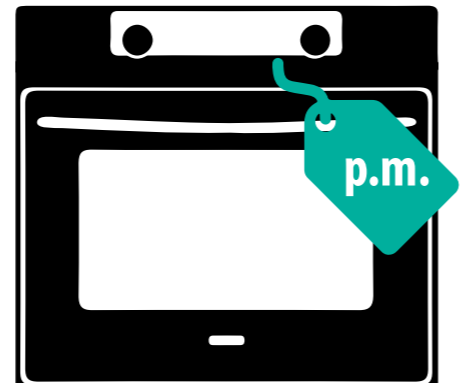


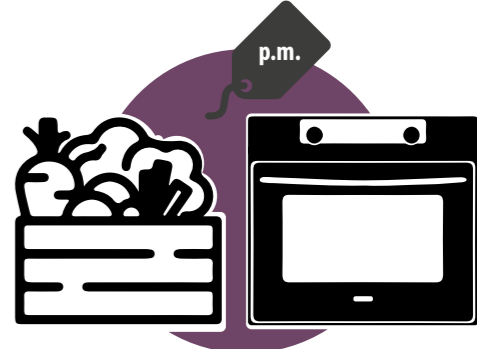




- 3.a. Acceptance: low perceived risks, high perceived benefits. Does it raise a lot of questions or is the scenario accepted or familiar?
- 3.b. ATAG target group: Does it help cooking enthusiasts? Does it fit the ATAG target group?
- 3.c. User's interest: Based on the results from the interviews.

Designer criteria

- 4.a. Design for Interaction: The resulting design direction should fit in the Master's programme Design for Interaction
- 4.b. Personal fit: The resulting design direction should require knowledge/skills that I personally can add to the company.
- 4.c. Working from home: Is this project suitable to do from a distance (not being able to work at ATAG a lot)?

KEY FINDINGS

The next page shows the result of the evaluation. Refurbishment, private lease and lease through housing are scenarios to show potential, but refurbishment is the strongest scenario.

	 Refurbishment	 Private lease	 Lease through housing	 Pay-per-use	 Subscription to meal
ATAG 	✓	✓	✓ ✓	✗	✗ ✗
Environment 	✓ ✓	✓	✓	✓ ✓	✗ ✗
User 	✓ ✓	✓	✓ ✓	✗ ✗	✗ ✗
Designer 	✓ ✓	✓	✗	✓	✗ ✗

4.4 | CHAPTER CONCLUSION

REFURBISHMENT

In this chapter, I investigated the user's attitude towards five circular business propositions. The results showed barriers and risk-benefit evaluations. The recommended circular business proposition for ATAG is refurbishment of the built-in oven, with buy-back.

KEY INSIGHTS

Costs and functionality are the strongest considerations for purchasing any oven. Costs must be in proportion with the benefits you get for it. Environment is barely a factor when people buy an oven. So, to motivate users to bring back their appliances, costs will be more convincing, rather than environmental impact.

Ownership is important to users. For some, a different type of ownership will not even be considered. Having different types of ownership is hard to imagine for built-in ovens. The oven is part of the kitchen, and thus belongs to the building, the real estate.

Maintenance in the service offers is not perceived as added value to users, because an oven does not require much maintenance, other than the daily cleaning. However, this daily cleaning can be done better and is not always done.

Giving users access to data of their own usage behaviour can help users feel in control. The data can be about energy use and its costs, but it can also be about what oven functionalities and when it was cleaned last. The way it is shown should be simple and clear, as some people find more data just more fuss.

REQUIREMENTS

The user research also resulted in more requirements for the design. Before going into the ideation phase of this project, chapter 5 describes more analysis. It

goes more into the technical implications of refurbishment of the oven, buy-back and product care.

Requirements

- R4.1** The design must be suitable for transfer of ownership switch of resident.
- R4.2** The design must enable personalisation, so the oven is tailored to the user's specific needs and preferences.
- R4.3** The design must enable the user to be in control over the appliance, the kitchen, and the cooking process.
- R4.4** The design must be understandable for users and not have too many distractions from the main functionalities.
- R4.5** The design must encourage regular product care activities, regardless of ownership (multiple users in household or different ownership model), purchase (user may not be the person who chose the appliance) or the End of Life (user may not be the person to dispose of the appliance).

Wishes

- W4.1** It is desirable that the design enables the user to explore and understand all the oven's functionalities, especially in the beginning.
- W4.2** It is desirable that the design is timeless with opportunity for temporary personalisation.

5

Towards refurbishment

Now that a circular business proposition is selected, a better understanding is needed for development of a design. This chapter goes into more specific analysis of the MAGNA combi-steam oven, refurbishment, buy-back and product care. This results into a set of requirements of the design.

5.1 | INTRODUCTION

Now that a circular business proposition is selected, a better understanding is needed for development of a design. This chapter goes into more specific analysis.

First, chapter 5.2 goes into the functionality and anatomy of the MAGNA combi-steam oven. Then chapter 5.3 describes more the technical implications of refurbishment of the oven and the new resulting appliance journey.

From this appliance journey we see that the user has a strong influence on if the appliance is sent back for refurbishment and in what state. That is why the analysis then goes into buy-back (chapter 5.4) and product care (chapter 5.5).

The results from this analysis are used as input for ideation and development in chapter 6.

5.2 | COMBI-STEAM OVEN

ATAG offers several ovens in their portfolio. The ATAG ovens have 11 oven functions: hot-air, eco-hot-air, grill, large grill, grill+fan, bottom and top heat, bottom heat+fan, bottom heat, bottomheat+hot air, top heat, pro roast.

Next to that, depending on the type of oven, the oven functionalities are combined with pyrolysis, steam, microwave or with steam+microwave in one (3-in-1 oven).

Pyrolysis function

Pyrolysis is a cleaning function at which the oven heats up to 500°C and all parts within the cavity should heat

up to that temperature as well. Food scraps or stains will burn to powder which the user can wipe out with a damp cloth. This function is not available for all ovens, especially not ovens with steam or microwave functionalities. Those have materials in the cavity that cannot heat up to such a high temperature. Oven with pyrolysis have a special cooling system so the outside of the oven and the kitchen cabinets do not heat up. For safety, the door is locked during pyrolysis. The cavity with its enamel coating should be burnt totally clean. (Interview quality assurance)

Steam function

With the steamfunction, the user can prepare dishes at 100°C (or lower). This helps keep vitamins and taste intact. Ovens with the steamgenerator also have the Steam Clean cleaningfunction. The oven must be cold, so the steam forms condensation on the walls. This condensation will soak off any stains and food scraps inside the oven. However, this is mixing water with fat, so for heavy stains this is not enough.

ANATOMY OF THE OVEN

Figure 5.2 shows the anatomy of the oven. The oven door is with soft-close & opening. On some shelf levels the oven has telescopic rails so the user can slide out the dish. The water reservoir is only in ovens with steam functions, and the MAGNA control panel with TFT touchscreen has the most used functionalities directly usable. info-tab with extra information

COMBI-STEAM OVEN

For the purpose of this study, a combi-steam oven was provided for testing, so the redesign is based on this (figure 5.1). The interventions should however be scalable to other models.



Figure 5.1 | Front of MAGNA combi-steam oven

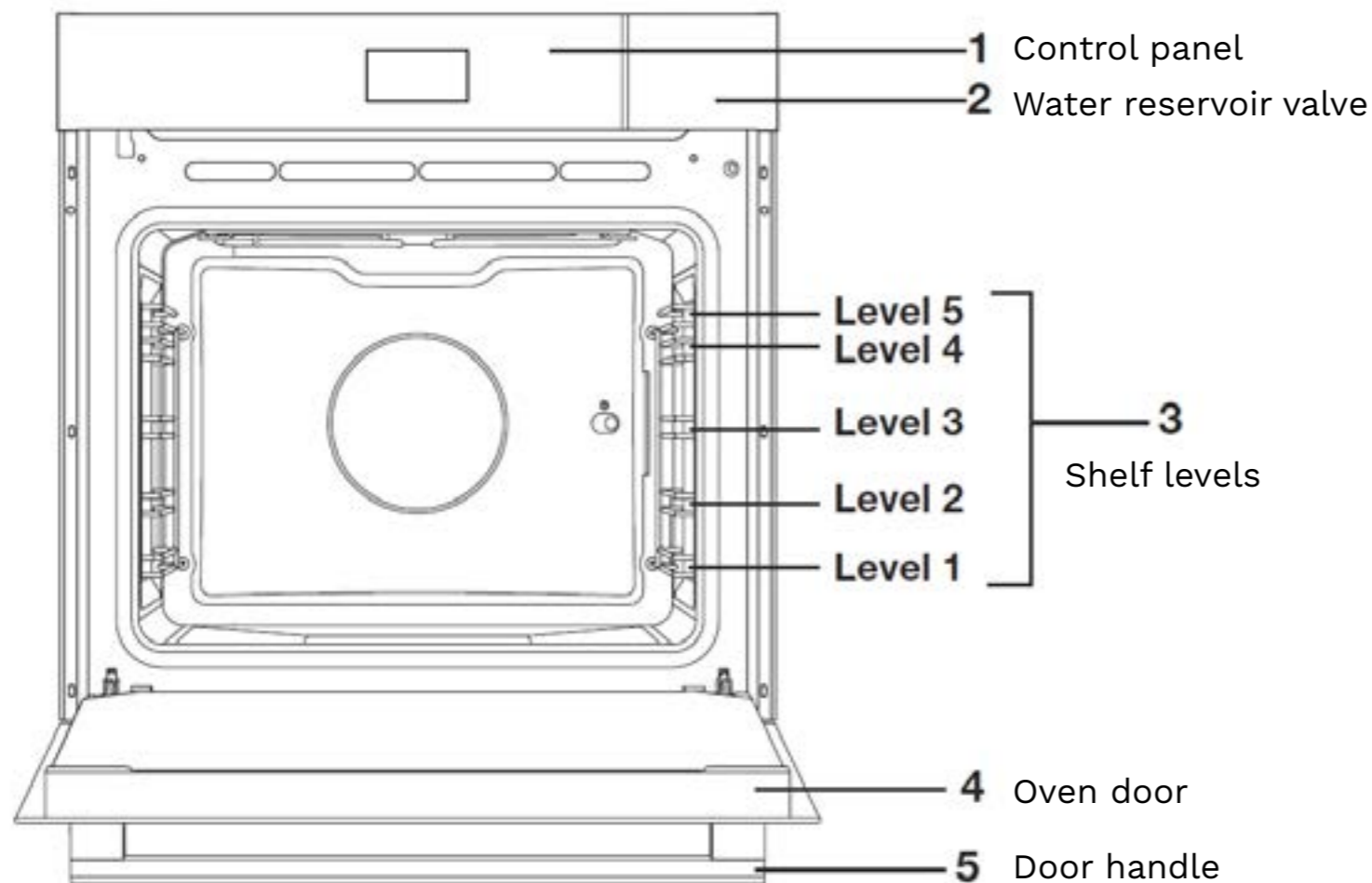


Figure 5.2 | Anatomy of the ATAG oven (from user manual)

TFT TOUCHSCREEN

The main screen of the oven shows the most frequently used functions, so they are immediately accessible (figure 5.4). The less frequently used functions are one touch further (figure 5.5).

When selecting a function users can select their preferred settings (figure 5.6).

The status screen (figure 5.7) provides immediate feedback in both graphics and text on selected and current temperature, duration and oven function.

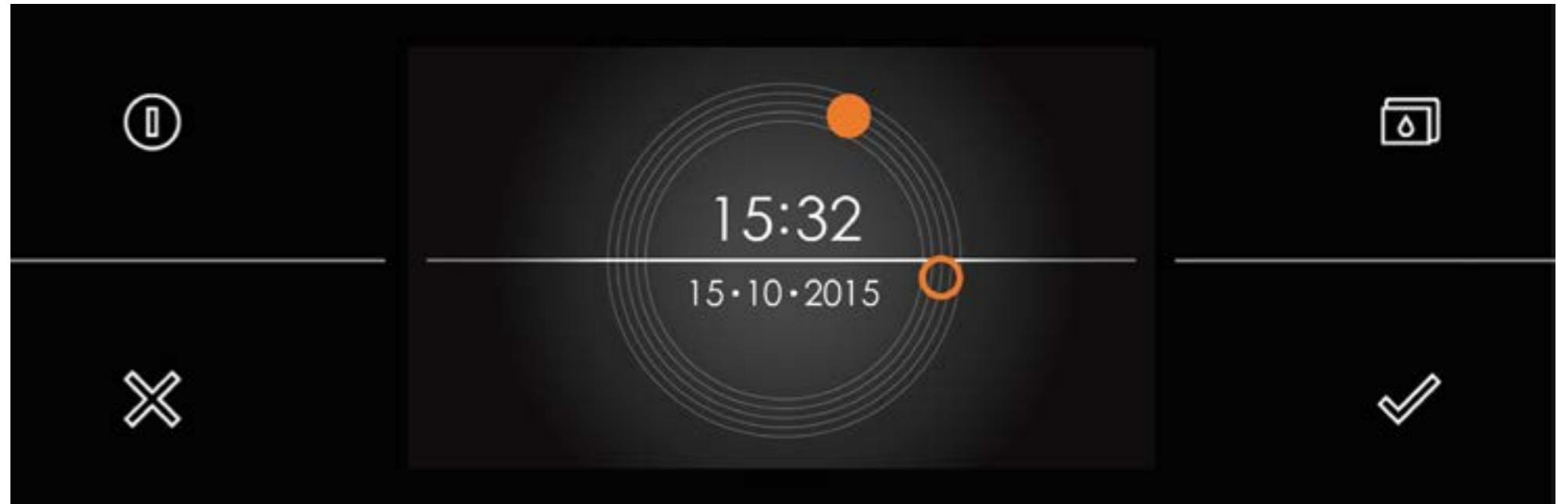


Figure 5.3 | TFT touchscreen of the MAGNA oven in stand-by. It has four fixed buttons: on/off, open water reservoir, no, and yes.

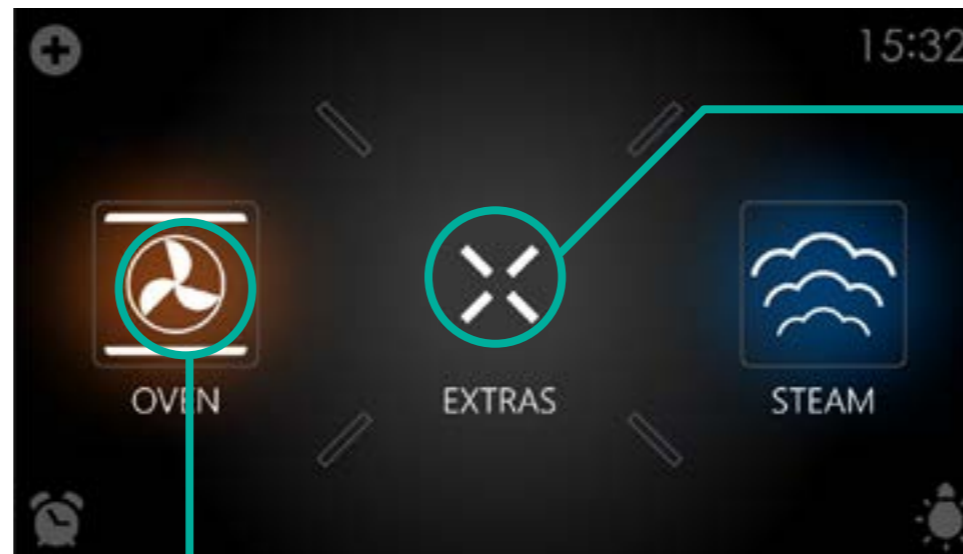


Figure 5.4 | Main screen



Figure 5.5 | Extras menu

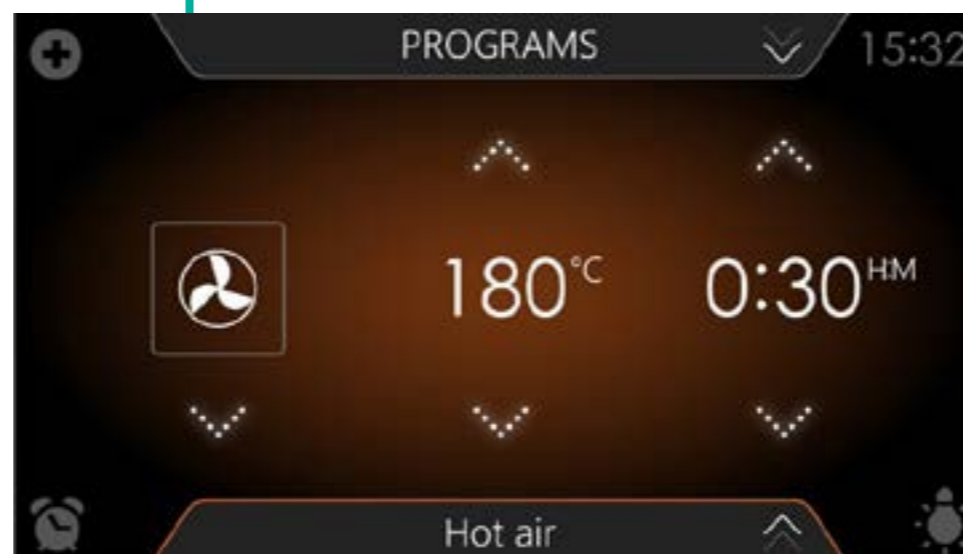


Figure 5.6 | Selecting oven settings

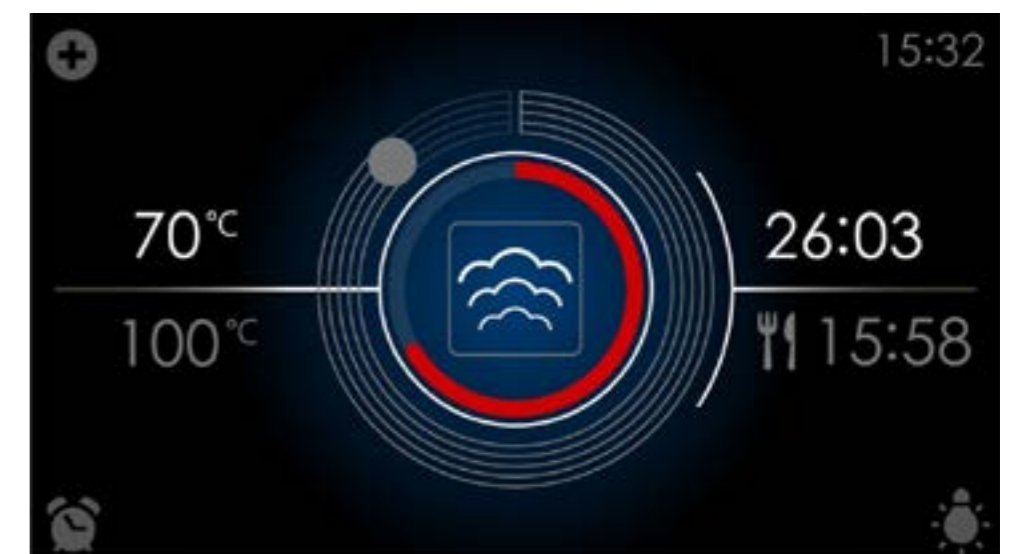


Figure 5.7 | Status screen while the oven is on



Figure 5.8 | The MAGNA combi-steam oven in use by one of my housemates

KEY INSIGHTS

this page shows the requirements that derived from the combi-steam oven.

Requirements

R5.1 The design must be applicable on the next generation MAGNA combi-steam oven with a larger TFT screen and the design philosophy of having direct access to most frequently used functions: oven and steam.

Wishes

W5.1 It is desirable that the design is expandable to ovens with a microwave or pyrolysis function.

5.3 | REFURBISHMENT OF THE OVEN

This chapter shows findings about refurbishment of the oven from internal communication, interviews with experts from ATAG and the user research in chapter 4.

USED OVEN

A used oven will always have traces of use. As stated in the user manual and through an interview with quality assurance, discolouration may occur on the stainless steel parts at temperatures above 180°C. These and other traces of use should be communicated, as people want to be able to assess for themselves whether an oven is used too much or not. Giving information on the age or 'mileage' of the oven can enable people to assess this. Other traces of use might be in the cavity. Small spots of affected enamel can be repaired with a special lacquer, which unfortunately is not the right colour, but it helps preventing rust.

Refurbished appliances must comply with legal standards of the food and commodities authorities. The user research has shown that there is trust in the refurbishment process that hygiene is not a barrier for them to buy a refurbished appliance. But technically, to professionally clean the cavity without damaging other parts it is best to separate it from the rest. This was suggested because this way you could use pyrolysis in a larger industrial oven.

ENVIRONMENT

Users did recognize the environmental benefit of a refurbished oven, with the notion that the appliance should not be so old that it is less energy-efficient than a new one. This is impossible for users to compare, so the supplier needs to assess the environmental benefit of refurbishment.

PRODUCT LIFE

Most ovens are disposed of before the end of its technical life. However, to make sure it can go through

another life cycle, there needs to be repair and maintenance in the refurbishment as well. Refurbished products are perceived to have a shorter product life. To ensure buyers they buy a good product, the manufacturer should give a warranty on the appliance.

Careful handling can extend an ovens product life. The user's daily behaviour and interaction with the appliance is important. Attachment and trust can motivate users to be careful with the appliance.

THE PROCESS

For refurbishment, it is needed to identify the major components that are close to failure. Have the most problematic components redesigned to last longer or to be modular, so it can be replaced/repared in refurbishment.

The electronics are the largest issue. The software sometimes gives errors and maybe it needs an update. But the update should fit the functionality of the hardware of course. The hot-air motor also shows some wear. Air and pressure that wants to escape from the oven sometimes goes through the bearings of the motor, which can make it rust. In refurbishment these must be checked.

Other parts that might need replacing are the heating element, which has a maximum of use and is easy to replace. In microwaves, there is a mica plate shielding the antenna which gets dirty but is also easy to replace. The door is easy to take out and clean the glass layers. Smart and preventative maintenance can help restore the material value of appliances.

To clean it and bring it back to good quality, the oven should be taken apart. Modular design for easier disassemble and reassembly of appliances is an important requirement to be able to repair and refurbish appliances.

THE DESIGN LINES

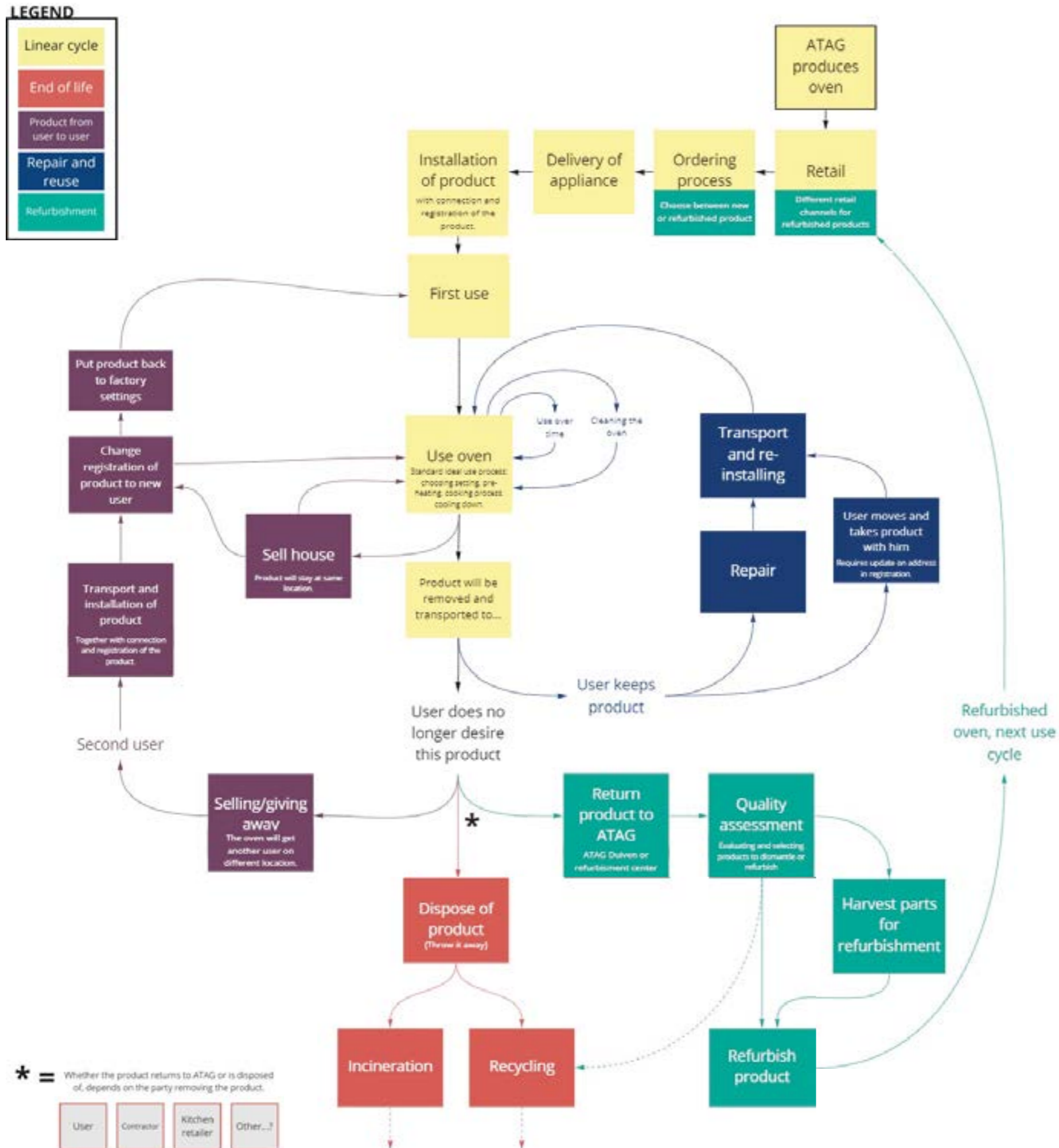


Figure 5.9 | Appliance journey mapped out with refurbishment

One of the identified barriers for refurbished ovens is the lack of newness. Some participants want the newest oven, with the newest functions. And the design look can also be an issue: Ovens are often sold in a design line, where all appliances match. In refurbishment you could give appliances an updated design. Some ovens of the brands ATAG and Pelgrim are based on the same product platform, where replacing the front to change its look is easy.

Instead of developing a low-end product version, refurbishment can be a cost-effective, high-quality and socially responsible alternative. A refurbished oven retail value is 75% of the new one. So, refurbishment activities should stay within that. The appliance should be marketed towards new target audience who do not desire newest functionalities.

APPLIANCE JOURNEY

Figure 5.9 shows an updated version of the appliance journey of chapter 3, with now also refurbishment. It shows how this creates an extra loop in kitchen appliances.

After the user no longer desires the oven (marked with star), it is crucial to get the appliance back. Chapter 5.4 goes into how companies get appliances back through buy-back. To get the appliances back in the best possible state, the user is also responsible for how the appliance is used. Chapter 5.5 goes into product care and how to design for it.

5.4 | BUY-BACK

Buy-back is where the product manufacturer the product sells to the user and buys it back later. Manufacturers could provide the option of buy-back, but a guaranteed buy-back is more circular since it the user is not guaranteed to be able to sell back the product. The manufacturer has more risk but is also motivated to improve their products. (KPMG, Copper8 & Kennedy Van der Laan, 2019)

Currently, appliances are disposed of in the municipal waste. The manual mentions this about disposal: “The appliance must be disposed of responsibly at the end of its useful life. The government can provide you with information about this.”

The Dutch government now has an old-for-new regulation. Meaning, consumers can hand in their electronic appliances in the store where you can buy a new, similar appliance. The store is obliged to take it in and is not allowed to ask money for this. (Rijksoverheid, 2020)

For refrigerators and freezers, the Dutch government also has the plan to create a return premium. Most likely from 2021, consumers can receive at least 35 euros for old refrigerators when buying a new one. This plan has yet to be worked out and is only for those appliances, not for the oven. (Rijksoverheid, 2020)

Buy-back has a strong incentive to users because they have ownership. Careful handling can increase the product life. Also, the manufacturer gets a strong incentive to redesign the product for a longer product life and they receive a lot of information about their product after the first use cycle. A drawback is that the product is out of control of the manufacturer and does not necessarily return. (KPMG, Copper8 & Kennedy Van der Laan, 2019)

EXAMPLES FROM PRACTICE

Some companies already are practicing a buy-back

or trade in system, where you receive credit for the return of your device or product. Most mentioned in interviews and casual conversations was the Apple Trade In, which appeared to be known amongst Apple users.

How it works: Trade in your device for credit toward a next purchase or a gift card. If the device is not eligible for credit, they will recycle it for free. Devices in any model or condition can be handed in. The estimated value is given after a few questions about the model and condition of the device.

The benefits mentioned on the website are see what it's worth instantly, data is safe and helps the planet. When buying a new device, the trade in is mentioned with the price: “from €809 without trade in*” (Apple (NL), 2020)

Other companies are for example Fairphone and Patagonia. Fairphone accepts any of their own phones back. The value for model 1 and model 2 is fixed and given on the website. This is also mentioned when ordering a new phone (Fairphone, 2020). Patagonia Worn-wear accepts Patagonia clothing that functions perfectly and is in good condition. You can send it in or bring it to a store. The credit can be used on Patagonia products again. Once an item is in good shape it will be accepted, and you get credit for the store. The amount depends only on the type of garment up to \$100 for each item (Patagonia, 2018).

Auping introduced in 2011 the Auping Take back System. When a new mattress is delivered, the old one is taken back in a special bag for dry and hygienic transport to the recycling facility. In 2018, they introduced the first circular mattress. The Evolve mattress has a circularity passport and recycle label A. The mattress has a Niaga label with an NFC tag, which you can scan. This shows the materials used in the product and where they come from, which are only suppliers inside Europe. There is also information on the recycling of the mattress. (Auping, 2020)

STAKEHOLDERS

In the user research in chapter 4, buy-back was mentioned. And participants responded positively. Handing in an appliance and knowing it will be reused is perceived beneficial.

Since ATAG appliances are sold through retailers, it would make sense for users to bring return their appliances there, however from experience with a project on reverse logistics of car parts, I know that extra stakeholders can complicate the system. Problems can occur especially with value estimation if this is assessed differently by the retailer than the manufacturer. The way the buy-back value is decided must be very clear and transparent or the middle party should be left out of this.

FINANCIAL VIABLE

Discussions with the supervisors have shown that credit or discount on new appliances is quite viable to give on kitchen appliances. In the kitchen industry it is a common practice to give 30-40% discount on kitchens, which means the products are overpriced from the start, so there is room to give discount for handed in appliances.

CONEY INSIGHTS

Buy-back can be a viable business proposition, but for it to be circular, it must be guaranteed instead of without obligation. Consumers are starting to be more familiar with it and various brands already do it. For setting up a buy-back system, quite some things need to be determined. Some examples are: What buy back values can be offered? How will customers receive credit? Which partners to partner up with? What products and models can be bought back? How will the condition be determined?

With the limited scope of this project, I choose to focus on the user. So, with the final design I aim to answer:

How to engage users in buy-back?

5.5 | PRODUCT CARE

This chapter goes into what product care is, what product care can and should be done on the combi-steam oven and how product care is stimulated.

DEFINITION

Product care can be understood as any action that helps to prolong the lifetime of a product, such as maintenance or reparation (Ackermann, 2018; Ackerman, Mugge & Schoormans, 2017).

WHAT PRODUCT CARE SHOULD BE DONE ON THE OVEN?

Product care is a variety of different types of activities that vary in time and effort. Tuimaka (2019) identified seven product care types: Repair, Creating something new/different, Product revival, Small care, Preventive measures, Instructed & mindful handling, and Routine acts.

Method

To find out what activities are necessary for the ATAG combi-steam oven, I did some research: Next to my personal experience of using the appliance, I asked on social media what I should do to clean my oven, I consulted the user manual, and I did an interview with an expert from quality assurance at ATAG Benelux. Find these research activities in appendix E.1.

Findings

How aggressive one can clean is unclear.

It is unclear how 'aggressive' one can clean the oven. On social media, one respondent mentions a paint scraper to get splashes of fat from the door, whereas another mentions that regular oven products can damage the special coating. The user manual calls for use of soft materials and non-aggressive cleaning detergents like a soft cloth, warm soapy water and a clean, damp cloth. A quality assurance expert at ATAG mentions that the enamel coating in the cavity is a

strong material that can handle aggressive cleaning materials. So you do not need be as careful as the manual says. However, if the enamel does get a scratch, it reveals the steel underneath and that may cause rusting, especially when steam ovens cannot dry after use.

Cleaning inside the oven

Instructions from the manual on cleaning are to clean the exterior surfaces, wipe and dry them, and remove splashes and stains on the interior surfaces and wipe and dry them. The most dirt and fat splatters end up on the topside of the cavity. There is a heating element that makes it hard to clean and burns the spots in faster. In the back there are little holes, they make it a little harder to clean, but there is not more dirt there than on other sides. In design of the oven the ribs or edges that dirt can stick behind are brought to a minimum. Users can take the racks out of the oven to clean them and behind them in the oven. The oven door and the oven door glass can also be removed for easier cleaning. On social media one respondent mentions the grease filter of the Miele oven, which she misunderstood and did not use for multiple years of using the oven.

The right detergent

For cleaning, users want a detergent that is safe with food. Either non-chemical, or specific for cleaning ovens, when it says that it does not give fumes. For cleaning instructions, users most likely refer to the use instructions of cleaning detergents like Dasty or HG over the ones in the oven manual since those are available at hand.

Cleaning functions

Functionality of the oven also changes how users clean their oven. With the steam function, you can soak the oven for easier cleaning. On social media, some respondents mention how to soak the oven with a bowl with water, vinegar, and lemon in the oven. This is like ATAG's Aqua Clean function, where



Figure 5.9 | The enamel coating can withstand more 'aggressive' cleaning materials, unlike what the user manual suggests.

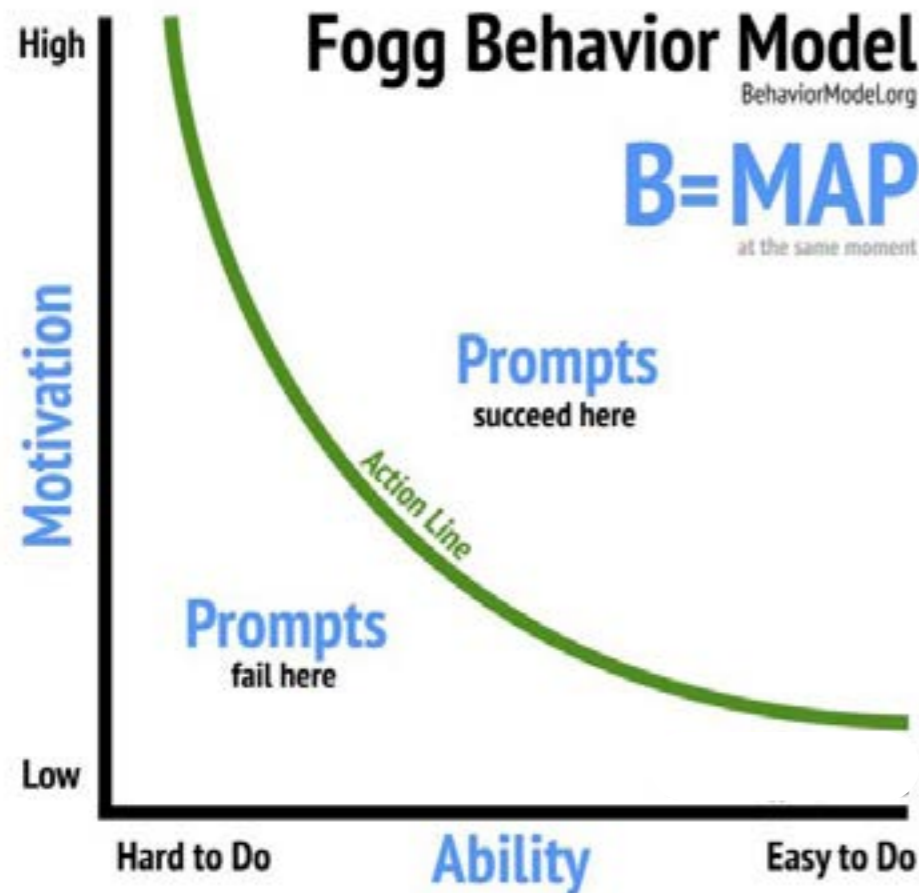


Figure 5.10 | Fogg Behavior Model, from <https://behaviormodel.org/>

the user can pour water on the hollow ‘floor’ of the cavity.

After a steam cycle, water should be removed from the appliance. “Let the oven cool down and dry the inside of the oven,” and “empty, clean and dry the water reservoir. Only fill the reservoir just prior to using it!” This is so no water will enter the vents and to prevent rust.

Infrequent cleaning activities

Activities that must be done less frequently but are necessary to guarantee the quality of the components, are cleaning the water tank filter and descaling the appliance. With descaling, the appliance alerts the user it needs to be done and the user manual contains a recommendation for a descaling agent that is “non-corrosive, not aggressive and is environmentally-friendly” (user manual).

HOW IS PRODUCT CARE STIMULATED?

Designing for Product care is about a behavioral change. “The Fogg Behavior Model (Figure 5.10) shows that three elements must converge at the same moment for a behavior to occur: Motivation, Ability, and a Prompt (also called ‘Trigger’).” (Fogg, 2009)

Higher motivation when oven is new

From research I found that a user’s attitude towards cleaning the oven changes over time. With little stains a new oven is easy to clean. The newness of the kitchen or the appliances motivates users to careful handling: “I love this new kitchen so much. I am just wary of grease stains that turn into accumulating ugly messes!” (respondent on social media).

Higher ability when done regularly.

Cleaning should be done regularly “to prevent fat and food particles from accumulating, especially on the surfaces of the interior and the exterior, the door and the seal.” (User manual). This way it remains a small task: No need to scrape. A sweep with a cloth should

be enough.

Lower motivation with self-cleaning oven

With self-cleaning functions, like pyrolysis, the user might become ‘lazy’ towards product care and overestimate its power or underestimate the frequency with which it should be used. On social media a respondent says his oven ‘cleans itself’, referring to cleaning functions like pyrolysis, which he does 2-3 times a year. The times a pyrolysis or steam clean function is needed depends on the use of the oven, and whether it is used for preparing a greasy piece of meat, a frozen pizza, or to steam vegetables. Most important is to use the clean function regularly. ATAG generally recommends for frequent users to use pyrolysis a few times a month. With regular use, the oven’s programmed settings for cleaning, rinsing, and drying might not be enough, and an additional deeper manual clean is needed every month or two.

Bit of motivation through personalisation

There are a few settings the user can personalise: At the first use, the user must set ‘Language’, ‘Time’, ‘Date’ and ‘Water hardness’. Setting the correct water hardness helps in product care, because the equipment will be programmed so that the descaling notification will appear in accordance with the actual water hardness. Users can also save settings in ‘favourites’, so they can find their more frequent used programmes faster.

Triggers are needed

Ackerman, Mugge & Schoormans (2018) found that many consumers are generally motivated to take care of their products and that they even have the right knowledge and tools. What is often missing are triggers that push people to take care of their products. Triggers can increase consumers’ motivation or ability.

fhhhf

Requirements

R5.1 The design must enable product care to be part of the use routine.

R5.2 The design must increase the user's motivation to do product care on the oven.

R5.3 The design must increase prompts/triggers to get users to do product care on the oven.

Wishes

W5.1 It is desirable that the design can be tailored to new users differently than experienced users because a user's attitudes towards and knowledge of the product and product care change over time.

W5.2 It is desirable that the design lets users experience the oven as smart and self-cleaning.

W5.3 It is desirable that the design increases the user's ability to do product care on the oven.

6

Ideation

This chapter describes the ideation phase. Insights from previous chapters are used as input to develop user-centered designs. Three concepts are developed and evaluated. The chapter concludes one concept that is developed into the final design based on buy-back and product care. Chapter 7 describes the final design for refurbishment.

6.1 | INTRODUCTION

Creating ideas is done in two main cycles.

The first ideation cycle focussed on refurbishment of the oven. I first mapped out how the ownership of the appliance moves from one stakeholder to the other. In a creative session design directions were identified that will benefit the refurbishment process. The design directions identified are all relevant for developing a refurbishment line. For this project, I selected two directions to focus on: Product care and returning the product back to ATAG.

The second ideation cycle focusses on those design directions. It consists of two brainstorm sessions; one focussed on product care, one on returning the product back to ATAG. Ideas of both brainstorms were selected to create three concepts that touch upon both design directions.

During the whole research I collected requirements and wishes. The next page shows an overview of the requirements and wishes. These are used to select and evaluate ideas and concepts.



R5.1: The design must be applicable on the next generation MAGNA combi-steam oven with a larger TFT screen and the design philosophy of having direct access to most frequently used functions: oven and steam.

R2.1: The design must be viable on either the NK market or the projects market, in the Benelux.

R1.3: It must be viable for ATAG Benelux to be or to become the supplier of the design or a key partner within the new product ecosystem.

W5.1: It is desirable that the design is expandable to ovens with microwave or pyrolysis functions.

W3.4: It is desirable that the design creates a closer relationship between ATAG and their customers.

R3.1: The design must prevent appliances from going to recycling or energy recovery by utilizing the circular strategy Reuse, Repair or Refurbish.

R3.2: The design must give ATAG the opportunity to gain control of the flow of materials and products.

R1.2: The design must be less resource intensive than the conventional appliance.

W3.1: It is desirable that the design encourages reuse or repair.

W3.2: It is desirable that the design enables multiple use cycles for an appliance.

W4.2: It is desirable that the design is timeless with opportunity for temporary personalisation.

R4.3: The design must enable the user to be in control over the appliance, the kitchen, and the cooking process.

R4.1: The design must be suitable for transfer of ownership through switch of resident.

R2.2: The design must improve the full cooking experience of the user or the full functionality of the oven

R4.4: The design must be understandable for users and not have too many distractions from the main functionalities.

R4.2: The design must enable personalisation, so the oven is tailored to the user's specific needs and preferences.

R3.3: The design must add value to users through service.

W2.1: The design should be desirable for users with an above average income, who have the ability and desire to invest in premium products for their more luxurious kitchens.

W2.2: The design should be desirable for cooking enthusiasts, who love to experiment with cooking and sharing the passion for cooking with friends.

W4.2: It is desirable that the design enables the user to explore and understand all the oven's functionalities.

W5.2: It is desirable that the design lets users experience the oven as smart and self-cleaning.

R5.1: The design must enable product care to be part of the use routine.

R4.5: The design must encourage regular and the right product care activities, regardless of ownership, purchase, or end of life.

R5.2: The design must increase the user's motivation to do product care on the oven.

R5.3: The design must increase prompts/triggers to get users to do product care on the oven.

W5.3: It is desirable that the design increases the user's ability to do product care on the oven.

W5.1: It is desirable that the design can be tailored to new users differently than experienced users because a user's attitude towards and knowledge of the product and product care changes over time.

REQUIREMENTS

6.2 | IDEATION CYCLE 1 - REFURBISHMENT

6.2.1 | OWNERSHIP IN REFURBISHMENT

Goal

For a creative session about refurbishment, I visualised the process by mapping out how the appliance moves from ATAG, to user, to ATAG again and to a second user. The visualisation is then used to find gaps and challenges for refurbishment, more than just the user-centered ones.

Relevant research questions:

- **What will happen to the appliance in a life cycle?**
- **Where are possible spaces for intervention that could benefit the refurbishment process?**

Method

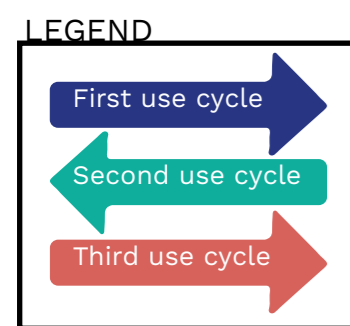
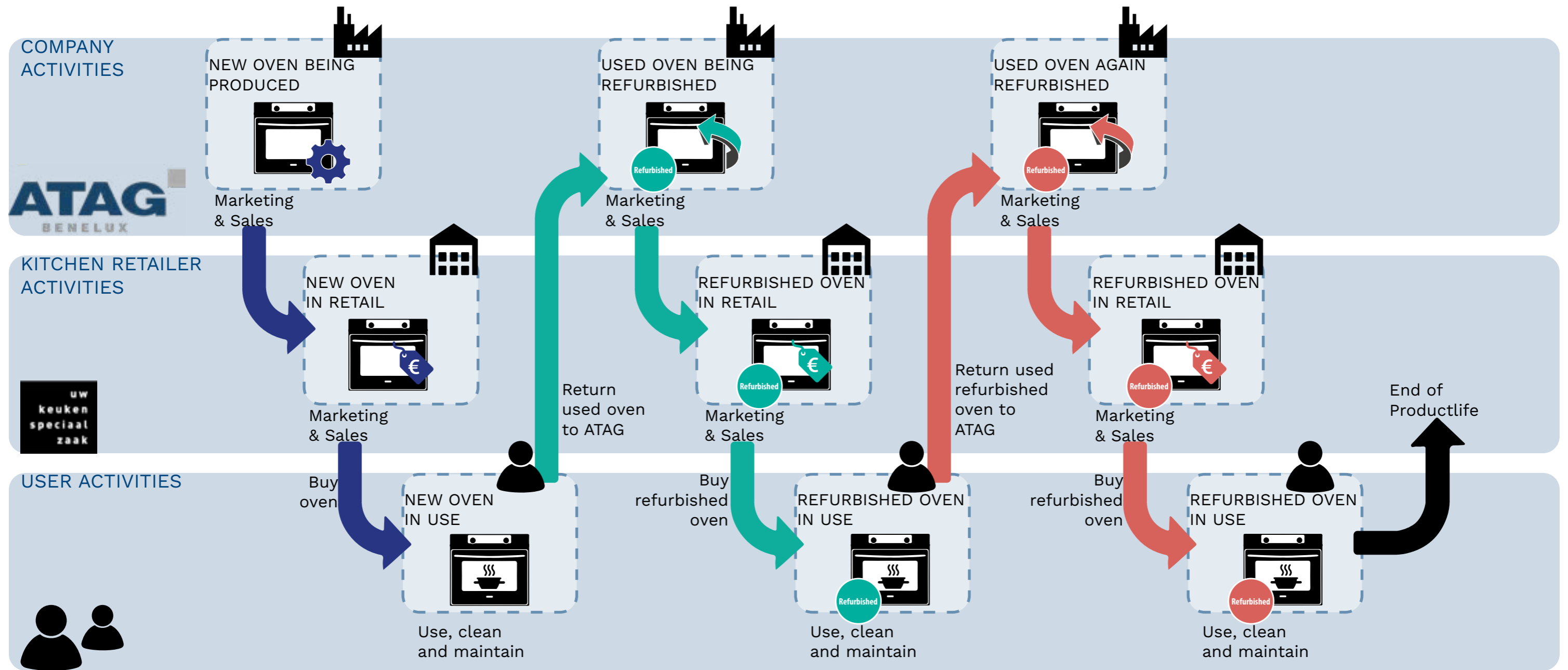
A first version of the visualisation was used for participants of the creative session to understand refurbishment. The visualisation shows how the appliance transfers over three groups of owners: The manufacturer ATAG, the kitchen retailer and the user. During the creative session this overview was explored. To keep the results of the brainstorm suitable for a Design for Interaction-graduation project, I made the participants during the session focus on the users. Find the first version in Appendix F.1.

After the session, another version was made. On this appliance journey, I mapped out what type of interventions can be used to benefit the refurbishment process. Results from the creative session were taken into account here.

Key insights

The next page shows the transfers of ownership in refurbishment. This is used to map interventions for refurbishment. These correspond with the idea clusters of the creative session, explained in the next sub-chapter. The interventions shown here are only a few interventions needed for refurbishment and they should each be explored more.

APPLIANCE JOURNEY



6.2.2 | CREATIVE SESSION AT ATAG

Goal

I assumed that designers already have some basic knowledge through their experience for user-centered design. The goal for the brainstorm session was to know what product solutions and which design strategies the participants would come up with. The brainstorm question was:

How can value be added in the design of the oven, for the user and the refurbishment process?

Method

A creative session was held with 5 participants: two design students from the Strategic Product Design and Integrative Product Design tracks of the University of Technology Delft and three employees at ATAG: an industrial designer, a design manager and the innovation manager. The prior knowledge on the topic of the participants were different levels. Two of the ATAG employees are very involved in the project, the other was not, and the two design students received an introduction on the topic. This brought very different perspectives to the table; inside/outside the project, and inside/outside the organisation. This helped to get a wide range of ideas during the session. The session plan can be found in Appendix F.1.

The session lasted around 4 hours, it consisted of exploring the topic of refurbishment, brainstorming design goals and creating ideas for user-centered design for refurbishment. After creating many ideas, the participants were also asked to express their interest in ideas with dot-voting. They then split up in two groups and each of the group developed a concept on a poster.

After the session, I analysed the ideas and clustered them, to find common themes. The ideas were collected in one place on pieces of paper. I made use of spontaneous clustering, where I grouped ideas based on similarity, which continued until all ideas had been placed into a group.



Figure 6.1 | impressions of the creative session at ATAG

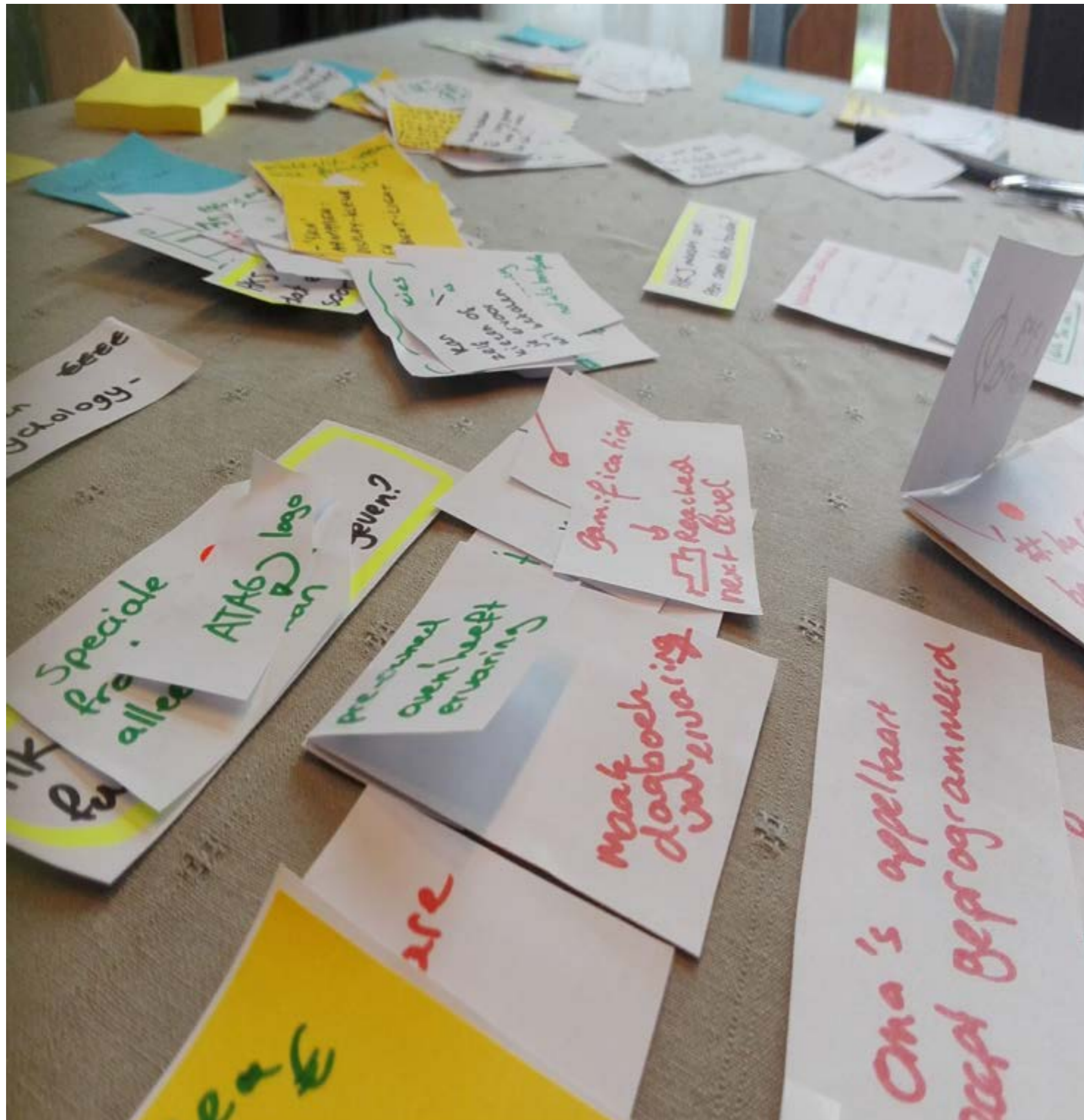


Figure 6.2 | impressions of the clustering process

Key Insights

At the end of the brainstorm session the participants came up with 12 design goals, 12 How-to's, and 115 ideas for user-centered design for refurbishment. I had then clustered this into 34 clusters, in 11 solution spaces. Find the design goals and how-to's in appendix F.2. The clusters with all ideas can be found in Appendix F.3.

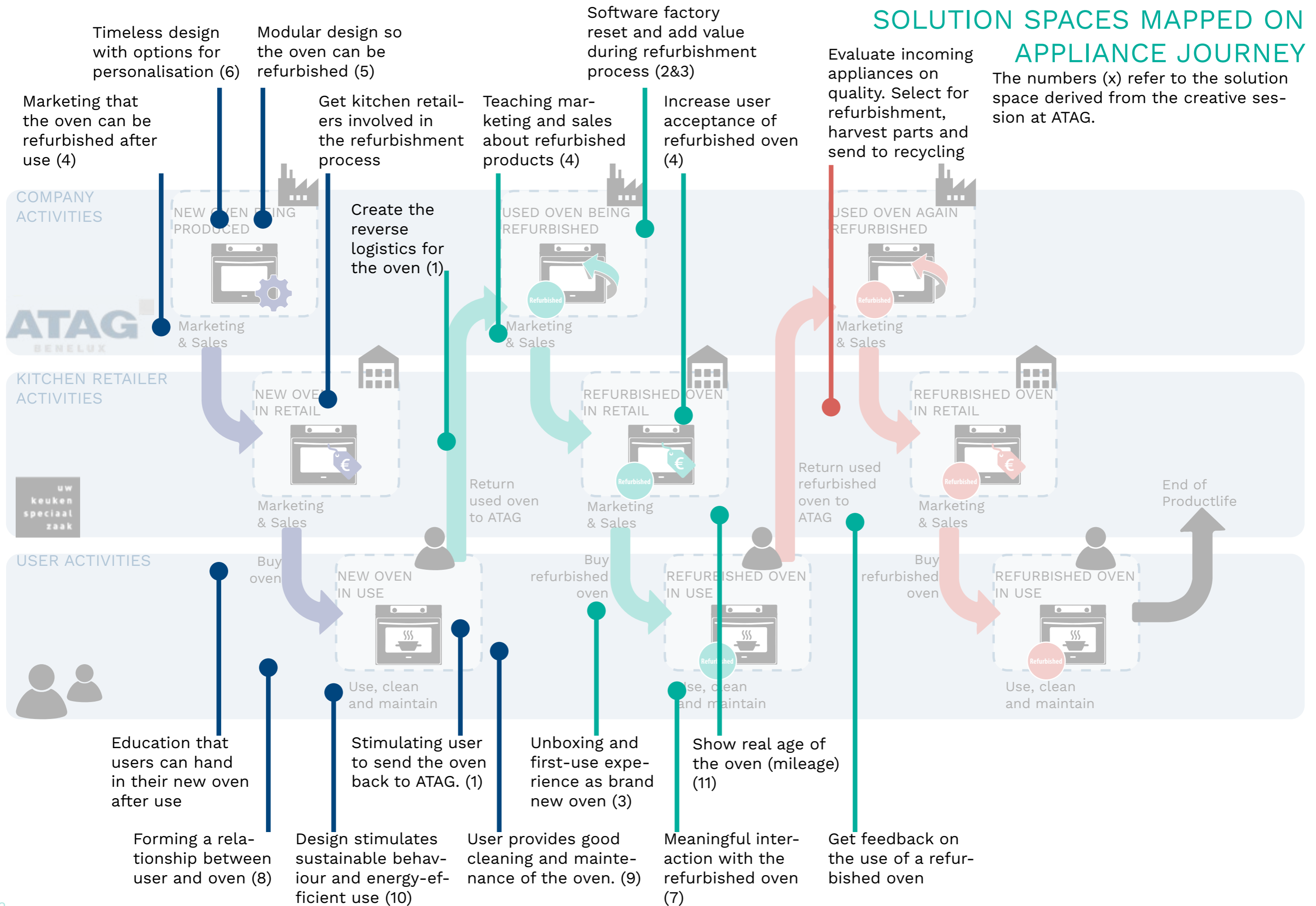
Solution spaces:

1. Ideas for returning the oven to ATAG
2. Ideas for refurbishment process
3. Ideas for adding value during refurbishment
4. Ideas for increasing environmental value
5. Ideas for modular design
6. Ideas for timeless design
7. Ideas for personalisation
8. Ideas for getting a relationship with your oven
9. Ideas for cleaning
10. Ideas for energy efficient use / sustainable behaviour
11. Ideas for showing real age of oven (mileage)
12. Other ideas

The clusters are mainly based on where in the appliance journey the intervention applies. On the next page the solution spaces are mapped out on the appliance journey. This enabled reflection and evaluation of the created ideas. This is done in chapter 6.2.3 which results in specific goals for the remainder of the project.

SOLUTION SPACES MAPPED ON APPLIANCE JOURNEY

The numbers (x) refer to the solution space derived from the creative session at ATAG.



6.2.3 | EVALUATION OF SOLUTION SPACES

Goal

The creative session at ATAG resulted in many different solution spaces that can be used to benefit refurbishment. To give focus to this project, I need to narrow the scope to a more specific goal, so I can contribute to the refurbishment of ovens.

The relevant research question is:

How can I contribute to the refurbishment of ATAG ovens?

Method

The solution spaces derived from the creative session are the basis of this chapter. To narrow the scope of the project, I evaluate these on a set of criteria (full evaluation is in Appendix F.4). The possible interventions in the solution space should...

1. ... be a potential design solution.
2. ... require knowledge/skills that I personally can add to the company.
3. ... be user-centered.
4. ... have the potential to make a significant difference in refurbishment.
5. And the resulting design goal should fit the scope of the remainder of this graduation project

Evaluation

Requirements for refurbishment process

Modular design

For refurbishment, modular parts and components are important. This issue is already on ATAG's radar and they will continue to work on this. Therefore is decided to not explore this option in too much detail. An oven with a removable cavity would be ideal for refurbishment, but this means changing the entire build-up of the oven.

Refurbishment process and adding value during refurbishment

Software update or factory reset is required for refurbishment, so users can enter their own personal settings and do not get the settings from previous user. This creates a brand-new user experience.

Showing real age of oven (mileage)

Chapter 4 has shown that users would like to know the amount of hours a refurbished oven has been used before. This could also be referred to as mileage of the oven, or 'real' age. Besides circular economy, ATAG is also innovating towards connected kitchen appliances, using the Internet of Things. Measuring 'real' age of the oven is one of the things ATAG can do for gathering data. This can be used to learn about the value depreciation of their products during use, to be able to estimate in what state their product will return. Communicating this mileage of a refurbished oven helps to increase transparency. There might be a downfall however: users should not focus on the fact that the oven has been used for a long time. So when communicating the mileage, user research will need to be done to achieve a balance between transparency and how this affects the perceived value of the refurbished oven.

Timeless Design

Design of the refurbishable oven should be timeless design hardware with personalisable software, so the personalisation can be removed after a use cycle. The current design of the oven has timeless design already, and the Create department of ATAG is also working on increasing the possibilities for personalisation.

Opportunities adding to refurbishment

Energy efficient use / sustainable behaviour

Creating sustainable use behaviour by stimulating the user to decrease oven use does not fit ATAG's goals, as they do not want to discourage users from using their products but rather stimulate them to use the oven to cook healthy food. However, stimulating energy efficient use like the eco-hot air or pre-heating at the right times, is still something ATAG can explore to reduce the environmental footprint. For example, ATAG has the eco-hot air function as second oven function, after the normal hot air function. If this is turned around, many users would be nudged to use

the eco-hot air instead of the other.

Increasing positive environmental value

ATAG should never stop increasing the environmental value of their appliances. Making the appliances more energy efficient or increasing the environmental value of the materials requires expertise of the engineers of ATAG. And increasing the perceived environmental value should be done through the communication around the appliances that are actually more environmentally friendly. However, it should be taken into account that this is done in the right way so customers don't perceive the performance of the appliance to be decreased.

Focus for This project

Cleaning

Given that part of the users disposes of their oven for other reasons than it not functioning as should, it is important to make sure the oven is in well state when it returns. Here, the user is considered a crucial stakeholder in refurbishment. Design can change users' behaviour, stimulating better maintenance and product care of the ovens. If the oven guides the user to keep the oven clean while using the oven regularly can benefit refurbishment process.

Returning oven to ATAG

Taking a user-centered perspective in getting products back is a new and innovative take on reverse logistics. Having the user as key stakeholder in returning the products, buy-back has potential, but should be refined and communicated in the right way.

Additional Opportunities

Personalisation

Personalisation of products has been shown to create more careful behaviour towards the product. However, for refurbishment, timeless design seems more effective since the same oven must fit into the look and design of different kitchens over a long period of time.

Temporary personalisation on the other hand can be interesting to make the user feel in charge and with a connection to their own oven. This personalisation

should be removed during refurbishing with a factory reset. But the personalisation should serve a purpose. For example, to create another type of interaction between user and oven.

Getting a relationship with your oven

Just creating a relationship is not necessarily good for refurbishment. Attachment has upsides (more careful with products) and downsides (not being able to send it off to proper reuse or refurbishment). The relationship should be created with a purpose.

CHAPTER CONCLUSION

This chapter shows valuable take-aways that are recommended for ATAG to take into account when setting up a refurbishment line. The design considerations for refurbishment should focus on timeless design, adding value during refurbishment process, creating a brand-new unboxing and on-boarding experience, and transparency of showing the mileage of an oven. Parallel to that it is important to continue working on a modular oven. I believe a modular oven would mean great steps towards a circular economy.

For this project the redesign of the oven should focus on the interaction between user and oven, making the user an important stakeholder in refurbishment. The new interaction should result in the behaviour of cleaning and maintenance (also called: product care) and returning oven to ATAG.

The next ideation cycle is about creating concepts that do that.

These pages show a random selection of ideas generated during the creative session, all from different How-to's.



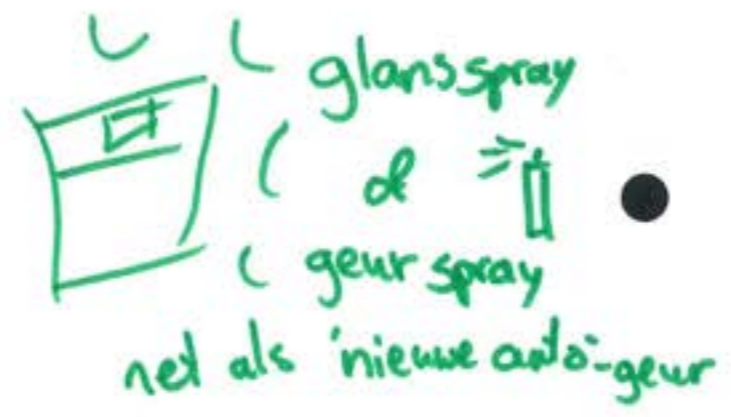
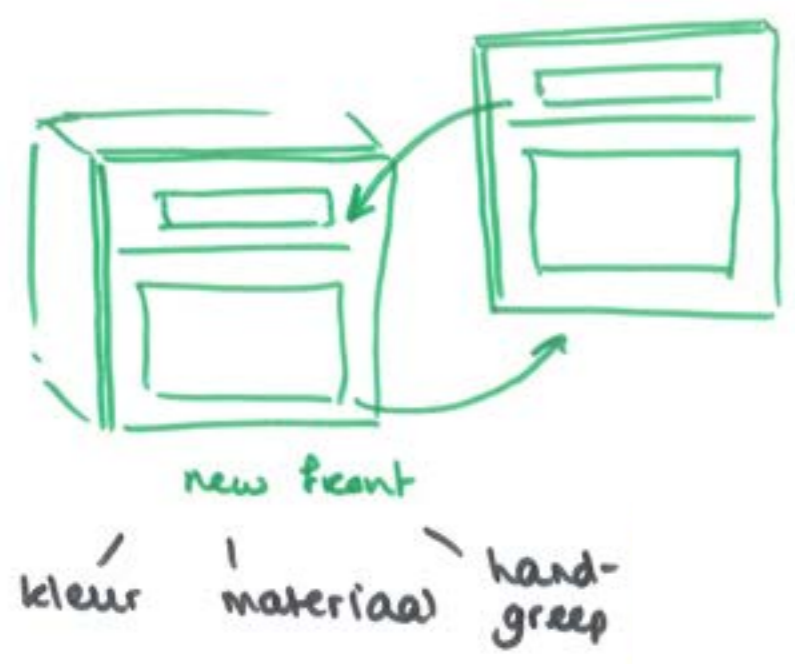
- meest gebruikte programma op 1e plek



abonnement op steeds de nieuwste oven, oude word ingelaveed.



Challenge: zo zuinig mogelijk koken (3 with een heuker)



-subtiel nudges, in user interface. (-beter voor smaak, -even snel open met tips & tricks)

netjes klasse

	A	=	500 €
	B	=	300 €
	C	=	50 €

'tot. kg CO2 bespaard' certificaat



Speciale front die alleen bij Relabistal kan



kilometer stand = experienced oven



Net als telefoon



MAAK MI SCHON!



Garantie binnen garantie terugkopen.



6.3 | IDEATION CYCLE 2 - PRODUCT CARE AND RETURNING THE PRODUCT TO ATAG

6.3.1 | BRAINSTORM - PRODUCT CARE TOOLKIT

Goal

The goal for the creative session was to create many ideas for product care, cleaning and maintenance. To make the most use of this brainstorm session I am building upon designers' existing knowledge on how to design for product care.

Toolkit

This brainstorm session is based on the Product Care Kit, developed by Tuimaka (2019). The kit a set of cards that present the most important factors which influence Product care. The set consists of the following cards: persona cards, product cards, product care type cards, design strategy cards and example cards with product solutions for each design strategy.

I followed the instructions on how to use the set, with the following steps:

1. Getting to know the tool
2. Setting a goal for the session: Create many ideas for product care, cleaning and maintenance Context and solution direction for my project
3. Defining the product: The ATAG oven
4. Who's your user?
5. Defining the desired behaviour (I picked 4 out of 7)
 - a. Small care
 - b. Instructed & Mindful handling
 - c. Routine acts
 - d. Preventive measures
6. Design strategies (for the group session I picked 6 out of 8)
 - a. Control
 - b. Enabling
 - c. Experiences
 - d. Informing

- e. Reflecting
- f. Appropriation
- g. (Social)
- h. (Change)

Brainstorm session 1 - Online group session

A brainstorm session was held with 6 participants from the Circular Design Lab (CDL), varying from Industrial Design Engineering Master students to faculty members. The brainstorm session was held online via Miro during one of the monthly meetings of the Circular Design Lab in Zoom.

The session lasted around 45 minutes. It started with a short introduction on the topic, product and the persona. In preparation I prepared a Miro board with the info on step 1 to 4, and space to brainstorm step 5 and 6 with the selected cards. Then the participants ideated on step 5 and 6, randomly picking a card to ideate on. Find the complete Miro board in appendix G.1.

The group ideation led to around 50 ideas.

Brainstorm session 2 - Individual ideation

The first brainstorm was fairly short and participants only covered a few of the cards. Also I assume the results of the brainstorm with the CDL was dependent on their knowledge of product care, cleaning and maintenance of ovens in general. I have been sensitized by my research and having experience with the steam oven. Therefore it is possible that I can develop different ideas compared to those of the online brainstorm session.

The goal for the individual ideation was to develop as



Figure 6.3 | impression on results for one product care type card

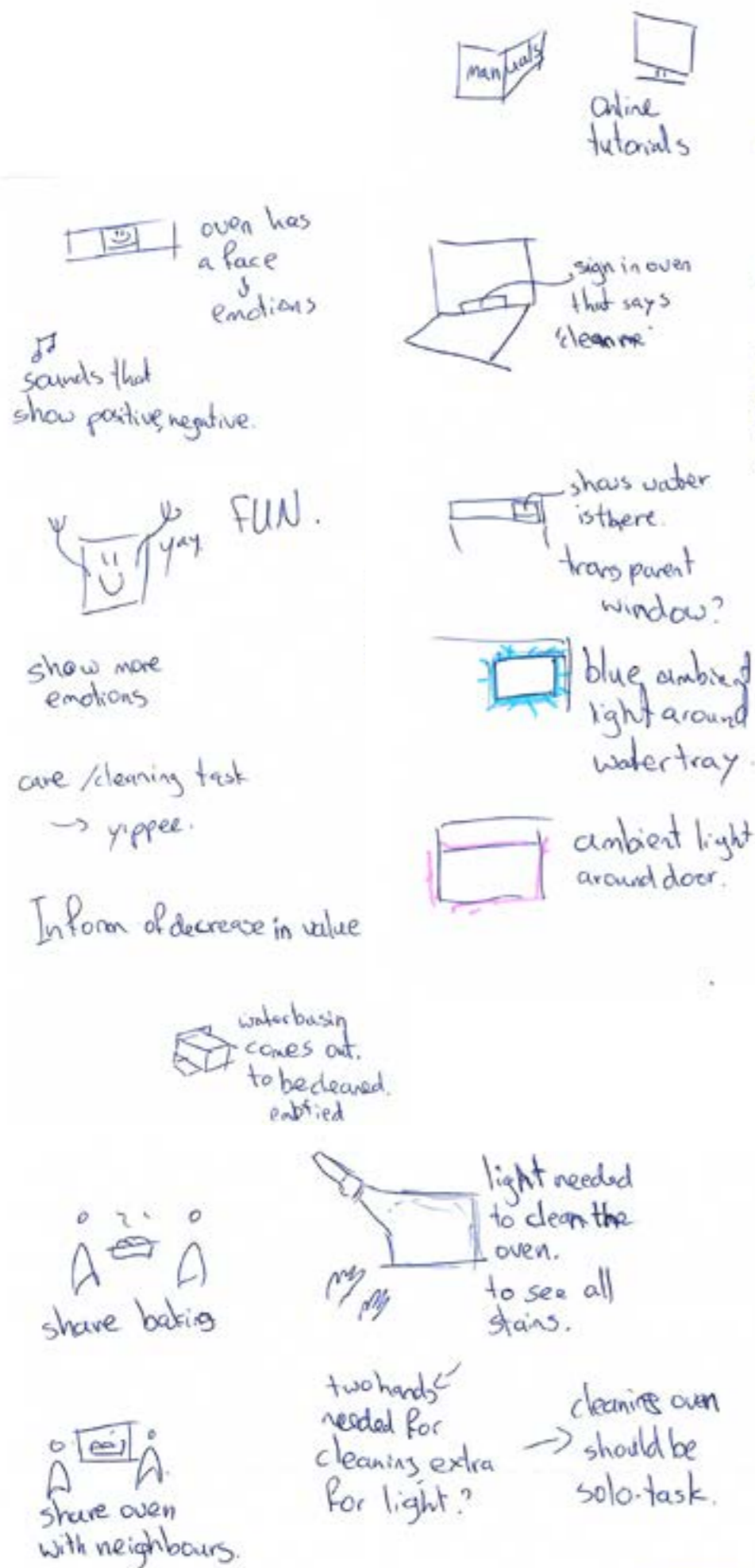


Figure 6.4 | Random selection of ideas generated in individual session

many ideas as possible, covering the whole spectrum of product care activities.

For this individual brainstorm, I used the same four selected desired behaviour cards, but included all of the design strategy cards with the corresponding example cards. I made myself brainstorm at least 5 minutes on every card, and when my inspiration was letting me, I would take longer. For extra inspiration, I made use of the example cards. Only when I had covered all questions on the cards and all example cards, I would move to the next card with new questions, gaining new inspiration.

The individual ideation led to another 150 small ideas.

Clustering

To find common themes I analysed the ideas created in the brainstorms. Clustering these based on the type of interaction, made it possible to reflect and evaluate on the created ideas and formulate groups that become one concept.

The ideas were collected in one place on pieces of paper. I made use of spontaneous clustering, where I pick an idea and place it next to a similar one, or form a new group. This went on until all product solutions were placed somewhere. The clustering process consisted of a few rounds. For one round an interaction designer was brought in to cluster it with me. This brought an outside perspective and helped see any missed links. By doing it together we had fresh ideas but still with my experience of the product and research present.

Results

Together, the brainstorm sessions led to around 200 small ideas. Clustering resulted in 51 combined ideas, clustered into 14 clusters. These can be found in appendix G.2.

The clusters are:

1. Ideas on what the interaction should bring forth
2. Ideas on how design can prevent the need for product care

3. Ideas on how a smart/connected oven does product care
4. Ideas on how the oven points out product care...
 - a. ...with mechanical movement
 - b. ...by using sound and light
 - c. ...by showing on display
5. User learns to perform product care (oven teaches)
6. Experience the result of product care
7. Ways and moments to customize your oven
8. Oven keeps memory of activities and more
9. User cleans and replaces parts
10. Peers and communities of users
11. ATAG does product care, or use the ATAG brand
12. Other

These clusters are used as input in creating concepts. Chapter 6.3.3 explains what ideas are selected and how.

6.3.2 | BRAINSTORM

- RETURNING THE OVEN TO ATAG

Goal

The goal for the creative session was to create ideas for returning the oven back to ATAG. I assumed that designers, especially those working on circular design, already have some basic knowledge through their education on how to incentivize the user to return products to the right place.

The brainstorm question is:

How can the user be triggered to get the oven back to ATAG?

Method

A brainstorm was held with me and two other students from the Circular Design Lab (CDL), who also happened to be doing the master Design for Interaction. As part of a larger creative session, I put my brainstorm question to the table. The brainstorm session was outside, held in person.

The brainstorm lasted around 30 minutes. It started with a short introduction on the topic, then we all created ideas individually and presented them to each other. By doing it together we had fresh ideas but still with my experience of the product and research present.

After the brainstorm session, I added more ideas derived from conversations with the company mentors, and ideas based on ideas in the dissertation of Poppelaar (2020) on the topic of divestment.

Result

The brainstorm led to around 54 ideas, in nine clusters. Appendix G.3 shows all ideas generated.

Clusters

1. Cashback, rewards and manual
2. Information and support
3. Experience and reminisce
4. Promotion
5. Connected oven
6. Ideas on pick-up and shipping
7. Self-diagnostics
8. Sticker or text in/on oven
9. Other

These clusters are used as input in creating concepts, as described on the next page.



Figure 6.5 | When a user replaces their oven, a trigger is needed for them to send their used oven off to ATAG



Figure 6.6 | Impression of individual brainstorm session with the Product care Toolkit

6.3.3 | CONVERGING INTO CONCEPTS

Goal

There are now many different ideas for product care and returning the product to ATAG. To create a design from this, groups of ideas are selected to form the basis of three concepts. These concepts will be evaluated and result into one final design.

The relevant research question is:

How can I redesign the ATAG oven, to create a meaningful interaction that stimulates product care and returning it to ATAG after the use cycle?

Method

The ideas derived from this ideation cycle are evaluated with a set of criteria to select ideas.

Criteria

1. The ideas selected together should complement each other to be combined into three comprehensive concepts.
2. The selected ideas should vary in the level in which the user does all product care vs the oven does all.
3. Each of the resulting concepts should have something on product care and something on returning the oven to ATAG.
4. The resulting concepts should contain an interaction between oven and user
5. The resulting concepts should have the potential to make a significant difference in refurbishment.

Results

Appendix G.4 shows the selected ideas grouped together. This is a summary of these groups:

Group 1

Personal communication, with a smiley character. User can manually change UI to create an emotional bond with the oven. Use the brand image. For returning the oven, offer an off-boarding service like a product relationship counsellor

Group 2

The oven keeps track of activity and knows when cleaning is needed and when it last was done. Use the display to guide users and use light to indicate where care is needed. A button attracts attention to start the interaction. For returning the product, the display shows a reminder when the oven is taken out of its place. Text physically in/on the oven also reminds the user to return the oven.

Group 3

The oven indicates need for cleaning, and teaches the user, in a tutorial mode, so that he has ability and knowledge what to do. Use light in cavity to show stains. For returning the oven, the company offers buy-back and the oven uses self-diagnosis to estimate the amount of money back, because that depends on the state of the oven.

These groups are used as basis for developing the three concepts. This is done in an iterative process.



Figure 6.7 | Example of cluster from group brainstorm about product care



Figure 6.8 | Example of cluster from group brainstorm about product care

OVEN TEACHES USER TO PERFORM PRODUCT CARE

Ability and knowledge to user

- Give good cleaning supplies with oven
- Have cleaning tools close to oven
- tool om gaatjes te bedekken wanneer je met zwaar geslacht gaat schoonmaken
- Manuals
- Sticker on oven with contact info in case of issues
- Show small maintenance tasks in manual or tutorials
- product care tips always available on the touchscreen
- NFC chip net als senseo apparaat in afstudeer opdracht (van Jozine Bouma)
- Online tutorials
- Instructions with guidance on the screen -> with clean visuals
- Instruction videos -> access them on screen

Tutorial mode first period of use

- First use -> first month of use shows more instructions. Later less. Instruct what to do. 'Tutorial mode'.

Light

- Keep light in oven on after use

Use light to indicate where care is needed

- Moving flashing lights to show where care is needed
- highlight parts that need cleaning
- spotlight showing what should be done.
- Use ambient light to show where you have to clean and what to do
- Blue ambient light around water tray
- Ambient light around door



Figure 6.9 | Example of cluster from individual brainstorm about product care

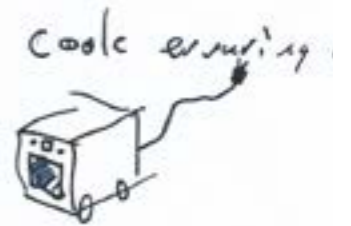
EXPERIENCE AND REMINISCENCE

Experience

- coole ervaring met terugbrengen
- afscheidsritueel
- afscheidsceremonie
- Ophalen is een ervaring
- speciale trolley voor coole ervaring

Reminiscence and look back

- By enabling to reminisce and look back at old appliances as well as their digital content at the time, designers can play on the factor of psychological compensation.



Off-boarding service

- Guide to a respectful goodbye
- a "ceremony to say goodbye" to give the new appliance a good start by cleaning the digital content from the old oven before putting it "into a new body".
- 1. Clean up your appliance's digital content
- 2. Make a back-up and transfer your data to your new appliance for a fresh start
- 3. Reminiscence on the time spent with your old appliance through visual memories
- 4. Thank your old appliance, erase data and place it in the care of ATAG.



Figure 6.10 | Example of cluster from brainstorm about returning the oven

EXAMPLES OF CLUSTERS FROM THE IDEATION PROCESS.

6.4 | CONCEPTS

The three groups of ideas are iterated upon and developed into three respective concepts.

CONCEPT 1 - BUILD A BOND

Through personalisation, the user becomes more attached to the oven. You can say the oven and the user become a 'team' in what they do: the oven helps the user finish meals and cakes. And the user helps the oven to do so by maintaining it.

Personalisation is about the settings in the screen, giving the appliance a name and letting the appliance use its user's name. It is also about uploading pictures for backgrounds, colour schemes and adjusting menu preferences.

The user gets more attached to the oven, and then better cares for the oven. When the time comes that the oven should be replaced, the user should be ensured that personal data is erased, but also reminisce on the good times to say a proper goodbye.

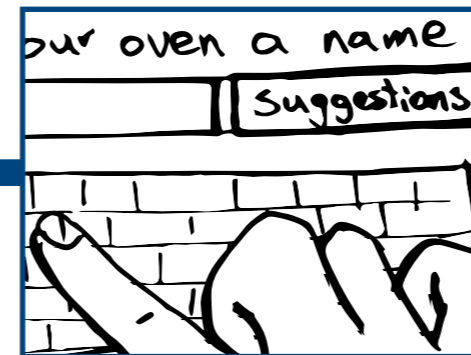
Scenario 1:

Oven asks user to give it a name. On first use.

Oven asks Saar to give it a name



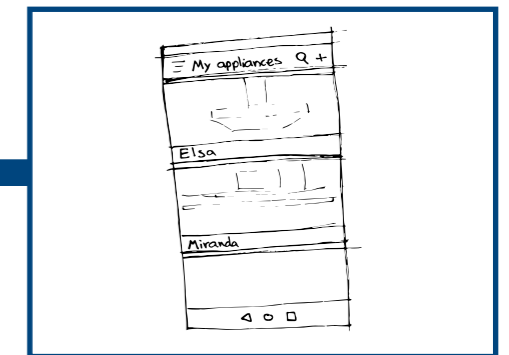
Oven gives suggestions



Saar enters a name that suits her



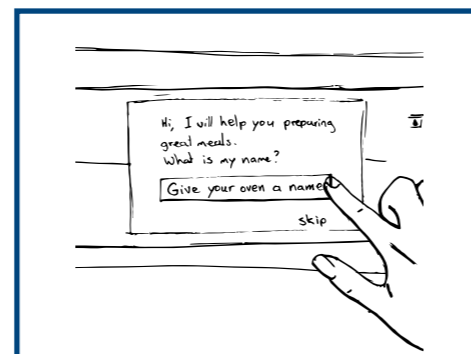
Name is used in following scenarios



Scenario 2:

Oven asks what he can call the user. On first use.

Oven asks Saar what to call her



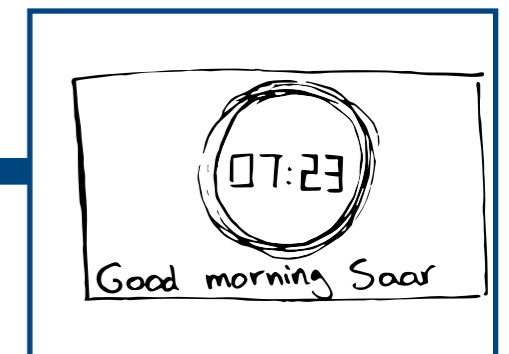
Oven gives suggestions



Saar enters a name that suits her



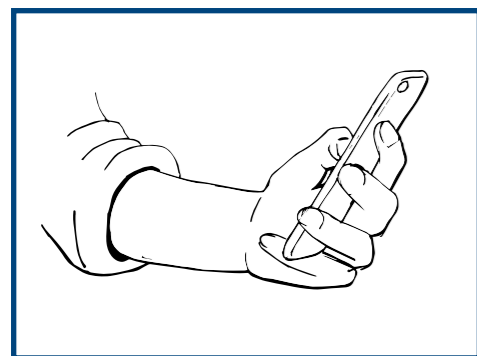
Name is used in following scenarios



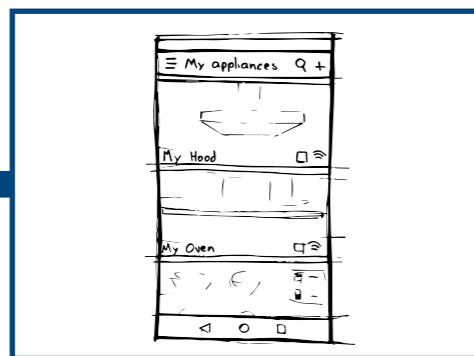
Scenario 3:

Users can upload pictures to the oven to be used as stand-by screen or background

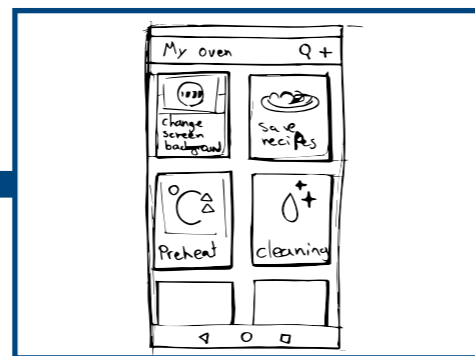
Saar uses the app on her phone



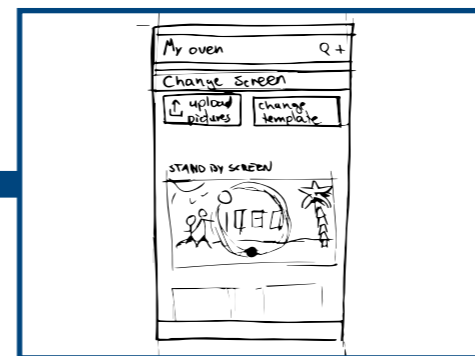
Uploads a few pictures



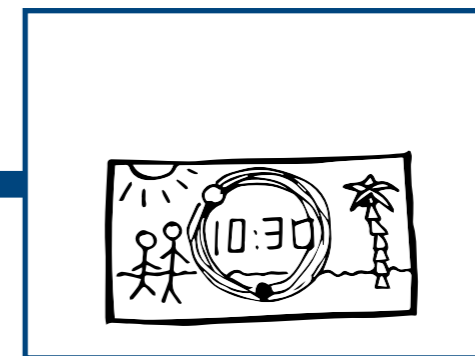
Choose setting when to show them



Oven shows the pictures



Saar feels happy with the oven

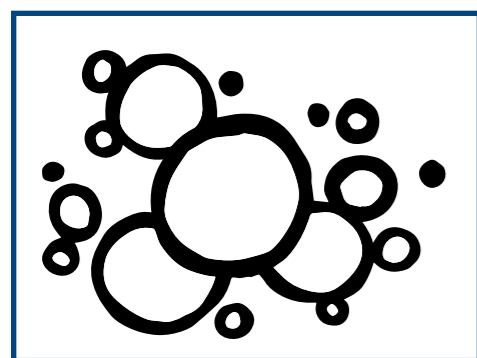


Saar can choose a background of the stand-by screen, or the timer. Keep clock visible, user can arrange composition of the screen or choose from a few templates

Scenario 4:

End of Product life. Guide to a respectful goodbye

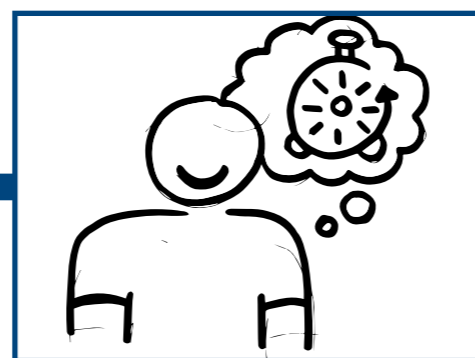
Clean up appliances digital content



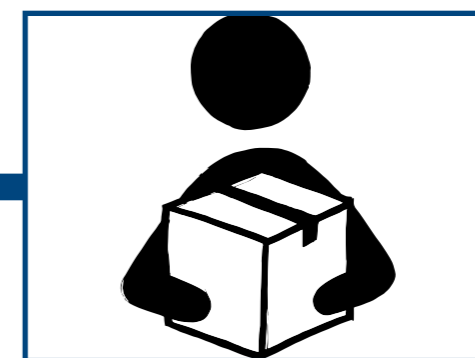
Make a back-up to transfer the data to the new appliance for a fresh start



Reminisce on the time spent with the old appliance through visual memories.



Thank your old appliance, erase data and place it in the care of ATAG



CONCEPT 2 - GUIDING THE USER

Using light and moving visuals, the oven guides the user into what tasks have to be done. The oven tracks the activities and oven settings and will at appropriate times ask for a maintenance task. This is done in a non-intrusive way, with a positive attitude.

Light in the cavity and water reservoir help the user easily recognise where tasks are requested.

When powersupply to the oven is taken out, the oven shows where the user can register the oven for pick-up by ATAG.

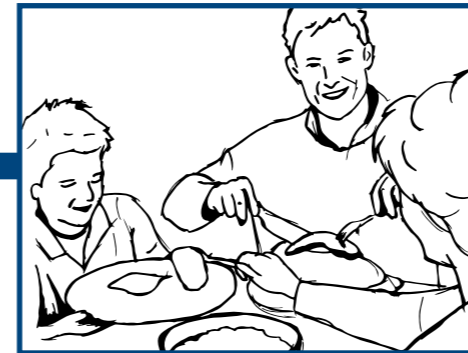
Scenario 1:

User has to dry or clean the inside of the cavity

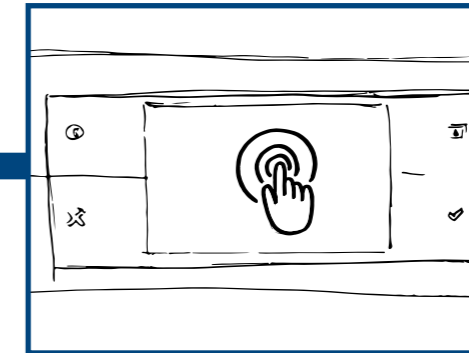
Lukas uses the oven



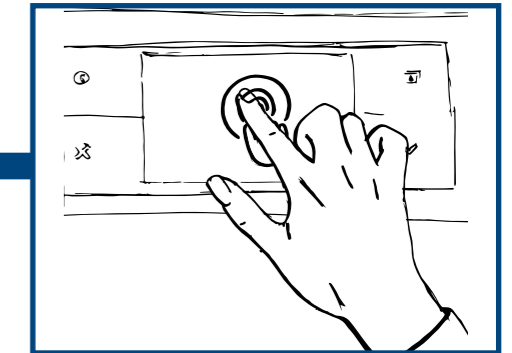
He enjoys his dinner



Oven attracts attention



Lukas taps screen



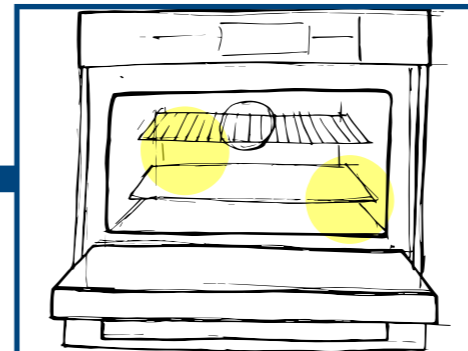
Timing: After half an hour*.
Screen: Subtle screen, asking you to tap it to find out more, nothing moving.

Screen shows task



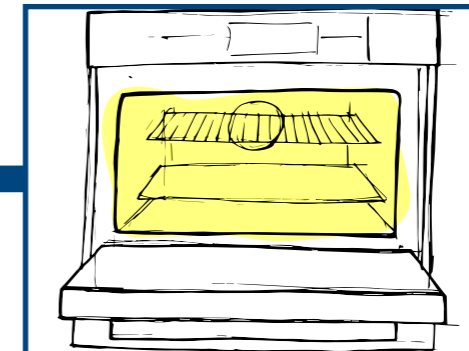
Tasks in few words.
Icon.

Light indicates where the task is



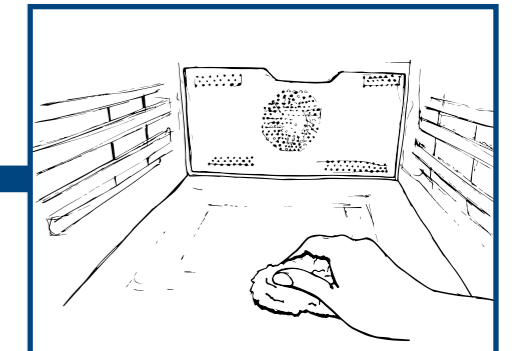
Multiple lights in cavity show a circling movement. You need at least four light for this.

Lights stop moving



Timing: When the door is open for 3 sec, the lights stop moving (all lights on).

Lukas does the task



Screen shows happy emotions.

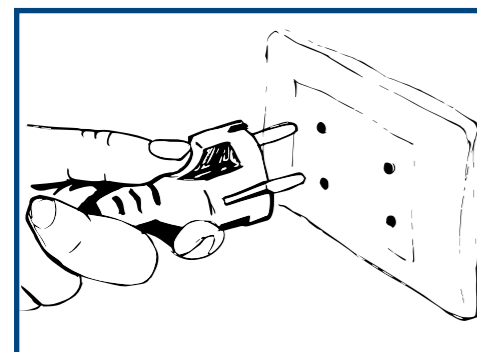


Timing: When door is closed again (task is done)

*-> users can put in ATAG app when they generally clean their oven

Scenario 2:

End of product life



When power is off, screen shows user where to put the oven for refurbishment.



Also text/sticker in or on the oven. [about increasing triggers]

Scenario 1:

User has to dry or clean the inside of the cavity.

Idris uses the oven



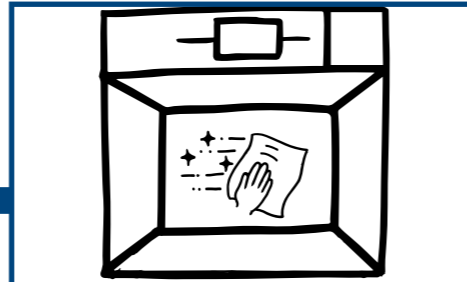
Oven tracks activities and use. And knows when certain activities should be done.

Oven shows that a task should be done



Timing: When oven programme ends, door open and closed, then after 3 seconds no new programme has started: show screen

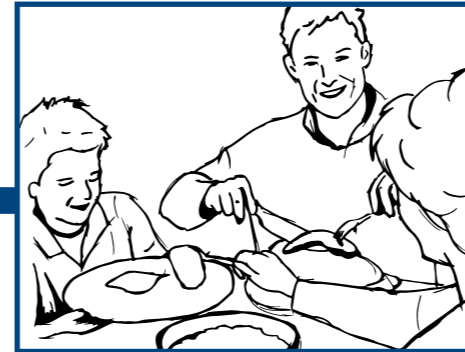
Learning stage One:



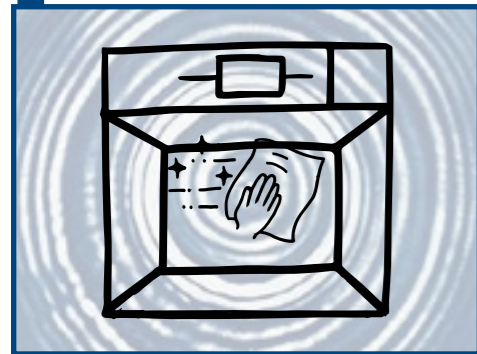
Wipe the inside of the oven with a soft cloth so no stains will burn in

Screen shows in detail what needs to be done, where and why.

Idris can first enjoy dinner

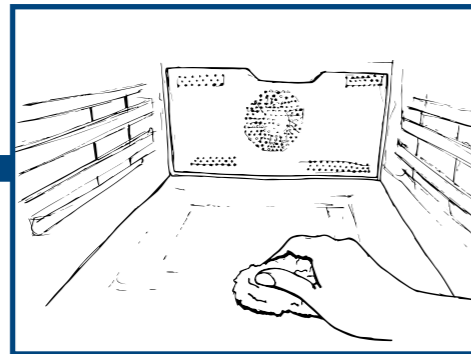


Oven attracts attention again

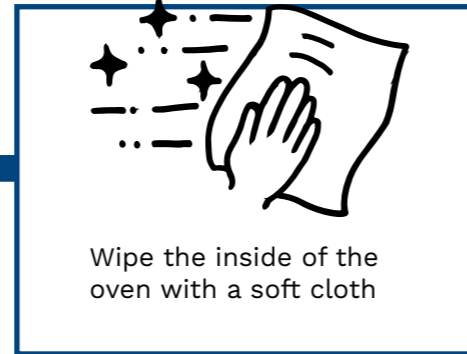


Timing: After half an hour*. Screen: Background of task starts moving, in calm, light-wave-like movements. Different 'motion'/colour combination for every task.

Idris does the task



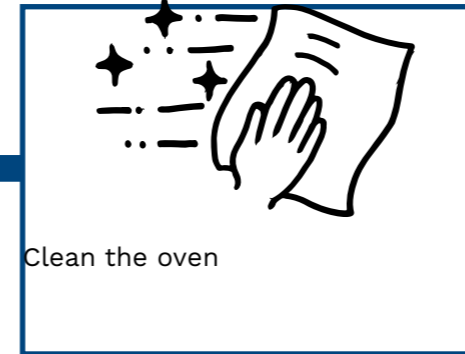
Learning stage Two:



Wipe the inside of the oven with a soft cloth

Learning stage Two starts after the first month of use, or 20 times use**. Screen: less text shown in screen.

Learning stage Three:



Clean the oven

Learning stage Three is the final stage, and starts after another five months, or 100 uses**. Screen: no text. Just (minimal version of) the icon and background.

* -> Can add machine learning effect, where oven learns more about the user's routines and adjust timings to that.

** -> periods here are guessed to be appropriate. Should be determined with user research

CONCEPT 3 - TEACHING THE USER

This concept uses a kind of 'tutorial mode', where in the first period of use (note: not only the first time), the oven guides the user more on how to take care of the oven. After a period of time, the amount of guidance and explanations goes down, assuming the user already knows how to do the tasks. After more time, the guidance goes to a minimum that still triggers the user to do something, but is even less intrusive, because the user knows its appliance well.

At the end of life, the oven is bought back by ATAG. The amount of money is determined on the basis of how well the user has used the oven. For that, the oven can apply self-diagnostics.

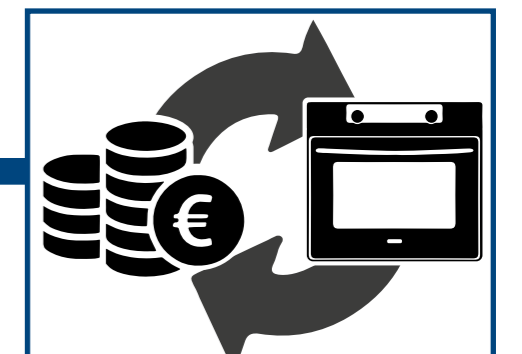
Scenario 2:

End of product life

Self diagnostics. Earning points throughout the use.



Buy-back. Amount is done by the self-diagnostics. 'Property of ATAG' more present.



6.5 | EVALUATING THE CONCEPTS

GOAL

To create one design, the three concepts presented in the previous chapter are evaluated. The corresponding research question is:

What redesign of the kitchen should be recommended to ATAG to create a circular oven?

METHOD

With limited time to evaluate the concepts with users, I invited two groups of people with professional skills allowing them to empathize with the user. I held two feedback sessions: Eight employees of ATAG Benelux with a varying set of expertise joined the first session. Then four design students in their master's programme with a varying level of engagement in the Circular Economy gave their feedback too. The feedback sessions were held online through video call, with a shared Miro board. Participants shared their feedback on digital post-its and verbally.

I collected all feedback in the Miro board, clustered in common themes to make visible which parts of the concepts were perceived positive or negative. Find the feedback in Appendix G.5.

KEY FINDINGS

Represented topics: Attachment, cleaning, and End of Life.

In the three concepts, three topics were found. Concept 1 represents creating attachment, and concept 2 and 3 focus more on cleaning. Then all three concepts also contain a part on their End of Life. These topics were discussed by participants, on their relevance and potential impact.

Creating attachment is an indirect approach to product care. The participants in the evaluation question the impact on the approach of this concept to attachment. Attachment through personalisation

is one approach. They argue that you create attachment to a product if it is trustworthy, and reliable. ATAG can also build its brand and create good touch-points with the user to create attachment.

Instead of personalising the oven with pictures and names, the participants would rather be guided in the cleaning and maintenance of the oven. There seems to be a consensus that guiding people in product care is important and can have a strong impact. Communication and advice are necessary for prolonging the lifetime of an oven and useful for the user. This is positive towards both concept 2 and 3. The way the oven gives guidance and reminders can however be more personalised, giving the user more control.

Some participants feel that for circular economy it is more beneficial to focus on the end of life, getting the appliance returned to ATAG. The user needs a good incentive to not give the appliance to the municipal waste. ATAG as company can take responsibility on where their appliances end up and take the role of informing their users. It is important to tailor the return logistics to both appliances that are disposed of because they are broken, which happens more abruptly, as well as appliances that are disposed of because the user desired a different kitchen. The participants from ATAG seem to show more interest in EoL, over cleaning the oven.

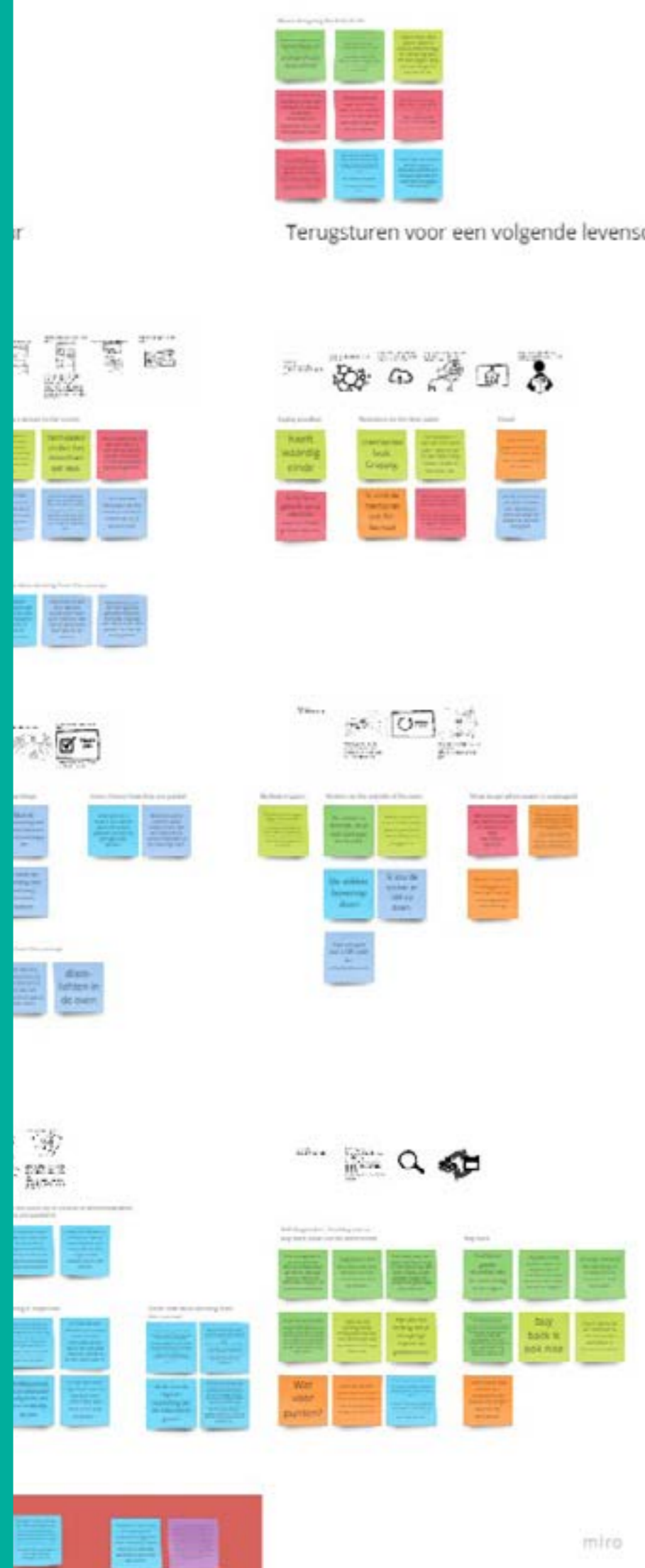
FINDINGS ON CONCEPT 1

Naming

Giving the oven a name already happens in the app. This has the purpose of being able to identify the appliance when you have multiple ones connected to your app. Giving it a more personal name to create connection does not spark much interest in the participants as it is abstract and not directly serving a purpose. Doing this action on the screen of the oven should really add to the experience.



Figure 6.11 | Impression of feedback on the online Miro board



Background picture

Participants mentioned that adding your own picture for the background would be nice. Next to being able to upload your own picture, this function should offer some stock pictures, so users can choose which fits better in their kitchen. This way it becomes like the background of a smartphone.

Saying goodbye

Saying goodbye to your appliance sparked the interest of the design students, but the ATAG employees did not see the reason for this, at least not directly. Priority for ATAG is first to at least be able to get some appliances back for refurbishment and involving the users in this. Saying goodbye to your appliance is something they can do on the longer term.

FINDINGS ON CONCEPT 2

Reminders and light for cleaning

Subtle reminders can really benefit the user, especially the notion that they are a little while after the use, and not directly. Also the use of light is nice. Users should however still be able to skip a cleaning task or be in control on when and how to be reminded. If they do not want to get any guidance, they should be warned that this might influence the quality of the product (and the buy-back value).

Sticker and screen when plugged out

The sticker for triggering the user on where to hand in the appliance is easy to do and good. It is hard to miss. Yet the limitation to this is when users decide on the destination of the appliance before it is taken out of the kitchen. In one of the concepts I suggested the text: 'Property of atag'. This might be confusing, but one of the participants suggested a new text: 'If it works, it belongs to you. If it does not work, it belongs to us.' The trigger on the screen has the same limitation and can also be missed when user is not standing in front of the oven at the right time.

FINDINGS ON CONCEPT 3

Different stages of learning

Giving more guidance and explaining why product care actions need to be done can be good for beginners and to get a routine of product care. However, the different stages are also hard to understand during use and might be confusing when they change. It is essential that the current stage and other stages are communicated clearly. The instructions should be helpful and not too annoying or demanding. Also, the participants express interest in letting users be in control, giving freedom to what level of guidance they want, how and when. And it is important that new users can still get to explore the oven.

Buy back

Buy back received most interest by the participants, as the strongest incentive for users to return their appliances to ATAG. And having the amount of money be depending on the state or the use of the appliance seems fair. However, it is hard to measure that. Earning points throughout the use can be confusing and hard to implement in the busy context of the kitchen.

COMPARING

When comparing, the participants from ATAG had a strong preference towards concept 3. Whereas the design students had a preference towards concept 2. Concept 1 sparked least interest. Some people expressed wanting a combination of all three or of concept 2 and 3.

For returning the appliance, buy back was discussed to be most promising. The design students also see something in the sticker, which is an easy thing to do for ATAG.

CONCLUSION

Let user in control, on what guidance they want to receive

The new design is a combination of concept 2 and 3, with freedom to users to decide what they want guidance in. With buy back and sticker saying something like: 'If it works, it belongs to you. If it does not work, it belongs to us.' The buy back value should be set to a certain price range. A-grade to C-grade wear. First you can define this, so experts can choose.

Future: self-diagnostics, where the oven can measure and knows its value.

7 Final design

This chapter presents the result of this Graduation project, the care assistant and buy-back incentive. This final design is discussed, and the different elements of the design are elaborated, such as the desired emotions, the different care scenarios, the buy-back system. At the end of this chapter recommendations for the further improvement of this design will be given.

7.1 | INTRODUCTION 7.2 | SUMMARY

In Chapter 6 I presented the ideation and development of one concept for product care and returning the oven to ATAG. This chapter presents the final version of the design, the Care Assistant and buy-back incentive and the way it can be used. This final design is the embodiment of the answers of to the research questions:

How can design be used for ATAG Benelux to create a circular business proposition?

And how can design be used to stimulate sustainable use and handling?

To show how the answers materialize in the design, the final design is illustrated by talking about how the care assistant communicates, how it presents information, and how it helps the user to clean and maintain their oven. This chapter also describes how the user is triggered to return the appliance to ATAG.

The recommended circular business proposition is for ATAG to take back appliances and refurbish those to be used again. This human centered design stimulates product care, which is a type of sustainable use and handling. The product care is needed to have a longer product life, or to take back an appliance that is in a better state (than it would be if product care had not been stimulated). With a buy-back system, users are stimulated to return the appliances, rather than let the appliance end up in recycling or worse.



7.3 | DESIGN GOAL

This vision and design goal show the envisioned result of the design. The requirements from the analysis phases are used as basis for this. It is a statement that describes what effect for the user(s) I intend to generate with the design.

VISION

Users should use their kitchen appliances with the same care as they do creating their meals.

DESIGN GOAL

The design should provide an experience where a cooking-enthusiastic semi-pro feels in control and is motivated to take care of their oven and return it to ATAG in the best possible state.

7.4 | INTERACTION VISION

This interaction vision expresses how users should feel when they interact with the oven. The emotions vary per step of interaction. Figure 7.1 shows the desired emotions per interaction part. The descriptions of the emotions can be found on the right.

When the oven is done, the user should feel relaxed, enjoying dinner. The user can be relaxed, knowing that he does not have to do something about cleaning the oven yet, and will be reminded on it later.

When the care assistant asks the user to do product care, the user should feel confident to start the process, knowing what is happening and how it works. He should feel fascinated and curious to start the interaction. The user should also feel kindness, wanting to care for the appliance with friendly interaction. The user feeling kindness towards the oven can also derive from feeling a sense of partnership or mutualism towards the oven: wanting to care for the oven, because it also helps you in cooking.

During the product care, confidence and kindness should be present in the interaction like when the care assistant starts. The user here should also feel kind about cleaning the oven well, but without scratching it. Next to that, the product care should be enjoyable, hence the emotion of joy.

When product care is done, the user can be pleased with the care, and thus should feel satisfaction. Pride can come from feeling they had completed an achievement. Here, the oven can show kindness towards the user for the product care.

When the appliance is no longer desired, the user can register it for buy-back. Pride can come from showing users they are doing something good for the planet, saving materials. They should also feel confident they know what to do and they will receive the money.

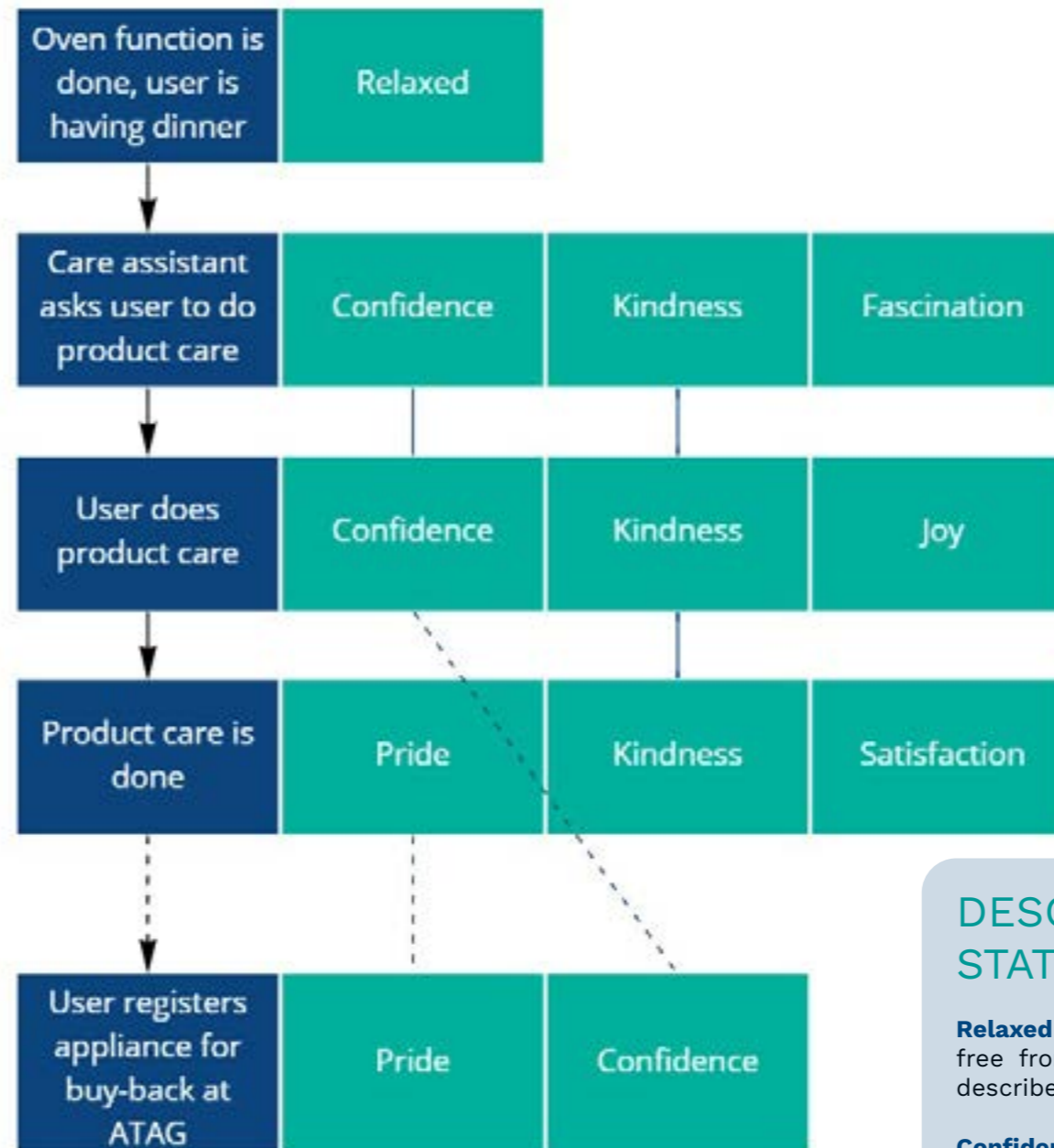


Figure 7.1 | Overview of intended emotions in different steps of interacting with the design

DESCRIPTIONS OF EMOTIONS AS STATED BY DESMET (2012):

Relaxed is an emotion of gratification; to enjoy a calm state of being free from mental or physical tension or concern. It can also be described as comfortable, carefree, serene, or tranquillity.

Confidence is an emotion of assurance; to experience faith in oneself or one's abilities to achieve or to act right. It can also be described as assurance, secure, or trust.

Kindness is an emotion of empathy; to experience a tendency to protect or contribute to the well-being of someone. It can also be described as caring, friendly, tenderness, or warm.

Fascination is an emotion of interest; to experience an urge to explore, investigate, or to understand something. It can also be described as curious, attentive, interest, or engrossed.

Joy is an emotion of enjoyment; to be pleased about (or taking pleasure in) something or some desirable event. It can also be described as happy, pleasure, delight, or cheerful.

Pride is an emotion of assurance; to experience an enjoyable sense of self-worth or achievement. It can also be described as triumphant, self-satisfaction, smug.

Satisfaction is an emotion of gratification; to enjoy the recent fulfilment of a need or desire. It can also be described as gratified, pleased, contentment, or fulfilment.

7.5 | BUY-BACK

Users can return their appliance to ATAG for a discount towards the next purchase.

The buy-back value of appliances will depend on type, age, and in what the appliance is.

A grade = as new, with few traces of use to fixable parts.

B grade = visible used. Little dents or scratches visible. An appliance can for example be 6 years old, but have no to limited traces of use, whereas another appliance can be 3 years old, with visible scratches on the appliance. The letter will have a lower value.

The conditions and buy-back need to be determined and be communicated to users. Users need to be able to assess what their appliance is worth. Based on the use data that the oven tracks can be estimated what grade the oven is.

In the form of a discount, the buy-back value stays within the company. However, it should also be desirable for users to hand in their appliance and receive store credit. For this ATAG can work together with partners so customers can buy kitchen accessories.

Users can learn about the buy-back system in different ways, as shown in figure 7.2. The goal is to let the users register the appliance for return, and then ATAG will do the rest. Registering can go through website, app, or a retailer can help the user. Because retailers and contractors are closer to the users and give advice, it is important to facilitate that they also can benefit and advice their clients to return their appliances.

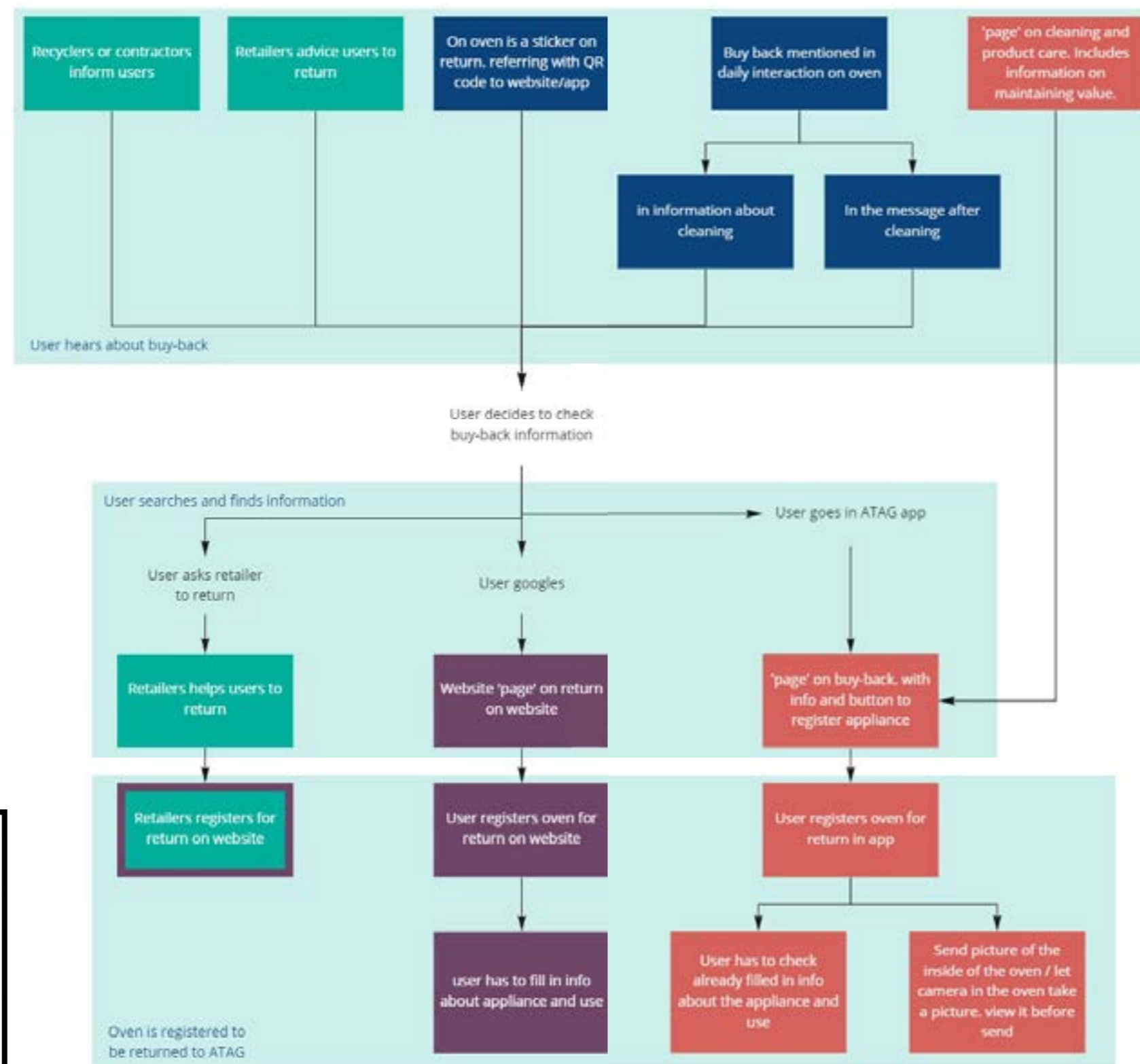


Figure 7.2 | Buy-back flow for users from when they learn about it till the oven is registered.



One of the touchpoints where the user can learn about the buy-back, is when the appliance is taken out of the kitchen cabinets. To create a trigger for users to remind them about the buy-back system, a sticker (figure 7.4) is designed to be placed on the outside of the oven. It attracts attention, gives some information, and then tells the user to look for more information on a website or the app. A QR code also refers to the website.



Figure 7.3 | Sticker on the side of the oven

ATAG
we love to cook

Take
Back
Guarantee

You love your appliance. And when you stop using it, trade it in for credit toward your next purchase. We can turn it into something good for the planet and you.

Register your appliance on the website or in the ATAG app, so we come pick it up.

Figure 7.4 | Sticker for on the side of the oven, so users are triggered to return the appliance

7.6 | CARE ASSISTANT

To stimulate product care, the design uses a care assistant.

TRACKS ACTIVITY

The oven tracks use and based on this data, it gives guidance into product care.

LEARNING

New users of an oven are keen on exploring their appliance, getting to know the functionalities. This care assistant makes use of that with two levels of guidance: explorer and master.

Explorer level (figure 7.5): tailored to new users. Information on how and why one should perform product care. Illustrations are descriptive and every step is shown.

Master level (figure 7.6): tailored to users who know their oven. In a glance it should be visible what the oven means. Illustrations are recognisable from two meters, and a few key words explain what needs to be done. The descriptions from explorer level are always accessible.

The care assistant goes from explorer to master level once the user has used a function 3 times or changes the settings for care assistant.

PERSONALISATION

Users can be in control of the care assistant by changing settings to their own preferences. They can change the intensity level from low to medium to high, based on what grade for buy-back value they are going for. The high intensity care assistant is activated more frequently.

Users can also change settings to what time of the day they would like to do product care, so the care assistant can fit into their daily routine,



Figure 7.5 | Example of a screen in explorer level

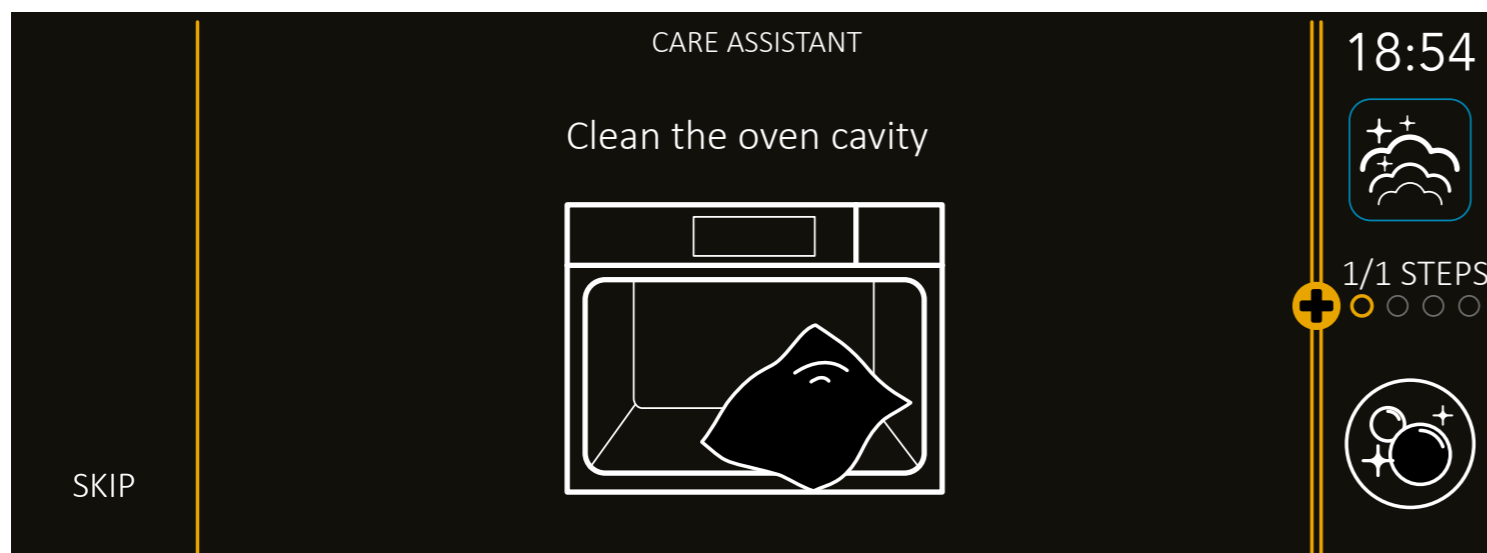


Figure 7.6 | Example of a screen in master level

EVALUATION WITH USER TEST

To evaluate the final design, I invited two participants. Participant K is familiar with the ATAG combi-steam oven, and participant M is familiar with a combi-steam oven of a different brand. The tests were executed in their own kitchen and started with an introduction of the scenario (you just used this oven function). They were asked to think out loud while interacting with the paper prototype of the oven screen.

The results are used in the 'evaluation' sections in the next chapter.



Figure 7.7 | Participant K takes out the water reservoir to fill it.

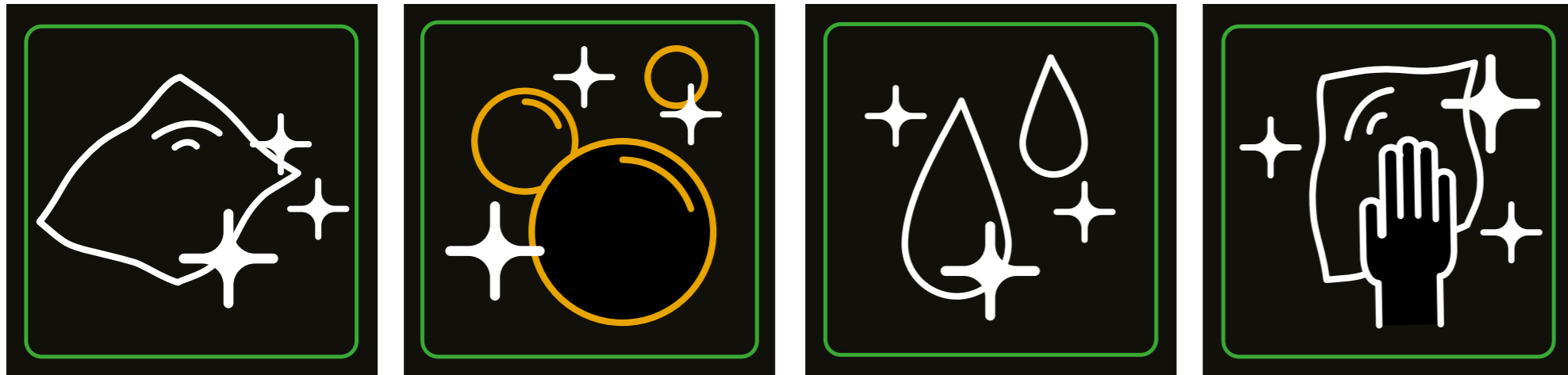


Figure 7.8 | Ideas for Care Assistant icon

FUNCTION ICON

In a discussion with experts the need for an icon that represents the care assistant became apparent. I made eight icons and asked two design students to tell me how they interpret the icon. Figure 7.11 shows the resulting icon. The stars represent something with clean, the bubbles indicated that it means something with soap or detergent and the green square is the colour that works with this.

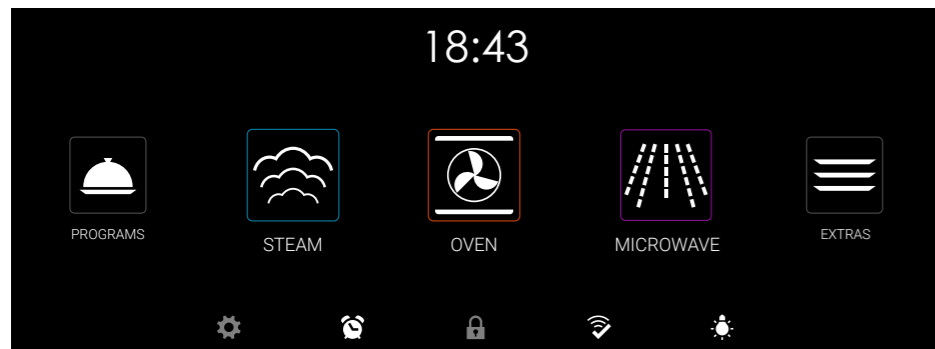


Figure 7.9 | Development screen for the next generation oven, ATAG 'ELEMENTS'. With the blue colour referring to steam, orange refers to oven functions and the colour purple refers to the microwave.

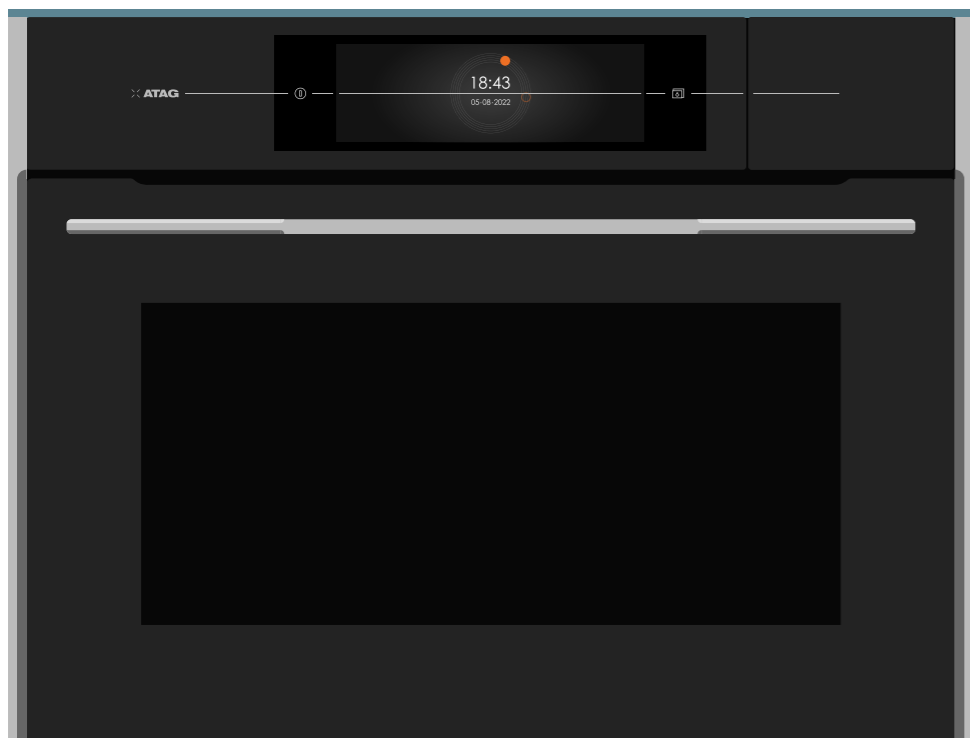


Figure 7.10 | Design of the future generation oven 'ELEMENTS'

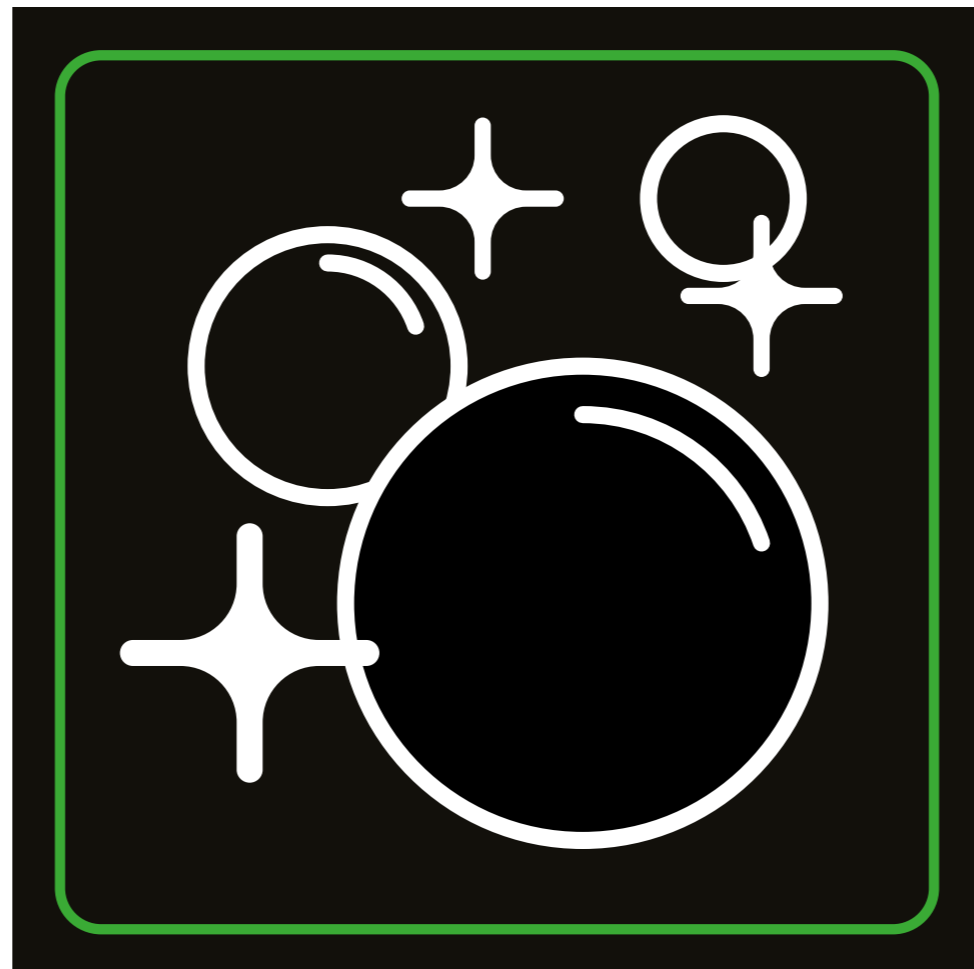


Figure 7.11 | Care Assistant icon

7.7 | CARE ASSISTANT IN DETAIL

This chapter shows the interaction and use flow of the care assistant. The explorer level with default settings is elaborated upon in sections with an interaction flow chart and the corresponding screens. The sections also include evaluation.

OVEN FUNCTION IS DONE

The intervention starts after the user uses the oven function (Figure 5.12). The care assistant does not directly ask attention, but the screen shows a preview (Figure 5.13) so the user knows that after dinner they will be asked to do something to maintain the oven.

The conditions are discussed on the next page.

The preview here was meant to give users reassurance, so they can relax and have dinner. A preview can assure users what to expect. The preview should show what task will happen.

Insights from user test

- The bubble icon is seen as start button by M.
- 'soon' is vague, both participants would like to know when and be able to change it if necessary.
- Missing 'light' button, to check whether food is ready.



Figure 7.12 | Screen on oven shows that oven function is done. It shows that the care assistant starts soon



Figure 7.13 | When clicked on the preview a little more text pops up with the opportunity to ask for more information.

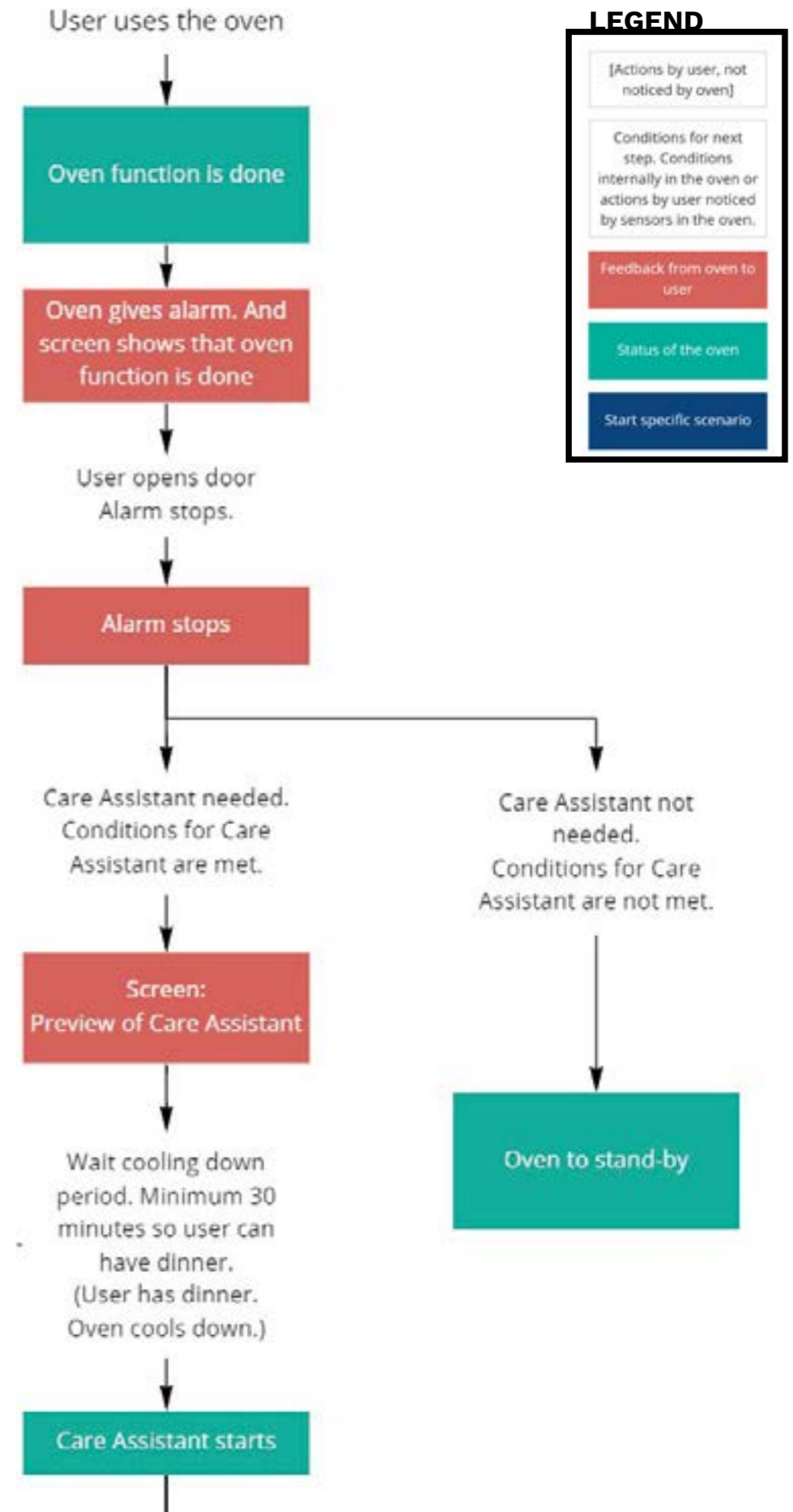


Figure 7.14 | First part of the flow chart showing how the interaction works

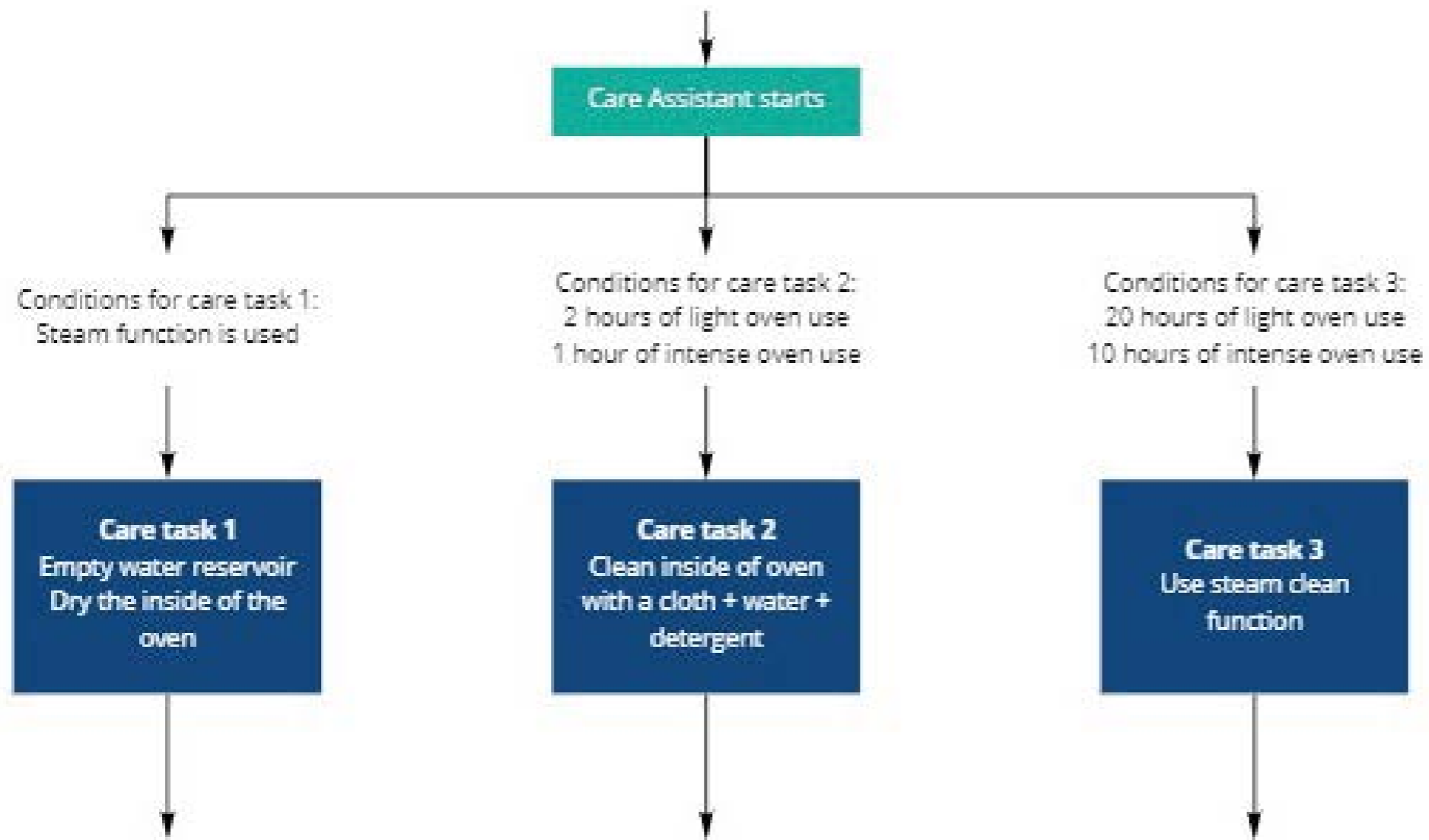


Figure 7.15 | Second part of the flow chart showing what conditions trigger what care task



Figure 7.16 | Light in the oven is turned on when care assistant starts. This attracts more attention to the oven cavity needing to be cleaned.

THREE CARE TASKS

From the analysis, three care tasks are identified that needs to be done regularly. These three tasks are included in this design. It is however scalable so that asks that are only rarely, like descaling and taking out the racks for a deep manual clean, can be included in the design.

Care task 1 should be done after every steam cycle: to empty the water reservoir and dry the oven cavity. This is also the condition for this care task. Here it is assumed that after a steam cycle for cooking, if the oven is still wet, the oven does not need extra cleaning like in cleaning task 2 and 3.

Care task 2 is to clean the inside of the oven with a cloth, water (and detergent). This is light cleaning which should be done regularly, yet not always. Care task 3 is the full steam clean cycle.

The conditions for task 2 and 3 are related to the use of the oven. Light oven use = Regular oven function below 200 degrees Celsius. Intense oven use = Grill or oven function 200 degrees Celsius or higher.

Future generations of ovens might also have sensors and cameras in the cavity. The conditions for care tasks can then easily depend on detected oils in the cavity or on detected spots.

CARE TASK 1

The flowchart (figure 7.19) shows that the next screen is triggered through an action like opening water reservoir or closing the door.

Insights from user test

- The function of the bubble icon is unclear (is it a button?)
- The dots are unclear. The title in the centre of the screen could show what step it is.



Figure 7.17 | Screen on oven shows user to take out water reservoir



Figure 7.18 | When the door to the water reservoir is opened, the screen shows that the reservoir should be emptied.

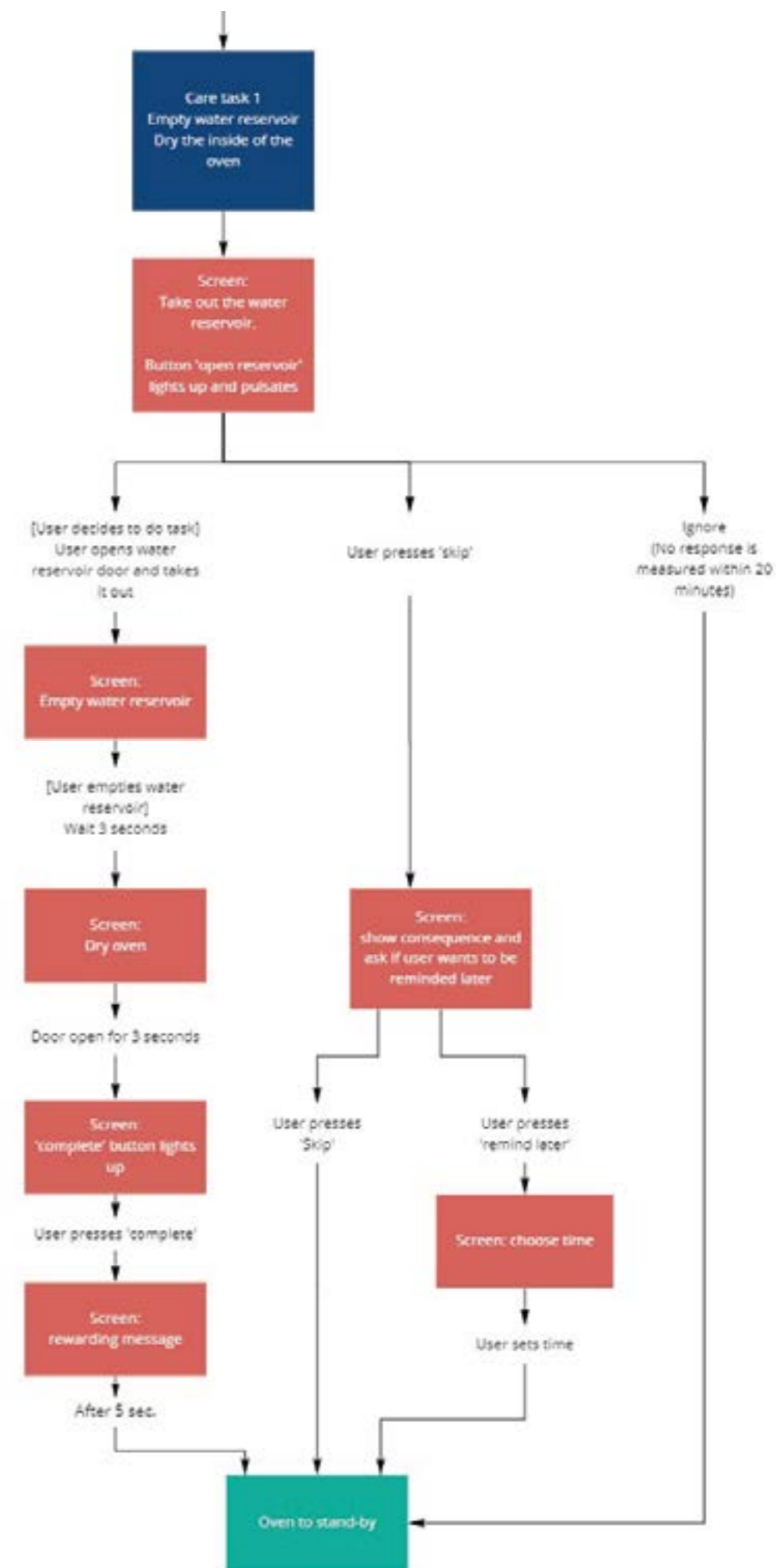


Figure 7.19 | Part of the flow chart showing how the interaction work with care task 1.

CARE TASK 2

In this task, the user needs to use a cloth to clean the inside of the oven. In case the user decides the oven is too dirty, they can choose to do a steam clean cycle first. This will give users control over what they do to clean their oven.

Insights from user test

- The two buttons are unclear.
- The 'complete' button appears to be another cleaning function that the oven executes, because it has the '5 minutes' and the little glimmers.
- Instead of the steps-dots, there could be a thin line separating the two cleaning options



Figure 7.23 | Participant K is cleaning the oven with a cloth

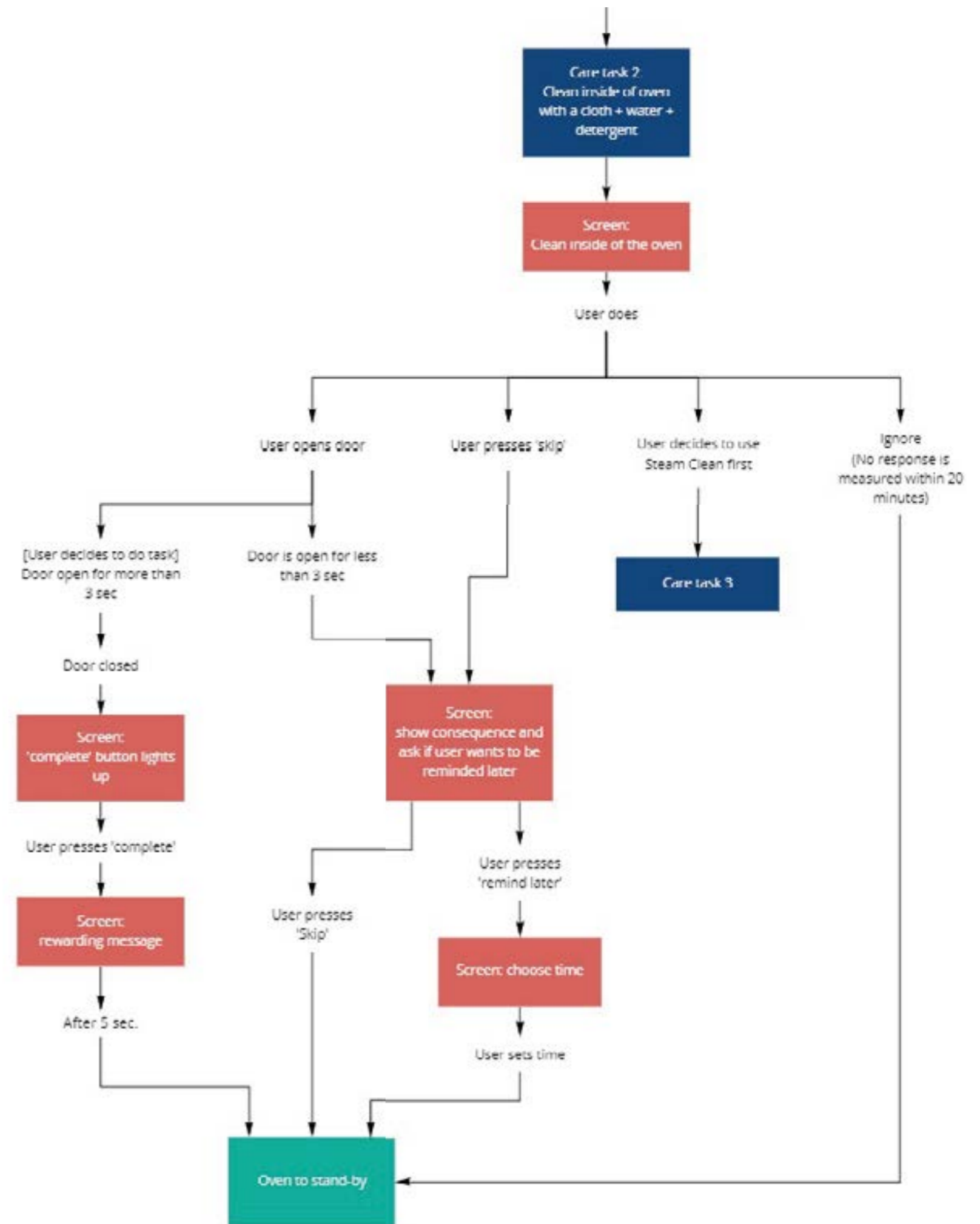


Figure 7.24 | Part of the flow chart showing how the interaction work with care task 2.

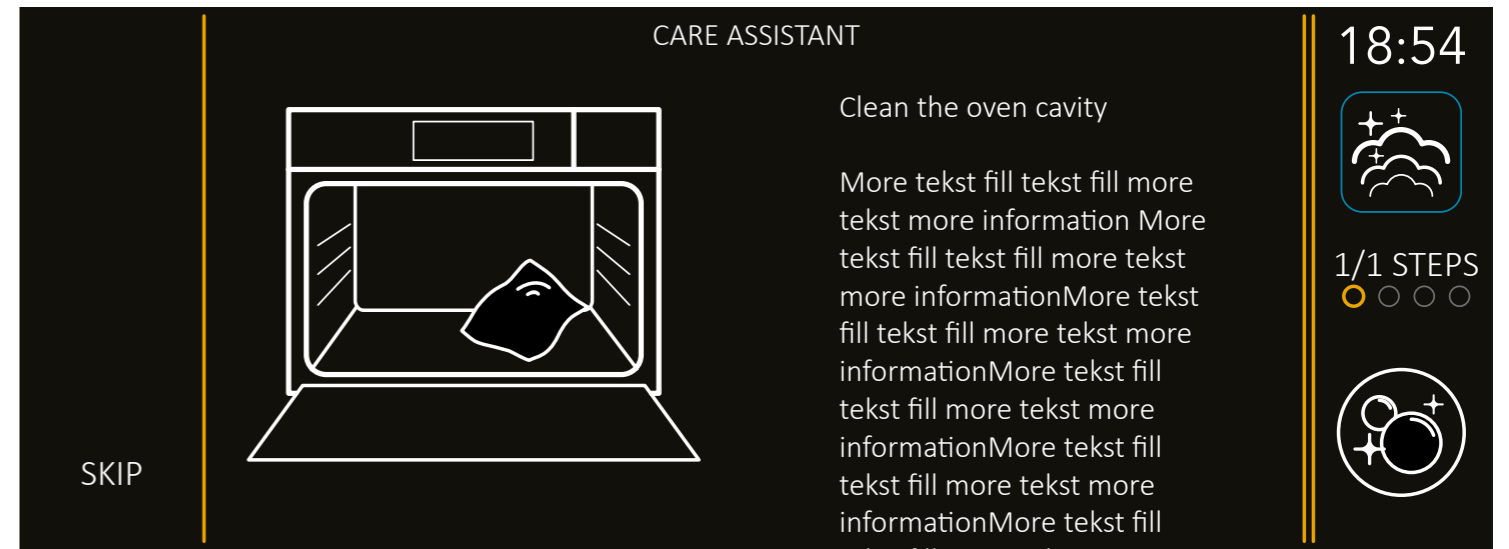


Figure 7.25 | This care task only takes one step, but the user has the option to choose steam clean instead

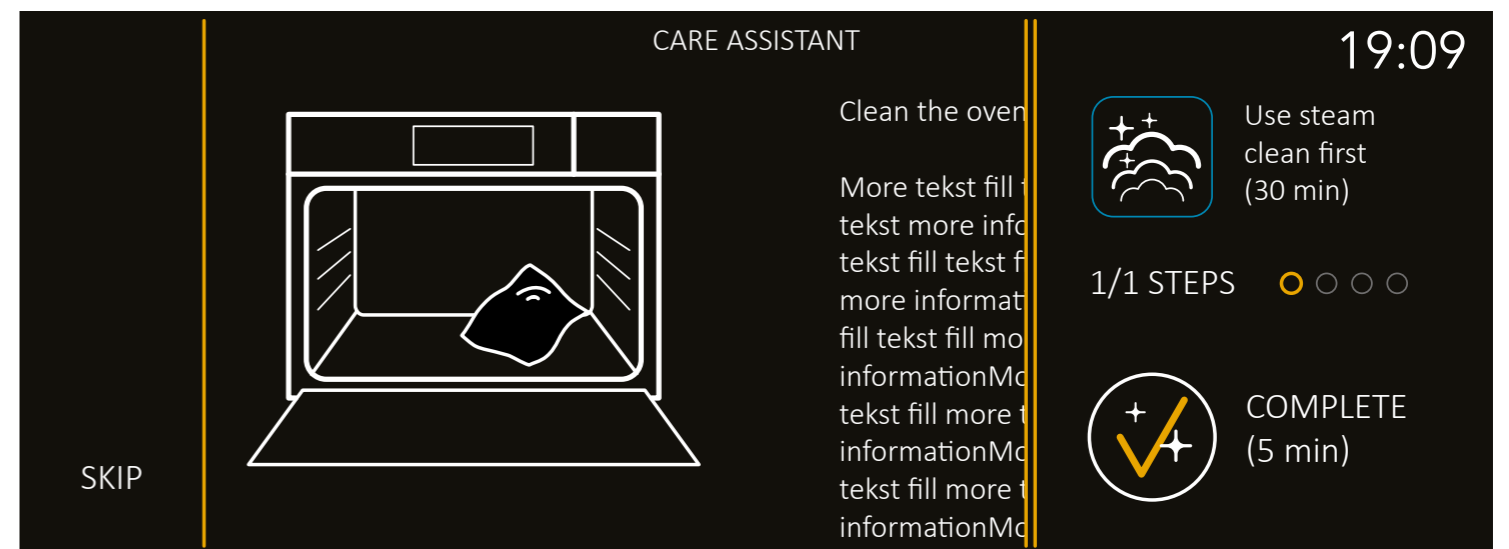


Figure 7.26 | When the door has been open for more than 3 seconds, the user is asked to confirm they did the task.

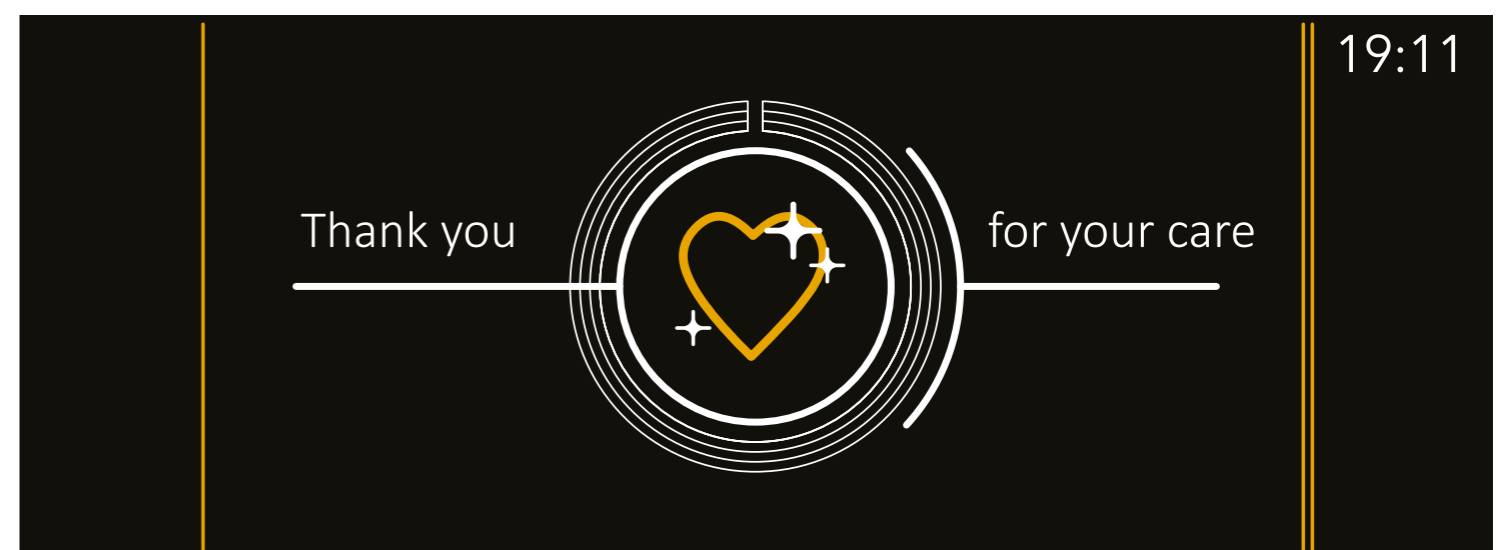


Figure 7.27 | Rewarding screen after the care assistant is done

CARE TASK 3

This care task combines the other two: fill the water reservoir, use steam to clean the oven, empty the water reservoir, and then clean the oven cavity.

Insights from user test

- The order and numbering of the steps is unclear: K knows the steam clean function and understood the four steps as preparation steps. The preview was interpreted as steps they had to do.

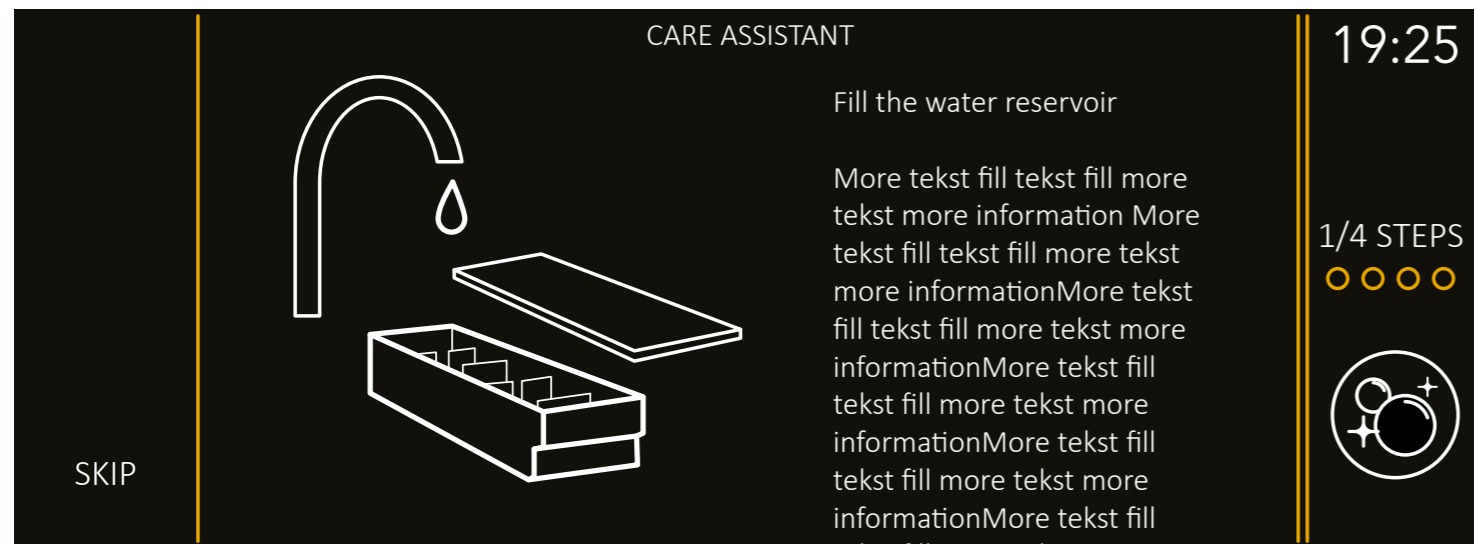


Figure 7.28 | First step is to fill the water reservoir

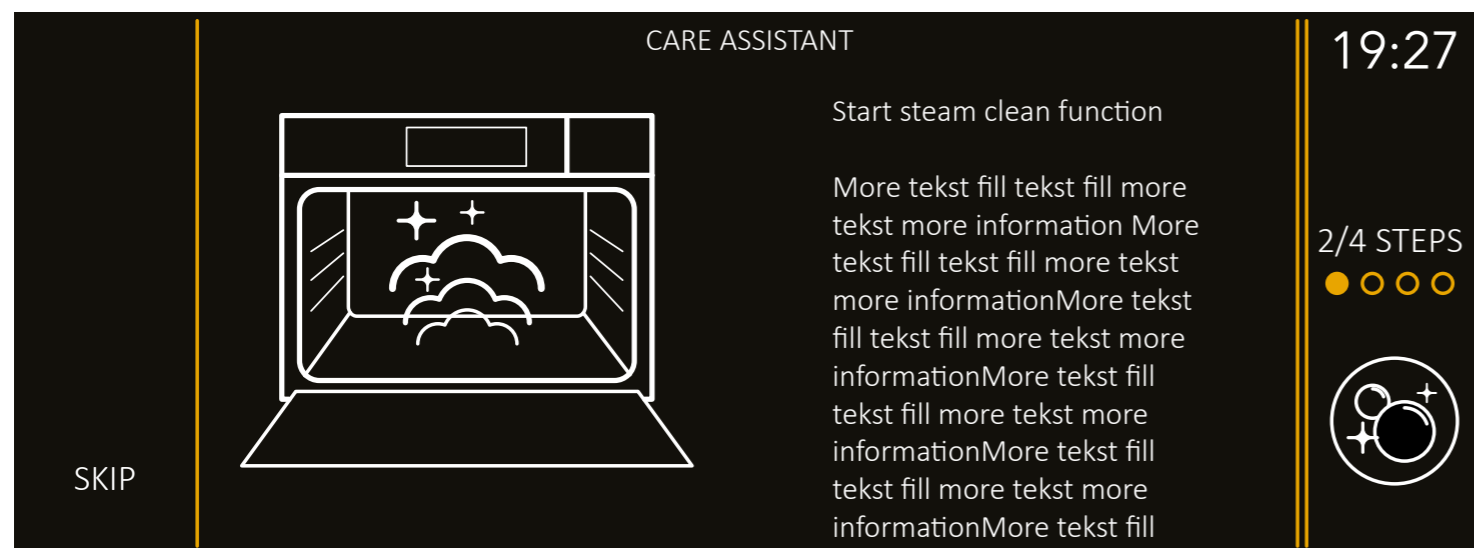


Figure 7.29 | Start the steam clean

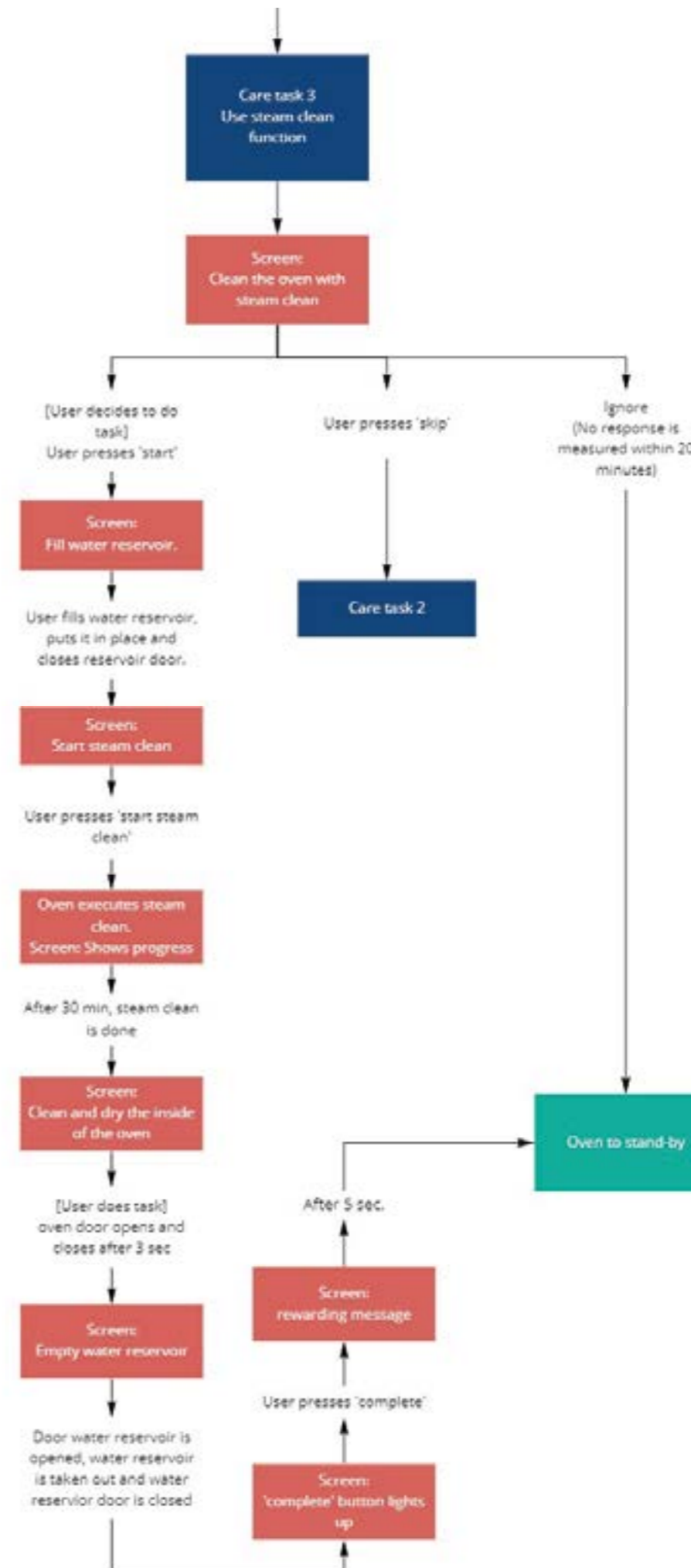


Figure 7.30 | Part of the flow chart showing how the interaction work with care task 3.

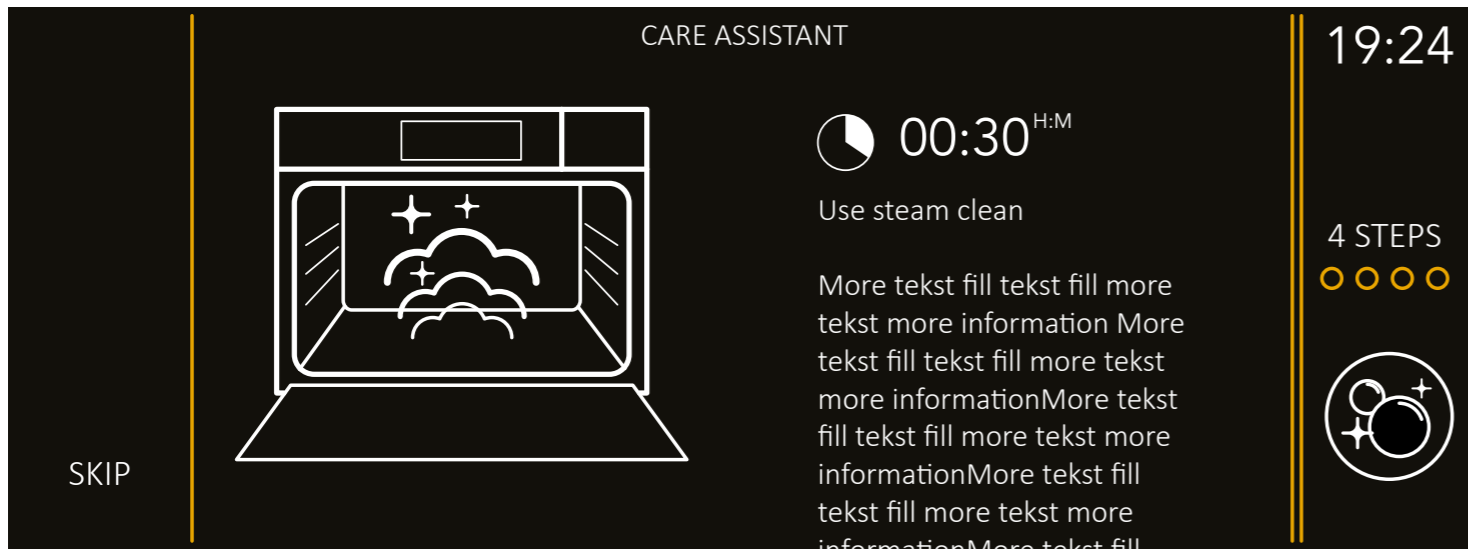


Figure 7.31 | The care assistants wants the user the use the steam clean, which takes 30 minutes.



Figure 7.32 | The oven shows that the steam clean is busy



Figure 7.33 | When tapped on the preview part on the right, it slides open, showing more information on what to do next.

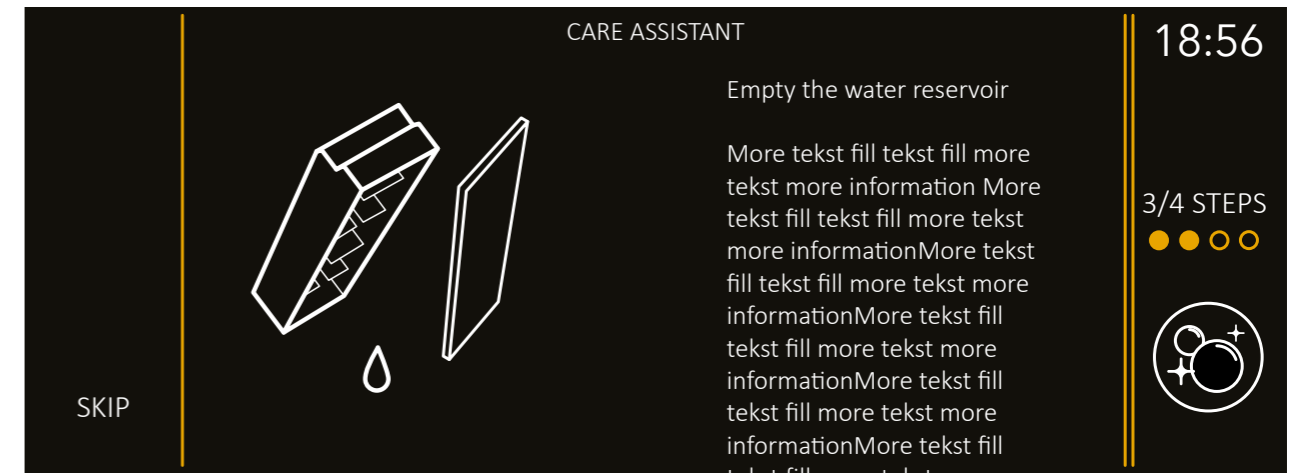


Figure 7.34 | When the steam clean is done, the screen shows the next step

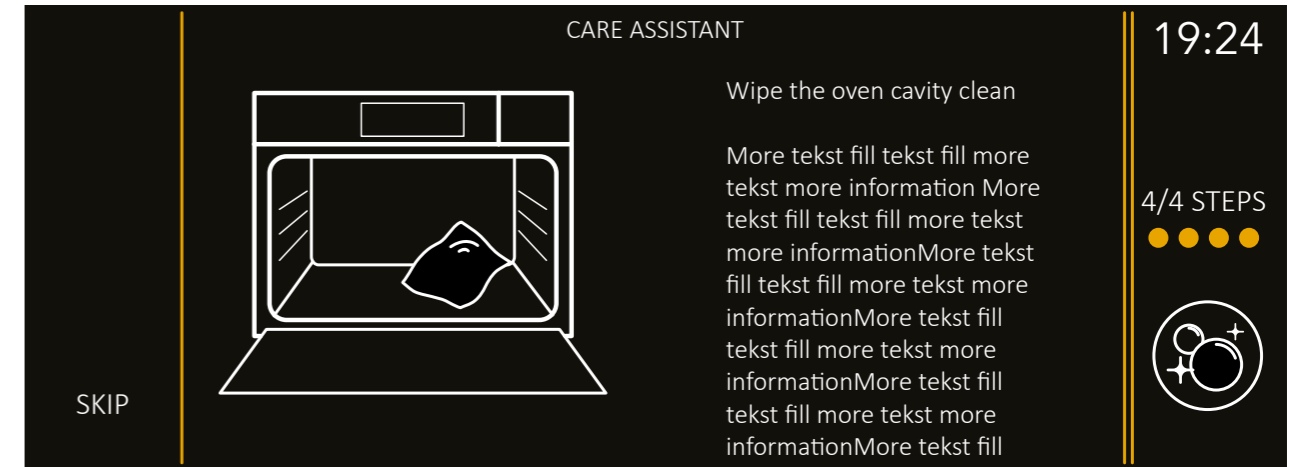


Figure 7.35 | The last step of care task 3.

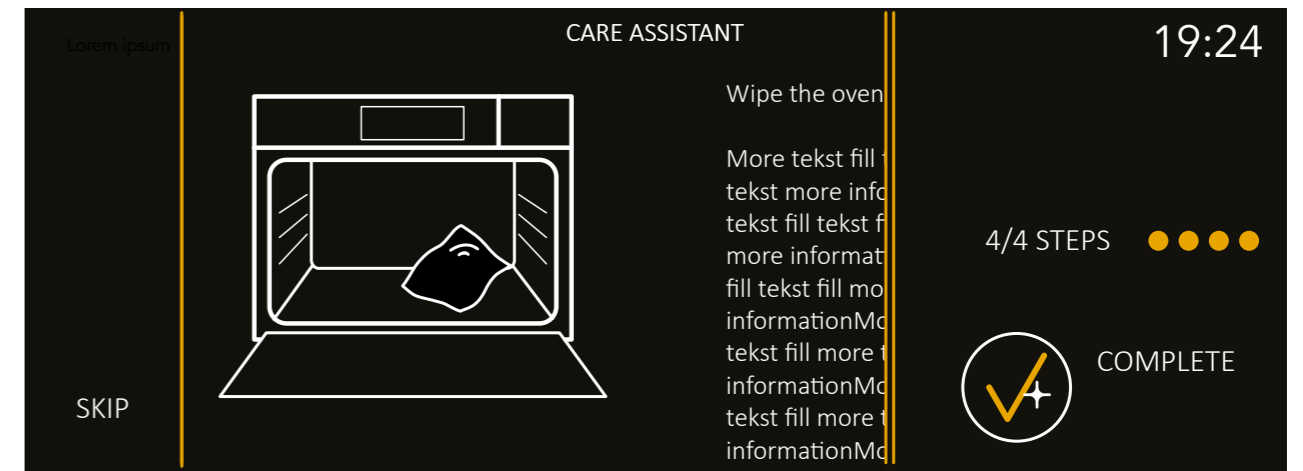


Figure 7.36 | When the door has been open for more than 3 seconds, the user is asked to confirm they did the task.

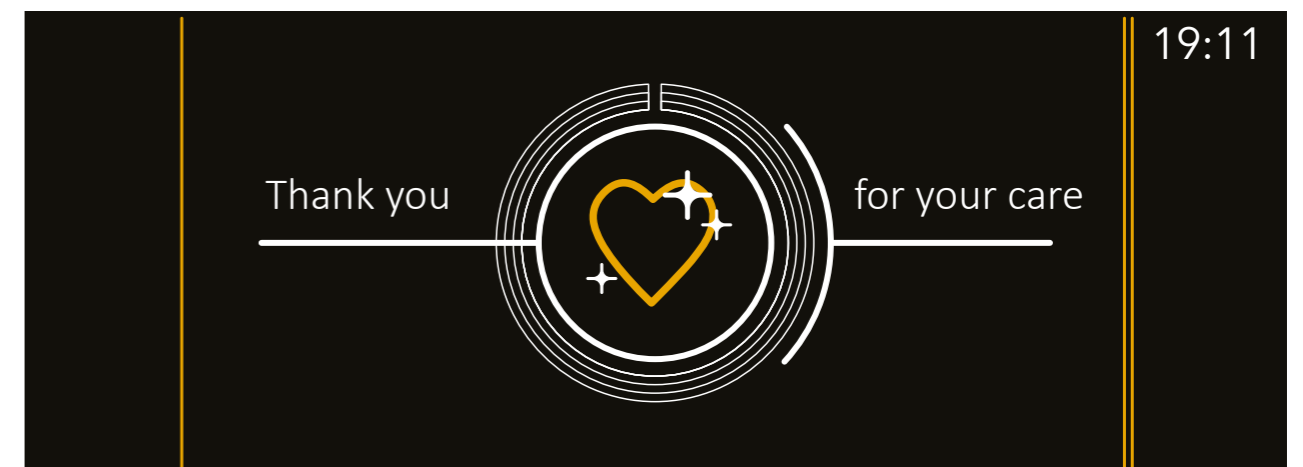


Figure 7.37 | Rewarding screen after the care assistant is done

8

Recommendations

This chapter presents recommendations for further implementation. To reflect on the bigger picture, a future vision with a strategic roadmap is created. This shows how the design will fit a larger strategy for ATAG towards a circular business.

8.1 | RECOMMENDATIONS

A design can always be further improved and the same counts for the final design of this graduation project. There are several recommendations that can be made related to the results of this project.

VALIDATING THE OUTCOME

Before the care assistant can be used on the oven, more usability tests and design iterations are needed to make sure it is usable, desirable, and that it results in the intended interaction.

Also, the user perception of buy-back has not been validated since the explorative user research of chapter 4 focussed more on the refurbished appliance.

Chapter 8.2 provides an evaluation of the design that goes more into what should be tested.

PARTNERSHIP

For buy-back and refurbishment ATAG needs to find partners. For buy-back the retailers that are now their clients can become partners. A system should be developed in cocreation with other stakeholders in the supply chain.

START WITH BUY-BACK AND SET UP REFURBISHMENT

Get back appliances and learn from them. Chapter 8.3 provides a future vision and chapter 8.4 shows a strategic roadmap in which buy-back and refurbishment are important steps towards a circular business unit. In development of the plans for refurbishment, use the results in this report. Take into account the user's attitudes from chapter 4, the technical implications of refurbishment in chapter 5, and the solution spaces from chapter 6.

8.2 | EVALUATION OF DESIGN

This graduation assignment became to be a research heavy project, which resulted in many insights, requirements, and recommendations throughout this report. It also resulted in the fact that the final design does not embody all intended details.

In this evaluation the requirements and wishes are evaluated in the groups that they were presented in chapter 6.1.

REQUIREMENTS

The requirements regarding ATAG are met. The MAGNA combi-steam oven, screen size were restrictions, and the design matches the interface style and design philosophy.

With buy-back and refurbishment, the requirements regarding environment are met. The effectiveness of the buy-back should be evaluated. In the user test, both participants expressed that they would clean the oven more if they know it has still value for returning it.

The user tests show that the design has the potential to enable users to be in control, that it is understandable. Both participants expressed they find it added value, as they regularly forget to empty the water reservoir or to clean the oven. Some iterations with user research need to be done however, to create the personalisation part and to find out how it improves the full cooking experience.

Regarding product care, the design does encourage regular and the right product care activities, increasing the user's motivation and the number of prompts/triggers to do product care on the oven. More research needs to be done into how the care assistant can become part of the use routine. For example, the user test revealed that users have different ways to set an alarm. K usually turns off the alarm by turning off the oven entirely. Not always is the oven function's timer used, but the separate alarms on the oven, or even

an alarm on their own phone. Context mapping or user testing in the real context for a longer period is needed.

WISHES

To use the design on other types of ovens, needs to be determined what care activities are needed in those ovens. Especially for microwave function needs to be determined how use and needed product care translate. With some adaptation, it is possible. The design does not create a closer relationship between ATAG and their customers.

The design is timeless with opportunity for temporary personalisation, which enables product attachment while it does not limit the products life. Buy-back and refurbishment together enable multiple use cycles for an appliance. It is not sure how it encourages reuse or repair. It might encourage people to hand in their appliance before it loses its value, to buy a new one. This is not necessarily wasteful, if the refurbishment is successful, and the appliance goes into another use cycle.

It is expected that the design does not majorly influence the target group, as it is the same appliance, with product care and buy-back. The refurbished appliance will have a different target group. The design specifically helps users explore their oven and get to know all its functionalities. With user tests, should also be researched whether the oven with care assistant is perceived as smart and self-cleaning, or if users perceive it more like they must do it.

Regarding the product care, should be researched whether users will learn and increase the ability to do product care, or whether they merely do as told. The learning stages should not be confusing that a user expects the explorer level and is surprised by the screen with less information. The use tests already showed that after interacting once with the care assistant, the user already learns and can understand the screen.

The user test also revealed that users mainly look for visual cues and act upon how they interpret icons before they read the text. The rewarding final screen was received well by the participants.

8.3 | FUTURE VISION

VISION STATEMENT 2030

ATAG circular business unit will be the leading supplier of circular kitchen solutions of high quality for everyone in the Benelux. Facilitating a closed cycle for kitchen appliances that is tailored to the user and allows users to express their lifestyle with a complete cooking experience.

CONSIDERATIONS

For developing this vision statement, first, the vision and mission of another circular project was taken into consideration. This was for the circular business unit, developed in a student project, in cocreation with experts from ATAG:

"Be the leading and most successful supplier of circular kitchen appliances and services of the highest quality for everyone in the Benelux. Facilitating a closed cycle for kitchen appliances that exceeds expectations of various target groups."

Activities of Brand ATAG 'we love to cook' were also selected to be relevant, derived from an internal strategy document:

- We inspire you to cook by developing and distributing relevant content
- We show you our innovative concepts with integrated product-service solutions
- We connect our service to your needs by aligning processes to the customer journey
- We offer a complete cooking experience by working together with the right partners.

Relevant developments in consumer needs that are considered are (derived from the same internal strategy document):

- The user wants to reduce impact on environment
- The user demands appliances tailored to their own situation
- The user desires to express their lifestyle
- The user desires an all-in-one solution (convenience)
- The user wants access to newest tech.



The ATAG Circular business unit

unit will be the leading supplier of circular kitchen solutions of high quality for everyone in the Benelux. Facilitating a closed cycle for kitchen appliances that is tailored to the user and allows users to express their lifestyle with a complete cooking experience.

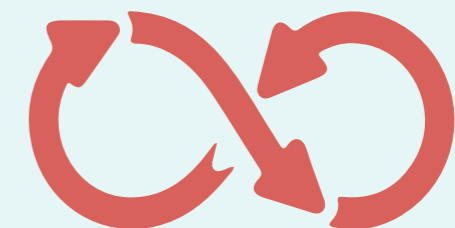


Figure 8.1 | Vision statement for the ATAG circular business unit 2030

8.4 | ROADMAP

STRATEGIC ROADMAP

Purpose

This roadmap is to show how the design shown in the previous chapter can and will fit in the larger strategy of ATAG towards a circular business. This strategic roadmap (figure 8.3) will function as a summary and reference for top management and stakeholders. It gives the 'bigger picture' of this project and an overview of the steps towards the vision.

Working towards a circular business is not a straightforward process. This chapter explains generally how the road will look and how long it will take. The horizons and timepacing are combined in one strategic roadmap.

HORIZONS

Horizon 1: Buy-back

The first horizon is to work towards getting appliances back and having reverse logistics in place. Not just for the oven, but for other product categories as well. ATAG is not yet experienced with this. ATAG can work together with logistic companies, retailers and waste managers. A discount offered by ATAG on new appliances will give users an incentive to start the reverse logistics. Also retailers will have an incentive to return appliances and offer the service to take out

the appliance that is being replaced. This will result in second purchases, collection of appliances and a steep learning curve on the appliances wear and tear after use.

Horizon 2: Refurbishment

In the second horizon the goal is to create a refurbishment line. The appliances that are returned to ATAG with the buy-back can be refurbished and offer knowledge on how to redesign for refurbishment. These refurbished appliances can be sold in the existing distribution channels for consumer acceptance. The refurbished appliances will be targeted towards a new user group, similar to the target group of the brand Pelgrim. This will result in a steep learning curve for the refurbishment partners, a wider target market, and a circular brand image.

Horizon 3: Subscription

In the end of the third horizon, the business model should be circular, offering both subscription and sales on new and refurbished appliances. If all goes well, reverse logistics for appliances are in place, refurbishment is cost effective and ATAG offers full repair and maintenance service on appliances in the form of a subscription contract, gaining control over its products and material flow.

TIMEPACING

The three horizons are one after the other, with the business efforts having a different focus every few years. However, development activities should also be with the next horizons in mind. Figure 8.2 shows how in the period now-2023, the focus is on buy-back, but there are also efforts preparing for refurbishment and some for the subscriptions.

Now-2023 Horizon 1

- Start with taking back appliances, setting up reverse logistics
- Learn from the returned appliances for optimization of future refurbishment line
- Design appliances for repair and maintenance so refurbishment and the service offer later will be

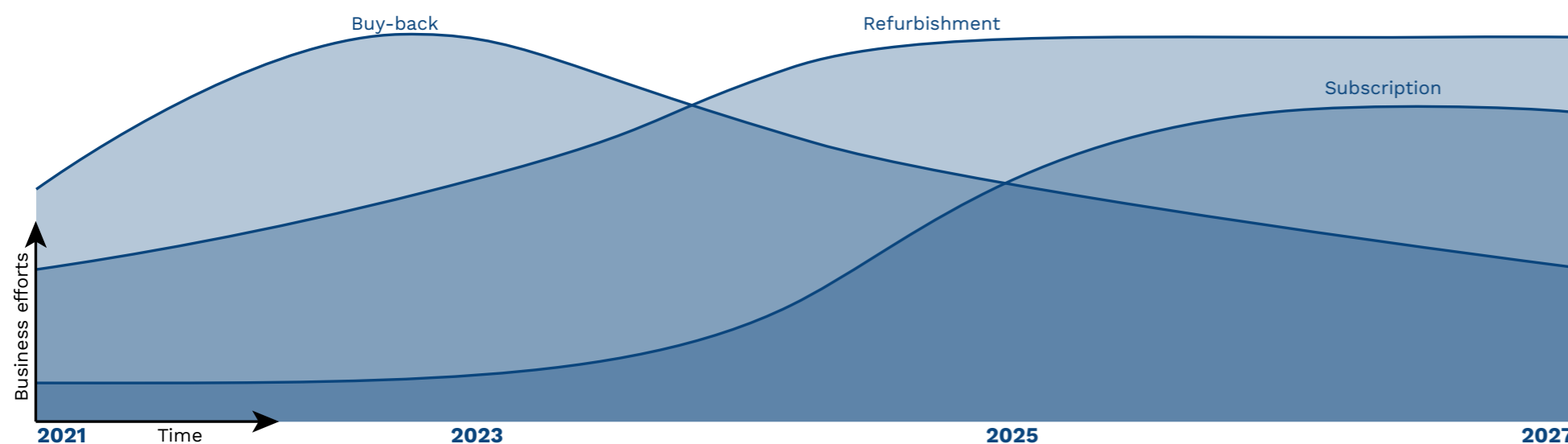


Figure 8.2 | Business efforts should not be only towards one horizon, but the others should also be prepared for.

easier and cost-effective

- Design for human-appliance interaction to be with care

2023-2025 Horizon 2

- Start refurbishment line with refurbishment partners.
- Learn from sales of refurbished products
- Develop service blueprint for the circular subscriptions

2025-2027 Horizon 3

- Offer circular kitchen appliances through subscription-based models in homes

TACTICAL ROADMAP

Figure 8.4 shows the roadmap more in detail towards the future vision. The roadmap is structured with three horizons and a vision statement at the end. The three horizons represent a product feature which belongs to a certain time frame within the estimated timeline. Next to the 'product' features, four other main activities are visualized to support the roadmap: market, user, technology and ATAG. The horizontal lines represent the development of that certain action, trend or value and the vertical lines are connecting those actions, trends, and values.

Using the roadmap

The tactical roadmap is designed for employees and partners who are going to execute the ideas towards the vision. It provides an overview for them when and what they should do. A lot of other activities are developing parallel to each other. The executers should know with which other related activities there are. The tactical roadmap helps give a nice and clear overview of the project.

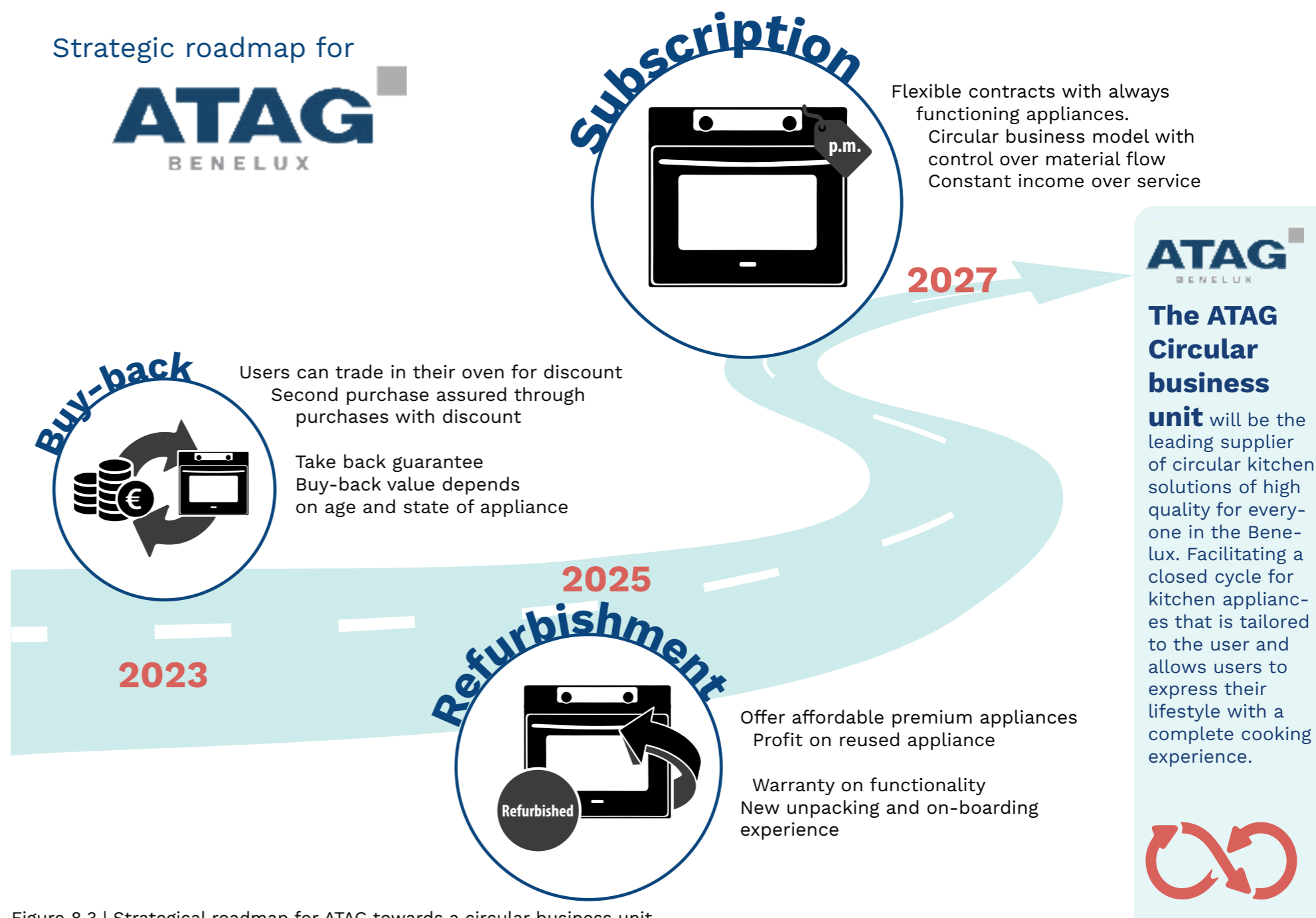


Figure 8.3 | Strategical roadmap for ATAG towards a circular business unit

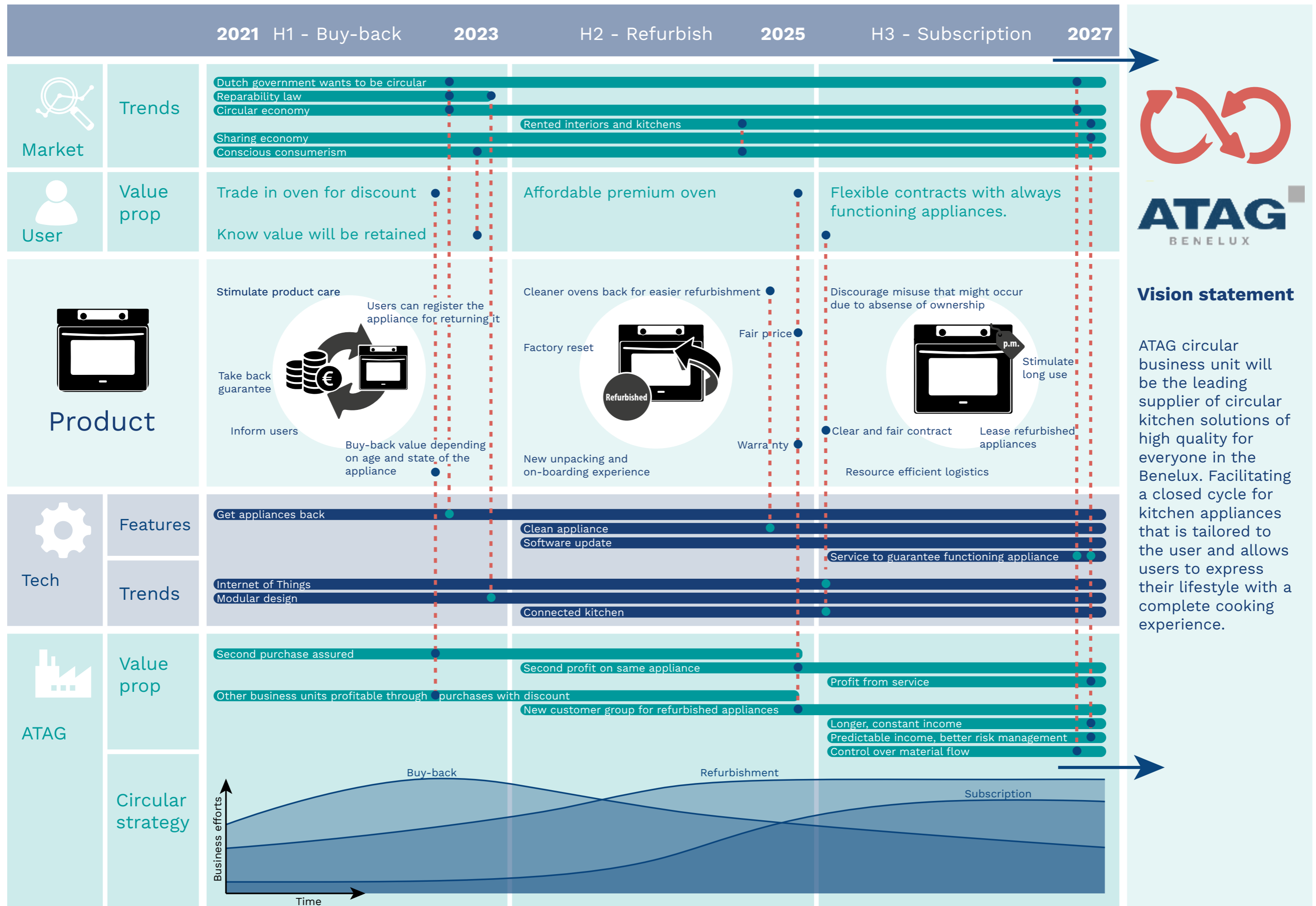


Figure 8.4 | Tactical roadmap for ATAG towards a circular business unit

9

**Personal reflection
and References**

9.1 | PERSONAL REFLECTION

I went into this project, thinking that I would end up designing a pay-per-use cooking hob. I thought with a circular business model, based on a different kind of ownership, I can create value for company, user, and nature. Instead, I found myself struggling to convince others (and eventually myself) that consumers and the kitchen industry are ready for different types of ownership. I took a wider perspective, gaining knowledge and insights from PSS, refurbishment, buy-back systems, product care, and more. During the last phase of my project, I read about the topic 'design for complexity', which I find scary, yet interesting. And I found myself wanting to learn more about that.

In my project brief, I wrote two ambitions. One was to write a scientific paper. I have not written a paper (yet), but the explorative user research was written with the intention to be written into a paper after this. The other ambition was to do user tests with a PSS, being able to assess the experience of a different type of ownership. This I did not do in the end.

I am happy that I let the project transform the way it happened. I wanted to gain knowledge and create something that would be useful to the company and contribute towards more sustainable kitchen appliances. With the results about consumer perceptions of PSS's, the solution spaces in refurbishment, product care and buy-back, I feel that I did manage to contribute to this goal. I do hope this is just one of the first steps and that my design and research will in the future have a positive impact towards a circular economy.

Looking back, this project has helped my personal development. I got the chance to be part of a company with inspiring colleagues. I facilitated creative sessions, both physical and online, I identified many solution spaces, I designed a user interface, increasing my Illustrator skills, and I got to learn more about how to design product care.

With corona pandemic parallel to the project, I first struggled with working from my room in a student house and with worries about not spreading the virus, on top of the 'usual struggle' of working individually on the master thesis. Thanks to the help of friends, family, ATAG and university, I managed to create a productive routine.

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