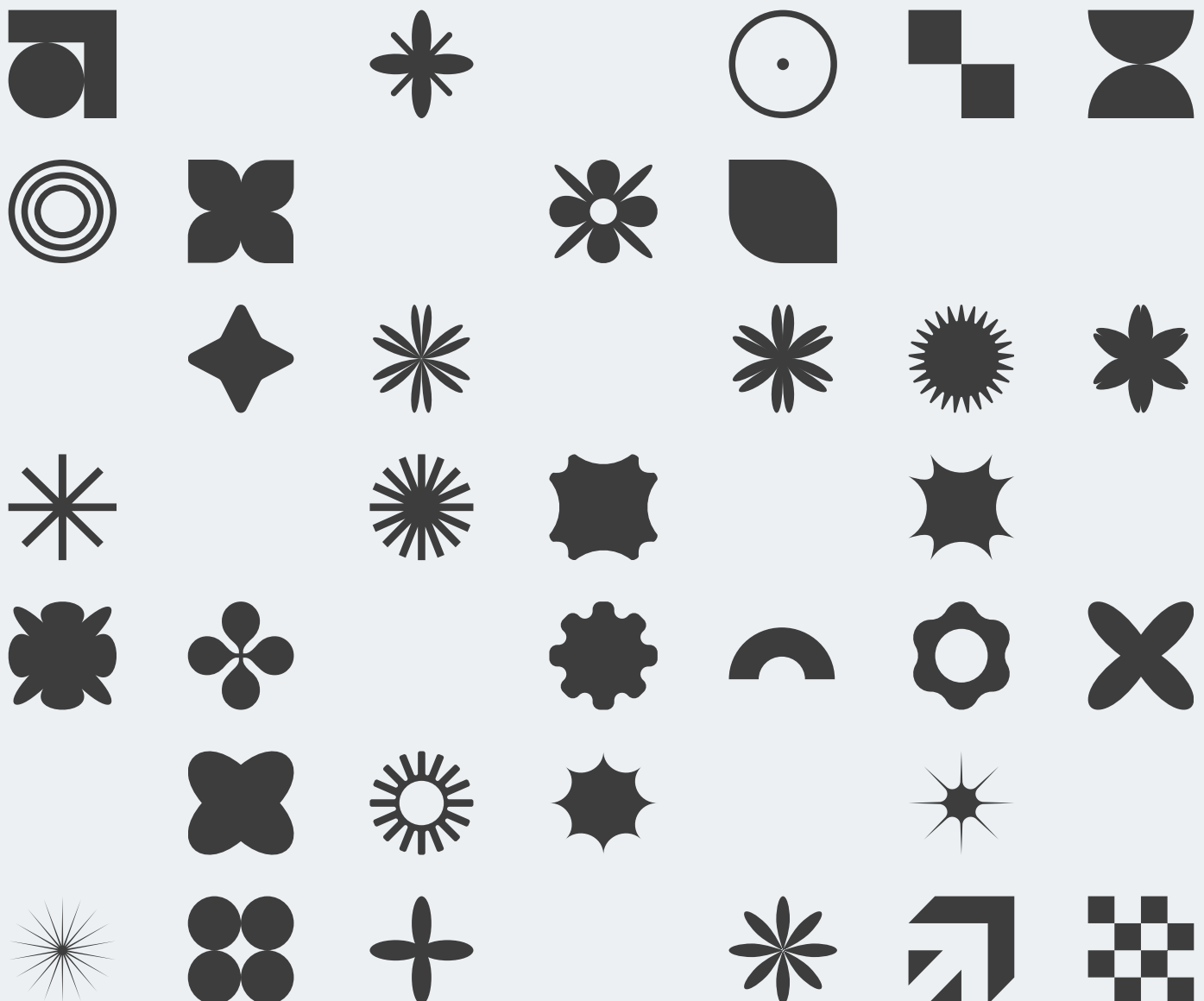


Threading connections:

Enhancing Seller-Buyer Engagement through
Communication of Product Properties in a
C2C Secondhand Clothing Marketplace



Master's Thesis

August 20th, 2024
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Acknowledgments

This graduation thesis marks the end of my two-years master's journey at Delft University of Technology. The report is the outcome of six-month design research; I eagerly took an initiative for this project for my graduation. As a Design for Interaction student, my personal ambition is to make a concrete impact through enhancing user experience design of C2C secondhand online platform. This personal ambition comes from my concern about the issues of overconsumption in first-hand clothing online shopping and the underutilization of secondhand online platforms.

I want to extend my gratitude to my mentors, Maarten Wijntjes and Sijia Bakker-Wu, who played crucial roles throughout this journey. Their generous guidance, constructive feedback, time, and positive support have been truly valuable in the success of this project. Each of our conversations provided new and insightful guidance, leaving me inspired after. I am deeply grateful for the opportunity to work under their supervision and their commitment to my academic growth. I also truly appreciate each and every participant who gave their time to the research. Their participation, responses and feedback have shaped the outcomes of the presented project.

This thesis was a very meaningful project to me, and I am happy to share this with the readers. Please enjoy reading.

Adinda Januardani

Executive Summary

01 Thesis objective
02 Method and results
03 Design contribution
04 Limitations and
future directions

01 Thesis objective

This thesis addresses the **main research question: “How to help customers to communicate product properties accurately for a C2C secondhand clothing online platform?”** Communicating product properties in C2C online marketplace is important because clothing is “high-touch” experience goods that need sensory evaluation to assess the product (Lynch et al., 2001a). The goal of the thesis is to provide design recommendations to improve engagement between sellers and buyers in C2C secondhand clothing online marketplaces by communicating secondhand product properties accurately. And as a Design for Interaction student, my personal ambition is to make a concrete impact through enhancing user experience design of C2C secondhand online platform. This personal ambition comes from my concern about the issues of overconsumption in first-hand clothing online shopping and the underutilization of secondhand online platforms. By identifying the real problems faced by the users of these platforms, I aim to develop concrete solutions that can be implemented, such as developing guidelines for the sellers of C2C secondhand online platforms in communicating product properties and feel encouraged with it, in order to help buyers to have a better understanding of the items. Additionally, I believe this thesis will inspire further research in this area, and contribute to the democratization of C2C within the circularity, this includes deeper investigation into the tangibility of online secondhand shopping, such as accurate measurements and material feel, as well as broader studies on behavior change in shifting mindset to make secondhand clothing a first choice.

02 Methods and results

To address the key research question, a comprehensive literature review was conducted, identifying a **general research gap: there have been no specific studies on communicating product properties in C2C secondhand clothing online marketplaces**. To bridge this gap, we investigate through conducting a Sequential Mixed Research method using **qualitative research** (in-depth interviews) for the first phase, with the key research question: **“What are the key factors influencing customer satisfaction in selling and buying clothing in the online C2C platform?”** These are the **key findings** from the in-depth interviews:

1. Customers often encounter measurement inaccuracies, as many of them struggle to determine how the clothing will fit without trying
2. There is often a lack of information about signs of use although customers expect some flaws in secondhand items, but often there's a lack of information about signs of use
3. Tactile experience is missing in online shopping, making it difficult to gauge the material of the secondhand clothing
4. Customers frequently feel disappointed when the actual color differs significantly from what they saw online.

In the second phase, we conducted **quantitative research** (online survey distributed across Europe), with the key research question: **“What solutions are feasible to implement on the platform to enhance the engagement between seller and buyer in the C2C online platform?”** We integrate the results of both phases of the research to answer the questions. These are the **key findings** from the survey:

- Provide visual and textual information to cater to buyers' needs, which often hinders their experience when lacking in the platform
- Allow sellers to easily provide visual and textual information of their product in the product listing page without hassle (e.g feel encouraged to put detailed measurements, provide clear images, etc)

03 Design contribution

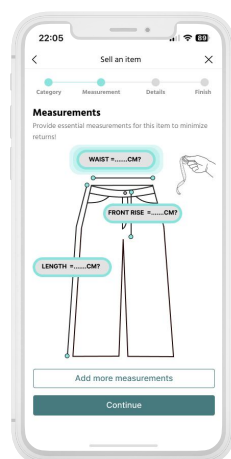
Based on the research, the insights revealed that there is a necessity in providing detailed information about product properties such as the detailed measurements of the product, signs of wear, true color representation, and its tactile descriptions. To address this need, a digital interactive prototype that is designed to cater the needs of users was

developed. This design prototype includes design features that enable sellers to offer accurate information about their items. The prototype was evaluated to measure its impact on seller and buyer engagement, assessing how effectively it meets user needs and improves communication of product attributes. The evaluation process involved user testing to gather feedback on the usability of the prototype, ensuring it aligns with the design goal and effectively bridges the identified research gap and enhances the overall online platform experience.

This study provides suggestions by examining solutions to encourage customers to effectively communicate product properties. On C2C platforms, individual sellers upload their own images and text for product information, resulting in varying levels of quality and clarity. The quality and clarity of these inputs are crucial for establishing trust, a driver of long-term success in C2C online platforms (Leonard & Jones, 2015; Ter Huurne et al., 2017). Previous studies have also shown that better interaction and higher trust correlate with improved business performance.

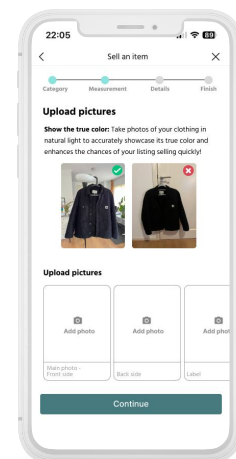
This research and design concept contributes to C2C secondhand online platforms by enhancing the communication of product properties. In C2C online platforms, sellers provide their own text and images for the product listings, which are reflected on the product detail page viewed by buyers. This information is crucial for buyers when making purchase decisions. We propose the following guidelines for sellers to improve product listings:

1. Visual guidance to help users input detailed measurements
2. Guidance for capturing and displaying the true color of products
3. Guidance for encouraging sellers to provide signs of wear
4. Guidance for capturing the item's dimension and tactile qualities through video



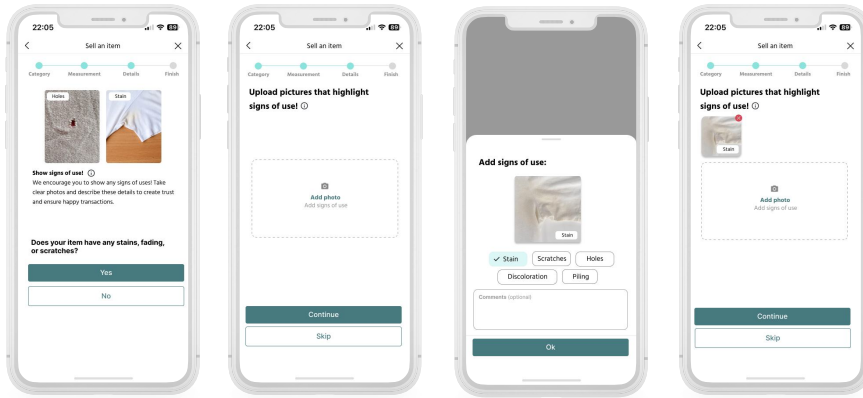
1. Measurements

Provide guidance for sellers to include essential measurements. In the product listing page, after selecting category, sellers receive prompts on what specific measurements are needed (e.g for trousers: length, waist)



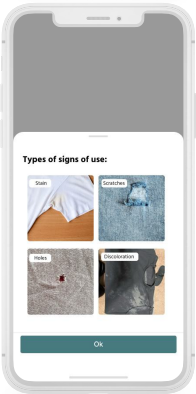
2. Color

Provide guidance on how to best capture the true color of clothing to avoid discrepancies, and encourage sellers to photograph items in natural light.



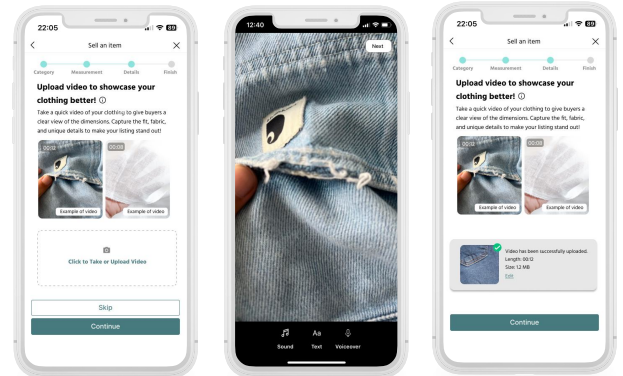
3. Signs of use

Provide guidance for sellers to detail and take photos of signs of wear. Encourage detailed descriptions and close-up images of any flaws.



4. Dimension/ Touch & feel

Provide guidance for sellers to take videos showcasing the item's dimensions and texture.



These recommendations are based on the primary themes identified in our research, aimed at enhancing interaction between buyers and sellers. The design can serve as a guideline to address the barriers customers face on C2C secondhand clothing online platforms today.

04 Limitation and future directions

In this study we explored what product attributes are important to communicate on online platforms for secondhand clothing, focusing on four types: measurements, signs of use, color, and dimension/ touch & feel. This provided us some interesting insights, however future research should dig more deeply into these attributes. For example, exploring how to provide more tactile information, such as fabric texture influences buying decisions. Additionally, broader studies on behavior change in shifting mindset to make secondhand clothing a first choice are also important. Lastly, from a practical perspective, future research is necessary to assess real-world feasibility by conducting A/B testing to refine the platform's functionality.

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01. Introduction

In recent years, secondhand clothing C2C online marketplaces are experiencing rapid growth worldwide for consumers to buy and sell their clothes. The secondhand market is experiencing rapid growth globally, driven by the rise of online second-hand markets and the sharing economy facilitated by information technology (Fernando et al., 2018). From Consultancy.eu (2024), the European secondhand market is now worth over €38 billion and is projected to reach €86 billion by 2028. It is estimated that over 87% of Europeans already participate in the secondhand market. The reason could be that today's consumers have shifted their perception of secondhand products, which were traditionally viewed as inferior (Norum & Norton, 2017). This could indicate that the secondhand clothing online market is growing rapidly and that customers' mindset is shifting towards making secondhand products their preferred choice.

The popularity in using C2C online platforms for trading secondhand clothing between consumers can be attributed to two particular global developments (Yeap et al., 2022). Firstly, there is the democratization of commerce through the Internet where the same Internet which once enabled businesses to sell his or her products online to consumers (B2C) has now empowered any technologically savvy (non-business) individual to sell their items to other individuals (C2C) via online intermediary platforms (Padmavathy et al., 2019) (Kandampully et al., 2022). Secondly and perhaps more importantly, there have been calls for more sustainable fashion consumption practices following disclosures of discarded garments ending up as clothing waste in landfills. More than 15 million tonnes of clothes are disposed of in landfills annually (Yang et al., 2017).

However, despite the increasing popularity and growth of online secondhand customer-to-customer (C2C) e-commerce, considering the calls for sustainable consumption and alternative options for cheaper items, research on online secondhand shopping remains limited. Many authors emphasize the lack of empirical research on the use of secondhand peer-to-peer (P2P) platforms (Parguel et al., 2017) and the fact that knowledge of secondhand goods online shopping is still in its infancy (Padmavathy et al., 2019). Most studies on online shopping have largely ignored online secondhand/used good purchases (Fernando et al., 2018). These studies often overlook user-centric factors in the online platform that can enhance their willingness to purchase secondhand clothing. This lack of research leaves out important aspects of consumer needs unexamined. As a result, the practical strategies influencing consumers' decisions to prefer secondhand clothing over new ones remains poorly understood.

One of the factors influencing consumer decision-making is the presentation of product information. And, in the context of consumer-to-consumer (C2C) online marketplaces, a major challenge is the quality of visual and textual information that can vary by different sellers. Accurate descriptions and detailed information help potential buyers make informed decisions about items that they cannot physically inspect before purchasing. In the C2C online marketplace context, where product photos are typically taken by individual sellers and can vary in quality and clarity, sharing information is an important type of interaction. Detailed descriptions and effective information sharing are crucial for building customer trust and helping buyers make informed decisions about items they cannot physically inspect. Customer-to-customer informational interactions affect customer trust in interacting with other members (Ting & Ahn, 2023). Communicating the product properties of secondhand online shopping is important because personal products, such as clothing, are goods that require sensory evaluation to assess the product. Sensory information is dominantly linked to consumer's perception of products and services (Krishna, 2012).

Although showing detailed product properties is crucial in the online platform, there have been no specific studies on communicating product properties in C2C secondhand fashion online marketplaces, which could improve engagement between sellers and buyers. This research gap emphasizes the need for an approach that considers online customers to present their products accurately in C2C online platforms. Therefore, this thesis examines how design as solutions can be implemented to enhance the communication of product properties on online platforms, thus improving engagement between sellers and buyers. Understanding the customer's experience is important in this research as we need to listen to buyers and sellers. The initial research question for this project is:

“What challenges do customers face on secondhand clothing C2C online platforms, and what strategies can improve how product information is communicated to enhance engagement between sellers and buyers?”

1.2 Project structure and chapter overview

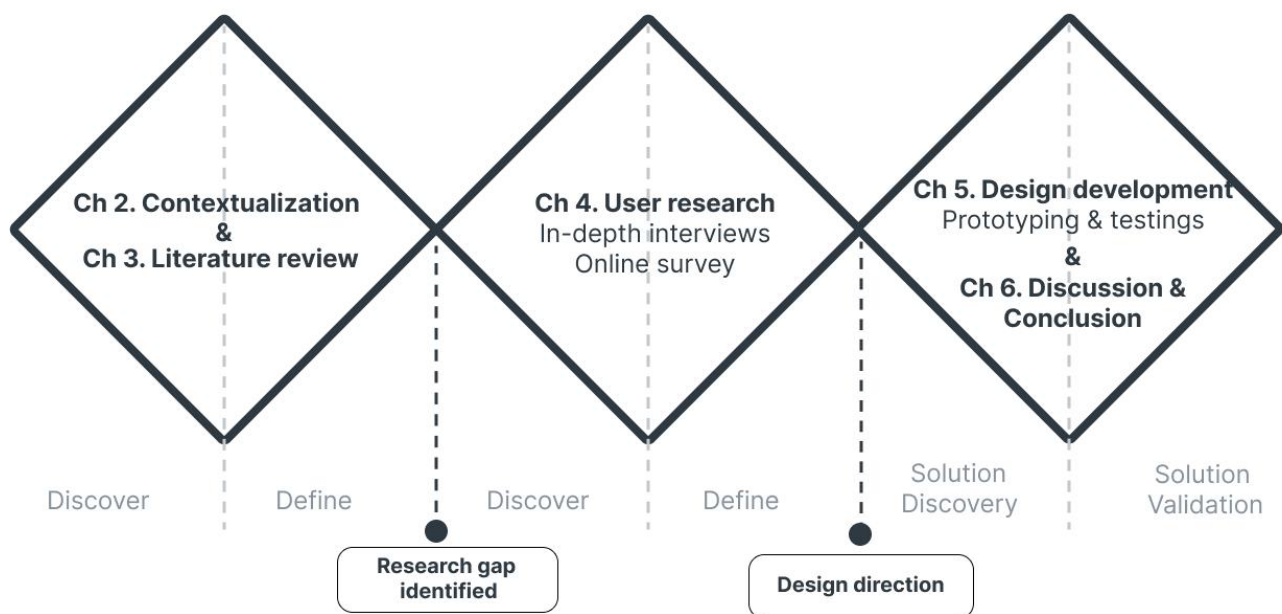
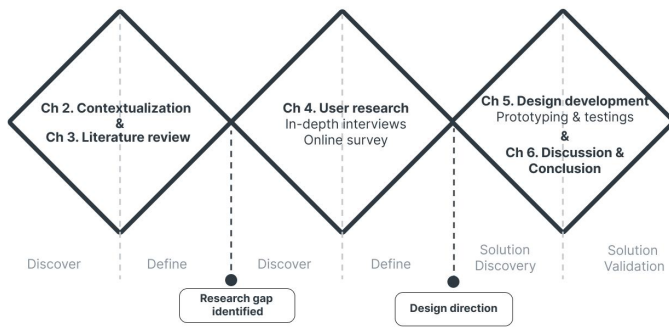


Figure 1: Project structure

In the contextualizing phase (Chapter 2), the goal is to understand the problem and gather insights through analyzing the secondhand online clothing industry and conducting a platform analysis in B2C (business-to-customer) and C2C (customer-to-customer). Through this phase, the research focus is narrowed down. The conclusion that is highlighted in the study is that there is a gap in understanding the trade-offs between personalized/amateur (C2C) and standardized/professional (B2C) approaches for product information presentation. A further investigation is necessary to examine the effects of varying photos quality and textual information quality on a buyer's perception.

From the literature review (Chapter 3), numerous studies have highlighted the drivers and barriers of secondhand clothing online shopping in C2C platforms. However, there are no specific studies on communicating product properties in C2C online marketplaces, which could improve engagement between sellers and buyers. Among the limited studies that aim to enhance interaction in C2C online platforms, there is a lack of consideration for the real-world context that users consider when making decisions. Following this, we conducted a Sequential Mixed-Method Explanatory Design as the research method from (Ivankova et al., 2006), which integrates qualitative and quantitative approaches.



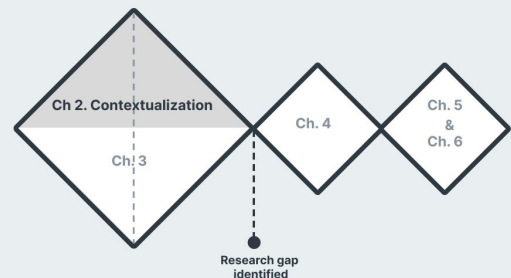
Qualitative research (Chapter 4.1) with in-depth interviews was conducted to gain a deep understanding of user needs and behaviors in the context of a C2C online platform marketplace. We interviewed 10 users to find out the “why” regarding the motives and barriers within online secondhand platform context, and therefore earn the insights that might have impact on the design directions. Quantitative research (Chapter 4.2) is conducted with an online survey and distributed across Europe and UK (n=100), to validate the findings from the qualitative research and ensure that the proposed design directions are valid to be implemented in the future. The outcome of this phase is a broad understanding of the problem space in secondhand clothing C2C online platforms and the specific needs of users.

After the user research, the goal is to clearly articulate the problem and establish a focused design challenge. This begins with synthesizing data collected from in-depth interviews and surveys, identifying key insights and patterns. Finally, a clear and actionable design goal is crafted to define the design direction. The outcome of this phase is a specific design goal and a clear direction for the design process, distilling insights into a specific challenge that needs to be addressed.

In the design development phase (Chapter 5), the objective is to develop solutions to address the main research question: “How to help customers to communicate product properties accurately on secondhand clothing C2C platforms?” During this phase, the focus is generating solutions for the C2C online platform to facilitate more accurate communication of material properties such as measurements, dimensions, color, and signs of use. In the validation phase, a prototype is developed and tested with users to gather feedback on how well it meets their needs. The key insights from this initial concept evaluation highlight the need for guiding users in providing both visual and textual information to potential buyers, ensuring clarity and transparency in product listings. In this last chapter (Chapter 6) we also provide the design contributions and offer future recommendations for further directions in the real-world scenarios.

02.

Contextualization



Intro:

This chapter aims to contextualize secondhand clothing online platforms and analyze the secondhand clothing marketplace (C2C and B2C) with a focus in Europe. It begins by examining the phenomena of secondhand online shopping (2.1), followed by key platforms in C2C and B2C (2.2) and the analysis in (2.3). The chapter concludes with a summary in (2.4).

Chapter overview:

- 2.1 Overview of the rise of secondhand clothing
- 2.2 Key platforms in the industry
- 2.3 Platform analysis
- 2.4 Conclusion

2.1 Overview of the rise of secondhand clothing

The rise of online shopping has offered consumers great convenience. Shopping online has become more convenient and popular over the past years owing to the cost-effective availability of internet or data (Turban et al., 2017). Globally, online shopping, particularly online secondhand shopping, has experienced the most rapid growth (Haridasan & Fernando, 2018). The rise in popularity of secondhand items have created business opportunities for e-commerce companies. Peer-to-peer (P2P) or customer-to-customer (C2C) platforms are terms used to describe concepts that involve individuals dealing directly with another, without intermediary. In this thesis we use the term C2C for consistency. This concept, offered by e-commerce companies or online classified businesses, have seen phenomenal growth in online secondhand shopping (Parguel et al., 2017). This growth has significantly transformed the retail landscape, offering convenience and accessibility to consumers.

The expansion of secondhand shopping within C2C platforms has been a significant development in the e-commerce sector. Nowadays, online platforms and retailers act as mediators of secondhand items (Cameron & Galloway, 2005; Fernando et al., 2018). Buying secondhand products online allows consumers to access a wide range of used items (Saarijärvi et al., 2018), offers essential information about these products (Sihvonen & Turunen, 2016), enables price comparisons between different options (Reichheld et al., 2000), and provides a convenient shopping experience.

Several online platforms have emerged as leaders in the secondhand clothing market in Europe such as Vinted, Vestiaire Collective, and Depop. These platforms offer secondhand clothing from various categories, supported by robust search functionalities, detailed product pages that contain visual and textual product description, secure payment systems, and delivery services that cater to the needs of both buyers and sellers. These technological advancements have not only improved customer's experience but also contributed to the rapid growth and acceptance of secondhand shopping in the online marketplace.

2.2. Key platforms in the industry (C2C and B2C)

The significant growth of the secondhand online platform industry has caused two types of secondhand trading platforms to emerge: business-to-consumer (B2C), and consumer-to-consumer (C2C).

2.2.1 Customer-to-Customer (C2C)

The concept of C2C interaction originates from the term "customer" in the classic service system model proposed by Eiglier and Langeard (1977), which highlights the presence of other customers in a service setting. More broadly, C2C interaction involves the transfer of information from one customer (or group of customers) to another customer (or group of customers) (Libai et al., 2010). With advancements in web technology, connections between customers have become both frequent and convenient (Zhang et al., 2022).

In recent years, customer-focused e-commerce markets have grown consistently, with customer-to-customer (C2C) e-commerce markets becoming particularly prevalent (Yang & Tang, 2008). In the C2C model, retailers allow individuals who want to sell the products to sell them directly on the platform, by making their own visual and textual information for the listings.

The preference for specific consumer-to-consumer (C2C) online platforms for secondhand clothing, such as Vinted, over general secondhand websites like eBay can be attributed to several key factors supported by relevant research. Firstly, C2C platforms like Vinted provide a more specialized and **curated experience** for secondhand clothing transactions. Jang & Kim (2023) highlights that the combination of convenient mobile apps, and the appeal of secondhand products leads to active participation, especially among younger generations. This specialized focus on secondhand clothing creates a more engaging and tailored environment for users compared to generalist platforms like eBay.

Secondly, the **user-generated content** plays a crucial role in the popularity of C2C platforms. For example, Depop, a social e-commerce platform has gained popularity largely due to its user-driven content. Yrjölä et al. (2017) emphasize that the content on social media-based C2C platforms is entirely user-generated, providing unique benefits compared to traditional e-commerce platforms. This user-driven content fosters a sense of community and authenticity, which can be particularly appealing in the context of secondhand clothing transactions.



Vinted

Vinted is a leading online marketplace for secondhand clothing in Europe, originating from Lithuania. Founded in 2008 by Milda Mitkute and Justas Janauskas, Vinted has grown rapidly, providing a platform where individuals can buy, sell, and swap pre-owned fashion items. The company's mission is to make secondhand the first choice worldwide, promoting sustainable fashion practices and reducing waste by extending the life cycle of clothing. Its popularity has surged across Europe, with millions of members from countries such as France, Germany, the Netherlands, and Spain, among others.



Vestiaire Collective

Vestiaire Collective is a luxury secondhand fashion platform based in France that connects buyers and sellers of pre-owned designer clothing and accessories. This platform is known for its rigorous authentication process to ensure the authenticity and quality of high-end items and trusted environment for luxury consumers. Their global reach and premium positioning appeal to luxurious clothing enthusiasts who seek rare and exclusive pieces.

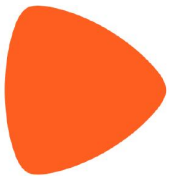


Depop

Depop is a social e-commerce platform, similar to Vinted and Vestiaire Collective, in which Depop users can buy and resell their items. Its user interface is modeled after Instagram, and users can sell items by posting pictures of them to their profiles, along with descriptions, hashtags, and prices. Users can follow sellers, whose posts will appear in their feeds. Depop users are also encouraged by the platform to use social networking services such as Instagram to promote their shop profiles.

2.2.2 Business-to-Customer (B2C)

In the B2C business model, transactions occur between business and consumers. This model involves e-commerce platforms selling products directly to end consumers. B2C platforms provide a structured and often more reliable shopping experience, with businesses responsible for ensuring product quality, managing logistics, and providing customer service. In the B2C platform, the shoppers have more trust in buying items since B2C e-commerce is an established platform (Gefen & Straub, 2004).



Zalando Pre-Owned

Zalando is an online retailer of fashion across Europe. The company which was founded in 2008 in Germany initially specialized in the sale of footwear, and in 2010, the company launched in the Netherlands and France and added apparel in the platform. They created "Zalando Pre-Owned", a service that allows customers to buy pre-owned clothing through the Zalando platform.



Kilo-Kilo Vintage Online

Kilo-Kilo Vintage is a marketplace initially specializing in the sale of pre-owned clothing by weight, rather than by individual item. The platform offers a diverse selection of curated vintage pieces, ranging from timeless classics to rare, eclectic finds, catering to a wide range of fashion tastes and preferences. In the Kilo-Kilo Vintage Online, they allow customers to purchase the vintage clothing in pieces. Their clothing is manually checked, making it credible for the buyer.



Farfetch Pre-Owned

Farfetch is an e-commerce company focused on luxury clothing and beauty products. This platform is for customers who seek secondhand high fashion options without compromising the quality of the item. Farfetch Pre-Owned features an extensive range of items from renowned fashion houses, ensuring that each piece meets standards of authenticity and condition.

2.3 Platform analysis

In the platform analysis of C2C (customer-to-customer) and B2C (business-to-customer) platforms for secondhand clothing, several key differences emerge. Product descriptions on C2C platforms vary in quality and often include personal anecdotes, whereas B2C platforms provide standardized, professional descriptions with detailed specifications. Visual information on C2C platforms consists of amateur photos, while B2C platforms offer high-quality, professional images with a consistent style. Condition reporting on C2C platforms is subjective and relies on photographic evidence, while B2C platforms include professional assessments and quality assurance checks. Additionally, B2C platforms offer comprehensive details, such as care instructions, and enhanced user interface features like advanced search filters, whereas C2C platforms have more direct communication between buyers and sellers through integrated messaging systems.

| | C2C | B2C |
|----------------------|---|---|
| Product descriptions | <p>Varied quality: Product description can be inconsistent in quality, since they are written by individual sellers with varying levels of expertise</p> <p>Personal touch: descriptions may include personal anecdotes for selling, offering a more personal touch</p> | <p>Standardized format: descriptions are typically more uniform and professional, with standardized format or ease of comparison</p> <p>Detailed specifications: often include detailed product specifications, usage information</p> |
| Visual information | <p>Amateur photos: photos are usually taken by individual sellers and can vary in quality and clarity</p> <p>Creative/unique listings: listings could be creatively presented, with sellers adding unique touches to attract buyers</p> | <p>Professional photos: high-quality images, professional photos</p> <p>Consistent style: listing maintain consistent style across the platform</p> |
| Condition reporting | <p>Subjective assessment: condition reporting is subjective, with descriptions such as "good condition" or "like new" varying widely between sellers</p> | <p>Professional assessment: items are assessed professionally with detailed condition reports</p> |

| | C2C | B2C |
|-----------------------------|--|---|
| | Photographic evidence: sellers often rely on multiple photos to demonstrate the condition of the item | Quality assurance: business may provide quality assurance checks and certifications |
| Additional reporting | Limited support: less emphasis on additional information such as detailed measurements and care instructions | Comprehensive details: often include comprehensive details such as detailed care instructions |
| User interface & navigation | Direct communication: buyers and seller can communicate directly through integrated messages systems | Enhanced features: advanced search filters, and sorting options |

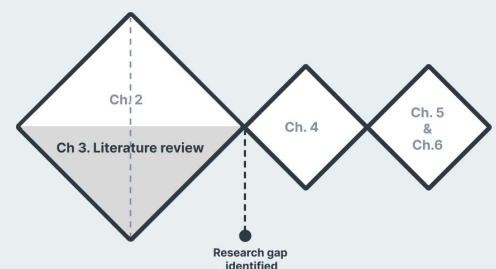
Figure 2: Comparison table C2C vs B2C secondhand clothing

2.4 Conclusion

From the analysis comparing Customer-to-Customer (C2C) and Business-to-Customer (B2C) platforms, the study concludes that there is a gap in understanding the implications of personalized/amateur (C2C) versus standardized/professional (B2C) approaches to product information presentation. C2C often features personalized and amateur presentations of product information, where individuals share their own visual and textual information of the products, but may lack consistency and professional polish. In contrast, B2C typically focuses on standardized and professional presentation of product information.

This platform analysis helped to narrow down the study focus. A further investigation is necessary to examine the effects of varying photos quality and textual information quality on a buyer's perception within the context. Chapter 3 (Literature Review) highlights the need to identify gaps in existing literature on communicating product properties in C2C online marketplaces, and Chapter 4 (User Research) emphasizes the necessity of further investigation into how different photo quality and textual information quality affect a buyer's perception. Understanding these gaps also help formulate specific key questions for the qualitative (4.1) and quantitative (4.2) phases of the research.

03. Literature Review



Intro:

Assessing clothing can be challenging because we need to see, touch, and feel to get an idea of how it will fit our bodies. When it comes to purchasing secondhand clothing online, this can be even harder because of the lack of physical interaction with the item. The goal of the literature review is to synthesize existing research on the motivations and barriers on secondhand clothing purchase on an online marketplace, and identify directions for further investigation.

The literature review is structured as follows: (3.1) Customer behavior in online secondhand clothing markets that examines motivations and barriers, (3.2) The limitation of product experience in C2C secondhand clothing online shopping, and finally (3.3) conclusions that covers the analysis from the previous sections and highlights the general research gap and suggest the refined research question to address the main design challenge in this project.

Chapter overview:

3.1 Customer behavior in secondhand clothing online shopping
3.2 The limitation of product experience in C2C secondhand clothing online platform
3.3 Conclusion

3.1 Customer behavior in secondhand clothing online shopping

3.1.1. Motivations

Previous studies highlight various motivations that influence customers to purchase secondhand products. Specifically for online secondhand clothing shopping, based on the theory of (Guiot & Roux, 2010), there are three basic types of motivations for secondhand consumption: economic, recreational, and critical. Economic motivation is driven by price sensitivity and includes the appeal of price rewards, the search for price fairness, and the activity of bargain hunting. Economic necessities and perceived price fairness are prominent factors driving this choice (Prieto & Caemmerer, 2013; Williams & Paddock, 2003). Recreational motivation, on the other hand, refers to an individual's desire to engage in activities that create enjoyable experiences and diminish negative ones (Kaczmarek, 2017). The desire for uniqueness and the pleasure derived from shopping are common motivators for secondhand purchases (Bardhi & Arnould, 2005; Turunen & Leipämaa-Leskinen, 2015). Lastly, critical motivation primarily arises from moral or ethical concerns, such as fighting against waste or overconsumption. Given that apparel manufacturing generates significant harmful waste and environmental issues (Ruppert-Stroescu et al., 2015), there has been a noticeable shift towards sustainable consumption in the clothing industry (Fu & Kim, 2019). Consequently, the consumption of secondhand clothing has grown in popularity (Nørup et al., 2019).

3.1.2 Barriers

Previous studies have examined various barriers associated with purchasing secondhand products. These barriers include concerns about contamination/hygiene, uncertainty in product quality and reliability, social stigma surrounding secondhand shopping, and issues related to trust in online platforms. For instance, some customers fear a higher risk of contamination from used items (Yan et al., 2015). Customers also tend to view secondhand products as less reliable due to their previous ownership (Lang and Zhang, 2019; Kim et al., 2021) and as inferior overall compared to new items (Norum & Norton, 2017). Social factors further compound these barriers, with some consumers fearing social disapproval or humiliation associated with buying secondhand, often seen as a marker of financial hardship (Hur, 2020; Silva et al., 2021). Additionally, the unknown history of secondhand goods, coupled with concerns about their condition and quality, contributes to consumer hesitation (Guiot & Roux, 2010; Schaefers et al., 2016; Sihvonen & Turunen, 2016). In the context of online shopping, trust becomes particularly crucial, especially since buyers cannot physically examine secondhand items before purchasing (Lang & Zhang, 2019; Padmavathy et al., 2019). Therefore, these diverse elements together influence consumer attitudes and behaviors regarding secondhand product purchases, emphasizing the intricate interaction of perceptions, trust concerns, and social dynamics in consumer decision-making.

3.2 The limitation of product experience in C2C secondhand clothing online platform

In online clothing shopping, customers have limitations on product experience and evaluation. Customers can try to picture how clothes will look and fit on them by using model images, but the technological interface may limit accurate evaluation of product information, such as look, touch, texture, fit, and comfort (Kim & Forsythe, 2008; Park et al., 2008). The lack of direct product experience in online clothing shopping may lead to purchase uncertainty for the customers.

There are several factors that contribute to purchase uncertainty. First, online shopping creates uncertainty due to the temporal and spatial separation between the retailer and the consumer (Bock et al., 2012). Second, these purchases involve information asymmetry, where consumers have less information about the product than retailers, increasing consumer uncertainty (Shen et al., 2011). Third, in secondhand online shopping, hidden information is significant because consumers cannot easily assess product or retailer information (Gautami et al., 2018). Fourth, in the secondhand market, consumers cannot physically inspect products or their quality and must rely on descriptions provided by the online store or retailer (Moriuchi & Takahashi, 2022). Therefore, retailers should focus on reducing perceived uncertainties for potential buyers (Gautami et al., 2018). Reducing these uncertainties is crucial to encourage consumer trust in shopping secondhand clothing online.

Product properties in secondhand online shopping can be challenging to assess. For clothing, these properties include visual, tactile, and behavioral aspects such as touch, feel, fit, and comfort. The lack of these factors can contribute to purchase uncertainty, since consumers are unable to physically assess the products and have to depend on product descriptions (Moriuchi & Takahashi, 2022). A study by (Lin et al., 2019) found that clothing fit is a crucial element for customer satisfaction. In this case, size fitting problem has become a key pain point for customers and brings excessive product returns to the e-commerce platforms. Touch and feel also become concerns, as personal products like clothing require a high-touch experience for proper evaluation (Lynch et al., 2001b). Additionally, standard intrinsic cues like color, shape, and design can be difficult to assess online due to variations based on usage and the information provided by sellers (Fernando et al., 2018). These findings indicate that the communication of product properties significantly influences purchase decisions, as online shoppers assess the product based on information provided by the sellers.

3.3 Conclusion

As the adoption of C2C secondhand fashion continues to grow, there is a growing demand for improved communication of product attributes by sellers. This includes detailed product descriptions, high-quality images, and transparency about any signs of use. Since in C2C customers create their own pictures and informational text, there is a bigger challenge and risk of purchase uncertainty. Inaccurate descriptions may lead to misunderstandings about the product's true condition, increasing the chance of dissatisfaction and return.

The existing literature has examined the current situation of C2C secondhand clothing, covering the consumer behavior and the challenges. However, current research does not adequately explore how product properties are communicated. Specifically, there is a significant gap in understanding how to help customers in effectively communicating product properties in C2C platforms, where they create their own product descriptions, including both visual and textual elements. This is important on online platforms where accurate and detailed product communication is essential for successful online shopping experiences. Therefore, this thesis focuses on exploring potential solutions for effectively communicating product properties in the C2C secondhand clothing platforms.

CH. 3 LITERATURE REVIEW

General research gap



There have been no specific studies on communicating product properties in C2C secondhand clothing online marketplaces, which could improve engagement between sellers and buyers.

Previous studies related to product properties:

Measurements

Detailed measurements are crucial for secondhand clothing purchases, as their absence can lead to problems due to the lack of immediate try-ons. However, no research has yet explored how to encourage sellers to provide detailed measurements on C2C platforms for secondhand clothing.

Signs of use

Buying used items involves financial and social risks due to potential defects and stains. Consumers tend to view "contaminated" products less favorably. Despite this, no study has investigated effective strategies to mitigate these risks and boost consumer confidence in second-hand clothing purchases.

Feel & Touch/ Dimension

In an online environment, personal products such as clothing are "high-touch" experience goods that need sensory evaluation to assess the product, but minimum study has yet to explore effective strategies for presenting clear dimensions secondhand fashion c2c platform specially.

Color

In secondhand products, standard intrinsic cues such as color, shape, and design are important but can't be easily evaluated online, especially on second-hand clothing platforms, no study has yet to explore effective strategies to presenting real color particularly on c2c second-hand platform.

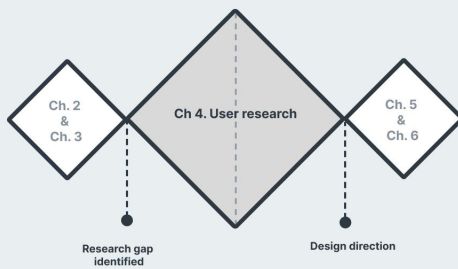
Potential design contribution:

Identify solutions to improve the accuracy of visual and textual information on secondhand clothing C2C online marketplaces, and communicate product properties accurately.

Refined main research question:

"How to help customers to communicate material properties accurately for a C2C secondhand clothing online platform?"

04. User Research



Intro:

In this chapter, the process and results of the research are presented using a mixed-method sequential explanatory design, connecting the qualitative and quantitative phases during the research process, and integrating the results of these two phases. The qualitative phase is to answer key research questions: "What are the key factors influencing customer satisfaction in selling and buying secondhand clothing in the online C2C platform?". The qualitative findings revealed that buyers of secondhand clothing prioritize accurate size, generally accept minor defects, but feel disappointed when the actual color differs from online photos, and sometimes struggle to judge the fit and the touch and feel of the product.

Following the qualitative phase, an online survey was conducted for the quantitative phase to answer the key research question: "What solutions are feasible to implement on the platform to enhance engagement between sellers and buyers in the C2C marketplace?" The quantitative findings revealed that in the secondhand clothing online market, buyers face challenges with inaccurate measurements, signs of use, color accuracy, and material quality, which lead to significant dissatisfaction and a quite high rate of complaints and returns. Sellers also deal with unwanted feedback and returns, primarily due to poor fit and item condition, and they struggle with taking quality photos, indicating a need for the platform to provide better guidance in the online platform for accurate measurements, clear images, and videos to improve the shopping experience.

Chapter overview:

- 4.1 In-depth interviews
- 4.2 Survey
- 4.3 Conclusions

4.1 In-depth interview

4.1.1 Goal

The main goal of the in-depth interviews is to understand the motivations and challenges within the context of a C2C secondhand clothing platform app and to identify what is missing from the app that could enhance the user experience for both sellers and buyers.

4.1.2 Method

The interview was conducted with 10 participants of C2C secondhand clothing online platforms, each in person and was both buyer and seller. The aim is to explore the factors influencing the purchase and sale of secondhand clothing online. The participants are aged 23-34, including 4 males and 6 females. The duration was 60-minute, covering all these points below:

Interview Structure

| Section | Objectives | Duration |
|---|--|----------|
| 1. Respondent introduction | Establishing rapport and introducing the purpose of this interview: to improve interactions between sellers and buyers in online secondhand marketplaces. | 2 mins |
| 2. Understanding personal experience with secondhand clothing | <ul style="list-style-type: none">• Understanding online shopping habits, focusing on preferences for new vs. secondhand clothing.• Explore their preferences for visual information when assessing items online. | 8 mins |
| 3. Buyer insights | | |
| 3.1 Investigating buyer behavior | Investigating buyers' motivations, considerations benefits and risks, browsing behaviors, purchasing process, communication experiences with sellers, encountered obstacles when purchasing secondhand clothing <ul style="list-style-type: none">• Discuss recent purchases and platforms used for buying secondhand clothing.• Explore the benefits considered when choosing secondhand items and the challenges faced during browsing. | 20 mins |

| | | |
|---|---|---------|
| 3.2 Product image assessment | <ul style="list-style-type: none"> • Understand product image perception from the buyer's perspective • Present hypothetical product images and ask for their preferences and reasons behind their choices. • Explore what attracts them to certain product images and why others are less appealing. | 15 mins |
| <hr/> 4. Seller insights <hr/> | | |
| 4.1 Investigating seller behavior | <p>Investigating seller's motivations, considerations benefits and risks, experiencing with potential buyers, and challenges encountered when selling secondhand clothing</p> <ul style="list-style-type: none"> • Discuss motivations for selling secondhand items and the benefits considered. • Explore challenges faced when selling online and the strategies used to overcome them. | 20 mins |
| 4.2 Understanding product listing process | <p>Understanding seller in creating a product listing</p> <ul style="list-style-type: none"> • Have the respondent create a hypothetical product listing and observe their decision-making process. • Discuss how they choose photos, create item descriptions, and set prices for their listings. | 15 mins |
| <hr/> 5. Closing | Conclude the interview and thank the participant | 3 mins |

Figure 3: Interview structure

4.1.3 Results

4.1.3.1 Buyer Behavior in Secondhand Clothing Purchases

The primary motivations for customers to buy secondhand clothing are to find cheaper alternatives, discover unique options, and address environmental concerns. These motivations align with the findings from literature review at chapter 3.1.1. On the other hand, several barriers are covered in this research such as they often encounter size inaccuracies, as many of them struggle to determine how the clothing will fit without trying it out. The tactile experience is missing in online shopping, making it difficult to gauge the material. Additionally, buyers frequently feel disappointed when the actual color differs significantly from what they saw online. There is also a lack of information regarding signs of use, which are often not described on the product detail page. Although they anticipate some flaws in secondhand items, they rely heavily on photos. These challenges highlight the difficulty buyers face in accurately assessing products from digital images alone, potentially leading to dissatisfaction and returns.

We also want to understand the product image perception from the customer perspective. We asked the participants to imagine themselves buying a jacket, with exact brand, type, color, and price. As a result, the presentation of products in photos also significantly impacts buyer perceptions. Clean, well-maintained backgrounds, such as clothing displayed on models or neatly hung, convey better hygiene compared to items laid on the floor. Natural lighting enhances color accuracy in photos, providing a more realistic representation due to its superior color rendering compared to artificial light. Background elements like greenery or contrasting colors not only draw attention but also enhance the overall aesthetic and comfort perception. Additionally, contextual elements within photos, such as familiar-sized objects like doors or furniture, help buyers gauge the size of items more accurately. These references offer practical insights into the scale of products, aiding buyers in making informed decisions about potential purchases.

| Themes | Key insights |
|--------------|---|
| Signs of use | <p>Minor defects are generally accepted by buyers of secondhand clothing.</p> <p>Clear and accurate information on sizing and color is crucial for buyer satisfaction.</p> |
| Color | <p>Buyers heavily rely on photos to judge the color of secondhand clothing.</p> <p>Natural lighting enhances the perceived accuracy of colors in photos.</p> <p>Contrasting backgrounds contribute to aesthetic appeal and comfort perception for buyers.</p> <p>Discrepancies between online images and real-life appearance are common, especially with non-neutral colors.</p> |
| Measurement | <p>Buyers struggle to gauge how clothing will fit without seeing it worn or modeled.</p> <p>Listings often lack models or worn examples, leading to uncertainty and potential dissatisfaction with fit.</p> |
| Dimension | <p>Familiar-sized objects in photos serve as practical references for buyers to estimate the size of items.</p> <p>Elements like doors provide a visual cue for assessing the scale of garments, helping buyers make more informed decisions.</p> |

Figure 4: Summary of key insights related to buyer behavior and preference in secondhand clothing purchases across different themes.

These findings highlight the difficulties buyers face when judging product qualities based only on photos. They emphasize the importance of providing clear and detailed product descriptions to reduce purchase uncertainties and increase satisfaction. The table summary above highlights key themes that have emerged.

Based on the qualitative research that we conducted, we came up with these potential design directions as described below:

1. Improving online experience: Redesign important touch points on the online platform, providing clear visual and textual guidance for buyers and sellers to narrow the information gap, like how the product should be presented. In the proposed online experience, we want to highlight key elements that can be integrated such as allowing seller to input detailed measurements with providing nudges, providing guidance to take a better pictures to show true color and also signs of use, and encouraging sellers to provide video in order to allow potential buyers in gauging the clothing's fit and material.
2. "Photobox": Inspired by a photo booth. An offline touchpoint for the seller to create highly accurate photos for their product listing. This features: camera, lighting with high color rendering index, mannequin, also other supporting tools like hanger, steamer, and measuring tape.
3. "The Seller Kit": A kit that sellers can buy is exclusively sold by the platform, including a collapsible softbox, retractable hanger, tripod, measuring tape, and a seller guide booklet.

4.1.3.2 Seller Behavior in Secondhand Clothing Purchases

The main motivations for sellers in listing their products secondhand are mainly to clear out space, earn extra money from things they no longer use, and support sustainability by giving their items a new life. Also many sellers feel good knowing their items will be valued and used by someone else. On the other hand, for the barriers, taking pictures is the hardest part of creating a product listing for sellers. Taking pictures is considered crucial since it mainly determines the listing's potential to get sold. They are aware that they need to take high-quality photos to appeal to potential buyers. At the same time, many sellers find it uncomfortable due to self image and privacy concerns to take pictures of themselves wearing the clothing, although they are aware that a clothing with a human model will attract more to buyers since it gives more the idea of scale (how it fits to the body). On another note, the sellers are actually aware of the importance of detailed measurements because buyers frequently ask about measurements (due to insufficient information in the product description). However the sellers do not feel encouraged enough in the current platform to provide all those details.

We also want to observe how they interact with the online platform and find out what works and what doesn't in the current product listing page, with the aim to enhance their experience in listing products and also to understand how they would communicate the product properties online.

| Themes | Key insights |
|-----------------------------|--|
| Taking pictures of the item | <p>Taking pictures is the most challenging part while creating a product listing, as it requires careful attention to angles and lighting to accurately showcase the item's features and appeal to potential buyers</p> <p>It is considered a lot of effort to take your own picture with yourself as the model to showcase the clothing.</p> <p>Sellers are also self-conscious and they tend not to show their own photo for the platform.</p> |
| Capturing color accuracy | <p>Difficulty in capturing the true color of the clothing under inadequate, artificial lighting can lead to returns from the buyer.</p> <p>Inadequate, artificial lighting may not accurately represent the true color of the clothing in the photos.</p> |

| Themes | Key insights |
|---|---|
| | <p>This typically occurs when the color falls outside the spectrum of black, white, or grey, making it challenging for the seller to accurately capture under limited, artificial lighting conditions.</p> |
| <p>Creating product listing</p> | <p>There is no urgency to display the 'best photos' or cater to 'what buyers want' because there is no significant push to do so while creating a product listing in the platform.</p> <p>Most of the time, sellers rely on their intuition when uploading the best pictures of the clothing they want to sell.</p> |
| <p>Measurements</p> | <p>The most frequently asked questions from the buyers are about measurements due to lack of information in the product detail page.</p> <p>Potential buyers don't want to risk making a purchase without having a clear understanding of the item's size and fit.</p> |
| <p>Video for gauging dimension/ texture</p> | <p>Video is perceived to reduce risk of misinformation when showcasing the product.</p> <p>Potential buyers will be able to see the item in more detail and see how it fits.</p> <p>Video is rarely seen in secondhand online platforms, although it can potentially create a bigger impact in the decision-making process.</p> |

Figure 5:
Summary of key insights related to seller behavior and preference in secondhand clothing purchases across different themes.

4.2 Survey

4.2.1 Goal

The goal of the survey is to:

1. Find out what solutions are feasible to implement on the platform to enhance the engagement between seller and buyer in the C2C platform.
2. Validate prior design directions that were proposed in the qualitative research results.

4.2.2 Method

The survey was conducted using the Qualtrics platform and distributed through Prolific. It targeted respondents across various European and UK countries, including Belgium, Hungary, Austria, Poland, Portugal, Croatia, Italy, England, the Netherlands, Spain, France, Sweden, Germany, Scotland, Denmark, and Czechia. In total, 100 respondents participated in the survey, providing insights into both buyer and seller behaviors in the secondhand clothing market.



Figure 6. Countries of origin of survey participants

Survey Structure

The survey is structured to cover aspects of buying and selling secondhand clothing online, focusing on the experiences and challenges of both buyers and sellers. For buyers, it looks into their purchasing habits, the problems they face, their preferences for item photos, and how useful they find videos are. For sellers, it examines the challenges of selling, the value of high-quality images, interest in photography equipment, and the idea of renting a studio for better photos. The survey also includes demographic questions to collect basic information about the respondents. Detailed questions and answer options are in the appendix.

| Section | Objectives |
|-------------------------------------|--|
| Buyer | |
| Section 1: Purchasing experience | Understand purchasing frequency, preferred device for secondhand clothing purchases (desktop, mobile phone, tablet), and factors influencing their decision to buy secondhand rather than new items. |
| Section 2: Challenge and risk | Understand the risks encountered when purchasing secondhand clothing online, including issues with material quality, color accuracy, measurement discrepancies, hygiene concerns, and construction/seam quality, along with their confidence levels in assessing item conditions based on photos, challenges in determining true colors and measurements, and also reasons for complaints and returns. |
| Section 3: Image perception | Evaluate participants' visual preference when selecting photos of clothing within a three second timeframe, that are all the same price, size, and color. |
| Section 4: Video possibility | Find out the helpfulness of using videos for understanding item details, seeing how the items fit, and learning about the fabric. |

| Section | Objectives |
|--|--|
| Seller | |
| Section 1: Challenge and risks | Understand the risks and challenges of selling secondhand clothing online, including buyer complaints, return requests, listing difficulties, photography issues, personal modeling motivation, missing resources for better photos, online platform features, and problems with product descriptions. |
| Section 2: Validate regarding photography kit | Validate interest in budgeting for a proper photography kit and assess beliefs about the importance of high-quality images and investing in photography equipment for selling secondhand clothing. |
| Section 3: Validate renting a studio for product photos | Assess interest in budgeting for studio rental to take high-quality pictures that accurately show color and material |
| General | |
| Demographic questions | Gather information about respondents' age, gender, employment status, and country of residence. |

Figure 7: Survey structure

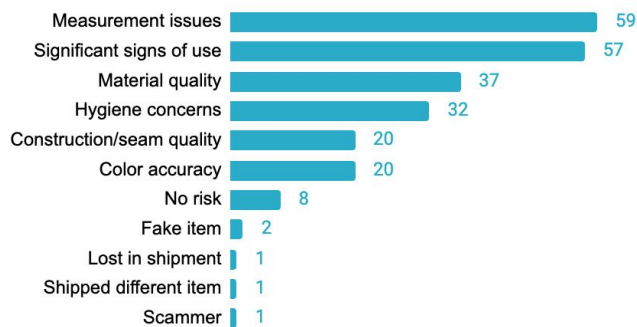
4.2.3 Results

4.2.3.1 Survey insights from buyers' side

Risk and challenge

Based on the survey, when buying secondhand clothing online, two major risks are inaccurate measurements and noticeable signs of use. Buyers often find that the listed sizes don't match the actual fit. Additionally, concerns about the quality and cleanliness of materials, like bad smells and visible dirt, can make the shopping experience difficult.

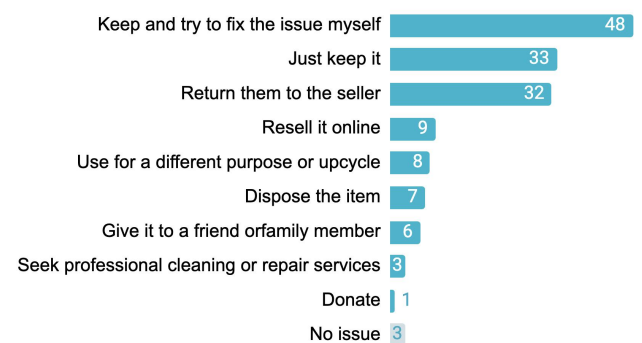
Q: What risks have you experienced when purchasing secondhand clothing online?



Complaint and Return

Even though many customers are generally satisfied, 36% have reported complaints about their purchases, often due to the actual condition of the items not matching the photos online. About 37% have returned items, mostly because they didn't fit well. Some customers also deal with unsatisfactory purchases by reselling, repurposing, or throwing them away.

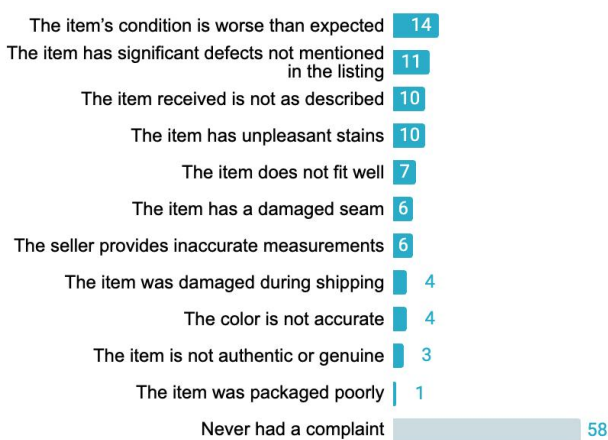
Q: What did you do with the item when encountering issues?



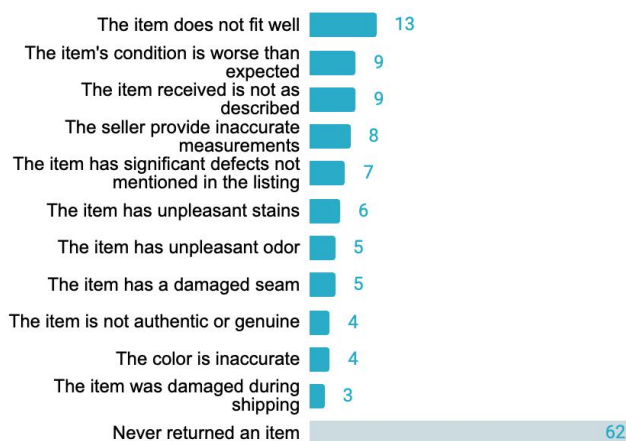
Q: Have you ever complained to a seller after you received an item?



Q: What are the reasons for your complaint about the item? (Select all that apply)



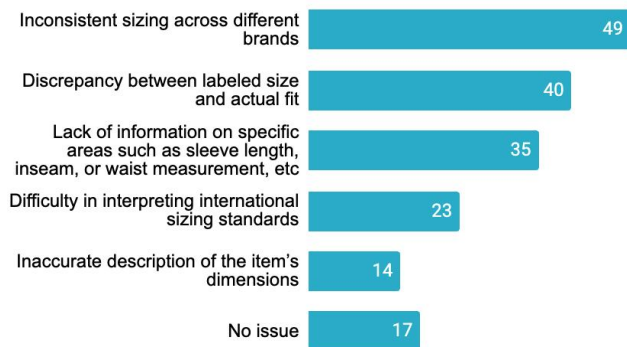
Q: What are the reasons for returning an item? (Select all that apply)



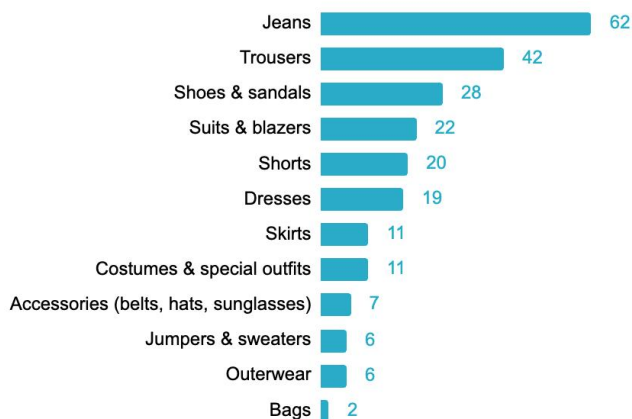
Measurements

Getting the right size is a big challenge, especially for bottoms like jeans and trousers. The lack of accurate and consistent size information online often leads to items not fitting as expected.

Q: What measurement-related issues have you experienced with the item you purchased?



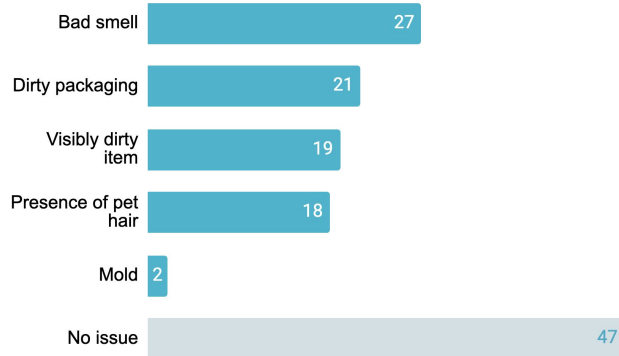
Q: What are the trickiest fashion categories when it comes to measurement? (Select all that apply)



Hygiene

More than half of the respondents reported hygiene issues, with bad smells being the most common problem. This highlights the need for better cleanliness standards for secondhand clothes.

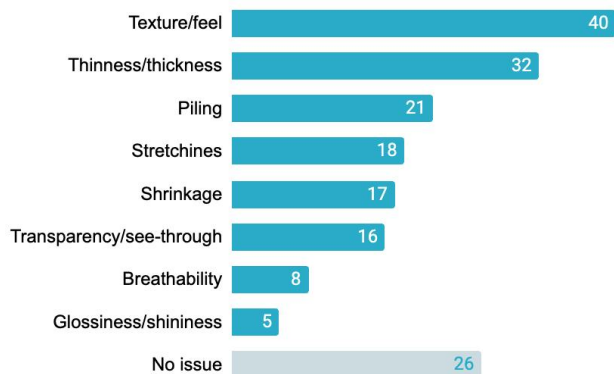
Q: What hygiene-related issues have you experienced with the item you purchased?
(Select all that apply)



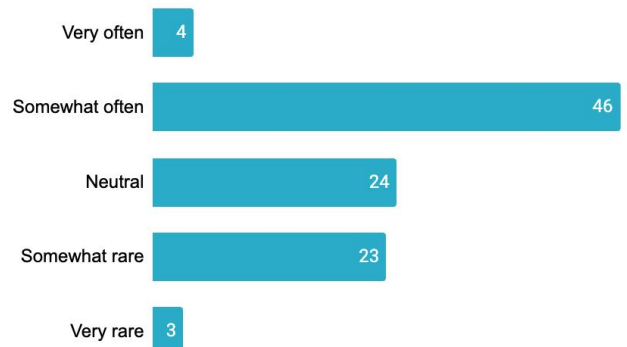
Material

Customers often face issues with the material of secondhand clothes, such as the texture or the thickness of the fabric. It's hard to judge the quality of materials from online images, which can lead to disappointment when the items arrive.

Q: What material-related issues have you experienced with the item you purchased?
(Select all that apply)



Q: I encounter difficulties in determining the true material of second-hand fashion item from online images



Color

Color discrepancies affect 25% of respondents, showing that online images often don't match the actual product color. This can lead to dissatisfaction and returns.

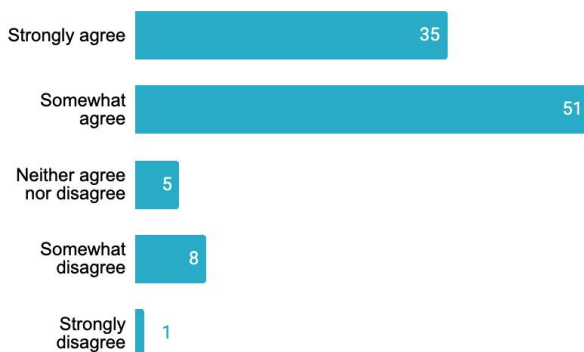
Q: Have you encountered color discrepancy between online image and actual product when you receive the item?



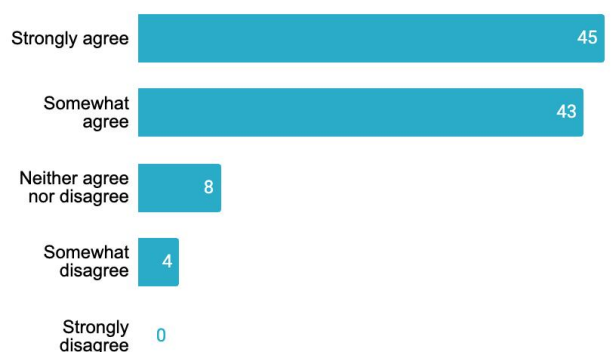
Video

Customers believe that videos would help them understand product details and fit better. Items like dresses, jeans, suits, blazers, trousers, and sweaters would particularly benefit from videos showing how they look and fit on a person.

Q: Video would help me to understand the the details of the item

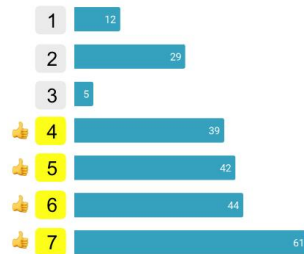


Q: Video would effectively demonstrate how the item fits on the body



Evaluation of product listing images

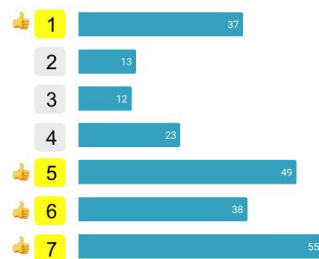
The participants had approximately 3 seconds to make their selections, and they could choose more than one image from a set of seven. The conclusion drawn from this data is that when clothing is hung, it gives the clearest representation of how it looks in real life, which is preferred by the customers. Additionally, it is noted that natural lighting provides a better impression of the real color of the item. Images 7, 6, and 5 received the highest selections, indicating that these representations were most appealing to the participants. These images show the jacket hanging against different backgrounds with good lighting, reinforcing the conclusion that hanging the item and using natural lighting are effective for accurately portraying secondhand clothing online.



Q: Within approximately 3 seconds, select the photo representations that you find most appealing for purchasing second-hand clothing. Imagine you want to buy a jacket and all these images are in the same price, size, and color. You can choose more than 1.



Figure 8: Set of images to test



Q: Within approximately 3 seconds, select the photo representations that you find most appealing for purchasing second-hand clothing. Imagine you want to buy a jacket and all these images are in the same price, size, and color. You can choose more than 1.



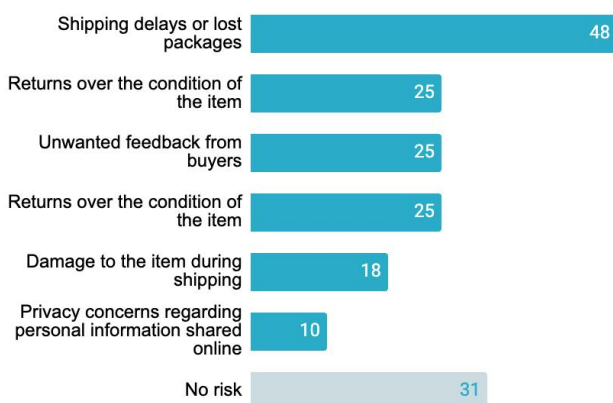
Figure 9: Set of images to test

4.2.3.2 Survey insights from sellers side

Risks and challenges

The primary issue sellers face is shipping delays, followed by unwanted feedback and returns from buyers. This highlights the need to improve the reliability of shipping processes.

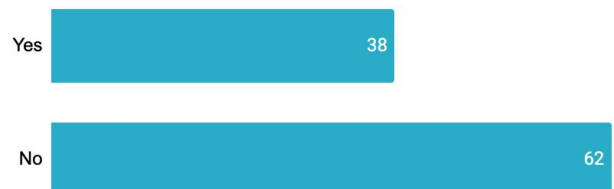
Q: What risks have you experienced when selling second-hand clothing online? (Select all that apply)



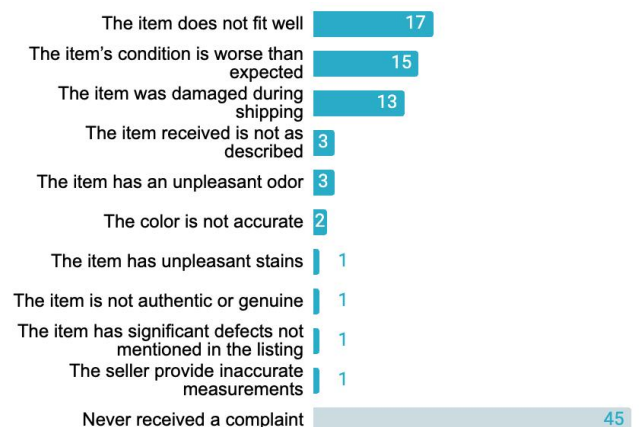
Complaint

More than a third of respondents have received a complaint from the buyer, and most complaints are about items not fitting, followed by items being in worse condition than expected.

Q: Have you ever received a complaint from the buyer?



Q: What are the reasons you have received a complaint from the buyer? (Select all that apply)



Return

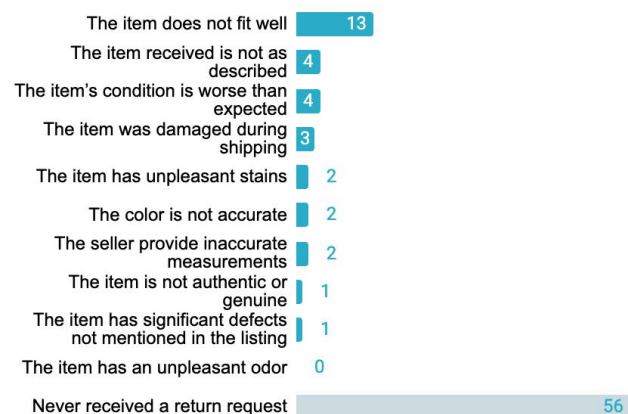
Almost a quarter of respondents have received a complaint from the buyer.



Complaint and return

The main reason for returning is that the item does not fit well.

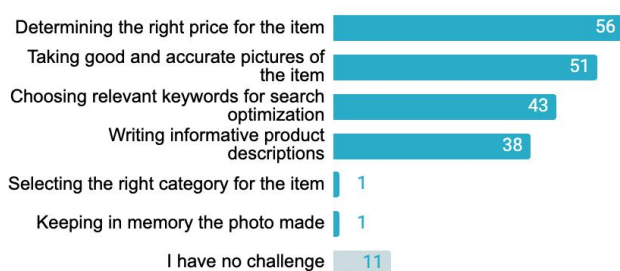
Q: What are the reasons you have received for a return request from the buyer? (Select all that apply)



Creating product listing

Beside determining the right price of the item, taking good and accurate pictures are considered the most challenging tasks for the sellers.

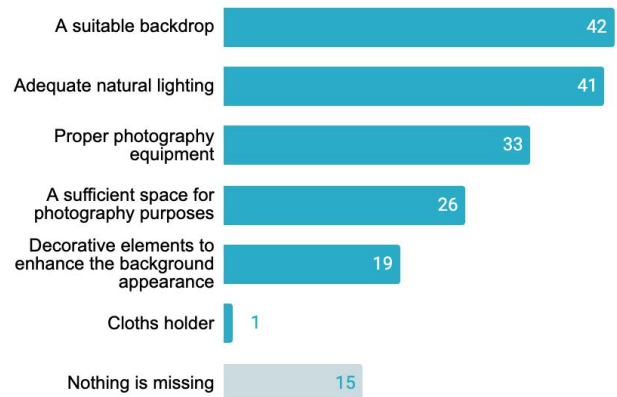
Q: What are the most challenging parts in creating a product listing? (Select all that apply)



What's missing in the house

Most sellers are having difficulty in choosing a suitable backdrop and adequate natural lighting to make the photos look better.

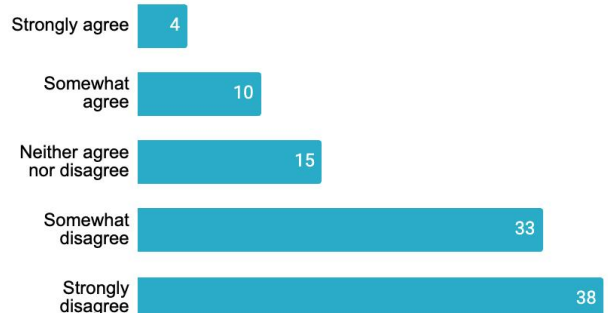
Q: What is missing in your house to make your picture better? (Select all that apply)



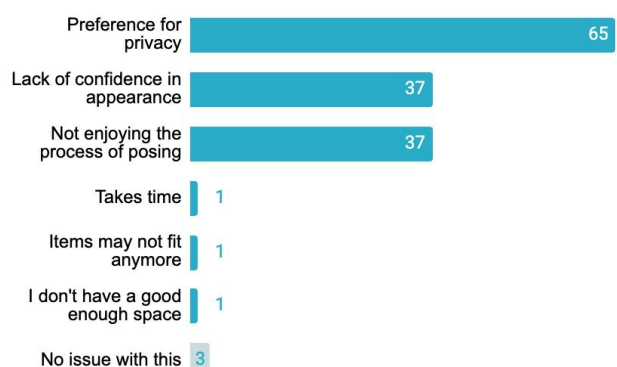
Picture

Most sellers are not motivated to take pictures with themselves as the model due to privacy issues and lack of confidence and also not enjoying the process of it.

Q: I am motivated to take pictures with myself as the model



Q: What is the reason if you dislike taking pictures as yourself as the model? (Select all that apply)



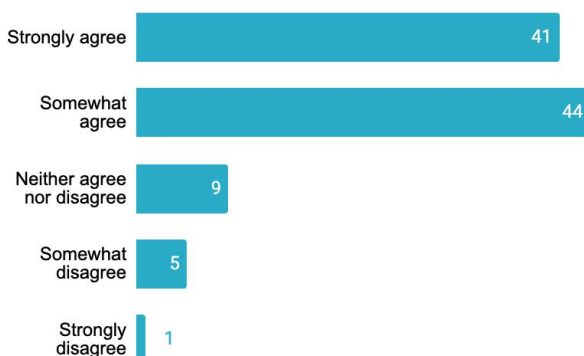
4.2.3.3 Insights for the design directions

Based on the survey, we also validated the potential design directions which we cover at the subchapter 4.1.3. Here we have results from the survey that the design direction #1 is the most feasible compared to #2 and #3.

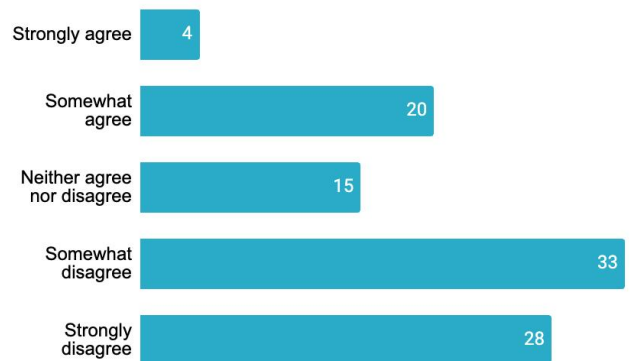
Why should we not go for Direction #2: "Photobox"

Although most sellers believe that high-quality images can enhance secondhand items, they are not interested in budgeting for renting a studio.

Q: I believe high-quality images enhance the appeal of second-hand items



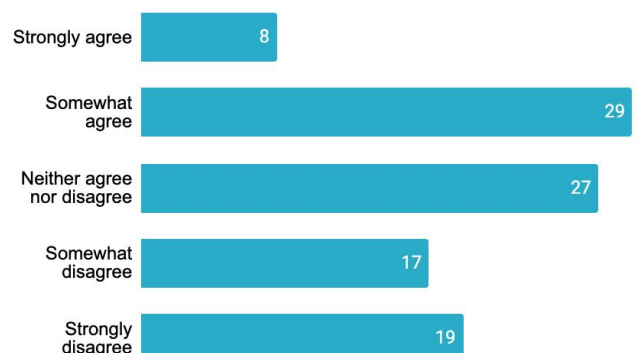
Q: I am interested in budgeting for a proper photography kit to take good pictures (able to show color and material more accurately)



Why should we not go for direction #3: "The Seller Kit" (photography kit)

Most of them are not interested in budgeting for a proper photography kit to improve their image quality.

Q: I believe investing in photography equipment to improve image quality is worth it for sellers of second-hand clothing



4.3 Conclusion

By addressing the research gaps identified in the previous chapter, this study tackles the primary research question: “how to help consumers to accurately communicate product properties accurately for a C2C secondhand clothing online platform?”. To help answer this, we have sub-questions for each research phase.

In the first phase, the in-depth interview, aimed to answer the question, “What are the key factors influencing customer satisfaction in selling and buying clothing on the online C2C platform?” The goal was to explore these factors in detail to understand the underlying reasons behind customer satisfaction and dissatisfaction in experiencing the current platform. Four themes emerged: measurement, color, signs of use, and touch and feel.

To identify practical solutions for improving user experience in buying and selling on the platform, we conducted a survey with the research question: “What solutions are feasible to implement on the platform to enhance the engagement between seller and buyer in the C2C secondhand clothing online platform?” The survey provided insights into the most feasible, desirable, and viable design direction to address customers’ needs.

Improving online experience: Design important touch points on the online platform to provide clear visual and textual guidance for customers, narrowing the information gap on product properties. In the proposed online experience, we want to highlight key elements that can be integrated such as allowing seller to input detailed measurements with providing nudges, providing guidance to take a better pictures to show true color and also signs of use, and encouraging sellers to provide video in order to allow potential buyers in gauging the clothing’s fit and material.

This design direction will be further explained with its evaluation in Chapter 5.

General

research gap → There have been no specific studies on communicating product properties in C2C secondhand clothing online marketplaces, which could improve engagement between sellers and buyers.

Previous studies related to product properties:

Measurements

Detailed measurements are crucial for secondhand clothing purchases, as their absence can lead to problems due to the lack of immediate try-ons. However, no research has yet explored how to encourage sellers to provide detailed measurements on C2C platforms for secondhand clothing.

Signs of use

Buying used items involves financial and social risks due to potential defects and stains. Consumers tend to view "contaminated" products less favorably. Despite this, no study has investigated effective strategies to mitigate these risks and boost consumer confidence in second-hand clothing purchases.

Feel & Touch/ Dimension

In an online environment, personal products such as clothing are "high-touch" experience goods that need sensory evaluation to assess the product, but minimum study has yet to explore effective strategies for presenting clear dimensions secondhand fashion c2c platform specially.

Color

In secondhand products, standard intrinsic cues such as color, shape, and design are important but can't be easily evaluated online, especially on second-hand clothing platforms, no study has yet to explore effective strategies to presenting real color particularly on c2c second-hand platform.

Potential design contribution:

In an online environment, personal products such as clothing are "high-touch" experience goods that need sensory evaluation to assess the product, but minimum study has yet to explore effective strategies for presenting clear dimensions secondhand fashion c2c platform specially.

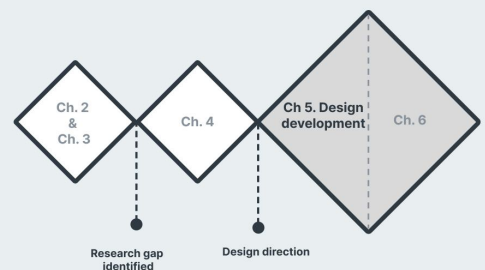
Refined main research question:

"How to help customers to communicate material properties accurately for a C2C secondhand clothing online platform? "

CH. 4 USER RESEARCH

| | | | |
|-------------------------------|---|--------------------------------|--|
| RQ. Qualitative phase: | "What are the key factors influencing customer satisfaction in selling and buying clothing on the online C2C platform?" | RQ. Quantitative phase: | "What solutions are feasible to implement on the platform to enhance the engagement between seller and buyer in the C2C secondhand clothing online platform?" |
| Key findings from QL: | <ol style="list-style-type: none"> 1. Customers often encounter measurement inaccuracies, as many of them struggle to determine how the clothing will fit without trying it out. 2. There is often a lack of information about signs of use although customers expect some flaws in secondhand items, but often there's a lack of information about signs of use 3. The tactile experience is missing in online shopping, making it difficult to gauge the material of the secondhand clothing 4. Customers frequently feel disappointed when the actual color differs significantly from what they saw online. | Key findings from QT: | <ul style="list-style-type: none"> • Provide visual and textual information to cater buyers' needs, which often hinders their experience when lacking in the platform • Allow sellers to easily provide visual and textual information of the clothing list their product in the product listing page without hassle (e.g feel encouraged to put detailed measurements, provide clear images, etc) |

05. Design Development



Intro:

This chapter is to develop the design based on the direction validated from the previous chapter, that is to **improve C2C online platform experience: Design important touch points on the online platform to provide clear visual and textual guidance for customers, narrowing the information gap on product properties.**

Chapter Overview:

- 5.1 Design goal
- 5.2 Design requirements
- 5.3 Evaluation

5.1 Design goal

The goal of this project is to help customers to communicate product properties accurately on a C2C secondhand clothing online platform. Specifically, the design aims to improve C2C online platform experience by enhancing key touch points on the online platform. This involves **providing clear visual and textual guidance for customers, thus narrowing the information gap regarding product properties of secondhand clothing.**

5.1.1 Target user

This project aims to address the needs of both sellers and buyers. This aligns with the main research question of the thesis: "How can we help customers accurately communicate product properties for a C2C secondhand clothing online platform?" A well designed product listing page will reflect on the product detail page thus benefit both buyers and sellers.

During the user research phase (Chapter 4), sellers highlighted challenges in listing products accurately, while buyers emphasized the importance of clear and detailed product information. Thus, improving the seller's experience in the listing phase is crucial to addressing these challenges and enhancing the overall effectiveness of the platform.

5.1.2 Scope and user journey

The main research question for the thesis is: "How to help customers to communicate product properties accurately for a C2C secondhand clothing online platform?"

To address this question effectively, we need to identify the phase of the user journey that has the most significant impact. In this case, the "pre-purchase" phase, particularly the "listing item phase, is the primary focus.

The seller has several main tasks. They need to prepare the item they want to put on the listing, and then take photos of the item from various angles, including close-ups of any signs of use. Then, the seller fills out the listing form, providing details such as the title description, measurements, brand, condition, and price. After entering all the details about the item, they upload it, and manage the item for the potential buyer such as replying to the chats and accepting or rejecting price offers.

Seller's User Journey



Main tasks

- Item selection: Seller chooses the item they want to sell.
- Taking pictures of the Item: Seller takes photos of the item from different angles, and also take close-ups of any signs of use.
- Creating a listing: Seller fills out the listing form, including the title, description, brand, size, condition, and price.
- Shipping options: Seller selects preferred shipping methods

Customer problems

- Sellers find it challenging to take pictures that accurately showcase the item's detail and make it appealing, as it requires careful attention to angles and lighting.
- Sellers find it difficult in capturing the true color of clothing under inadequate, artificial lighting can lead to returns from buyers.
- Sellers feel it is a lot of effort to take their own pictures as a model and are often self-conscious, making them to avoid showing their own photo.
- Sellers often rely on intuition when uploading pictures, lacking urgency to display the best photos to meet buyer's expectations.
- Sellers frequently receive questions about measurements due to a lack of detailed information in the product listing through the personal messages, this makes buyers hesitant to make a purchase without a clear understanding of size and fit.

Customer needs

- Sellers need guidance in taking pictures that accurately showcase the item's details and they need to make it appealing.
- Sellers need guidance in capturing the true color of clothing under inadequate, artificial lighting to prevent returns from buyers.
- Sellers need alternatives to taking their own pictures as a model, as they often feel self-conscious and avoid showing their own photos.
- Sellers need tools to improve photo quality and urgency in displaying the best photos to meet buyers' expectations.
- Sellers need to provide detailed measurements in product listings to reduce frequent questions from buyers and to ensure buyers have a clear understanding of size and fit, which will reduce hesitation in making a purchase.

5.2 Design requirements

To develop a universally applicable design for C2C secondhand platforms, the following requirements should be considered based on user needs and the research insights:

- **Intuitive guidance:** the platform should be user-friendly and easy to navigate, ensuring that sellers can easily input and display product information
- **Context-aware guidance:** The platform should provide context-specific prompts to help sellers include the necessary details for the listings
- **Supportive guidance:** the platform should provide tools that help sellers in accurately conveying product properties

To answer the main research question, the design requirements should include the following design considerations which will be explained in the next section.

5.2.1 Key areas of design considerations

From these product attributes, this chapter considers how to achieve the design goal. This section below lists relevant questions and suggests referring to a literature review for each potential solution.

From chapter 4



| Key elements | Question | Potential solutions |
|--------------------------|---|---|
| Measurements | ▶ What can encourage users to input detailed measurements? | Refer to the literature review for guidance on inputting measurements |
| Color | ▶ How to capture the true color of a clothing? | Refer to literature review for guidance on capturing the true color of clothing |
| Signs of use | ▶ How to provide signs of use in a secondhand clothing accurately ? | Refer to the literature review for detailed descriptions of signs of use in secondhand clothing |
| Dimensions/ touch & feel | ▶ How to provide tactile qualities of a clothing online? | Refer to literature review on guidance for to capturing tactile qualities |



See in the subchapter 5.2.2

Figure 10.
Thinking process from
research to design

5.2.1.1 Inputting measurements: providing visual aids to guide users

Providing visual guidance for instructions online is crucial for various scientific reasons. Research consistently demonstrates that incorporating visuals, such as still graphics or animations, with online help instructions significantly enhances users' task performance, enabling them to complete tasks more efficiently and with fewer errors compared to text-only instructions (Harrison, 1995). Research has also shown that visual aids play a significant role in enhancing understanding and retention of information across various domains (Carifio & Perla, 2007).

In the context of e-commerce, the use of visual aids in instructions can significantly impact user experience and comprehension. Visual complexity of websites have been identified as key factors influencing users' first impressions and aesthetic judgments (Tuch et al., 2012). By incorporating visual elements into simple instructions, individuals are more likely to grasp and retain information, leading to better outcomes. In the case of instructions in e-commerce, providing visual aids can help clarify complex processes, guide users through tasks.

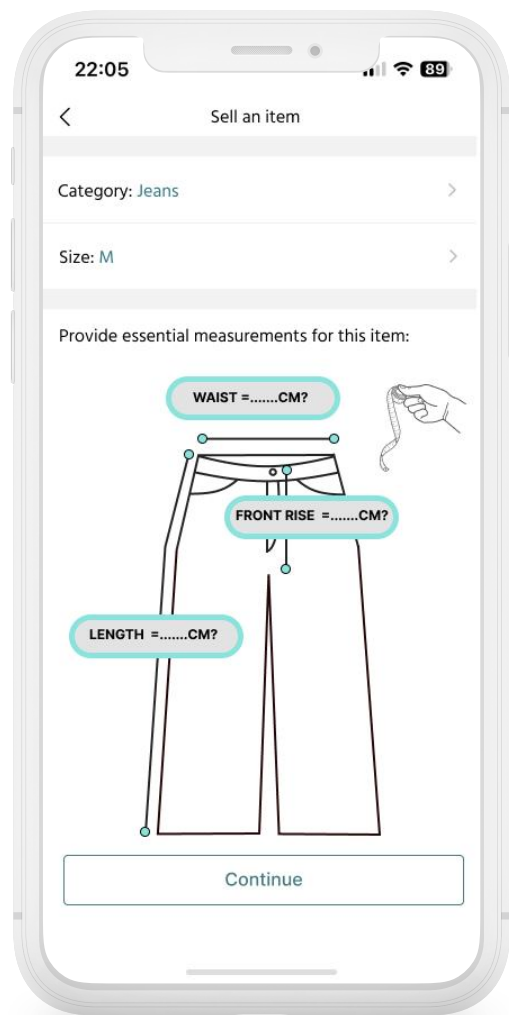


Figure 11. Recommendation for inputting detailed measurements

5.2.1.2 Capturing true color of the product: providing guidance to capture true color of the product

Taking photos of clothing using natural lighting is essential due to its high rendering index. The high rendering index of natural lighting accurately renders colors and textures, ensuring that the colors of the clothing are faithfully represented in photographs (Miandji et al., 2021). It also captures the intricate details and characteristics of the clothing, thus enhancing the overall visual impact of the photographs. It is essential for ecommerce since customers heavily rely on visual information to make purchasing decisions. Natural lighting ensures that the colors of the clothing are accurately depicted, enabling customers to have a realistic expectation of the product they are purchasing (Lai & Chang, 2021). Additionally, natural lighting aids in highlighting the true characteristics of the fabric used in clothing. Different fabrics react distinctively to light, and capturing clothing under natural lighting conditions can unveil the texture, sheen, and drape of the fabric accurately (Aliaga et al., 2017).

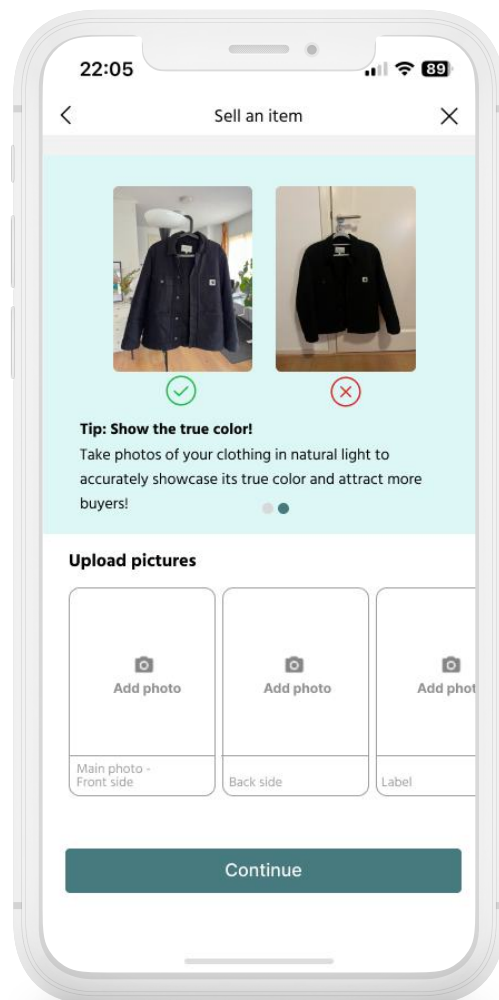


Figure 12. Recommendation for capturing true color of the clothing

5.2.1.3 Inputting signs of use: encourage detailed descriptions and close-up images of signs of use

Providing detailed descriptions and close-up images of signs of use in secondhand clothing is important. Detailed descriptions and close-up images can help in assessing the quality of secondhand clothing, which is a significant concern for consumers (Norum & Norton, 2017). By accurately depicting defects through images, sellers can provide transparency about the condition of the clothing, potentially reducing these concerns and increasing consumer trust. This transparency can lead to more informed purchasing decisions and reduce the possibility of returns.

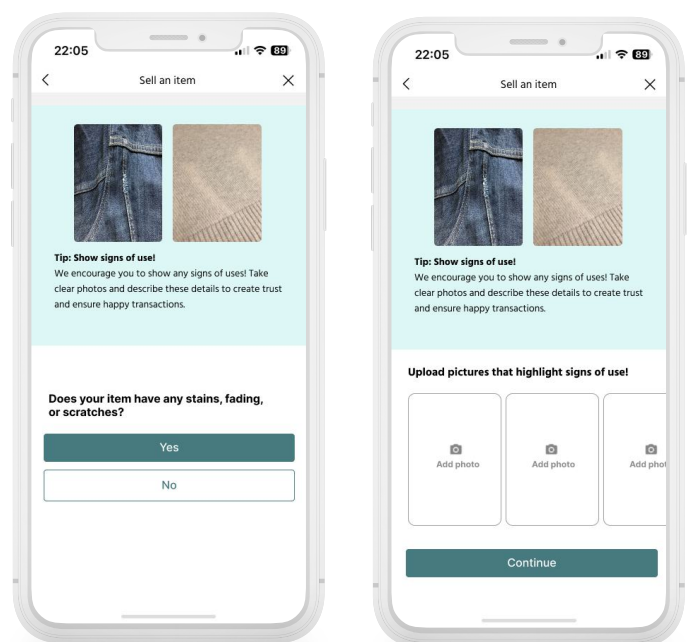


Figure 13. Recommendation for inputting signs of use

5.2.1.4 Adding video to show dimensions/ touch & feel: Guide sellers on taking videos that showcase the item's dimensions and feel.

Providing videos that showcase the dimensions and touch & feel of garments is crucial for several reasons. Firstly, the evaluation of clothing heavily relies on sensory experiences such as touch and feel (Bacci et al., 2012). Traditional methods of evaluating fabric quality through subjective touch assessments highlight the importance of tactile sensations in the clothing industry (Lima et al., 2005). Research has shown that sensory evaluation and instrumental measurements play a significant role in determining the tactile properties of fabrics, emphasizing the need to convey these aspects accurately (Yang et al., 2014).

Moreover, the use of videos to showcase clothing dimensions and touch & feel aligns with the growing trend of video content being used to convey scientific information effectively (Kaufman, 2021). Videos have been found to be more effective than text in showcasing multiple dimensions of research, which can be applied to showcasing the intricate details of clothing (Striewski et al., 2022).

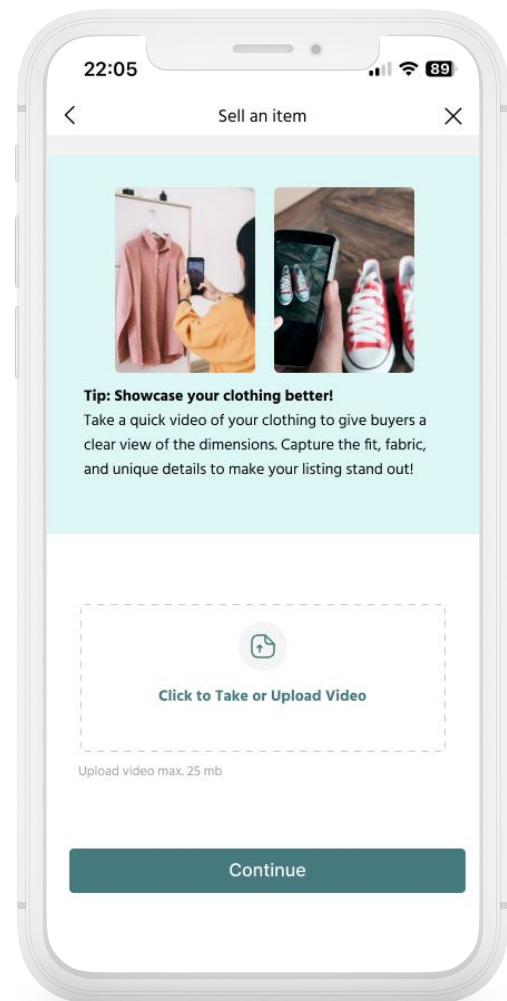


Figure 14. Recommendation for taking a video to capture tactile qualities

5.2.2 Design details of prototype

5.2.2.1 Measurement page

Design goal

Provide guidance to input accurate and essential measurements of the item sellers are listing. The page uses visual cues to clearly indicate where each measurement should be taken, helping the user provide precise information. The focus is on ease of use, with minimal text and a straightforward layout to ensure that users can quickly and accurately complete the task of adding measurements before proceeding to the next step in the selling process.

Measurement page

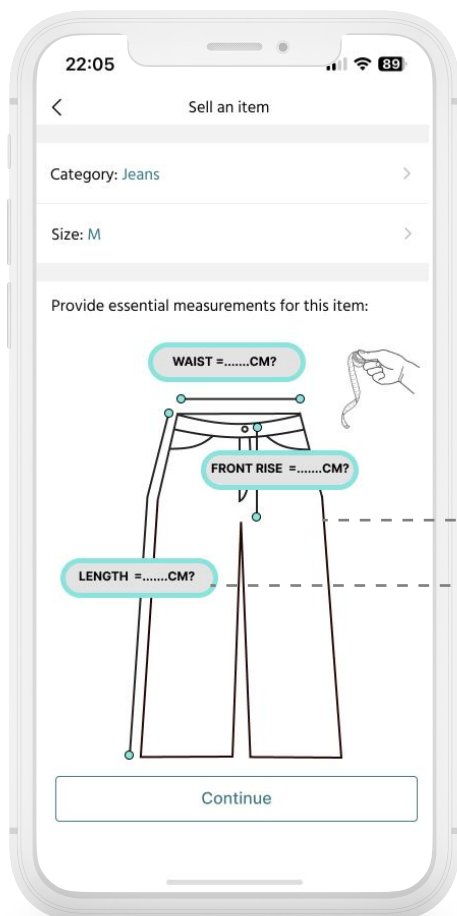


Figure 15. Measurement page interface

Core elements

- **Instructional text:** The text "Provide essential measurements for this item:" guides the user on what they need to do on this page
- **Illustration of clothing:** An outline drawing of a clothing's item representing the category, in this case trousers, with three measurement areas highlighted:
 - Waist: The circumference around the waist of the trousers.
 - Front Rise: The distance from the top of the waistband to the crotch seam.
 - Length: The length of the trousers from the waistband to the bottom hem.
- **Measurement input fields:** Each measurement area is labeled with a placeholder (e.g., "WAIST = ...CM?") where the user needs to input the corresponding measurement in centimeters.
- **Action Button:** At the bottom of the page, a button labeled "Continue" is displayed, allowing the user to proceed after entering the measurements.

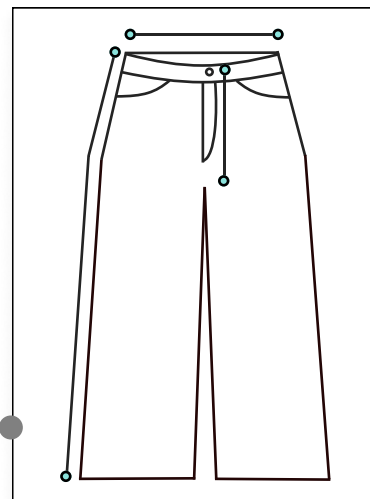


Figure 16. Illustration of clothing

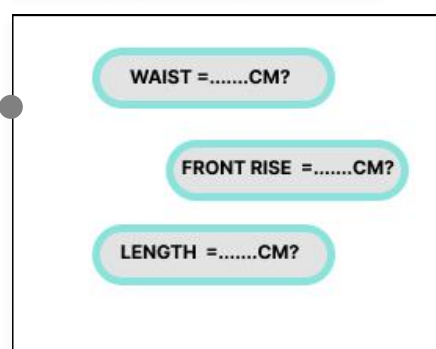


Figure 17. Measurement input fields

5.2.2.2 Color page

Design goal

The design goal of this page is to guide sellers on how to take and upload high-quality photos of their items, emphasizing the importance of using natural light to accurately represent the item's color.

Color page

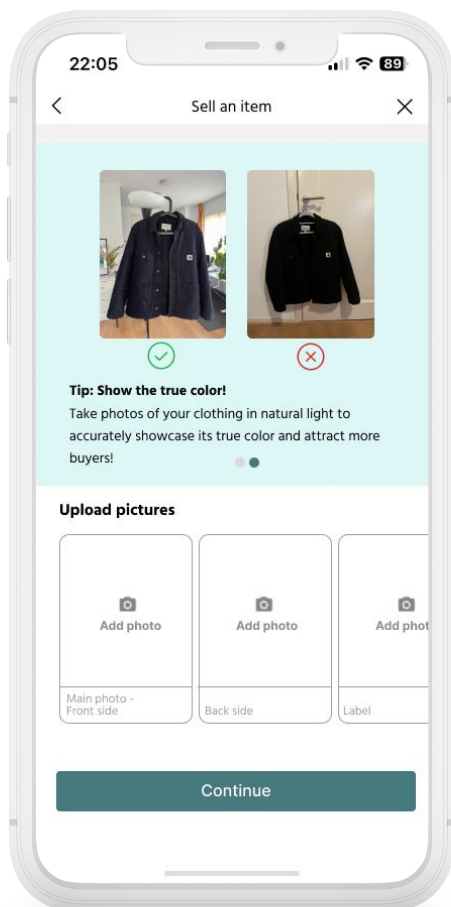


Figure 18. Interface for uploading pictures with instruction to capture natural lighting

Core elements

- **Tip section:** two example photos, marked with a green checkmark, shows the jacket in natural light, while the right photo, marked with a red "X," shows the same jacket but in poorer lighting
- **Upload section:** for adding photos. The upload area are labeled as "Main photo - Front side," "Back side," and "Label."
- **Text:** "Tip: Show the true color! Take photos of your clothing in natural light to accurately showcase its true color and attract more buyers!" This advises users to take photos of their clothing in natural light to accurately showcase the item's true color.
- **Action button:** A "Continue" button is located at the bottom of the page, allowing the user to proceed after uploading the required photos.

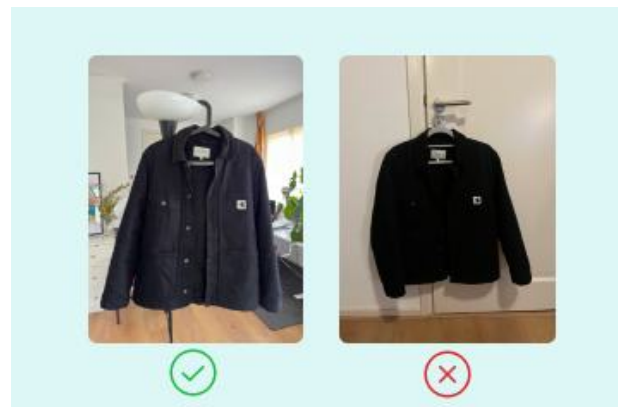


Figure 19. Example photos

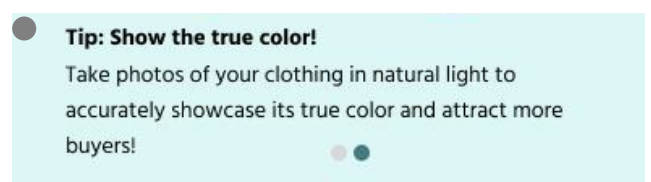


Figure 20. Instructional text

5.2.2.3 Signs of use page

Core elements

First page:

- Tip section: displays images of clothing item with visible signs of use, accompanied by message encouraging sellers to show any signs of wear on the item. The message should suggest that taking clear pictures and describing these details can create trust and ensure successful transactions.
- Prompt: Does your item have any stains, fading, or scratches?
- Option button: There are two buttons, "Yes" and "No," for the user to select whether the item has visible signs of wear.

Design goal of signs of use page

The design goal of this page is to guide sellers through accurately representing the condition of their items by documenting and showcasing any signs of wear, such as stains and scratches, among others.

Second page:

- Tip section: the same images and message at the first page, continuing the encouragement to show signs of use.
- Upload section: labeled "add photo" for the user to upload pictures that highlight any signs of wear on the item.
- Action button: A "Continue" button at the bottom allows the user to proceed after uploading the photos.

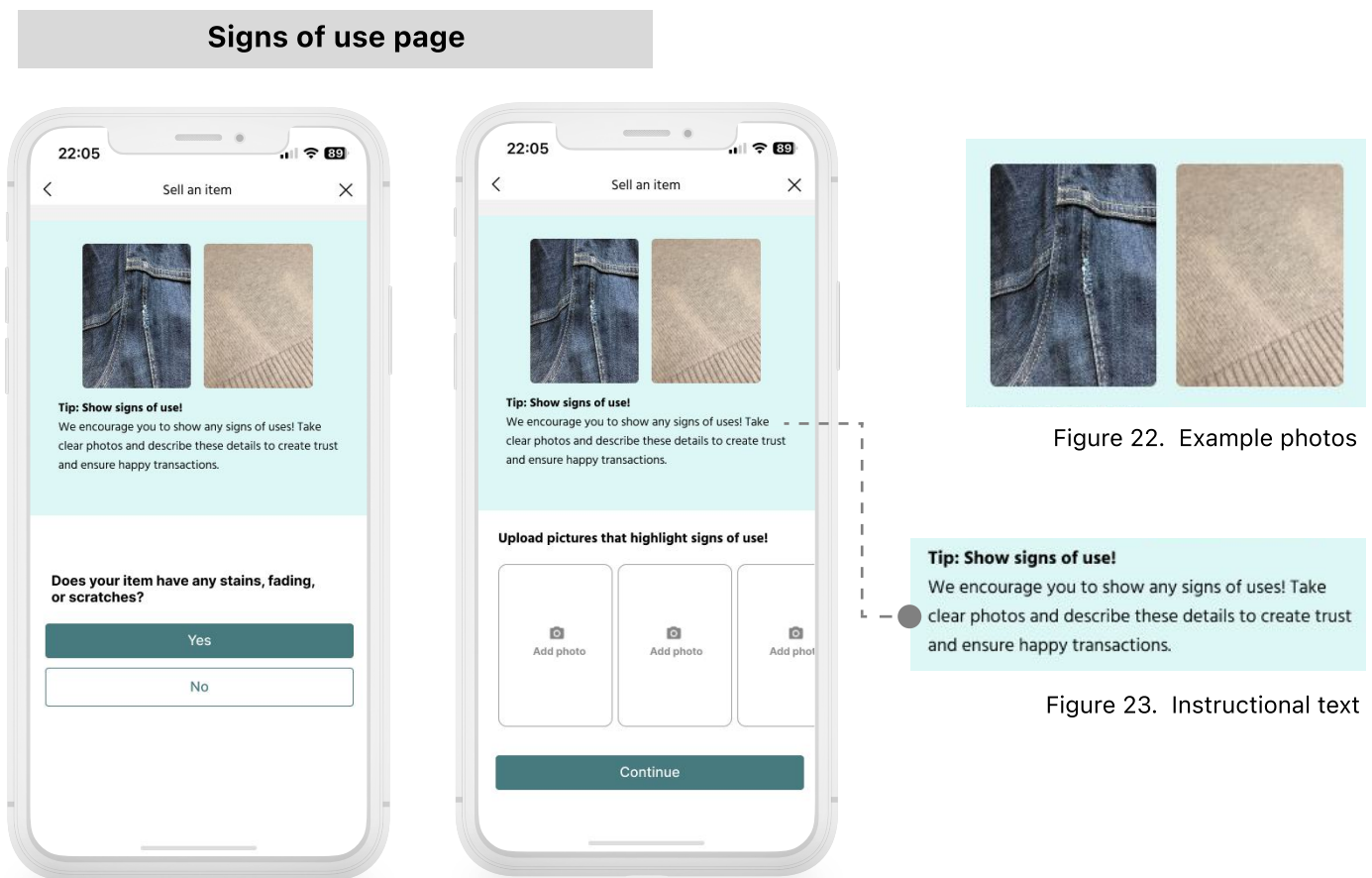


Figure 21. Interface for uploading a video

5.2.2.3 Dimension/ touch & feel page

Design goal of dimension/ touch & feel page

The design goal of this page is to encourage sellers to enhance their item listings by uploading videos that provide potential buyers with a more comprehensive view of the item.

Core elements

- Tip section: image depicts someone taking a video of a hanging garment and another images showing a close-up of a clothing item
- Text: "Tip: showcase your clothing better!" followed by a suggestions for users to take a quick video of their clothing. The message emphasizes that a video can help give buyers a clearer view of the item's dimensions and feel.
- Upload section: large area for better visibility and attention with an icon that suggests the action of uploading or taking a video.
- Action button: a "continue" button is located at the bottom of the page, which the user can click after uploading or taking a video.

Dimensions/ touch and feel page

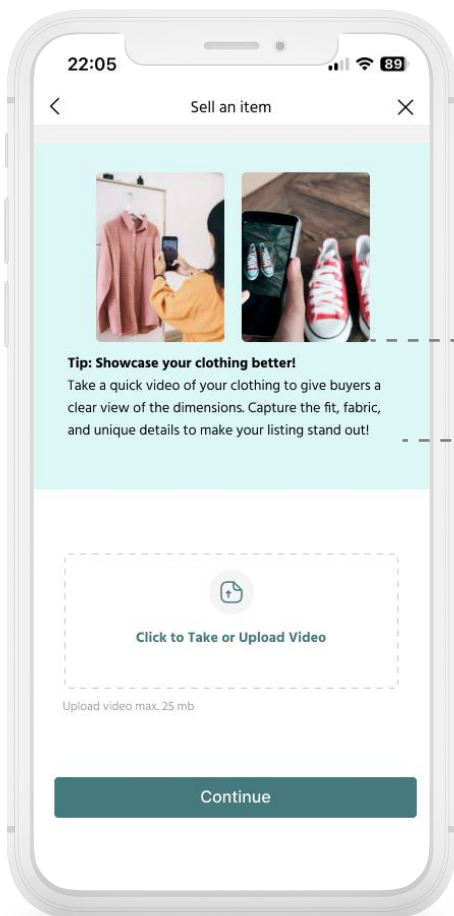


Figure 24. Interface for uploading a video



Figure 25. Capturing video

Tip: Showcase your clothing better!

Take a quick video of your clothing to give buyers a clear view of the dimensions. Capture the fit, fabric, and unique details to make your listing stand out!

Figure 26. Instructional text

5.2.3 Conclusion

To conclude this chapter, we have summarized key areas that require improvement to help sellers communicate product properties accurately on a C2C secondhand clothing online platform. Firstly, providing guidance for sellers to include essential measurements is important. On the product listing page, after selecting the category, sellers receive prompts for specific measurements needed. Secondly, providing tips on how to best capture the true color of clothing can help avoid discrepancies. Sellers should be encouraged to photograph items in natural light to achieve accurate color representation. Thirdly, it is important to guide sellers on detailing and photographing signs of wear. Encouraging detailed descriptions and close-up images of flaws enhance the buyer's understanding of the item's condition. Finally, providing guidance for sellers to take videos showcasing the item's dimensions can help convey the feel and touch of the item more effectively. By addressing these challenges, we aim to provide solutions that cater to the needs of sellers. To ensure the effectiveness of these solutions, we need to validate them by conducting an evaluation test that we explain in section 5.3.

5.3 Evaluation

This section includes the results of evaluation with the users. We want to figure out how effective our design concept is to communicate product properties for secondhand clothing.

5.3.1 Goal

The goal of the evaluation is to evaluate the effectiveness of proposed design concepts to improve the communication of product properties such as measurements, signs of use, dimensions, and color on a second-hand clothing C2C platform. Based on Chapter 5.2, this study translates the user needs into design and generates digital prototypes as the tool of the test. In addition to validating the insights, this chapter will explore how the users of C2C secondhand clothing online platform use a device while interacting with the prototype.

5.3.2 Methodology

The main consideration of this test is to evaluate the concept design that closely aligns with the intended goals. User testing, semi-structured interview, and metric questions were conducted in the test.

1. User testing

The method involves using a concept test with an interactive mobile Figma prototype that showcases a complete flow, specifically designed to address issues related to communicating product properties on a second-hand C2C online platform. During the tasks, participants use the prototype using a mobile phone to interact with the design using a complete flow of listing a product.

| Task | Scenario | Scenario | |
|---|--|--|---|
| Task 1: communicating measurements (10 minutes) | You will list an item on a second-hand fashion platform and provide the measurements, can you show me how you would do it? | You will list an item on a second-hand fashion platform and provide the measurements, can you show me how you would do it? | <ul style="list-style-type: none"> • How easy was it to follow the guide and provide measurements? (Rate 1-5) also collect qualitative feedback on this. • How confident are you to provide accuracy? |
| Task 2: communicating color (10 minutes) | You need to describe accurately the real color of the item <ul style="list-style-type: none"> • Take pictures | Identify the color of the item and capture it accurately. | <ul style="list-style-type: none"> • How easy was it to follow the guide and capture the color accurately? • How confident are you to provide accuracy? |
| Task 3: communicating signs of use (10 minutes) | There are some signs of use in your clothing, can you show me how you would input them? | Identify the signs of use in the clothing. <ul style="list-style-type: none"> • Take pictures • Describe them accurately | <ul style="list-style-type: none"> • How easy was it to follow the guide and provide signs of use accurately? (Rate 1-5) also collect qualitative feedback on this • How confident are you to provide accuracy? |
| Task 4: communicating dimensions (10 minutes) | You need to capture visually the dimensions of an item (texture, thickness, thinness) | Capture the product dimension through video | <ul style="list-style-type: none"> • How easy was it to follow the guide and provide dimensions? • How confident are you to provide accuracy? |

2. Semi-structured interview

After user completing a task, a follow-up question is conducted to have discussion regarding experience of using the prototype. The discussion involves their problems and needs of the current design.

3. Metrics

We use metrics to measure the effectiveness of the proposed design. Data is collected after user finishes the task.

| 1. Ease of Use ratings (1-5 scale) | | 2. Confidence Ratings (1-5 scale) | |
|------------------------------------|---|-----------------------------------|---|
| Task 1: | Communicating measurements (ease of following the guide and providing measurements) | Task 1: | Communicating measurements (confidence in providing accurate measurements) |
| Task 2: | Communicating signs of use (ease of following the guide and providing signs of use) | Task 2: | Communicating sign of use (confidence in capturing signs of use accurately) |
| Task 3: | Communicating dimensions (ease of following the guide and providing dimensions) | Task 3: | Communicating dimensions (confidence in providing accurate dimensions) |
| Task 4: | Communicating color (ease of following the guide and capturing the real color) | Task 4: | Communicating color (confidence in capturing the color accurately) |

Figure 28. Metrics

5.3.3 Session Outline

The participant criteria for the test include selecting current users (n=5) of second-hand fashion platforms, both buyers and sellers of second-hand clothing C2C online platform. According to Nielsen Norman Group, a leading authority in the field of usability and user experience research, a minimum of five participants is typically deemed sufficient for a qualitative usability study. This recommendation is based on their extensive research into user behavior and interaction, as well as their established methodologies for effective usability testing (Pavlíček & Pavlíčková, 2023). This recommendation aligns with a research indicating that 5-10 participants are generally satisfactory for usability testing, with the suggestion that multiple small tests can be more beneficial for iterative improvements based on findings from smaller user samples (Howes et al., 2019).

| Seller's selling frequency | |
|----------------------------|----------------------------|
| P1 | 2 sold in the last year |
| P2 | 3-4 sold in the last year |
| P3 | 2-3 sold every 3 months |
| P4 | Minimum 1 sold every month |
| P5 | Minimum 2 sold every month |

The participants include both male and female users. The participants of this evaluation showed different levels of selling activity. Some sellers were quite active, while others sold items only occasionally, indicating that there is a range of selling frequencies among the participants, rather than distinct categories. Based on a study by (Ocak & Cagiltay, 2017), one of the primary reasons for using non-frequent users in usability tests is to uncover issues that may not be apparent to regular users. Involving non-frequent users helps in evaluating the system's learnability and intuitiveness, as they can provide valuable insights into the initial user experience.

Figure 29. Participants' selling frequency

Each test session is conducted individually, with a single participant with a duration of 30 minutes. The location for the session is in the Industrial Design Engineering building on TU Delft Campus. The researcher performed as the moderator, guiding the session. The entire session was recorded to ensure that all observations and feedback are captured for further analysis.

The test material consists of:

- Second-hand clothing with sign of use (stains, scratches)
- Measuring tape
- A mobile phone (owned by the researcher)



Figure 30.
Evaluation

5.3.4 Task Procedure

5.3.4.1 Task 1: Communicating measurements

Task scenario: You will list an item on a second-hand fashion platform and include the measurements, can you show me how you would do it?

The goal of this task is to provide guides for sellers to include essential measurements. On the product listing page, after sellers select a category, they receive specific prompts that indicate which measurements are required. For example, when listing trousers, sellers might be prompted to enter details such as the length and waist size.

However, while these prompts are helpful, users have indicated that they could be even more motivated to input measurements immediately if the interface were designed to be more intuitive and visually engaging. Specifically, users have suggested that including line drawings of the clothing category they have selected could significantly enhance their experience. These line drawings would visually highlight the specific areas of the clothing that need to be measured, providing a clear and immediate reference for the seller.

In addition to the visual prompts, users also appreciate the inclusion of a text field positioned directly next to the relevant part of the clothing in the line drawing. This placement serves as a direct and immediate call to action, encouraging sellers to input the measurements as they view the visual cue. One participant shared their reaction, "When I see this [text field to input measurement], I want to click this immediately, and expect there to input the measurement." This feedback highlights how the strategic positioning of the text field next to the relevant clothing part makes the task of entering measurements more intuitive and convenient.

Another participant shared a similar thought, stating, "I would enter this measurement right away before I forget." This feedback highlights the concept that placing the text field close to the relevant part of the line drawing not only encourages quick action but also helps sellers remember to include all the necessary measurements. This design reduces the chances of sellers missing important details, ensuring that buyers receive accurate information about the clothing.

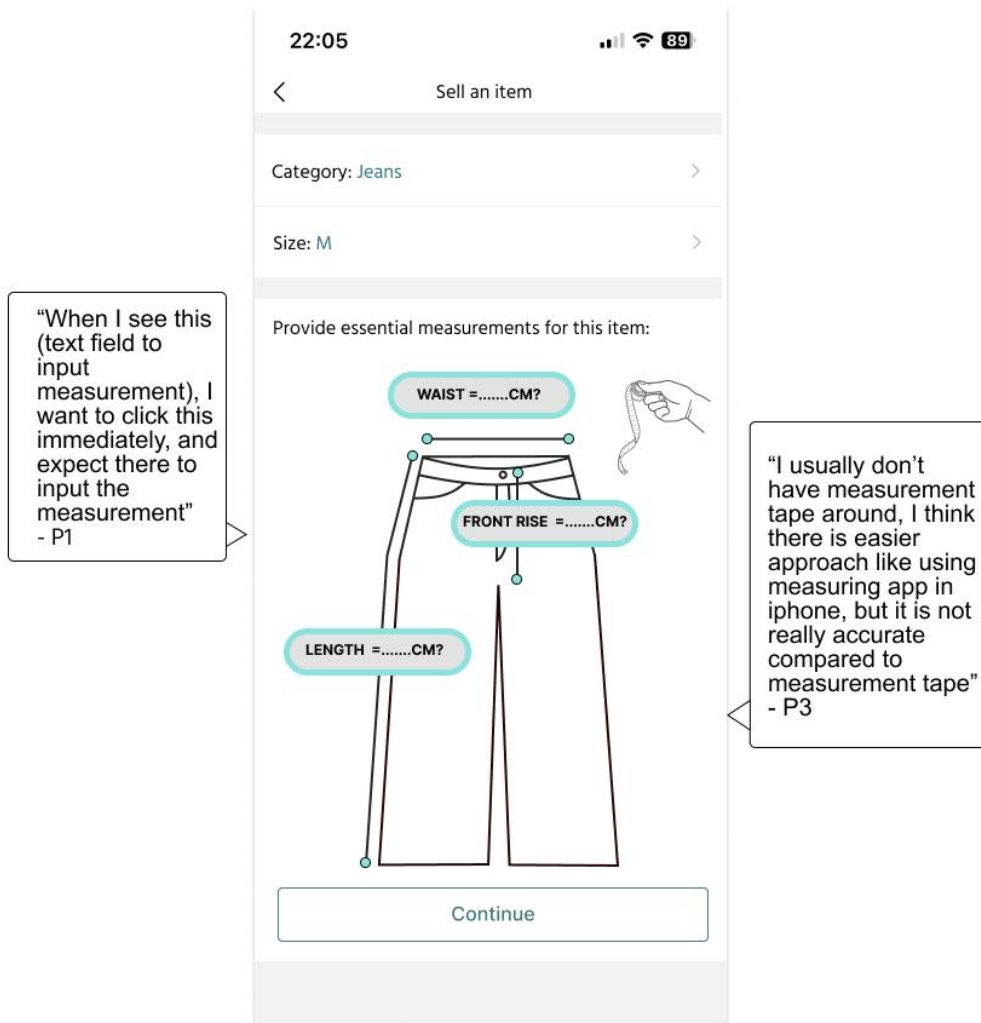


Figure 31. Prototype interface for task 1

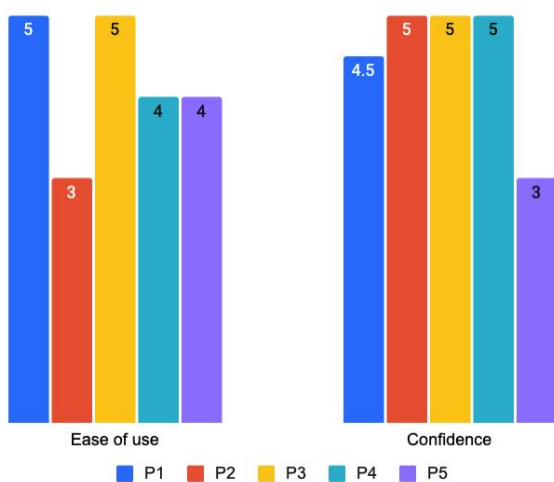


Figure 32. User rating on new measurement feature

5.3.4.2 Task 2: Communicating color

Task scenario: You need to describe the true color of the item using pictures

The goal of this task is to provide guidance on how to best capture the true color of clothing to avoid discrepancies, and encourage sellers to photograph items in natural light.

Users find it very useful to have this type of guidance, as it helps them to better showcase the true colors of their products in their listings. Despite the usefulness of the guide, many users continue to encounter challenges in their efforts to capture accurate colors. In real-world scenarios, sellers often find themselves dealing with poor lighting conditions, which can lead to photos that do not accurately represent the true color of the clothing. As a result, some sellers resort to editing their photos in an attempt to correct these color issues. However, this can be a time-consuming process, and if not done carefully, it can lead to further inaccuracies.

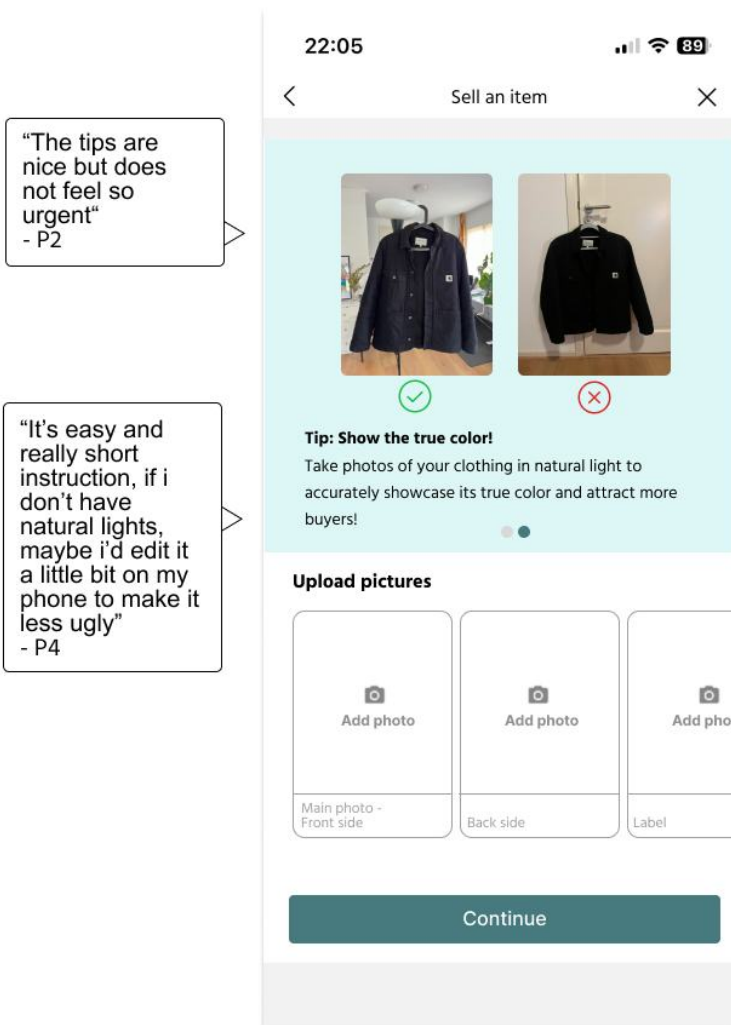


Figure 33. Prototype interface for task 2

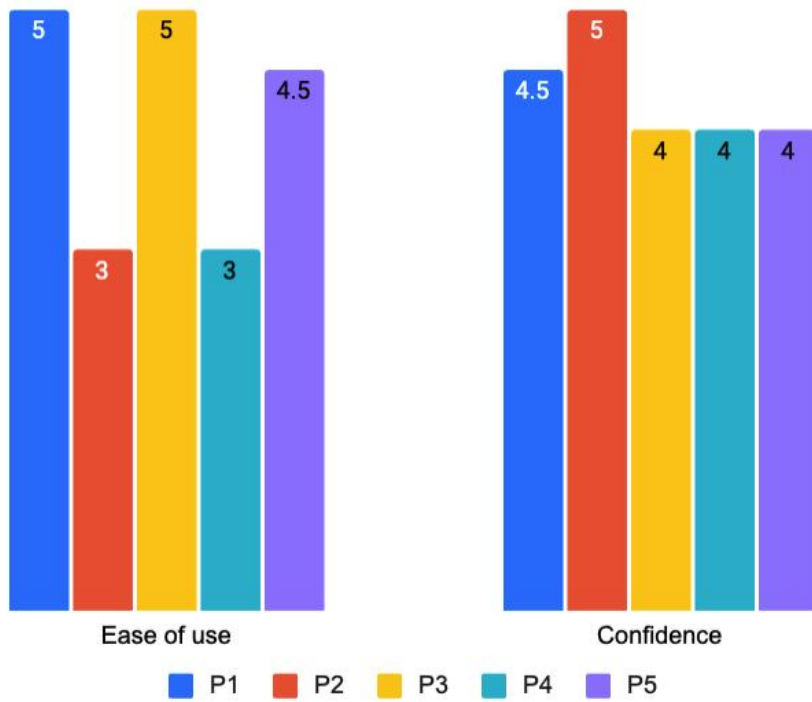


Figure 34. User rating on new photography guide feature

5.3.4.3 Task 3: Communicating signs of use

The goal of this task is to provide guide for sellers to detail and photograph signs of wear. Most participants in this task need clearer example photos and detailed descriptions of what type of signs of use they need to display. They find that the signs of wear are too subtle, making it difficult to understand what exactly should be captured in the photographs. One participant noted "The example photos are not clear, it is too subtle", This feedback suggests that the current images do not adequately highlight the specific signs of wear that sellers should be focusing on.

Additionally, there is a recurring issue with the descriptions accompanying the photos. Participants have pointed out that while the images do show signs of use, they do not clearly explain what those signs are. One participant commented, "The picture shows 'signs of use,' but it doesn't tell what that is. It would be better to point out and describe more in detail to the sellers." This indicates a need for more precise annotations and explanations that clearly identify and describe the signs of wear shown in the photos.

Overall, while participants find the idea of the guide useful, they are seeking more clarity and detail. They need better visual examples that clearly depict signs of wear, along with detailed descriptions that explain what these signs are and how they should be captured.

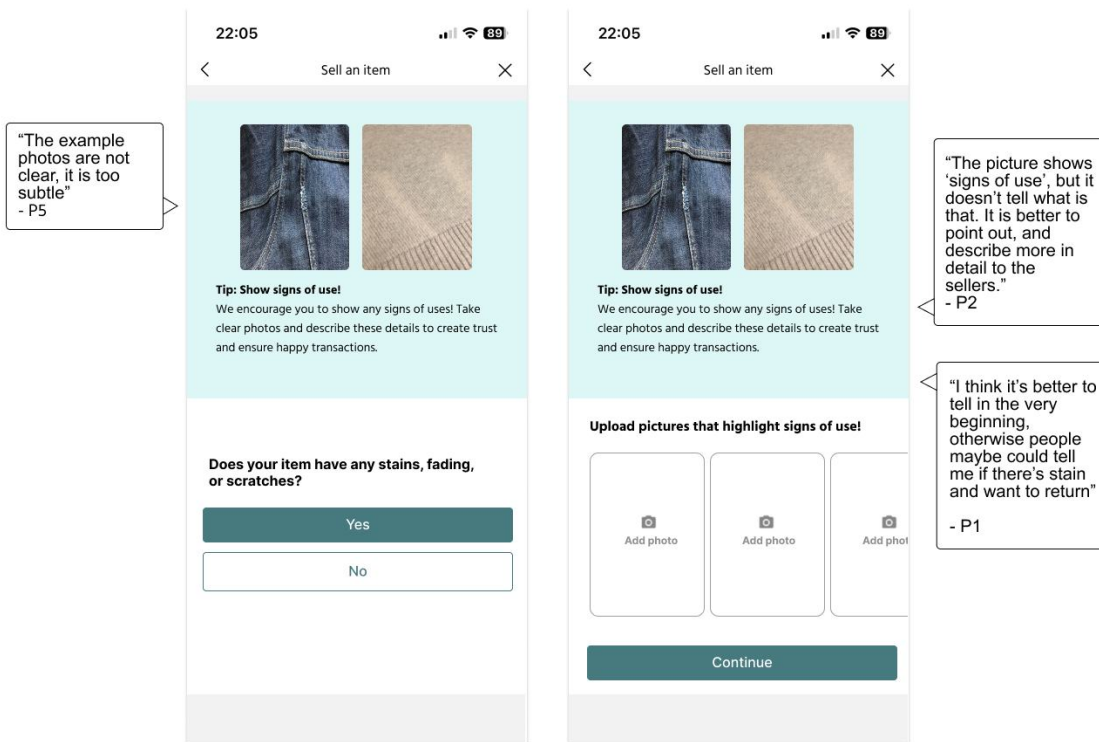


Figure 35. Prototype interface for task 3

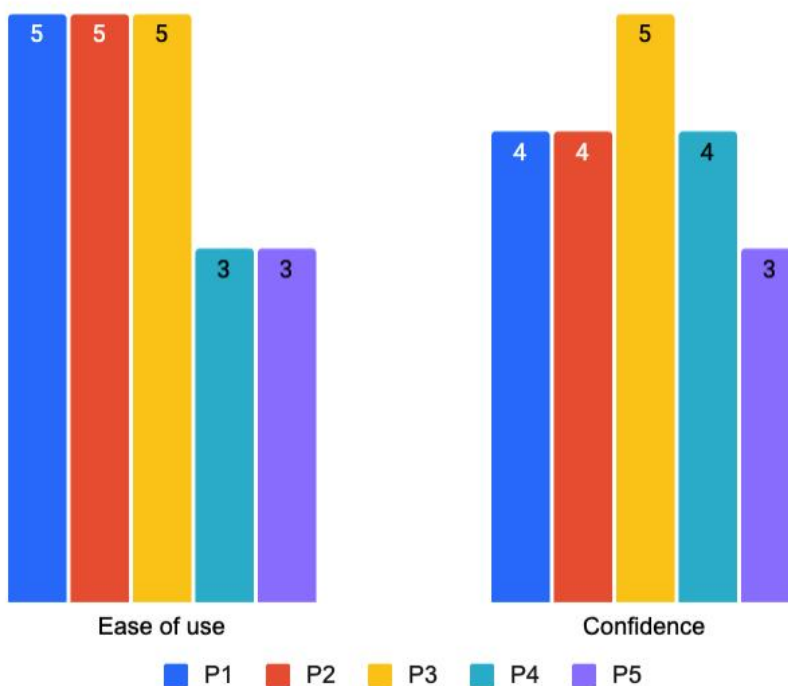


Figure 36. User rating on new signs of use feature

5.3.4.4 Task 4: communicating dimensions

Task scenario: You need to capture visually the characteristics of an item (texture, thickness, thinness)

The goal of this task is to provide guide for sellers to take videos showcasing the item. Participants find video listings appealing because they show the true condition of items in a realistic way.

One participant highlighted the appeal of video listings by stating, "It is quite interesting because it tells the real situation of your clothing; video is already realistic, showing the real condition." This feedback underscores the value that videos bring to online listings. Despite the clear advantages of video listings, many sellers are hesitant to use them. Several concerns have been raised, primarily revolving around the complexity of the setup process and the technical challenges involved. Sellers worry about the time and effort required to produce a high-quality video. Additionally, there is a common concern about the amount of storage space that video files occupy, which can be an obstacle for those with limited storage capacity on their devices.

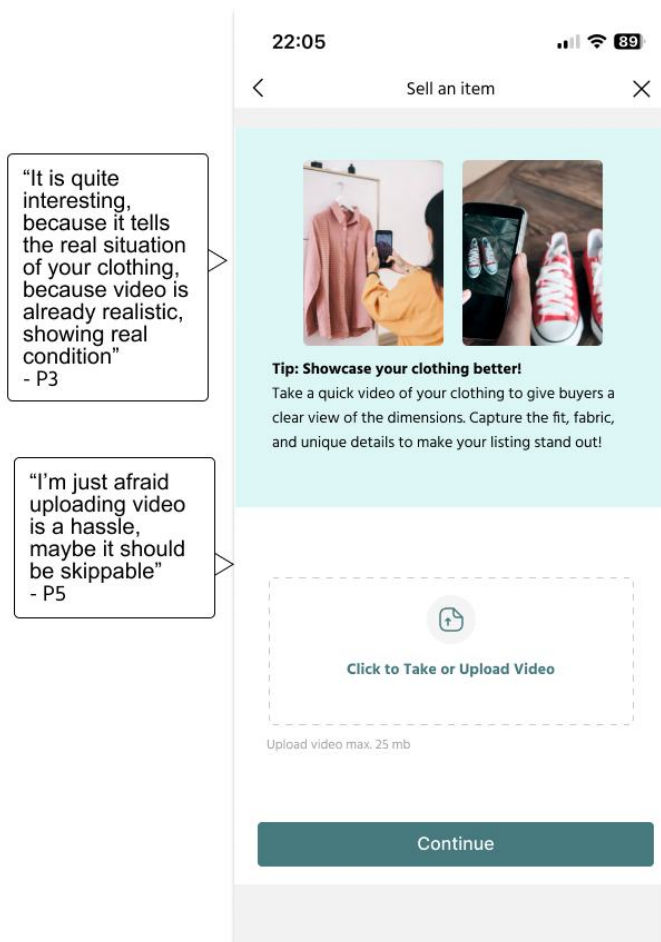


Figure 37. Prototype interface for task 4

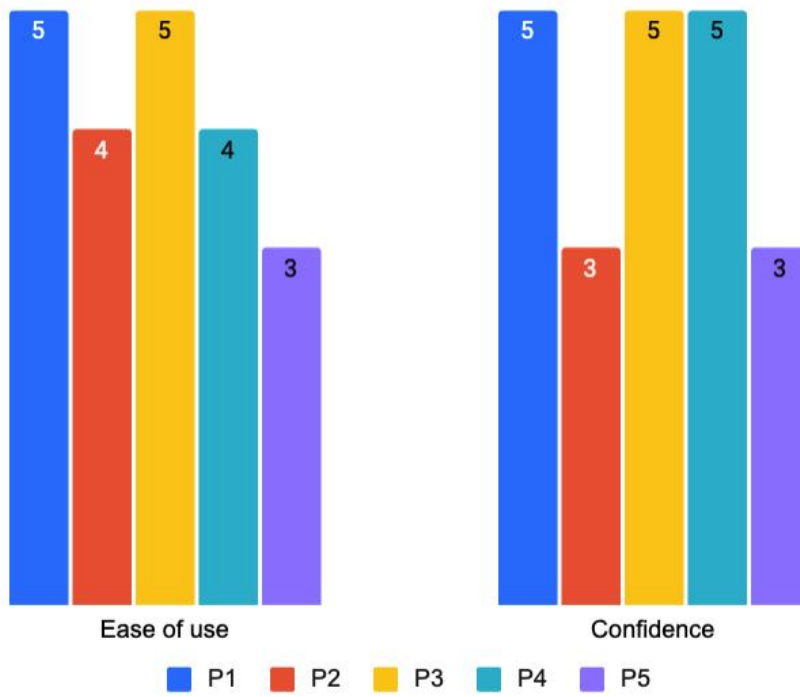


Figure 38. User rating on new video upload feature

5.3.5 Results

In this chapter, we validated the proposed design and gathered user feedback. We examined the proposed design, with solutions for enhancing the measurement accuracy, capturing the true color of the clothing, showing signs of use, and providing the touch and feel information for the users. Overall, the proposed design has received positive feedback and has the potential to meet user needs in the real-world setting. From these findings, we can derive several enhancement recommendations for the implementation in the platform:

5.3.5.1 Enhancing measurement accuracy through visual prompts and motivational cues

To address this issue, we need to provide nudges such as a guide for users to put the measurement one by one. Also, we need to provide a message to warn of the possibility of the item being returned, such as "Provide essential measurements for this item to minimize returns!". According to the survey in chapter 4.2, the highest return rates and customer dissatisfaction are due to inaccurate measurements. Therefore, increasing customer motivation to provide detailed measurements is crucial to preventing returns and ensuring buyer satisfaction.

Our findings indicate that lighting significantly affects color accuracy. Poor lighting conditions often result in misrepresented colors. Providing visual tips and message such as "Take photos of your clothing in natural light to accurately showcase its true color and enhance the chances of your listing selling quickly!" boost user's motivation in capturing their listing under natural lighting conditions.

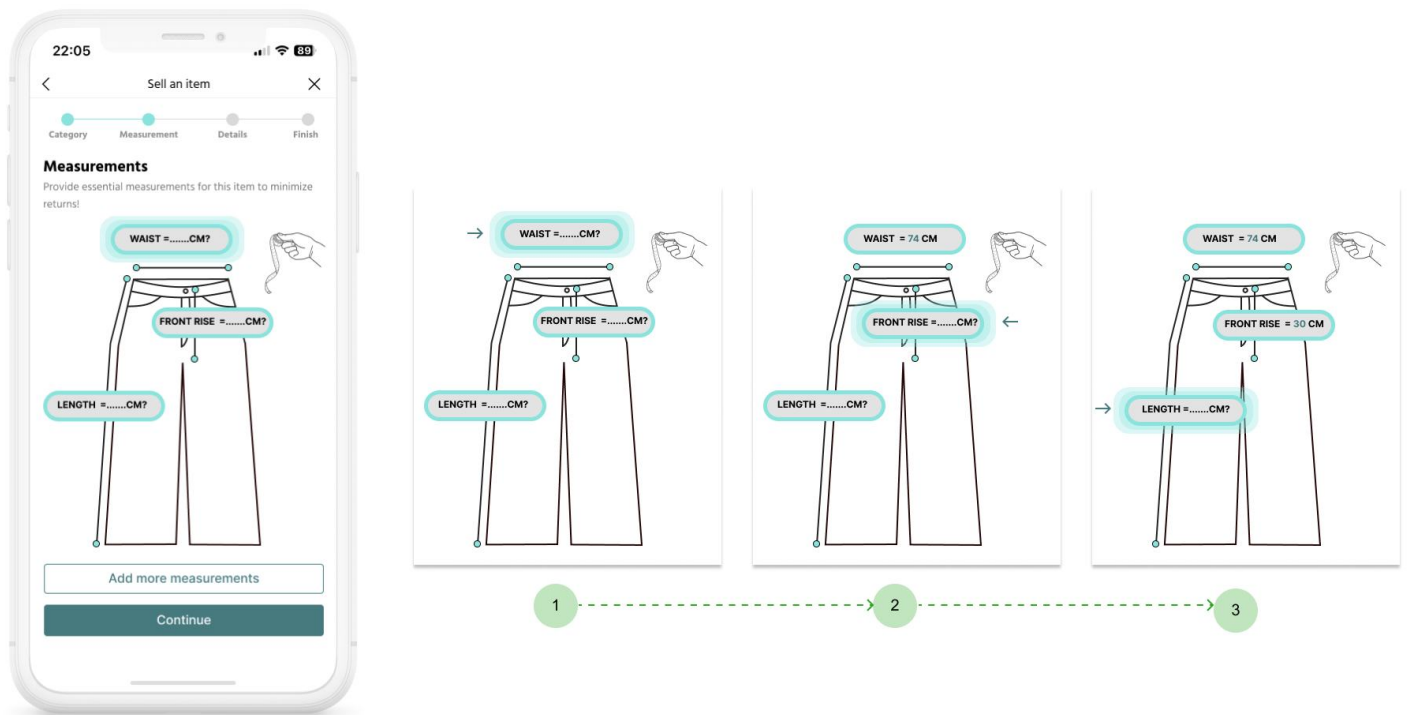


Figure 39. A new design adjustment for measurement input based on insights from the evaluation. To guide users, the field text will pulse, directing them to input information step by step for each part of the clothing. Additionally, we also added more flexibility for users to include additional measurements details they wish to provide.

5.3.5.2 Practical guide on natural lighting photography for true color representation

Our findings indicate that lighting significantly affects color accuracy. Poor lighting conditions often result in misrepresented colors. Providing visual tips and message such as “Take photos of your clothing in natural light to accurately showcase its true color and enhance the chances of your listing selling quickly!” boost user’s motivation in capturing their listing under natural lighting conditions.

In general, compared to other tasks, this task was considered the easiest by the participants. The “do and don’t” tips were very clear and legible to all participants. There is no significant change to this section design as it already fulfills user’s needs.

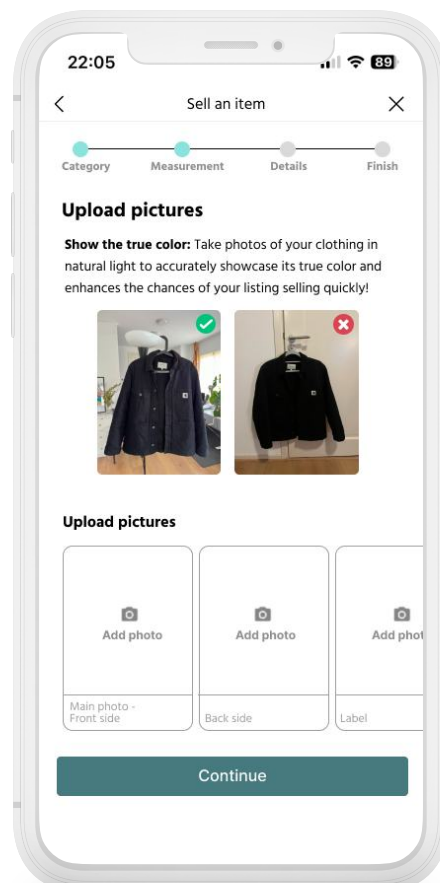


Figure 40. Prototype interface for color communication

5.3.5.3 Enhancing clarity in depicting signs of use through photos and detailed descriptions

Providing example photos that highlight different types of signs of use such as scratches, stains, holes, or discoloration along with detailed description is important. Each photo should be accompanied by a clear explanation of the signs of use, helping sellers to accurately depict the condition of their items.

Providing detailed signs of use with visual and textual information is still not a standardized practice yet in secondhand clothing C2C platforms. From the evaluation, users can feel overwhelmed by this type of new task because they need to provide detailed photos, type of signs of use, and additional comments. To address this problem, we can break down tasks so users can process information more effectively, leading to improved usability and user experience (Paas & Ayres, 2014).

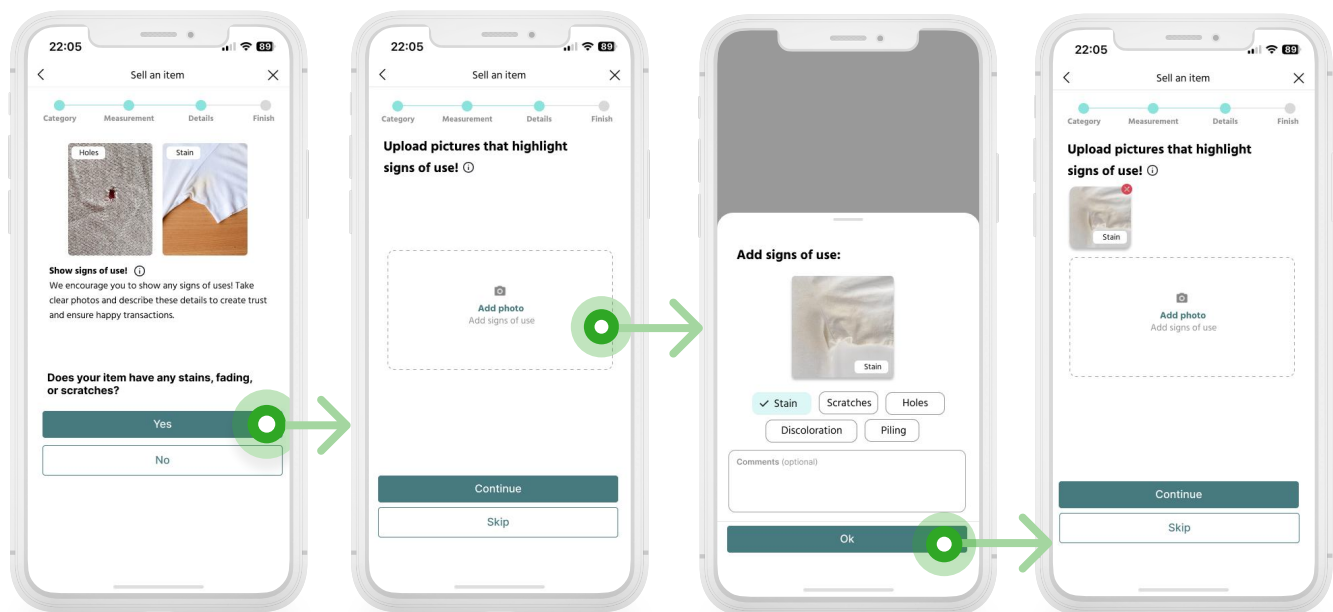
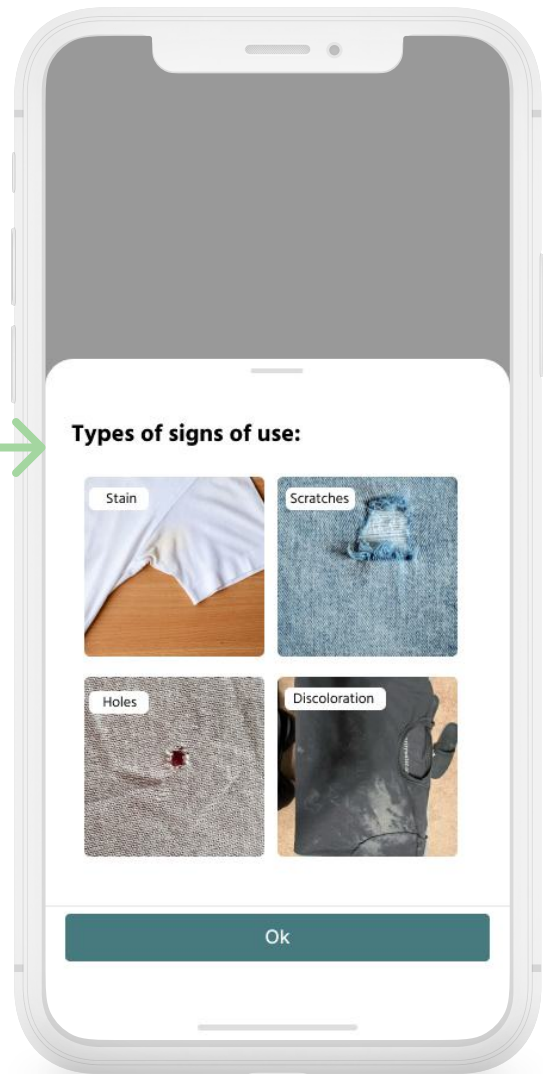


Figure 41. The task of inputting signs of use is divided into smaller steps to reduce cognitive load.

Show signs of use! ⓘ
We encourage you to show any signs of uses! Take clear photos and describe these details to create trust and ensure happy transactions.

Figure 42:
Displaying different types of signs of use helps users gain a better understanding.



5.3.5.4 Video uploading feature for additional clarity of product dimensions and condition

From this evaluation test we learned that users were aware that product videos could help potential buyers to get a feel of the material and dimension of the product being viewed. However, users also felt that video capturing and uploading process could be challenging and complicated.

To address this concern, providing users with simple guides on creating effective videos could be beneficial. Tips on easy setup and using natural lighting can help users feel more comfortable with the process. After the user picked or recorded the video, there is an optional caption box to add more details to the video in writing.

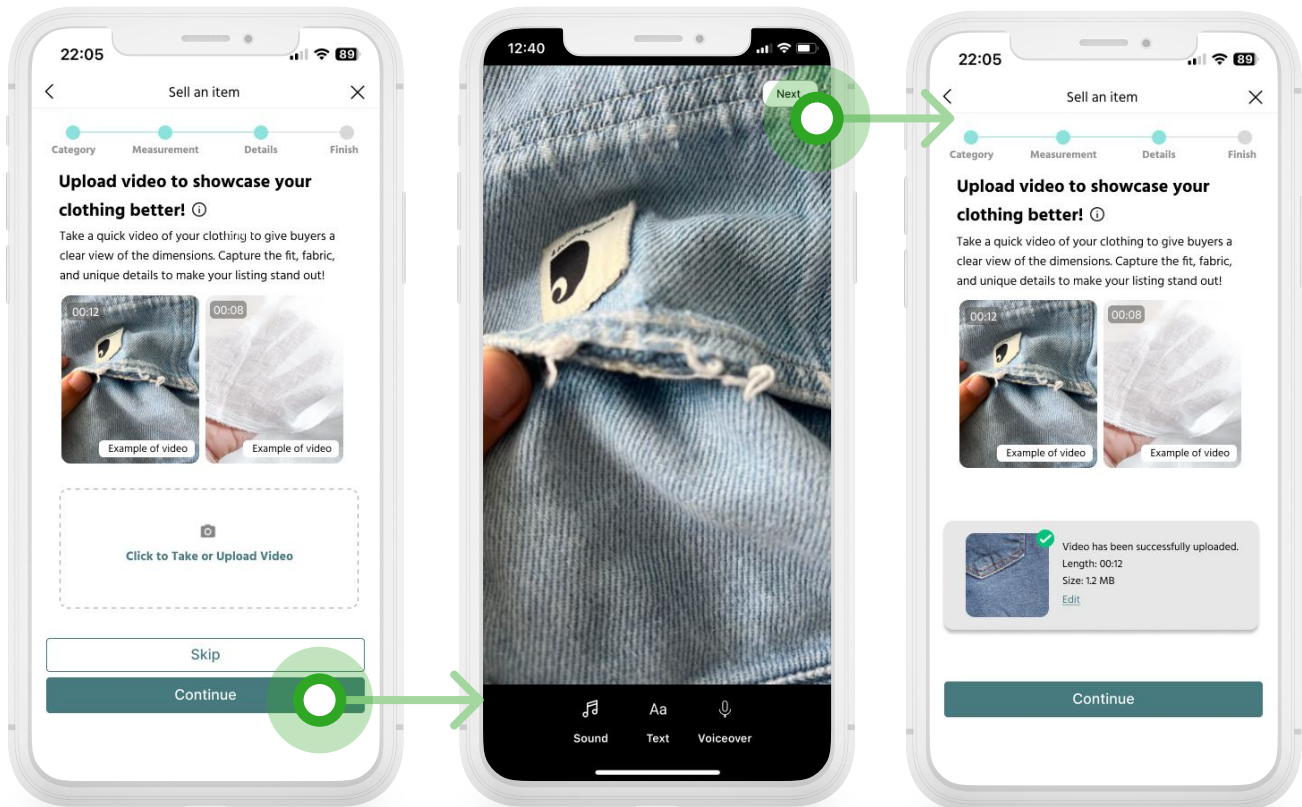
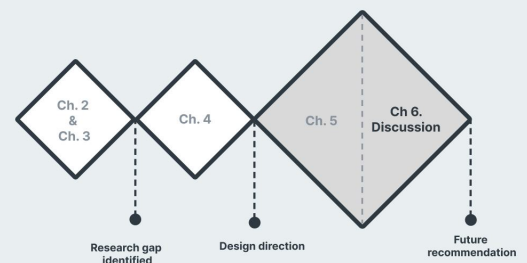


Figure 43. A new design adjustment enhances ease in uploading videos, offering users the flexibility to take and annotate videos of the item.

06. Discussion & Conclusion



Intro:

This chapter provides an **overview of the findings** from each phase of the thesis project and the design recommendations. It also explores **the limitations** encountered during the user research phase and provides recommendations to effectively address the issues. Additionally, it suggests directions for **future research** in the context of the C2C secondhand clothing online marketplace.

Chapter Overview:

- 6.1 Design contribution
- 6.2 Limitation
- 6.3 Recommendations for future development

6.1 Design contribution

In the context of secondhand clothing C2C online marketplaces, the user experience is quite similar to general online clothing shopping, but it differs in the difficulty of communicating product properties due to varying standards since the textual and visual information are produced by the customers. The aim of this thesis is to develop a universally applicable design for C2C online marketplaces.

To achieve this goal, the research focuses on identifying the gaps in the current studies and uncovering the challenges faced by the user in the C2C context. This analysis helps formulate solutions to address the problems, with the **main research question for this thesis: “How to help customers to communicate material properties accurately for a C2C secondhand clothing online platform?”**. We investigate this by utilizing mixed-method research and splitting into two questions for each phase.

For **qualitative research**, the key question is **“What are the key factors influencing customer satisfaction in selling and buying clothing on the online C2C platform?”**. The **main findings** from this research phase are as follows:

- Customers often encounter measurement inaccuracies, as many of them struggle to determine how the clothing will fit without trying it out.
- There is often a lack of information about signs of use although customers expect some flaws in secondhand items, but often there’s a lack of information about signs of use.
- Tactile experience is missing in online shopping, making it difficult to gauge the material of the secondhand clothing.
- Customers frequently feel disappointed when the actual color differs significantly from what they saw online.

To complement the qualitative research, we conducted **quantitative research** to address the key question **"What solutions are feasible to implement on the platform to enhance the engagement between seller and buyer in the C2C secondhand clothing online platform?"**. The **main findings** from this research phase are as follows:

- Provide visual and textual information to cater to buyers' needs, which often hinders their experience when lacking in the platform
- Allow sellers to easily provide visual and textual information of the clothing on the product listing page without hassle (e.g feel encouraged to put detailed measurements, provide clear images, etc).

From both phases, we integrate the results in the analysis to generate ideas for design recommendations. This thesis provides design recommendations for implementation on the platform. These recommendations aim to enhance the communication of product properties, particularly to improve the listing phase, ensuring the accuracy of each property's description. Key touchpoints on the online platform are designed to provide clear visual and textual guidance for customers, therefore narrowing the information gap on product properties. These include:

- 1. Providing guidance to include essential measurements.** On the product listing page, after selecting category, sellers receive prompts on what specific measurements are needed (e.g for trousers: length, waist)
- 2. Providing guidance on how to best capture the true color of clothing to avoid discrepancies,** by encouraging sellers to photograph items in natural light.
- 3. Providing guidance for sellers to detail signs of wear,** by encouraging sellers to input detailed descriptions and close-up images of any flaws.
- 4. Provide guidance for sellers to take videos showcasing the item's dimension/ tactile quality.** Videos can be a useful resource for this purpose to accurately convey the dimensions and tactile quality of the secondhand item.

In validating the design with users, it was found to have met user needs effectively by addressing common challenges in selling and buying secondhand clothing online. Data triangulation through mixed methods confirmed that the design meets user needs and addresses the challenges faced in the C2C secondhand clothing online marketplace.

6.2 Limitations

This thesis has a couple of limitations. First, during the evaluation phase, the limited number of participants resulted in a relatively small sample size for the study. Therefore, it is necessary to include a larger and more representative sample of C2C users from various European countries. Conducting an online study with a representative sample would be worthwhile to validate the design recommendations.

Secondly, our study focused on Europe and the UK, studying selling and buying in the secondhand clothing online marketplace within these areas, which may yield different insights compared to other regions. For example, cultural norms and values significantly influence consumers' perception of secondhand clothing. Studies have shown that cultural factors in Asia can lead to differences in self-consciousness and the influence of perceived norms on recommendation behavior related to secondhand apparel shopping (Lo et al., 2019). The stigma associated with buying secondhand clothing may exist in Asian countries where the practice is not as normalized as in Western societies (Xu et al., 2014). This may imply that the design approach on the platform could be different from what is researched in Europe and UK.

6.3 Recommendations for future development

There are several recommendations to be communicated in this section. First, an elaborate study exploring each specific product attribute should be conducted to gain deeper insights and open opportunities for more comprehensive design recommendations. For example, since measurements are the most crucial product property that has the biggest influence on product returns, a study should **investigate the use of contemporary tools** such as LiDAR (Light Detection and Ranging) to provide better accessibility and accurate measurements for clothing.

LiDAR technology has become increasingly accessible, particularly through smartphone applications, due to its ease of use and accuracy in various measurement tasks. In iPhone pro models (iPhone 12 Pro and later), LiDAR is included, which can improve measurement accuracy. The integration of LiDAR with smartphone cameras has already enabled convenient and precise measurements in a wide range of measurement tasks, such as wound size assessment (Song et al., 2023), 3D imaging for applications like augmented reality and automotive industries (Villa et al., 2021), and even structural mapping in tree trunks (Parnow et al., 2023). To conclude, LiDAR can significantly enhance the accuracy of measurements for clothing due to ease of use and high precision, and incorporating an in-app measurement feature that utilizes LiDAR can address the issue regarding convenience and accuracy of measurements for clothing.

Secondly, from a practical perspective, to test the application in a real-world setting, future research is necessary to assess real-world feasibility by **conducting A/B testing** to refine the platform's functionality, for example, encouraging more detailed measurement for some users and keeping existing design for others. This will create **two different types** of product detail pages, one with more details on measurements. From this, we can study the product return rates and satisfaction rates between the two approaches. This method allows for evidence-based decision-making and helps in identifying potential issues with new designs or features before a full-scale release, therefore reducing the risk of negative impacts (Pokhilko et al., 2019; Xu et al., 2015).

Lastly, a broader study on behavior change in shifting mindset to make secondhand clothing a first choice are also important. Understanding consumer behavior in the secondhand clothing market is important due to the significant shift in consumer preferences towards sustainable consumption practices (Ek Styvén & Mariani, 2020). Therefore, **a comprehensive study on the behavior change** should be conducted to provide a holistic understanding of user behavior, including the motivations, challenges, and barriers associated with buying and selling secondhand clothing. By analyzing these factors, the study will offer valuable insights into how users interact with the C2C marketplace and how the platform can be optimized to better meet their needs.

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Appendix



Personal Project Brief – IDE Master Graduation Project

Problem Definition

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

(max 200 words)

*Problem statement: The lack of trust between sellers and buyers in a C2C marketplace for second-hand fashion transactions may influence their engagement and purchasing decisions.

*The opportunities that I see to create added value for Vinted as the stakeholder are as follows:

- Providing novel interactions to enhance the seller-buyer engagement, thereby increasing engagement and user retention
- Provide analysis from in-depth qualitative research on customers on second-hand fashion, not only focusing on Vinted customers but also second-hand fashion enthusiasts in general, to identify gaps that currently Vinted does not address
- Analyzing factors that attract consumers more to the future of second-hand fashion c2c marketplaces
- Offering insights to the platform for future product development

*The opportunities that I see to create added value for Vinted customers as the stakeholder are as follows:

- Offering insights for sellers on how they can boost their product listings and attract buyers to their product listings and attract buyers to their products

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for.

Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence)

As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Design interactions to improve information accuracy of the second-hand product from seller to buyer in an online marketplace. The goal is to enhance seller-buyer engagement and increase the confidence in selling and purchasing second-hand products.

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

*Research:

- Explore existing c2c second-hand fashion marketplaces to understand their current offerings and target audiences, and conduct competitor analysis to identify gaps among them
- Literature review on buyer-seller interaction and second-hand fashion purchasing motive
- Conduct qualitative research to understand; 1) consumers' concerns and tensions, 2) consumers' perception on fashion in general and second-hand fashion specifically, 3) the needs and journey into selling and purchasing fashion items, 4) the ideal characteristics of a second-hand fashion c2c marketplace

*Design:

- Generate ideas based on the findings from the research and set design goals and criteria to develop prototype
- Create digital interface and conduct testing to finalize the design concept

*Evaluation: - Evaluate interaction experiences of the final design outcome to the representative users



IDE Master Graduation Project

Project team, procedural checks and Personal Project Brief

In this document the agreements made between student and supervisory team about the student's IDE Master Graduation Project are set out. This document may also include involvement of an external client, however does not cover any legal matters student and client (might) agree upon. Next to that, this document facilitates the required procedural checks:

- Student defines the team, what the student is going to do/deliver and how that will come about
- Chair of the supervisory team signs, to formally approve the project's setup / Project brief
- SSC E&SA (Shared Service Centre, Education & Student Affairs) report on the student's registration and study progress
- IDE's Board of Examiners confirms the proposed supervisory team on their eligibility, and whether the student is allowed to start the Graduation Project

STUDENT DATA & MASTER PROGRAMME

Complete all fields and indicate which master(s) you are in

Family name

Initials

Given name

Student number

IDE master(s) IPD Dfl SPD

2nd non-IDE master

Individual programme (date of approval)

Medisign

HPM

SUPERVISORY TEAM

Fill in the required information of supervisory team members. If applicable, company mentor is added as 2nd mentor

Chair dept./section

mentor dept./section

2nd mentor

client:

city: country:

optional comments

- ! Ensure a heterogeneous team. In case you wish to include team members from the same section, explain why.
- ! Chair should request the IDE Board of Examiners for approval when a non-IDE mentor is proposed. Include CV and motivation letter.
- ! 2nd mentor only applies when a client is involved.

APPROVAL OF CHAIR on PROJECT PROPOSAL / PROJECT BRIEF -> to be filled in by the Chair of the supervisory team

Sign for approval (Chair)

Name Date Signature

Project planning and key moments

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

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

| | |
|---------------------|----------------------|
| Kick off meeting | <u>04/03 - 08/03</u> |
| Mid-term evaluation | <u>22/04 - 26/04</u> |
| Green light meeting | <u>24/06 - 28/06</u> |
| Graduation ceremony | <u>29/07 - 09/08</u> |

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

| | |
|-------------------------------------|--------------------------|
| Part of project scheduled part-time | <input type="checkbox"/> |
| For how many project weeks | <input type="text"/> |
| Number of project days per week | <input type="text"/> |

Comments:

Motivation and personal ambitions

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

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

(200 words max)

The competencies I want to develop:

- In-depth product research using qualitative method, and analyze the data to create meaningful insights
- Rigorous market research skills; research, identify insights, and make informed decisions
- Consumer behaviour analysis related to second-hand products, including factors influencing purchasing decisions and perceptions product offerings, and apply the learnings for product development
- Learn how to research trends
- Develop compelling product offerings that resonate with target audiences.

and my personal learning ambitions which I explicitly want to address in this project:

- Exploring various types of interactions to enhance the engagement in second-hand fashion online marketplace
- Improving prototyping skills
- Developing rigorous research skills, including proper literature review, thorough data collection, and analysis methods relevant to the study
- Enhancing my ability to think critically about novel approaches for product development within the context of the C2C marketplace.

