

Under Construction: Repair and Rework Kit

Exploring Needlework, DIY, and
Sustainable Fashion

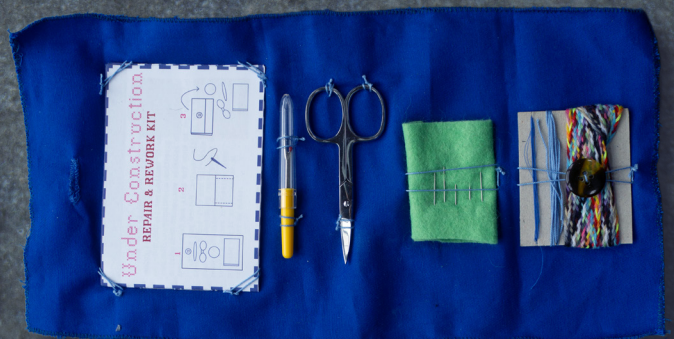
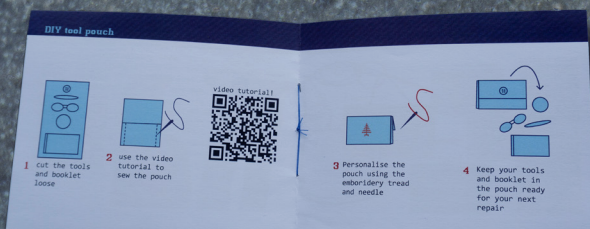
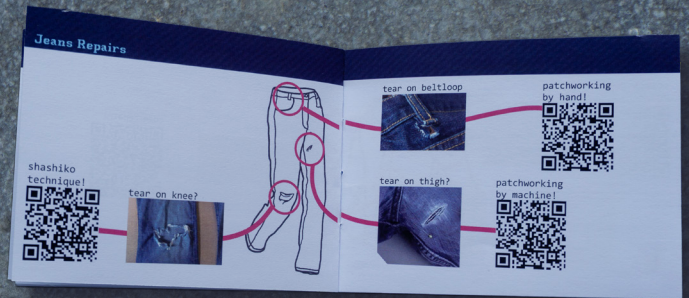
*Master Thesis by
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PREFACE

There are many things that inspired me to start this project about needlework. One of the biggest contributors to this is my grandma. She taught me how to be creative with textiles. When I was small, she would always teach me ways to create something new from an old clothing. It would be a waste to just throw it away! There is always a potential behind an out-of-date clothing piece, and this is notion is also at the core of my project with the rework practice.

Historical research is also a big part of this project. I was inspired to use it for this project during a research elective together with Jeff, my chair. In this elective I was free to explore this method and create my own project.

I want to thank all my friends and family for supporting me during my thesis. There was, always someone I could brainstorm with or chat to. Thank you to my sister and mom for playing in the video for the showcase of this project!

I am also very thankful for the supervisors of this project. I was always happy to share my ideas and talk things through with my chair Jeff and love. This helped a lot, also during the historical research. Thank you for inspiring and encouraging me throughout the process! Ianus Keller, who kindly stepped in later in the project and helped during the finalisation of the concept. His insights improved the concept and evaluations a lot.

Special thanks to Bregje van Eekelen, who acted as chair in the beginning of the project. Her thoughtful and sharp insights helped a lot to think critically of the research and topic of this project

ABSTRACT

The current fashion industry is characterized by overconsumption, disposability, and a loss of knowledge about textiles. This thesis investigates how needlework, which was once a more prevalent, can be repositioned through design to support sustainable fashion practices, particularly among young people in the Netherlands. Through a combination of historical research, stakeholder interviews, and design, this project explores how repair, rework, and DIY culture can contribute to garment longevity and empowerment.

The research identifies that while young people are increasingly interested in sustainable fashion, many lack the skills and knowledge to repair or rework their clothes. At the same time, traditional education and commercial systems provide limited support for developing these practical skills. Drawing from these insights, the final design concept is the “Under Construction: Repair & Rework Kit”. This is a hands-on toolkit that introduces basic needlework skills through an accessible and guided experience. The kit encourages users to make their own tool pouch before moving on to repairing garments, lowering the barrier to entry, as this step introduces them to key techniques needed for repair. The kit is available as an opensource resource, so expert needleworkers can create a self-made kit, to gift to beginner needleworkers.

The evaluation of the prototype demonstrated that the kit has value to beginner needleworkers, who perceive their lack of knowledge as a barrier. Repair and Rework practices are threatened by the guided experience of the kit. There is also a personalisation step that empowers users to take ownership of their kit. This highlights how design can facilitate learning-by-doing and foster a sense of agency in sustainable behavior. This thesis shows that design interventions rooted in needlework and DIY can revive lost knowledge, promote sustainable consumption, and contribute to personal and environmental well-being. Ultimately, by reconnecting people with the process of making, we can challenge the fast fashion model and inspire more meaningful relationships with our clothing.

GLOSSARY

Sustainability: This is a complex term that is defined by many scholars in different ways. For this thesis, sustainability is viewed as reducing waste to benefit the environment and climate. However, in the context of textiles, Sandra Niessen's view of Regenerative Fashion is also used.

Regenerative Fashion: This term was taken from the anthropologist Sandra Niessen. She explains that she views sustainable fashion as something that is restorative for both nature and culture. This means that not only are textile materials treated in an environmentally conscious way, but knowledge about textiles is also restored and preserved. Achieving this is one of the overarching goals of this thesis.

Textile: Simply put, this term refers to a woven or knitted cloth. However, a more comprehensive definition is: any material made from fibres, filaments, or yarns—natural or man-made—produced through interlacing. Textiles are central to this project, and their history has played an important role in guiding the design process.

Fibres, Filaments and Yarns: Textiles are made up of smaller components. Fibres are raw materials, such as wool from sheep or cotton from plants. Filaments are also raw materials, but unlike fibres, they are long and continuous strands made through extrusion. Fibres are typically short, while filaments are unbroken. Both fibres and filaments can be spun together to create yarn, which can then be used to weave or knit fabric.

Fashion: This term is defined by the cultural impact it has on society. In comparison to clothing, which refers to the practical garments people wear, fashion refers to the overarching trends or styles of clothing. Fashion is also a tool for expressing one's identity or taste.

Needlework: This term refers to work done to manipulate textiles using a needle-like tool, often by hand. Examples of techniques include weaving, knitting, and sewing.

Ready-made / Ready-to-wear: These terms refer to clothing that is manufactured to be fully finished and ready to purchase. In contrast to custom-made clothing, ready-made garments are not fitted to the individual wearer but come in standard sizes.

Repair: This refers to fixing items that were previously broken. In this thesis, the term is especially focused on repairing clothing and textiles.

Rework: This term refers to changing a clothing item or textile product in terms of function, purpose, or design. For example, an old tablecloth could be turned into a hand towel (change of function), a pair of jeans into gardening pants (change of purpose), or a dress could be given new embellishments like sewn-on appliqués (change of design). The reworked item may have been broken or worn out, but this is not always the case.

DIY (Do It Yourself): This term is used for the activity of decorating, repairing, or making things on your own, instead of hiring someone else to do it. While DIY can apply to home projects, in this thesis it generally refers to textile-related practices.

Amateur Making: Similar to DIY, amateur making refers to craft activities done by individuals who are not professionals. These creations are often made for personal use.

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I. Introduction

This chapter outlines the problem statement, the assignment, and the research questions that guide this project. It also introduces the design direction and presents the final design concept. A brief overview of the preliminary historical research is included to provide context. Finally, the chapter offers a reading guide to help the reader navigate the rest of the thesis.

1.1 PROBLEM DEFINITION

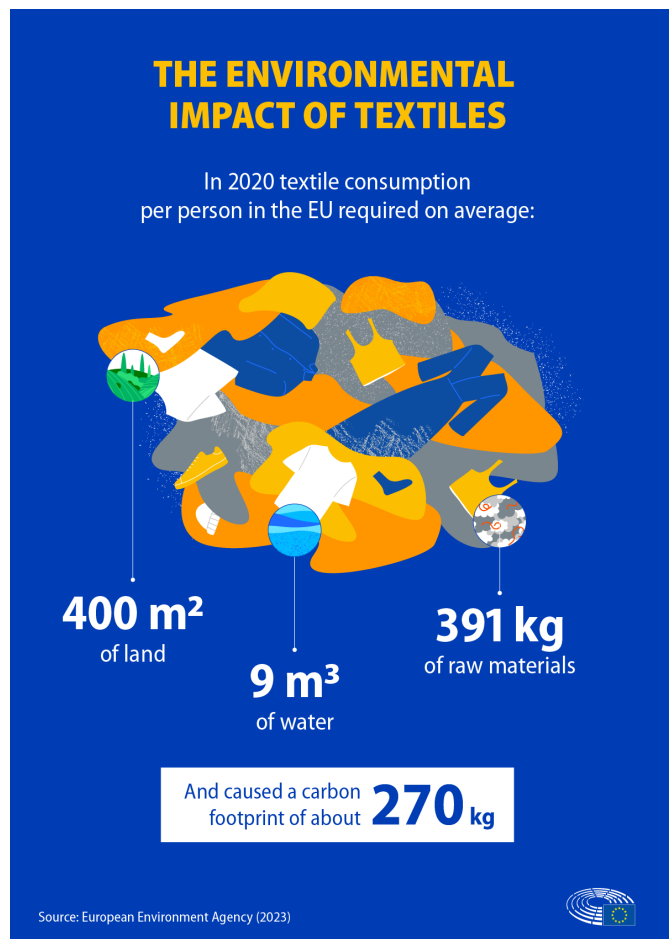
The effects of the fast fashion industry on society are not new. Today, the clothes we consume are cheap and trend-driven. However, concerns about this type of consumption have existed for a long time. As early as 1924, the author of the *Principles of Clothing Selection* voiced concern about the rapid turnover of fashion, noting that “fashion changes so rapidly that garments are discarded long before they are worn out” (Buttrick, 1924).

Around the 1900s, the way clothing was made began to shift. The industry transitioned to a production method from primarily custom-made garments to ready-made garments. This transition allowed clothes to be produced faster and at a lower cost, but it also changed how people relate to their clothing. Today, our relationship with textiles is more distant. Garment-making is often seen as a thing of the past — something associated with our grandmothers. The knowledge of textile craft has faded from everyday life as a necessary means to save money.

In the early 20th century, some durable fabrics were still produced locally in the Netherlands. For example, wool blankets were made in Tilburg (Jenkins, 2003), and flax was grown in Zeeland to make linen (Riensema et al., 1990). However, by the 1980s, the production of wool and linen had largely moved to low-income countries (Janssens, 2001; Riensema et al., 1990). While this shift is not inherently negative, because this global shift also allows for exchange in culture and knowledge, it has distanced many of us from the craft and knowledge of textile production in daily life.

Fast production of clothing and textiles has both pros and cons. On one hand, fast fashion makes clothing more affordable and accessible to a broader population. Since clothing is a basic necessity, lower prices can give more opportunities for people with lower incomes to meet their needs regarding textiles and fashion. On the other hand, the

Figure 1: The environmental impact of textiles (European Environment Agency, 2023)



system contributes significantly to environmental degradation. One particularly harmful aspect is the creation of excess waste through discarded garments. The average textile consumption of a person in the EU can involve up to 391 kg of raw materials(Figure 1) (European Environment Agency, 2023).

It is evident that the current fashion system needs to change in some way. Textile has become more disposable and this has an affect people and planet. To find sustainable solution within the confines of a system that is growth based is challanging. Sandra Niessen, pleaded for innovative solutions that look for “regenerative fashion” that is restorative for culture as well as for nature during the 2021 State of Fashion biennale (Niessen, 2020). She explained she saw the effects of the fashion system in the villages of Indonesia. People were losing the knowledge of their traditional textile craft, because a of the young people had to move to out of their village to work at the clothing factories.

Projects that regenerate knowledge and skills, not just materials, are also inmportant to building a more sustainable future. The unsustainable structure of the textile industry is, in part, sustained by a lack of public awareness about how textile products are made (Lee et al., 2017). The “out of sight, out of mind” mindset enables unethical practices in environmental management, labor, and waste (Niinimäki et al., 2020).

In the past, textiles played a much larger role in daily life. Spinning your own yarn, knitting, sewing, and repairing clothes were common activities done at home (National Women’s History Museum, 2016). In school, woman were even taught basic sewing and repair techniques in school (Visser & van de Garde, 2013). Although, textile craft never really went away, it does dip in and out of popularity. For example, since the pandemic there has been a resurgence in textile craft. People began to practice more needlework hobbies like crocheting, sewing and knitting, when they had more time on their hands. This more environmentally conscious resurgence goes hand in hand with a growing ultra-fast fashion industry of companies like Shein and Temu.

This resurgence in textile-making is encouraging, yet most people still lack the basic skills to create or repair garments. This is concerning, as gaining these skills may be a key step toward more sustainable textile consumption. Strengthening needlework and other textile skills may serve as a tangible way to counteract the disposability of fashion.

This thesis investigates how engaging with needlework can contribute to more sustainable fashion consumption, particularly through design interventions that reconnect people with the value and process of making. By exploring the intersection of craft, design, and sustainability, this research aims to highlight how hands-on practices can empower individuals and support creating less waste within the fashion system.

1.2 METHODOLOGY AND RESEARCH QUESTIONS

The main goal of this project is to explore how design can strengthen the practice of needlework among young people in the Netherlands. Within this problem context, there is a clear opportunity for a design intervention. Strengthening knowledge and engagement with needlework in relation to sustainability is an abstract challenge; a design intervention can provide a tangible, practical example that actively engages with the issue. Furthermore, the fashion system is complex and deeply interconnected with human behavior. Design offers the potential to create interventions that involve people directly, making space for new practices and perspectives to emerge. to reach this goal, the project is divided into three phases, based on the Basic Design Cycle by Roozenburg & Eekels (1995). Figure XX provides an overview of the full process followed during the project. The phases consist of a research phase, an ideation phase, and an evaluation phase, as shown in Figure 2. According to the Basic Design Cycle, it is essential to investigate the context of the problem in order to establish criteria that will guide the design process. Once these criteria are defined, an iterative process begins, where potential solutions are developed and evaluated. In this project, the research phase concludes with a proposed design direction. This direction then informs the ideation phase, during which multiple iterations and evaluations lead to the final design concept. In the research phase, several approaches were used to explore the context of the problem. The phase began with an exploratory historical analysis of the relationship between people, needlework, and clothing in the 19th and 20th centuries. To gather this information, the archives of the Textile Museum were consulted, and a historian with expertise in textiles was interviewed, alongside additional online research.

This historical exploration helped refine the understanding of the problem definition. The data was used to trace how the issue has evolved over time and to provide essential background context. This pool of information also served as inspiration throughout the design process. Additionally, it informed the development of the research questions, which are introduced at the beginning of each chapter. The research questions developed are as follows:

Main research question:

1. How can design strengthen the practice of needlework for the young people in the Netherlands?

Sub research questions:

- 1.1 How can needlework contribute to sustainable fashion?
- 1.2 What opportunities are there to strengthen the practice of needlework?
- 1.3 How can a design intervene to strengthen needlework?

Sub research question 1.1 is important to create a basis on using needlework as a method to create more sustainable practices within the fashion system. This will give insights on how to approach designing a product that enhances the sustainable aspects of needlework. The method used to answer this question was to do a literary study. The book *Historical Perspectives on Sustainable Fashion: inspiration for change* by Twigger Holroyd, Farley Gordon and Hill was used as a starting point and additional literature was gathered to broaden the perspective within this research question. The historical literature found was partly used in answering research question 1.1, for example.

Sub research question 1.2 was important to explore the system of sustainable fashion in the Netherlands and gain insight into the stakeholders of the context. The results of this research section were used to discover opportunities that could be used as a starting point for the design process. In addition, to online

research and literary research five stakeholders were contacted and interviewed and a networking event about repair was visited.

Sub-research question encompasses the final design and the evaluations done during the design process. The main methods used to explore how design can strengthen needlework we prototyping and evaluating the design concept with users. The design process and methods will be further explained in Chapter 3 Paragraph 3.1.

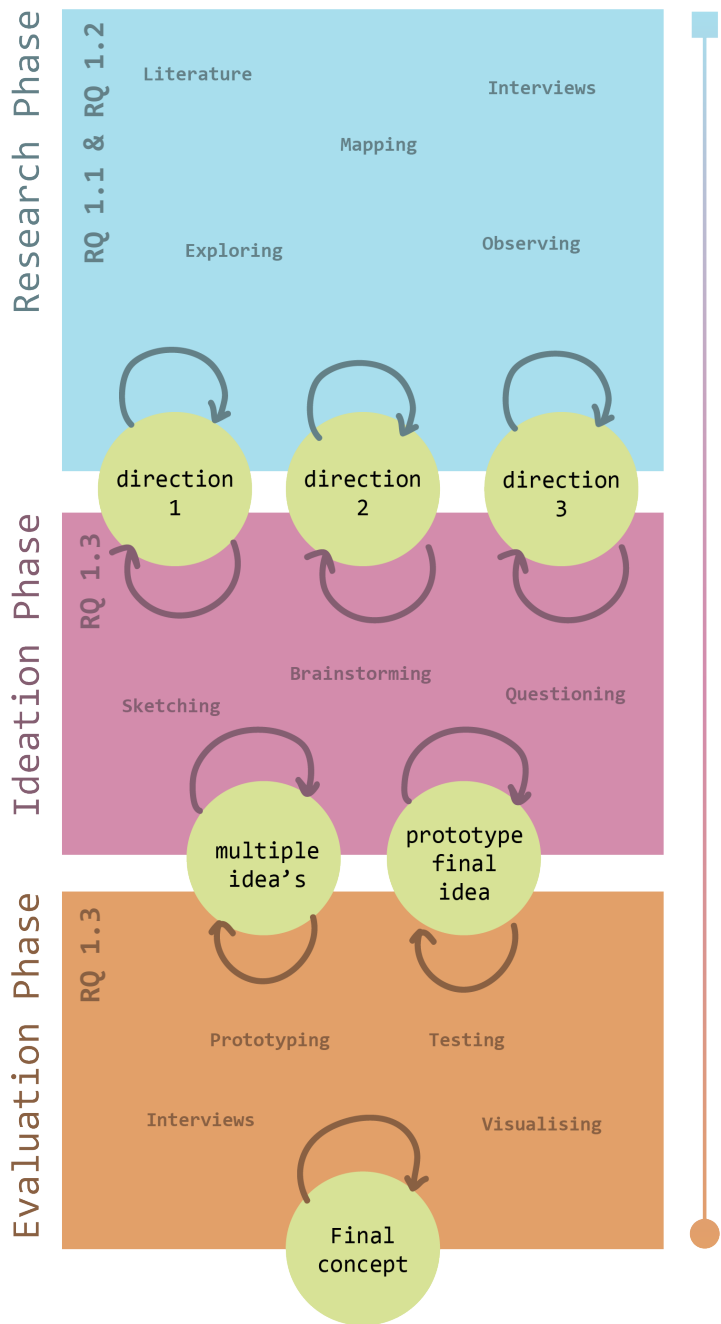


Figure 2: Overview of Design Process

1.3 DESIGN DIRECTION AND GOAL

The final design direction for this project focuses on empowering young people to learn repair and rework skills within the context of needlework. The goal is for young people to gain hands-on skills they can access when needed and build upon over time. This supports longer garment lifespans and helps reduce unnecessary textile waste. There is an opportunity to focus on young people who are interested in sustainability but lack the knowledge or confidence to begin repairing or reworking their clothing. Additionally, there is potential to streamline the needlework learning experience, making it both comprehensive and hands-on. The aim is to create an accessible, engaging learning journey that makes it easier and faster to get started with needlework.

Therefore, the design goal is:

to design an hands-on and streamlined experience that empowers young people (18-25) to learn about needlework in the Netherlands.

There are also broader goals that the design could address. This project aims to contribute to a more sustainable fashion system, so it is important to ensure that the design itself generates minimal waste. However, this also means creating an instinct to repair or rework clothing in people. Making repaired or reworked clothing more standard in fashion land. Empowering people to take fashion into their own hands (Twigger Holroyd 2013).

Additionally, there is an opportunity to highlight the value of making, which is often underrepresented in education. Introducing a DIY element into the design could support both of these goals. DIY not only promotes sustainability but also creates space for developing making skills. This approach can help extend the life of garments, support the user's well-being, and offer a meaningful opportunity for self-expression.

There is also a broader goal to create a solution that is restorative for both culture and nature, as mentioned in the problem definition in chapter 1 section 1.1. Sandra Niessen (2020) argues that knowledge and skills should be preserved in a way that remains connected to nature. In line with this, the design should place emphasis on empowering people to gain access to the knowledge and skills of needlework, ensuring that these practices are passed on and valued in a sustainable future.



1.4 HISTORIC BACKGROUND

This section briefly presents key insights from the historical research that influenced the development of this project. The research began with the question: What is the relationship between people and textiles, both in the past and present? Several important factors that shaped and transformed this relationship over time will be discussed, along with how they influenced the perception of textiles within the context of this project. Insights from the textile historian interviewed during the research phase are also included in this section.

Knowledge and skill

The relationship between people and textiles has been important for a very long time. An example of this can be seen in one of the oldest letters ever found. A private letter, carved into a stone tablet from the 20th–19th century BCE, shows a dispute between two people about their textiles. The text reads:

“Why do you always write to me? The textiles that you send me each time aren’t good! Who is this person living in your house and denigrating the cloth that I send you?”

This quote illustrates that textiles were not only widely traded but cases some personal reactions. Textiles have been an item of trade for a long time. Fabric would have been woven on a handloom by a craftsperson, often over many hours (Good, 2001). While the maker of the cloth mentioned in the letter may not have met expectations, the effort and labour for a single piece of cloth does exceed what is typical in today’s fast fashion production. Craft was essential in textile production, with every step requiring its own tools and techniques. The knowledge of how to do these crafts can still be important today.

The historian contacted for this project emphasized the importance of understanding how textiles are made and how this knowledge influences the way we buy clothing. They compared it to visiting a market:

“You look at the fruit and vegetables, you make sure you have a ripe and fresh one. Each vegetable is different, and you know what to look for. With textiles, it’s different. People are rarely taught by their parents’ which textiles are good quality or how to care for their clothes.”

This example shows how knowledge changes the way we interact with everyday items. Needlework, as a hands-on craft, offers direct experience with textiles and helps build this kind of awareness. A hundred years ago, people generally took better care of their clothing because it was more expensive and valuable. Today, that same care could be encouraged by reconnecting with the skills involved in textile making. The historian suggested that needlework is a skill that could fit into modern life again, influencing the way we care for our clothing.

It is interesting to see how ready-made clothing, globalization, and the rise of the fashion industry have shaped the textile system into what it is today. This project focuses the knowledge and skills needed to work with textiles in order to take better care of clothing.

Needlework Technique and Tools

The technique of repairing textiles sits within the world of needlework. It was established that under this term there are a range of techniques used to manipulate fabric. What’s interesting is that these techniques are not only decorative, but also functional. Many of them can be used for both embellishment and repair. For example, patchwork can be used to create a quilt with a beautiful pattern, but also to cover up a hole in the knee of your jeans. Even though there’s often a sense of stuffiness or tradition attached to needlework, it actually offers a lot of room for practical repair as well as personal expression.

Needlework, as the name suggests, involves using a needle. This also extends to modern tools like sewing machines, looms, and knitting machines, they all still rely on some form of needle. These machines still need human involvement, because the work they're doing is so intricate. Textile structures are complex, and that complexity means full automation isn't always possible. For instance, there's still no machine that can exactly replicate crochet, so if you buy something crocheted, it's most likely made entirely by hand.

The techniques and the tools used in needlework are closely tied to how we relate to our clothes. It's not just about function or decoration; it's a mix of both. In this project, that mix is explored to think about sustainability in fashion. Tools play a big role in how we work with textiles, and that idea was part of the thinking behind the repair kit.

Connecting though needlework

Doing needlework is also a way of connecting with others. During wartime, for example, men, women, and children would gather to knit clothing for soldiers. Whole communities came together to make socks and sweaters. This shows that needlework can be more than just a solitary activity; it can also be something shared.

This kind of social connection still exists today. Stitch and bitch groups, for instance, are gatherings where people do needlework while socialising. These activities create space for conversation and community, with the act of making at the centre.

Needlework skills are often passed down through generations, similar to how a family recipe is shared. Many people learn to sew from their parents or grandparents, making it part of family memory and tradition.

Needlework has also been used to tell stories. Old tapestries, for example, often depict historical events or everyday scenes, combining craftsmanship with narrative.

All of this shows how needlework connects people in different ways: through shared activity, generational learning, and storytelling. While this theme was not the focus of the project, it remained present in the background.

1.5 READING GUIDE

This reading guide provides an overview of the structure of the thesis and can be used to locate specific information. The thesis is organized into four chapters, each contributing to the understanding and development of the final design.

Chapter 1 – Introduction

This chapter introduces the project and presents the background necessary to understand the rest of the thesis. It includes the problem definition and outlines key factors that influence the development of the project. Additionally, the assignment and overall design direction are introduced to set the stage for the design process described in Chapter 3.

Chapter 2 – Contextual Research

This chapter presents research into the context of the project and concludes with the proposed design direction. Sub-research questions 1.1 and 1.2 guide the first two sections:

- Section 2.1 explores why needlework could serve as a strategy for a more sustainable fashion system.
- Section 2.2 examines opportunities within the sustainable fashion landscape in the Netherlands.

The chapter concludes with a summary of insights and the presentation of the chosen design direction.

Chapter 3 – Design Concept and Evaluation

This chapter presents the final design concept and outlines the design process and methods used. It begins with the instruction of sub-research question 1.3 an overview of the approach, followed by a detailed introduction to the concept. Key elements of the physical design, user interaction, and stakeholder involvement are highlighted. The chapter concludes with the results of the evaluations conducted throughout the process.

Chapter 4 – Conclusion, discussion reflection

The final chapter provides overall conclusions drawn from the research and design work. It also offers recommendations for future design iterations and research. Limitations of the project and other discussion points are addressed, along with a personal reflection on the thesis process.



2. CONTEXT ANALYSIS

This chapter contains the research results of the research question 1&2 into the context needlework and sustainability in the Netherlands. First, this chapter will delve into how needlework can contribute to a more sustainable fashion system. Secondly, the context of the Netherlands and the stakeholders involved will be explored and opportunities that arise will be highlighted. To close, the chapter will summarise the findings of the research and discuss the direction of the design phase.

2.1 NEEDLEWORK AND SUSTAINABILITY

The simplest definition of a textile is a woven or knit cloth, as defined by the Miriam-Webster (2025). However, when looking at a more comprehensive definition, it becomes clear that textile craft is more complex than it seems. As in the standard handbook of the British textile industry, a textile can be defined as: “any manufacture from fibres, filaments or yarns, natural or man-made, obtained by interlacing.” (Hall, 1950)

This interlacing of yarn creates the a abundance of possibility in the a variety of techniques and the types of applications. Figure 3 shows an overview of different techniques, including weaving, crocheting, felting, and knitting. These techniques can be used to create different types of cloths with different properties. When done by hand, all of these require some type of needle to create or finish. Therefore, needlework is essentially defined as textile work done with a needle. Some kind of needle tool is present in almost all the techniques included under the term. Besides the techniques mentioned earlier in this paragraph, others like sewing, patchwork, and embroidery are also considered needlework.

These techniques also made it possible to create all kinds of objects useful in daily life throughout history. You can make clothes to stay warm. You can twist rope and weave cloth for shelter. It's even possible to make baskets to store food in, by weaving plants (Good, 2001). Although baskets, rope, and cloth are still useful objects today, most of us are now further removed from the making of these things. Compared to life before the Industrial Revolution, today's textiles are largely produced with the help of machines, although much of the work still involves manual labour compared to other sectors (European Environment Agency, 2022)

Yet, the making or manipulation of textiles is no longer something embedded in our daily lives. Needlework, for many, might seem redundant, a hobby used to make decorative items. We have machines now, and we can pay others to do it for us. Does needlework contribute to our modern life and can it benefit the sustainability of the planet?

Sub-research question 1: How can needlework contribute to a more sustainable relationship with clothing?



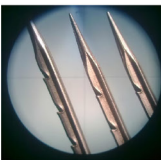
Weaving



Knitting



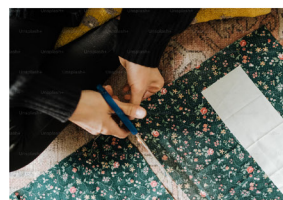
Crocheting



Felting



Sewing



Patchwork



Embroidery



Darning

Figure 3: Needlework techniques overview

2.1.1 Resue, Repair and Rework

Fashion now often operates within unsustainable systemic structures. Examples include planned obsolescence, rapid trend cycles and the intentional discarding of items to preserve exclusivity of the brand. There are many facets that can be addressed to improve the system. The life cycle of a clothing item involves several stages, from raw material extraction to the end of life (Munasinghe, 2021), as illustrated in Figure 4.

At each of these stages, there are opportunities for improvement. For instance, using less harmful materials and production methods, minimizing waste in the design and manufacturing processes, and improving labour practices and the treatment of animals all contribute to greater sustainability. These aspects can be regulated to varying degrees by companies and governments, for example, through environmental standards, labour laws, and cor-

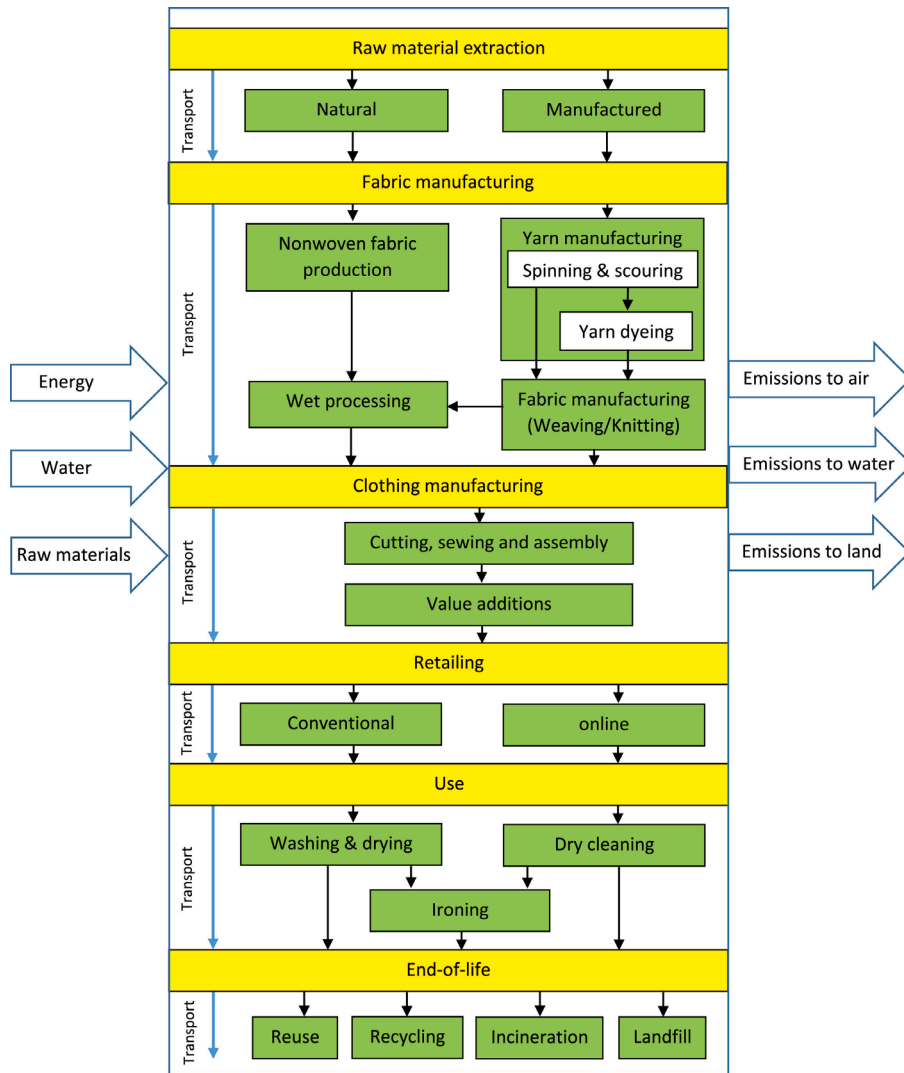


Figure 4: A generic life cycle diagram for clothing. (Munasinghe 2021)

porate sustainability policies. However, once a garment reaches the user, it is up to them how to interact with their wardrobe, and to some extent less regulated. Decisions about care, repair, reuse, or disposal are largely left to individual choice. In this context, the role of needlework becomes particularly interesting, because it can play a role in the care of a garment.

Ideally, clothing would be worn for as long as possible; new items are purchased. Reusing, repairing and reworking are ways to extend their lifespan. Reusing an item can take many forms like passing clothing to friends and family, donating it to charity or reselling. However, repeated use naturally leads to wear and tear, creating the need for repair. To prevent items from being discarded prematurely, due to a small tear or a loose button, repair becomes essential. The ideal result of extending the lifespan of a clothing item is a reduced environmental impact, achieved through less waste and lower levels of consumption.

Many needlework techniques can be used to repair clothing and textiles. Darning, for example, is a method primarily used to mend holes in fabric. It can create a seamless patch by

imitating the original weave or knit structure of the garment. This technique was an important component of needlework education in the 18th and 19th century. Figure 5 shows a darning sampler, which was used to teach young girls how to repair textiles.

However, there are many possibilities when it comes to repairing textiles. While darning is considered a more “proper” technique, used to repair holes in an invisible way (Figure 6),



Figure 6: The invisible technique of linen darning is worked on the wrong side of the fabric by laying in a warp and weaving a plain-weave weft across. (Boe, 2022)



Figure 5: Stoplap van Catharina Johanna op den Dijk at Zeeuws Museum, 1779-1780 (Wennekes, 2021)

there is no correct method for mending. Movements such as visible mending demonstrate that repair work does not have to be monotonous. This movement is an active resistance against consumer culture and promotes a refusal to wear clothing that conforms to the conventional standards (McGovern & Barnes, 2022). Instead, this type of mending embodies the idea of mending as something beautiful and something that should be visible (Figure 7).

Similarly, the Japanese technique of sashiko (Figure 8) offers a traditional form of decorative mending. Originally used to reinforce workwear, sashiko combines embroidery with fabric patches, adding both durability and visual interest to garments (Hayes, 2019).



Figure 7: Visible mending (Fulop, 2024)



Figure 8: Sashiko Kimono: Sashiko Kimono Meiji period (1868-1912) Metropolitan Art Museum

Another way to approach extending the lifetime of a garment is by reworking or altering. This can involve adjusting the size and fit, or even transforming the item a new purpose. In the 18th century, for instance, reworking clothing was an effective way to save money, because the cost of textile exceeded the cost for the labour needed to alter. As a result, hand-me-downs were often altered to fit changing styles. Women's skirts, for example, could be repurposed into men's vests or children's garments (Baumgarten, 1998). Large pieces of fabric, such as skirts, petticoats, or shawls, were frequently passed down like heirlooms, prized for their rework ability. This is demon-

strated by a dress (Figure 9) and corresponding handbag, made entirely from repurposed paisley shawls. (Twigger Holroyd, 2023). A modern example of reworking clothing might include sewing new pockets on to jeans or remixing two t-shirts (Figure 10). These types of alterations require sewing techniques, however Twigger Holroyd (2013) suggest that re-knitting can also be a way to rework clothing. In this way store bought knitwear a personal touch as well (Figure 11). Like mending, reworking can serve as an act of resistance against the status quo by rejecting the need to buy new clothing.

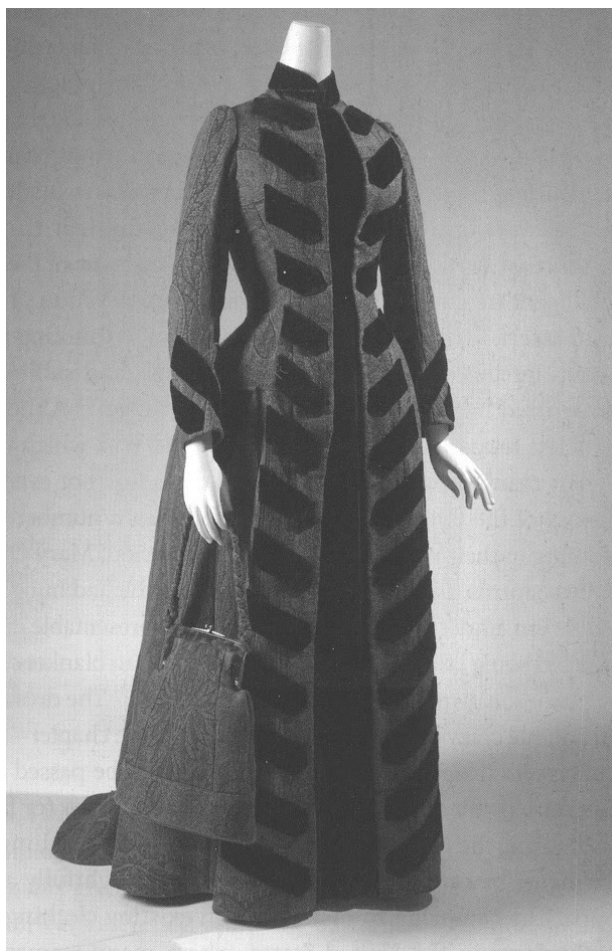


Figure 9: Shawl dress (Twigger Holroyd, 2023)



Figure 10: Rework jeans and shirt (Fixing Fashion, 2025)



Figure 11: Reworked sweater. The hot pink details are the rework additions. (Twigger Holroyd, 2013)

2.1.2 Amateur making and DIY

Doing needlework is part of an amateur making/ DIY(Do it your self) culture. It focusses not on pure readymade clothing ,but doing needlework means creating something yourself from scratch or add an embellishment yourself. The act of DIYing with textiles in an amateur setting can offer sustainability benefits. For instance, there are negative environmental and social impacts associated with industrial fashion production, such as pollution and exploitative labour practices, which are reduced or avoided for instance. The amateur maker preforms a part of the production themselves, in the creation of the garment. The fabric, if bought new, does not necessarily avoid the same negative impacts. Nonetheless, a stronger connection between amateur making and sustainability can be seen in the longevity of the garment and personal wellbeing, which includes self-expression, and a sense of empowerment.

Amateur making and DIY skills can contribute to the longevity of clothing by creating a new purpose for the item, was seen in in the rework examples in Figures 10-11. Adding an element of functionality, like new pockets or closures, or an element of novelty, like a new patten or decorative trim. Changing the garments purpose can extend the lifetime by using it for informal events like gardening or woodworking. Giving a garment a decorative element can change the way you see the garment and make more exciting to wear again.

In the context of industrial design, there is a

parallel with DIY and product personalisation. Figure 10 illustrates the connection between personalisation and a stronger emotional bond between the user and the product. When users personalise a product, they invest more time and effort into it, which can strengthen their attachment. Changing the appearance of a product, in particular, allows for self-expression and further deepens this emotional connection (Mugge et al., 2009). As a result, users may be more inclined to take better care of the product and keep it for a longer period.

The value of user involvement is also discussed by Hoftijzer (2011). They describes how incorporating a DIY element into user or product design can be a sustainable approach, especially when viewed through John R. Ehrenfeld's (2008) definition of sustainability. Customising a product supports personal development by encouraging skill-building and allowing for the expression of individual preferences, which contributes to human flourishing. When a product is tailored to personal needs, users are more likely to value and keep it, reducing the urge to purchase new items. This approach shifts production from a purely top-down process to one that involves the user in creation. As a result, the human-product relationship becomes closer, which can increase the user's care for the item and enhance its longevity. Needlework also has been shown to positively influence wellbeing, which is a key part of the United Nations (2015) Sustainable Development Goals. Supporting mental and social wellbeing is essential in working toward a more sustainable society. There are several ways how

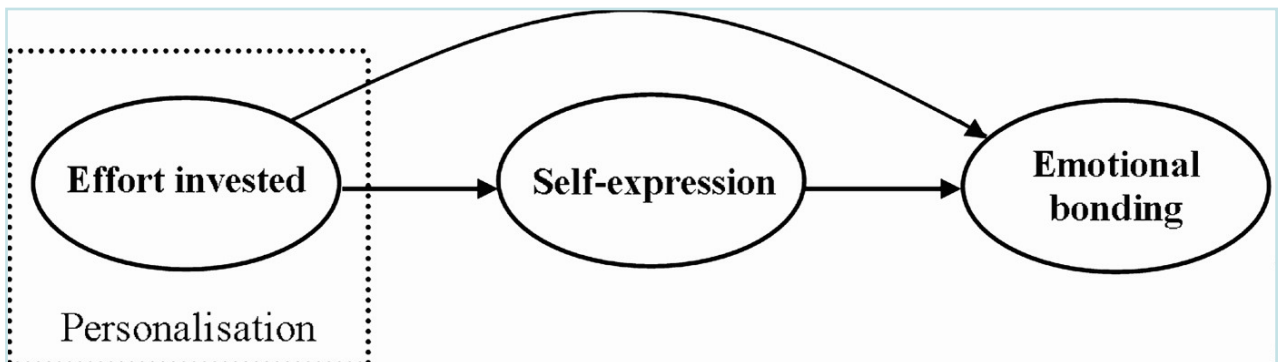


Figure 12: model emotional bonding (Mugge et al., 2009)

needlework can contribute to this. A study that compiled research about needlework and well-being shows that several eras are enhanced by doing needlework. The activity of needlework was beneficial in the mental wellbeing, because of the calming and meditative effect. However, needlework can also play a role in social connections, a sense of purpose and self-identity. Needlework can be a way to express yourself (See Figure XX) supporting your sense identity and sharing this interest with others can foster a connection. (Le lagadec et al, 2024).

DIY practices like needlework can reshape how we understand fashion itself, to empower users against overconsumption. Twigger Holroyd (2013) explores home-made and altered clothing as a form of folk fashion. Just as folk music is created by amateurs for their own enjoyment, fashion can also belong to the people. To extend this metaphor, she suggests viewing fashion as land, specifically as commons. Historically, commons were shared plots of land used collectively by communities, in contrast

to privately owned land. In this analogy, the clothing in our closets becomes the shared resource of fashion's commons, accessible and open to modification by anyone. Looking at fashion in this way challenges the traditional, linear system where designers produce and consumers simply buy. Instead, consumers can take an active role by altering, personalizing, or co-designing their garments. One example of this is the re-knitting practice shown in Figure 9, which supports sustainable engagement with clothing by sharing open knowledge on how to creatively rework knitwear. There is value in being able to have some agency of the things in your environment. In this way you the option does not always have to This way, you're not always limited to buying something that doesn't fully match your preferences. There's a certain power in making clothes yourself, or in repurposing and mending what you already have. It gives people more control over fashion, placing it in their hands instead of leaving it solely to big fashion companies.

2.1.3 Conclusion

Repair, rework, and DIY practices can play a valuable role in making fashion more sustainable by extending the life of garments. These activities not only resist the culture of over-consumption but also create space for personal expression and creativity, with no single “correct” way to mend or alter clothing. Giving a garment a new purpose can be personalised to the individual, shaped by someone’s needs, style, or story. Amateur making and DIY also encourage more mindful habits, with needlework in particular offering a calming, grounding activity. When time and care are invested, these DIY activities can strengthen the emotional bond with items, changing the way you care for them. Altering garments yourself can also empower individuals to take agency over their wardrobes by reinterpreting fashion on their own terms. In this way, needlework and DIY highlight the potential of personal engagement with clothing as a meaningful strategy for sustainable fashion.

2.1.4 Discussion

As stated in the conclusion, needlework can support a more sustainable fashion system. However, there are nuances to this approach. Repairing and reworking can save garments from being discarded, but these practices require a certain level of knowledge and skill. While this is not a strict requirement, it does affect the outcome of the repair, such as how it looks and how long it lasts. Experience helps in choosing the right technique for a specific purpose.

When visiting a repair café in Rotterdam for this project, it became clear why people came to such places. The experts were quick to suggest the best way to repair a particular hole or tear. They made decisions based on the material of the clothing and the size of the damage, selecting the most effective repair method. Home-making does not automatically create an emotional connection with a garment. As Mugge et al. explain, a significant amount of time and effort, along with self-expression, is

often necessary to form a bond between clothing and wearer. Twigger Holroyd (2013) also noted that home-made clothing doesn’t always turn out as expected, and this can result in the garment being discarded anyway. Amateur making also creates some waste. For example, leftover threads or mistakes made during cutting.

There is value in empowering individuals to take sustainability and fashion into their own hands. However, this raises questions about how responsibility is distributed. Individuals cannot be the only ones expected to act. Large corporations must also be held accountable for their role in creating more sustainable systems. What needlework offers is more than just an individual solution. It brings forward regenerative knowledge, supports wellbeing, and allows for self-expression. Ideally, it adds value to people’s lives without placing the full weight of responsibility on them alone.

2.1.5 Insights

From answering this research question, several insights have emerged that are important for the design phase. These will be further discussed in Section 2.3.

- Needlework becomes relevant when garments are in use. The way we interact with clothing can be improved in terms of sustainability.
- Repair and rework can be done through needlework. These two activities can improve both the longevity of garments and the wellbeing of individuals. However, they require knowledge and skill.
- There is no single correct way to mend. Repair and rework can be both practical and expressive. This supports personal wellbeing and can also extend the life of garments.
- Altering clothing yourself, whether through repair or rework, can strengthen the emotional bond with the item, as you invest time and effort and express yourself through the process.
- DIY activities in product design can support sustainability.
- DIY practices can also empower individuals by giving them the opportunity to shape their clothing according to personal preferences.
- Repair and rework should be more prevalent in fashion.

2.2 OPPORTUNITIES TO STRENGTHEN NEEDLEWORK SKILLS

In the past, needlework skills were essential to keep up textiles. Textiles were more expensive and therefore of higher value. Making, remaking, and repairing clothing helped preserve textile products and allowed them to remain in use for longer. During the 18th century, for example, before the mechanisation of textile production, people spent a significant portion of their income on textiles. As a result, they took better care of their clothing. Wearing garments until they were worn out, and then repairing or repurposing them, was a common practice across all social classes (Twigger Holroyd et al., 2023).

This need for needlework skills is also reflected in the inclusion of needlework in girls' education. The National Onderwijsmuseum in Dordrecht describes how, in the Netherlands, needlework became a mandatory subject in primary education for girls in 1914. It was introduced under the name Nuttige Handwerken, which translates to "useful needlework." The lessons focused on domestic tasks such as repairing holes, embroidering pillows, and knitting socks. These skills were considered essential for girls preparing for marriage, as they enabled them to manage the textile resources of a household. At the same time, they also opened up opportunities for employment in the textile industry. While the inclusion of needlework may have been well intentioned, it carried misogynistic implications. Boys were not required to take part in these classes and were instead given free time or woodworking lessons. By the 1960s and 70s, boys were included, and needlework classes were renamed textiele werkvormen (textile crafts). This marked a shift toward creativity, allowing students to view needlework more as an art form rather than purely a domestic skill.

Today, needlework continues to serve as an outlet for creativity, as seen in the visible mending movement and modern rework examples discussed in the section 2. However, questions remain about how people access these skills and who participates in this process?

Sub-research question 2: What opportunities are there to strengthen the practice of needlework?

2.2.1 Interest in sustainability but lack of knowledge

Disposing of clothing is the final step in the life cycle of a garment. Items can be discarded through donation or placed in a textile collection container. In a study conducted in the Netherlands, Soyer and Dittrich (2021) found that common reasons for clothing disposal include poor fit or defects that the owner cannot mend themselves. However, some garments are also discarded simply because they are no longer seen as exciting. In these cases, boredom can play a role (Kwon et al., 2020).

Properly repairing or reworking clothing requires skill. The lack of repair knowledge can be a barrier that prevents people from mending their clothes. This was highlighted in a report that surveyed citizens of Rotterdam (Figure 13), where a lack of repair knowledge was identified as a reason for not repairing clothing (Rijkswaterstaat & The Bin, 2023).

It is understandable that repairing clothing takes time, but learning the necessary techniques also requires time and effort. This creates a sort of loop: you don't repair your clothes because you don't know how, but if you don't take the time to learn, you will never repair them. Developing the skill and knowledge to determine which technique is appropriate for

each type of repair is key. While there is the option of having an item professionally repaired, this may not seem worthwhile, especially if the clothing item wasn't expensive. However, this presents an opportunity to break through the barrier of learning repair skills, making it easier to repair more items, and potentially even rework clothing.

There is interest in sustainable fashion among Gen Z, particularly in second-hand fashion (Masserini et al., 2024). This interest in sustainability in fashion is linked to the need for self-actualization. However, this interest in sustainability does not necessarily mean that their consumption habits align with sustainable models (Palomo-Domínguez et al., 2023). As young people take control of their own budgets once they reach adulthood, exploring their identity becomes an important step, and clothing and fashion play a key role in this process. Young people (18-25) would benefit from learning about repairing and reworking clothing, as this could contribute to more sustainable con-

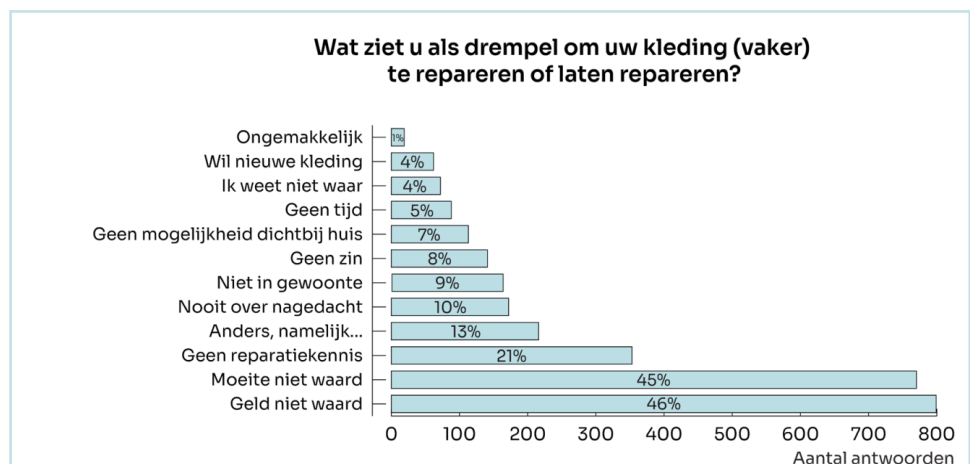


Figure 13: Wat are boundaries that prevent you from repairing more often yourself or pay for a service? RWS Kantar Public (Rijkswaterstaat & The Bin, 2023)

2.2.2 The sustainable fashion system in the Netherlands

When examining young people in the Netherlands, there are various ways to learn about repairing or reworking clothing. Figure 14 provides an overview of the stakeholders involved in the fashion system in the Netherlands. The purpose of this figure is to visualize the ways in which young people can engage with sustainable fashion practices. Since this research focuses on the practice of needlework, the inner circle highlights stakeholders who provide knowledge on repairing and reworking, and are accessible to young people. The middle layer is dedicated to stakeholders involved in educating young people about sustainable fashion in more general terms. The outer layer includes stakeholders who are involved in sustainable fashion but play a less direct role in educating young people



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2.2.3 Stakeholders in the online and physical space

The contrast between online and physical spaces is particularly interesting when considering that needlework is a highly tactile and hands-on activity. However, the online space offers significant value as a learning tool. Many individual creators share helpful content for those learning to repair clothing. Platforms like YouTube, Instagram, and TikTok host a wide range of tutorials and inspiration. In addition, there are dedicated platforms that focus specifically on repair and rework, such as Fixing Fashion. Their goal is to address the waste generated by fast fashion by offering inspiration, practical information, and community building (Figure 15).

The online space also broadens access to second-hand fashion, as seen on resale platforms like Vinted.

In physical spaces, there are more opportunities for hands-on learning. Repair cafés are

accessible places where people can learn about repairing and reworking clothing. At these cafés, experienced sewers volunteer their time to help visitors with sewing and repair inquiries, free of charge. Since the volunteers often have limited availability, these cafés typically open only once a week or even once a month. They are usually located in neighborhoods and also serve as community gathering spaces. An example is the textile repair café at Het Wijkpaleis in Rotterdam (Figure 16), where people of all ages from the neighborhood come together. As part of this research, a visit was made to a repair café in Rotterdam, which is run by a group of artists and makers who organise community activities in exchange for atelier space. In conversation with the organisers, it was explained that the café welcomes all kinds of textile-related projects, ranging from sewing garments from scratch to assisting with repairs.

On the other end of the spectrum, tailors generally do not offer education in repair or

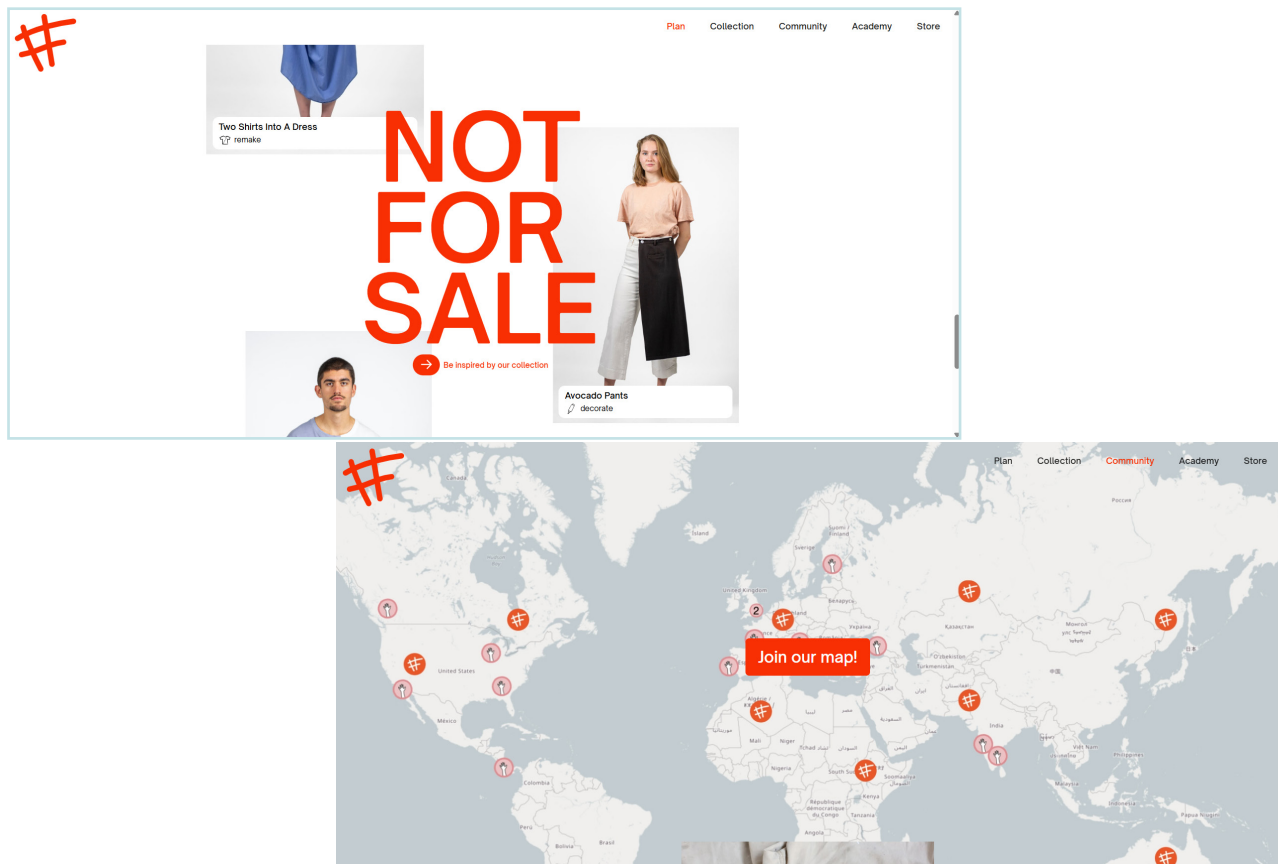


Figure 15: Website homepage and community launch page. Fixing fashion (Fixing Fashion, 2025)



Figure 16: Repair café space



Figure 17: Repair café space

rework. Instead, they carry out repairs or alterations as a paid service. However, they remain vital to the system due to their craftsmanship and ability to handle complex repairs and alterations.

Between these two kinds of spaces there are the sewing shops. These shops offer courses in sewing and repair techniques while also providing repair services. A notable example is De Naai-erij, which not only offers services and classes but also organizes repair cafés and educational events for primary and secondary schools (Figure 17). One of the owners of the Naai-erij was contacted for to talk about their involvement in educating people on repairing clothing. They explained they see this as one of their important services. They offer classes repair and sewing classes at their shop and organize clothing swaps at schools to teach people about sustainable fashion. They also help other to set up a similar kind of initiative. As seen in Figure 14 This kind of initiative spans all three layers of involvement in educating young people. Although young people (ages 18–25) are no longer in mandatory education, their first introduction to repair/rework knowledge may begins at school. In the Netherlands, efforts are being made to integrate sustainability and repair into the education system, not only through the initiatives of individual teachers and schools, but also with support from various organizations. Museums, like Textile Muse-

um in Tilburg, offer workshops and guided tours, while circular craft centers (circulaire ambachtscentra) organize educational events. Other organizations contribute by developing lesson plans and providing tools for teaching. The circulaire ambachtscentra are particularly noteworthy, as they form a broad national network. These centers combine the functions of municipal waste facilities, charity shops, and repair workshops, while also serving educational and social roles.

Policymakers play a key role in the broader sustainable fashion system by creating space, providing funding, and offering incentives to support such initiatives.

Museums, like the Textile Museum in Tilburg, offer more focus on the heritage of textile. For this research the education manager of the textile museum was contacted. They explained that their main goals is to educate young people on the heritage of textile production, but they do offer special workshops on sustainable textiles and repair.

2.2.4 Target points of repair in the Netherlands

The collective Heel Nederland Repareert brings together various stakeholders, from policymakers to repair cafe owners, to promote repair culture in the Netherlands. During this research a networking event was visited that was hosted by this collective, to gain knowledge on how (textile) repair manifests in the Netherlands. During this event they unveiled have set specific goals to stimulate repair practices across the country.

A interesting objective related to this thesis is to ensure that both digital and physical spaces are available for repair initiatives. This is reflected in examples such as the establishment of a repair point in the Hoog Catharijne shopping mall and the creation of an online electronics repair register for consumers and professionals. Providing enough visibility and access to these initiatives is essential to prevent repair from being overshadowed by the default option of buying new.

Another interesting goal is the integration of repair into education. The aim is to normalize repair practices by training a new generation of repair professionals. One example is the introduction of a repair-focused elective within vocational (MBO) education programs. Through the lens of these two goals an analysis of the stakeholders was conducted. The following paragraphs 2.2.5, 2.2.6 will show the results of this.

2.2.5 Space and accessibility of needlework knowledge

The accessibility of repair and rework knowledge varies among the stakeholder groups described in Paragraph 2.2.3. In general, online spaces are highly accessible to younger individuals, as they are often skilled at navigating various digital platforms. Communities of individual makers actively promote clothing repair and offer inspiration for reworking garments. A wide range of tips, patterns, and techniques is readily available online. However, the internet can be an unpredictable and

sometimes unreliable source of information. Due to its algorithmic nature, content is often filtered based on previous behaviour, showing users only what aligns with their existing interests. Additionally, online spaces are saturated with advertisements and distractions that encourage consumption rather than sustainable practices.

Needlework, to some extent, requires technical skill. A basic level of understanding and manual dexterity is often necessary to make sense of the content available online. For example, matching a specific technique to a particular repair challenge can be difficult without prior knowledge, making it hard to formulate precise search terms. It can also be unclear which tools are needed and how to use them effectively. Navigating these aspects can feel overwhelming, particularly for those new to the practice. Repairing and reworking clothing requires both experience and knowledge, and taking the first step can be difficult without guidance. Basic skills are often learned from parents or grandparents, as needlework knowledge is sometimes passed down through generations. However, as the perceived need for repairing and reworking clothing has declined, the motivation to pass on these basic sewing skills has also diminished. In this context, repair cafés and sewing shops provide accessible entry points for learning the fundamentals. They offer valuable support, especially since troubleshooting specific issues can be challenging without prior experience.

To a degree, repair is overshadowed by the commercial aspect of fashion when looking at physical and online space. While repair cafés and sewing shops offer accessible opportunities to learn about repairing clothing, many of these spaces are located outside city centers. In contrast, commercial retailers such as H&M, Primark, and Zara dominate central shopping areas and attract significantly more attention. Although some of these brands do offer repair information on their websites, it is often strategically hidden. For instance, instructions on how to sew a button can be found on H&M's website, but only after navigating through several layers. In comparison, environmentally

conscious brands like Patagonia demonstrate that it is possible to highlight repair alongside product sales. Although their repair resources are modest, they are featured directly on the homepage, making them more visible and accessible.

Encountering repair and rework knowledge solely online may not provide enough incentive to begin practicing needlework. Physical spaces offer hands-on learning opportunities, although these places are sometimes overlooked.

2.2.6 The skill of needlework in education

At present, there is no mandatory inclusion of needlework or repair skills in the Dutch school system. However, needlework still appears in certain educational contexts. The Vrije School (Waldorf Education) education system, for example, continues to include needlework projects in primary education. A teacher explains in a blog post (De Waal, 2023) that they teach children needlework within a specific anthroposophical framework. The aim is for children to experience the act of making and to develop both cognitive and motor skills. Although the focus is not specifically on repair or reworking, students engage in activities such as crocheting tablecloths, embroidering, and knitting mittens. Textile craft courses are also still offered in some secondary schools, although these tend to approach the subject from a more artistic perspective. Overall, the inclusion of needlework in education in the Netherlands is limited, which means there are young people have little exposure to these skills through education.

Looking at the broader spectrum of repair and sustainability, there is increasing attention on introducing circularity into schools. Initiatives such as Circularity Weeks and Days involve educational activities for students, which may include museum visits, project-based learning, or hands-on workshops. The network of Circular Craft Centres (Circulair Ambachtscentra) also provides educational programs. While both initiatives focus primarily on product circularity, clothing repair and reworking are usually only minor components. Greater emphasis tends to be placed on the repair of electronic

waste (e-waste), which makes sense given its significant environmental impact. However, textile waste also represents a substantial environmental challenge and deserves more attention. Addressing this issue could support more comprehensive sustainability learning. There are also initiatives that advocate for embedding repair practices within the education system. Reparerennu and Leren voor Morgen are two such organisations that coordinate projects aimed at integrating circular skills into education. Both were present at a recent network event, where they hosted a discussion session involving policymakers, teachers, and curriculum developers. During this session, two key challenges emerged that hinder the integration of repair-related activities into educational programs.

First, cognitive skills are generally more highly valued within the education system than practical, skills such as repair. As a result, practical making skills are often given lower priority in curriculum development. Second, there is a form of educational pillarization across different academic levels. Practical subjects like making and repair are typically associated with tracks such as VMBO and MAVO, rather than with tracks like HAVO and VWO. This results in unequal exposure to repair skills depending on the student's educational pathway, despite the fact that such skills offer benefits across all levels.

The discussion also revealed that while many teachers are enthusiastic about incorporating repair education, they often lack the time or resources to implement significant curricular changes.

One of the organisers of the discussion, representing Leren voor Morgen, was contacted for further insight into how they view repair skills within the education system. They emphasized their commitment to supporting the repair ecosystem in the Netherlands by promoting more opportunities for repair craftsmanship. Their goal is to ensure that repair education is included in the lower levels of education so that there will be enough skilled individuals capable of repairing items such as clothing, furniture, and electronics. This also

helps facilitate the creation of initiatives and spaces where people can bring items for repair. Establishing these repair “touchpoints” is crucial, but it also reinforces the challenges discussed earlier: the undervaluing of practical skills and the segregation of such skills into specific educational tracks. While there is value in having trained professionals perform repairs, there are also significant benefits in empowering individuals to repair textiles themselves. Therefore, it is important to develop initiatives that encourage repair knowledge and skill development across all levels of education.

2.2.7 Conclusion

To conclude, within the sustainable fashion system in the Netherlands, there are multiple pathways for young people to learn needlework skills. The online space offers a wealth of information through individual creators, dedicated platforms, and social media. However, because needlework is such a practical skill, physical spaces offer a more hands-on learning experience. Repair cafés and sewing shops are important stakeholders that provide expertise and guidance. Still, there is some debate around how accessible these places really are. Learning only from online sources can be overwhelming, and troubleshooting specific problems is often difficult. At the same time, physical spaces can be hard to reach or overshadowed by commercial retailers.

Another key player in the system is the education sector. While some schools incorporate textile repair into their curricula, it is often a minor component, with greater emphasis placed on repairing electronic waste. Expanding educational focus to include textile repair would offer a more holistic understanding of sustainability. There is also a clear divide in how making skills are taught across different education levels. These skills not only contribute to sustainable practices but also support well-being, self-expression, and empowerment, making them valuable for every learner.

Young people (18-25) are the focus as a target group because they can benefit greatly from learning about needlework. They show an interest in sustainability and may be more open to learning about repair and rework practices. At the same time, many are exploring their personal style and wardrobe needs. Needlework can support this journey by offering the tools to customize, repair, and rework clothing, making repair a creative part of how they engage with fashion.

2.2.8 Discussion

The target group of young people (ages 18–25) was chosen for this analysis. While there are other groups who could also benefit from learning needlework skills, the choice was made with a few key considerations in mind. Across all age groups, it is important to engage with sustainability and develop the skills needed to support it. However, older age groups may already have established fashion habits and wardrobe preferences. They may also have more financial resources to outsource repairs to tailors. In contrast, young people are still shaping their style and habits, making them a relevant group to encourage learning repair and rework skills. Younger age groups (15-18) were also considered for the analysis as they have similar characteristics. However, due to the expansiveness of the education system and accessibility this group this was left out of the scope of this project.

The target group of young people was not contacted directly, interviews or surveys were not conducted. For future research, this would be highly recommended, as it could offer insight into whether for how many people a lack of knowledge is a primary barrier to repair, and whether there are additional motivations that influence their interest in needlework.

Several stakeholders featured in the analysis were contacted directly, although more could be included in future research to deepen the understanding of their goals and motivations.

2.2.9 Insights

From answering this research question, several insights have emerged that are important for the design phase. These will be further discussed in Section 2.3.

- There is an opportunity to teach young people (18-25) of needlework. They are exploring their personal wardrobe needs and have interest in sustainability to make the step of doing needlework.
- There is an opportunity to help young people who want to make a step towards sustainable fashion step over the barrier that they don't have the knowledge of techniques of repair and rework.
- There is an opportunity to use the accessible knowledge aspect of the online space and/or the hands-on quality of physical space.
- It is important find a solution that addresses textile and repair knowledge for young people.
- There is an opportunity to create a solution that emphasises individual making skills as these are not always emphasised through education.

2.3 DESIGN DIRECTION AND KEY-TAKE AWAYS CHAPTER 2

In Chapter 2, the context of the design definition was explored. Two sub-research questions were established and answered using various methods. In answering these questions, several insights were important in shaping the final design direction. After establishing the design direction, the ideation phase of the design process begins. The following steps and methods used in the design process will be outlined in Chapter 3, Section 3.1. Since design is an iterative process, the design directions that were explored before arriving at the final version will also be briefly discussed in Section 3.1.

2.3.1 Summary Insights

In section 2.1 the sub-research question 1.1 was answered:

Sub research question 1: How can needlework contribute to a more sustainable relationship with clothing?

There were several key takeaways that contributed to forming the design direction. In summary, needlework can contribute to the ways people interact sustainably with their textiles and clothing. The main ways needlework can contribute are through repair and rework practices. These practices require skill and technique and can help people extend the longevity of their clothing. Nonetheless, there is room for self-expression within this. There are no real rules that dictate what a proper repair is, for example whether it should be visible or not. Needlework is a part of DIY. Adding effort and time into an object can improve the emotional bond you have with the item, and if this adds an element of self-expression, the bond becomes even stronger. Doing reworking activities can also empower individuals and give them the opportunity to create something that fits their needs.

In section 2.2 the sub-research question 1.2 was answered:

Sub-research question 2: What opportunities are there to strengthen the practice of needlework?

Young people were selected as the target group for this project. Within this group, key characteristics include an interest in sustainable fashion and the perception that a lack of knowledge is a barrier to starting with repair. This means they are often beginners in needlework or have no experience at all. To learn needlework, inspiration can be drawn from both online and physical spaces. Online platforms are accessible, but can be difficult to navigate at times. Physical spaces offer a hands-on, learning-by-doing experience, which aligns well with the nature of needlework. However, within the education system, textile repair and the development of making skills are often not emphasised. This is a gap the design could address by placing more focus on both repair and making.

2.3.2 Design direction and goal

The final design direction for this project focuses on empowering young people to learn repair and rework skills within the context of needlework. The goal is for young people to gain hands-on skills they can access when needed and build upon over time. This supports longer garment lifespans and helps reduce unnecessary textile waste. There is an opportunity to focus on young people who are interested in sustainability but lack the knowledge or confidence to begin repairing or reworking their clothing. Additionally, there is potential to streamline the needlework learning experience, making it both comprehensive and hands-on. The aim is to create an accessible, engaging learning journey that makes it easier and faster to get started with needlework.

Therefore, the design goal is:

to design an hands-on and streamlined experience that empowers young people (18-25) to learn about needlework in the Netherlands.

There are also broader goals that the design could address. This project aims to contribute to a more sustainable fashion system, so it is important to ensure that the design itself generates minimal waste. However, this also means creating an instinct to repair or rework clothing in people. Making repaired or reworked clothing more standard in fashion land. Empowering people to take fashion into their own hands (Twigger Holroyd 2013).

Additionally, there is an opportunity to highlight the value of making, which is often underrepresented in education. Introducing a DIY element into the design could support both of these goals. DIY not only promotes sustainability but also creates space for developing making skills. This approach can help extend the life of garments, support the user's well-being, and offer a meaningful opportunity for self-expression.

There is also a broader goal to create a solution that is restorative for both culture and nature, as mentioned in the problem definition in chapter 1 section 1.1. Sandra Niessen (2020) argues that knowledge and skills should be preserved in a way that remains connected to nature. In line with this, the design should place emphasis on empowering people to gain access to the knowledge and skills of needlework, ensuring that these practices are passed on and valued in a sustainable future.

To achieve the desired effect an interaction vision was established. The interaction with the design should be like starting a game in tutorial mode. This activity is a way of learning a skill in a hands-on and accessible way. In this analogy the game rules and mechanics are learned in a learn by doing way. In this way you get to know the tools at your disposal. There is a structure that is followed however, before you are set out on your own. Although it takes a bit of time this experience makes you more confident to continue the rest of the way.

The qualities that are important are eye-opening, empowering and educational.

Eye-opening: the tutorial introduces you to all the tools, techniques and rules of the game, that open you up to the new context you are entering.

Guiding: The player is learning by doing in a step by step way and is instructed to new concepts one at a time.

Empowering: the experience creates a safe space for trial and error making the player gain confidence before setting out in the game for real.

3 UNDER CONSTRUCTION: REPAIR & REWORK KIT

This chapter will discuss methodology, the final design concept and evaluations. A overview of the design process and methods will start this chapter. After, there the execution of the final concept will be introduced and details around the concept. Then, the results of several evaluations of the design will be elaborated on. To close, this chapter there will be a conclusion of the results of the evaluation. The final disussion on the design, the limitation and rekomanda-tions will be discussed in chapter 4.

As the fashion system as we know it grew, perspectives changed and new idea's continue to come forth. Design is a part of thinking of new ways of changing the status quo, this also applies to the sustainable fashion system. There are many part of the fashion system that can be approved upon: how we shop, how to produce and how to take care of our clothing. The Jumpsuit and Dressing is Easy are design examples that attempt to change something within the system.

JUMPSUIT is a design project society aimed at changing the way we shop and chose clothing (Figure 18). The Rational Dress society created the design of unisex jumpsuit to inspired people to shop less and wear less. The jumpsuit embodies a functional outfit that stands out against the endless variety in clothing. The clothing piece is available as a ready-made item or free pattern. The pattern is easily adjustable for all different body types. (Glaum-Lathbury, 2016).

Another way, design can plays a big role construction of clothing. Dressing is Easy, a kit by Italian architect firm Archizoom, is an example where the construction of close is questioned (Buzzi, 2018). This "domestic assembly case" allows the user to create a diverse set of garments using only pieces of rectangle cloth as seen in Figure 19. The kit includes tools and instructions. The instructions show a simple way of constructing clothing. It is interesting how the kit creates a different way of seeing clothing as constructed out of a simple square shape and giving them a Ikea like home construction element.

In this design project, it will be explored how design could also influence the way we take care of our clothing. As stated in Chapter 2 section 2.1, needlework can improve the longevity of our clothing. How can design change this process of repair and rework?

Sub-research question 2: How can design strengthen the practice of needlework for young people in the Netherlands?



Figure 18: JUMPSUIT by The Rational Dress Society (Glaum-Lathbury, 2016).



Figure 19: dressing is easy by Archizoom (1973) (Buzzi, 2018)



3.1 DESIGN PROCESS AND METHODS

The design process was guided by a combination of practice-based methods, selected for their relevance to the project and research question. This section discusses the applied techniques and the reasoning behind their use. Figure 20 shows the phases that were followed as part of the design process. The overall process is based on the phases in the basic design cycle taken from Roozenburg & Eekels (1995). Figure 20 also shows the and over view of significant iterations done during the process, marked by the arrows. The three phases and the iterations will be detailed in the following paragraphs.

3.1.1 Research phase

During the research phase it was important to broadly delve into the context described in the problem statement. This consisted of two parts. Literary research was conducted into why supporting needlework as a means of sustainable interaction with textile could be possible. A combination of literary and field research was conducted to explore the various stakeholders in the context of sustainable fashion in the Netherlands. A more detailed description of the research approach can be found in chapter 3 section 3.3. After this research a design direction was formulated using the design parameters, which were found at that stage. This process was iterated on three times to come to the final direction.

In formulating directions it was important to analyse the interaction people and textiles and people and sustainable fashion system. As well, as how design can play a role in this. This type of analysis of the context by observing and delving into the context was important during the design for interaction master. This can also be seen the Vision in Product design method (Hekkert & Van Dijk, 2011). Where old interactions are deconstructed before designing new interactions in a future context. The design direction was used to create an interaction vision and qualities that were used during the ideation phase, this was done iteratively before landing on one direction and vision.

3.1.2 Ideation phase

The goal of the ideation phase was to generate a broad set of ideas to explore the possibilities in the design direction. To generate ideas several ideation sessions were conducted. The design directions were used as a starting point for the ideation sessions. The ideation sessions were conducted using brainstorming and answering the WWWWWH-questions (who, what where, when, why and how). Answering these questions helped to frame the design direction. The Deft Design Guide was used as a guide to follow these methods (Van Boeijen, et al., 2009).

The first ideation session was conducted alone. After, it was decided to iterate on the design direction before continuing. More research was done and a new direction was developed. The process of brainstorming and answering the WWWWWH-questions was repeated before starting a ideation session with a group of other students.

This ideation session was conducted with three additional students, to get a broader perspective on topic and ideas. These sessions were focussed on three topics: how to introduce repair activities, how to introduce rework activities and how to lower the barriers to learn repair. The sessions were conducted by having the three topics explained on sheet of A3 papers. These papers would be rotated between the four students and each would have 5 min time to brainstorm ideas. After 20 minutes there was a group discussion on the ideas on the sheets of paper. After this session it was clear there were more questions that needed to be answers in order to continue, therefore the direction was iterated upon again, by doing more research into the context.

The final direction was developed after this two ideation sessions were conducted again, one alone and one with an additional student. The second ideation session was conducted with one additional student. In both session the topic was how to incentivize a DIY activity that could help learn how to do needlework. The approach this time was to have a 15 min brainstorm though having a discussion on the topic and prior formed ideas

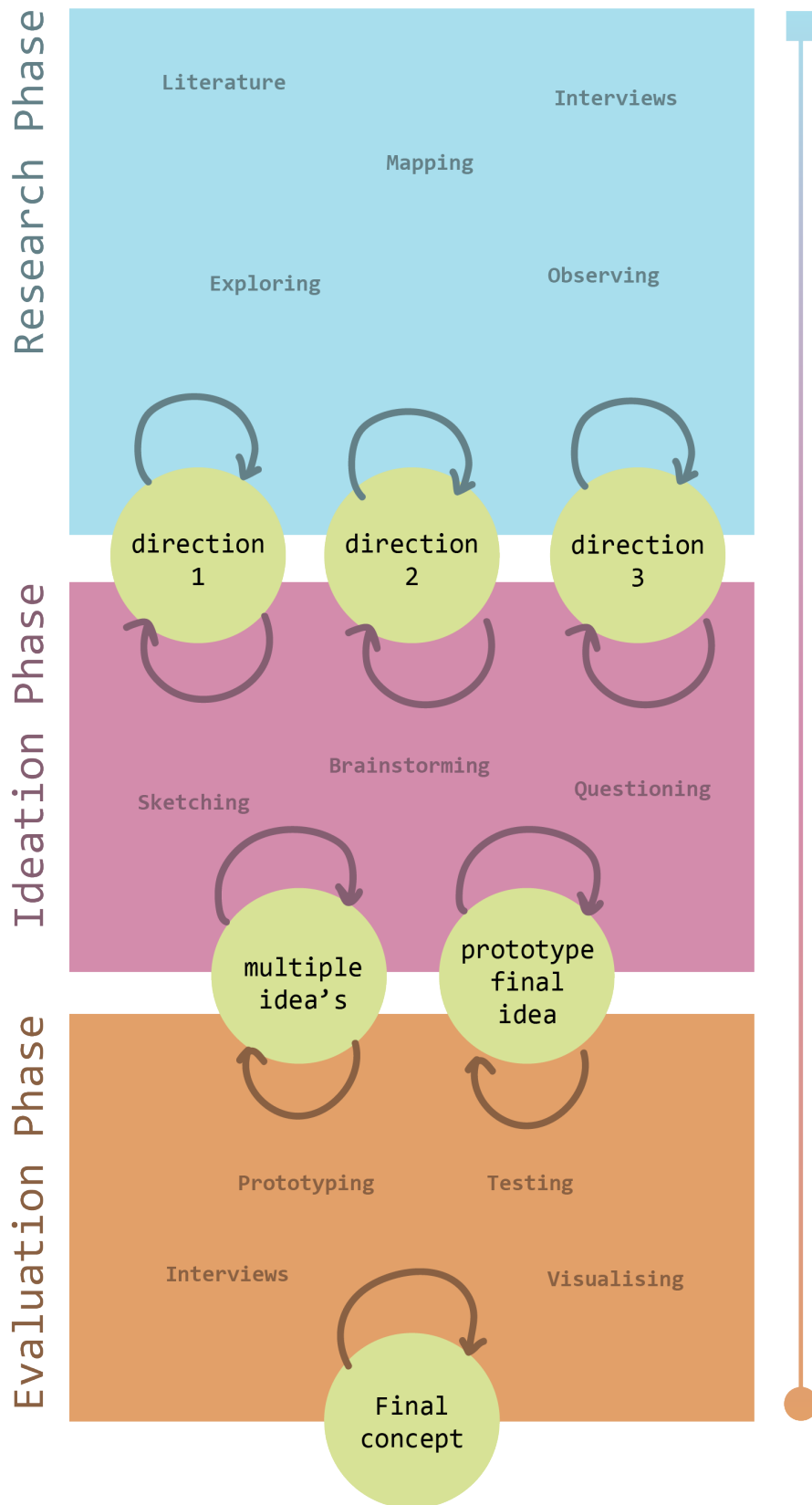


Figure 20: Overview of Design Process

After this three ideas were selected that had most potential in the design direction and interaction vision. A selection of the ideation results can be found in Appendix A.

3.1.3 Design direction iterations

Two versions of the design direction were explored before arriving at the final concept. The first version focused on incorporating needlework skills related to repair and rework into the education system, targeting a younger age group (15–18). The goal was to introduce more practical needlework skills into school settings through a design intervention. However, further investigation revealed that the complexity of the education system presented too many challenges. Within the scope of this project, there was not enough time to fully map this system or gain access to it. As a result, further research was conducted through sub-research questions 1.1 and 1.2.

The second direction explored the idea of creating a design intervention that empowered young people to engage with needlework in both physical and online spaces. There was an opportunity to use public space as a touchpoint to raise awareness about repair and rework among young people. However, this direction lacked the hands-on experience that is essential for learning needlework and developing practical skills. Therefore, additional research was carried out on amateur making and DIY practices. Following this iteration, the final design direction was formulated.

3.1.4 Evaluation phase

The evaluation phase was conducted not only to evaluate the idea's but to iterate on the execution of the final concept. Three evaluations using different methods were conducted during this phase.

The first evaluation used low-fidelity prototypes to explore the three idea's. Prototyping helps to get the idea's closer to reality, that when they are just a sketch and allows to better evaluate them (Van Boeijen, et al., 2009). These prototypes were evaluated by creating a description of the product and comparing the

interaction with the interaction qualities established from the interaction vision. After this evaluation idea of the Repair and Rework kit was chosen from the idea's to develop further. A second prototype was developed after discussing the old prototype with advances needleworkers. This second prototype was then used in for two following evaluations, which led to the final concept.

The second evaluation was conducted to determine the desirability of the concept to understand whether they feel drawn to it, and why. After a pilot test, six participants were interviewed. Four participants were selected to fit to the user group and two participants were selected at random. During the evaluation a survey was conducted to estimate how much money the participants wanted to pay for the product using the Van Westendorp's Price Sensitivity Meter (Van Westendorp, 1976)

The third evaluation was conducted to evaluate the experience of the interaction with the prototype, using the interaction qualities. For this two participant were asked to create the pouch, after which an interview would be conducted. During the interview PrEMO (Van Boeijen, et al., 2009) was used when questions were asked about feelings. This method helps participants identify multiple emotions and discuss them.

After these evaluations a final iteration was made to incorporate the insights gained from these evaluations. A more detailed description of the evaluations and the following results will be discussed in paragraph 3.3.

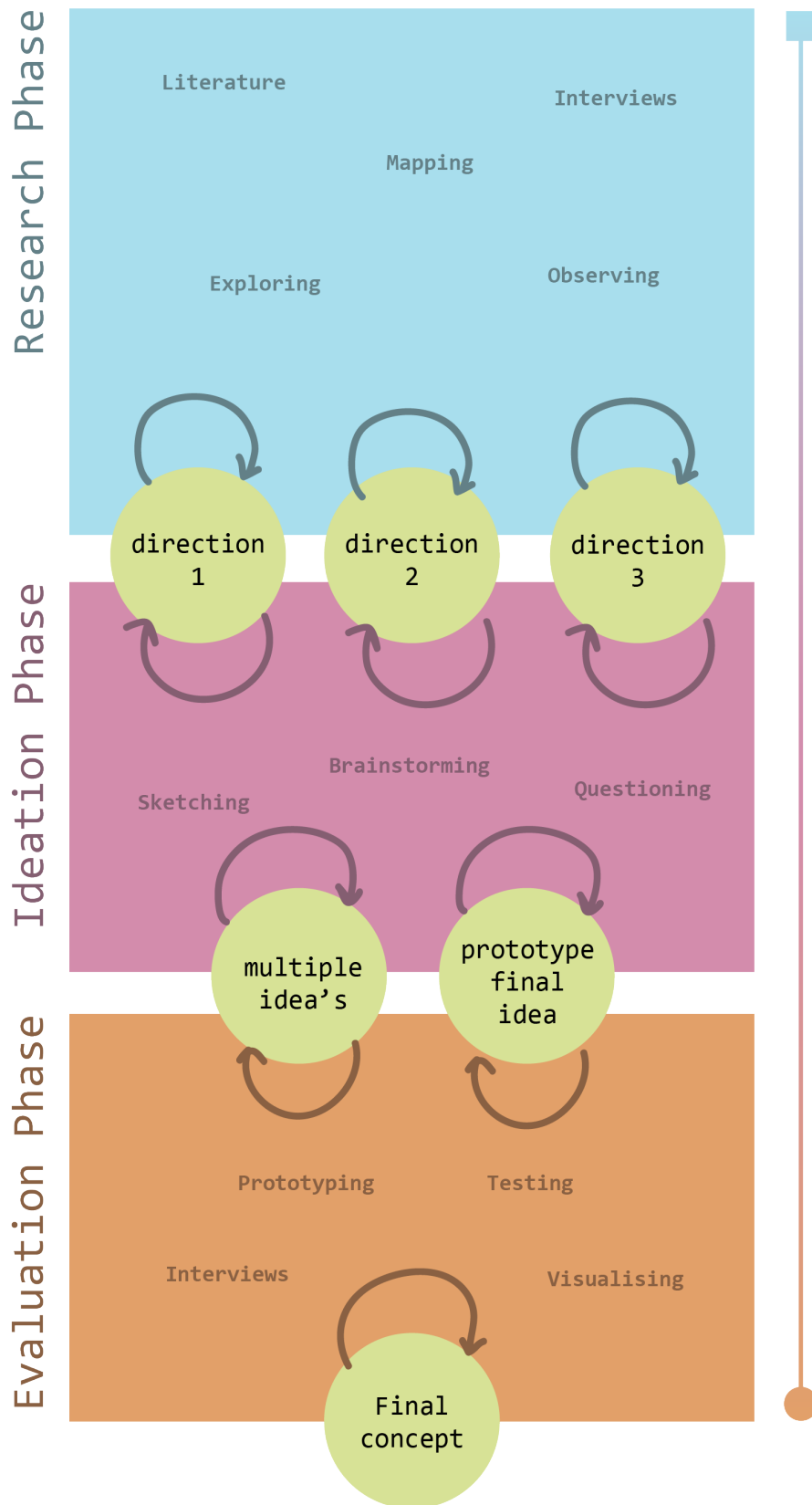


Figure 20: Overview of Design Process

3.2 EXECUTION: FINAL DESIGN CONCEPT

The final concept is a Repair and Rework Kit designed to empower young people to build their needlework skills. The final prototype, shown in Figure 21, consists of a curated selection of basic repair tools, a piece of fabric, and an illustrated instruction booklet.

Under Construction refers to the purpose of the kit: to think of clothing as an ongoing construction, repairing and reworking along the way.

Before beginning garment repairs, users start by constructing their own tool pouch using the fabric provided. This introductory step teaches essential techniques and helps users become familiar with needle and thread in a simple yet practical way. It lowers the barrier to getting started and encourages a mindset shift, positioning repair as something approachable, hands-on, and creative.

The kit is aimed at beginners who are curious about repairing their clothing but don't know or where to begin. The booklet includes answers to two key questions: What tools do I need?

And what techniques should I use? Over time, the kit aims to build an instinct to repair and rework, ultimately reducing textile waste.

This kit is available open source. The website Fixing Fashion serves as an example platform where the kit could be hosted. In this model, more experienced needleworkers could create the kit themselves to gift to a beginner. Alternatively, organisations could use the open-source materials to produce and distribute kits. Museum gift shops would be suitable locations, as they often support socially oriented projects. Here, the kit could be purchased either as a gift or directly by beginners looking to get started.

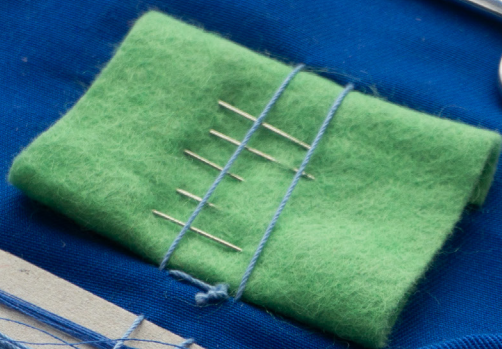
Figure 21: Under Construction: repair and rework kit

Under Construction

REPAIR & REWORK KIT







3.2.1 Final design details: Tools and materials

The tools in the kit are specifically selected to support young beginners. Since they are just starting out, they may not yet know which tools to buy or how to use them. To support this, the included booklet guides users through each tool in the kit. It is also assumed that these young people may be starting to live independently and may not yet have these tools at home. A beginner kit, therefore, suits both their budget and living situation.

The kit contains a seam ripper, small scissors, needles, thread, and a button (Figure 22). A seam ripper is essential for undoing seams, useful for fixing mistakes or taking apart parts of a garment. Fabric scissors are important because cutting paper can dull the blades, making them ineffective for fabric. The small scissors included are ideal for cutting fine details and are compact enough to fit neatly in the pouch. The needles come with a hard cover, keeping them secure and safely stored on the fabric swatch they're attached to. A variety of needle sizes are provided to suit different fabric types and thread thicknesses. The thread is a multi-coloured sewing braid, designed so users don't need a different spool for every colour. It is wrapped around a piece of cardboard for easy access. The button included is used for closing the pouch.

If the kit is made by an experienced needle-worker as a gift, the tools can be sourced from their own collection, such as an extra seam ripper, a leftover button, or thread from past projects. Figure 23 illustrates this approach. The pouch can be tied up with the ribbon that is included in the pattern. There is an option to embroider the edges of the ribbon, to personalise the gift (Figure 24)



Figure 23: Self-made kit



Figure 24: Kit wrapped up with the ribbon



Figure 22: Overview of the tools and features

3.2.2 Final design details: Cloth and Pouch

From the rectangular piece of cloth included in the kit, the user will create a tool pouch. The fabric is made from thick cotton twill, which is sturdy enough to be used without a lining. This material is beginner-friendly because it does not stretch and is durable. The edges are pre-finished with an overlock stitch using an overlock machine. This is an efficient way to prevent fraying.

For self-made kits, the fabric can be sourced from scrap materials from an experienced needleworker's collection. While it may differ from cotton twill, this is acceptable. The only requirement is that the fabric be thick and non-stretch. For example, an old pair of jeans could make a great alternative.

A buttonhole is pre-stitched using a sewing machine. The user will open it manually using the seam ripper.

A rectangle was chosen as the base shape of the pouch because it is easy to cut from larger fabric scraps and minimizes material waste. In contrast, curves or irregular shapes tend to produce more offcuts.

Constructing the pouch introduces several foundational sewing techniques, as seen in Figure 25. The user will learn the backstitch, blanket stitch, and cross-stitch. Sewing on a button is also part of the process, offering a practical skill for future repairs or reworks. There is also an optional step to personalize the pouch using embroidery, this mirrors techniques used in visible mending or reworking.

Although the pouch starts as a flat rectangle, the corners are shaped with simple seams to give it structure, as shown in Figure 25.

All materials needed for construction and personalisation, including the button, construction thread, and embroidery thread, are included in the kit.



Figure 25: Overview techniques learned while making the pouch



3.2.3 Final design details: Booklet

The booklet serves as a step-by-step guide to help users begin repairing and reworking their garments. It includes an introduction, needlework tips and tricks, reworking inspiration, a pouch tutorial, and specific repair guides. The front cover (Figure 26) acts as the central visual element of the kit, presenting both the name and purpose of the project. It also includes an illustration showing the DIY nature of the pouch, so that users can immediately understand what the kit is for at first glance. The introduction (Figure 27) welcomes users and helps ease them into the learning process, while outlining the contents of the booklet. Before they start making the pouch, users are guided through a tool overview and a section on needlework tips and tricks (Figure 28).

These pages help beginners understand the tools included in the kit and how to use them effectively. The rework inspiration section (Figure 29) is designed to broaden the user's perspective. While repair is the first step, reworking offers further creative potential. This section ties into the pouch personalization process, encouraging users to treat their repairs as opportunities for self-expression. Just like altering a garment, decorating the pouch helps form a stronger emotional bond with the item, reinforcing the idea that needlework can be creative, empowering, and personal.

Instructions for making the pouch and learning key techniques (Figure 30) are provided through a video tutorial, accessible via an online platform. The video format offers visual guidance without overloading the booklet with text or diagrams, keeping the guide compact and aligned with open-source values. When it comes to repair, the booklet helps users identify different types of tears and holes across three garment categories (Figure 31). It includes visual examples and links to video tutorials for each issue. Repairs for wool sweaters are excluded, as these often require specialized tools and threads not included in the kit. The Fixing Fashion website (see subsection 2.2.3) served as an important reference point

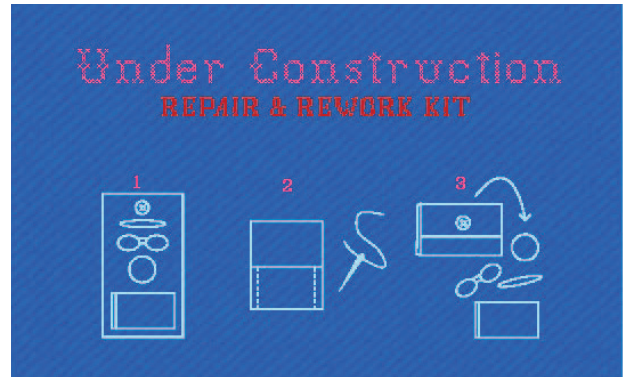


Figure 26: Front page



Figure 27: Intorduction

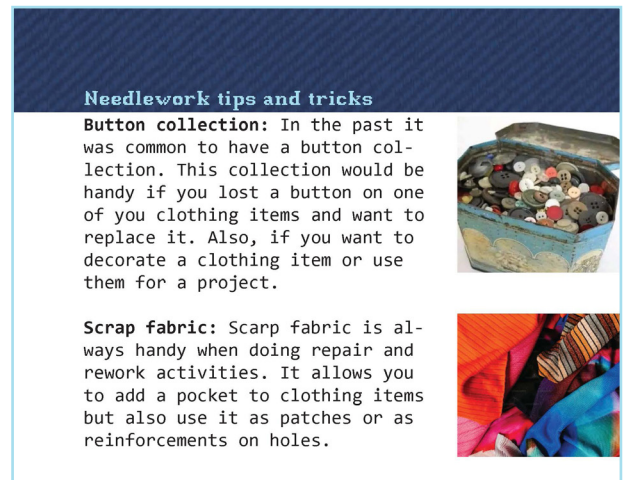


Figure 28: Tips and Tricks

REWORKING

Reworking means giving new life to clothes by changing or customising them. It was once a common skill, people resized, mended, or updated garments to make them last. Today, reworking helps reduce waste and makes fashion more personal. In this kit, you'll start by making your own tool pouch and personalise it. That's your first rework: transforming fabric into something useful and yours and making it your own. To the right you see examples of reworking and if you follow the QR code it will bring you to a page full of rework inspiration.

rework inspiration?



check out the community page on Fixing Fashion!



Figure 29: Reworking inspiration

DIY tool pouch

- 1 cut the tools and booklet loose

- 2 use the video tutorial to sew the pouch

video tutorial!

- 3 Personalise the pouch using the embroidery thread and needle

- 4 Keep your tools and booklet in the pouch ready for your next repair


Figure 30: Video tutorial pouch

T-shirt Repairs

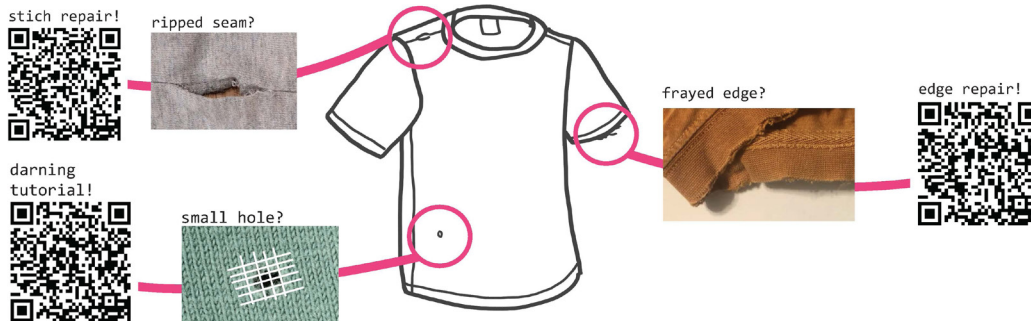


Figure 31: Repair guide

when developing the instructional approach. It helped structure key repair and rework methods in an accessible and beginner-friendly way. For self-made versions of the kit, the booklet design is adjusted for home printing. Figure 32-34 shows the simplified layout, which includes dotted cutting lines (inspired by a sewing thread motif) and hole marks for hand-binding. To reduce ink use, the front and back covers are simplified, avoiding full background designs to make printing on standard paper more practical.

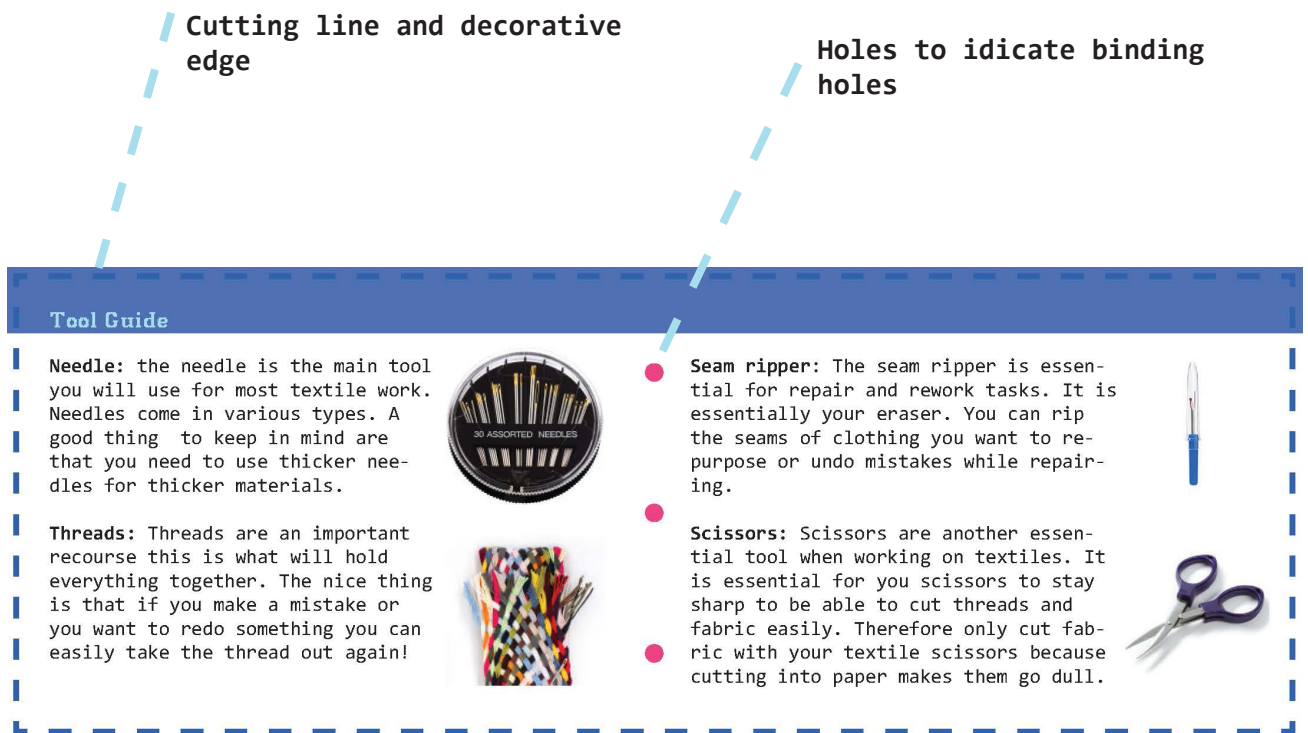


Figure 32: AT HOME PRINT:tool guide

Simplyfied front page

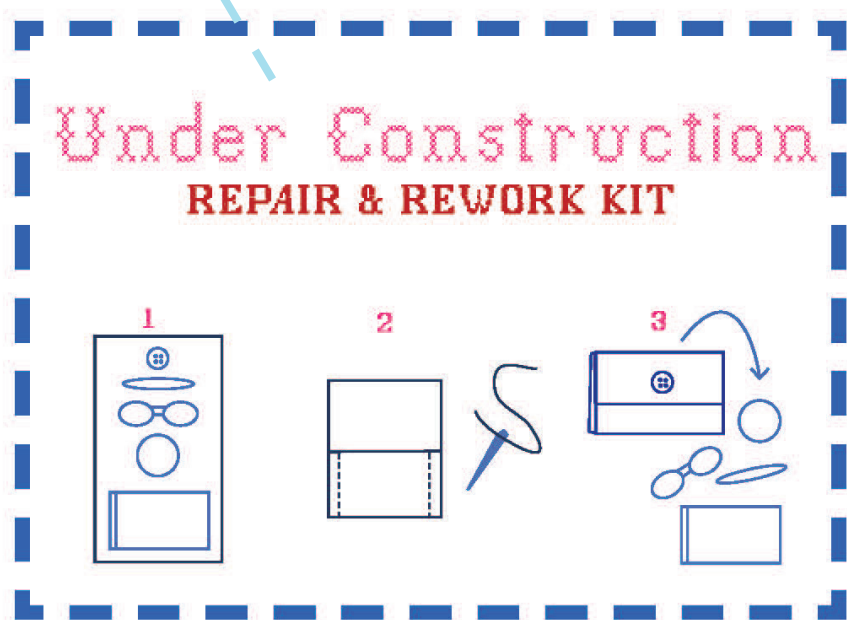


Figure 33: AT HOME PRINT:Front page



Figure 34: AT HOME PRINT:repair guide

3.2.4 Final design details: Online platform

Fixing Fashion would be a suitable platform to connect with the repair kit. By linking the kit to their website, beginner needleworkers are directed to a broader community where they can continue learning and engage with others. Uploading the kit and booklet as open-source materials on their site can act as a call to action: encouraging expert needleworkers to gift a self-made kit to beginners. This simple gesture could give someone the starting point they need on their sustainable fashion journey. The integration would require minimal additions to their existing website, as Fixing Fashion already offers detailed repair techniques. A new page could be added under their “Academy” section, where they currently share open-source learning materials. This new page would include an introductory video explaining the kit’s concept and purpose, along with downloadable materials for making a kit (Figure 35).

Required Materials

- A pattern template for the fabric piece and ribbon
- A printable PDF of the booklet
- A step-by-step instruction guide for assembling the kit

There are three key components: the fabric and ribbon, the tools, and the booklet. The fabric piece should be cut according to the provided pattern. Its edges must be overlocked, and a buttonhole added using a sewing machine. The ribbon, which will also be included in the pattern, needs to be sewn as well. Both can be sourced from scrap fabric, though the main fabric should be thick and non-stretch. The ribbon can be made from lighter material.

Tools and materials can either come from the expert needleworker’s own collection, such as an extra seam ripper or leftover thread, or be purchased from a market or store. A tex-

tile ribbon was chosen intentionally to reflect the material qualities of the rest of the kit and highlight the creative potential of textiles. The included thread should be prepped by winding it around a small piece of cardboard, as shown in the instructions (Figure 36).

The booklet can be printed at home on standard A4 paper. There are both color and black-and-white versions available to accommodate different printer types. Compared to the shop version, the DIY booklet has a simplified design for easier assembly. It must be cut and bound using needle and thread. Once assembled, the tools and booklet can be attached to the folded fabric, and the ribbon tied around to complete the kit.

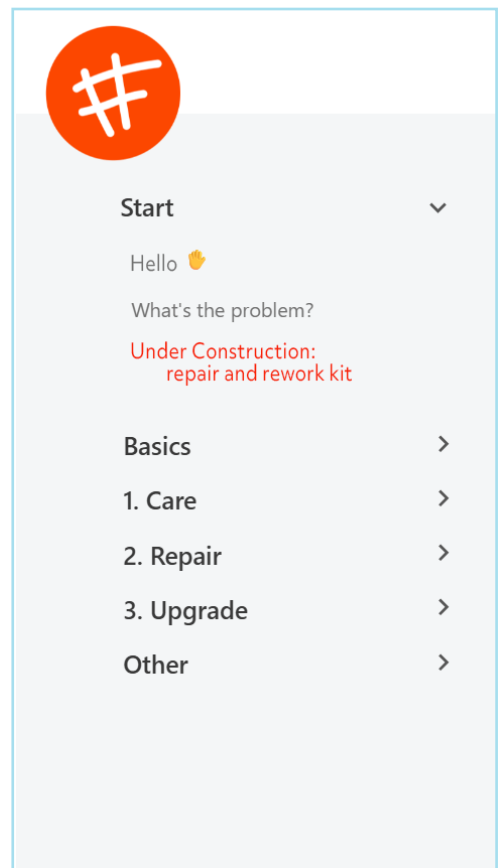


Figure 35: Fixing Fashion modified website



Figure 36: Example of what a self-made kit would look like. There are different types of tools that can be included

Map

Academy

Login

Join

Under Construction: repair and rework kit

EDIT

Are you an experienced needleworker looking to inspire someone new to the craft? The Repair Kit is designed for you to easily create and gift a meaningful starter set to beginners in your family or friend circle.

With this kit beginners will start by completing the tool pouch and personalising it. During this activity, beginners gain confidence and practical skills in a simple, hands-on way. The booklet that is included helps beginners find the right repair techniques for their worn or torn clothing.

Below you will find all the necessary guides to make a kit! The open-source materials include a pattern for the cloth, and an illustrated booklet and guide on finding the right tools and fabric.

By gifting this kit, you're not only sharing essential needlework skills but also encouraging a creative, sustainable approach to clothing repair—helping reduce textile waste one stitch at a time.

1. Instruction Guide: [download here](#)
2. Pattern: [download here](#)
3. Instruction Booklet in Colour: [download here](#)
4. Instruction Booklet in Black and White: [download here](#)



Report a Problem

3.2.5 Interaction scenario: Making the pouch

The interaction with the kit follows four steps: reading the booklet, making the pouch, repairing clothing, and reworking clothing. Figure 37 shows these steps in order. During each step, the user's skills and confidence with needlework grow. The interaction qualities explained in chapter 2 subsection 2.3.3 were used to shape the experience. These are Eye-Opening, Guiding, and Empowering.

Reading the booklet:

When reading the booklet, the user is introduced to the concepts of repair and reworking, and why these are important. The introductory section also includes an explanation of the included tools and how to use them. This step helps the user understand the purpose of the kit and opens their eyes to the possibilities these tools offer.

This is where the user gains new information; the experience is guided, but also eye-opening regarding the potential of needlework.

Making the pouch:

When the user is ready to start creating, it's time to transform the piece of cloth into a pouch. A video tutorial is provided to teach several sewing techniques that will be useful when repairing or reworking clothing. Once finished, the pouch will serve as storage for the tools and the booklet. This step may take some time, but it builds the user's confidence to tackle future repairs and reworks. It shifts their mindset, repairing starts to feel achievable, just like making the pouch. After constructing it, the user is invited to add a personal touch using embroidery thread. Similar to the darning sampler mentioned in subsection XX, the pouch becomes a space to experiment, learn, and make mistakes before moving on to clothing.

In this step, the user gains the confidence to do more needlework. It shows them that while learning takes time, needlework is not as difficult as it may seem. It opens their eyes to the possibilities offered not just through repair, but also through personalization.

Repairing clothing:

Once the pouch is complete, the kit can be used as a kind of first aid kit when clothing needs repair. The booklet helps the user identify the appropriate technique for each specific repair and guides them to a video tutorial explaining that technique. This creates an accessible way of troubleshooting.

Here, the user is supported by the booklet, lowering the threshold to begin repairing.

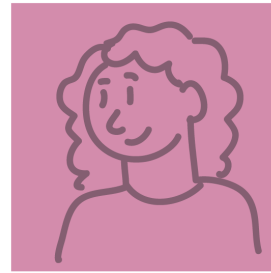
Reworking clothing:

The user can also choose to rework a piece of clothing. Inspiration is provided in the kit, but this part is the least guided to allow for personal creativity and expression. Reworking may also require additional tools, like a sewing machine. The act of adding a personal touch to the pouch closely relates to this step, it introduces the user to the idea of transforming an object to better suit their personality and needs.

By the time the user reaches this stage, they will have gained more experience and feel empowered to reshape their clothing to reflect their personal style.

Journey of the Beginner Needleworker: building their experience.

Has little experience in needlework but wants be more sustainable with fashion. Does not know where to start



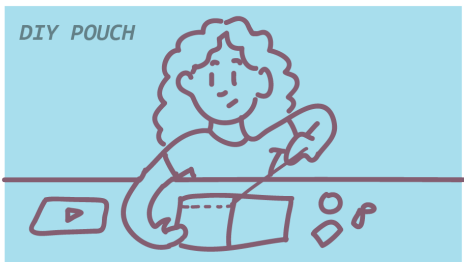
**Beginner
Needleworker**

1



The booklet kicks off the users journey

2



By making the pouch the user builds confidence in needlework skills and learns usefull techniques

3



With the help of the booklet the user gets directed to tutorial to help them repair items

4



Inspired by the booklet the user can rework items with their new skills

Figure 37: Journey of the beginner needleworker showing their buidling of skils

3.2.6 Interaction scenario: Getting the kit online and offline

During testing, it became apparent that users were interested in giving this product as a gift. There are two ways that the gifting can take place.

The kit will be available the kit will be available online as open-source material. In this scenario, more experienced needleworkers can gift it to a friend or family member. There are several reasons that may inspire this gift. These cases are based on observations and conversations throughout the project:

- An older family member giving the gift to a younger family member:
“My grandma bought me the tools for my own sewing kit when I moved out of my parents’ house. She curated the tools and gathered them in a box as a gift for me.”
The kit can provide an extra layer to this kind of gift by adding an experience to it and including learning resources.
- A more advanced needleworker wanting to create a personal gift:
“Creating a personal gift for a friend takes work but is gratifying. I always doubt if they will really use it if it is not practical.”
The kit offers a practical and meaningful gift for someone interested in sustainable fashion. The gift-giver can also share their experience and hobby with another person.

Figure 38 shows how a more advanced needleworker could acquire and gift the kit. The materials to create a kit can be sourced from the Fixing Fashion website, where all necessary open-source materials will be available. The kit can be assembled by using the pattern to sew the piece of cloth and the ribbon, gather the appropriate materials and print and bind the booklet. The kit can then be wrapped and gifted to someone who is still a beginner. This establishes a connection between the gift-giver and the beginner needleworker. The experienced person can offer help if the beginner does not understand certain steps in

making the pouch for example. Once the pouch is finished, the beginner can show off what they made. They can share their needlework knowledge, which creates a shared experience. The kit is fully made by the gift-giver, and they carefully choose the fabric and tools. This makes the gift more personal. Using the open-source materials, the cycle of gift-giving can continue, as recipients may be inspired to create a kit for another beginner once they’ve gained more confidence and skill

A museum shop could make the kits available for purchase. A museum focused on textiles, or one with an exhibition on sustainable fashion, would be ideal at this stage. There are two paths through which the product can end up with the user: one where they buy the kit for themselves, and one where they receive it as a gift. After visitors go through the museum, they will arrive at the museum shop. The repair kit will act as a call to action for beginner needleworkers. In this way, they can take the inspiration gained from the exhibition and have a practical starting point for repairing their clothing.

The kit will be displayed in the museum shop with an example booklet, pouch, and wrapped kit, so the intention behind the product is clear. A more advanced needleworker might be inspired to buy the kit for someone they know who is interested in learning to repair. As a gift, the kit is a practical item with an added experience that sets it apart from other gifts, such as a book or a plain tool set. At the counter, the gift will be wrapped using the included string, which helps present the kit clearly as a gift.

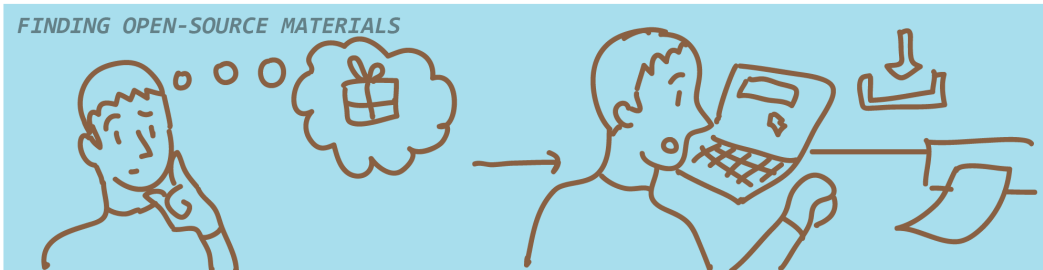


Want to gift a friend/family member a personal gift that is practice as well as experiential

Journey of the Expert Needleworker: passing the touch.

Intermediate/
Advanced
Needleworker

1



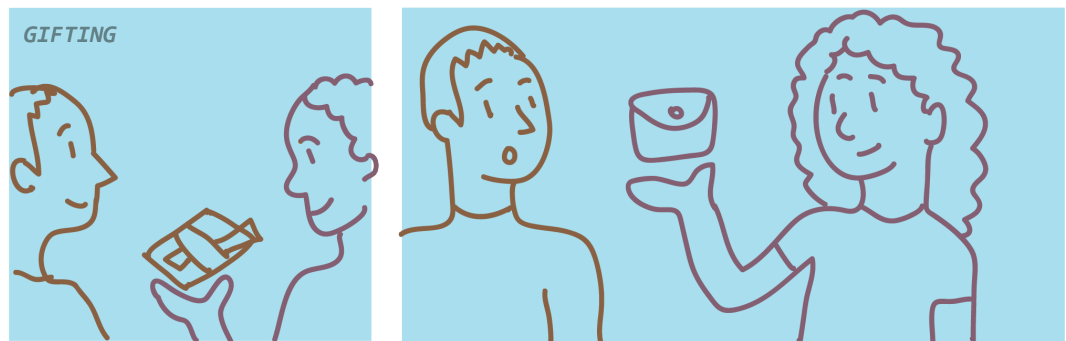
Materials needed to create the kit yourself can be found on Fixing fashion

2



The three parts of the kit are assembled: sewing the cloth, gathering materials, printing the booklet

3



Wrap up the kit to gift it, a connection is established between giver and receiver

Figure 38: Journey of the Expert needleworker showing them passing the touch

3.2.7 Production and upscaling

This project places a strong emphasis on sustainability and a non-profit approach. Its goal is to teach people skills that help reduce waste. As such, production should generate minimal waste, and sustainability must remain a priority throughout. The aim is to shift mindsets and build skills, not to profit from beginners, but to create something regenerative for both nature and culture. For this reason, the project operates with a non-profit ethos. The project will be considered successful if it inspires people to repair more. This can be achieved by enabling people to download the pattern for the kit and make it themselves.

The kit can be produced in two ways: by expert needleworkers or by organisations. Both groups will be able to use the open source materials available on the Fixing Fashion website. When an expert needleworker creates a kit, they can freely access the materials online. The instructions come with guidelines, which recommend using scrap materials for the kit or example. This approach not only reduces waste but also lowers costs. There are also guidelines for selecting the tools included in the kit. As a result, kits created by individuals may vary slightly in appearance and quality. However, each one will be unique. The kits will carry a personal touch from the maker, which can enhance their value for the recipient. When beginner needleworkers use the kit, they will gradually develop their skills and may eventually become intermediate or even advanced needleworkers. This progression can inspire them to create a kit for another beginner using the open source materials. If they have upgraded the tools from their original kit, they can even regift their beginner tools.

The open source materials are primarily aimed at intermediate or advanced needleworkers, who already have the confidence to create a kit. However, to reach more beginners, there are also open source materials available for organisations. These organisations can produce the

kit themselves. Suitable organisations include social ateliers and workshops. One example is Stichting Stunt in Delft, which has a sewing studio that produces recycled textile products like tote bags for the Oude and Nieuwe Kerk in Delft. Such organisations could collaborate with museums to produce kits on a small scale for museum shops.

Museum shops would be an ideal venue for distributing the kits, especially given the non-profit nature of the project. Several museums in the Netherlands focus on textile-related topics. For example, Museum Rijswijk is a small museum that specialises in paper and textile art. Larger textile-focused museums such as the Textile Museum in Tilburg, Museum de Kantfabriek in Horst, and the Weverijmuseum in Geldrop could also be interested. The Textile Museum in Tilburg was approached with the prototype, and the shop manager expressed interest in the concept. There could be additional value in weaving the cloth for the kits in their textile lab, creating a keepsake tied directly to the museum. Since the Textile Museum blends heritage and design, this kit aligns well with its mission, particularly as it promotes traditional needlework knowledge.

Museums that occasionally host exhibitions on textiles or sustainable fashion might also be interested. For instance, the Zeeuws Museum recently organised an exhibition called DARN, highlighting the beauty of textile repair in Zeeland. On a broader scale, museums that promote sustainability regardless of their focus on textiles could be interested. Art museums such as the Rijksmuseum could find value in the kit due to its sustainable ethos, educational content, and connection to cultural heritage. It is possible that collaborating museums and Fixing Fashion might support the project, as these organisations often work with donations and grants that fund non-profit initiatives. This approach would help broaden the reach to more beginner needleworkers. Beginners could buy the kit themselves in a museum shop, or an experienced needleworker might purchase it as a gift. However, the decentralised production of kits also means the quality of the

product may vary. While the project aims to remain non-profit, working with different organisations may introduce challenges. Some may decide to use the open source materials to create commercial products. While this would stray from the original intent, it could still have a positive impact by encouraging repair and rework, even if profit is involved.

Guidelines for organisations include instructions for the three key components of the kit: the cloth, the tools including button and thread, and the booklet. The cloth can be made from recycled cotton sourced in the Netherlands. One such supplier is Enschede Textielstad, which weaves recycled cotton. Using this type of material supports the message of the kit by repurposing waste into something new while also supporting local production. Cotton is water-intensive to grow, so using recycled cotton helps reduce environmental impact.

To keep prices low, the specific tools required for the kit should be purchased wholesale in large quantities. The booklets can be printed by a professional printer. While the prototype features a booklet bound with thread, which fits the textile theme, staples are a more standard option for this booklet size when ordered from a print shop.

All choices in the kit's design have been made to balance aesthetic appeal with sustainable production practices. If the guidelines are not followed, it could negatively affect both the quality and sustainability of the kit.

Producing the kit involves several steps: cutting, hemming, creating a buttonhole, and attaching the tools and booklet. These tasks require a sewing machine, a serger, and possibly a punch needle. These machines are common in sewing studios. At home, a sewing machine is sufficient, though not strictly necessary, as it simply speeds up the process. Based on the prototype, creating the kit at home takes about 1 to 1.5 hours. In a professional setting with proper equipment, the process would be quicker.

There is a design tension between production time and the DIY element. The kit's purpose is to empower users and teach skills through making the pouch. This means the kit is, in a sense, an incomplete product. If the tools were instead packaged in a ready-made pouch, much of the educational and interactive experience would be lost. That said, this alternative would be faster and simpler to produce, as sewing on the tools takes more time than constructing the pouch itself. Because the current version takes more time to make, it is also more costly. The learning value comes with a trade-off in production efficiency.

From a home-use perspective, another tension arises. The value of gifting the kit lies in its personal touch. The creator chooses the fabric and tools with care, investing time and effort, more than a typical gift would require. Whether this is feasible depends on the creator's access to materials and their level of expertise.

Fixing Fashion was chosen as the host platform for the open source materials for several reasons. The website already provides many instructional videos, which the kit's booklet can link to. It shares the same mission of promoting sustainable fashion and teaching needlework skills. Adding the kit materials to Fixing Fashion could serve as a call to action, encouraging people to share knowledge and resources. However, one potential obstacle is Fixing Fashion's opposition to selling products. They advocate against consumerism and believe selling products contradicts their mission of making fashion more sustainable. Their platform is intended to show that buying new clothing is unnecessary. The kit is also available for organisations to produce and distribute. The goal is to keep profits minimal, though this cannot be fully guaranteed once a design is open source. Still, the kit represents a form of undesigned practice. It works to dismantle unsustainable systems rather than simply offer more sustainable alternatives within them.

This aligns with the concept of undesigning, which involves removing harmful structures instead of adding green solutions that do not

address root causes. The kit reduces habits of overconsumption by encouraging repair and reworking of garments. It also minimises reliance on commercial systems by giving people the tools and skills to pursue alternatives. In this way, the project may still align with Fixing Fashion's values even though it results in a physical product. Figure 39 shows the relations of the following stakeholders:

The stakeholders:

Beginner Needleworkers: Receive and Use the Kit

Pros:

- Can share the outcome with the gift-giver, creating a shared experience
- Offers a clear and supported entry point into repairing clothing

Cons:

- Requires time and effort to create the pouch before tools can be used

Expert Needleworkers: Assemble and Gift the Kit

Pros:

- Offers a meaningful, personal gift for friends or family
- Provides a way to share a hobby and inspire others to learn

Cons:

- Takes more time and effort than purchasing a standard gift
- Uncertainty about whether the gift recipient owns the required tools

Fixing Fashion: Maintain the Platform

Pros:

- Expands outreach for repairing, reworking, and the platform itself
- Encourages collaboration with like-minded organisations

Cons:

- Creates tension between the open-source, non-profit philosophy and the fact that the kit

is a product being sold
otherwise generate direct income

Sewing Atelier: Create the Kit

Pros:

- Contributes to a sustainable and socially driven product
- Offers opportunities to build connections with cultural institutions like museums

Cons:

- The non-profit nature of the project may not align with their financial or operational model

Museums: Sell the Kit

Pros:

- Supports educational, sustainable, and cultural heritage initiatives
- Provides a meaningful product that aligns with relevant exhibitions or values

Cons:

- Requires allocating shop space that could otherwise generate direct income

3.2.8 Price and costs

The costs to make the kit were estimated using the prototypes as an example. The calculation can be found in Appendix B. When creating a self-made kit, the cost of materials ranges between €1.20 and €13.70. This variation depends on how many materials the expert needleworker already has available. Typically, experienced needleworkers have leftover materials from

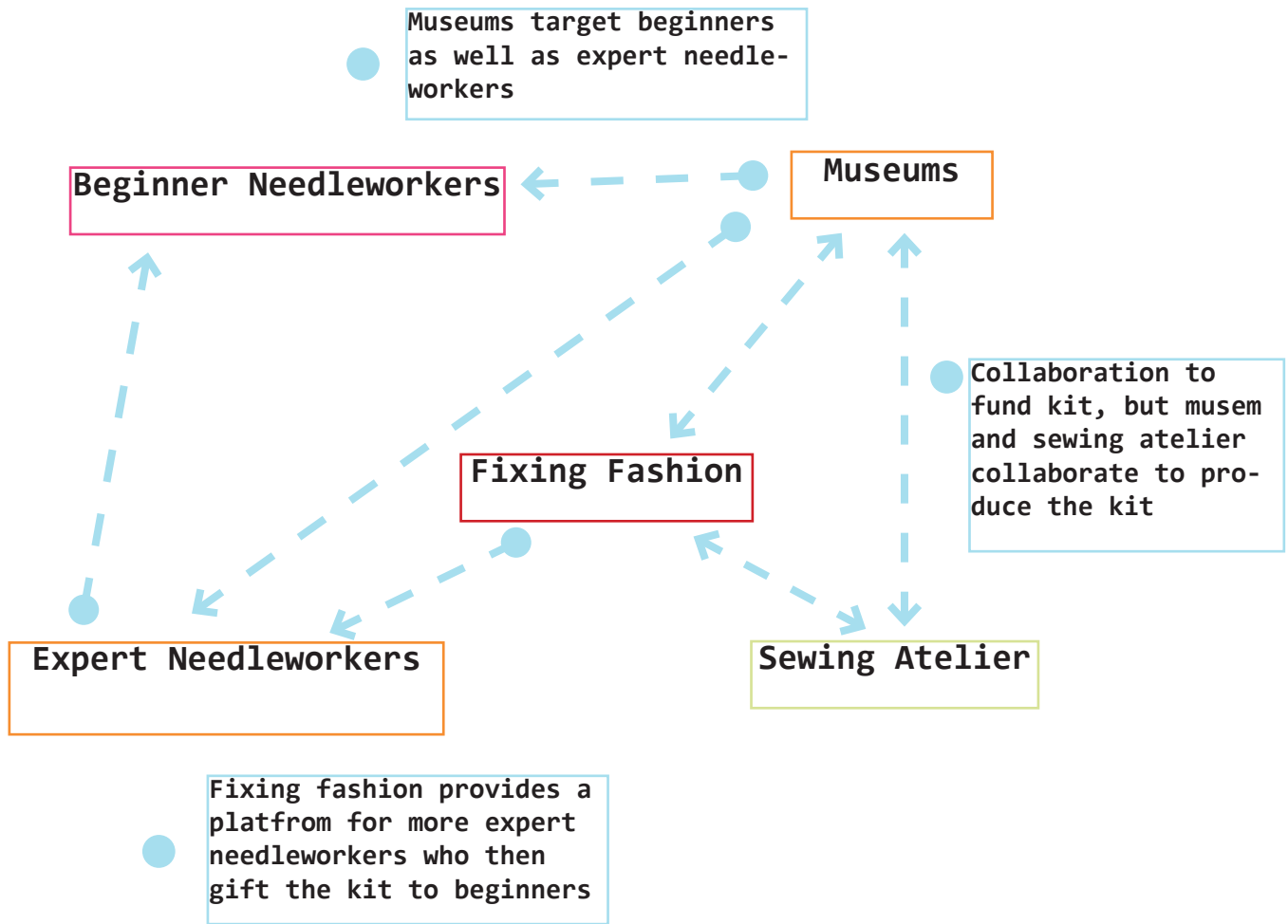


Figure 39: Overview of stakeholder relations

previous projects, as well as certain tools or supplies already in stock.

The estimated upper price of €13.70 is based on sourcing the tools from a local market, where prices are generally lower than in retail stores. If all materials were bought in a store, the cost would increase to approximately €24.70. Both prices are considered reasonable for a hand-made gift. However, the added time required to assemble the kit must also be taken into account.

Assembling the kit takes approximately 1 to 1.5 hours, based on the time needed to produce the prototype and assuming the maker has an expert skill level. Time must also be allotted for

sourcing materials. In many cases, only the tools would need to be purchased, while the rest of the components could come from scrap materials. In this case, the cost would range from €7.20 to €9.20, depending on whether the tools are sourced from a market or a store.

The evaluation of desirability included a price indication of what potential users would be willing to spend on the kit. Most respondents indicated a range of €11 to €20, which aligns well with the estimated cost based on the prototype.

3.2.9 Branding: Under Construction

The branding for the concept was based on the value that the kit promotes. There needs to be a shift in the mindset people have in regards to clothing wearing and consumption. Instead of focussing on buying new clothing when it is damaged or when we don't like it anymore, our clothes should be "under construction". When our clothing gets damaged it will be repaired and when it does not fit our needs anymore it needs to be redesigned.

Repairing clothing and reworking clothing is an important step in terms of longevity of clothing. Having basic needlework skills is an important part of this. Having these skills allows people to adapt their the clothing they already own to their needs. The kit is an extension of this notion helping users to gain the skills necessary. This message is reflected in the instruction text included in the booklet. In order to empower young people to be active with their clothing. They should learn that to having needlework skills together with their creativity open up possibility that they could be the designer of their clothing even if it is in a small way. The idea of clothing being Under Construction is incorporated in the materiality and look/feel of the product. Figure 41 shows the mood board used to explore this.

The choice of fabric is incorporated in the idea of under construction as well. The cotton twill fabric is often associated with workwear, because of its sturdy and durable qualities. Visual interest is created by combining the workwear fabric with more delicate embroidery. This ties in needlework as part of the personalisation of the pouch.

The pouch is meant to be a practise ground, therefore fabric must look sturdy. By giving the fabric a sturdy appearance it makes experimenting more inviting.

The edges of the pouch are finished with an overlock stitch, this keeps the fabric from fraying to much, but it does give off a slight unfinished appearance (Figure 40). This reinforces the notion that the pouch yet to be completed

and is still "under construction".

The graphic design of the booklet as modelled after the mood board to create a coherent visuals language. The font used imitates hand-stitched lettering and the colours used are inspired by the fabric used as seen in Figure 40.



Figure 40: Design details": "Under Construction"



Figure 41: Moodboard: "Under Construction"

3.2.10 Conclusion

In this subsection a reflection is done on how the design fits within the design direction, how the design fits with the overarching goals and what the design further explores.

The design goal of this design was to:

to design an hands-on and streamlined experience that empowers young people (18–25) to learn about needlework in the Netherlands. This design creates a hand-on experience, by using the DIY element. By nudging the user to create a pouch before using the tools for repair. This activity shows the user they can do needlework if they put some effort and time into it. They may also discover that it does not take as much time and effort as they think. In this way they will gain confidence and be empowered to change clothing according to their needs and wants.

When the pouch is constructed, the user is invited to personalise the pouch, with the included embroidery thread. This step will create an emotional bond with the kit and makes keeping it more enjoyable.

The experience of learning needlework is more streamlined by guiding the user in the first steps. The kit provides the complete package: the tools, the experience and the instructions. The user no longer has to search for information, but the booklet provides a guide on how to find the right repair techniques. The DIY activity lowers the barrier of starting to use needlework for repair, making it easier to see possibilities when it comes to repair and rework. When the pouch is completed, the users will have a place to go, when they encounter a repair problem. The booklet and tools include everything to make an easy start.

This learning experience is also important when it comes to regenerative fashion. When there are more skilled needleworkers, fashion can change into a more pro-active phenomenon. In stead of only buying and wearing clothing people can participate in how their clothing works for them. By using rework tech-

niques clothing can be fulfil a more personal goal with the user and fit their needs, without the requirement of buying something new. The knowledge, shared with this design, aids the sustainable fashion system.

The essence of DIY activity is that there are no real rules. In a professional setting there are protocols and deadlines for follow, but DIY offers freedom. It allows you create things on your own terms. This is contrasted by the learning aspect of the kit, here it is important to guide the user though certain steps, before they set out on their own. The kit explores the balance between freedom and structure, in the design of the interaction as well as the production/upscaling. The DIY part tries to strike a balance between a structured task, that teaches you the basics, and the freedom of personalisation. The personalisation is a crucial step in the making of the pouch as this teaches the user the freedom that comes with reworking. In the production and upscaling, the balance between freedom and structure is also explored. The opensource quality of the design is important for the goal of regenerative fashion. The opensource materials ensure everyone can access the repair and rework knowledge. The materials to make a kit are also free, which means anyone could create a kit. This adds a tension between the quality of the product and the freedom to adjust certain parts of the design. This creates unique kits, that are more personal for the receivers of the kits. This adds to the goal of fashion being renarrative and not constricted by structures that are in place.

This design also explored DIY elements in product design. Mugge (2009) and Hoftijzer (2011) explore this in their research as well. This design incorporated the DIY element as a way of learning new skills. Personalisation, although part of the design, is not the final goal. That is that more people learn to do needlework skills. These skills can benefit the sustainable fashion system, by inspiring and instinct in people to repair and rework more clothing. The DIY element was also incorporated in the look of the product. The product is partly “un-

der construction”, so an incomplete product. This was incorporated in the look and feel, creating incentive to not be careful with the cloth, but use it to practice on.

This design also explores unmaking in product design as an empowering practice within sustainable fashion. By encouraging people to take garments apart, rethink their construction, and rework them to better suit personal needs, the kit helps eliminate habits of overconsumption—challenging the idea that worn or ill-fitting clothes must automatically be replaced. It reduces dependence on commercial spaces by creating a fashion commons, where individuals can engage directly with their clothing and transform it through hands-on interaction. The product is grounded in open-source and gifting principles, aiming to decentralize access to fashion tools and knowledge. Rather than presenting repair as a task reserved for professionals, as is often the case in formal education, the kit frames needlework and unmaking as shared, community-based practices. In doing so, it restores textile knowledge and opens space for creativity, sustainability, and self-expression through both making and unmaking.

3.3 EVALUATION RESULTS

In this section the evaluation results will be shared. First, the evaluation on prototyping will be shared. Second, the evaluation on desirability will be shared. Lastly, the evaluation on the experience will be shared. At the end of this section you will find the conclusion and discussion of the evaluations and adjustments made to the final concept.

3.3.1 Prototyping of idea's method and results

The first evaluation activity was conducted using a series of prototypes. The goal was to assess the experience of three main ideas that emerged at the end of the ideation phase. Each idea was described and evaluated against the interaction qualities established in the interaction vision (see Chapter Subsection 2.3.2), in order to determine which concept aligned best with the intended design direction.

All three ideas aimed to incentivize a DIY activity. DIY inherently offers a sense of freedom—for example, there are no strict rules when it comes to repairing or reworking, as it often involves personal expression. However, when designing for beginners, it is also important to provide guidance and structure that matches their skill level and knowledge. The prototypes were created to explore the balance between freedom and guidance.

Description – Idea 1:

This prototype (Figure 42) presents the idea of a rework kit. The first version of the kit enables users to add pockets to a pair of pants, transforming them into workwear-style trousers. If the pants are no longer useful or become too worn, the detachable pockets can give the jeans a renewed purpose.

The second version of the kit allows users to add embellishments or logos to t-shirts using embroidery. This version enables users to personalize garments or cover holes creatively through embroidery techniques. Both kits include the necessary materials (such

as pockets or embroidery thread), tools, and instructions. Each version is designed to help users develop different needlework skills: the pocket kit focuses on sewing, while the t-shirt kit emphasizes embroidery. Although the kits can be used for repair, their primary focus is on reworking and creatively transforming items of clothing.

Description – Prototype 2:

This prototype (Figure 43) introduces the concept of a repair kit. It encourages DIY engagement by guiding the user through the process of creating a pouch to store their repair tools. By transforming a piece of cloth into a functional pouch, users are introduced to basic needlework techniques.

Through making the pouch, they learn various stitches that will be useful for both repair and future reworking projects. Once the pouch is completed, users are encouraged to personalize it—using embroidery, for example—serving as their first step into reworking practices.

The accompanying booklet provides information about the tools included in the kit, a guide to basic repair techniques, and inspiration for reworking garments. The kit is also linked to an online platform offering video tutorials on constructing the pouch, as well as various repair and rework techniques.

Once complete, the pouch serves not only as a storage solution but also as a toolkit the user can turn to for future repairs. The process of making the pouch jumpstarts skill development, which can be built on through ongoing repair and rework activities.

Description – Prototype 3:

This prototype (Figure 44) presents a kit focused on learning about textiles and exploring tools through hands-on experimentation. It includes starter materials, basic tools, and a booklet. At its core, the kit embraces the philosophy of tinkering—a method of exploration that involves engaging with materials, tools, or techniques to discover how things work and



Figure 42: Prototypes of idea 1

how to create with them (Vossoughi & Bevan, 2014).

In this approach, learning by doing is essential. Unlike more structured kits, this one does not have a specific end goal. Instead, the activity invites users to explore freely: do they want to repair something, rework an old garment, or simply create something new from scratch? This open-ended framework gives users the freedom to choose their path. The kit includes a booklet designed to act as both a guide and a journal. Users are encouraged to document their experiences and insights as they engage with the materials and try out different activities. These notes serve as a kind of record—similar to documenting the results of an experiment—capturing discoveries and personal learning moments.

Through this playful and exploratory process, users gradually build their skills and confidence in textile work, guided by curiosity rather than instruction.

Evaluation

Each prototype was evaluated against the design direction, the interaction qualities—eye-opening, guiding, and empowering—as well as the overall design goal. Prototype 2 was ultimately chosen for development into the final concept. This prototype was the strongest because it struck a good balance between freedom and structure. It guides the user through the basics of repair and rework, while also encouraging them to explore the creative freedom that reworking allows within that framework.

Prototype 1 places greater emphasis on reworking than on repair, but its structure is quite rigid. For example, the rework activity is predefined—such as adding pockets to pants—limiting the user’s creative input.

Prototype 3, on the other hand, is too open-ended. While this explorative, tinkering-based approach may suit some learners, it does not align well with the target group: beginners who often face barriers when trying to learn needlework. For them, the lack of struc-

ture may be overwhelming or too time-consuming.

In contrast, Prototype 2 introduces learning moments in response to practical needs, such as repairing clothing, making it more suitable and approachable for beginners. It allows users to gain confidence while offering opportunities for self-expression through rework.

A table summarizing these considerations can be found in Appendix C.

Although Prototype 2 was selected, there were still areas for improvement. Notably, the rework component needed greater emphasis, as this aspect is central to the empowerment goal of the project.

To develop the final prototype, several iterations were created to test tool selection and refine the pouch pattern (Appendix D). An expert needleworker was consulted to determine the essential repair tools for beginners. Two key considerations were identified: including thread in the kit and determining the appropriate size for the booklet.

Thread was added to make quick repairs possible. A multicoloured thread was chosen, as it offers versatility for different types of garments. The booklet was designed to be compact, yet legible, with clearly visible text and visuals. The size of the cloth was then adjusted accordingly to accommodate both the tools and the booklet.



Figure 43: Prototypes of idea 2



Figure 44: Prototypes of idea 3

3.3.2 Desirability of the concept: method and results

The second evaluation was conducted through interviews using a prototype of the final concept. The goal of this evaluation was to understand how appealing or attractive the repair kit is to the intended audience. Specifically, the desirability test aimed to uncover whether young people are drawn to the kit, and to understand the reasons behind their level of interest.

Two assessment criteria were established to analyze participant responses (Appendix F):

- Emotional response to the kit
- Relevance of the product to the participants' lives
- Responses were evaluated according to objectives linked to these two criteria.

Before each interview, quantitative data was collected to gauge the participants' interest in sustainable fashion and their needlework skill level. This helped determine how well they fit within the target group. Additionally, Van Westendorp's Price Sensitivity Meter was used to assess the price participants were willing to pay for the product. Due to the small sample size (four participants), a graph was not used; instead, the results were presented in a table format.

The study took place in a closed-off room within the IDE Faculty building, as shown in the test setup (Figure 45). To simulate a realistic context, participants were provided with a written scenario and image, placing the product in a museum gift shop. The product itself was presented in a display-style setup, with a mock-up of the booklet included to enhance the immersive experience.

Before the main evaluation, a pilot test was conducted, after which the interview questions were refined. Four participants were selected

based on their needlework experience and interest in sustainability. Two participants were IDE students; the other two were from outside TU Delft. Each interview lasted approximately 30 minutes. Figure 45 shows the test setup.

The evaluation results are divided into three categories:

- Emotional response to the product
- Relevance of the product to the participants' lives
- Price indication

The concept form and completed question forms can be found in Appendix E and G.

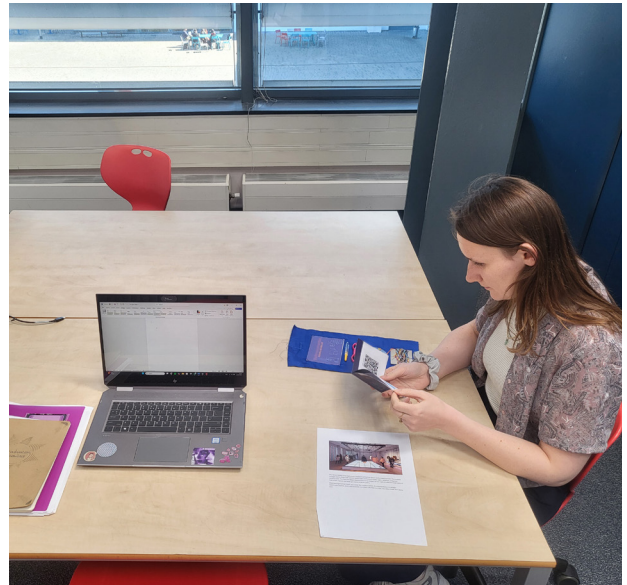


Figure 45: Evaluation desirability set up

Results emotional response

The emotional response of participants was strongest when they considered the kit as a gift, as explored in question 9. Most participants expressed interest and curiosity about giving the product to someone else. They were generally quick to think of a specific friend or family member they would gift it to, often describing this person as creative, someone who enjoys learning new skills, and is environmentally conscious. An important consideration for

many was whether the recipient already owned basic tools, making this gift more appropriate for someone they know well.

Participants highlighted several reasons why they considered the kit a good gift:

- Its practical yet aesthetic quality
- The added experience of making the pouch
- The complete package: combining tools, information, and a learning activity

Additionally, Participant 1 mentioned that the kit would make a thoughtful gift for someone moving out of their parents' house or preparing to travel for a long time.

In terms of buying the product for themselves, the overall emotional response ranged from moderate to positive. Participants expressed curiosity and interest, particularly during question 15, where they compared this kit to other repair kits. This prompted them to reflect on the utility and appeal of different features, and they identified several aspects of the repair and rework kit as desirable:

- The compact set of tools
- The combination of tools and information
- The presentation
- The added DIY element

It was noticeable that participants with the most repair experience showed the least interest in buying the kit for themselves. However, they responded more positively to the idea of giving it as a gift.

The DIY element was discussed further in question 12. Although the product is, in a sense, incomplete (requiring the user to make the pouch), this aspect did not deter participants. For example, Participant 3 commented, "Mess-

ing around with the pouch would be nice before starting on the real repairs." Some participants expressed concern about the time commitment involved in making the pouch, even if they recognized it as a valuable learning activity. At the same time, others noted that the design of the product encourages completion, since leaving the pouch unfinished would result in loose tools.

Interestingly, the two participants with the least repair knowledge did not initially notice the DIY nature of the pouch. This only became clear to them during the follow-up questions, suggesting that the product's DIY aspect may need to be made more explicit in its presentation.

Relevance to life

One out of four participants described the kit as being highly relevant to their current life situation. Participant 1 shared a recent experience where they needed to repair a pair of socks but didn't know how to do it or where to buy the necessary tools. As a result, they ended up purchasing new socks and kept the damaged ones with the intention to fix them later. They found the booklet particularly helpful, as it offered clear information about tools and techniques—something they lacked, especially since they didn't know how to describe the repair problems they encountered.

Two participants found the kit relevant, but in more specific or future-oriented contexts.

Participant 2 mentioned that they currently live with their parents and therefore have access to repair tools at home. However, they noted that once they move out, they would want to have their own set of tools, making the kit a good fit for that transition.

Participant 4 reflected on a past period when the kit would have been very useful. At a younger age, they had more clothing in need of repair and less money to replace items. In that situation, receiving a kit like this as a gift would have been particularly valuable.

Participant 3, who had more experience with repairing clothes, found the kit less personally relevant. Although they were interested in learning new techniques presented in the booklet, they already owned most of the tools, reducing the kit's direct applicability in their daily life.

Price Indication

When discussing price, participants identified several factors that would influence their decision to purchase the kit: necessity, presentation, price-to-quality ratio, and potential long-term savings. Among these, the price-to-quality ratio was the most frequently mentioned consideration. It was important to participants that the tools included in the kit were of good quality relative to the price.

Two participants also noted that if the museum exhibition where the product was sold was inspiring, it could positively influence their decision to buy the product. This suggests that the context and emotional momentum of a museum visit could play a role in encouraging purchases.

Based on responses to the Van Westendorp's Price Sensitivity Meter questions, Table 1 was created to visualize the results. The findings indicate the following:

A price below €9 was considered too cheap, possibly raising concerns about quality.

A price around €11 was seen as a bargain.

A price around €15 was considered acceptable, though starting to feel expensive.

A price above €20 was considered too expensive by most participants.

In summary, the acceptable price range for the kit falls between €11 and €20, aligning well with the estimated production cost and participant expectations.

Price indication

Questions	Participant 1	Participant 2	Participant 3	Participant 4
Priced to low	5-9 euros	5-9 euros	under 5 euros	under 5 euro
Priced to be a bargain	13-15 euros	10-12 euros	5-9 euros	10-12 euros
Priced to be expensive but not out of the question	Over 15 euros	Over 15 euros	10-12 euros	Over 15 euros
Too expensive	Over 20 euros	Over 20 euros	Over 15 euros	Over 30 euros

Table 1: questions and answers per participant

3.3.3 Experience of creating the pouch: method and results

The third evaluation was conducted by interviewing two participants after they created the pouch using a prototype (Figure 46). The goal of this evaluation was to determine whether the intended interaction of making the pouch had the desired impact. Specifically, it focused on how the experience aligned with the interaction qualities defined earlier in the project.

From these interaction qualities, two assessment criteria were established :

- Eye-opening
- Empowering/Confidence
- Relevance to Skills

The interaction quality of guiding was not evaluated in this session, as it is primarily linked to the booklet and explanatory video, which were not included in the prototype testing. The evaluation plan can be found in Appendix H.

The pouches were made in a home setting during the evening, with both participants working simultaneously, as shown in the test set-up (Figure 47). Since no instructional video was available, the researcher provided guidance throughout the process, simulating the role that the video would play in the final product. The making process took approximately 1.5 to 2 hours. Interviews were conducted the following day, lasting approximately 30 minutes each.

Two participants were selected based on differing levels of needlework experience:

Participant 1: Had little to no experience with needlework but expressed a desire to learn basic repair skills. This participant was given the scenario of having purchased the kit for herself.

Participant 2: Had slightly more experience

and fit the profile of someone who is creative and environmentally conscious—a description given by previous participants as a potential gift recipient. This participant received the kit as a gift.

This setup was informed by earlier desirability evaluations, which suggested the kit could appeal both as a self-purchase and as a gift for a like-minded individual.

During the interviews, PrEMO was used to assess emotional responses. The materials used during the evaluation can be found in Appendix H.

Relevance to Skills and Life

Participants 1 and 2 responded differently regarding the relevance of making the pouch to their skills and daily lives.

Participant 1 found the activity highly relevant. Before making the pouch, they were curious about repair work but hesitant to try it. The main barriers for them were a lack of knowledge, uncertainty about how to repair, where to buy tools, and which tools were needed. Additionally, they feared the process would be time-consuming and difficult. However, their experience with making the pouch changed this perception.

Participant 1 noted that making the pouch was easier than expected. Although some stitches were challenging at first, they quickly got the hang of it. They expressed that this experience helped remove the initial barrier and would recommend it to others facing similar hesitations. They realized that working with textiles was not as difficult as they previously thought. Furthermore, Participant 1 mentioned discovering a genuine enjoyment of sewing through this activity, which inspired them to use their new skills in the future. They felt proud of the skills they developed during the pouch-making process.

Participant 2, who had more prior sewing experience, described feeling confident in their sewing skills but admitted to some apprehen-



Figure 46: Prototypes used during evaluation experience



Figure 47: Evaluation experience set up

sion about repairing nicer or more expensive clothing. Their attitude toward repairing was more positive compared to Participant 1, framing it as both an achievement and a fun experience rather than a daunting task.

This difference was also reflected in their thoughts about keeping the pouch. Participant 1 was excited to use the pouch and intended to keep it alongside their other tools at home for easy access when needed. Participant 2 appreciated the pouch because of the effort they put into making it but noted that they already owned many of the included tools.

Both participants successfully completed the pouch, with no significant difference observed in the quality of the final product (see Figure 48).

Eye-Opening Quality

Participant 1 experienced several moments of discovery that introduced new techniques and shifted their perspective. With little prior knowledge about constructing things with textiles, the process of making the pouch opened up a new way of crafting for them. They were surprised to learn that sewing the edges would create rounded corners and that turning the textile inside out could neatly hide the seams. The transformation of a simple piece of cloth into a useful pouch was unexpected and sparked curiosity about what more they could create with these skills.

Participant 1 also realized that working with textiles was easier than they had anticipated, discovering that imperfect stitches could still produce a sturdy pouch. Additionally, they found they enjoyed working with textiles and wanted to continue exploring this craft. The personalization step particularly inspired them—they admitted they would not have thought of personalizing the pouch on their own, and this step significantly enhanced the fun aspect of the experience.

Participant 2 experienced the eye-opening quality to a lesser extent. They learned a new technique, how to sew a button, that they



Figure 48: the pouches made by participants

had not known before. However, this did not greatly impact their existing skillset. Participant 2 also recognized that their hand-sewing skills were not as strong as they assumed prior to using a sewing machine. On a positive note, they rediscovered the excitement and calming, “zen” feeling that comes from making things by hand.

Confident and Empowering Quality

Participant 1 experienced the most significant growth in confidence throughout the process. After completing the pouch, they expressed pride in their accomplishment, emphasizing how satisfying it was to have developed the skills needed to construct the pouch successfully. The experience reduced the hesitation they initially felt—especially around not knowing how to use the tools or whether their work would be “good enough.” Seeing that they could produce a sturdy, functional result helped to dispel those doubts.

The personalization step played a key role in boosting their sense of ownership. They highlighted that putting time and effort into making and decorating the pouch made it feel more valuable than a store-bought alternative. The handmade aspect increased their emotional connection to the item. They also mentioned feeling more prepared to attempt future repairs using similar techniques, though they acknowledged they would still need guidance if faced with unfamiliar repair challenges.

Participant 2 also reported feeling proud after completing the pouch, particularly because they now had a functional and self-made item they could use for future repairs. However, their sense of empowerment was more practical and subdued. During the making process, they experienced a dip in confidence, noting they were somewhat embarrassed by the unevenness of their stitches, which did not meet their expectations. This contrasted with their initial belief that they were more skilled due to past sewing machine use.

Unlike Participant 1, Participant 2 did not attribute much personal significance to the personalization step. While they were pleased with

the pouch and its utility, this did not enhance their emotional attachment to the product in a notable way.

3.3.4 Conclusion

Several important insights emerged from the evaluations. During the initial evaluation of the prototypes, the Repair and Rework Kit was selected as the final concept due to its effective balance between freedom and structure, and its flexible approach to learning. These qualities made it especially suitable for the intended target group of beginners in needlework who face a barrier to getting started.

In the desirability evaluation, the product's potential as a gift stood out most. Participants responded positively to the idea of gifting the kit, especially to people they knew well—those who are creative, enjoy hands-on activities, and are environmentally conscious. Positive aspects frequently mentioned included the practical yet aesthetic design, the hands-on experience of making the pouch, and the comprehensive nature of the kit, which combines tools, information, and activity.

However, the evaluation also revealed a threshold of relevance based on experience level. Participants with more needlework experience were less enthusiastic about purchasing the kit for themselves, although they still considered it a good gift. Conversely, the participant with the least experience found the kit to be highly relevant to their life, particularly because it addressed their previous lack of knowledge and tools. Participants also noted that the kit would be especially useful when moving out of the parental home, where borrowing tools is no longer an option.

Regarding pricing, participants identified a typical acceptable price range between €11 and €20, aligning with the expectations formed during the prototype phase. Factors influencing price sensitivity included perceived quality, completeness of the kit, and the inspiration gained from the museum context.

The final experience evaluation revealed that the kit can have a significant impact, particularly on users who are motivated by sustain-

able values but lack confidence or knowledge in repair. One participant, who had no previous repair experience, described the experience as eye-opening and empowering. Making the pouch lowered their perceived barrier to entry, built confidence in their abilities, and sparked curiosity about further textile work. The personalization step was especially meaningful, as it contributed to a strong sense of ownership and pride in the final product.

Overall, the evaluations show that the kit has strong potential to support and empower a specific user group, beginners with an interest in sustainability, by offering a low-threshold, engaging way to begin learning repair skills.

3.3.5 Limitations

Each of the three evaluations faced limitations that should be considered when interpreting the results.

Prototype Evaluation

During the first evaluation, which focused on selecting a concept, end users were not consulted. Involving users at this stage would have provided valuable insights into their needs and priorities, helping to ensure that the selected concept aligned more closely with their expectations. The lack of user input in this phase limits the depth of understanding regarding initial user needs.

Desirability Evaluation

The desirability evaluation was conducted with only four participants, which is a small sample size. This limits the validity and generalizability of the findings. A larger sample would be needed to draw stronger conclusions and could potentially alter the results, including the insights around emotional response, relevance, and pricing.

Additionally, the Van Westendorp Price Sensitivity Meter results were influenced by the low number of participants, reducing the reliability of the price range estimate.

Another limitation was the use of an initial question form at the start of the interview,

which may have influenced participant responses. For example, when describing someone they would gift the product to, participants closely matched the intended target group—possibly due to priming from the form. In future studies, it would be more effective to administer such forms after the interview.

Furthermore, no physical example of the pouch was shown during the interviews. This may have led to misunderstandings or limited engagement with the concept. Providing a sample could improve clarity and support more informed feedback.

Pouch Experience Evaluation

This evaluation involved only two participants, which again limits the validity of the findings. A larger and more diverse group would strengthen conclusions about the impact of the pouch-making experience.

Additionally, participants followed instructions from a researcher rather than a video tutorial, even though the intended scenario involves users learning through a video at home. A future study should explore how users respond when following the video independently, as this better reflects the actual use case.

Moreover, the evaluation was conducted with both participants simultaneously, which introduced an unintended social aspect. In contrast, the intended experience is solitary, and the presence of another person may have influenced motivation or engagement. A more accurate evaluation would involve users completing the pouch alone, to better assess independent interaction and the potential for boredom or disengagement.

3.3.6 Adjustments

The key adjustments that were made to the final concept after the evaluations were:

- There should be more focus on reworking as well. This was adjusted in the final concept by connecting the personalisation step of the pouch with the reworking of clothing. This was done in the booklet.

- More focus on the product as a gift for beginners, rather than the beginners buying it for themselves. This was adjusted in the interaction of the kit, by adding the resources to create your own kit and adding the ribbon to tie the kit into a gift.

- Personalisation was important to the participants. A personalisation step was added to the pouch. Now, a decorative trim is made along the edge.

Other key adjustments were:

- adding the resources to make the kit as open-source materials to Fixing Fashion. This reinforces the goal of regenerative fashion. There were adjustments made to the design of the booklet and the tools of the kit for this.

- Changing the size of the pouch to accommodate the threads added, but also to improve useability.

4 FINAL THOUGHTS

This chapter contains the overall conclusion and recommendation for the design project, as well as a discussion on the limitations. To end, this chapter there will be a personal reflection on the overall process.

4.1 CONCLUSION AND RECOMMENDATIONS

In this design project several interesting paths were explored Needlework, DIY and Sustainable fashion. Needlework was used as an approach to sustainable fashion. When designing within this frame it is important to focus on repair and rework practices, as these are expressive as well as practical ways of reducing waste. DIY in product design was explored by using it as a hands-on learning tool. This step was guided to a degree because this helps lower the barrier, for learners who are hesitant because they are still beginners. However, when designing such a DIY step, there should also be a step of personalisation. When the personalisation step is involves, the user can express themselves, and this allows for an emotional bond to grow. In this way, design can strengthen needlework the practice of needlework for young people in the Netherlands.

Form the evaluations done there is an indication that beginner needleworkers, who are struggling because of a lack of knowledge, could really benefit from a product like the repair and rework kit. Nonetheless, further research needs to be done to determine its value for a more sustainable fashion system.

- More research can be done towards the desirability of the design among the target group but also among expert needleworkers, who were later also targeted with the design.
- More research can be done towards the experience of the target group when making the pouch. This could determine if the online resources aid in the experience.
- There could also be more research towards the barriers of the target group, as now only lack of knowledge was found as a barrier. There could be more barriers that can be targeted in a revised design
- There could also be more research done on a long-term basis to discover is the users of the kit will use it to repair and eventually rework. This could also reveal how their skills will build over time, when the kit is used.

4.2 DISCUSSION ON LIMITATIONS

There are limitations to the current design. Self-expression is something that requires freedom and exploration. The kit only offers limited resources to achieve this and there is a limit of how many resources can be added. To achieve more self-expression would be good as this is connected to folk fashion explored in sub-section 2.1.2

There is a limitation in the target group. This group consists of young people (18-25) who are interested in sustainability, but do not have needlework skills yet. There is no estimation on how large this group is, and this effects the impact within fashion system. However, this can be further explored.

There is also a limited reach when it comes to opensource materials, there is a certain degree that is uncontrolled. How, when and why people/organizations will use the resources is less determined. A positive thing is that it also allows for creativity and improvements within the communi-

4.3 REFLECTION

During this project I explored combining historical research in a design project. I had explored this two times earlier. Once within the course DFI research methods and once for a research elective. When in these I used historical methods to create a more comprehensive and critical perspective on a certain situation or of a certain system. What inspired me about using this method was the broad perspective it gives, and it allows for new inspiration that I might not have found otherwise.

In this thesis these two factors were most important, although in the beginning I imagined the use of the historical research to be different. In the beginning the goal was to compare the past and present systems of sustainable/unsustainable fashion, however this proved to be not as helpful for the analysis and design direction. Therefore, a different approach was taken. I used the historical research to inform my understanding and formulation of the research questions. This also helped shape my critical understanding of the topics of sustainable fashion and needlework. I also used the historical research as references and inspiration, for example the Archizoom kit and the darn samplers.

I think this method would be good when combined with context mapping with the target group. I did not have the chance to do this in this project, but it can help shine a light on barriers on a more individual level. I also think more involvement of the users could be ideal in the prototyping phase to involve their needs and wants.

The evaluation methods were quite effective for the project. One thing that could really improve this would be to evaluate more participants.

In the design process it took a while before I got to an effective design direction. I think this is due to me still figuring out the historical methods, but also in less contact with the target group.

Overall, the project reached me a lot of new things about the topic and my design process, and I think the result is an interesting design project, with a lot of layers. It was fun to be able to use the historical methods and textile knowledge I gained in my master courses.



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APPENDIX

The appendix can be found in a seperate document



