Master thesis

Design for
BEHAVIOUR CHANGE OF CONSUMERS
around
FURNITURE REPAIR AND UPGRADING

Laura Hurenkamp
Design for Interaction,
Delft University of Technology

Author
Laura Hurenkamp

Master thesis
Msc. Design for Interaction
Faculty of Industrial Design Engineering
Delft University of Technology

In collaboration with
Het Groene Brein
Ministerie van Infrastructuur & Waterstaat

Supervisory team TU Delft
Chair - Prof. dr. ir. Ruth Mugge
Mentor - Dr. ir. Sonja van Dam

Company mentors
Het Groene Brein - Roos Janssen
Ministerie van I&W - Daniëlle Broeze

March 2024

TU Delft
Het Groene Brein
Ministerie van Infrastructuur en Waterstaat

ACKNOWLEDGEMENTS

Dear reader,

I would like to thank all the people that supported me during this master thesis, and made it a very enjoyable project to work on:

My TU Delft supervisors **Ruth Mugge** and **Sonja van Dam** for their guidance on the approach of my project and their quick responses to all my questions. Additionally, I highly appreciate the time and attention they devoted to helping me in structuring and writing this report.

Roos Janssen, my supervisor from Het Groene Brein, for her endless enthusiasm and her efforts in sharing my project with companies in the Reuse Alliance. Thanks to Roos, I had the chance to collaborate with Intergamma on my final design, which I enjoyed and made the outcome more valuable.

My supervisor **Daniëlle Broeze** from I&W, for always being there for me to assist in difficult choices and approaches to my project, and for sharing her expertise on behaviour change. Additionally, I would like to thank all the other employees and interns of the BIT team at I&W for their insights, ideas, and making me feel welcomed in the team.

Michelle van Dijk from the Sustainability Department of Intergamma, for her collaboration in improving the final design. I would also like to express my gratitude to Jan Bikkers, the manager of Gamma Woerden, for warmly welcoming me and assisting in setting up this user test in his store.
All the participants of my generative sessions and brainstorming sessions for their time, enthusiasm, and sharing their stories and ideas.

The experts I have interviewed:

- The **employees of Ambacht Centre Foenix in Apeldoorn**, for giving me a great tour around the organization and sharing their expertise about furniture repair and the behaviour of their customers.

- **Wilco Wezenberg** from Thorbecke in Bedrijf (part of Ambacht Centre WaardeRing in Zwolle) for providing insight into the organization of Waardering and sharing the process of upgrading wooden furniture. It was fantastic to see how the network of organisations is providing valuable education while contributing to sustainability.

- **Gosia and Okke** from Meublowski,
  Sieds Wijnja from Jafix,
  Amita Janssen, and
  Julius Kroot for sharing their expertise in furniture repair and consumer behaviour.

- **Deborah Sumter**, and **Benthe Snäll** from HvA for facilitating the survey research.

ABBREVIATIONS & DEFINITIONS

Definitions

- **BIT** – Behaviour Insights Team
- **I&W** – Ministry of Infrastructure and Water Management
- **IDE** – Industrial Design Engineering
- **BCW** – Behaviour Change Wheel (Michie et al., 2011)

Definitions

- **Repair:** Returning a defective product or waste to a condition where it fulfils its intended use (European-Commission, 2022).
- **Upgrading:** Enhancing the functionality, performance, capacity or aesthetics of a product (European-Commission, 2022).
- **Refurbishment:** Preparing or modifying an object that is waste or a product to restore its performance or functionality within the intended use, range of performance and maintenance originally conceived at the design stage, or to meet applicable technical standards or regulatory requirements, with the result of making a fully functional product (European-Commission, 2022).
- **Reuse:** reusing a product as it is (European-Commission, 2022).
- **Product attachment:** The strength of the emotional bond a consumer experiences with a product (Berge et al., 2021).
- **Do-It-Yourself (DIY):** Activities in which individuals engage raw and semi-raw materials and component parts to produce, transform, or reconstruct material possessions, including those drawn from the natural environment (e.g., landscaping) (Wolf & McQuitty, 2011).

SUMMARY

This Design for Interaction master thesis is focussed on the development of a design intervention to encourage consumer behaviour towards DIY repair and upgrading of furniture. The project was carried out in collaboration with the Behaviour Insights Team of the Ministry of Infrastructure and Water Management and Het Groene Brein.

Problem background

Furniture is a product category which causes a large environmental impact due to the materials they contain and consumers' current replacement behaviour. In the Netherlands, over half of the large amount of disposed furniture pieces have not reaching the end of their lifespan (Koch & Vringer, 2023). Increasing repair and upgrading behaviour can extend the life of damaged or undesired furniture pieces and thereby reduce environmental impact.

Research

To determine how a design intervention can most effectively contribute to the desired behaviour change, the following research activities were applied:

- Literature research
- Generative research sessions
- Interviews with experts
- Survey amongst consumers

These activities have led to an understanding of the factors influencing current consumer behaviour and the identification of a target group with the highest potential for behaviour change. Besides, insights were gained into the context and stakeholders, and into which repair or upgrade activities are feasible and result in optimal impact reduction.

Design Goal

From the research outcomes, the following design goal was formulated.

The design intervention should support 18-35 aged, high income, high education consumers, living in the big cities, to ...

1. ... make a plan with a desired outcome for ...
2. ... together perform ...

... DIY repair and/or upgrade activities for furniture from the low/medium priced segment made from wood and/or textile and foam in 2024.

Design proposal

The outcome of this master thesis is a design intervention named ‘Opknappers,’ a proposal for Intergamma (the umbrella organization of Karwei and Gamma). The proposal includes DIY cards and an exposition showcasing and explaining repair/ upgrade possibilities in the physical shops. Additionally, a concept for the Opknappers app has been developed, which allows consumers to visualise upgrade options for their own furniture. Finally, a plan was made for using Intergamma’s websites and social media to support consumers in the DIY process. The final design was evaluated with customers and employees of Intergamma, and final improvements and recommendations were made.

CONTENT

DEFINE

DEVELOP

DELIVER

01

INTRODUCTION

This IDE master thesis, from the master Design for Interaction focusses on the development of a design intervention that changes the behaviour of consumers concerning furniture repair and upgrading to reduce the environmental impact of the furniture industry. This thesis was carried out in collaboration with the Behaviour Insights Team (BIT) of the Ministry of Infrastructure and Water Management and Het Groene Brein.

In this introduction chapter, the topic of the project as well as the taken approach will be introduced. Firstly, section 1.1 states the project scope. Next, the broad context and background of the current problem situation are discussed in 1.2. Following are sections 1.3 and 1.4 which elaborate on the angle taken in this thesis, stating the goal of the project and the overall structure of the approach, which is also used to structure this report.

1.1
PROJECT SCOPE

At the start of this thesis, the project's initial scope was established by defining repair and upgrading, selecting an initial target group, specifying the furniture items that are focussed on and the timeframe.

Definitions repair & upgrading

The project is focussed on both repair and upgrading of furniture. Both strategies keep the original functionality of the product intact. For example, a repaired or upgraded table can have changed aesthetics or added functionalities. However, it will keep being a table. Using materials of existing furniture to create 'new' products with a different functionality is called upcycling, this strategy is not part of the scope. At the beginning of the project, the option was left open whether repair or upgrading is carried out by consumers themselves or by experts.

'**Repair**' means returning a defective product or waste to a condition where it fulfils its intended use. (European-Commission, 2022)

'**Upgrading**' means enhancing the functionality, performance, capacity or aesthetics of a product. (European-Commission, 2022)

Target group

The project was started with a large target group: all consumers that own furniture and are living in the Netherlands.

Furniture

The project does focus specifically on furniture pieces that are out-of-warranty and owned by consumers, thereby excluding the products owned by companies. To specify the products covered under the term 'furniture', the categories outlined by Alex Forrest in his research on circularity in the furniture sector are stated below and give an idea (2017):

- Kitchen furniture
- Mattresses
- Metal furniture
- Non upholstered seats
- Upholstered seats/sofa beds/futon
- Wooden furniture
- Other furniture

Electrical devices like a microwave, refrigerator or tv are not seen as furniture. Some products with electrical components like lamps or chairs with changing seats etc. are seen as furniture. Besides, both indoor as outdoor furniture pieces are included in the scope.

Finally, the focus is on furniture pieces that for which repairing or upgrading can potentially prolong the lifespan. This means that it is technically possible, socially accepted and desired to repair and upgrade the products. The research part of the project will investigate which product types fit these requirements.

Time

The aim is to create a design intervention that can be applied today.

1.2 BACKGROUND

1.2.1 Climate impact of the furniture sector

The current situation is well known: Environmental problems and resource scarcity arise due to our growing world population, wealth and needs. Research by CE Delft (Bruinsma, 2021) shows that the average Dutchman makes by far the biggest impact on the environment by having stuff. A product category that causes a large environmental impact is furniture (Ackermann et al., 2018; CE Delft, 2020). Seating furniture accounts for about 10% of the CO2 emissions caused by the stuff owned by an average Dutch household (Roumen & Geeris, 2023). The impact is caused by the large number of materials that are used in furniture which require energy, land use, and emissions for their production. The Dutch furniture sector emits 1.76 Mton CO2-eq every year, which is a relatively large CO2-footprint (Intven et al., 2022).

A second cause for the large impact is people's current replacement behaviour. Both consumers and businesses are discarding large amounts of furniture. In the EU, 10 million tonnes of furniture are thrown away per year (Forrest et al., 2017). Problematic is that over half of all discarded products in the Netherlands have not reached the end of their lifespan (Koch & Vringer, 2023). The replacement behaviour of consumers has been accelerated by technical development and fashion trends (Berge et al., 2021). Some of the discarded products are reused but the majority ends up in incinerators (Intven et al., 2022). Incineration of the materials does generate energy but produces even more CO2 emissions.

Overall, the way people treat furniture contributes significantly to the large environmental impact of the industry. To improve the situation, circular strategies must be implemented. The CO2 emissions of the sector could be reduced by almost one-third when becoming fully circular (a reduction of 470 kton CO2-eq. from the total of 1,76 Mton CO2-eq (Rijksoverheid, 2023).

1.2.2 Circular strategies

To achieve circularity in a sector, diverse strategies can be applied, including repair and upgrading. The R-ladder, depicted in Figure 1, represents all circular strategies. A higher position on the ladder indicates greater potential for saving resources (RVO, 2023).

The greatest impact can be achieved by implementing R1 (refuse & rethink) on all furniture. This strategy involves consumers not buying new furniture and thereby not using resources. Minimalizing the purchasing of furniture is a good strategy, however, other circular strategies are required as well since people do need furniture, products do wear out thus never buying or producing furniture is not realistic in current society.

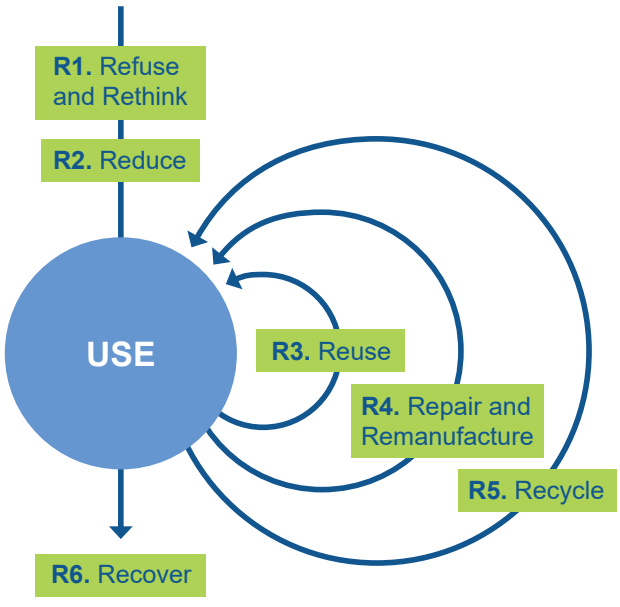


Figure 1: R-ladder with circular strategies

The industry and politics have started to work on R2 (reduce impact by sustainable design). New products are designed with attention to repairability, recyclability and low impact materials. However, the supply of eco-friendly furniture is currently less common and harder to find (Geeris et al., 2023). As a result, and considering the significant potential in the products that already exist today, strategies further down the ladder are also required.

One principle of the Circular Economy is the "power of the inner circle", which suggests that most savings can be gained by the inner loops (R3 & R4). These strategies lengthen the time a product is being used and should be preferred strategies over the outer loops like refurbishment and recycling (Ackermann, Tuimaka, et al., 2021). Research by Tauw (2022) acknowledges that most CO_2 savings can be achieved by extending the lifespan of existing furniture.

Essentially, all inner loop strategies are necessary for lifespan extention as the most effective strategy varies depending on the situation. Some products can be reused as they are (R3), while others may face challenges such as damage or undesired aesthetics. In such cases, repair and upgrading, (both falling under R4) are crucial for lifespan extension. Repair helps to sustain materials and products, which leads to fewer usable products that are thrown away (Ackermann et al., 2021). Upgrading contributes by making undesired products desirable.

1.2.3 Stakeholders, the crucial role of consumers

Currently, furniture repair and upgrading are not yet widely practiced by the industry and consumers. To implement these strategies on a larger scale, all stakeholders in the furniture industry will have to make changes: the government, industry and consumers.

Dutch politics is already active on this issue. In 2016, the government launched the programme: Nederland Circulair in 2050, which established that the Netherlands will have a fully circular economy by 2050 (Rijksoverheid, 2016). The programme also focusses on furniture, especially on the need for ecodesign rules, lifespan extension and high quality recycling (Rijksoverheid, 2023). The government has made one ministry responsible for the subject of circularity which is the Ministry of Infrastructure and Water Management.

Making circular behaviour such as repairing and upgrading the norm also requires effort from the industry (Rijksoverheid, 2023). Companies can support consumers' sustainable behaviour by making reuse and repair possible and accessible with, for example: services, spreading knowledge, new business models, supplying materials, educating repairers and more. Recently, Het Groene Brein initiated The Reuse Alliance, a coalition of companies in the furniture industry working together to extend the lifespan of furniture. (The Reuse Alliance, 2023).

The last group of stakeholders and the most crucial ones are consumers. Repairing and upgrading furniture can be carried out by either consumers themselves or outsourced to services offered by the industry. In both cases, the action is initiated by the consumer which is why their behaviour plays a crucial role (Ackermann et al., 2019). This initiative is not widely taken by consumers, only 17% of Dutch consumers report having repaired or outsourced the repair of their furniture (Geeris et al., 2023).

Consumers already recognise the need to take more care of their products, repair being part of this (Ackermann et al., 2017). Furthermore, people in the Netherlands are, on average, 68 (on scale of 1-100) open to furniture repair (Geeris et al., 2023). However, people often fail to include these activities in their daily lives or hesitate to perform them (Ackermann, Schoormans, et al., 2021). Several studies have identified barriers that hinder people's ability to engage in product care. Factors such as lacking skills, information, unavailability of spare parts, or high costs of repair services have been stated (Ackermann et al., 2017, 2021a, 2021b).

1.3 PROJECT GOAL

The goal of this graduation project is to, firstly, delve deeper into the obstacles that hinder consumer behaviour regarding repair and upgrading of furniture. And secondly, to utilise this information and develop a design intervention that increases consumers' willingness to repair and/or upgrade furniture and helps them to turn their willingness into actions.

1.4 PROJECT & REPORT STRUCTURE

This report presents the complete design process that was carried out during the master thesis. The chapters are divided into four phases corresponding to the phases of the project: discover, define, develop and deliver, these are based on the double diamond model (Design Council, 2005). Figure 2 illustrates the phases as well as the chapter numbers from the report.

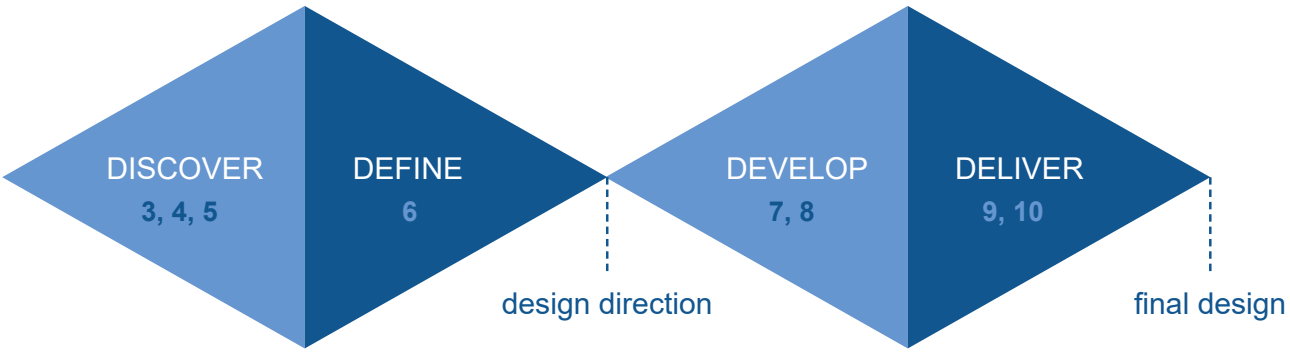


Figure 2: Double diamond structure

In the first diamond, a variety of research activities have been applied to gather information about the broad scope of furniture repair and upgrading. Chapters 3,4 and 5 discuss the insights that were gained in the discover phase into:

- Factors that influence current consumer behaviour.
- The current system of furniture repair and the roles of stakeholders.
- The influence of physical characteristics of furniture on environmental impact and repairability.

These insights were used in the define phase to formulate a more specific design direction and requirements which can be found in Chapter 6.

Following is the develop phase, in which a wide variety of ideas were generated. Selecting and developing the most promising ones led to a final concept direction, as can be read in Chapters 7 and 8. Lastly, in the deliver phase, the concept direction was optimised into a final design called 'Opknappers', a proposal for Intergamma (the umbrella organization of DIY shops Gamma and Karwei). The design is presented and evaluated in Chapters 9 and 10.
During a design process, the phases were not as static as the diamond shapes suggest. In reality, the phases flow into each other and going back a fourth between phases occurs regularly.

Before jumping into the Chapters mentioned above, the report provides an overview of the used abbreviations and definitions on page 3. Additionally, Chapter 2 provides an overview of all the methods used throughout the entire design process. At the end of the report, a personal reflection is included in Chapter 11, followed by a bibliography and appendices.

02

METHODS & TOOLS

Several tools and methods were used during the explore, define and develop phases of the project, an overview is presented in Figure 3. In the following sections, the methods and tools are described in more detail, literature and desk research have been left out as it is assumed that these methods are generally well-known.

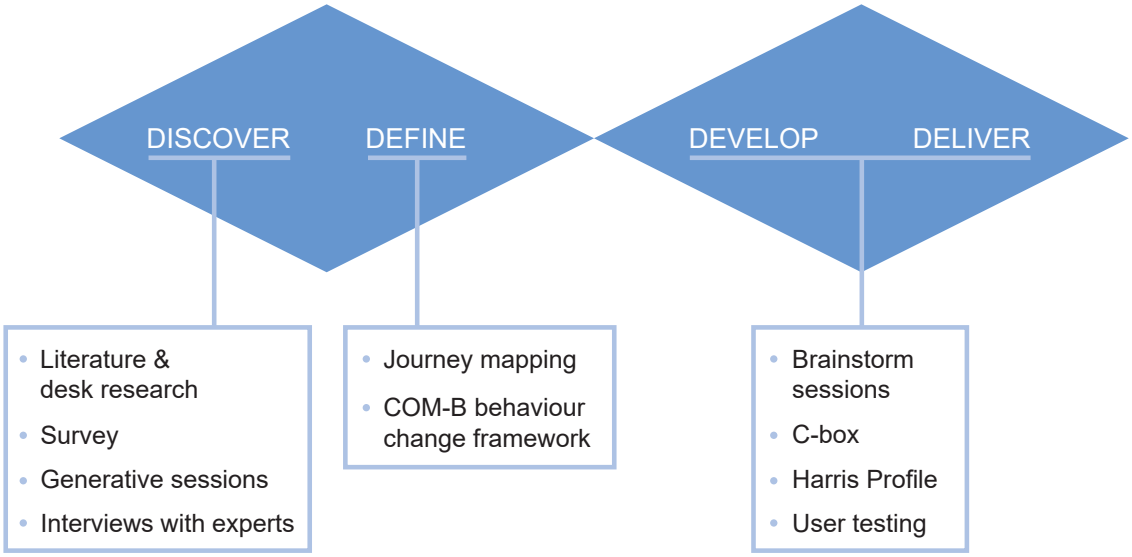


Figure 3: Used methods and tools

2.1
SURVEY

A survey research on DIY furniture repair/upgrading was conducted in collaboration with Deborah Summter, a researcher from the Urban Upcycling project of the HvA. Three questions about furniture repair and upcycling were included in HvA's survey, which primarily focused on furniture upcycling. The survey was distributed online through LinkedIn and WhatsApp groups. The questions regarding repair/upgrade were formulated as follows:

1. Have you ever repaired or refurbished furniture yourself? yes/no
2. What is a reason for you to do this or not? ... (open question)
3. If you have ever repaired or refurbished furniture, can you describe what you did? ... (open question)

2.2
GENERATIVE SESSIONS

Generative sessions are part of the generative research approach, introduced by Elizabeth Sanders and Pieter Jan Stappers in their book Convival Toolbox (2012). The general approach of these sessions is to invite groups of around 5 participants to perform a series of 'make' and 'say' activities which are aimed to uncover their experiences, opinions and knowledge about the topic of research.

In the scope of this project, the method was applied for two reasons. Firstly, to get insight into the cognitive and practical steps that consumers go through in the process of furniture repair/upgrading. Secondly, the aim was to uncover the barriers and driving factors that influence consumer behaviour during this process.

Generative sessions are well-suited for these goals because the "make" activities and group discussions help participants to reveal tacit and latent knowledge. Additionally, the sessions allow for sharing barriers and driving factors in the context of personal stories which makes them easier to understand. Lastly, the method allows for investigating whether the 'make' activities lead to different results compared to literature findings, as the studied literature works primarily rely on what consumers 'say' in interviews and questionnaires.

In Figure 4, an overview is presented of the method that was applied in this project. A total of 16 participants followed a process of two steps: they individually completed sensitizing exercises and participated in one of the 2 group sessions that were organised one week later.

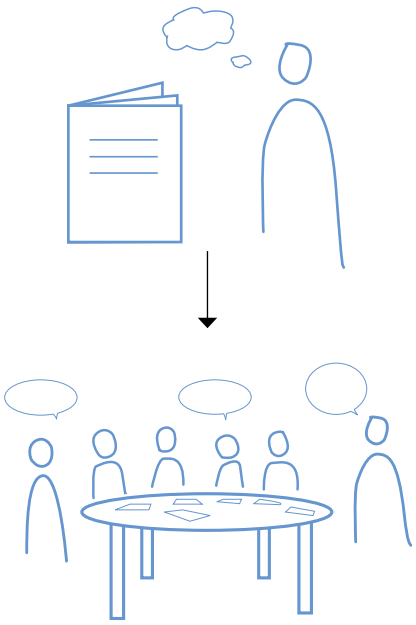


Figure 4: Overview generative research setup

2.2.1 Sensitizing

The purpose of the sensitizing exercises was to familiarize the participants with the research topic and make it easier to share their repair and upgrade experiences during the sessions. A printed booklet with exercises and needed tools were per personally delivered and explained to each participant (Figure 5).

In the exercises, participants were asked to describe their favourite and least favourite furniture pieces and share their emotions connected to these pieces with the help of an emotion trigger set. The set consisted out of emotion words and visualisations (Caicedo & Desmet, 2009; Fokkinga & Desmet, 2022). Lastly, participants shared pictures of furniture pieces they would and would not repair or upgrade, these were used later in the sessions. The full version of the booklet can be found in Appendix A.

Figure 5: Sensitize booklet and emotion trigger set

2.2.2 Session plan

Groups of 6 participants were invited for a 1,5 h during sessions at the facilitator's home. In the session, several activities were planned which addressed the following topics:

1. The decision process on why the participants choose to repair/upgrade one piece of furniture and not the other, using the submitted pictures.

2. What happens next to a piece of furniture that is not repaired or upgraded?

3. Creating a detailed storyline of a past repair/upgrade experience including practical steps, thoughts, emotions, and stakeholders.

For each of these topics, participants were asked to individually complete a pre-structured worksheet, and afterwards discuss their creations and findings with the group. Figure 6 offers a glimpse into the setting. The complete session planning and worksheets can be found in Appendix A.

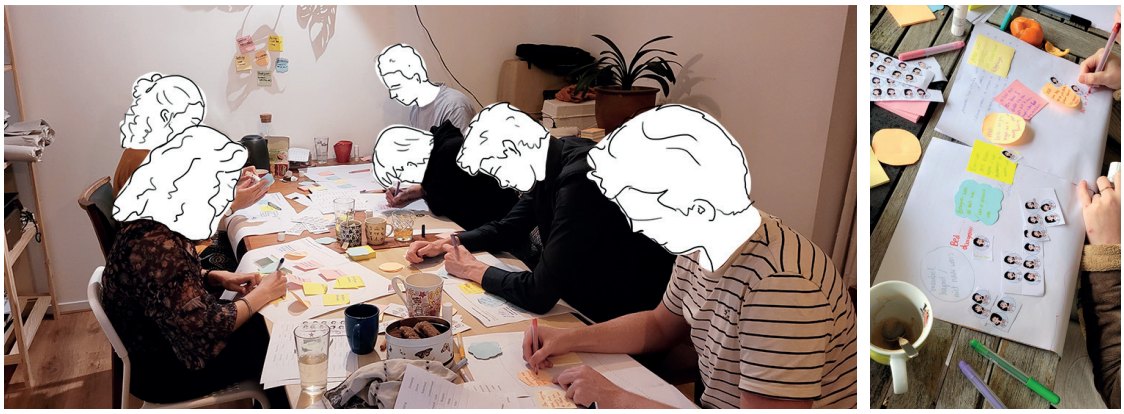


Figure 6: Setting of generative sessions

2.2.3 Participants

As the study focuses on the behaviour of all Dutch people, it would have been ideal to organise sessions with participants varying in age, gender, income, education, lifestyle etc. However, due to the time constraints of this project, opportunistic sampling was conducted while simultaneously aiming for maximum diversity.

Eight students from TU Delft with diverse study backgrounds and genders, but all roughly of the same age, participated in a pilot session (with two participants) and the first group session (six participants). The remaining participants were also generally highly educated, however, there was a wider age range present. Six of these individuals attended the second group session, while the other two completed the activities at a later moment as they were unable to join the session. Further details about the participants can be found in Appendix A.

2.3 INTERVIEWS WITH EXPERTS

The experts listed below were interviewed to learn from their expertise on consumer behaviour and furniture repair. A semi-structured interview approach was applied in all conversations. The results of these interviews are referenced in Chapters 3, 4, and 5 of this report.

Circular Ambacht Centres
Two Ambacht Centres were visited that are both actively involved in repair and upgrading of furniture. Ambacht Centres are partnerships between thrift shops, repair facilities, waste disposal sites and educational institutions. These partnerships have both a social and environmental purpose (NVRD, 2023).

Foenix in Apeldoorn – 5 October 2023
This Ambacht Centre features a wood workshop that is dedicated to repairing and upcycling furniture. Additionally, the location houses a textile workshop where furniture is occasionally upgraded, a repair café and thrift shop. Coordinators and employees from all these departments were interviewed.

De WaardeRing in Zwolle – 9 October 2023
The educational initiative Thorbecke in Bedrijf, part of the larger collaboration network WaardeRing, was visited. It is specifically focused on providing education and internships to students from practical and secondary special education (from the schools: Thorbecke SG, TalentStad, De Twijn, and De Ambelt). One aspect of the education involves upgrading wooden furniture. Wilco Wezenberg was interviewed, the coordinator of Thorbecke in Bedrijf.

Sieds Wijnja - 4 October 2023
founder and owner of Jafix, an online platform for repair manuals.

Amita Janssen - 12 October 2023
Organizer of repair events in Amsterdam where visitors can bring their own damaged products and utilize the available supplies and expert support to repair them.

Julius Kroot – 30 October 2023
Student furniture design & product design at HvA who, simultaneously with this project, worked on making undesired furniture in thrift shops more appealing. For his project, Julius conducted interviews at various thrift shops.

Meublowski – 23 November 2023
Reupholstery company located in Utrecht. Gosia and Okke were interviewed, the owners of the company and experts in the field of upholstery.

Other interviews
Lastly, summaries of interviews were consulted which are conducted at the start of 2023 by partners of the Reuse Alliance. The interviews were held with:

- The Substitude – A community of sustainable brands and professionals in the interior design and renovation industry.
- Leolux – Furniture design, production, and retail company
- Label Van De Berg – Furniture design, production, and retail company
- POS – Furniture repair company
- Vitra Circle – Web shop selling used furniture Items from Vitra and Artek.

2.4
JOURNEY MAPPING

Journey Mapping is a method that, as the name suggests, is used to illustrate the journey of a user during a specific activity or interaction with a product/service. This structured, step-by-step representation allows for the identification of barriers, opportunities, and touchpoints in the journey, which can be used as input for design (Freeman et al., 2017). In this project, a journey map was utilized in the form of a timeline to illustrate the steps involved in the repair or upgrade process of consumers.

2.5
COM-B BEHAVIOUR CHANGE FRAMEWORK

COM-B is a behaviour change framework developed by Susan Michie, Maartje van Stralen and Robert West (2011). The basis of the framework can be seen in Figure 7, it states that three key factors are influencing human behaviour: Capability (C), Opportunity (O) and Motivation (M).

Capacity refers to whether a person has the knowledge, skills, and abilities to perform a certain behaviour, both physical and psychological.

Opportunity includes all external factors that influence human behaviour. These can be divided into social and physical opportunities.

Motivation includes all internal brain processes that energise and direct behaviour. This domain contains reflective motivational factors (having goals, ideas about consequences etc.) and automatic factors (triggers and emotional responses).

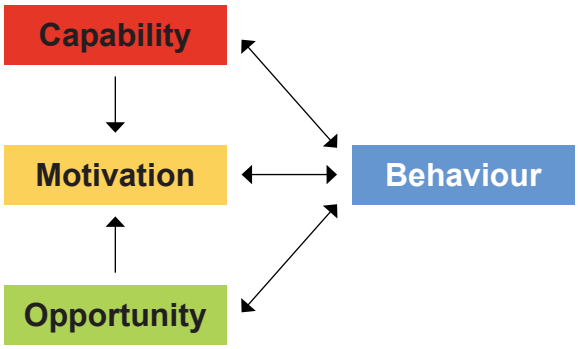


Figure 7: COM-B framework

It was chosen to use this framework as it helps to structure and understand the factors influencing a specific behaviour. Furthermore, it assists in identifying which domain(s) can be targeted by an intervention to reach the desired effect.

There are several other models for structuring human behaviour (e.g., FOG and the Theory of planned behaviour). The COM-B model was chosen because the BIT employees are using it in all their work and could thereby provide advice and support.

2.6 BRAINSTORM SESSIONS

Two brainstorm group sessions were organised in the develop phase of the project. One session was held with 6 fellow IDE graduations students, a second session was held with 6 experts in the field of furniture repair and behaviour change (employees of I&W, Rijkswaterstaat and Sieds Wijnja from Jafix).

Both sessions were structured as depicted in Figure 8. Participants were introduced to the design goal and invited to share their first ideas. Following, a second round of ideas was generated using How To questions (Van Boeijen et al., 2020). Finally, all the outcomes were reviewed in a group discussion. Some of the ideas were combined, and the most promising directions were selected. A more detailed session plan can be found in Appendix B.

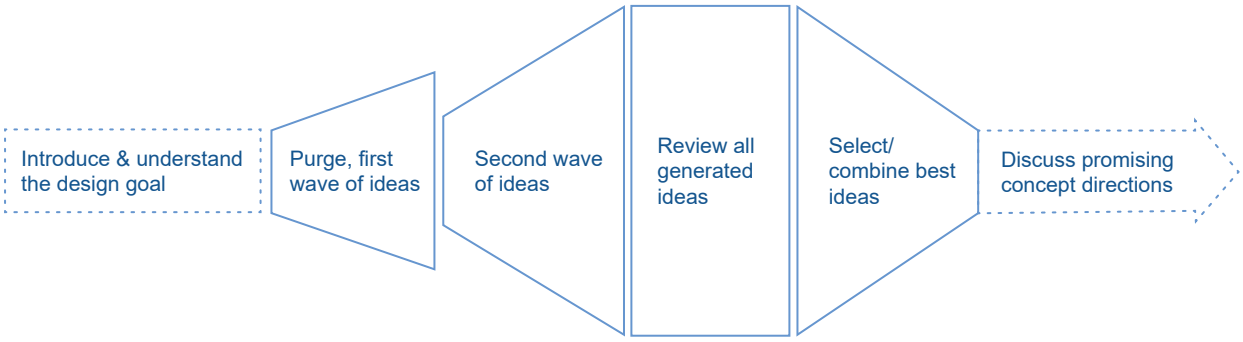


Figure 8: structure of brainstorm sessions

2.7
IDEA EVALUATION AND SELECTION

In the develop phase of the project, the most promising ideas were selected from a large pool using two methods: a C-box and the Harris profile, these are both proposed in the Delft Design Guide (Van Boeijen et al., 2020).

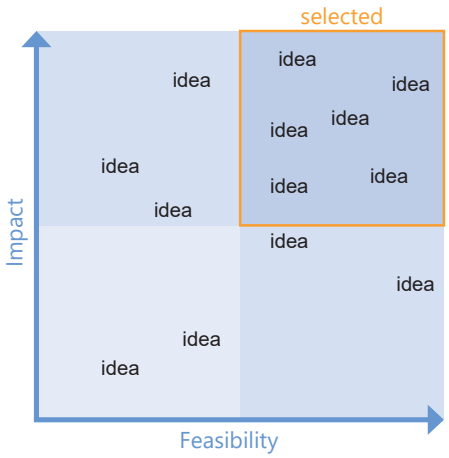


Figure 9: C-box

2.7.1 C-box

The C-Box serves as a framework for plotting ideas, based on their expected impact (y-axis) and expected feasibility (x-axis) as visualised in Figure 9. Hereby, the most promising ideas end up the upper-right quadrant of the framework.

2.7.2 Harris profile

A Harris profile is a visual representation of a rough assessment based on a selection of criteria, an example is illustrated in Figure 10.

The 6 criteria that were chosen are based on the APEASE criteria (Affordability, Practicality, Effectiveness and cost-effectiveness, Acceptability, Side effects/safety, and Equity). These are commonly applied by designers to determine which types of interventions are most likely to have an impact (Michie et al., 2014). To apply the criteria in this project, they have been reformulated and rearranged, from most to least important.

1. **Effectiveness**
   Does the idea reach the design goal and eventually reduce climate impact of the furniture industry?

2. **Acceptability**
   Are people open to this idea?

3. **Practicability**
   How feasible is the implementation?

4. **Spill-over effects**
   Are there unwanted side-effects or unintended consequences?

5. **Affordability for the user**

6. **Cost effectiveness**

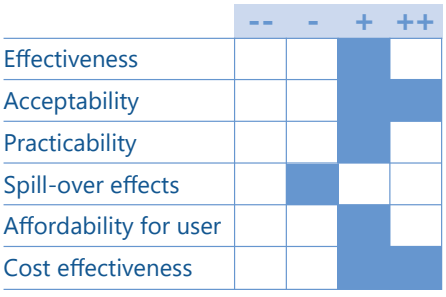


Figure 10: Harris profile

2.8
USER TEST – TWO CONCEPTS

The two most promising design concepts (as presented in Chapter 8.1) were evaluated with the target group through user tests. During these approximately 30-minute tests, prototypes of the concepts were explained, tested, and discussed in semi-structured interviews (the interview questions are available in Appendix C). The order in which the concepts were evaluated was alternated in the tests. Figure 11 demonstrates how a participant interacts with the app).

Figure 11: User test – 2 most promising concepts

2.9
USER TEST – FINAL DESIGN

To evaluate the final design proposal, a user test was organized at the Gamma in Woerden. On Saturday afternoon, January 13, 2024, visitors of this store were asked to experience prototypes of the design and share their opinions in a short interview. Figure 12 offers a glimpse into the setup.

In the test, the DIY cards, the exposition, store shelf, and Opknappers app were evaluated. The social media and website proposal were not included. Additional details about the setup, prototypes, and the interview guide can be found in Appendix C.

Participants

A total of 29 Gamma visitors gave feedback on the design of Opknappers. From this total, 10 participants fell within the age range of the target group (18-35 years old), while the others were older. Almost all participants evaluated all prototypes, though a few had limited time and only reviewed the app or the other three elements.

Figure 12: Final user test

DISCOVER

This part of the report is devoted to the first phase in the double diamond: the discover phase. As the project is aimed at changing the behaviour of consumers towards more repair/upgrading, it is valuable to gain insight into all factors within the broader context of the furniture sector that influence current and potential future behaviour.

Research indicates that all factors influencing a circular economy can be categorized into social, economic, organizational, technological, product design, and environmental aspects (Oorschot et al., 2020). In the research of this project, these aspects were taken into account in the three research areas presented in Figure 13.

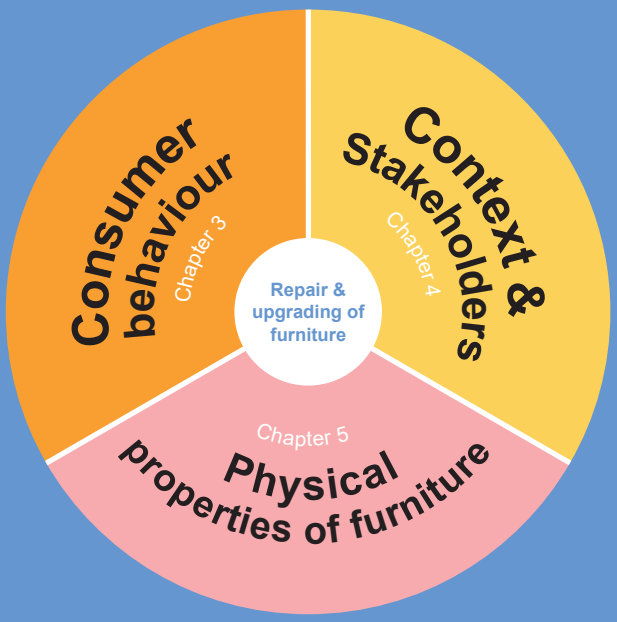


Figure 13: Overview of research areas

Consumer behaviour
This area is focussed on understanding current consumer behaviour and the factors (e.g. social, economic) influencing this.

Context & stakeholders
In this area, the current system and stakeholders of furniture repair/upgrading were further investigated to identify the challenges and opportunities that affect consumers (e.g. economic and organisational aspects).

Physical properties of furniture
The final area is devoted to researching how technological aspects and product design aspects affect the reparability and environmental impact of furniture.

03

CONSUMER BEHAVIOUR

In this research area, the current behaviour of consumers around furniture repair and upgrading was studied by four research activities: literature research, a small survey, generative research and expert interviews. Figure 14 shows the activities and research questions to which they relate.

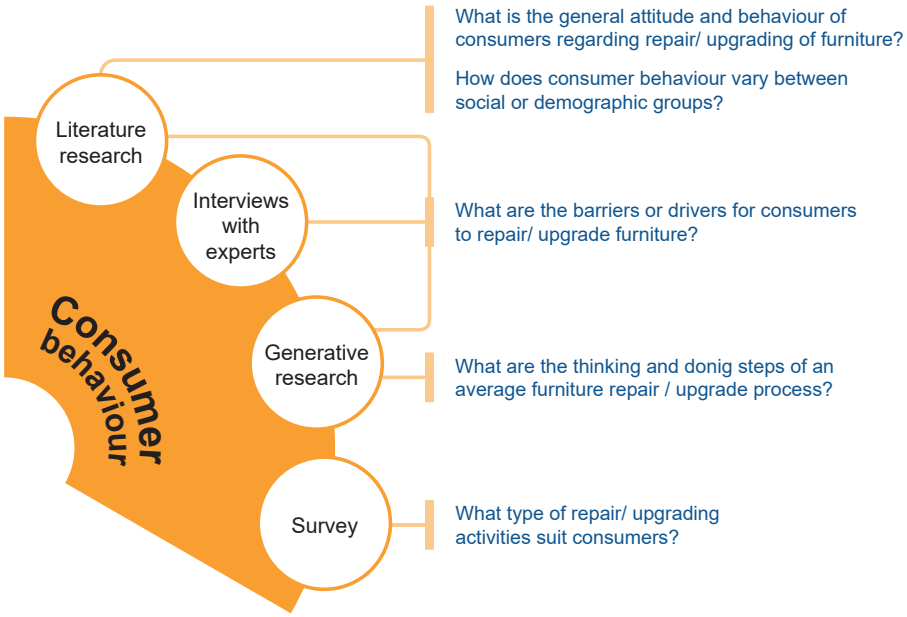


Figure 14: Research activities and questions - Consumer behaviour

Firstly, the outcomes of the literature research are discussed in section 3.1. Insight was gained into the attitude of Dutch consumers towards furniture repair/upgrading and a how this differs between social and demographic groups. Furthermore, a deeper understanding was gained into the factors that have influence on current consumer behaviour.

Following is 3.2, in which the small survey research is discussed that reveals which types of furniture repair and upgrading activities are already performed by consumers.

The factors influencing consumer behaviour have been further investigated and refined through generative research and expert interviews as can be read in sections 3.3 and 3.4.

All these findings are analysed in section 3.5 to conclude which factors can be addressed by the design intervention to stimulate more repair/upgrading.

3.1
LITERATURE RESEARCH Consumer behaviour

3.1.1 General attitude

As mentioned in the introduction, Dutch consumers have indicated to be on average 68 (on a scale from 0-100) open to repair of furniture. However, the percentage of people who reported actually performing repairs (DIY or outsourcing) is 17% (Geeris et al., 2023). This data shows that there is an intention behaviour gap for repair of furniture: a gap between what people want and do (Koch & Vringer, 2023). Milieu Centraal states that the potential for behavioural change is greatest in cases where the is a large intention-behaviour gap, thereby, furniture repair is a promising strategy (Geeris et al., 2023).

3.1.2 Behavioural differences in social or demographic groups

After gaining insight into the average openness and repair behaviour of Dutch consumers, further research was conducted to identify a more specific selection of consumers that have the largest intention-behaviour gap. These individuals are desired as a target group for the design intervention as they are likely to be the first to change their behaviour and become an early majority. In this way, a social tipping point can be reached and eventually the late majority will follow in the change of behaviour (Geeris et al., 2023). It was found that differences in intention-behaviour gap can be identified based on the characteristics: education, income, age, and place of residence.

3.1.2.1 Education & income

The largest intention-behaviour gap was found among high-income and high education people (Geeris et al., 2023). People with a high income scored an openness of 64,1%, compared to an openness of 57,2% amongst people with low incomes. High educated people scored an openness of 70,3% compared to an openness of 50,4% amongst low educated persons. These findings are supported by the survey research that was conducted by Bente de Keizer, a graduate intern of the Ministry of I&W (Keizer, 2024). Furthermore, it was found that high income and highly educated people have the highest concern for the environment in general (Geeris et al., 2023; Umpfenbach, 2014).

Despite the environmental concern of high income and high educated consumers, they tend to have the biggest environmental impact per person, due to them consuming more, traveling more, etc. (Geeris et al., 2023; Umpfenbach, 2014). This impactful lifestyle was also found in the way these people treat furniture. High income consumers dispose and buy new furniture more often compared to people with low incomes (Geeris et al., 2023). Besides, their motivations for buying new furniture are frequently not connected to products reaching the end of their lifespan. For example, individuals with higher incomes more often cite reasons such as the desire for something new (36% among high-income individuals compared to 21% among low-income individuals), desire for more comfort (20% compared to 12%), and trend sensitiveness (9% compared to 2%) for

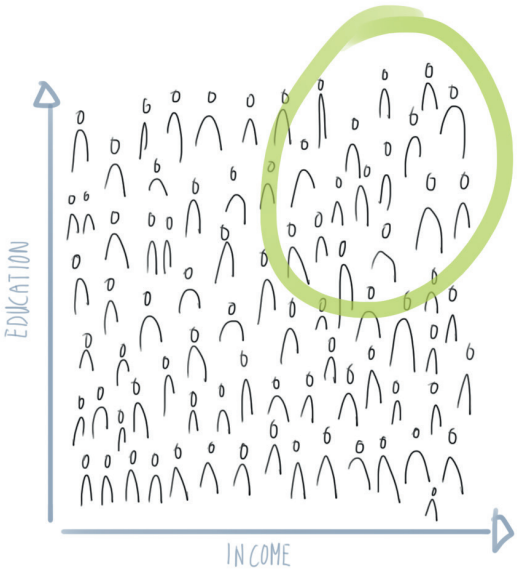


Figure 15: Target group first selection step

buying new furniture (Geeris et al., 2023). These insights show that high education and high-income are characteristics of consumers with the greatest potential for behaviour change due to the large intention-behaviour gap.

3.1.2.2 Age

In addition to income, it appeared that consumers' behaviour and attitude are age-dependent. Young people (aged 18 to 35) were found to have the most openness to sustainable behaviour in general. (Geeris et al., 2023). However, regarding DIY furniture repair, research revealed that besides the young generation, also older individuals (aged 55-80 years) stand out in terms of openness (Keizer, 2024).

In the previous section, it was concluded that high income and high education are characteristics desired for the target group. There are approximately 3 times as many older people (55-80) with an above-modal income than younger ones in the Netherlands (CBS, 2023a, 2023b). Targeting the older population with the design intervention could therefore reach far more people than when choosing the young generation. However, it was decided not to select the target group based on size, but priority was given to the largest intention-behaviour gap, as this leads to the highest probability of reaching actual behaviour change, the goal of this project. To determine this aspect, the current behaviour of these two groups was further studied.

It was found that the young generation is more often disposing and buying furniture than older people (Geeris et al., 2023). The following reasons for this behaviour were pointed out in literature: Young people lack knowledge and interest in repair, or they have the money to buy new products (Kort et al., 2021). Additionally, younger people more commonly cite a desire for something new as a reason for replacement (Roumen & Geeris, 2023). This desire is likely connected to being trend sensitive, research indicated that 25-34 year-olds in particular find it important to keep up with sofa trends (Vries et al., 2022).

Older people (55-80) generally behave more sustainably regarding furniture. They tend to replace furniture only when it becomes worn out, and more often buy long lasting furniture (Geeris et al., 2023; Koch & Vringer, 2023). Besides, there are more older aged repair fanatics that visit and volunteer in repair cafes (Jong et al., 2021; Milieu-Centraal, 2023). Lastly, a sober mentality is present among a part of the high educated, high income older people (Motivaction, 2023).

These insights show that the younger generation behaves less sustainably and thus has a larger intention-behaviour gap than older people. Therefore, despite being less in group size, a young age (18-35) was taken as preferred characteristic for the target group. An additional reason is that people adopting sustainable behaviour at a young age can result in impact reduction for a longer term.

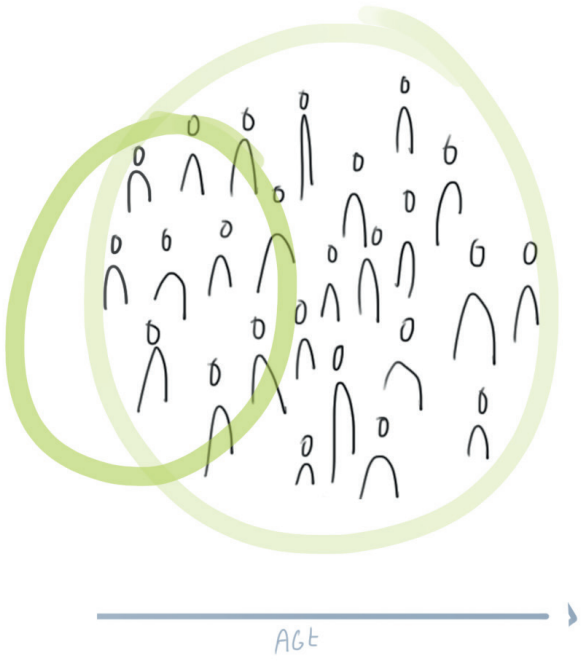


Figure 16: Target group second selection step

3.1.2.3 Place of residence

Lastly, it was found that the intervention could be targeted most effectively in the big cities of the Netherlands. Most openness to furniture repair was found for consumers living in the 3 large municipalities in the Netherlands: Amsterdam, Rotterdam and The Hague (Geeris et al., 2023).

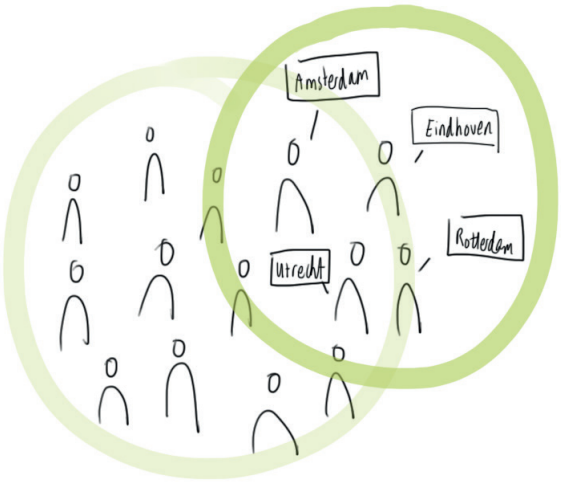


Figure 17: Target group third selection step

3.1.2.4 Conclusion – chosen target group

All the previously mentioned insights have been combined to define the characteristics of the target group for the design intervention: High-income, highly educated, young consumers (18-34 years old) living in big cities in the Netherlands (Figure 18). It should be noted that this group consists of both students and 'starters'. With 'starters' are meant first time (rental) homeowners. Students do not meet all characteristics as many students do not yet have a high income, at age up to 25, only 3.5% of people have an above-modal income (CBS, 2023b). However, most students do have a high probability of earning a high income after their studies and are therefore included as part of the target group. Starters do meet all the characteristics, and this is a large group, 28.5 per cent of people aged 25-35 have an above-modal income (CBS, 2023b).

Figure 18: Target group

3.1.2.3 Lifestyle & mindset of the target group

Additional research was conducted into the mindset of the chosen target group to learn how these individuals can be best approached by the design. Motivaction compiled 5 profiles of Dutch people, based on lifestyle and attitude towards sustainability (Hoekstra et al., 2013). Description of all the profiles can be found in Appendix D. It was found that high-income and highly educated young people are particularly represented in the two profiles: status-conscious and responsible (Motivaction, 2023).

People with a responsible profile are concerned about environmental issues and intrinsically motivated to behave sustainably. They already apply this mindset to their actions when they have the capacity and opportunities to do so. However, they occasionally prioritize enjoyment over sustainability and, for example, take a flight for a holiday. In terms of increased furniture repair or upgrading, there is great potential in this group, as their intrinsic motivation is likely to result in behaviour change when a design intervention reduces other barriers.

In addition, a part of the target group has a status-conscious profile. This subgroup is aware of environmental problems but lacks concern. These people have a materialistic attitude, value social status, are open to change and interested in 'the newest of the newest', especially for technological innovations. They are open to sustainable options but strongly value comfort and luxury. Young people with this profile will not be motivated to change their behaviour based on environmental concern, they need motivative sources like social status or desirable products.

Motivaction has provided advice for approaching these groups when aiming for behaviour change, tips for both responsible and status-conscious profiles are combined in the list below:

- Emphasise personal benefits.
- Communicate factual, not judgemental.
- Provide the 'latest of the latest' (technological innovation).
- Target social status/showing what you have.
- Point out opportunities.
- Give appreciation for sustainable behaviour.
- Trigger intrinsic motivation (mainly for environmentally concerned people).

Figure 19: Target group characteristics

3.1.3 Barriers & drivers for repair/upgrading

More in-depth literature review was focussed on uncovering the reasons behind the identified intention-behaviour gap: why do many consumers not engage in furniture repair when they are open to it? An overview of consumer thought processes and specific factors that serve as barriers and drivers for repair/upgrading behaviour are discussed in this chapter.

3.1.3.1 Overview decision process - trade-offs

Firstly, based on literature findings, an overview has been created of the thought process that consumers go through when a piece of furniture no longer meets their needs. It was found that consumers' start assessing and making trade-offs between the following 3 areas to choose for repair/ upgrading or disposing the product (Berge et al., 2021):

- The value they see in their current product (mental book value).
- Their attitude towards repair/upgrading.
- Their attitude towards a new product with which they can replace the current one.

Within these three areas, the assessments are based on different factors, these are listed in Figure 20. As can be seen in the blue circle, consumers can determine the value of their current product based on five factors, these are proposed and explained in the framework about product replacement behaviour of Berge, Mugge and Magnier (2021) as:

- Functional value - the functional, utilitarian, and physical performance of the product.
- Emotional value - the feelings and effective states aroused by the product.
- Social value - the product causing associations and belonging to a group.
- Epistemic value - the product arousing curiosity.
- Conditional value - situations or circumstances influencing consumer decisions.

To evaluate the option of replacing a product, consumers consider the factors in the red circle: the cost and expected value of buying a new product (Berge et al., 2021). For assessing the third area, repairing or upgrading the furniture piece, consumers consider the factors in the green circle: the costs, value and technical factors that come with repair/upgrading (Terzioğlu, 2021).

All aspects and values can influence each other and change over time. In addition, considerations vary per consumer, per specific piece of furniture and per situation. Therefore, there is no set combination of factors leading to repair/upgrade behaviour.

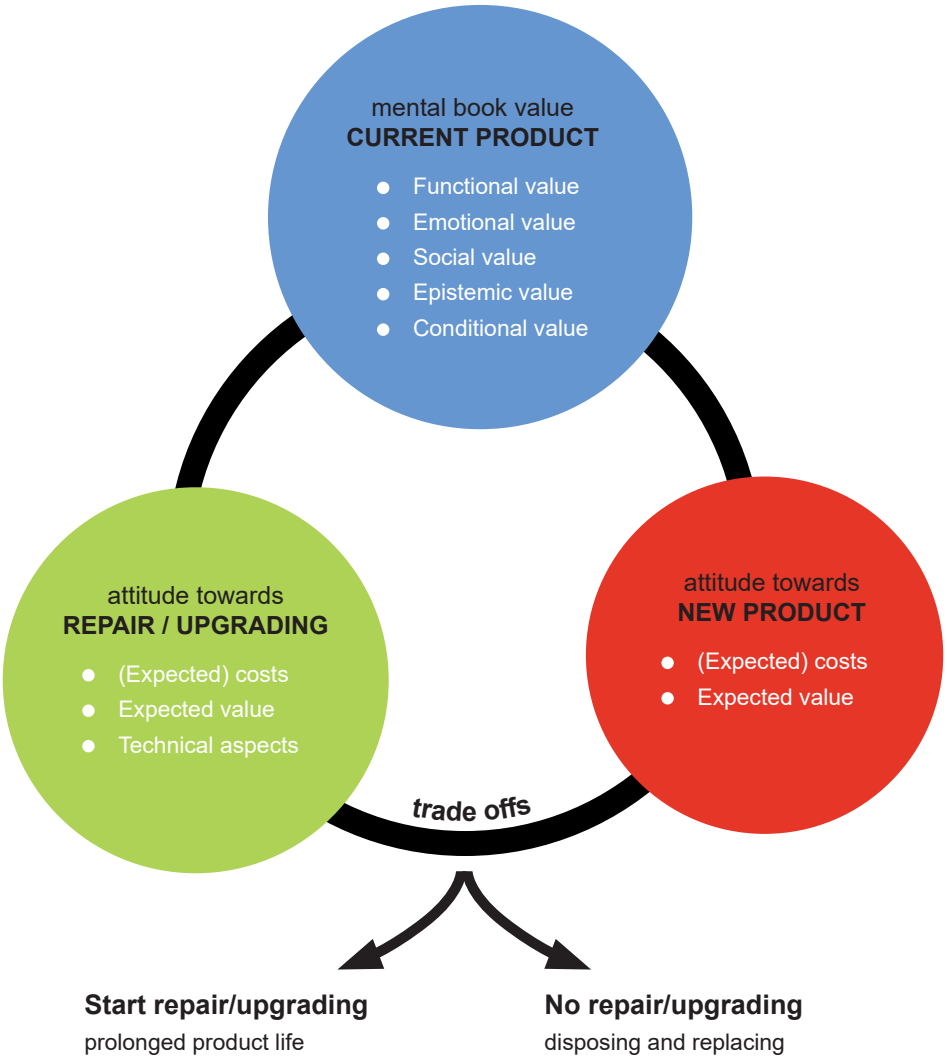


Figure 20: trade-offs for decision to repair/upgrade

3.1.3.2 Specific barriers and drivers in each area

The three assessment areas and their aspects are further explored by identifying individual barriers and drivers for consumers to perform repair and/or upgrading of furniture. These are listed in the next section of the report, with the icons in Figure 21 indicating how the factor most often influences consumers.

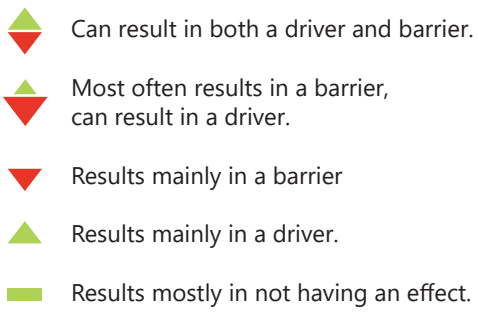


Figure 21: icons for barriers & drivers

Mental book value
CURRENT PRODUCT

Functional value

Functionality

When furniture has a high functionality, this acts as a driver for product care (Ackermann et al., 2017; Ackermann, Schoormans, et al., 2021). Primarily, products that are perceived as indispensable, or used daily are repaired faster (Ackermann et al., 2018; Terzioğlu, 2021; Vos & Wullems, 2022). When consumers cannot use a product effectively, this is a barrier to repair/upgrading. For example, 23% of Dutch consumers mentioned that they buy new furniture simply because they desire a different size. (Geeris et al., 2023). It also appears that people care less anyway for products they do not really need (Ackermann et al., 2018).

Condition

An often mentioned reason for discarding a furniture piece is it being worn out (Geeris et al., 2023). This factor is defined as the condition of the current product and is connected to functional value factor. Primarily in the case of poor product condition, a product is more likely to fail in performing its function effectively (e.g., when a wheel of an office chair does not roll properly).

Emotional value

Emotional attachment

Being emotionally attached to a furniture piece positively influences consumers' repair and upgrade behaviour (Ackermann et al., 2017, 2018; Ackermann, Schoormans, et al., 2021; Jong et al., 2021; Vos & Wullems, 2022). One of the causes for an emotional connection is when the product fits with the identity of the user (Ackermann et al., 2017). As can be expected, a lack of emotional attachment forms a barrier to repair/upgrade behaviour. A situation in which this occurs is for example when a product has shared ownership, this leads to less product care (Ackermann et al., 2017, 2018).

Original costs

It was found that consumers are more likely to repair products with high purchase costs and are less likely to repair cheaper products (Ackermann et al., 2017, 2018; Intven et al., 2022; Vos & Wullems, 2022). It is expected that high costs stimulate emotional attachment. This factor emerges in most of the cases as a barrier, because the current offer of furniture in the low-price segment is high (Hebrok, 2016; Roumen & Geeris, 2023).

Enjoy usage

Another emotional value is the experienced pleasure/fun from a product which, when positive, drives consumers to take care of it (Ackermann et al., 2017, 2018). This also applies the other way round as people are more inclined to replace uncomfortable furniture (Geeris et al., 2023).

Social value

Social norm

Social norms are one of the main determinants of behaviour and create a barrier in the case of furniture repair/upgrade behaviour. In today's society, consuming is seen as a good thing. There is a strong desire for new products as buying brings a happy but temporary feeling which leads to more consuming (Roumen & Geeris, 2023). Additionally, certain life events such as moving to a new house, change of household members, or redecorating a home are strongly connected to behaviour following this norm. People often cited these life events as reasons for disposal (Geeris et al., 2023; Hebrok, 2016; Intven et al., 2022; Koch & Vringer, 2023). Furthermore, repair is not yet commonly considered as an option as consumers often do not believe that products are made to be repaired (Berge et al., 2022). A small shift can be seen in people's attitude towards reusing stuff as thrift shopping increases in popularity (Intven et al., 2022)

Epistemic value

Tendency to loose interest

Literature reports that people can become tired of a product after some time. In fact, repeated product use causes a sense of satiation as products and their values are mentally written off by the consumer (Berge et al., 2021; Vries et al., 2022). For example, a third of the respondents from Milieu Centraal's research indicate that they replace furniture because they feel the need for something new (Geeris et al., 2023). This characteristic often poses a barrier to repair/upgrade as people don't wish to keep the furniture piece. Interest in a product can be re-generated if a consumer can come up with an idea to use the product in an innovative way (Ackermann, Schoormans, et al., 2021).

Trend sensitiveness

Connected to losing interest is the barrier formed by consumers' trend sensitiveness, which has grown in the field of furniture since the 1980s (Hanemaaijer et al., 2023). This sensitivity and the continuous developments of new trends cause people to change interiors more easily (Hanemaaijer et al., 2023; Intven et al., 2022; Rijksoverheid, 2023; Roumen & Geeris, 2023).

Aesthetic value

When a product is perceived as aesthetically pleasing, consumers want the product to remain beautiful which results in a driver for product care (Ackermann et al., 2017; Ackermann, Schoormans, et al., 2021). On the other hand, aesthetic flaws can become a barrier as people often dispose physically well-performing furniture due to flaws like a worn surface or undesirable design (Hebrok, 2016).

Conditional value

Lack of triggers for repair/upgr.

Research of Ackermann, Mugge and Schoormans states that consumers lack triggers to perform product care (2017). Triggers are stimuli that provoke a behaviour by enhancing people's motivation, ability or work as a signal. Examples of triggers for product care are: the appearance of a product itself can indicate that care is needed, or the stimulating effect of a user's social environment or some sort of challenge.

Attitude towards NEW PRODUCT

Costs

Costs replacement

The cost trade-off has a significant effect on consumer behaviour, with the majority of Dutch people (61%) indicating that their choice for repair is based on this factor (Kort et al., 2021; Sire, 2019). In the trade-off, the assessment of the three areas come together: people consider the expected cost of a new product, the costs of repair, and the estimated value of their current product. Additionally, a person's budget plays a role (Kort et al., 2021).

The cost trade-off can result in both a barrier as a driver. However, often there is a lack of financial gain for repair. In many cases replacing a product feels or is cheaper than having it repaired by a professional (Forrest et al., 2017; Hanemaaijer et al., 2023; Kort et al., 2021).

Expected value

Value new product

Consumers compare the value of their own product with that of new products which often results in a barrier for repair or upgrade behaviour. New products are regularly perceived as more attractive, user-friendly and efficient (Kort et al., 2021). The bigger the difference is estimated, the less value people see in their current product and the more inclined they are to choose for replacement (Berge et al., 2021). Even consumers who do repair fanatically, mention that they still choose to buy new furniture if the quality is better (Jong et al., 2021). Retailers focus on this value comparison by hyping the value of new products with marketing strategies (Berge et al., 2021; Geeris et al., 2023).

Effort & time replacement

The high convenience and quickness of replacement are often cited as reasons for disposal and form a barrier to repair/upgrade behaviour (Hebrok, 2016; Kort et al., 2021; Umpfenbach, 2014). Accordingly, 12% of Dutch people cite convenience as a reason for choosing replacement over repair (Geeris et al., 2023).

Attitude towards REPAIR/UPGRADING

Costs

Expectations costs repair

As mentioned earlier, consumer behaviour is strongly influenced by cost considerations. The costs of repair often act as a barrier, especially in the case of outsourcing repair as this is relatively expensive (European-Commission, 2022; Hebrok, 2016). Also, the majority of people do not expect additional costs for a sofa after purchase and are therefore easily disappointed by repair costs (Vries et al., 2022). In the case of a DIY repair, the potentially low costs are mentioned as a driver, however, it can be difficult to make this estimation (Kort et al., 2021; Wolf & McQuitty, 2011).

Expected value

Identity of repair/upgrade

People have different perceptions regarding repair/upgrading which can result in both a barrier and driving factor. Some people associate signs of repair with economic hardship and poverty while others actually like to identify with the image of repairing/upgrading as they see it as a sign of empowerment, fulfilment of craftmanship and uniqueness (Terzioğlu, 2021; Wolf & McQuitty, 2011).

Environmental concern

Concerns/awareness about climate issues can act as a driver. People can be intrinsically motivated to behave sustainably by not wanting to waste products (Ackermann et al., 2017, 2018; Ackermann, Tuimaka, et al., 2021; Vos & Wullems, 2022). Replacing a still functional product can be accompanied with a feeling of guilt (Berge et al., 2021). The majority of Dutch people (70%) also find it abnormal to purchase large new furniture pieces every 5 to 7 years (Geeris et al., 2023).

Nevertheless, this attitude does often not translate into behaviour. 60-75% of Dutch people think it is important to reduce climate change, but they do not buy less furniture (Roumen & Geeris, 2023). Also, people with an aversion to wasting products still dispose of products before the end of their functional life (Berge et al., 2021). One of the reasons for this is that the majority (66%) of people do not consider the impact of buying new furniture (Geeris et al., 2023). It is also stated that environmental concern alone does not make people change their behaviour, other factors such as saving costs, social, health, etc. are needed (Umpfenbach, 2014).

Previous experiences

Positive or negative previous experiences affect people's tendency to perform product care in the future (Ackermann et al., 2017). This effect can be achieved through personal experiences as well as acquaintances who share their experiences (Ackermann et al., 2018; Vos & Wullems, 2022).

Confidence/ self-efficacy

A lack of confidence is a strong barrier to repair behaviour. This results in for example a concern around reversibility: people are nervous for doing something that creates unwanted results which they cannot undo (Ackermann et al., 2018; Terzioğlu, 2021). In the case people are confident, they experience so called self-efficacy (a can-do-mentality) which acts as a driver for repair and upgrading (Berge et al., 2022).

Enjoy DIY

Consumers who frequently repair or upgrade products often mention that they simply do so because they enjoy it (Jong et al., 2021). Also, it was found that people generally do have willingness to learn more about product care activities such as repair which can work as a driver (Ackermann et al., 2018).

Expectations result

Expectations about the outcome of repairing/upgrading can affect behaviour both positively and negatively. It drives people when they have a particular goal in mind that they can only achieve with repair/upgrading (Terzioğlu, 2021; Wolf & McQuitty, 2011).

The expectations serve as a barrier when consumers doubt whether the product will last long after repair (Terzioğlu, 2021; Vos & Wullems, 2022) The same negative effect is achieved when people hesitate if the product is repairable in the first place, here the complexity of the product plays a role (Ackermann et al., 2017; Ackermann, Schoormans, et al., 2021; Vos & Wullems, 2022). In current furniture design, structures and material types are often concealed, and hide the potential for repair/maintenance (Hebrok, 2016). Lastly, if expectations about the result are too high, they can actually lead to disappointment which negatively influences people's willingness to start projects in the future (Wolf & McQuitty, 2011).

Technical aspects

Effort & time

It was found that consumers' choice and ability for repair depends on the (estimated) required time and effort, they prefer to carry out simple, low effort and low time repairs (Ackermann et al., 2017; Kort et al., 2021; Terzioğlu, 2021; Vos & Wullems, 2022). As repair/upgrading of furniture does require time and effort, this factor is often experienced as a barrier. 70% of Dutch people noted that they would replace large furniture less often if repair/upgrading would be easier (Geeris et al., 2023).

Required knowledge and skills

The knowledge and skills a person has concerning repair/upgrading affect their ability and choice to do so (Ackermann et al., 2017; Wolf & McQuitty, 2011). Generally, this factor works as a barrier as average consumers only have the knowledge and skills for simple repairs (Kort et al., 2021). Manufacturers or retailers generally do not help with knowledge sharing, consumers rarely receive information on product durability and repair (Forrest et al., 2017).

For very easy repair or maintenance activities, a lack of information is not a barrier, but people still struggle. Other named aspects play a role in these situations (Ackermann et al., 2022).

Low product repairability

A major barrier to furniture repair is the fact that much of today's furniture is not designed to be repair-friendly (Forrest et al., 2017; Intven et al., 2022; Rijksoverheid, 2023). This barrier is discussed in more detail in Chapter 4.

Accessibility tools & supplies

Lastly, a lack of equipment has been identified as a barrier for repair and maintenance (Ackermann et al., 2017; Ackermann, Schoormans, et al., 2021). This includes both the tools that people do not have in-house, but also spare parts that are often poorly available throughout the industry (Forrest et al., 2017; Intven et al., 2022; Kort et al., 2021).

Main takeaways

- The design intervention should ensure that repair/upgrading is considered in people's mental trade-off in the first place. Besides, the mentioned barriers and drivers should be addressed to steer the decision towards repair/upgrading.

- It can be interesting to target consumers who are experiencing life events like moving to a new house, change of people in the household or are redecorating their house.

- Since furniture in the low/medium price segments is repaired less frequently compared to the high-price segment, focussing the design on these items can potentially lead to the most impact reduction.

3.2
SURVEY

An online survey was used to research the type of DIY repairs/upgrades that consumers are already performing nowadays. The aim of this research was to find out what type of repairs/upgrades exist, are doable, and can thereby potentially be stimulated by the design. The survey was conducted in collaboration with the Urban Upcycling study from the Hogeschool van Amsterdam, more information on the method can be found in Chapter 2.1 (HvA, 2023).

3.4.1 Results & conclusion

In total, 152 people have completed the survey. From this group, 84% have repaired/ upgraded their own furniture. The activities that have been performed by these people, were summarized into the categories displayed in Figure 22. The percentages represent the proportion of participants who engaged in activities within the categories. Percentages exceed 100% as people often combined multiple techniques or projects in their responses.

Figure 22: summarised results survey research

Most often, projects were mentioned in the category of repairing/upgrading construction. In here, all reinforcements and adjustments made to the construction of the furniture were included like (re)placing legs, wheels, knobs joints etc. Secondly, surface treatment of wood was commonly performed. This includes activities such as varnishing, staining, oiling and sanding. Furthermore, many projects were mentioned concerning upholstery/textile work such as repairing loose stitches, making cushion covers, upholstery of entire furniture pieces or having this done by experts. In addition, there are activities that do are not considered being repair/ upgrading such as building new furniture or maintenance.

The results of this survey are biased, as most participants were followers of the Urban Upcycling project and are therefore likely to be above-average interested in repair/ upgrading. Therefore, the results do not precisely indicate which types of repair/ upgrading are performed by or doable for the average Dutch individual. However, the results do provide an idea of DIY activities that are possible.

Main takeaway

- Repair and upgrade activities in the fields of construction, wood surface treatment, and reupholstery/textile can serve as an initial collection of specific activities that the design can support or encourage.

3.3
GENERATIVE SESSIONS

Generative sessions were conducted to gain insight into the cognitive and practical steps that consumers go through in the process of furniture repair/upgrading. Secondly, the method was used for identifying the barriers and driving factors that influence the behaviour of the participants during their process and compare these insights to the literature findings. A look into the setting of the sessions is presented in Figure 23. Chapter 2.2 provides more details about the method.

Figure 23: Setting of generative sessions

3.3.1 Results & conclusions

The collected materials of the generated sessions were audio recordings of the group discussions and completed worksheets of which some examples are shown in Figure 24. These were used to create an overview of the average repair/upgrade journey and identify experienced barriers and drivers.

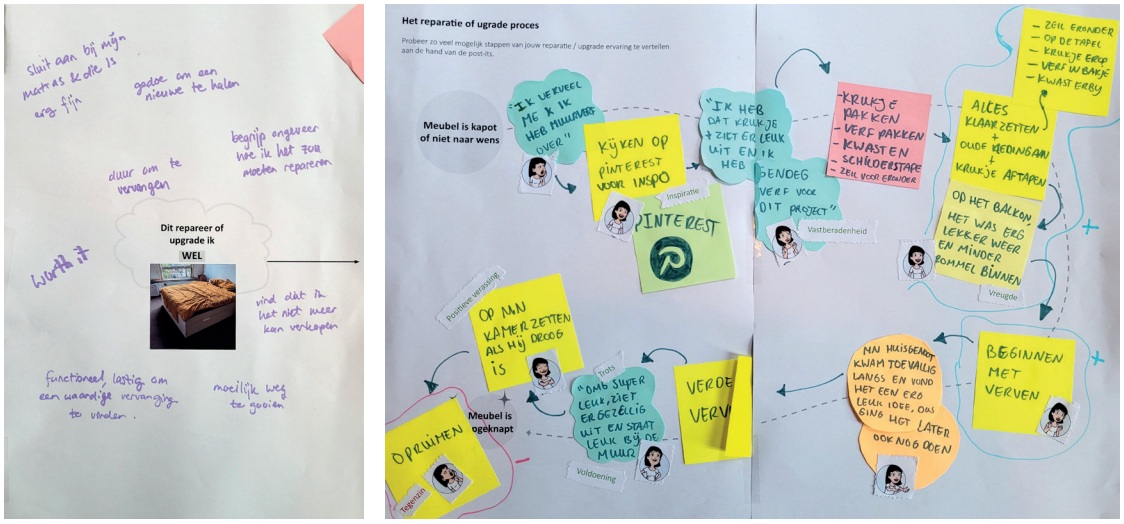


Figure 24: Examples of completed worksheets from generative sessions.

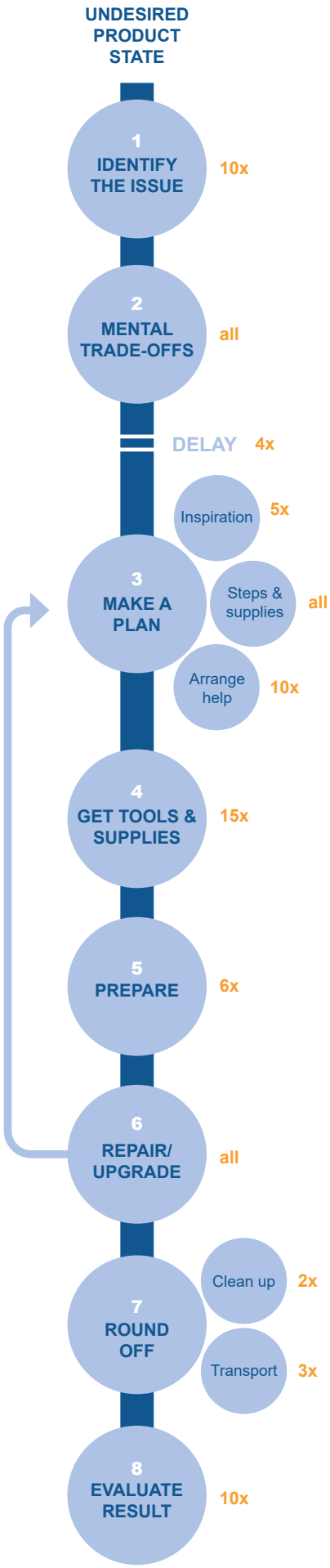


Figure 25: Steps in the average repair/upgrade journey

3.3.1.1 The average repair/upgrade journey

From the completed worksheets of activity 1 and 3 (1: explain the decision to repair/upgrade a piece of furniture or not. 3: create a timeline of a previous experience), an overview of all the steps in the repair/upgrade processes of all participants was created, this overview is presented in Appendix E.

The comprehensive overview has been condensed to the generalised journey as can be seen in Figure 25. The orange numbers indicate the total participants who mentioned each step.

It was striking that several participants had a clear delay time in their process, mainly after the issue of the furniture piece was known. In these cases, there was no time, motivation, plan, or trigger to move to action. Besides, it was noticeable that most of the participants arranged the help of, for example, a family member, partner, or friend to make a plan, collect materials and carry out the repair/upgrade.

Furthermore, in four cases the participants' plans did not work out as expected so they went from the executive step back to making a plan and often needed new materials. In these cases, the support of a helping person often came in handy.

Lasty, it was noticed that the evaluation moment of the result was always accompanied by positive emotions such as pride and joy, even in cases where imperfections were noticed. Often, results were shared with others which increased the happy feeling even more.

3.3.1.2 Barriers & drivers

In addition to the practical steps, the generative research results revealed what barriers or drivers were experienced by participants during their processes. The comprehensive journey in Appendix E contains these findings for each individual, and below, these findings are compiled and compared with the literature.

Results that agree to literature research

Firstly, there was a strong alignment found with the literature regarding several factors that influence how participants assess the value of their current product and their attitude towards repair/upgrading. These factors are presented below along with some paraphrased statements from participants.

New factors

In addition to all the similarities, two behavioural factors emerged from the results that had not been identified in literature research: the positive effect of receiving help from others and the need for having a plan. Both are further elaborated below.

Advice/help from others

The majority of the participants (10 out of 16) requested and received help from others during their repair or upgrade process, they experienced this as a significant driver. The help came from family members, friends, and partners.

The positive effect of working together was found to be caused by various reasons. Firstly, an extra person brings in extra knowledge and skills. It was noticeable that mainly the younger participants with less experience asked for help as they needed extra knowledge and skills for making a plan and executing it. Three of them specifically mentioned that they had no idea where to start without help. The six participants who tackled the task on their own were more experienced or had a very simple task.

"First, I tried it myself, but it didn't work out. Then I called my father, and together it went better."

"I asked for advice from my colleagues; they are professionals."

Secondly, from some stories, it appeared that working in a team increased a person's feeling of self-efficacy and confidence. This was caused by the additional knowledge and skills of a team member, but was also effective for participants who had knowledge themselves. They did still check their plan with others to gain a more confident feeling.

"I asked my boyfriend what he thought about the plan."

A third effect is that people were more motivated to start repair/upgrade after reaching out for help. They were more likely to schedule a fixed time for the task with their teammate, which resulted in less procrastination.

"Me and my housemate made a plan to fix the table, then we proceeded to execute it together."

"I had discussed a specific day with my boyfriend to pick up the drill from my parents and actually get it done."

Lastly, help is useful in more logistical aspects like transportation, physical challenges, as well as providing tools and supplies.

To make use of this drivers, some knowledge, skill, and effort is required, as the person must know whom to whom to ask for help and how to request and organise it.

Need for a plan

The second newfound factor is the need of people for a plan of attack. When present, this factor appeared to serve as a driver for starting a repair/upgrade project. In the absence of inspiration or a plan of action, people did not start repairing/upgrading.

"I got an idea on how to fix it, then I quickly started trying it."

Earlier mentioned factors are related to making a plan. For example, it is required to have the knowledge and skills, and expectations about the result to make a plan. Additionally, receiving help from others could be beneficial.

Contradictions/additions to literature review

In addition, interesting contradictions with the literature were found regarding the effect of earlier mentioned factors as explained below.

Functionality

From the story of one participant, it appeared that high product functionality can also act as a barrier. She did not want to miss the product during the time of the repair and replacement was a faster option.

Lack of triggers for repair/upgr.

During the sessions, four participants shared stories in which triggers initiated repair/upgrading behaviour. These triggers were boredom, annoyance due to the defect, being motivated by finding suitable materials, and receiving inspiration from others. This does not mean that the general lack of triggers as described in literature does not exist, but it demonstrates how triggers can have a positive effect when they are present.

Social norm

Three participants mentioned that they repair furniture as it is their habit. They do not go along with the social norm focussed on consuming. This shows that another social norm is present for some people.

Effort & time replacement

Instead of the convenience of disposing, 6 participants mentioned that disposing and replacing the furniture was actually difficult for them (they found it a physical and logistical challenge or hard to find a good replacement). As a result, they would prefer repair over replacement. This factor can therefore possibly result in both a barrier and driver.

Costs replacement

Instead of replacing being cheaper than repairing, 7 participants (all low-income students) chose repair over replacement as they felt the cost of a new product was a barrier. As students are included in the target group, the replacement costs factor is interpreted as equally resulting in barriers as drivers.

Expectations result

The result expectations that were mentioned in the literature were focussed on the potential improvements of the product state (does repair result in lifespan extension?) and feasibility of repair. In the sessions iparticipants appeared to be specifically driven by expectations about the aesthetic value of the result. This effect even made furniture that was not aesthetic in its current state, attractive for upgrading. Besides, people named their expectations about emotional result as a driver (feeling proud).

Accessibility tools & supplies

Lastly, it was discovered that not only the factual accessibility of tools and supplies plays a role, but also people's expectations about it. The thought "it probably won't be available" acts as a barrier.

Not found barrier/driver:
One factor described in the literature was not found in the generative sessions: the effects of the identity on repair/upgrading. It is very plausible that this factors is of influence but did simply not come up in the conversation with the limited number of participants of the study. Since the literature works are based on more ground, it was assumed that this barrier/driver is present.

Main takeaways

- The two newly discovered factors were taken along into the overall analysis of barriers and drivers conducted in section 3.4.
- High replacement costs and positive emotions about the result can be used as arguments to persuade people because they will recognize themselves in these aspects.
- The triggers: boredom, annoyance, inspiration from others, and attractive materials appear to be effective. The design can focus on triggering more people in these ways.

3.4 INTERVIEWS WITH EXPERTS Consumer behaviour

Interviews with experts from the furniture repair/upgrade industry were conducted to investigate their perspective on consumer behaviour and the influential factors. Generally, the experts agreed with the identified barriers & drivers that resulted from the literature and generative research. Some statements from the interviews illustrating this are presented in Appendix F.

Aesthetic value

Besides the similarities, extra information was gained regarding the aesthetic preferences of consumers about their current products and results of upgrading. From interviews with Julius Kroot and Ambacht Centre Zwolle, it became clear that consumers are particularly not interested in furniture with the following characteristics:

- Furniture with (slight) damage or discolouration.
- Heavy, bulky, old-fashioned wooden furniture made of pine or very dark lacquered wood.
- Very standard, basic furniture.

These items are often disposed of via thrift shops and are hard to sell to a second owner.

Expectations result

Trend sensitiveness

From the same interviews and interview with Ambacht Centre Apeldoorn, it was revealed what type of furniture upgrades are trendy and desired by consumers now. This includes upgrades in which old & modern styles are combined, such as an old tabletop with modern legs. In high demand are also old wooden cupboards, sanded and painted in trendy colours, or oiled, with metal knobs. Furthermore, consumers value results of high quality and are looking for unique items. Lastly, the two Ambacht Centres noted that consumers are sensitive to the way upgraded furniture is presented to them, an attractive display with a nice background and decoration attracts interest.

Main takeaways

- Since the user group is trend-sensitive, their attention can be captured by promoting trendy upgrade results. Additionally, their interest might increase when presenting the results in an attractive way and by emphasizing the opportunity of unique and high quality results.
- It appears that the desired upgrade results align well with the characteristics of unwanted furniture (old wooden furniture with slight damage can be transformed into trendy coloured pieces for example). Reminding consumers to this connection might help them to recognize the potential of their undesired pieces.

3.5 ANALYSIS BARRIERS & DRIVERS

All collected insights into the barriers and drivers that influence current consumer behaviour were further analysed to define a more specific direction for the design intervention. This involved determining which specific factors can be influenced by the design to increase repair and upgrading behaviour. For the analysis, a user journey and the COM-B behaviour change model were used.

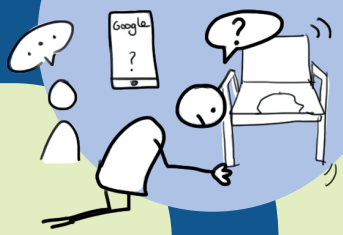
3.5.1 User journey

A user journey was created to summarize and organize the research findings. In the journey, the eight steps of the repair/upgrade process that were identified through the generative sessions are illustrated. Additionally, for each step, the possible barriers and driving factors that consumers could experience are mentioned. The journey can be found on the following pages (Figure 26), more details about the method, journey mapping, can be found in Chapter 2.4.

REPAIR / UPGRADE JOURNEY

UNDESIRED PRODUCT STATE

1 IDENTIFY THE ISSUE



- Required knowledge & skills
- Low product repairability

DELAY

2 MENTAL TRADE-OFFS

- Costs replacement
- Value new product
- Effort & time replacement

- Functionality
- Condition
- Emotional attachment
- Aesthetic value
- Enjoy usage
- Original costs
- Tendency to loose interest
- Trend sensitiveness

VALUE CURRENT PRODUCT

VALUE NEW PRODUCT

DELAY

ATTITUDE TOWARDS REPAIR/UPGRADING

- Expectations costs repair
- Expectations result
- Identity of repair/upgrade
- Previous experiences
- Need for a plan
- Confidence/ self-efficacy
- Required knowledge & skills
- Accessibility tools & supplies
- Effort & time
- Environmental concern
- Low product repairability
- Lack of triggers for repair/upgr.
- Social norm
- Advice / help from others
- Enjoy DIY

DISPOSE

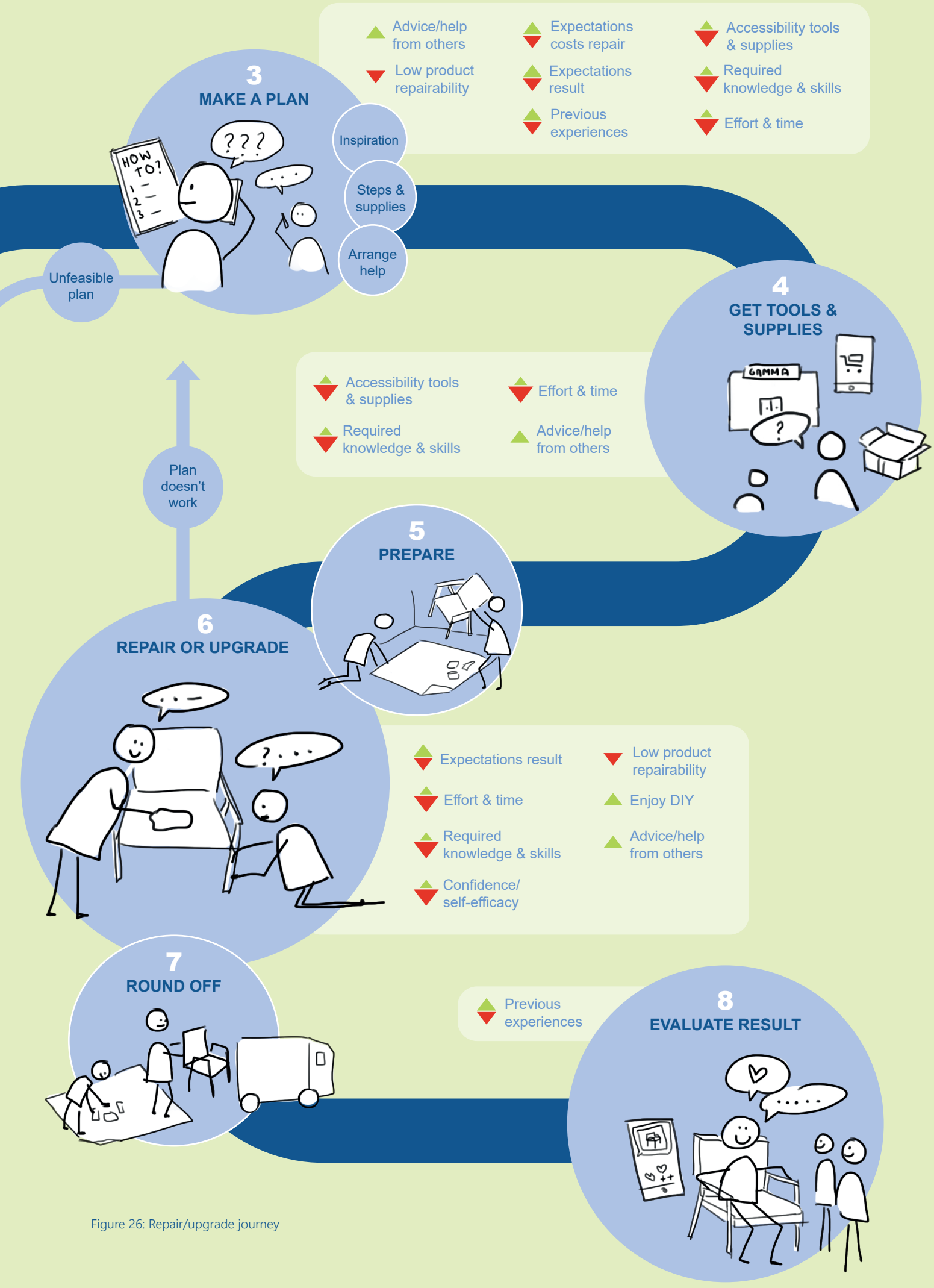


Figure 26: Repair/upgrade journey

3.5.2 Selecting influenceable barriers & drivers

The next step of the analysis involved evaluating whether there are specific factors within the journey overview, that could potentially be influenced through a design intervention within the scope of this project. Not all barriers and drivers are easily influenceable by the design, for instance, some barriers require a significant amount of time, political intervention, or industry-wide adjustments for improvement. Making the selection led to excluding the following factors:

- All factors influencing people's attitude towards replacement are excluded: the costs, value, and time/effort. It is not expected that the design intervention can create a big effect here as the furniture industry is enormous and numerous stakeholders are influencing prices, new developments, trends, marketing, and user-friendly shopping experiences.

- All factors related to the attitude of consumers regarding their current product are excluded (such as aesthetics, condition, emotional attachment). It is assumed that there will always be cases where furniture does not perform well on these aspects, this is inevitable. In these situations, repair or upgrading come into play as they can improve the product value. In this project, the decision was made to consider this value assessment of the 'old', unrepaired product as a starting point, which the design does not concern itself with. The design is focused on assisting individuals in repair/upgrading after this point by targeting other factors (such as supply availability or knowledge sharing).

- The factors connected to the social norm (social norm, the identity of repair/upgrading and trend sensitiveness) are excluded as well, as it has been assumed that the mindset of the broad population cannot be changed in the short term. Furthermore, the low reparability of current furniture is excluded, as current products are not designed to be repair-friendly. Improving this issue is only feasible for future products, not for the current products which are within the scope of the project.

- Lastly, environmental concern was not included as it was found to not significantly influence behaviour.

2.5.3 COM-B behaviour change framework

Knowing the barriers and drivers that are potentially influenceable by the design, the next step is to determine which approach is suitable for addressing these factors to achieve behaviour change. To accomplish this, the factors are categorized according to the COM-B framework. This framework divides factors into the three domains that influence human behaviour: people's own Capability, Opportunity determined by external influences, and a person's Motivation (more detail about COM-B in Chapter 2.5) (Michie et al., 2014). Figure 27 depicts the model with the selected barriers and drivers (for those interested, Appendix G contains an overview of the COM-B framework with all barriers and drivers, including those not selected).

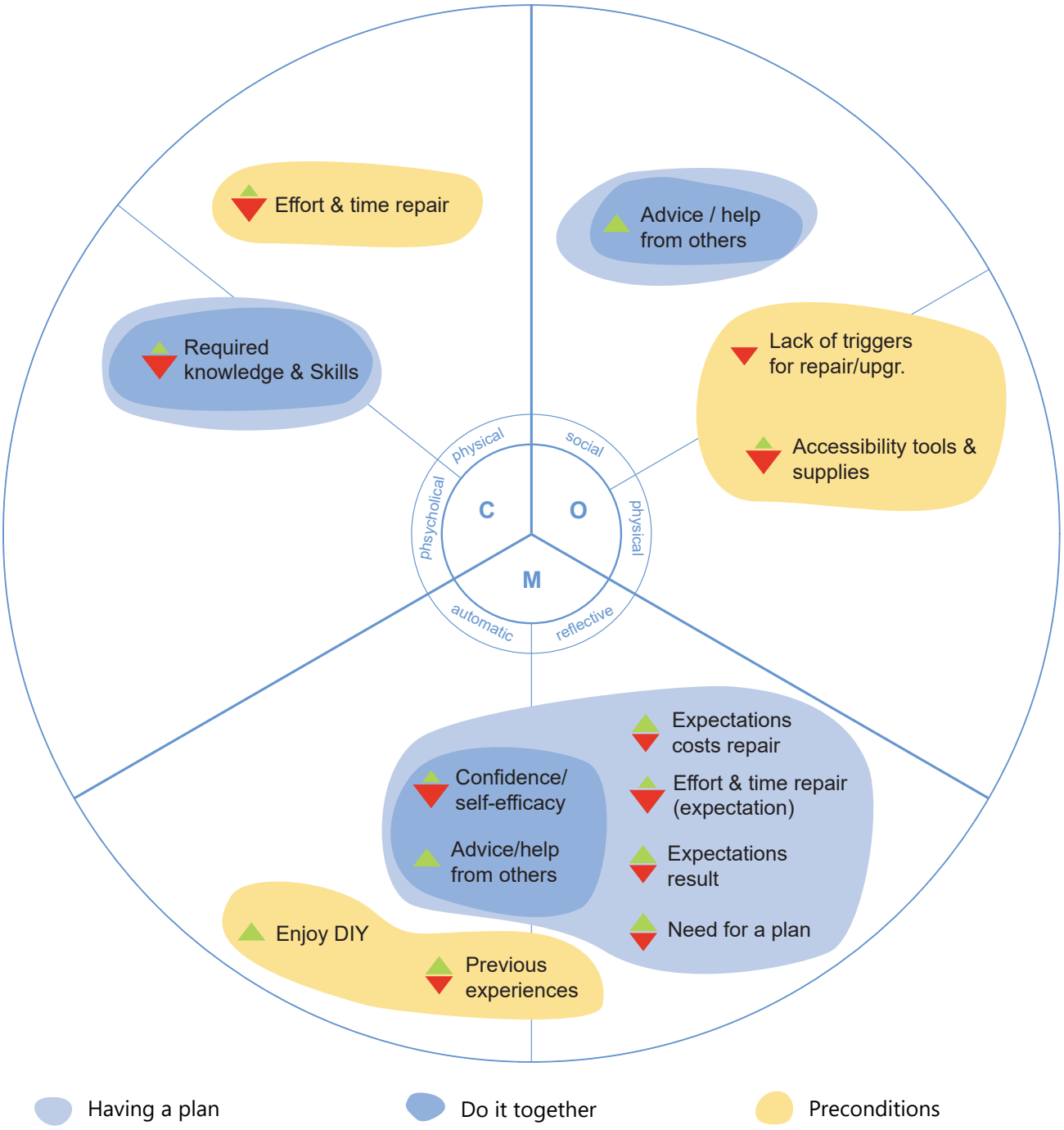


Figure 27: COM-B framework with the selection of influenceable barriers & drivers

The initial goal of this analysis was to check whether the factors were concentrated in one of the three domains as this would suggest an approach focussed on, for example, increasing motivation. However, the barriers and drivers are present in all three areas. Additionally, from the research conducted in this project, no insight was gained into whether certain factors have more influence than others. Therefore, it is concluded that it is desired to address all the factors and thereby all three domains of COM-B through the intervention.

It has been noticed that the barriers and driving factors can be summarized under two connected themes. Additionally, a group of factors was identified as preconditions. The two themes and preconditions are indicated by the coloured blocks in Figure 27 and explained on the next page.

2.5.3.1 Having a plan

This theme includes the factors that are part of making a plan of attack. People were found to need an initial rough plan to consider repair/upgrading in their mental trade-off (step 2 in the journey), but also a more detailed plan for starting their activity (step 3).

A necessary component of a plan for considering repair/upgrading are expectations regarding possible costs, achievable results, the steps in the process, and required time and effort. These factors are found in the motivation domain of the COM-B model. When individuals have a clear expectations of what is involved in the repair/upgrading process and feel positively about it, they are more motivated to begin. Capacity in terms of knowledge and skills is required from the consumer to be able to form these expectations and make the plan. People need to know the possibilities or which steps to follow, or how to acquire the knowledge and skills that they don't have.

2.5.3.2 Do it together

The second theme is about collaboration. It was observed that receiving advice or help from others has a significant driving effect. This factor is placed in the social opportunity domain of the COM-B model as there must be someone in the person's environment who can offer help. When a helper is present, the positive effect contributes to the person's capacity by bringing extra knowledge and skills. Besides, the collaboration boosts the confidence of the person which serves as a motivational factor.

This theme is related to the previous theme as the positive effects of working together also facilitate the creation of a plan. Additionally, the positive effect extends further throughout the journey as the person can be supported during the execution of the plan (steps 5, 6, 7).

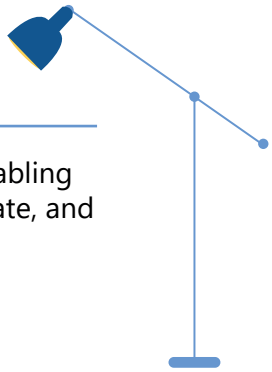
2.5.3.3 Preconditions

Included in the preconditions are factors that, regardless of the two mentioned themes, must have a positive outcome for consumers to engage in repair/upgrade behaviour. Within the opportunity domain of COM-B, these are the factors: lack of triggers and availability of tools and supplies. Both need to be provided from the external environment of the consumer so that people consider repair/upgrading in their mental trade-off and the execution is feasible.

Furthermore, in terms of capacity, there is a certain limit to the effort and time that is feasible for consumers to invest in repair/upgrading. Generally, this limit was found to be low. Therefore, it is important to ensure that the targeted behaviour regarding repair/upgrading is low effort and time consuming.

The final precondition is connected to motivation. It is essential to ensure that repair/upgrading is perceived as somewhat pleasant, otherwise, people will become demotivated and will not sustain the desired behaviour.

Main takeaway



- The potential impact of a design intervention lies in enabling consumers to make a plan, ensuring that they collaborate, and addressing the preconditions:

  - Offering triggers for repair/ upgrading
  - Ensure the accessibility tools & supplies
  - Making the required effort and time of a repair/upgrade process feasible
  - Making the experience somewhat pleasant

04

CONTEXT
INDUSTRY & STAKEHOLDERS

In this research area, the broader context of furniture repair and upgrading has been studied. With the help of literature and desk research, deeper understanding was gained into how the system of furniture repair, upgrading and the current alternative, disposal, are regulated in the Netherlands. In addition, stakeholders and their roles have been identified.

These insights were used to find external challenges and opportunities that can influence repair/upgrade behaviour which could become part of a design solution. Figure 28 shows the research activities and questions that were used. The findings of literature and desk research are presented in section 4.1 and the outcomes of the expert interviews can be found in 4.2.

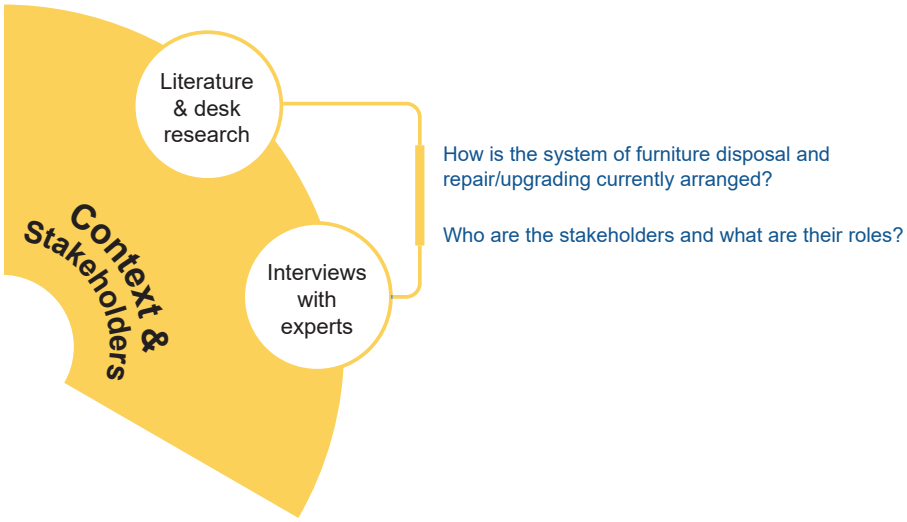


Figure 28: Research activities and questions – Context and stakeholders

4.1.1 Increasing amount of furniture

Research shows that the Netherlands owned around 12 billion kilograms of furniture in 2022 of which the majority is owned by households (CBS, 2022; Forrest et al., 2017). In the upcoming years, the furniture numbers in are expected to rise even further, due to the increasing number of single-person households (Hanemaaijer et al., 2023; Intven et al., 2022). In early 2022, there were over 8 million households, this will increase to 9 million in 2038 and to 9.8 million in 2070 (Stoeldraijer et al., 2021). As more houses will be built, more furniture will be needed. Furthermore, the increase is caused by the expected further decline in the lifespan of furniture (Intven et al., 2022).

4.1.2 Material flows

To better understand what happens to these huge volumes of furniture, Tauw conducted research on the annual material flows of large upholstered seating furniture like sofas and chairs (Intven et al., 2022). This focus was chosen as these larger pieces of furniture have a significant environmental impact. Figure 29 shows the estimated material flow of the furniture pieces.

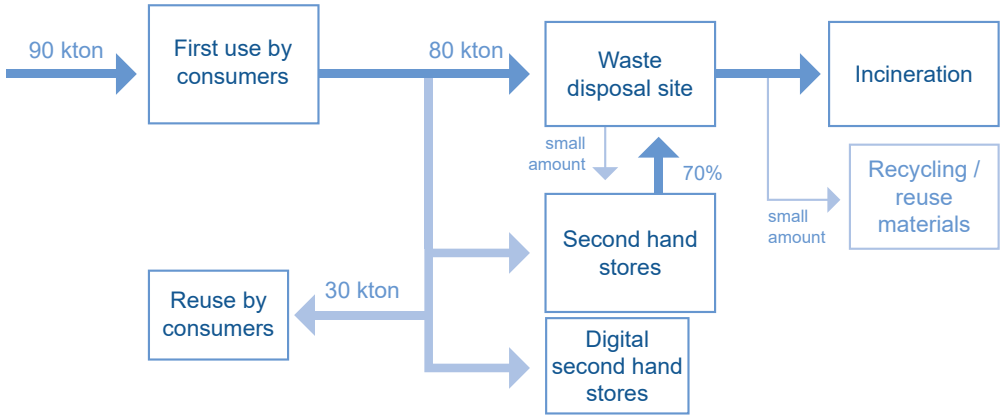


Figure 29: Material flow large seating furniture

It was estimated that 90kton of large seating furniture is bought annually by private consumers. Each year, around 110ktons are discarded, of which around 30kton is reused for which digital marketplaces and second-hand shops play an important role. However, the majority of discarded products end up directly at waste disposal sites. Additionally, around 70% of the furniture in second-hand shops ends up being discarded in the end, as it remains unsold (Statement by Kees Schrauwen – Cyclus (waste disposal service)). The vast majority of furniture in the disposal areas is burned in incinerators (Intven et al., 2022).

4.1.2.1 Type of discarded products

Sofas and mattresses are on average mostly discarded by consumers. In third and fourth place are bed frames and wardrobes (Geeris et al., 2023). Furthermore, it is noteworthy that more than half of the furniture pieces are still in good condition when being disposed (Hanemaaijer et al., 2023; Koch & Vringer, 2023). A small proportion of good quality furniture pieces does get selected at the waste disposal sites and is transferred second hand stores. However, this does not happen much yet because few products meet the requirements, and financial resources and space in the thrift shops are scarce (Intven et al., 2022).

4.1.3 Stakeholders in the repair system

Further research was focussed on how the current system of furniture repair is structured by identifying stakeholders and their roles. The focus was placed on repair, as most stakeholders are involved in this field rather than upgrading. However, there is some overlap, as, for example, reupholstering furniture can be considered both repair and upgrading.

The furniture repair system in the Netherlands can be divided between in-warranty and out-of-warranty repair. In the case of repair under warranty, the retailer, manufacturer, and a contracted repair company play a role. However, it was chosen to focus on out-of-warranty furniture in this project, the two approaches: outsourcing and do-it-yourself (DIY) are addressed in more detail.

4.1.3.1 Outsourcing options

In case of outsourcing repair, a consumer can go to the retailer or manufacturer of the product as in some cases, these employ their own repairmen (Kort et al., 2021). Furthermore, there are several large and small companies that offer repair services. An example of a large company is POS which supports a large variety of repairs (POS Service Group, 2024). Examples of smaller companies include the approximately 900 small reupholstery companies in the Netherlands. These are still small-scale professionals who upholster a few pieces a year (Intven et al., 2022).

Outsourcing barriers

Outsourcing a repair is currently not an attractive option for consumers. The repair branch for out-of-warranty products is barely regulated and not well organised (Kort et al., 2021). There many one-man businesses, and it is not clear where to find which service (Intven et al., 2022). As mentioned before, it is expensive to outsource repair (Forrest et al., 2017; Intven et al., 2022). Primarily, reupholstering can be pricey, as it easily costs as much as buying a new piece from the lower price segment (Intven et al., 2022). Consumers make these large investments only for very expensive or emotionally valuable products (Intven et al., 2022; Vos & Wullems, 2022)
.
These high prices are due to the fact that furniture repair is labour-intensive work which is costly in EU (Forrest et al., 2017). Furthermore, products are often not designed to be repaired which makes it difficult and even more time-consuming (Intven et al., 2022). In addition, companies experience high costs for transport and for keeping parts in stock (Forrest et al., 2017). All these reasons make it currently very challenging for companies to develop a viable business model for offering (affordable) repair services. Circular Ambacht Centres do have the expectation that a business case around repair of wooden furniture is easier to realise than upholstered furniture, as wooden furniture is easier to work with (Intven et al., 2022).

4.1.3.2 DIY

Figure 30 provides an overview of stakeholder groups who may play a role in the various steps of a person's DIY repair/upgrade journey. These stakeholder groups were identified through the generative sessions results, and desk research regarding initiatives and organisations in the field of furniture repair/upgrading (an overview is available in Appendix H). Whether and to what extent these stakeholders play a role in a journey, varies per case.

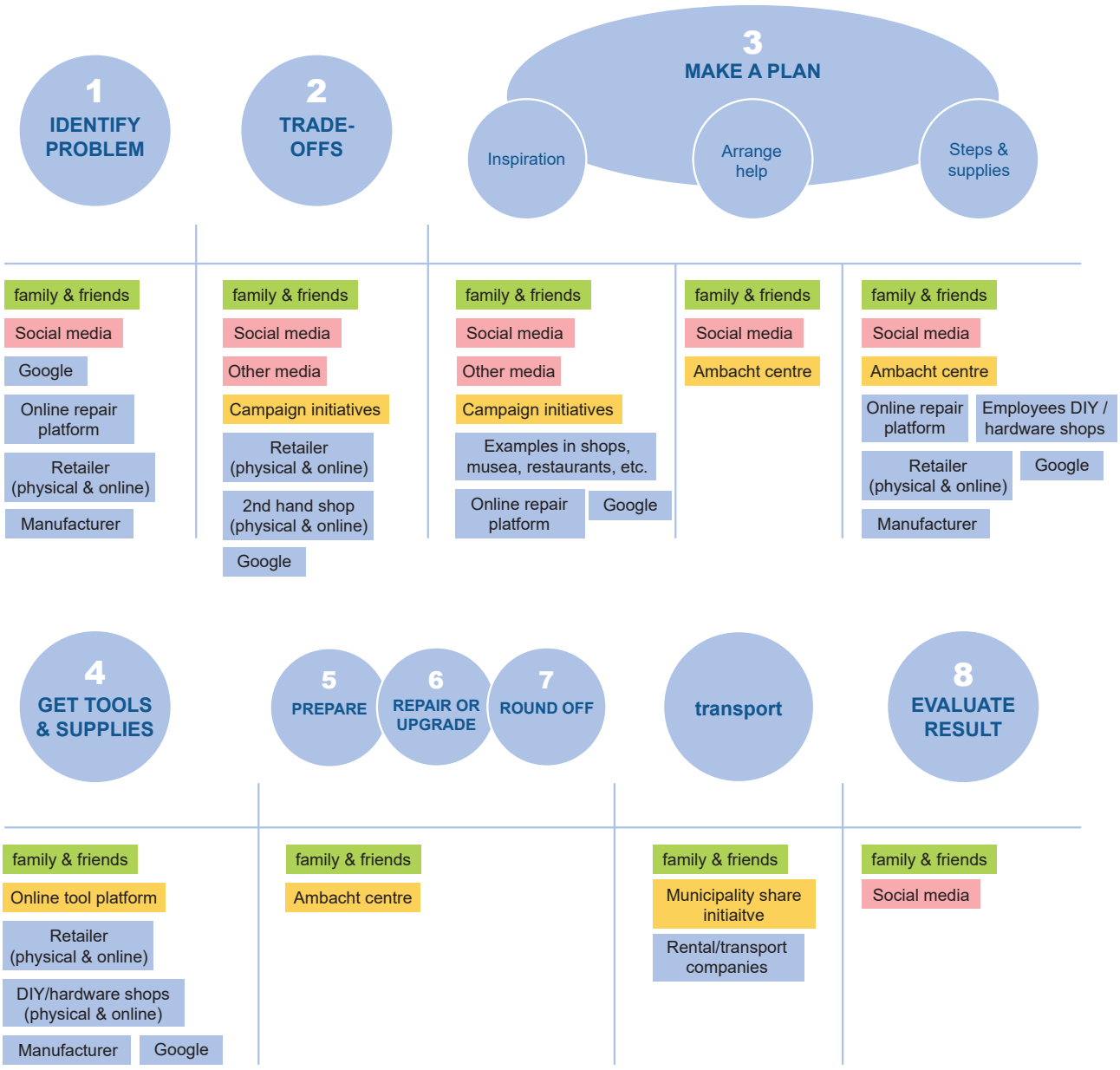


Figure 30: Possible stakeholders in a DIY journey

Interestingly, there are three stakeholders who can play a role in several steps of the journey. Firstly, friends & family, they have the ability to provide inspiration, triggers, assistance, information, transportation, tools, and support for evaluating results. Secondly, social media plays a significant role in the process. It can provide triggers, inspiration and serves as a source of information. Besides, it supports sharing results with others at the end of the process.

The third most often mentioned stakeholder are online search engines like Google. People explore the internet for inspiration and information and may end up on informative online repair platforms (e.g., Jafix or iFixit). This informative role is also fulfilled by offline stakeholders. For instance, staff at DIY stores like Gamma or Praxis are often approached by consumers for advice.

Furthermore, an interesting stakeholder are Circular Ambacht Centres, which have knowledge and supplies available at various locations in the Netherlands to assist people with their repair/upgrade projects. Currently, this resource is not widely used as many consumers are unaware of their existence; 85% of Dutch citizens have never read or heard about Ambacht Centres (Gier, 2019).

Aside from social media, people receive triggers and inspiration by physical examples found in places like shops, restaurants, and other people's homes. Additionally, they are influenced by other media channels such as television, websites/magazines (e.g., VT Wonen), and campaigns set up by organizations like Milieu Centraal or Sire.

In the area of transport, there are commercial services offering support. Besides, some municipalities (e.g., Rotterdam, Schiedam) offer free cargo bikes and trailers for bringing waste to disposal sites, this service could potentially be used for transport of products in need of repair.

Besides all these mentioned stakeholders, there are parties in the repair system that are not in direct contact with consumers. These include, for example, the Dutch government, the European Commission and companies that are fighting for a sustainable furniture sector through legislation. More details about these initiatives can be found in Appendix H.

Main takeaways

- The amount of furniture in the Netherlands is enormous, and the demand is growing. If we do not start the transition towards circular behaviour, the environmental impact will continue to rise. Besides, which shows the relevance of this project.

- Since large amounts of discarded furniture are still in good condition but have undesired characteristics or minor damages, there is theoretically an enormous number of furniture items suitable for repair/upgrading and thereby large potential impact reduction.

- The furniture sector is currently unable to offer affordable options for repair services on a large scale. Therefore, the decision is made to focus the design intervention on DIY repair and upgrading by consumers, as there is potential for increasing the number of repairs/upgrades by this strategy.

- Since the stakeholders mentioned in Figure 30 already have a connection with consumers during their DIY journey, a design could reach the target group through these parties. Current support they offer could be upscaled or the design could encourage more people to discover the support of for example Ambacht Centres and transportation services.

4.2
INTERVIEWS WITH EXPERTS Stakeholder roles

Earlier in this report (Chapter 3.3), results from interviews with experts and stakeholders were discussed (Chapter 2.3 contains more information on the method and interviewees). In some of these interviews, insights were gained into the strategy of these stakeholders for supporting furniture repair/upgrading behaviour. This resulted in learnings about effective approaches, challenges and opportunities.

4.2.1 Results

4.2.1.1 Ambacht Centres

Both Ambacht Centres that were visited were doing an impressive job in reusing materials, products and providing educational and social support to their employees. Furthermore, they were both involved in repairing/upgrading furniture from thrift stores and selling these products.

At both locations the number of upgraded furniture pieces was relatively low (estimated around 50-100 pieces per year). In the case of Zwolle, the focus was placed primarily on educating and guiding students, not on large scale production. In Apeldoorn, they did not yet receive a large consumer demand for the repaired/ upgraded furniture they sold the thrift store. Employees stated that people expect low prices when visiting a thrift store and are therefore not interested in the higher priced, upgraded pieces. Furthermore, this Ambach Centre shared that not many clients were bringing in requests for specific repairs on their own products. Employees stated that this was mainly related to low visibility of the Ambacht Centre, people are unaware that the wood workshop can offer such services. Additionally, the transportation of furniture is seen as a barrier.

Main takeaway

- By increasing the visibility of Ambacht Centres, more people might consider outsourcing their repair/upgrade or perhaps collaborating with experts in the centres to execute the project. However, the centres are not organised and aimed for doing this on a large scale.

4.2.1.2 Amita Janssen

Amita organizes repair events that are well visited for the following reasons according to Amita: The Sunday afternoon is an effective moment for the event as people have time and see the sessions as a social and relaxing activity. Additionally, the easily accessible and atmospheric location (a café close to the train station) are inviting. Lastly, using social media, primarily Instagram, helped her to reach her target group of people aged around 25. The events work particularly well for small items that need to be repaired, people did not bring big furniture pieces due to the transportation barrier.

Main takeaway

- Promoting repair/upgrading as a relaxed and social (Sunday) activity can be helpful.
- The younger generation can be reached through social media.
- Hosting repair support at external locations is not suitable for furniture unless a solution is generated for the transportation barrier.

4.2.1.3 Meublowski

The owners of upholstery company Meublowski had many ideas to support people in DIY upholstery (e.g., a punch card which allows people to use the workshop and tools, tutorial content, organised workshops, etc.). However, they noted that, alongside running the business, they currently lack the time and budget to implement these ideas.

Main takeaway

- Experts are willing to assist people in DIY. However, time and financial limitations hinder them to realise this plan. A design could facilitate in this situation.

05

PHYSICAL PROPERTIES OF FURNITURE

In the third research area, literature review, desk research, and expert interviews were carried out to explore how the large environmental impact and low repairability of furniture is influenced by physical properties of these products. Figure 31 shows the research activities and more detailed research questions. The literature and desk research findings on environmental impact are covered in section 5.1. Section 5.2 combines insights from literature and the interviews regarding repairability. Finally, section 5.3 delves deeper into the feasibility of specific repair and upgrade activities according to the experts.

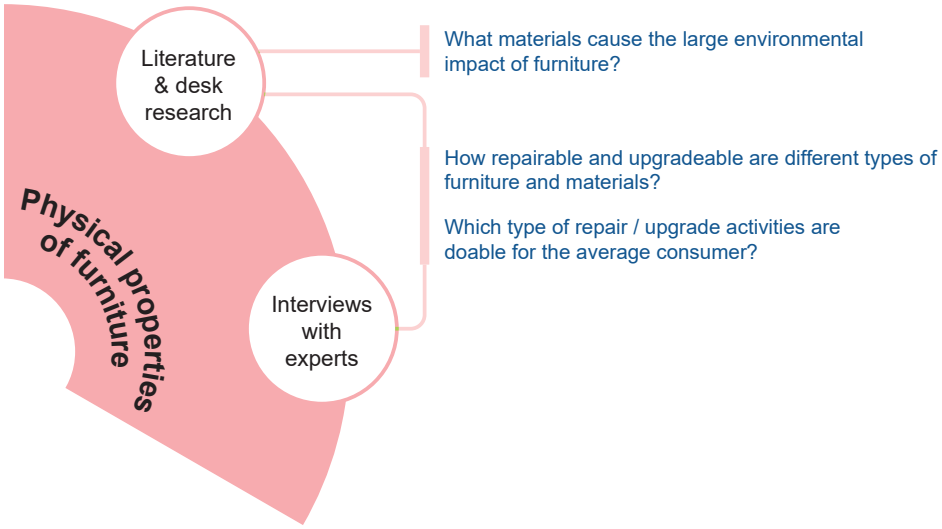


Figure 31: Research activities and questions – Physical properties of furniture

The takeaways of this chapter are used to select a product group within the broad range of furniture for which repair/upgrading is technically feasible, doable for the average consumer, and significantly reduces climate impact. This group serves as input for defining the direction of the design intervention as it is most effective to target these items.

5.1.1 Materials

There is a wide variety of materials present in furniture, the exact ratio in all types of furniture is not precisely known. However, there is insight into the material distribution of a subgroup: upholstered seating furniture, which was found to be the majority (75%) of all seating furniture (Intven et al., 2022). Research by Tauw states that de average ratio of materials in sofas is as depicted in Figure 32.

- **67%** Wood (solid or panels)
- **14%** Foam (plastic)
- **10%** Textile
- **1%** Metal
- **1%** Hard plastic
- **6%** Other (wool, latex etc.)

Figure 32: Upholstered seat material ratio (Intven et al., 2022)

Results from another study describe different percentages, however, the rough proportions align: wood is also mentioned as the most applied material, followed by foam and textile (Forrest et al., 2017). The variance in percentages may be due to the different years in which the research were conducted and whether mattresses were included or not.

Apart from upholstered seats, there are other large product categories such as kitchen furniture, which often incorporates a lot of wood chipboard. Additionally, there are types of furniture containing significant amounts of metal and hard plastics. Besides, elastic materials are used in the lower price segment to replace the function of metal springs (Intven et al., 2022). Furthermore, materials that are commonly used in connections include glue as well as metal joints such as staples, nails, and studs (Intven et al., 2022).

Within the listed materials, there is an enormous variety of types used. For instance, in the case of wood: Solid wood is used in 12% of furniture, particularly in the high-price range and pressed sheet material and wood contaminated with glue are often utilized in the lower price segments. Similarly, there are various price and quality types of foam rubber. Regarding textiles, there are large variations in material types and processing such as coatings (Intven et al., 2022).

5.1.2 Climate impact

CO2 emissions by production
Most CO2 emissions are emitted at the front end of the furniture lifecycle: the production phase (Intven et al., 2022). Several studies have investigated the impact

material production for furniture and agree that by far the most CO2-eq per kg of material is connected making textiles and upholstery (Forrest et al., 2017; Intven et al., 2022). The materials with second and third most CO2-eq per kg are stated to be wood (mainly chipboard) and foam (polyurethane). Lastly, a large CO2 impact is caused by a variety of materials like wool, leather, and latex. Metal and plastic seem not to cause as much CO2 emissions in the production of furniture. (Intven et al., 2022).

CO2 emissions by disposing process

Besides production, a significant amount of climate impact is generated during the disposal process of furniture. An estimation was made of the materials in the total amount of furniture at disposal areas in the Netherlands. It was found that wood, including chipboard, constitutes the majority (38 ktons). A small amount is recycled, however, this is often not possible or profitable due to contamination with other materials. Smaller proportions of the total amount of materials are represented by foam (8 kton) and upholstery (6 kton). Plastic and metal are disposed of in significantly lower quantities, and metal is typically separated from the waste stream and recycled. The majority of the materials are incinerated which leads to large CO2 emissions. Burning plastics such as the foam of seating furniture contributes most to these emissions (Intven et al., 2022).

Impact of circular strategies

Through circular strategies such as repair and upgrading, the environmental impact of furniture can be reduced. However, the extend of impact reduction depends on two factors:

- The increase of the product's lifespan.
- The additional materials and processes needed for repair/refurbishment. (Honkoop et al., 2022)

The ideal strategy is to maximize the product's lifespan while minimizing the impact of additional materials and processes. However, it is not always feasible to reuse a product as it is or by making alterations with minimal impact. In such cases (for example, when upholstery needs to be replaced), a trade-off should be made between reducing impact by extending the lifespan and causing additional impact. This trade-off can be influenced by future innovations, such as the availability of more low-impact repair/upgrade materials (like eco-friendly paint or recycled textiles). Additionally, improvements in production processes or recycling systems of furniture may lead to disposal and replacement being the most environmentally friendly choice in some cases.

Main takeaway

The most reduction of environmental impact can be achieved by:

- Extending the lifespan of textiles, wood (solid and chipboard), and foam padding as these are the most used materials in furniture and cause most CO2 emissions during production and disposal (textile and wood in the production phase, foam in the disposal phase when being incinerated).

- maximizing lifespan extension, while minimizing the environmental impact caused using additional materials and processes.

5.2 LITERATURE, DESK RESEARCH & INTERVIEWS WITH EXPERTS Repairability

Both literature, desk research, and interviews with furniture repair experts (see Chapter 2.3 for more information) have been consulted to gain insights into the low repairability of current furniture pieces. Due to the significant similarities found across the sources, the results have been combined into one overview. The following reasons were found to be causing poor repairability:

- There is a great variety of parts and materials in furniture, also they differ in quality. This hinders reuse and repair at part level and makes disassembly complex and labour-intensive (Rijksoverheid, 2023).
- Identification of materials can be difficult because manufacturers manipulate material looks very effectively (Intven et al., 2022) (Ambacht Centre Apeldoorn).
- Joining techniques vary largely across furniture which causes more difficult and time-intensive repairs (Intven et al., 2022). Also, joints can be hard to take apart in general (e.g., staples or glue) (Label van den Berg).
- If one joint needs to be disassembled, often, other joints need to be loosened too which makes repair complex (Ambacht Centre Apeldoorn).
- Product parts that need repair are often not easy to reach. For example, the whole upholstery, foam and other parts of a sofa need to be disassembled to reach the structure underneath (Intven et al., 2022).
- Some materials or production methods are simply not repairable (e.g., broken chipboards, several types of plastic, foamed-in sofas or chairs) (Ambacht Centre Apeldoorn) (The Substitude).
- There is a lack of available spare parts (Forrest et al., 2017).

5.3 INTERVIEWS WITH EXPERTS Doability of repair/upgrading

During the interviews, experts were also asked which repair/upgrade activities they believe are potentially doable for DIY by the average consumer. A survey research was already conducted around this topic and to reveal which DIY activities are already being carried out by consumers, the results are discussed in Chapter 3.2. In the interviews with experts, the focus was on the material and product characteristics that influence doability.

5.3.1 Causes for repair

Firstly, it was examined which types of material failures or damages often cause the need for repair or upgrading. The experts named the following reasons:

- Scratches/damage or discolouration of the surface (Ambacht Centre Apeldoorn).
- Especially the joints of wooden furniture break or loosen (Ambacht Centre Apeldoorn).
- All electrical parts have a high risk of breaking (Leolux).
- Broken parts in a frame (POS).
- Upholstery and the foam layer will inevitably wear out after a certain period of use (Label vd Berg) (interview Leolux)(Meublowski).

- Metal springs crack /get loose (POS).
- Felt caps on bottom of furniture need replacement (Vitra Circle).
- Gas springs and shock mounts need replacement (Vitra Circle).

5.3.2 Repairs/upgrade activities suitable for DIY

When experts were asked about the doability of repairing above mentioned damages, several emphasized that little skills and knowledge can be expected from the average consumer. However, they did provide some examples of tasks that should be doable for the average consumers:

- Minor repairs (like filling a gap), sanding, and painting of solid wood furniture (Ambacht Centre Apeldoorn & Zwolle).
- Gluing a layer of material onto a surface (Ambacht Centre Apeldoorn).
- Tightening screw joints when there is no damage to the material which the screw holds on to (Ambacht Centre Apeldoorn).
- Reglue joints of wooden furniture (Meublowski).
- Upholstery of easily accessible and non-curved surfaces, preferably rectangular (e.g., a seat of a stool). For this activity, the use of a sewing machine is not required, and the actions involved are relatively simple (Meublowski) (Ambacht Centre Apeldoorn).
- Maintenance or cleaning-oriented activities, such as removing stains from wood or textiles, vacuuming a sofa, or applying oil to wood (Meublowski).

5.3.3 Repairs/upgrades too complex for the average consumer

The repair and upgrade activities that were mentioned to require expert-level skills or knowledge include metalworking, repairing the more complex wooden constructions and replacing, replacing gas springs (Ambacht Centre Apeldoorn) (Ambacht Centre Apeldoorn) (POS).

Additional insights have been gained into the challenges of more complex upholstery projects. The complexity arises particularly when objects have curved shapes or when the attachment technique of the upholstery is complicated. The quality of the results depends heavily on a person's sewing skills and understanding of construction (Meublowski) (Ambacht Centre Apeldoorn). Additionally, experts at Meublowski mentioned that consumers might lack some initial knowledge to create a feasible plan. For instance, consumers need to understand which fabric types are suitable and easy to work with, and knowledge is needed to assess whether a project is easy or difficult. When consumers have this knowledge, it is more likely that they can also tackle a more complex upholstery project.

Main takeaways

- The average consumer can only perform simple repairs as the activities mentioned in 5.3.2. A design intervention could encourage DIY in these cases while directing people towards outsourcing in more complex situations.

- There is an opportunity in identifying and sharing the essential knowledge that would enable beginners to succeed in more complex projects. Perhaps, knowledge exchange between experts and consumers can be supported.

DEFINE

The overall aim of this project, as mentioned in the introduction, is to design an intervention which will help consumers to perform more furniture repair and/or upgrading. With the results of the three research areas, this still very broad goal was further specified in the define phase. Chapter 6 presents how a design direction was formulated which serves as the basis for developing the design.

06

DESIGN DIRECTION

This chapter presents how the design direction was established. Firstly, a design goal was formulated (6.1) and secondly, a list of more detailed requirements and wishes was set up (6.2). These two elements were used for generating, evaluating and improving concepts later in the project.

6.1
DESIGN GOAL

The research takeaways, presented in Chapters 3, 4 and 5, have been reviewed to determine the specific goal that the design intervention should fulfil to achieve the desired effect: increased furniture repair/upgrading behaviour and thereby, reduced environmental impact. To formulate the specific design goal, the following aspects were taken into consideration:

- Which target group should the design primarily focus on for the highest likelihood of behaviour change?
- What is the specific target behaviour that these people should perform or change? (Which behaviour is both feasible and effective?)
- What support should the design provide to enable them to do this?

The answers to these questions were found in the research takeaways and the following statement was formulated as a design goal:

DESIGN GOAL

Support 18-35 aged, high income, high educated consumers, living in the big cities, to ...

1. ... make a plan for ...
2. ... together perform ...

... DIY repair and/or upgrade activities for furniture from the low/medium priced segment made from wood and/or textile and foam in 2024.

It was decided to include two target behaviours as these were both found to be important drivers. The emphasis has been placed on part 1, creating a plan, which is essential to initiate a repair/upgrading journey. Part 2 can serve as a supporting factor for part 1 and can assist consumers later in their journey.

6.2
DESIGN REQUIREMENTS & WISHES

The design goal provides a broad overview of how the design should operate. However, the research revealed many more details and takeaways that can steer the the development of the design. These have been integrated in a list of requirements and wishes.

The first two categories of requirements serve to reach the two target behaviours that are included in the design goal. Next in the list are the preconditions identified in Chapter 3.4. The last category of requirements has been incorporated to ensure that the design strives for maximum reduction in environmental impact. In the list of wishes, the found preferences and sensitivities of the target group are included.

Requirements - the design should:

Support the target group to make a plan for DIY furniture repair/upgrading by ..

1. .. providing the user with the required knowledge & skills regarding:
    a. The required tools and supplies.
    b. The specific actions that need to be performed.
    c. How these actions should be executed.
2. .. providing the user with realistic expectations about
    a. The costs of the plan.
    b. The required effort & time for the plan.
    c. The feasibility of the plan.
    d. The possible result(s) in terms of aesthetics and/or product state.

Support the target group to do it together by ..

3. ..facilitating the asking and receiving help from others.
4. ..stimulating users to ask help from others.

Ensure that the preconditions are met by ..

5. .. ensuring a low effort & time investment for users to perform repair/upgrading.
6. .. triggering users to start repairing/upgrading.
7. .. making a repair/upgrade journey a pleasant/fun experience.
8. .. ensuring the required tools & supplies are accessible.

Maximise environmental impact reduction by ..

9. .. reaching as large a part of the target group as possible.
10. .. stimulating users to specifically repair or upgrade furniture made of wood, textile, foam, in the low/medium price segment.
11. .. stimulate users to perform doable activities.
12. .. stimulate users to perform repairs/upgrades that result in maximum lifespan extension and require minimal additional impact.

Wishes - The design could:

Target the preferences and sensitivities of the target group by ..

1. .. promoting results that fit the current trends.
2. .. promoting and facilitate unique results.
3. .. emphasising personal benefits in communication.
4. .. providing the latest of the latest (technical) innovations.
5. .. paying attention to quality concern.
6. .. enabling social status by repair / upgrading.
7. .. giving appreciation for sustainable behaviour.
8. .. communicating factual, not judgemental.
9. .. emphasising the positive emotions that can arise at the end of the journey.

DEVELOP

The aim of the third phase of the double diamond, the develop phase, is to generate a wide range of ideas and concepts that align with the formulated design goal and requirements. The ideation phase is elaborated on in Chapter 7. From here, a detailed concept direction was developed as presented in Chapter 8. This direction served as the starting point the development of the final design in the last phase of the project, the deliver phase.

07

IDEATION & SELECTION PROCESS

This chapter is focussed on the process of generating ideas and selecting the most promising ones. As can be seen in Figure 33, a broad solution range was explored in with the help of brainstorm sessions which are shortly discussed in section 7.1. Following were three rounds of evaluation which led to selecting two ideas with the highest potential, as presented in 7.2.

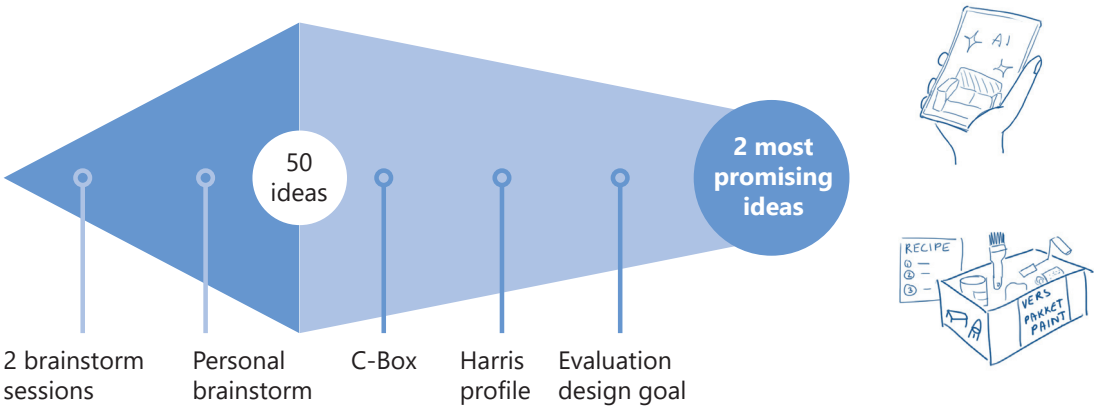


Figure 33: Methods for the ideation and selection process

7.1
IDEATION THROUGH BRAINSTORMS

Two brainstorming sessions were organised to generate as many ideas as possible for achieving the design goal. More details about the sessions and participants can be found in Chapter 2.6. The generated ideas and comments were clustered and supplemented with a personal brainstorm which resulted in a total pool of around 50 ideas, these are presented in Appendix J.

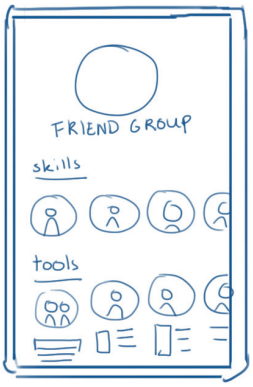
7.2
IDEA EVALUATION AND SELECTION

7.2.1 C-Box

To filter the best ideas from the large pool, a C-box was used (details about this method can be found in Chapter 2.7). All ideas were placed in the framework (Appendix K) and assessed on the two criteria: potential impact and feasibility.

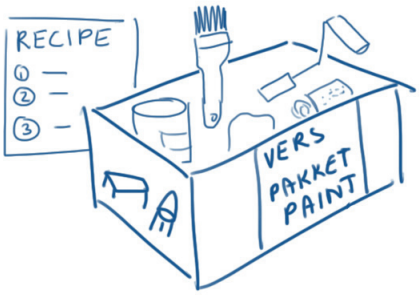
Assigning the scores was mostly based on intuition, as precise assessment wasn't feasible with the ideas still being fuzzy. However, when evaluating potential impact, it was considered whether the idea could reach a large target group and if it truly encourages more repair/upgrade behaviour. To assess feasibility, the required material, financial, time, and social investments were estimated. As a result, the 11 ideas presented in Figure 34 were selected as being most promising. Ideas requiring large investments and/or offer uncertain effects on behaviour change were excluded (e.g., a repair bus with crew, a museum dedicated to repair, TV series, a 'repaired' mark on furniture).

1 Luxurious collection of DIY supplies

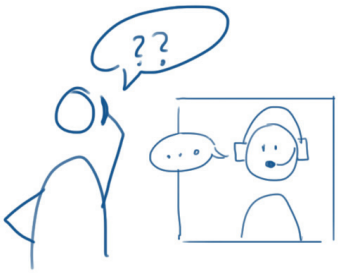


2 Whatsapp group overview of skills & tools

3 Neighbourhood platform/committee for DIY support



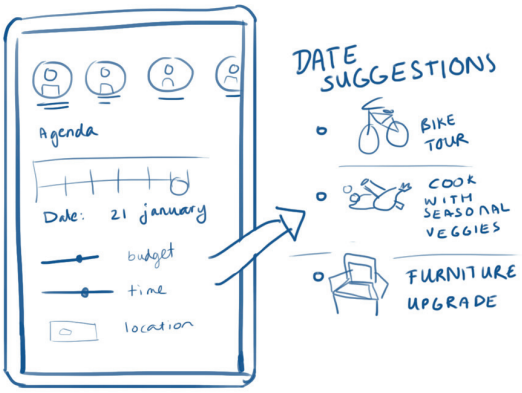
4 "Verspakketten" and recipe cards in shops



5 Call centre / chat option for contacting experts

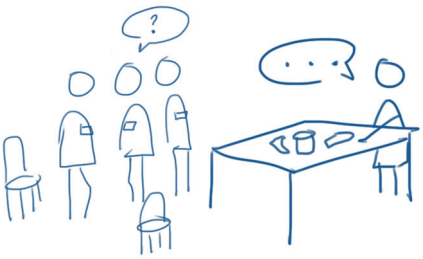
6 Workshops in cafe: upgrade our interior

7 'Strava'-like platform: share DIY results



8 Green activity generator (plans sustainable dates)

9 AI driven tool that visualises upgrade options



10 Workshops targeted at company team building days

11 Ikea hacks competition: Upgrade a common Ikea piece

Figure 34: 11 ideas selected by a C-box

7.2.2 Harris profile

Using the Harris profile method, the 11 selected ideas were further evaluated, based on the six criteria at the left side of Figure 34. Details about the Harris profile and chosen criteria can be found in Chapter 2.7.

After assessing all ideas, four of them stood out with significantly higher scores, these are illustrated in Figure 35 (the results of all ideas are included in Appendix L). The following sections will provide a brief explanation of these ideas and their scores.

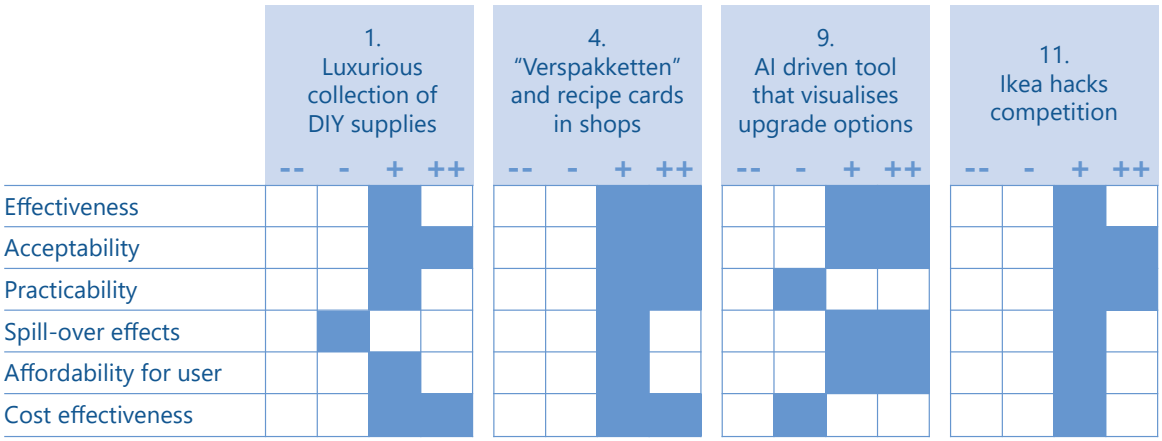


Figure 35: Harris profiles 4 best scoring ideas

7.2.2.1 Luxurious collection of DIY supplies

In collaboration with luxury brands or popular designers/artists, a collection of DIY supplies can be developed (Figure 36). Products such as beautiful handles, legs, high-quality paint, elegant prints, and more can be sold in luxury stores like Bijenkorf.

It is expected that people from the target group are interested in this idea as they have a materialistic attitude and value social status. When buying these products, consumers are naturally motivated to perform the upgrade behaviour as they would like to make use of their purchase. Furthermore, this idea can become a profitable business model. A negative point is that that the idea further stimulates the consumerism social norm.

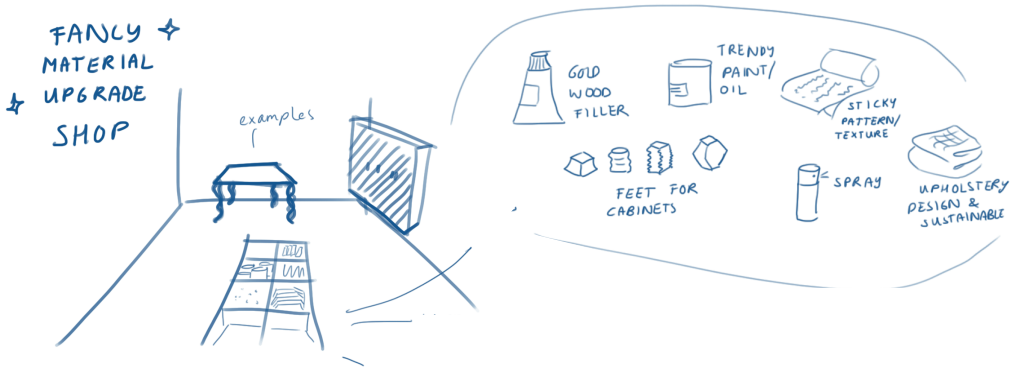


Figure 36: Idea luxurious DIY collection

7.2.2.2 "Verspaketten" and recipe cards in shops

Similar to the concept of various supermarkets, paper recipe cards and pre-filled packages can be distributed and sold (Figure 37). In this case the items are not focussed on food, but on the steps and supplies for DIY upgrade/repair activities.

This idea received high scores on effectiveness and acceptability because it is based on an existing successful concept. Furthermore, the implementation does not require significant costs. The idea scores moderately on spill-over and affordability because consumers might purchase products in packages that they do not need, which potentially results in wasted materials.

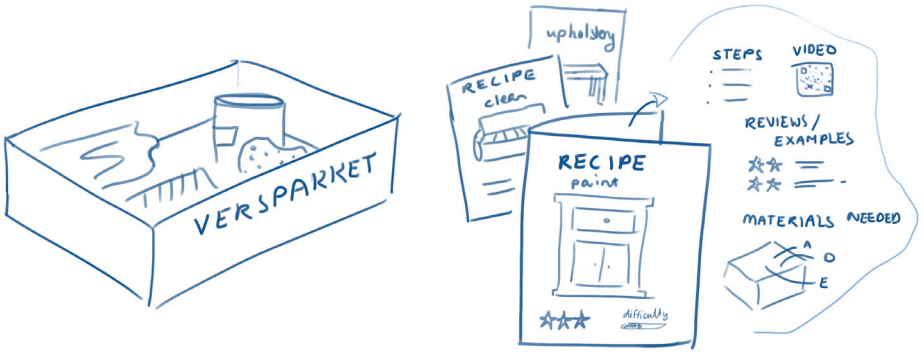


Figure 37: Idea 'verspaketten' and recipe cards

7.2.2.3 AI driven tool that visualises upgrade options

Users can take a photo of their own furniture and use the digital AI-powered tool to look at possible upgrade results, for example by changing colours, materials or components (Figure 38). Additionally, the tool includes information about the required time, costs, supplies and steps for the upgrade.

This idea received high scores on most criteria as it is expected that the target group will like this tool for its technological innovativeness and valuable assistance for making a plan. Besides, it is free to use and thereby affordable. The idea scores lower on practicability and cost-effectiveness because the development of this tool requires a large time and financial investment.

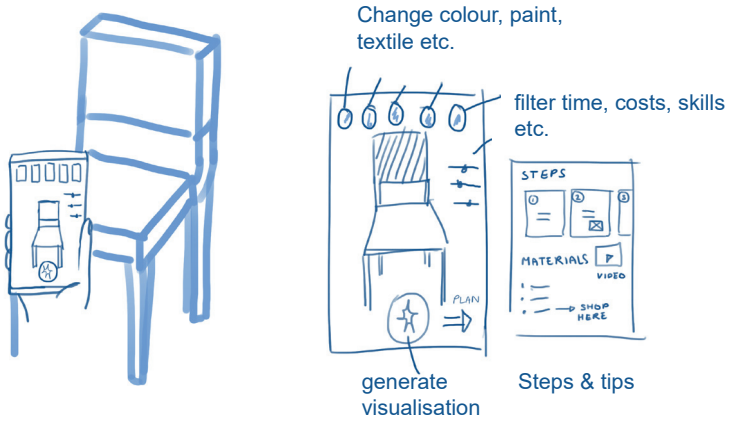


Figure 38: Idea Ai driven upgrade visualiser

7.2.2.4 Ikea hacks upgrade competition

Based on the social media trend "Ikea hacks", Ikea can organise a competition where participants are asked to submit their upgraded version (hack) of a basic furniture piece that many people have in their homes (e.g., the Lack table) (Figure 39). A campaign can be built around this competition.

This concept is potentially quite effective because it can be targeted towards a specific audience and encourages people in a direct way to perform repair or upgrade behaviour. Additionally, such contests/campaigns are common and therefore acceptable and likely to be practically feasible and cost effective. Moreover, since people already have the table at home it can be affordable.

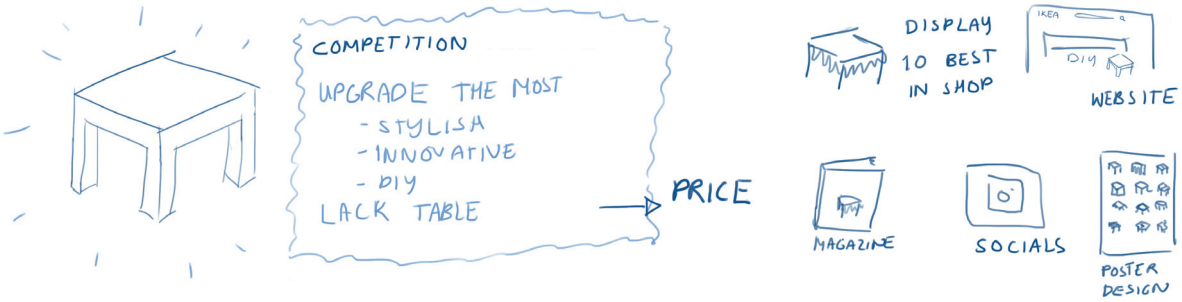


Figure 39: Idea Ikea hacks competition

7.2.2.5 Reasons for the lower scores of the other ideas

It was noticeable that many of the lower-scoring ideas were primarily focused on stimulating the teamwork aspect trough facilitating the exchange of help (ideas 2, 3, 5, & 7). The effectiveness of these ideas was expected to be low as consumers still need to take the initiative to consider and start a DIY project before they feel the need for help. To drive this initiative, triggers and an initial plan are crucial, therefore, higher scores were awarded to the ideas that offer support in these areas. Additionally, establishing a community help structure is expected to take a long time.

Low scores on effectiveness were also given to the ideas in which users are invited to try repair in some type of workshop setting (ideas 6, 8, 10). The risk here is that people might perceive it as a fun, one-time activity and are not adopting long-term changes in behaviour. As a result, it was concluded that it is more effective to focus on supporting people in repairing their own furniture in their own environment.

Main takeaways

- A design intervention solely focussed on the teamwork aspect is not expected to be effective. However, it can be considered whether these ideas can be integrated into the remaining "making a plan" ideas, in order to combine their values.
- It is preferred that the design stimulates people to perform repair in a similar way as desired in the long-term: repair/upgrading of someone' own furniture in their own environment.

7.2.3 Evaluation design goal

In the final evaluation step, the remaining 4 concepts were assessed using the design goal which states that the design should support users to (1) make a plan and (2) perform repair/upgrading together. The app and recipe card ideas offer the most support in creating a plan by providing the step-by-step guides and supplies lists. Additionally, support in this area is provided by the realistic expectations about potential results, required costs, effort, and time that they share with users. The other two ideas do not provide support for making a plan.

Since the ideas strongly focused on teamwork were not selected in the previous evaluation round, the remaining ideas aren't particularly strong in this aspect. Only the Ikea competition has the potential to encourage teamwork.

As providing support for making an initial plan is crucial for people to consider and start a DIY project, , and the emphasis of the design goal was placed on this aspect, it was chosen to further develop the recipe card and AI tool ideas.

08

DEFINING THE FINAL CONCEPT DIRECTION

This chapter is dedicated to the process of defining a final concept direction. Firstly, the two selected ideas have been further developed as presented in section 8.1. During this process, Intergamma (the umbrella organisation of DIY stores Gamma and Karwei) has become involved in the project for discussing concept improvements and as a potential stakeholder for implementing one of the concepts in the future. They were contacted and engaged through the Reuse Alliance.

After further developing the two ideas, they were evaluated using qualitative research methods, as discussed in section 8.2. The conclusion of the final concept direction is presented in 8.3.

8.1
DEVELOPMENT & PROTOTYPES OF 2 CONCEPTS

The following sections present the more detailed concepts and prototypes of the recipe card and the AI-driven tool ideas. The references for the pictures used in the prototypes are included in the reference list on page 118.

8.1.1 Recipe cards & pre-filled packages in Gamma

Recipe cards

The recipe cards have been designed as A4-sized (width) paper card in the Gamma brand style. These cards can be showcased in Gamma stores and can be made available for customers to take home.

Figure 40: Recipe card - first prototype

As prototypes, two card designs have been developed, Figure 40 shows one of them (Appendix M displays both cards in full-size). The topic of each card is a specific DIY technique which is applicable for various furniture types. The front side features a before- and after-photo, along with indications of the required time, skills, and costs. On the back side of the card, there is a step-by-step plan, a list of required materials, links to additional information, and reviews of other users.

Pre-filled packages

The idea of pre-filled packages has been further developed into a visual (Figure 41) illustrating the concept: the packages are linked to each recipe card and therefore have the same title and images. They contain all the required supplies for the task, except for items that vary significantly per consumer (e.g., paint colours).

Figure 41: Pre-filled packages - first prototype

Alternative to packages: store shelf

An alternative was designed to the pre-filled packages as it was expected that not everyone would respond positively to them (people might already have supplies at home and do not want to buy unneeded products). Figure 42 presents a store shelf which contains the items listed on the recipe cards. Corresponding letter labels on both the shelf and the cards make it even easier to locate the products. Also, the cards themselves and more product information can be displayed on the shelf.

Figure 42: Store shelf - first prototype

8.1.2 AI driven visualisation tool for furniture upgrading

The AI tool has been further developed into a prototype of a phone application, using Figma. Figure 43 illustrates the how the app works: After taking a photo of a furniture piece, the AI recognizes the product from the background and identifies the materials. Afterwards, the user can create visualisations of possible upgrades for the materials and structure of the furniture piece, and add extra elements. Additionally, the app provides inspiration by showing more ideas when the user scrolls downwards (similar to Pinterest), and it can generate a step-by-step plan.

Figure 43: AI driven upgrade visualisation tool - first prototype

8.2
EVALUATION OF 2 CONCEPTS

The two concepts were evaluated by collecting the opinions of potential users, feedback from Intergamma, and by revisiting the design criteria and wishes. The outcomes are presented in the next sections.

8.2.1 User tests

The opinion of the target group about the two concepts was collected through user tests with 13 participants (a peek into the setting can be seen in Figure 44). Chapter 2.8 contains more details about the test method.

Figure 44: User test setting 2 concepts

Results

The gathered feedback has been summarized and is presented below. The comments are categorized based on whether they relate to the desirability of the concept, its effectiveness, or areas of improvement.

Recipe cards & pre-filled packages

Desirability

+ Having a plan printed on paper is experienced as being clear.
+ Participants found it valuable to have Gamma staff around them and hereby, have direct access to advice.

Effectivity

+ This concept was perceived as more inviting than the app as you can bump into it even when you are not actively looking for DIY furniture support.
+ In this concept, a user is one step closer to actually repairing/upgrading because the next step, collecting supplies, is immediately possible.

Areas of improvement

- Providing packages with supplies is not desired by most participants as people already own some of the supplies and it evokes mistrust over the price.

AI driven visualisation app

Desirability

+ The personal visualisation aspect of the app was seen as very valuable. People needed support for imagining how their own furniture could look like in their own surroundings.
+ Using the app is fun

Effectivity

+/- The app asks more initiative from the user, they will only use it to just try it out for fun, or already have an initial plan for their DIY project.

Areas of improvement

- Downloading an app can be a barrier.

+/- The cards show just one picture of a possible result. It is hard to imagine how the same technique can be applied to other types of furniture.

There is doubt about whether it is more effective to target the concept at retailers like Ikea. Many people from the target group can be reached here at the moment they are about to replace furniture. However, it was also discussed that these consumers may have already decided on replacement and are therefore less likely to reconsider repair/upgrading.

8.2.2 Assessment by Intergamma

The concepts were discussed with an employee of the sustainability department of Intergamma to assess their feasibility and desirability. Overall, there was a high level of interest in concepts promoting repair/upgrading behaviour as Intergamma is already active in this area.

It became clear that the development of the app concept was expected to be challenging in terms of feasibility. This is due to the significant time and effort that are required. Also, this was caused by the uncertainty about potential profit or CO2 impact reduction. However, there was enthusiasm for the recipe cards and pre-filled packages concept, as the implementation time and effort are low. Additionally, some areas of improvement were mentioned:

AI driven visualisation app

Areas of improvement

- The concept can be applied to both Gamma and Karwei shops as furniture repair suits the vision of both.
- It is preferred to expand the concept beyond furniture, the cards can focus on a broader range of repair activities in and around the house.
- A catchy title desired

- Intergamma is unlikely to sell textiles as this does not fit their identity. Cleaning agents for textiles are being sold.

8.2.3 Assessment by design requirements & wishes

For the final round of assessment, the concepts were evaluated based on the design requirements and wishes which are introduced in Chapter 6.2.

Requirements - the design should:	Recipe cards & pre-filled packages	AI driven visualisation app
Support the target group to make a plan for DIY furniture repair/upgrading by ..		
1. .. providing the user with the required knowledge & skills regarding:		
a. The required tools and supplies.	++	++
b. The specific actions that need to be performed.	+	++
c. How these actions should be executed.	+	++
2. .. providing the user with realistic expectations about		
a. The costs of the plan.	++	++
b. The required effort & time for the plan.	++	++
c. The feasibility of the plan.	+	+
d. The possible result(s) (aesthetics and/or product state).	+	
Support the target group to do it together by ..		
3. ..facilitating the asking and receiving help from others.	−	−−
4. ..stimulating users to ask help from others.	−	−−
Ensure that the preconditions are met by ..		
5. .. ensuring a low effort/time investment for users.	++	+
6. .. triggering users to start repairing/upgrading.	+	+−
7. .. making a repair/upgrade journey a pleasant/fun experience.	+−	+
8. .. ensuring the required tools & supplies are accessible.	++	+−
Maximise environmental impact reduction by ..		
9. .. reaching as large a part of the target group as possible.	+−	++
10. .. stimulating users to specifically repair or upgrade furniture made of wood, textile, foam, in the low/medium price segment.	++	+
11. ..stimulate users to perform doable activities.	++	+
12. ..stimulate users to perform repairs/upgrades that result in maximum lifespan extension and require minimal additional impact.	++	+
	+23 −4	+22 −6

Wishes - The design could:

Target the preferences and sensitivities of the target group by ..

	Recipe cards & pre-filled packages	AI driven visualisation app
1. .. promoting results that fit the current trends.	++	++
2. .. promoting and facilitate unique results.	+	++
3. .. emphasising personal benefits in communication.	+−	++
4. .. providing the latest of the latest (technical) innovations.	−	++
5. .. paying attention to quality concern.	+	+−
6. .. enabling social status by repair/upgrading.	−−	−−
7. .. giving appreciation for sustainable behaviour.	+−	+−
8. .. communicating factual, not judgemental.	++	++
9. .. emphasising the positive emotions that can arise at the end of the journey.	−−	−−
	+8 −7	+12 −6

This analysis has shown that based on the requirements, there is not a clear winner. Both concepts excel on other aspects. The areas in which the app scores higher are caused by the personalised and endless visualizations and step-by-step plans. These strongly support users in forming expectations about all the possible (and potentially unique) results. Additionally, the plans are more focused on the users' needs and are therefore more helpful. Lastly, the app is fun to use, its technological innovation is attractive, and it has the potential to reach a larger target group since it can be downloaded by everyone.

The recipe card concept excelled in facilitating easier access to supplies and working as a trigger. Additionally, this concept allows for more control over which DIY activities are promoted. In the app, users have access to information about all possible DIY techniques, but in the shop, the recipe cards can be specifically targeted at low effort, doable and high impact reducing DIY's. Furthermore, placing the cards in the Gamma stores can reduce some of the concerns users may have about the quality of their DIY results, as Gamma's products and employees are trusted by consumers.

Points of improvement

Both concepts could primarily improve on supporting the 'do it together' aspect. Besides, the tools and supplies can be made more accessible in the app concept. Additionally, the target group's sensitivity for social status and the motivational factor of experiencing positive emotions after completing a DIY, could be used more effectively in both concepts.

8.3
CONCLUSION: FINAL CONCEPT(S) DIRECTION

Based on the findings from the three assessment methods, it was concluded that there is no single winning concept. Instead, combining both concepts was decided to be the most promising direction for the final design. Only Intergamma has expressed a clear preference for the recipe cards concept. The other two assessment methods have shown that the concepts have strengths in different areas which are all desirable in the final design, they are summarized in Figure 45.

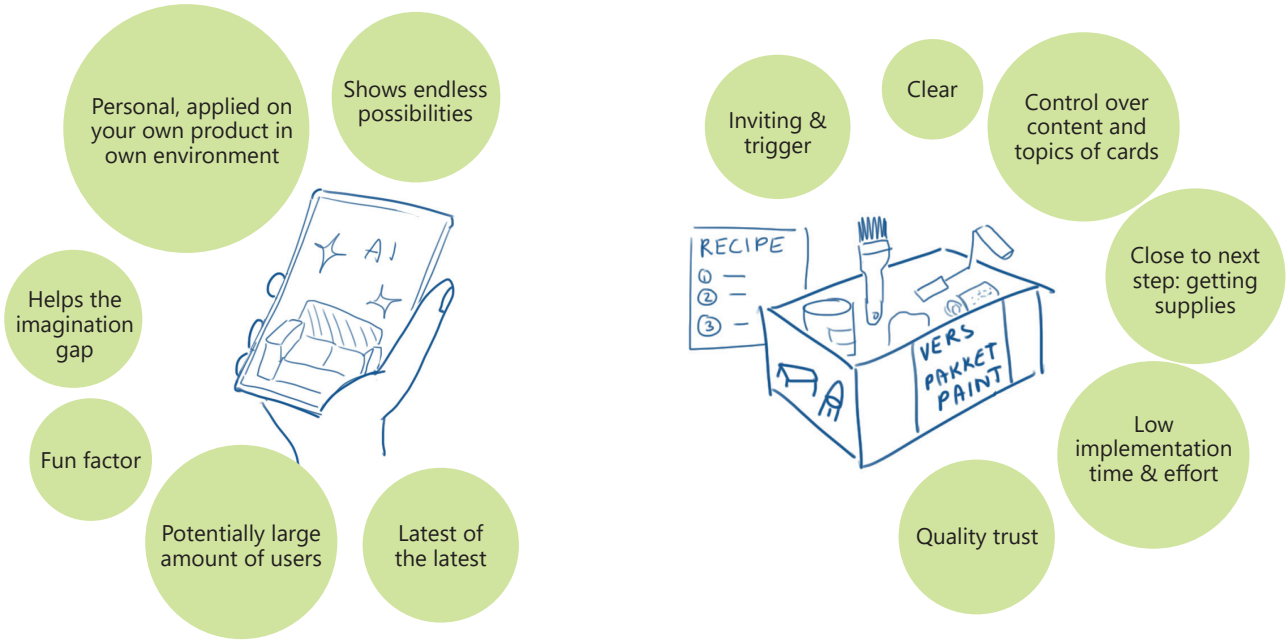


Figure 45: Strengths of the two concepts

Additional points of improvement

For the further development of the combined concept direction, additional points of improvement were collected by analysing the support that is provided in the various phases of the user journey.

It was concluded that even by offering both the app and recipe card concepts, there is a lack of support for providing triggers for repair/upgrading in steps 1 and 2 of the journey (Figure 46).

Besides, both elements are not yet focussed on providing support in the executional steps (5, 6 and 7). It would be beneficial if the design could help people to overcome the hesitation to start the repair/upgrade after having gathered the necessary supplies. Additionally, in case of failures or unexpected challenges, additional support can be provided by enhancing knowledge, boosting confidence, and facilitating assistance from others.

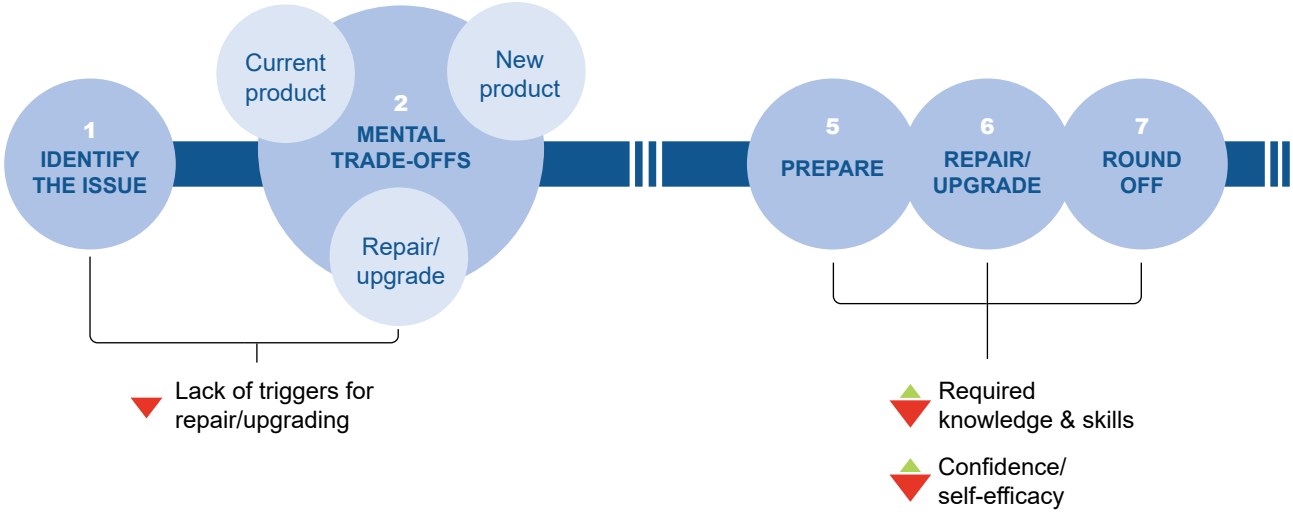


Figure 46: Room for improvement in supporting journey

DELIVER

In the fourth phase of the project, the deliver phase, a final design proposal for Intergamma was created by further developing the concept direction and points of improvements that were formulated in the previous phase. Chapter 9 presents the result of this final design iteration.

Furthermore, the effect of the proposal is evaluated through a user test conducted in a Gamma store and a conversation with the sustainability department of Intergamma. Chapter 10 presents the evaluation results, along with improvements, and recommendations that were made from here.

09

FINAL DESIGN: OPKNAPPERS

This chapter focuses on presenting the final design proposal for Intergamma called ‘Opknappers’ (Dutch for ‘fixer-uppers’). Section 9.1 provides an overview of the elements that the design consists of, and each element is addressed in more detail in sections 9.2 to 9.7. Finally, a roadmap is presented in 9.8, in which implementation steps are suggested.

9.1
OVERVIEW OF OPKNAPPERS

Opknappers exists out of six elements which are introduced shortly on the following page (Figure 47). Each element is designed to support users in specific parts of their DIY repair/upgrade journey as indicated by the connection lines. In the following sections, the elements are described in more detail in a slightly different order than the overview as this creates a more natural flow in the storyline.

UNDESIRED PRODUCT STATE

1 IDENTIFY THE ISSUE

current product

replace

2 MENTAL TRADE-OFFS

repair/ upgrade

3 MAKE A PLAN

4 GET TOOLS & SUPPLIES

5 PREPARE

6 REPAIR/ UPGRADE

7 ROUND OFF

8 EVALUATE RESULT

In-shop exposition

House shaped showrooms with examples of repaired and upgraded furniture are set up in Gamma and Karwei stores to trigger consumers.

Social media promotion

Furniture repair and upgrading will be promoted on Intergamma's channels and through influencers to trigger and inform consumers.

Elaboration websites

Current DIY website- and app pages of Intergamma are elaborated with furniture related content and online findability will be increased.

DIY cards

Paper cards are showcased in shops and can be taken home. The visualised techniques trigger consumers and the listed steps and materials assist in planning.

Product shelf

A store shelf located next to the exposition contains supplies and additional product information for the repairs/upgrades presented on the DIY cards.

Opknappers app

This AI-powered app creates visualizations and plans for upgrading your own furniture. Also, it facilitates community support, collecting supplies and sharing results.

Figure 47: Elements of Opknappers

9.2
DIY CARDS

These paper cards are intended to be displayed at the physical stores of both Gamma and Karwei, inside the Opknappers exhibitions (further details in 9.3). Six example cards have been designed in detail and their front sides are showed in Figure 48. The full-size designs are included in Appendix N.

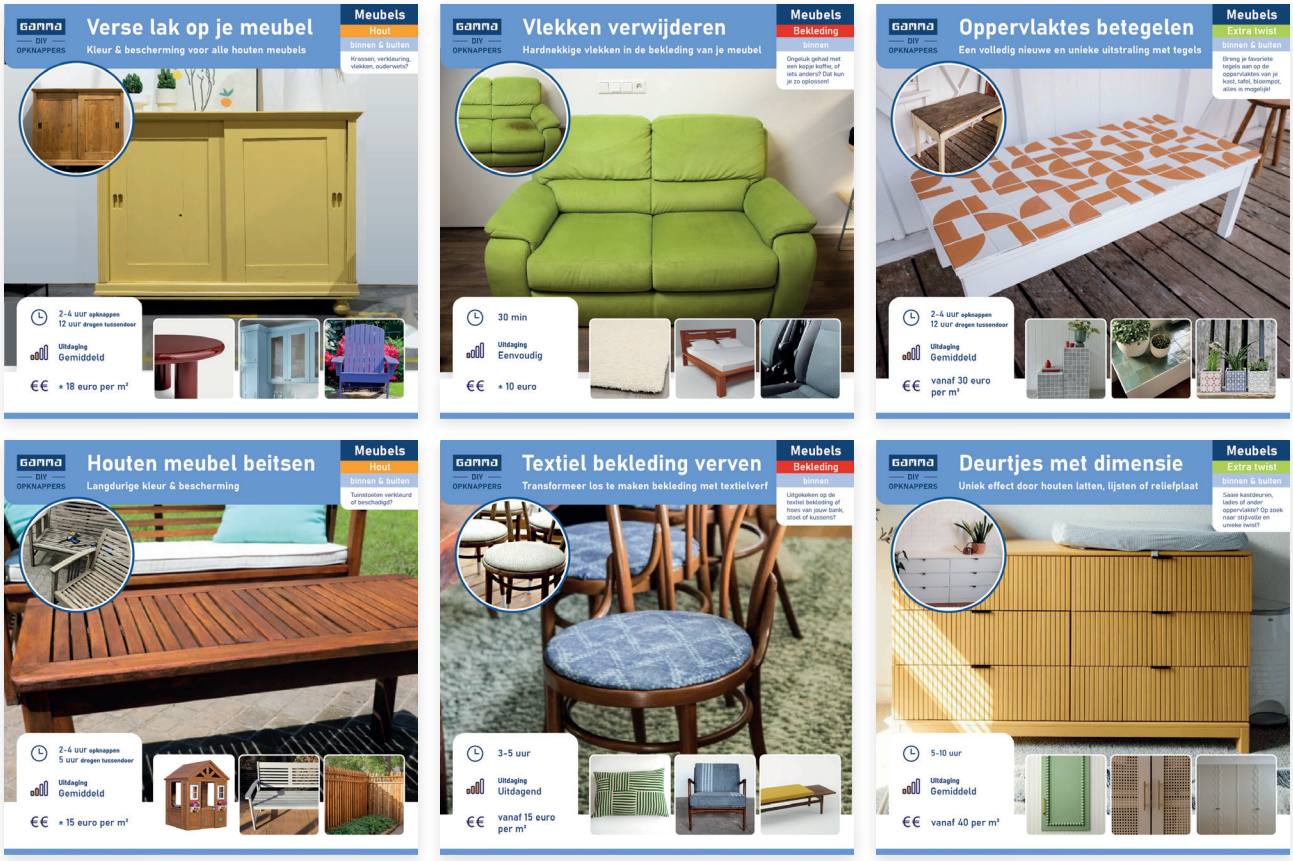


Figure 48: Six examples of DIY cards

The purpose of these cards is to trigger customers who are visiting the shops for another purpose by providing them insight into potential DIY results. Additionally, knowledge is provided to form expectations about required costs, skills, time, the process steps, and supplies. For people who already consider a DIY project, the information about the specific techniques can help to create a detailed plan.

- Lack of triggers for repair/upgrading
- Need for a plan
- Expectations costs repair
- Expectations result
- Required knowledge and skills

9.2.1 Content & layout

The cards are designed as square, A4-sized (width) flyers in the Gamma or Karwei house style (in the prototypes, only the Gamma style was applied). All text is in Dutch, as the majority of store visitors are Dutch-speaking.

The front of the card includes the elements presented in Figure 49. Compared to the first prototype (discussed in Chapter 8.1), additional pictures have been added to demonstrate how the technique is applicable to a wider range of furniture types. Additionally, a category label has been incorporated, which will be elaborated on in the next section. Lastly, the indications for time and costs are more detailed to provide consumers with more realistic expectations.

Front

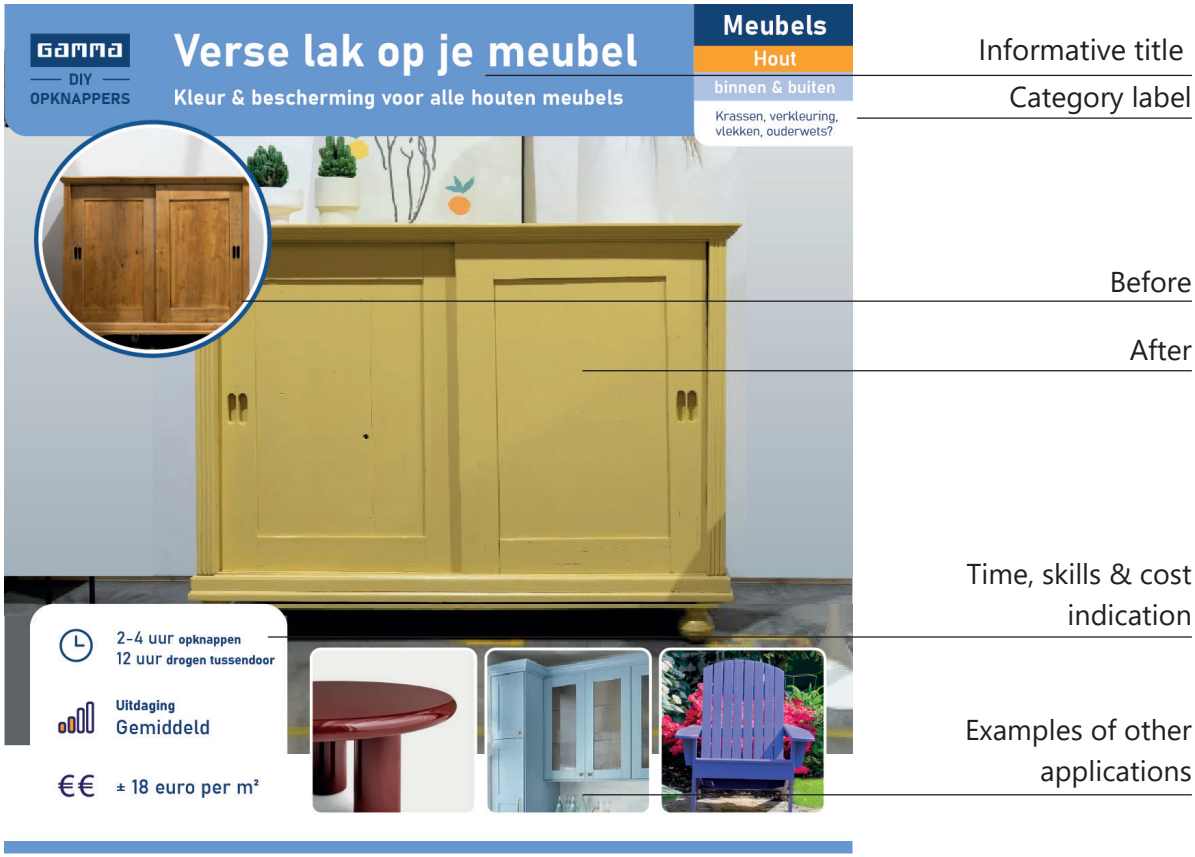


Figure 49: Front of DIY card

The elements on the back of the card are displayed in Figure 50. A change from the initial prototype is the more visual design of both the step-by-step plan and supplies list. This enables users to quickly absorb the information and helps them to recognize the supplies more easily while shopping. Another update is that the cards direct users to try the Opknappers app to explore how the technique on the card can be applied to their own furniture.

Figure 50: Back of DIY card

9.2.2 Categories & topics

The topics covered by the cards will be renewed and expanded over time. Hereby, the cards can stay up-to-date with trends and keep triggering visitors with new suggestions. Appendix N presents a proposal for the topics that can be included at the start of the collection.

For achieving as much environmental impact reduction as possible, the card topics should primarily focus on high-impact products: wood and textile-containing furniture from medium- and low-price segments. Furthermore, the image at the front of the card could display commonly owned furniture pieces that are frequently disposed to encourage people to work on these products specifically. Lastly, users can be guided towards the most sustainable methods for using materials and processes in their DIY.

The cards feature a category label at the top right corner, dividing furniture repair and upgrade activities into three groups (Figure 51).

1. Wood
   E.g., paint, oil, maintenance, repair of surface damages and structural woodwork.
2. Extra 'twist'
   Adding new elements like knobs, accessories, surfaces.
3. Upholstery
   Cleaning, repair and re-upholstery.

These categories are created to make the extensive collection more organized and thereby easier to look into for users. The categories are based on the survey research (Chapter 3.2), in which repairs/upgrades in these specific areas were frequently mentioned.

Lastly, the term 'Meubels' (furniture) is included to provide Intergamma the opportunity to expand the cards to other repair/upgrade domains, some examples are presented in Figure 51 as well.

Figure 51: Categories DIY cards

9.3
IN-SHOP EXHIBITION

The exhibition that is designed to be placed in the Intergamma stores in the big cities in The Netherlands is displayed in Figure 52. It is an Ikea-like, life-size prototype of a room of approximately 2.5 x 2.5 meters. Examples of upgraded and repaired furniture are placed inside, and each item is linked to topics of the DIY cards. The side columns of the exhibition are used to display the DIY cards collection.

Figure 23: Exposition

This element is designed to attract the attention of customers and trigger them for DIY repair/upgrading by reminding them of the potential stylish and trendy outcomes. As the cards are nearby, visitors are invited to explore the DIY techniques in more detail.

▼ Lack of triggers for repair/upgrading

▲▼ Expectations result

9.3.1 Promotion of other elements

In addition to displaying the cards, the exhibition can be used to promote the Opknappers app and Opknappers website pages of Intergamma. This can be accomplished by placing QR codes on the walls. Furthermore, an interactive display (Figure 53) can be incorporated into the exhibition, allowing visitors to experiment with the app. Gamma already has such digital displays in their stores which can be seen in Appendix O.

Figure 53: Opknappers app on interactive display

Lastly, on the exterior walls of the exposition, there is space for promotion materials. A photo of people working together on a DIY project can be displayed with statements that appeal to the target group, such as “create unique result” and “imagine how proud you would feel”.

9.3.2 Structure

From conversations with Intergamma, it was learned that consistency across the store layouts is desired. Therefore, the wall and floor structure will be standardized for each store to ensure that the overall look of the exhibition is uniform, only the items inside may vary. Furthermore, the structure ensures a clear distinction between the exhibition components and the rest of store. This reduces the likelihood of exhibition pieces being placed at unintended parts of the store or being used for other purposes.

9.3.3 Topics

Similar to the DIY cards, the exhibition can promote a broader range of repair/ upgrade topics beyond just furniture. Appendix O contains a suggestion for which other DIY projects in and around the house could be added to the furniture setup. After a certain time period, the walls of the exhibition and items within can be changed to present other DIY repair themes as shown in Figure 54. Hereby, Intergamma can keep making effective use of the exhibition structures.

Figure 54: Exhibition housing other themes

9.3.4 Implementation

The implementation of the exhibition all the Intergamma stores in the big cities in The Netherlands requires a significant investment. Therefore, it is recommended to start with a pilot in a few shops to test whether this investment would lead to the desired outcome (this approach is further detailed in the roadmap in 9.8). It is assumed that Intergamma is open to building larger exhibition structures as they do this more often (Appendix O). To create the example furniture pieces, Intergamma could consider collaborating with Ambacht Centres, as they specialize in this area.

9.4 OPKNAPPERS STORE SHELF

The concept of the Opknappers store shelf is already introduced in Chapter 8.1. The shelf is positioned next to the exhibition in the stores and contains products that are listed in the DIY cards. Figure 55 illustrates how the shelf could look like. The purpose of the shelf is to make access to tools and supplies effortless and provide extra information to help users in making product choices.

Accessibility tools and supplies

Required knowledge and skills

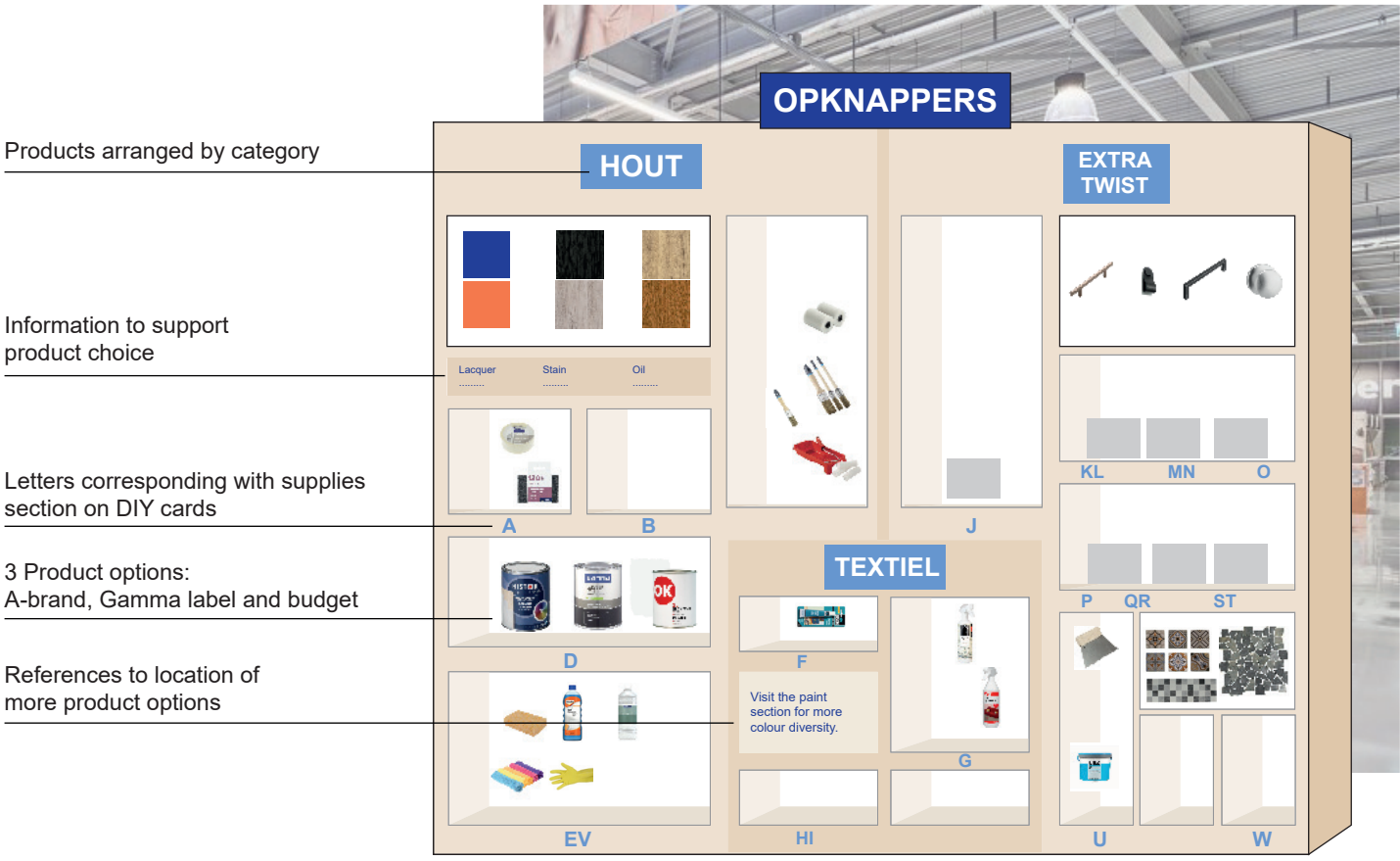


Figure 55: Opknappers store shelf

9.4.1 Products & information in the shelf

The shelf is divided into the same three categories as the DIY cards, and products are arranged according to letter codes which are also indicated on the cards. All the supplies that are commonly needed for the techniques on the cards are present (e.g., brushes, sandpaper, glue, primer). For products where consumers have many different choices (such as paint colours), some example products are present and a reference to the location in the store where more options can be found. Appendix P provides an overview of the precise products that could be housed in the shelf.

The shelf displays as few options per product type as possible so users can make quick and easy product choices. For example, for items like tape, sandpaper, wipes and gloves, only 1 or 2 house brand variants need to be available. In the case of products like primer and the example paint colours, the shelf presents a budget, house brand, and A-label variant. To further support users in finding the right products for their DIY activity, additional information is placed on the shelf. For example, the differences between the house brand and A-label products are explained, or which type of brush is suitable for a specific task, and samples are shown of wood treatments.

9.4.2 Collaborations

As Intergamma has indicated to be not interested in selling textiles, a collaboration could be initiated with a specialized textile shop. In this way, the supplies list on the textile-focused DIY cards can suggest people to visit this partner shop. Additionally, the store shelf in the Gamma or Karwei store could contain samples of textiles.

9.5
OPKNAPPERS APP

With the Opknappers app, users can transform a picture of their own furniture and visualise endless upgrade possibilities. As introduced in the first prototype in Chapter 8.1, the AI in the app recognizes the furniture piece and its materials from the photo and users can customize each material or add extra elements as illustrated in Figure 56. The text in the app is in Dutch, as it is currently aimed at the Dutch-speaking target group.

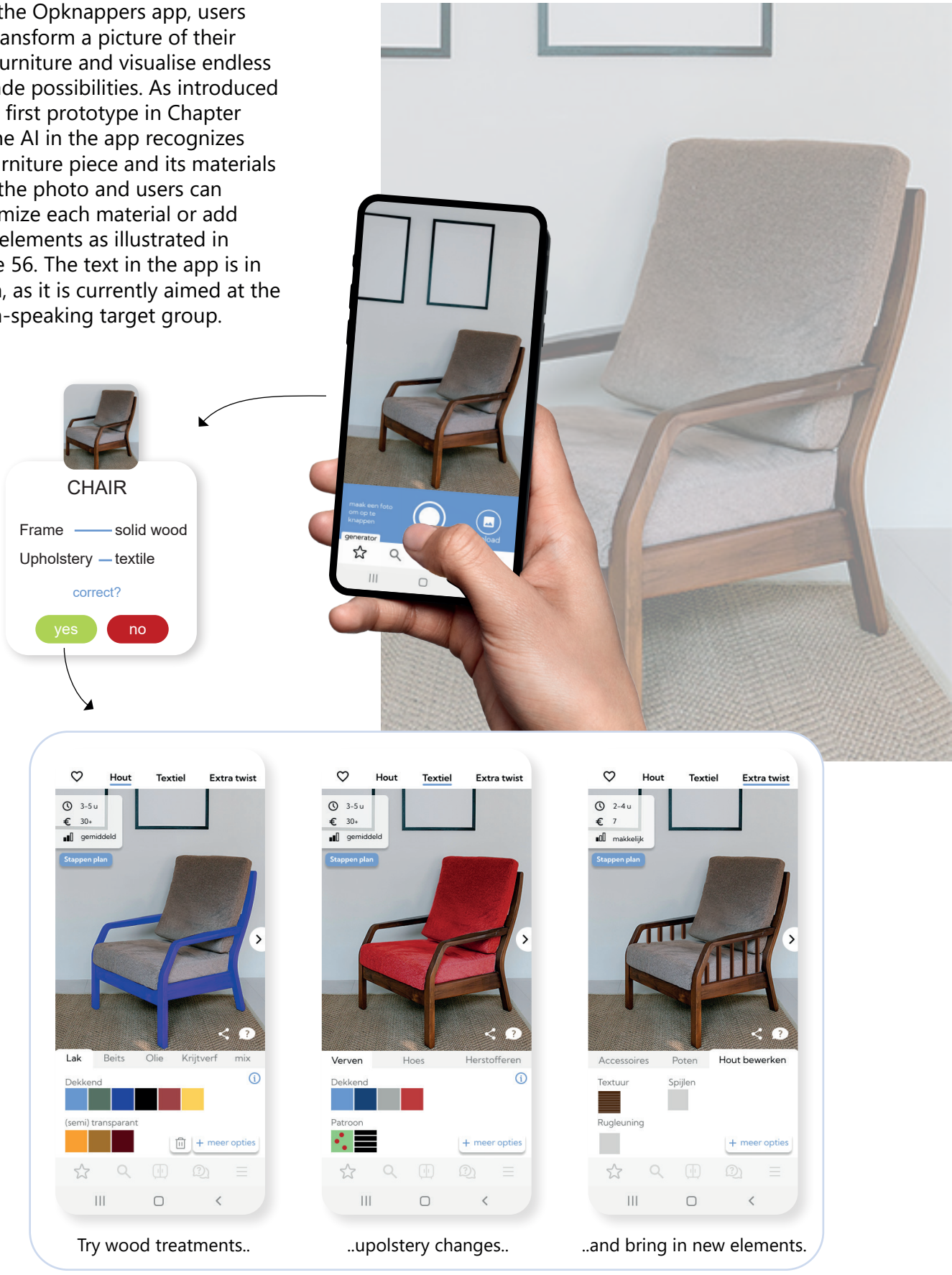
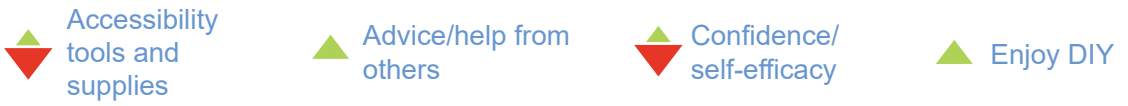


Figure 56: Opknappers app introduction

The app is targeted at individuals who are a bit further in the mental trade-off phase and are considering a DIY upgrade project, or have already decided to start one. The app assists users in the third step of their journey: making a plan. This support primarily involves creating expectations about potential results, but also providing information about costs, effort, time, required skills, and sharing the precise steps and needed supplies.

Furthermore, the app provides support in gathering the tools and supplies (step 4 in the journey) through the linked web shop. Lastly, it facilitates the exchange of help, knowledge and results among users to support confidence and joy during the project execution (steps 5, 6, 7) and evaluation step (8).



9.5.1 Details about functionalities

Figure 57 (on the following page) illustrates the visualisation functionality, as well as the step-by-step plans and inspiration page. These are explained in detail below.

Upgrade visualisations

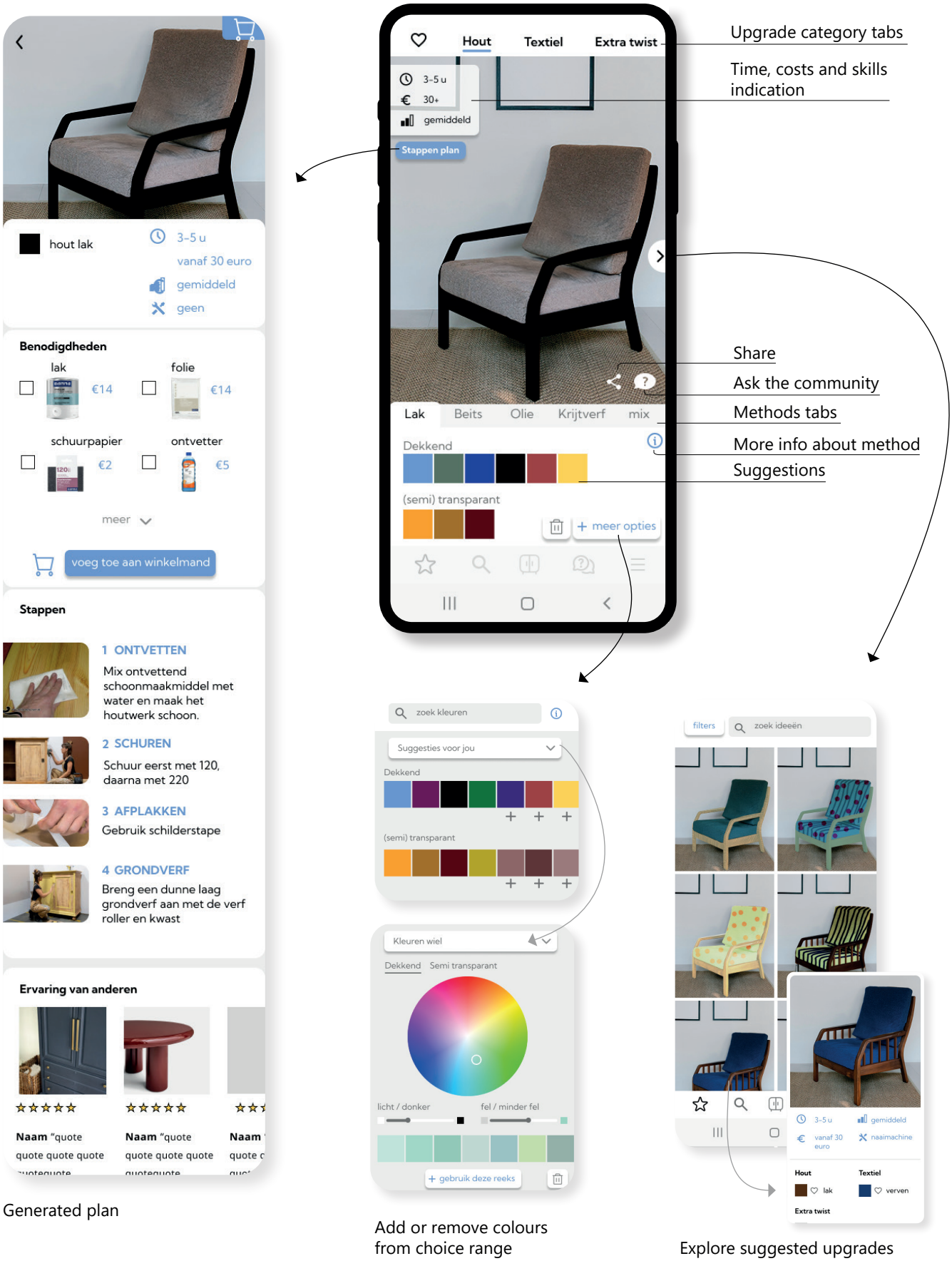
In the tabs at the top of the screen, the upgrade options are categorised based on the identified materials. When opening these tabs, users can explore the methods that are applicable to their furniture piece. The app provides personalised suggestions of colours and materials for the methods, but users can also explore other options. The visualisations can easily be shared with friends and family via social media.

Step-by-step plans

For each visualisation, a step-by-step plan with a supplies list can be generated. This plan includes quantities of materials and specific tips that are tailored to the furniture piece in the picture.

Extra inspiration

To gain additional inspiration, users can swipe right from the visualisation tool to reveal a personalised page with a broad range of upgrade possibilities.



Generated plan

Add or remove colours from choice range

Explore suggested upgrades

Figure 57: Opknappers visualisation & generate plan pages

Additional pages

Trough the down menu bar, users also have access to the 'Explore', 'My Projects', and 'Community' pages, these are displayed in Figure 58. The first one offers personalised content like tutorial videos or products which can trigger and inform users about DIY activities aside from the project they are currently working on. In the 'My projects' page, all the projects are stored that the user has saved and is working on. On the 'Community' page, users of can ask each other questions and view previous discussions. Experts are invited to participate in the discussions and are distinguished by a clear expert emblem. Additionally, this page includes the "Project of the Week" election to trigger inspiration, joy, and social status.

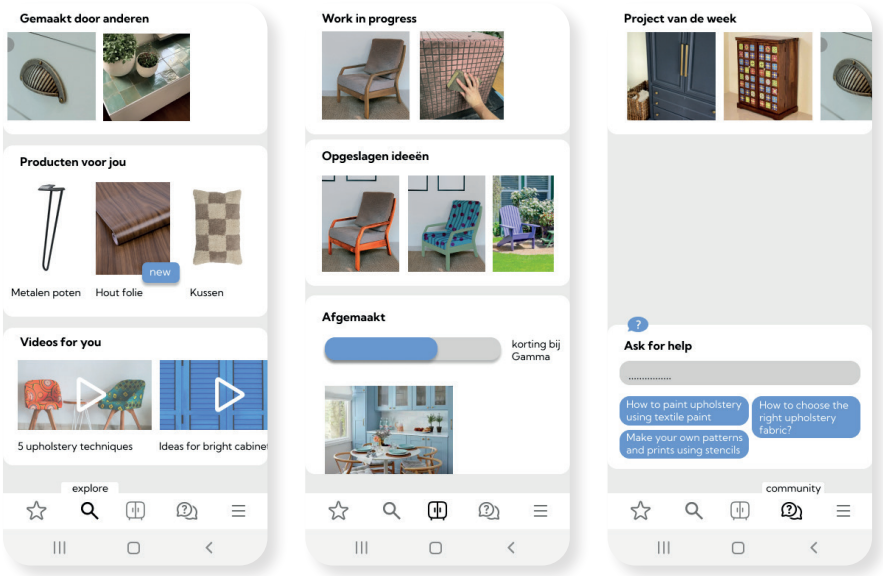


Figure 58: Explore, My projects and Community pages

9.5.2 Application of AI technology

In the app, AI technology will be applied in several ways. Firstly, image recognition and data analysis are used to recognize and distinguish the furniture piece and its materials from the photo. Databases with furniture products like retailers' websites can be used to gather information about different product types. The app asks the user to confirm the identified materials because, for example, wood can sometimes appear very authentic but might not be solid. These distinctions influence the techniques that can be applied. Thereby, the verification results in greater certainty that the app suggests feasible upgrades. Additionally, AI data analysis is applied for identifying current trends, available DIY products, and tutorials from the internet.

AI technologies in the field of image and content generation will be used to generate the visualizations and step-by-step plans. Experts in the furniture repair/upgrade field could help to train the AI by sharing basic steps and specialized tips for the tutorials.

Lastly, AI technology is used to personalise the content to a user's preferences. As can be seen in Figure 59, the app takes input from current trends and the personal style questionnaire filled out by users when they use the app for the first time. Additionally, personal user data is tracked in a similar manner to many social media platforms. The app monitors which types of upgrades are frequently viewed, liked, and searched by the user. With all this input, the AI can generate upgrade elements, examples, and further content that are likely to be interesting for the user.

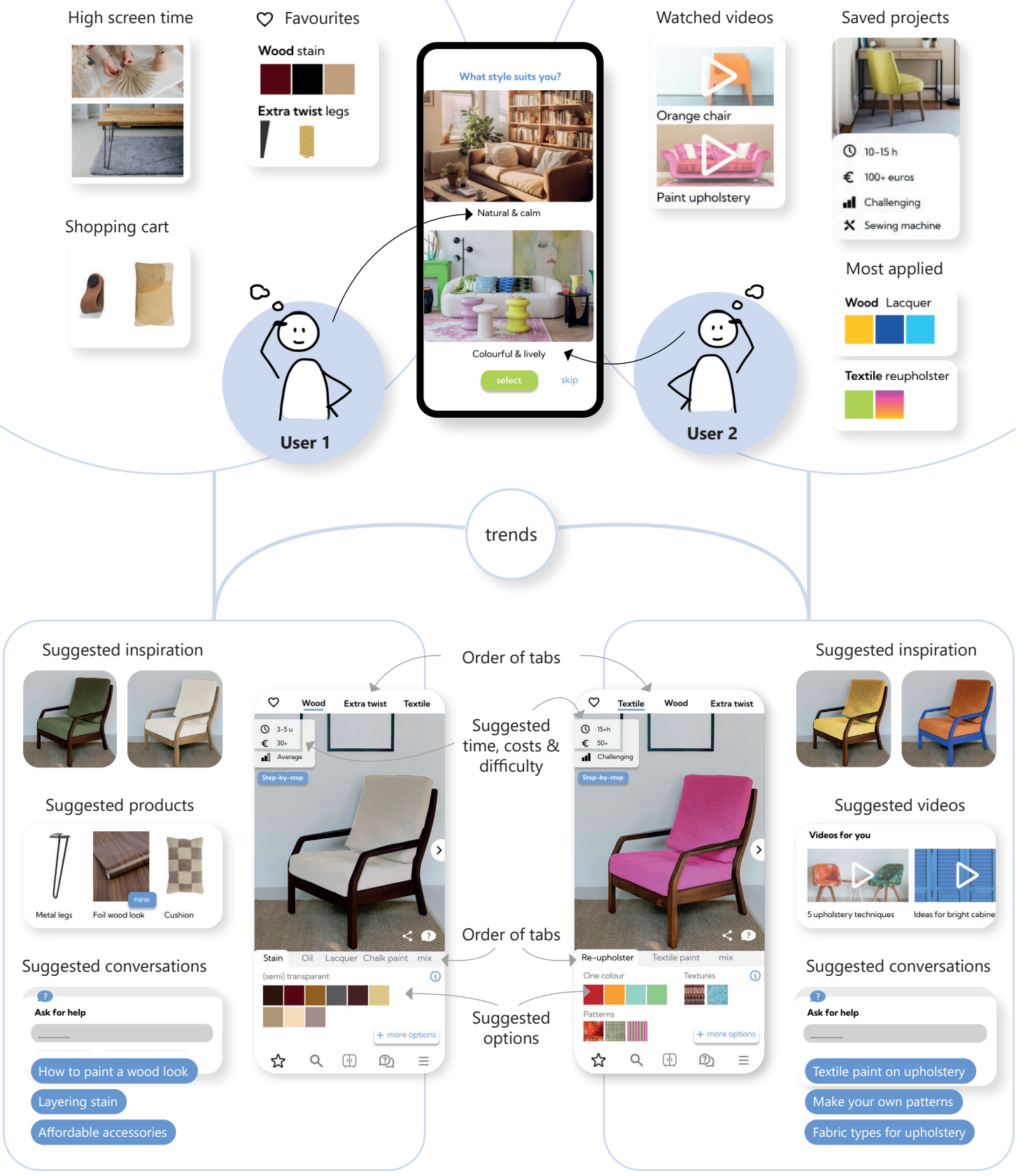


Figure 59: Personalisation of suggestions

9.4.4 Business plan proposal

Multiple parties will need to join forces for developing the app. This is because there is no single company which has the knowledge and supplies for all possible furniture repair and upgrading activities. It is intended that the app can offer these. Therefore, it is an idea for Intergamma to use the already existing collaboration structure of the Reuse Alliance to find partners.

9.6
SOCIAL MEDIA CAMPAIGN

Another component of the Opknappers proposal is a social media campaign initiated by Intergamma. The goal is to reach the selected target audience extensively and inspire and inform them about the possibilities of DIY furniture repair/upgrading.

Intergamma can create tutorial content based on the DIY cards, and can also develop promotion content to show the Opknappers exhibitions, store shelf and app. The channels of Intergamma can be used, but it is recommended to also collaborate with influencers to enhance their reach. Besides, these influencers can assist in creating high-quality content, which can be featured on the Gamma and Karwei websites.

9.7
ELABORATION INTERGAMMA WEBSITES

The current websites (and apps) of Gamma and Karwei already offer tutorials on various DIY projects. These web pages will be elaborated to include the topics and step-by-step plans of all DIY cards. Figure 60 illustrates how this digital database of the cards might look on the Gamma website. Some adjustments have been made to the current layout of the website to improve its user friendliness.

The goal of these website pages is to reach people who are in the trade-off or 'making a plan' phase of their DIY journey. When they are browsing the internet to find repair or upgrade possibilities and tutorials, they will easily find the content and can immediately order supplies from the web shop. This effect can be enhanced by further improving online traffic to the websites, for example, by using relevant keywords or promotions.

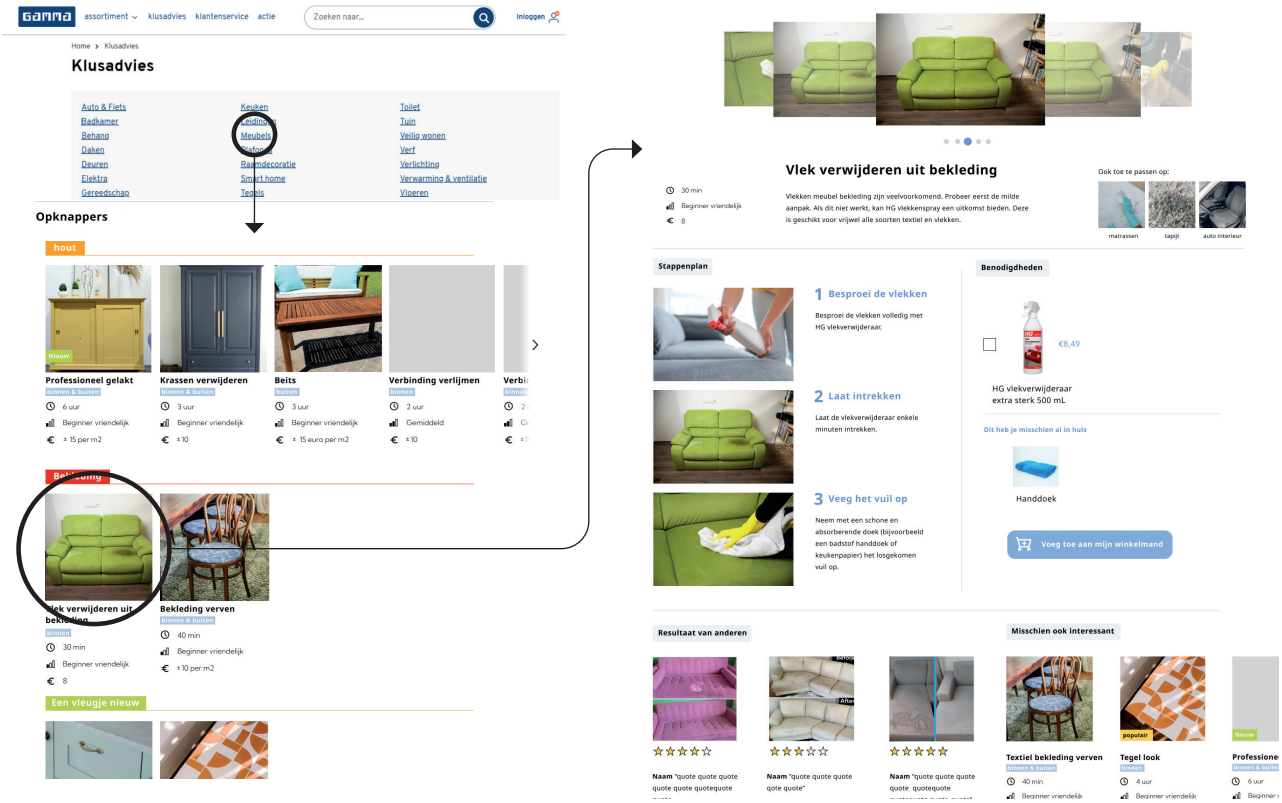


Figure 60: Opknapper website pages Gamma

9.8
ROADMAP

Implementing the Opknappers design proposal will require significant investments from Intergamma. This is because the in-store elements (cards, exhibition, and shelf) need to be produced in large numbers for the numerous stores, and the development of the Opknappers app will be time consuming. To address the ambitious goal, a roadmap has been created as can be seen in Figure 61. In this roadmap, the implementation is planned in three stages, which are together roughly estimated to take around three to four years to complete.

Stage 1
It is recommended to start in stage one with a pilot in which a small collection of DIY cards and a scaled-down version of the exposition/store shelf are placed in a few locations. Furthermore, Intergamma can start managing and creating Opknappers content for its websites and social media platforms. From this point forward, the content should be regularly updated and supplemented. Lastly, in stage one, collaborations with other companies should be established to start working on the development of the Opknappers app.

Stage 2
In the second stage, the DIY cards collection can be expanded with more furniture-related cards, as well as other repair topics. Additionally, the full-sized exhibition and store shelf can be implemented in a greater number of stores. Meanwhile, the Opknappers app can be developed.

Stage 3
In the final stage, the card collection, exhibition, and store shelf can be implemented in all the Intergamma stores in major cities in the Netherlands. Additionally, the app will be launched during this phase which should be promoted through all other elements of Opknappers.

Between the three stages, rounds of evaluation are planned to assess whether the design effectively reaches the target group and achieves the desired behaviour change. Adjustments can be made during these evaluations to refine the design for the next stage.

Once the proposal has been fully implemented, Intergamma can consider how to further develop the design elements (stage four). For example, the DIY card collection can be expanded to cover other themes, the exhibitions can feature different topics, and their content can be exchanged between stores. Additionally, it can be explored if it is feasible and effective to implement the DIY cards and exhibitions at other locations such as thrift stores or furniture retailers.

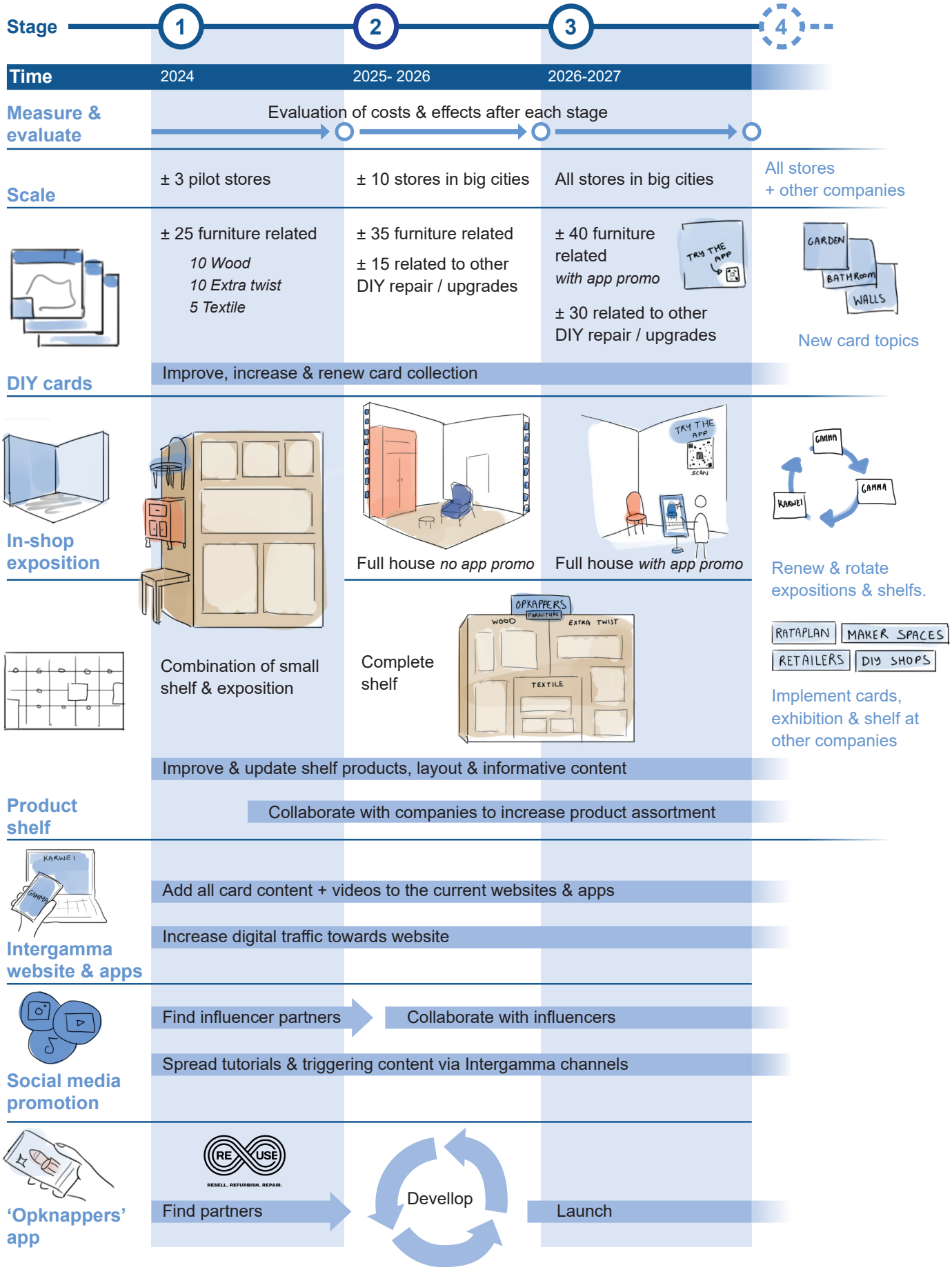


Figure 61: Roadmap implementation Opknappers

10

EVALUATION OF FINAL DESIGN

The final design has been evaluated to determine if the design goal (stated in Chapter 6.1) is achieved. For this purpose, user tests were conducted at Gamma Woerden during which visitors shared their opinions on the expected effectiveness and desirability of the design. The results are described in section 10.1. Additionally, it was assessed whether the final design is feasible and viable for Intergamma to potentially implement. For this reason, conversations were held with two Intergamma employees as described in section 10.2.

The evaluations led to a conclusion regarding the strengths and weaknesses of the final design which are discussed in 10.3. Furthermore, improvements and recommendations for further development of the design are formulated in chapter 10.4.

10.1
USER TESTS IN GAMMA

On a Saturday afternoon (January 13th), visitors of Gamma Woerden were invited to experience and evaluate prototypes of the design. The test was focusses on assessing the DIY cards, the exposition (without the digital app column), store shelf, and Opknappers app, the social media and website proposal were not part of the test. Figure 62 provides a look into the setting, more details about the method can be found in Chapter 2.9.

Figure 62: User tests at Gamma Woerden

10.1.2 Results

29 participants provided feedback on the design. The results are summarized and the points that were frequently mentioned are addressed on the next pages. A distinction was made between feedback about the app and the other three elements, as these were discussed separately with the participants.

DIY cards

Store shelf

Exhibition

Overall, the feedback on the in-store elements was positive. Out of the 27 participants, 21 saw them as potentially effective, 6 people indicated they would not use them.

\+ The mentioned positive points were mainly connected to the cards and exhibition providing inspiration, and a triggering effect. 10 participants especially emphasized that bumping into the concepts would place the idea of DIY repair/ upgrading in their head. Additionally, many participants found the step-by-step guides on the cards helpful (mentioned 6 times) and accessible, with some noting that these are particularly helpful for beginners. Furthermore, 2 participants shared that they often spend endless time looking around the store to find products, the shelf would assist them here.

+/- For the majority of participants, it was difficult to assess whether the inspiration and triggers would lead to them performing an actual repair or upgrade. Many indicated that this would be more likely if they had suitable furniture, and when they would already have initial thoughts about DIY repair/upgrading before seeing the concept.

Besides, the participants provided valuable feedback regarding the product shelf. Four of them indicated that they do not immediately take the next step to gather supplies when just being inspired by the cards and exhibition. They would need some time in between these steps for coming up with a detailed plan. Therefore, an extensive shelf might not be used much.

\- The 6 participants who would not use the designs were already very skilled (3x) and did not need support for generating ideas or plans. The others mentioned a lack of time, no interest in DIY in general, and one preferred getting inspiration from Instagram.

Areas of improvement

- Consumers should be protected from DIY mistakes by making it very clear which type of furniture/materials the DIY card tutorials are applicable to.
- In the exposition could show both the initial and the upgraded states of the furniture pieces to make the DIY aspect clearer.

Opknappers app

The overall feedback on the Opknappers app was positive as well. Out of the 26 participants sharing their opinion, 22 were positive and 4 would not use the app.

\+ People were mainly positive about the visualisation functionality. They appreciated being able to see how upgrades would look on their own furniture in their own house. Also, they found the app enjoyable to use, and felt it provided inspiration. The participants with more DIY experience were interested in this aspect as they could try out their own ideas. Additionally, 4 people mentioned that the app would assist them in discussing their plans with others.

\+/- When discussing the effectiveness of the app, the participants also found it challenging to determine if they would carry out more repairs or upgrades due to this concept. Nine people clearly stated they would use it. Others would only use the app if they already had an idea in mind. Furthermore, four people mentioned the importance of knowing that the app exists and downloading the app was seen as a potential barrier by 2 persons, two others did not see this as an issue.

\- The 4 people who indicated they would not use the app preferred getting their ideas from elsewhere, didn't like apps in general, or mentioned a lack of time and suitable furniture.

Area of improvement

- The tip was given to include video tutorials in the step-by-step plans.

Feedback on joined effect of design elements

Six participants specifically mentioned how they would combine the different elements of the design in their user journey. Some would first be inspired or triggered by the shop experience, and then use the app at home to further develop their ideas. Others mentioned the opposite approach: creating a plan at home with the app and afterwards visit Gamma to be supported by the product shelf and gain extra inspiration from the exposition and cards. Additionally, two participants mentioned that they found it difficult to imagine how DIY cards could be applied on their own furniture, in these cases, the app could help.

Point of concern

Some concerns emerged about whether the selected target group could be effectively reached in large numbers in the stores. This was because the Gamma shop was not crowded during the user test, and out of the 29 visitors spoken to, just 10 were in the age range of 18-25. Employees indicated that the quietness was due to the recent holidays. This concern was further explored during a conversation with Intergamma as can be read in 10.2.

10.2
EVALUATION WITH INTERGAMMA EMPLOYEES

Conversations were held with the manager of Gamma Woerden as well as a representative from the overarching sustainability department of Intergamma. From the discussion with the Gamma manager, it mainly emerged that the exposition was a desired element as these are often successfully attracting the attention of visitors. Additionally, it was mentioned that the store layout is flexible, and space is frequently made for temporary collections. Therefore, it was expected that placing the exhibition in the shop is feasible.

From the conversation with the sustainability department, it became clear that there are limitations regarding in-store space, a slightly smaller exhibition would be more feasible. Additionally, it was mentioned that Intergamma is at the start of developing new concepts and business plans around sustainability and will conduct pilots in the fall of 2024, the proposal from this thesis will be taken along in the development process.

Lastly, it was further discussed whether the target group can be reached in the stores. It was stated that the target group does visit the stores (mainly 25+) and there is little difference between visitors of Karwei or Gamma. Besides, visitors typically come with a specific purpose and do not come to just look around as can be the case in Ikea for example.

10.3
CONCLUSION

Based on the evaluations, it was concluded whether the design proposal, Opknappers, achieves the design goal and overarching goal: environmental impact reduction in the furniture sector. Research in this project revealed that increasing consumers' DIY repair and upgrade behaviour of high impact products is the most promising strategy for this goal.

It is concluded that the design contributes to this behaviour change by successfully supporting consumers in one of their needs: making a plan for a DIY project. The design elements were found to convey inspiration, support for setting realistic expectations, and more detailed information for making this plan. Besides, it is expected that this support will reach the target group. The elements in Gamma and Karwei stores primarily reach visitors aged 25 and above, while the entire target group (aged 18-35) can be reached through the website pages, social media, and the Opknappers app.

The design proposal does not perform as well on the second aspect that was found to contribute to the behaviour change: working together. Some small elements like a text promoting teamwork have been added to the DIY cards, however, these are not expected to have significant impact.

Furthermore, during the research, preconditions emerged that should be addressed to facilitate the behaviour change. Reflecting on these, it is concluded that the design addresses the lack of triggers for repair and upgrading by providing these through the exhibitions and social media. Additionally, the proposal enhances the accessibility

of supplies, and reduces the time and effort required for a DIY project since people don't have to figure out every step of the journey on their own. The last precondition, ensuring that DIY is a pleasant or fun experience, is not specifically addressed by the design.

Overall, the design goal has been partly achieved, the support for making a plan is succesful and the majority of preconditions are addressed. It remains uncertain whether this is enough to result into increased repair/upgrade behaviour. Participants of the final user tests also found it difficult to assess the ultimate effect. This uncertainty is due to the numerous factors that have not been addressed by the design and still play a role, such as social norms, value of new products and low repairability.

Research into the path towards large-scale sustainable societal transitions has revealed that such significant change often does not happen in big moves. Instead, it is made possible through the accumulation of meaningful small steps (Het Groene Brein, 2021). It is expected that implementing the Opknappers proposal can achieve such a small step in the big transition towards increased furniture repair and upgrading. To initiate the larger movement, other stakeholders will also need to put effort into addressing drivers/barriers within their reach of influence.

The implementation of Opknappers is expected to be feasible, as Intergamma has shown interest in the design and has confidence in its viability, particularly in regards to the DIY cards, websites, social media, and a slightly scaled-down exhibition. The potential for implementing the app is not yet fully clear, as it depends on whether Intergamma can develop it themselves or if they, and other stakeholders are willing to collaborate. During a presentation of the final design at I&W, Intergamma and Ikea were present and expressed to be open for further investigating such collaboration.

10.4
IMPROVEMENTS & RECOMMENDATIONS

In the previous sections, several areas were identified in which the Opknappers design proposal lacks support or could be enhanced. Initial suggestions for concrete improvements, as well as recommendations for further research and development are presented in this section.

10.4.1 Improvements

Exposition + store shelf

The exhibition can be combined with the store shelf, as depicted in Figure 63. This reduces the amount of store space that is needed. Additionally, furniture pieces can be placed in the exhibition that have been upgraded halfway to clearly communicate this upgrading step to customers.

The product shelf has been reduced in size because it was found that people do not immediately purchase all the DIY products when they first encounter the exhibition. Therefore, the shelf now only to provides a few example products, along with information and swatches, to give people an idea of which supplies are available in the store for when they would need them.

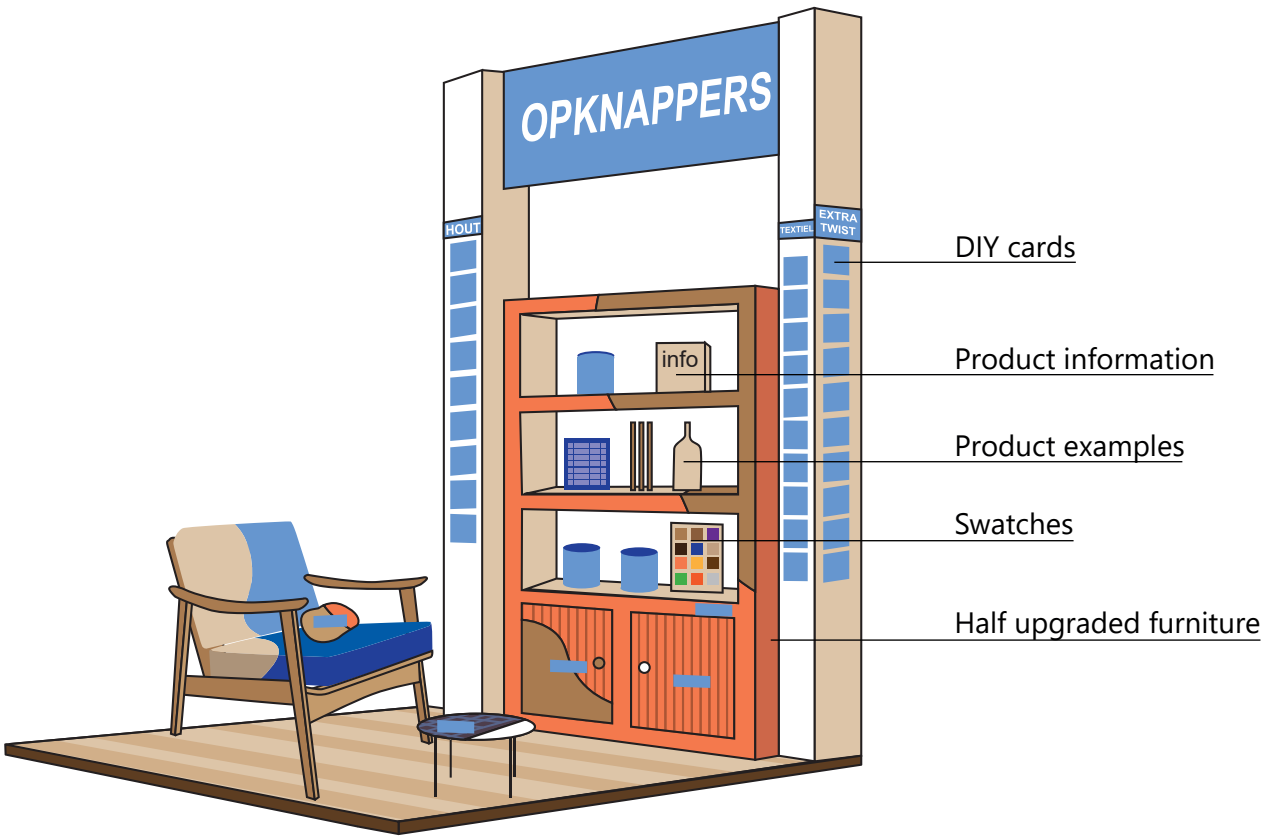


Figure 63: Improved exposition + store shelf

Stimulating teamwork by WhatsApp messages

A second improvement focuses on promoting teamwork. The DIY cards and visualisations in the app could include links which generate pre-written WhatsApp messages asking others for help. As depicted in Figure 64, the messages are aimed at the two positive aspects of teamwork as identified in the research: increasing knowledge and confidence.

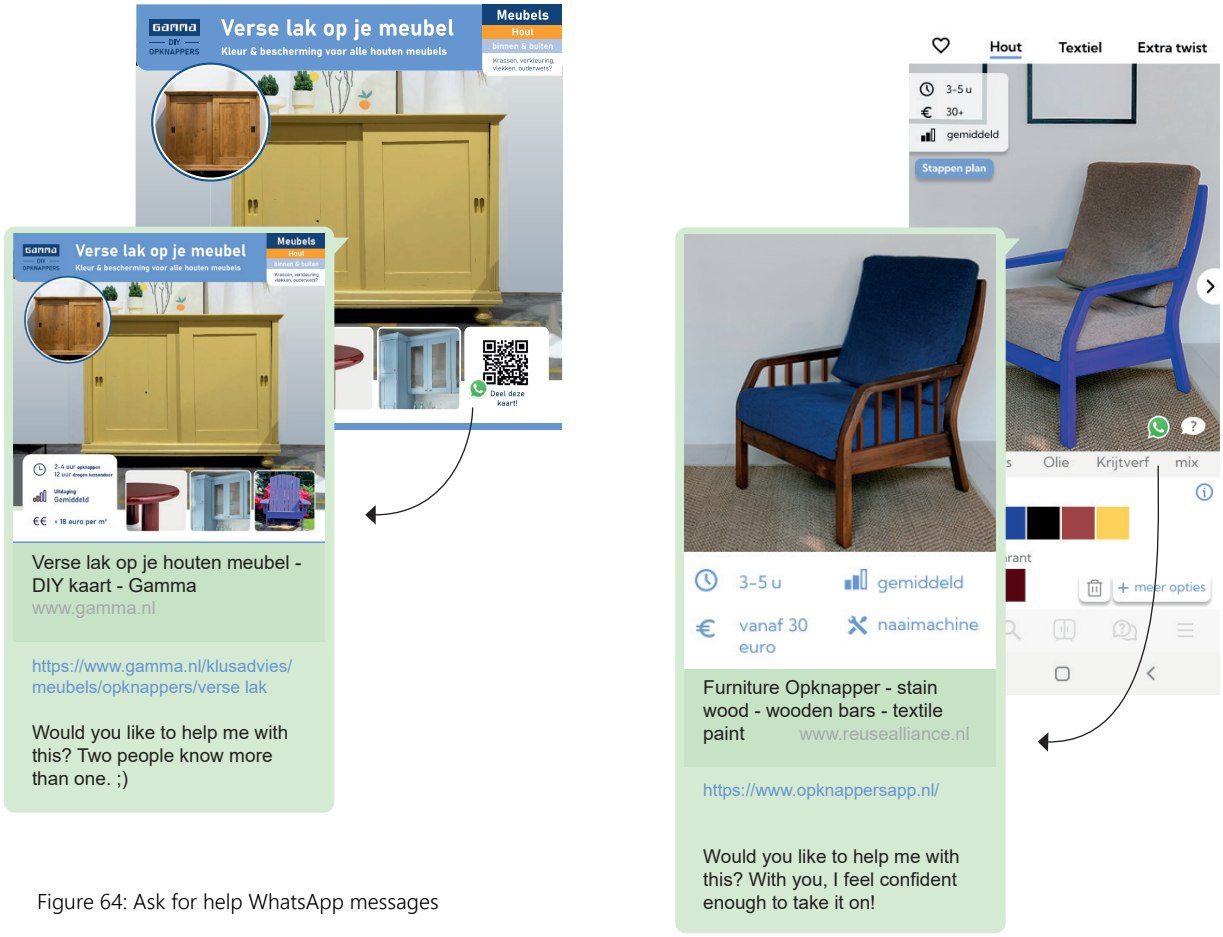


Figure 64: Ask for help WhatsApp messages

Videos in app & websites

Several participants in the user test expressed a preference for tutorials in video format. These can be added to the step-by-step plan in both the Opknappers app and the Intergamma websites. The videos could be made in collaboration with social media influencers.

10.4.2 Recommendations

Additional effort for promoting teamwork

It is expected that more steps are necessary to encourage consumers to towards teamwork. Therefore, further research and development of plans are needed in this area. By scaling up teamwork, the fun factor of DIY activities can simultaneously be improved, as DIY becomes a socially enjoyable activity. Two ideas are presented below which could be considered.

- Gift packages for DIY furniture repair/upgrade activities that consumers can give each other for occasions like housewarmings. Within this package, a voucher for supplies or the supplies themselves can be included (when the giving person knows exactly what the recipient still needs). Additionally, the person presenting the gift can offer their help in completing the task.

- Hosting workshops or providing workspaces focused on repairing/upgrading of people's smaller, easily transportable furniture items. In the workshop location, all necessary supplies and an expert will be available to assist people. Additionally, the space and could be set up as a relaxed environment where individuals can come on weekends to enjoy their DIY projects in a social setting with nice food and drinks. An additional idea is to incorporate these spaces into thrift stores so people can buy and upgrade a second-hand furniture piece before taking it home.

Detailed communication approach

It should be further explored which tone of voice and content are most suitable for communication with users via different social media platforms, the Intergamma websites and promotion materials in the shops.

The focus should be primarily on encouraging people to make a plan and to collaborate. Additionally, it may be effective to address the sensitivities of the target group that were identified in the research. For example, it can be impactful to highlight the positive emotions that result from DIY, social status, and the potential for unique results. Furthermore, consumers were found to appreciate recognition for their sustainable behaviour.

Lastly, it can be beneficial to target Opknappers promotions on specific moments in the year, such as holidays when many people have time for DIY projects.

Most effective DIY topics and tutorials

Further research is needed to determine which specific DIY activities should be featured on the DIY cards, websites, and social media. These activities should fit the interests of the target group by aligning with current trends and with the amount of money and time consumers are willing to invest. Additionally, it is important to research the environmental impact of different DIY's, targeting furniture items that are often disposed, and using environmentally friendly upgrade methods are particularly desirable. Lastly, in the tutorials, attention should be given to covering preconditions of the DIY methods so that consumers understand on which materials they can apply the tutorial.

Further development of the app

A final recommendation is to spend multiple rounds of testing and refinement for developing the Opknappers app and making it a well-functioning, user-friendly application. Additionally, it could be explored whether the visualization functionality can be integrated into platforms like Marktplaats so visitors of this website can instantly see how a second-hand piece of furniture could be upgraded.

11

PERSONAL REFLECTION

Looking back on my thesis process, I feel very positive about the experience. Firstly, the subject aligns very well with my interests. I enjoy it a lot to work on DIY projects in my free time, so diving into furniture repair/ upgrading, and meeting with experts, was amazing. Additionally, I would like to pursue my design career in the field of circularity, so this project was a perfect fit for me.

Furthermore, all the opportunities I received through my supervisors greatly contributed to my positive experience. They helped me to get into contact with Ambacht Centres, Intergamma, researchers, and gave me the opportunity to participate in and present at meetings of the Reuse Alliance. I found it very exciting, valuable, and motivating to interact with all these stakeholders. Also, I am thankful for how smoothly the networking process went as this can be challenging sometimes. Additionally, I enjoyed the project because it was very fun to spend my final study days together with other graduate students at IDE and with the interns and employees at I&W.

Alongside these positive aspects, I have gained a few learning points. Firstly, I noticed that due to my enthusiasm about the collaboration with Intergamma, I would sometimes prioritise their feedback in making decisions. It is important to take along their feedback but I have learned the importance of also incorporating my research finding and personal opinion. Besides, I discovered that it can also be valuable to surprise or convince a company with a design proposal that may not align with their initial plans but suggests a new direction.

I enjoyed working independently on this thesis. However, I sometimes questioned if I was too independent and was asking too little feedback. Luckily, I didn't face significant obstacles where I got stuck, so there were no situations in which feedback was very urgent. However, I do realise that I could have asked for the expertise of my supervisors more often to optimize my approach or to identify aspects that I may not have handled well and did not realize on my own. My learning point is that my work improves a lot through feedback, I need to be open to it, and should not hesitate to ask if someone has time, they can always say no.

The biggest challenge for me was writing the report. I really enjoyed spending time on research and design activities. As a result, I did not make much time for documentation along the way. In the end, I had difficulty with putting all the activities into a well-structured story and I struggled with distinguishing between what is, and is not relevant to highlight. I think writing this report was a good exercise for me, and I learned a lot from the feedback of my supervisors. For example, I learned that it is more efficient to first work on a clear structure and then write the texts in more detail, otherwise you keep rewriting.

A final challenge that more often arises in my projects is planning. I tend to make ambitious plans and realize later that the execution takes more time. This was also the case with writing this report. Thankfully, things usually turn out well when I work hard, but I need to remain critical on which steps are necessary and which are not, so the quality of the end result is not compromised.

Lastly, a positive aspect worth mentioning is that I was pleasantly surprised by the outcomes of the brainstorm sessions with experts and students. It was enjoyable and participants shared ideas and insights that I would not have come up with on my own.

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