CHALMERS
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Reforming Urban Delivery Experiences

A Human-Centered Approach to Enhancing In-Store Personnel Efficiency

Master's thesis in Computer science and engineering

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Abstract

As consumer expectations and technological advancements continue to evolve, same-day delivery has emerged as a future component of retail commerce.

This Interaction Design Master's thesis explores the implementation of a same-day delivery service from the perspective of retail workers, focusing on optimizing their workflow through effective user experience (UX) and user interface (UI) design. The study involved a comprehensive user study to determine the specific needs and requirements of retail workers in a same-day delivery setting. This included receiving orders, picking and packing items, and coordinating with delivery operators.

The primary outcome of this research is the development of a user-friendly UI designed for use within retail environments. This interface supports the entire delivery process and is specifically tailored to enhance the efficiency and user experience of retail workers. Considerable attention was given to the adaptability of the UI across different device types, with particular emphasis on desktop and mobile platforms to accommodate the dynamic retail working environment. Additionally, the thesis introduces an innovative physical product that integrates into the same-day delivery system. This device improves process efficiency through visual feedback utilizing a light indicator.

The effectiveness of the designed UI and the physical product was evaluated through user testing, which provided critical insights and feedback. This feedback fueled a subsequent iteration of the design, leading to a refined prototype that better met the users' needs. The iterative design process, coupled with real-world application and testing, underscores the thesis's contribution to enhancing same-day delivery services in retail settings, ultimately improving the workflow and satisfaction of retail workers.

Keywords: UI, same-day delivery, interaction design, UX design, project, Master thesis.

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Pontus Borén, Gothenburg, 2024-06-19
Jonas Ellis, Gothenburg, 2024-06-19

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Introduction

The domain of urban delivery services, exemplified by Parent Company's Subsidiary, is at the intersection of logistics, e-commerce, and customer service. This dynamic environment demands a seamless interaction between technology and human users, especially in the in-store setting where personnel play a crucial role in maintaining the efficiency and quality of the service. Interaction design becomes pivotal in shaping the user interface to meet the specific needs of in-store personnel, ensuring a smooth and enjoyable workflow. The integration of technology not only streamlines operational processes but also contributes to a positive user experience, making it an ideal domain for interaction design.

At this juncture is where this master thesis will be conducted, handling these various challenges and opportunities. In collaboration with the Parent Company, the thesis will focus on delving deeper into the retail personnel's needs and requirements from the system as a whole but also in detail. Combining the complex nature of the retail store environment and surrounding stakeholders such as customers and delivery operators, the thesis aims to result in a satisfiable user experience with the new same-day delivery service.

1.0.1 The Research Problem

The challenge lies in enhancing the efficiency and experience of in-store personnel involved in the Subsidiary, which provides fast, efficient, and high-quality deliveries in urban environments. The complexities arise from the simultaneous demands of order picking and packing while serving customers in the store. To maintain the excellence of this service, there is a need to gain a comprehensive understanding of the experiences and workflows of in-store personnel, leading to the development of a user interface that streamlines their tasks and contributes to a positive working environment. The rising demand for shopping requires retail companies to continually refine supply chain strategies to meet customer needs. To address the growing preference for shorter delivery times, there is a need to enhance customer services accordingly [1].

1.0.2 Research Question

What are the factors for a successful and satisfying performance of the activity packing orders in-store, whilst maintaining a high level of customer service towards

visiting customers?

How could the resulting insights be visualized in a concept implemented in order to enhance order picking and handling?

1.0.3 Stakeholders

Parent Company is the primary stakeholder, representing the overarching organization that has developed the Subsidiary. Their interests lie in optimizing the efficiency and effectiveness of their delivery service while ensuring a positive and productive work environment for in-store personnel. Due to confidentiality reasons, the parent company and subsidiary wishes to remain anonymous and will therefore be referenced as above in the report.

This subgroup within Parent Company is directly responsible for the development, implementation, and management of the Subsidiary. Their focus is on improving the user experience for both customers and in-store personnel, aiming to maintain high standards of service in urban delivery.

In-store personnel, including staff involved in order picking, packing, and customer service, are vital stakeholders. Their experiences, challenges, and insights will directly impact the success of the Subsidiary. Improving their work processes and overall satisfaction is a key goal of the research.

While not the primary focus, customers are indirect stakeholders whose experience is impacted by the efficiency of in-store personnel. A positive interaction between in-store staff and the Subsidiary contributes to a more satisfying customer experience.

The internal design and technology team within Parent Company is responsible for implementing the proposed design suggestions. Their involvement is critical in translating insights into a user-friendly and technically feasible user interface.

1.0.4 Result and Aim

The intended result of this research project is a comprehensive design proposal for a user interface tailored to the needs of in-store personnel working with the Subsidiary. This project will achieve its goals through a phased approach, starting with an in-depth exploration of in-store personnel workflows and culminating in the design and testing of an optimized user interface for the Subsidiary. This proposal will include detailed insights gathered from user studies, a well-defined customer journey, and a user interface design that focuses on improving efficiency, ease of use, and overall work satisfaction for the target users.

1.0.5 Delimitation

The scope of this project, when viewed from the perspective of our subsidiary, is considerably broader than the aspects we will be addressing. Implementing a same-day delivery service incorporates numerous factors and involves various stakeholders. Given the complexity and the potential for large demands on our resources, we have

decided specific delimitations. These delimitations enable us to focus more intensively on particular components of the service, thereby enhancing the overall quality and effectiveness of the projects results. By clearly defining these delimitations, we aim to manage the project's scope effectively, ensuring that the research is both manageable and thorough, focusing primarily on the areas deemed most critical for in-depth investigation.

The process of same-day delivery can be segmented into several distinct perspectives: namely, those of the customers, the retail workers, and the delivery operators. Each segment has unique challenges and requirements, which can be seen below.

1.0.5.1 Customer Perspective

This includes considerations like fluctuations in delivery pricing, inventory accuracy, product assortment, promotional impacts, and the return of orders. Although these factors are crucial, they fall outside the primary scope of our research. However, where our system is significantly influenced by these, they have been taken into account.

1.0.5.2 Delivery Operators and Retail Workers

The workflows of delivery operators are intricately linked with those of retail workers. Our study includes the overlapping aspects of these workflows. While it might not always be feasible to have a delivery operator available immediately for every order, our project assumes that such availability is consistent, which is a delimitation in our research. The delivery operators in this system are external parties which will be integrated into the system, hence requiring assumptions.

1.0.5.3 Focus on Retail Workers

The main emphasis of this thesis is on the needs and requirements of retail workers. Certain necessary information related to shipping and delivery, which could be mandated by regulations or needed by personnel, is not comprehensively covered in our study. We have made reasonable assumptions and included sections on what we deem essential, but acknowledge that there can be additional details that are beyond the scope of this thesis.

1.0.5.4 Sustainability factors

This project will not incorporate any sustainability factors regarding environmental aspects. Mainly due to the projects time frame and prioritization of factors, but also due to the Companyts instructions and alignment for this project. The project will however include sustainability factors regarding the sustainability of retail workers environment and their daily tasks. This will involve their current tasks and potential new tasks from the implementation of the new system, aiming to find a good balance to maintain a desired working environment.

2

Background

Commerce is the transaction of goods and services between businesses and consumers and has been a cornerstone of human civilization, evolving from ancient barter systems to the sophisticated digital marketplaces of today. At its core, commerce involves buying, selling, and trading goods and services, enabled by various channels and utilizing numerous methodologies to facilitate transactions. The primary goal of commerce is to satisfy the diverse needs and desires of consumers, thereby generating profit for sellers. In the today's digital age, commerce has transcended traditional boundaries, enabling global transactions and innovations such as e-commerce, has allowed for purchasing almost anything online at any time.

In the context of evolving consumer expectations and technological advancements, same-day delivery has emerged as a significant aspect of commerce, particularly in retail. This service enhances customer satisfaction by reducing the time between purchase and recieval of goods, thereby meeting the increasing demand for instant gratification [2]. Same-day delivery can be difficult to implement due to complex logistical factors that requires efficient order management systems and also urban environment challenges such as traffic congestion or access limitations[2].

To operate successfully as a retailer, processes and methodologies surrounding retail management is important to follow. This includes a wide range of activities such as product assortment, sales strategies, customer service, and managing inventory levels[3]. Retail stores are at the end of the supply chain for handling merchandise, before reaching the end consumer. The objective of retail management is to enhance customer satisfaction and maximize sales and profitability[4]. To help manage the logistical and data side of retail management, various order management systems are employed.

This chapter will cover different areas, methods, and technologies connected to the research area of same-day delivery

2.1 Order Management System - What is it?

An Order Management System (OMS) is a crucial software solution in retail and e-commerce, overseeing the entire order fulfillment process. It efficiently handles order processing, inventory management, tracking, and customer communication [5].

While there may be various systems in place during the consumer-buying process,

OMS systems overarches the whole process, seamlessly integrating with other business systems like Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM), ensuring efficiency and accuracy across the entire order fulfillment ecosystem [5]. An OMS is essential for optimizing processes, improving inventory management, and enhancing customer satisfaction in modern retail and e-commerce enterprises.

2.2 Different methods for purchasing items from retail stores

The following methods are examples of different ways to proceed with buying merchandise from retailers

2.2.1 Brick-and-Mortar

Brick-and-mortar stores refer to physical stores that customers can enter for purchasing merchandise such as retail stores. The store layouts can differ, where customers may encounter spacious displays to compact setups where items are fetched from a warehouse by store personnel. In-store shopping promotes a more personalised experience with instant gratification [6]. In this scenario, two primary stakeholders are involved: purchasing customers and in-store personnel who assist them.

2.2.2 Online Shopping

Online shopping is one of the most common internet activities where electronics is one of the leading categories for purchases, offering easy comparison between product prices [7]. Items are shipped directly from a warehouse, or with emerging alternatives such as dark stores, an urban-based warehousing solution that reduces delivery times and costs by locating closer to consumers [8]. Delivery times typically range from 1 to 5 days, depending on the store's chosen delivery services. This method involves three essential stakeholders: customers, order delivery and logistics, and warehouse or in-store personnel, depending on the shipping location.

2.2.3 Click-and-Collect

This method is a combination of online shopping along with the urgency advantageous of in-store pickup [9]. Customers make purchases online, and in-store personnel set aside the items for customer retrieval upon store visitation. Click-and-Collect relies on the presence of a physical store, offering customers quicker access to their purchases compared to standard online orders. This offers retailers an advantageous edge in increasing customer value, being perceived as an additional service [10]. With only two stakeholders, customers and in-store personnel, this method creates a higher flexibility on the customers side, minimizing time pressure for instance.

2.2.4 Same-day Delivery

Considered by some as an evolution of Click-and-Collect, same-day delivery further enhances customer service by minimizing delivery times. Customers place orders online, which are then packed by in-store personnel before being delivered to their homes by designated delivery operators. This method, often requires a physical store or a dark store near the end-customer to enable delivery times the same day [11]. With three stakeholders involvedcustomers, in-store personnel, and delivery operatorssame-day delivery aims to balance workload efficiency while ensuring customer satisfaction.

This is becoming a large player in the logistics and transportation sector, acknowledged by the Parent company the thesis is in collaboration with. Nonetheless, it remains relatively unfamiliar in Sweden, requiring further research and implementation. This underscores the significance of our thesis.

3

Related Works

In the following section, works, theories, guidelines, and research areas will be covered that tangents the thesis topic. To successfully approach and execute phases during the project, adherence to these subjects will be necessary.

3.1 Cognitive Ergonomics

Ergonomics as a general term refers to the study of work which can be divided into two main parts, either the situation of the person at work or the result or outcome of the work. Cognitive ergonomics focuses on the latter aspect which revolves around the quality of work being produced, concerning both the system of work and the work itself [12]. A big concern within cognitive ergonomics is lowering the risk of unwanted outcomes and also the impact if such outcomes do occur.

In order to optimize the quality of work, it is essential to break down the cognitive tasks the user must perform. In case of multi-tasking, Wickens multiple resource theory can be applied to measure the performance which is closely related to attention and workload [13]. According to Wickens there are different dimensions in which humans process information and during high demanding tasks conducted simultaneously it is vital not to overload these pools of information. If the user is not able to provide enough resources to the allocated tasks, human errors may occur.

Cognitive ergonomics is crucial to investigate in the project because it focuses on designing systems and interfaces that align with human cognitive abilities and limitations. In-store personnel are tasked with multiple simultaneous activities like order picking, packing, and customer service in a fast-paced environment, understanding cognitive ergonomics can provide insights into optimizing the user interface to reduce cognitive load, improve decision-making, and enhance overall efficiency and experience for the personnel.

3.1.1 Interaction Design and UX Design

Interaction design is commonly used as an overarching term when talking about this field within design, referring to its methods, theories, and approaches. Many disciplines are under the umbrella of Interaction design with different focuses, such as UI design, software design, user-centered design, user experience design, etc. The

core of Interaction design is to facilitate everyday life in the aspect of interacting with people through products or services [14].

User experience (UX) design is a subgroup within interaction design and is used for the process of designing products that focuses on providing meaning and important experiences to users. Considering the whole experience users are exposed to, UX designers form an understanding of the users and apply that knowledge to form a meticulous product [15]. Within UX design there are four different levels according to the Nielsen Norman Group Conference in Amsterdam in 2008, Utility, Usability, Desirability, and Brand experience [16].

3.1.2 Same-day Delivery

In the world of retail, same-day delivery has emerged as a pivotal focus, expanding beyond food services to encompass a diverse range of products in traditional retail stores. According to Saleh [17], nearly half of the online shoppers, 49 percent, express an increased desire to shop online due to the availability of same-day delivery services. He also states that 25 percent of the shoppers would abandon their cart if the option of same-day delivery was not available when checking out. Gifts and flowers, computers and software, automotive and office supplies were some of the products that customers would abandon most if same-day delivery was not available.

The key factors that contribute to problems with same-day delivery for online purchases include the need to meet time constraints, the uncertainty of future requests, the need to optimize routing decisions, and the potential need to involve third-party delivery services. These factors make it challenging to efficiently and effectively deliver online purchases on the same day they are ordered [18].

3.1.3 Mobile Point of Sale

Lestariningati [19] discusses the design and implementation of mobile Point Of Sale (POS) systems using Mini PC Raspberry Pi and Smartphone Android OS. The document explores the development of portable POS devices that are linked to input and output devices such as barcode scanners and thermal printers, equipped with specialized POS software. The research compares the two types of implementations, highlighting the functionality, cost-effectiveness, ease of development, user-friendliness, and energy consumption of each solution. The study aims to create POS machines that can record sales transactions efficiently and be easily transported to different locations where transactions occur.

Understanding how mobile POS systems are designed and implemented can provide insights into integrating technology for efficient and effective operations in a same-day delivery system. Lestariningati [19] discusses the components and hardware used in mobile POS systems, such as Raspberry Pi and smartphones. Insights into the software development aspects of mobile POS systems, including programming languages and user interfaces.

3.1.4 Technology in Retail

According to Shankar et. al. [20] shoppers are nowadays more engaged in omnichannel and multichannel shopping, utilizing different services such as click-and-collect, mobile check-in, and mobile payment. Retailers and employees are exploring new technologies to enhance customer experiences and operational efficiency, such as AI-powered personalization, recommendation systems, and supply chain optimization. They may face barriers such as adoption differences between general and targeted shoppers, practical time lags in adoption, and investment horizons impacting technology adoption.

Shankar et. al. [20] also states that the ability to enter new markets and bypass traditional channels can drive technology adoption in retail. To be able to meet evolving customer demands for seamless shopping experiences and personalized services is also an important factor. Retailers seek to gain a competitive edge by leveraging technology for better customer engagement, data analytics, and operational effectiveness.

Mobile devices and applications have become essential tools for retailers to deliver personalized offers, facilitate mobile payments, and engage with customers throughout their shopping journey [21].

3.1.5 User Experience in Same-Day Delivery Services

Banerjee et. al. [22] explores how design and optimization of Same-Day Delivery (SDD) systems in e-commerce, specifically exploring the impact of allowing service regions to vary over the course of the service day. The authors discuss the possibility of not following the current system where a service region is defined in advance and all customers in the service region can place same-day delivery orders during the same time span. They exploration of the possibility to allow service regions to vary, can lead to an approximate increase total orders, and offering different order cutoff times to different parts of the overall region, the system may operate more efficiently and serve more customers.

Something to take into consideration is last-Mile Delivery which is the final transport of a customer order from, for example, a distribution center or store all the way to the customer who is waiting for the package and is usually carried out by transport companies, courier companies, etc. [23]. With retailers currently making next- or even same-day deliveries more implemented, as one of their services, the last-mile delivery person is facing experience such as time pressure and tight deadlines[24].

4

Methodology

4.1 Project Management

Project management is essential for organized planning, resource allocation, and timely execution of tasks [25]. It ensures clear communication, minimizes risks, and maximizes overall project success.

4.1.1 GANTT

Gantt charts are important tools in project management. These charts use horizontal bars to illustrate how long each task takes on a timeline, providing clarity to the project schedule.

Gantt charts promote simplicity and aid teams, as well as other stakeholders, to understand project milestones and deadlines [26]. They also facilitate real-time tracking of the project, so teams can stay on schedule and adjust to changes quickly.

In project management, Gantt charts are crucial, ensuring tasks are executed in an organized manner. By its visual clarity and transparency, teams are able to collaborate and communicate easier [26]

4.2 Design Process

The following sections showcases the design structure that the process follows throughout the whole project.

4.2.1 Design Thinking

Design thinking is a non-linear and iterative process employed by teams to comprehend users, question assumptions, redefine problems, and generate innovative solutions for prototyping and testing. This approach is particularly effective when addressing ill-defined or unknown problems and unfolds in five key phases. The first part is to understand the problem, typically conducting user research, and (1) Empathizing with the user allows the possibility to set aside assumptions and gain insight into users' needs. Information gathered is analyzed to (2) Define problem statements. Building on the foundation, the next step is to (3) Ideate, think

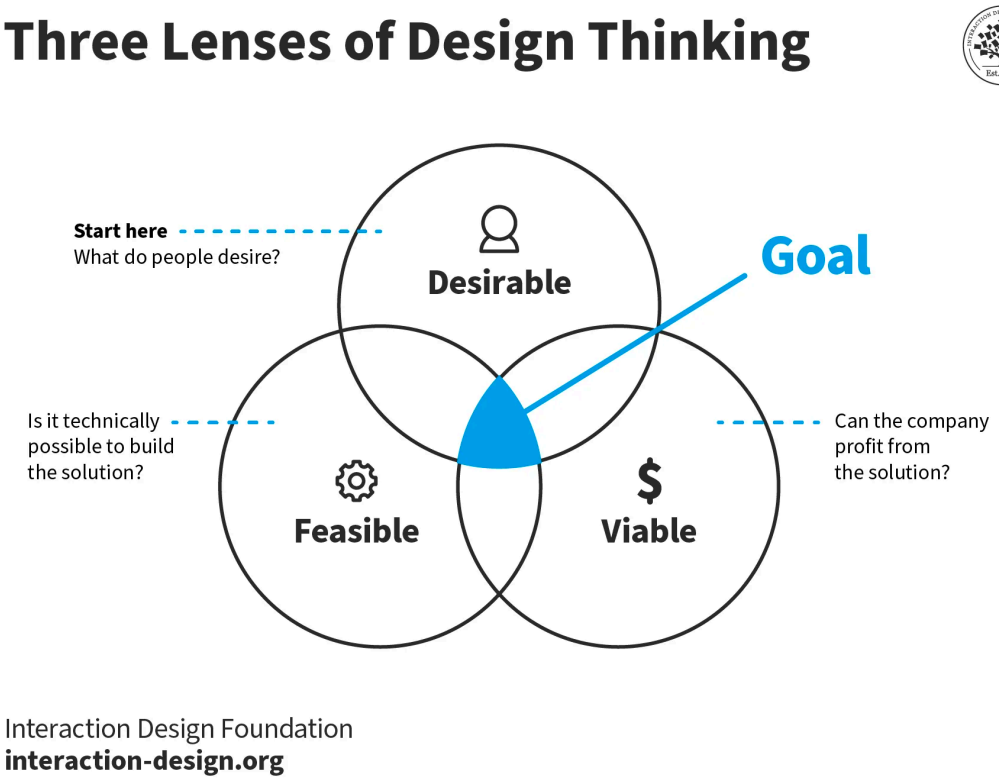


Figure 4.1: Three lenses of design thinking, Interaction design foundation (2016)

creatively, challenge assumptions, brainstorm alternative perspectives, and identify innovative solutions to the defined problems. Later, the team creates (4) Prototypes of the product to explore ideas, using various methods. The prototypes are (5) Tested with real users to evaluate their effectiveness in solving the problem. Insights gained may lead to refining the prototype or revisiting the Define stage to reassess the problem [27].

The Interaction Design Foundation [27] states that design thinking seamlessly integrates three lenses: Desirability, Feasibility, and Viability, see figure 4.1. Starting with Desirability, the team prioritizes understanding end users' needs, steering clear of assumptions. Moving to Feasibility, potential solutions are assessed practically, with iterations and resource plans as needed. Viability emphasizes commercial success, crucial for both profit-driven and non-profit organizations. Design thinking recommends initiating with Desirability, avoiding premature fixation on technical constraints, and promoting a user-centric and innovative approach, diverging from the traditional problem-solving process.

4.2.2 Altered Double Diamond

The Design Council [28] presents another way of looking at the design process, the Double Diamond framework, see figure 4.2. The Double Diamond effectively com-

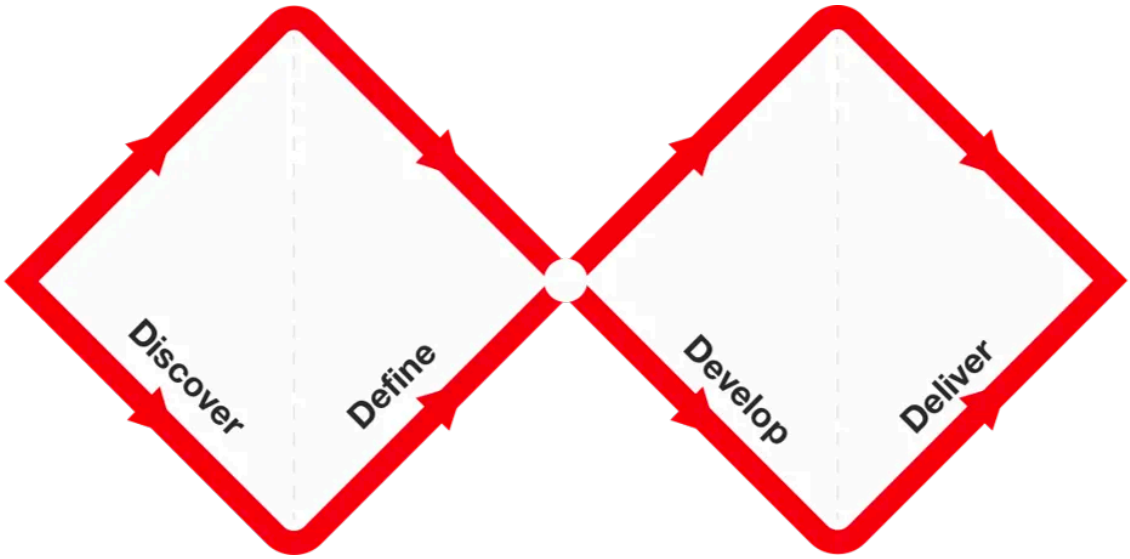


Figure 4.2: Double diamond process, Design Council (2024)

municates a clear representation of the design process. Consisting of two diamonds, the process involves exploring an issue extensively or deeply (divergent thinking) and then taking focused action (convergent thinking).

Similar to the design thinking process, the double diamond starts with the "Discover" phase. The first phase of the first diamond emphasizes gaining a genuine understanding of the problem by engaging with and spending time with individuals affected by the issues. Moving to the "Define" phase, insights from the discovery inform a redefinition of the challenge.

Transitioning to the second diamond, "Develop" encourages diverse answers to the clearly defined problem, drawing inspiration from various sources and engaging in co-design with a diverse group of individuals. The subsequent "Deliver" phase entails testing different solutions on a small scale, discarding ineffective ones, and enhancing those that prove viable.

This method can throughout the process, be altered with an addition of a third diamond, see figure 4.3, were the design is evaluated and re-iterated into a final design concept [29].

The Design Council [28] states that it is crucial to note that this process is not strictly linear, as indicated by the arrows on the diagram. Organizations may loop back, exactly as in the Design Thinking process, to the beginning as they learn more about underlying problems.

The selection of methods that will be used during this project will closely align with both the Design Thinking process and the Double Diamond process and will overall be using user-centered design methods and pathways to create a user-friendly result [30]

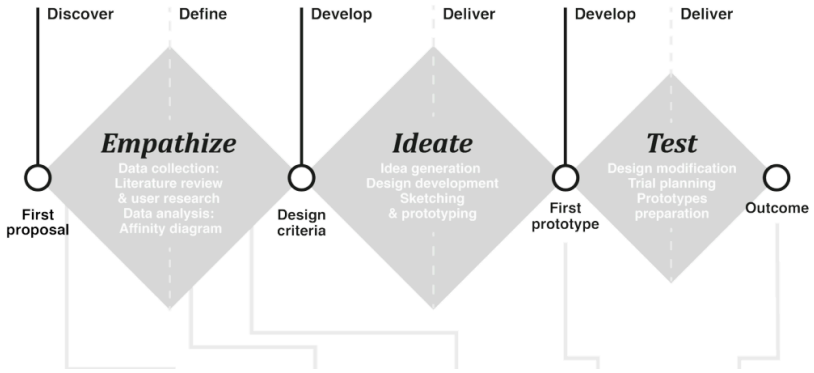


Figure 4.3: Triple diamond, Wong Chin-Chin (2018)

4.3 Data Gathering

Data gathering is a fatal first step in most design projects and more so in user-experienced focused projects. The concept of data is a wide spectrum, including numbers, words, measurements, descriptions, comments, photos, sketches, films, videos, or any information that proves valuable in comprehending a specific design, user needs, or user behavior. This information can manifest as either quantitative or qualitative, offering diverse insights into the subject at hand [14]

Qualitative data collection involves gathering non-numerical information, often through methods such as interviews, observations, and open-ended survey questions. This approach aims to understand the underlying reasons, motivations, and opinions of individuals or groups. On the other hand, quantitative data collection involves gathering numerical data that can be analyzed using statistical methods. This often involves structured surveys, experiments, or other methods that produce numerical data, allowing for statistical analysis and generalization of findings to a larger population [31]

4.3.1 Interviews

Interviews are meetings with users to find out their experiences, views, attitudes, motivations, and behavior regarding products and services or gathering information from experts in a certain area.

Interviews can be used several times during the process with different intentions. At the beginning of the process, an interview can provide valuable information about how current products and systems are used, how users behave, what drives them, what irritates them, etc. During later parts of the design process, users can be involved to provide feedback on developed concepts at an interview.

The interview can be very structured, with precise question formulations around everything that requires answers, it can also be semi-structured, or unstructured. A structured interview provides very precise answers to the questions, yet may not account for unanticipated topics or insights . An unstructured interview resembles a conversation, allowing participants to freely share information on desired topics.

A semi-structured interview guide lies between a predefined list of areas and specific questions, allowing for flexibility in the interviewee's responses.

Pilot testing the interview is crucial for assessing the clarity of questions and estimating their duration. [32].

4.3.2 Questionnaire

Questionnaires, alongside interviews, are a key tool for collecting information on thoughts, feelings, behaviors, or attitudes. They are simple to produce but require careful attention to question wording, response options, sequencing, and length. Achieving a good response rate involves considerations of appearance, clarity, instructions, arrangement, design, and layout.

Open-ended questions allow for in-depth responses, while closed-ended questions facilitate numerical analysis. Likert scale questions are recommended for maintaining question neutrality and evaluating response strength. Questionnaires are often triangulated with methods like observation to enhance data reliability and depth [33].

4.3.3 Observations - Think Aloud

Observation is a method to identify undiscovered areas of development and to identify the needs users have in specific situations. Participatory observation involves seeing, listening, asking, and experiencing the users' situation. There are a variety of observation methods: for example, 'user observations', 'think aloud protocols', 'user narration', and 'cognitive walkthrough'. The think-aloud protocol is a method where participants verbalize and articulate what they are doing and thinking as they complete a task and is one of the most common observation methods [33].

Observation helps you identify user needs in a specific context. The observation gives you an understanding of important aspects to consider, dependencies and relationships with which the task is connected, and the goals and attitudes the users have in the situation. The method thus aims to support your understanding of what can provide a good user experience. It is about identifying what the user intuitively reinforces should be done and what is more responsive first [32].

4.4 Data Analysis

Data analysis is a crucial process influenced by predefined goals and collected data. Three primary approaches, qualitative, quantitative, or a combination, are often employed for a comprehensive understanding. The initial analysis involves identifying patterns or calculating numerical values, followed by data cleansing to identify and rectify anomalies. More detailed analysis employs structured frameworks or theories, with interpretation running parallel to the analysis [14].

4.4.1 Affinity Diagramming

Affinity Diagramming involves visually clustering research insights, observations, and concerns into meaningful categories and relationships. Designers use individual notes to capture details, avoiding predefined categories. Instead, clusters emerge based on shared affinity, leading to named category themes.

This method makes implied knowledge buried in transcripts visible, facilitating research synthesis. Affinity diagramming in contextual analysis incorporates human stories from interviews and observations [33].

4.4.2 Customer/User Journey Mapping

A journey map visualizes human interactions with a multi-channel product or service, portraying a narrative of actions, feelings, perceptions, and mindset. It aims to provide an honest representation of the user's experience, encompassing moments of indecision, confusion, frustration, delight, and closure.

This visual tool enables the evaluation and improvement of each interactive experience through design. Multiple journey maps, created alongside personas and scenarios, are informed by direct customer interactions. They shift organizational focus from an operational view to the real-world context in which products and services are used [33].

The customer journey method gives you an understanding of the process users go through. The aim is to identify the experience in all the interactions, so-called 'touch-points, users have with the product, the work task, or the service, and to focus on developing these interactions into a good overall experience [32].

4.4.3 Needs and Requirements

Design requirements are a set of guidelines that outline the essential functionalities, capabilities, and characteristics of a product, ensuring alignment with user needs. Serving as a roadmap, these requirements guide the design and development process to ensure the end product is user-friendly, accessible, and valuable[34].

According to Adams [35], understanding user needs and requirements is a crucial aspect of human-robot interaction design. It involves comprehensively grasping the preferences, limitations, and expectations of the end users who will interact with the robotic systems. By delving into the specific needs and requirements of the users, designers can tailor the human-robot interaction to enhance usability, efficiency, and overall user satisfaction

4.4.4 HTA - Flowchart

Flowcharts or Hierarchical Task Analysis are diagrams of how the user operates and does tasks in processes. They are versatile tools to visualize the interactions in designs and artifacts and make an easy way to present maps of designs to stakeholders. They show everything users might do in interactive contexts [36].

4.5 Ideation

Ideation is the dynamic process of generating ideas through a continuous exchange between designers and design works. This involves a simultaneous engagement in activities such as comprehending problems, brainstorming potential solutions, evaluating these solutions, and redefining the problem to navigate challenges or leverage emerging opportunities. Designers manifest their imaginative concepts on mediums that serve as external memory, engaging in a negotiated dialogue. Problems undergo reframing, and the design evolves iteratively through reflective interactions with the materials of a design solution [37].

4.5.1 Brainstorming

Brainstorming aims to develop a large number of ideas. The method is based on the participants' creative potential being stimulated by hearing and seeing other people's ideas. For that reason, the rules must be followed so that all participants feel safe in pronouncing wild and crazy ideas, which can lead to something completely new [32].

Brainstorming establishes a space free from judgment, allowing the open expression of creative ideas and the exploration of new concepts. Some widely embraced principles during this process involve prioritizing quantity over quality, refraining from judgment and criticism, building upon each other's ideas, and embracing the unconventional [33].

4.5.2 Moodboard

Moodboards serve as essential design and marketing tools, particularly prevalent in the fashion industry and related consumer product sectors, enabling the visual communication of information. Mood boards offer a designated "space" for designers to organize collected visuals in a meaningful manner, facilitating the seamless flow of thoughts, inspirations, and creativity toward the ultimate design outcomes [38].

4.5.3 Semantic Keywords

The semantic Keyword scale consists of carefully selected adjectives and properties that describe the desired expression of an artifact. The adjectives are based on collected information about the user and the environment the product will be in. The words can be described briefly with a focus on the relationship to the user and together form a unified picture of the values a product should embody. Based on the compiled word scale, the words are ranked, or designed in different ways to reflect their relative importance [39].

4.6 Prototyping

Prototypes are important because they serve as filters and manifestations of design ideas, enabling designers to reflect on their design activities and explore a design space. They help in generating, conceptualizing, and comparing prototypes, and are instrumental in design exploration and communication. Prototypes also allow designers to predict and evaluate certain effects before implementing a design, making them more aware of the complexity and responsibility of their design decisions [40].

4.6.1 Sketching

Sketching is an externalized representation that fulfills various functions during the design process. It can serve as an aid for analysis, solution generation, evaluation, and communication, as well as external storage [41].

Sketching allows designers to externalize their ideas and concepts, making them tangible and visible. This process of externalization helps designers to understand better and refine their ideas. It also gives the opportunity to explore a wide range of ideas and possibilities quickly and without the risk associated with more formal representations [42].

4.6.2 Prototyping Lo-Fi and Hi-Fi

Prototypes play a crucial role in conducting early and iterative concept testing, involving collaboration among the design team, clients, and potential users. Low-fidelity prototyping is prevalent in the early stages of ideation across various design disciplines, often taking the form of concept sketches, storyboards, or sketch models. In interface and software design, a widely employed method of low-fidelity prototyping is paper prototyping, wherein printed pages simulate interface screens. Low-fidelity prototypes may be sketch models intended for iterative design review or as proof of concept models to test form and scale [33].

On the other hand, High-fidelity prototypes are similar in expression and feel, and perhaps even in functionality, to what the final product is supposed to work. High-fidelity prototypes are beneficial for in-depth evaluation of key design elements like content, visuals, interactivity, functionality, and media. For instance, they prove valuable in usability studies to assess if users can grasp the system within a set timeframe. This stage also plays a vital role in securing client acceptance, serving as a final design document requiring client approval before implementation. Typically, it is developed later in the project, solidifying ideas unless there's a critical issue demanding resolution before progressing with other tasks [43].

4.6.3 Computer Aided Sketching

According to Company [44] Compter-aided sketching (CAS) refers to the use of digital tools to assist designers in creating sketches during the conceptual design phase of product development. CAS tools aim to combine the advantages of traditional

paper-and-pencil sketching with the benefits of integration into the overall design process, including Computer-Aided Design (CAD).

Sketching plays a crucial role in the development of new industrial products by assisting product designers during the creative stages of design and helping them to develop inventions. Traditional paper-and-pencil sketching offers advantages such as being cheap, simple to use, providing immediate visual and kinesthetic feedback, and allowing for easy correction and revision. Sketching allows designers to give visible form to their thoughts and aspirations, making it a potent instrument in the design process.

4.6.4 Mockup

Design mockups, refer to visual representations of the user interface of a software application. These mockups are valuable tools for enhancing the comprehension of functional requirements in software development. By incorporating screen mockups with use cases, stakeholders can improve their understanding of the software system being developed, leading to increased effectiveness, efficiency, and clarity in requirement comprehension. Additionally, design mockups serve as a significant source of information for grasping the application domain, user-system interactions, and problem domain of the software system[45]

4.7 Evaluation

Sharp et al. [14] emphasize that evaluation is an important part of the design process, encompassing the collection and analysis of data on users' experiences with design artifacts like sketches, prototypes, apps, or computer systems. The primary aim is to enhance the artifact's design, considering both usability, how the user find the use, and users' overall experiences such as satisfaction, enjoyment, and motivation during interaction.

4.7.1 Usability Testing

Usability Testing is an evaluative method focused on observing a user's task-based experience with digital applications. Its primary goal is to identify and rectify frustrating and confusing aspects of an interface before launch through retesting. The previously mentioned Think-Aloud Protocol is often used, revealing issues by observing instances where the user struggles to complete tasks within a reasonable time, tries different approaches, gives up, completes a different task, expresses surprise or delight, shows frustration or confusion, blames themselves, asserts that something is wrong, or offers suggestions for the interface or flow of events [33].

4.7.2 Heuristic Evaluation

This usability inspection method involves evaluators assessing an interface based on agreed-upon best practices or usability "rules of thumb." Unlike usability tests

with users, team members inspect and address baseline usability issues before user testing. Repeated application of heuristics during iterative design enhances their intuition, making usability problems easier to identify. Evaluations are conducted by novices trained in heuristics and by evaluators familiar with the subject and usability practices. The method proves effective in detecting critical dialogue elements and assessing the effectiveness of heuristics early in the design process. Even with low-fidelity prototypes in the middle phases of design, these evaluations enhance the effectiveness of later usability tests [33].

5

Planning

As can be seen in the methodology part, this project will take on several phases that come with different challenges and aspects. In this chapter we will discuss chosen methods as to why they are optimal for our project, while comparing them to similar but undesired methods. We have divided the project into parts for ease in time planning and such.

Part 1: Create an understanding of the product and company. The project starts with a discussion with the company to understand what is being explored and then developed. What are the needs and guidelines to follow from the main stakeholder? What is the structure of the project and what is expected from us to contribute with?

After the initiation, the next part is performing a literature review, looking for related works and information about methods that will be used and why they are useful. The use of a literature review will increase the awareness and understanding of what is currently being worked on or has been worked on in the field of delivery systems [46].

Development of questionnaires and interview forms will then occur to make the part of collecting data efficient. As Nilsson et al., [32] mention, interviews will help us understand the in-store personnel experiences, views, attitudes, motivations, and behavior in the current system, while the more structured questionnaire will provide quantitative data that later can be analyzed [33].

Part 2: User studies. When the preparation is done we will begin conducting interviews, questionnaires, and observational studies to understand the experiences, workflows, and challenges faced by in-store personnel. Conducting user studies in the early stages of product development proves more effective for enhancing product usability compared to iterative usability testing [47].

Part 3: Customer Journey Mapping and Analysis. By analyzing the data from the previous stage allows us to gain a clear understanding of needs and requirements from in-store personnel. To help the analysis, methods such as affinity diagrams, customer journey mapping, HTA, etc. can be beneficial to reduce the complexity. Also, visualizing crucial problem areas and touchpoints in the process can aid the analysis [33].

Part 4: Design Ideation and Prototyping. After analyzing, we will create low-fidelity prototypes for design concepts, incorporating feedback from internal team reviews and selecting the most promising solution for further development. Different ideation methods such as brainstorming, semantic keywords, and moodboards will be used to assist in the process of creating the best possible solution for the personnel working in the store [37].

Part 5: User Testing. To test and perhaps confirm the prototypes with in-store personnel, gather feedback, and refine the design proposal accordingly, user tests will be performed. This will assist us and help us get an understanding of the personnel's experiences [33].

Part 6: Final Design Proposal Consolidate the findings into a comprehensive design proposal, including user interface specifications, recommendations, and potential implementation strategies.

5.0.1 Gantt Schedule

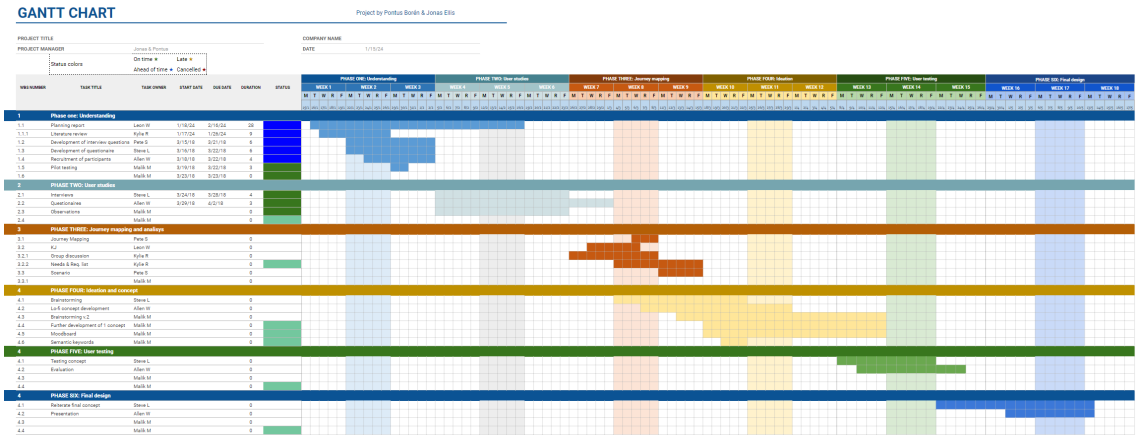


Figure 5.1: gantt chart

5.0.2 Weekly planning

Week 1- 5: Part 1-2 of the project. Schedule initial discussions with Parent Company to delve into their needs, guidelines, and overarching objectives.

Develop interview and survey protocols for in-store personnel. Confirm ethical considerations and informed consent procedures.

Start qualitative interviews and distributed surveys. Begin initial data analysis to help with customer journey mapping.

Week 3 - 12 Part 2-4 of the project.

Analyze initial findings from user studies to identify key touchpoints and pain points. Collaborate with Parent Company stakeholders to gather additional insights.

Develop a detailed customer journey map based on in-store personnel experiences. Conduct a workshop with Parent Company stakeholders for validation and input.

Synthesize insights from user studies and customer journey mapping. Facilitate ideation sessions with the design and technology team to generate initial design concepts.

Week 7 - 18 Part 4 - 7 of the project.

Create low-fidelity prototypes for the selected design concepts. Conduct internal team reviews and refine prototypes based on feedback.

Develop a testing plan, including criteria for participant selection and usability metrics. Prepare materials and scenarios for user testing sessions.

Iteratively test the prototype with in-store personnel. Perform analysis using the KJ method and refine the design proposal accordingly.

Consolidate findings into a comprehensive design proposal. Finalize and organize the report.

6

Process and Execution

The projects process and execution can be defined and described through six different phases. To create an efficient project, we followed the design process that is describes in chapter 4. The process begins with creating an understanding of the area and then extends all the way into a final design solution that is presented.

6.1 Initial Research

The first part of the project was to create an understand of what was supposed to be done and get an understanding of the specific area. To achieve this, we had meetings with the company and our supervisors, followed by a visit at the site. Further knowledge was gained by doing a literature review. The literature review concluded related works that enhanced the awareness of the current situation. Research on relevant methods was then completed to get a clear path of the process.

6.2 User Research

User research served as a pivotal phase in understanding the needs, behaviors, and preferences of the stakeholders who interact with the system. In this section, the project delved into the user research methodology, which encompasses various approaches including defining user profiles, recruiting participants, administering questionnaires, conducting interviews, and making observational visits. Through these methodologies, we aim to garner comprehensive insights into the user experience, thereby informing the design and development of our same-day delivery system.

Understanding the user's perspective is important to tailor solutions that resonate with the intended audience. Recruiting participants for our research endeavors presented its own set of challenges and creative solutions. A meticulously crafted questionnaire served as the main factor of our data collection efforts, facilitating structured feedback from stakeholders. Qualitative data gathered through interviews provided valuable context to complement quantitative findings. On-site observations and visits offered firsthand insights into the operational dynamics of the click-and-collect system.

In the subsequent sections, we delve into each methodology in detail, presenting the process and execution done in our user research.

6.2.1 Who Are The Users?

In the large scope of the project there are three categories identified which are, end-customers, retail personnel, and operators. Our focus lies within the boundaries of retail personnel in the aspect of order handling. To further define the target audience, we sought after the retail stores and workers that have experience with online orders, click-and-collect, same-day delivery, and similar order handling systems. Due to the goal of our project, to implement a same-day delivery system, retail stores that already have undergone the transition to the described order handling systems, creates an easier transition into our potential system. Therefore, these users are the most probable to be able to implement the future system in the near future without restructuring too much with personnel in aspects such as daily routines, experience, and performance. It is also believed by the company we are collaborating with that this is the case for the management aspect as well.

Kategori	Moder bolag	Företag	Mail	Telefon	Skickat Mail
Kläder		Vero moda			
		Lagerhaus			
		Jack & Jones			
	Varner	Cubus, Dressmann, Dressmann XL, Bik Bok			
		Intersport			
		Stadium			
		Shelta			
		Cubus			
		Bik Bok			
		Carlings			
		HM			
		VOLT			
	Strongpoint	Click-and-collect fokus			
Teknik					
		Kjell och co			
		Clas Ohlson			
	Power				
Hemmet					
		granit			
		Cervera			
		Jula			
		Indiska			
		Ivsk			

Figure 6.1: Recruitment process

6.2.2 Recruiting Participants

To recruit participants for the questionnaire, interviews, and observations was initially done by distributing the questionnaire to different parties, see figure 6.1. This was done due to the questionnaire including a segment about further participation in the study through interviews and observations. The only constraint to distributing

the questionnaire was that the receiving store was based in Sweden and worked with a Click-and-Collect or similar system. Our plan was that the questionnaire would generate some participants for the upcoming interviews and observations.

However, the response rate for participating in further studies was not very prominent. To reach additional participants locally in Gothenburg various desired retail stores were contacted via phone or visited in-person. When visiting stores in-person, QR-code flyers were given out to interested people in order to access more staff members. Furthermore, friends and family with experience in the desired department were contacted.

6.2.2.1 QR-Code Flyer

Due to initially low response rate on the questionnaire, additional methods and creative strategies were required in order to get further replies. The challenge arose from our inability to effectively connect and engage with a sufficient number of individuals within our target audience. This was countered by creating a small flyer, see figure 6.2, with an eye-catching title and short description, accompanied by a QR-code that led to our survey. When visiting stores in-person the flyer was given out to potential participants, after confirming they worked with the desired order handling system. The strategy involved engaging the individual we conversed with to distribute these flyers in either the lunchroom or common area, thereby providing additional opportunities for other staff members to complete the questionnaire.

Figure 6.2: Questionnaire flyer

6.2.3 Questionnaire

To gather valuable insights from stakeholders, a questionnaire was created, facilitating systematic data collection and analysis. Leveraging the accessibility and convenience of Google Forms, a digital platform useful for widespread distribution, the questionnaire was crafted with cautious attention to detail and iterative refinements. For examination see Appendix A.

The initial phase of questionnaire development made the creation of a preliminary draft in English, complete inquiries that encompassed both current user experiences and forward-looking perspectives on the future system. Structured into distinct sections, including Background, General Thoughts on Current Store Systems and Technology, Evaluation of Click and Collect Services, and Reflections on Future Same-Day Delivery Systems, the questionnaire was designed to produce comprehensive responses while accommodating diverse stakeholder perspectives.

Subsequent iterations of the questionnaire involved a process of refinement and optimization, with a focus on enhancing clarity, and respondent engagement. The questionnaire underwent revisions, transitioning from scenario-based inquiries to concise, quantitative questions tailored to streamline response collection and facilitate data analysis. This iterative shortening process aimed to optimize questionnaire efficacy, ensuring that data collection remained efficient and informative while minimizing the burden for the respondent.

In its final iteration, the questionnaire underwent a collaborative refinement process, involving key stakeholders from the company as well as guidance from the project supervisor. This collaborative process created a stripped-down questionnaire version that aimed towards a delicate balance between comprehensiveness and conciseness, capturing essential insights applicable to project objectives while trying to avoid respondent fatigue.

6.2.4 Interviews

Interviews were selected as the preferred method for gathering qualitative data for our user research. These interviews were conducted both on-site and online, depending on the preference of the respondent. Before the interviews, a script was developed to ensure an optimized structure and cover important questions, see appendix B. However, it was also decided that the interviews should follow a semi-structured format to allow for a deeper understanding of the system while maintaining a natural flow in the conversation. After obtaining consent from the participants, the interviews were recorded to aid in recalling what was said and to facilitate the transcription process for later analysis of the results.

Firstly, participants were asked about their background to establish rapport and ensure their comfort. Questions in this section were designed to be straightforward and aimed at easing participants into the conversation.

The second theme delved into the specifics of the Click-and-Collect (CaC) system in their workplace. Participants were prompted to provide a comprehensive summary

of how the CaC system functions and describe their workflow while fulfilling a CaC order. This section aimed to gain insights into the functionality of the system, including its features, and the overall workflow.

Following this, participants were invited to share their thoughts and opinions on the CaC system. They were encouraged to express what they liked and disliked, both about specific parts of the process and the system as a whole. This section aimed to gather subjective feedback on the user experience and identify areas for improvement within the process.

The interview then transitioned to questions related to cognitive ergonomics, particularly focusing on stress and performance during task execution. Participants were probed about their multitasking abilities, such as assisting in-store customers while completing a CaC order. This section aimed to explore the cognitive demands of their tasks and how they managed them within the process.

Lastly, the interview introduced a section on the future system, specifically same-day delivery. Participants were asked about their initial thoughts on this new system and invited to compare it with their existing process. Discussions centered around potential improvements and challenges that might arise in the new system, aiming to gather insights into process enhancements for future implementations.

6.2.5 Observations and Visits

To gain an initial and comprehensive understanding of the existing Click-and-Collect (CaC) system and its various functionalities, observational visits were conducted. The primary aim was to gain insights into the workflow of the staff when processing a CaC order. This included identifying any pain points in the process and determining aspects that were deemed effective. Additionally, observations were made to assess the user interface (UI), including how staff navigated through different menus, prioritized functions, and utilized available information. The focus was on understanding the layout of the UI, the accessibility of key features, and the relevance of displayed information to the task at hand.

During on-site interviews, participants frequently provided demonstrations of their operational methods and interacted with the interface they worked with. This occurred particularly when questions were posed concerning specific aspects of the process.

However, a single visit was dedicated solely to observational purposes, where a Click-and-Collect (CaC) order was observed from initiation to completion, see figure 6.3. This observation allowed for firsthand insight into the participant's interaction with the devices used, their workflow, and task management. Additionally, the participant was encouraged to vocalize their thoughts as they navigated through the process steps, providing valuable insights into their decision-making processes and thought patterns during task execution.

Figure 6.3: Observation visit

6.3 Data Analysis

The data analysis phase of this project constituted a comprehensive exploration of multifaceted insights gathered through various methodological lenses. Embracing a holistic approach, the analysis delved into thematic, hierarchical task, and quantitative analyses, augmented by the perspectives unveiled by customer journey mapping.

6.3.1 Thematic Analysis

After all the user research were carried out, everything that had been said was transcribed, partly during the interviews moment as well as the answers to the questionnaire. This gave a good insight into their perceived experience.

Figure 6.4: Thematic analysis

These transcripts were then translated into digital post-it notes using the collaborative platform Miro, facilitating seamless organization and clustering. Through this methodical approach, six main thematic domains emerged: Current System, New System, Process, System Guidelines, System Functionality, and Quotes, see figure 6.4.

Within each thematic domain, several of sub-themes emerged, shedding light on the intricacies and complexities inherent in participant narratives. For instance, within the current system theme, participants expressed a spectrum of emotions ranging from positivity to negativity, along with overarching impressions of the system in place.

Similarly, the new system theme unraveled participants' wishes, initial thoughts, and evaluative viewpoints, providing insights into their aspirations for system enhancement. The process-related sub-themes delved into various operational facets such as receiving orders, handling/packing protocols, and order handover procedures, illuminating the practical intricacies embedded within the system workflow.

Exploration of system guidelines and functionality revealed a plethora of insights, spanning cognitive aspects, time pressures, user interface design, and more. Each sub-theme served as a important elements for understanding the multifaceted dimensions of participant experiences and perspectives.

In essence, this thematic analysis serves as a rich information source, weaving together the diverse threads of participant narratives to provide invaluable insights.

These findings not only contribute to scholarly discourse but also hold practical implications for informing interventions and improvements within the domain under investigation.

6.3.2 HTA

The hierarchical task analysis (HTA) method was employed in this study to analyze the process of completing an order, see figure 6.5. The primary task of *Complete an Order* was deconstructed into three main sub-tasks: *Receive order*, *Handling and Packing Orders*, and *Handing over Orders*.

The sub-task *Receive Order* encompassed several sub-sub-tasks, including *Get notified*, *Review*, *Prioritize*, and *Initiate order packing*. Similarly, *Handling and Packing Orders* involved sub-sub-tasks such as *Locate*, *Transport*, *Inspect/review*, and *Pack*, each with further sub-divisions delineating the specific actions required. The third sub-task, *Handing over Orders*, comprised activities like *Prepare*, *Provide assistance*, *Identity Confirmation*, and *Hand Over*, each with its own set of detailed sub-actions. For a larger image of the HTA, see appendix D

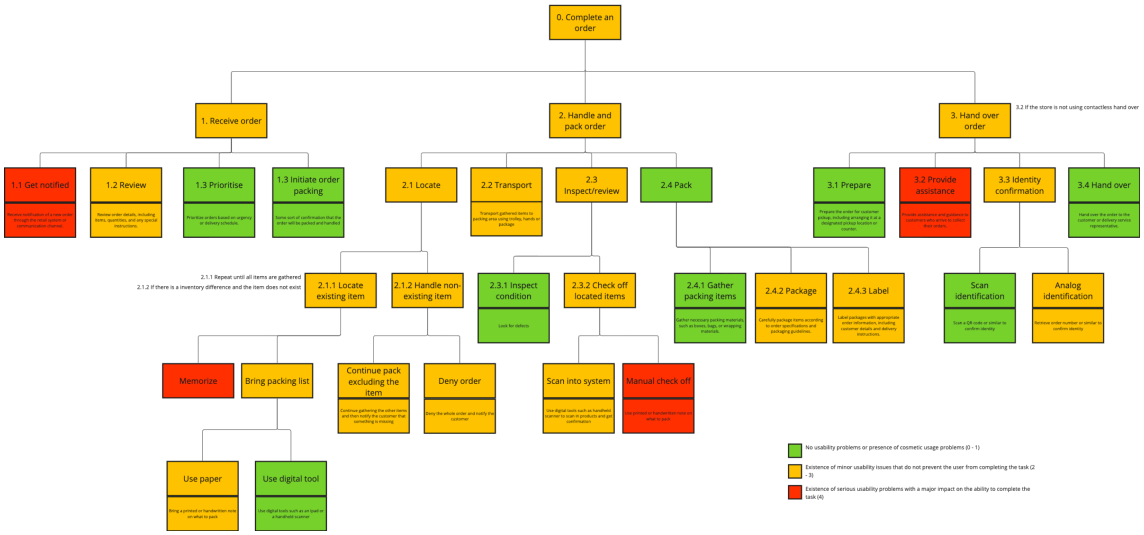


Figure 6.5: HTA overview

During the analysis process, each task and sub-task was assigned a color to denote the likelihood of usability errors. Tasks marked with green indicated minimal to no usability issues or only cosmetic usage problems, while yellow signified the presence of minor usability concerns that did not impede task completion significantly. Tasks marked in red were flagged for serious usability problems that could significantly hinder the ability to complete the task effectively.

Moreover, special considerations were noted for tasks that needed further explanation, indicating instances where certain actions occurred only under specific circumstances or conditions.

The HTA provided a systematic framework for understanding the hierarchical structure of the order completion process, facilitating the identification of potential usability issues and areas for improvement. By breaking down complex tasks into manageable components, the HTA method offered valuable insights into the workflow dynamics and user interactions involved in fulfilling orders within the studied context.

6.3.3 Journey mapping

To create a more tangible visualisation of the different parts of the process, two user-journey map were constructed, see figure 6.6 for an example and appendix E for additional variations. The process was divided into 5 different stages starting with, *Receiving order*, *locating items*, *collecting items*, *Packing order*, and *handling order*.

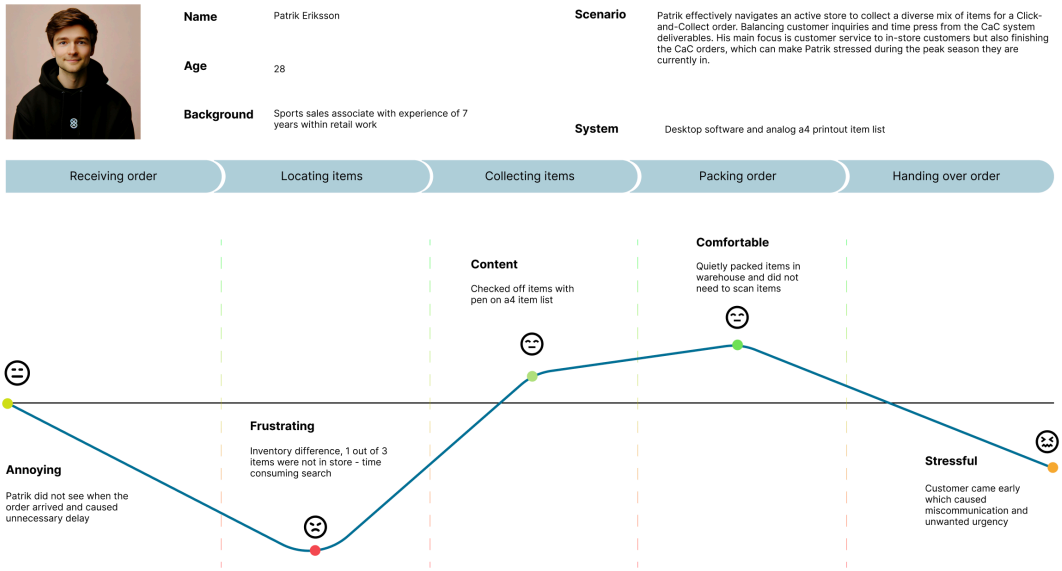


Figure 6.6: Example on one of the journey maps

6.3.4 Quantitative Analysis

A quantitative analysis approach was undertaken to examine various parts of the data collected through the Google Form questionnaire. Initially, the responses gathered from the Google Form were exported to Google Sheets for comprehensive data management and analysis.

Subsequently, relevant graphs and tables were generated to exemplify patterns and trends within the dataset. Graphical representations, such as histograms, pie charts, and bar graphs, were employed to illustrate the spread and distribution of demographic variables such as age and gender, see examples in figure 6.7. Additionally, tables were constructed to provide a tabular overview of the demographic composition and other pertinent variables within the dataset.

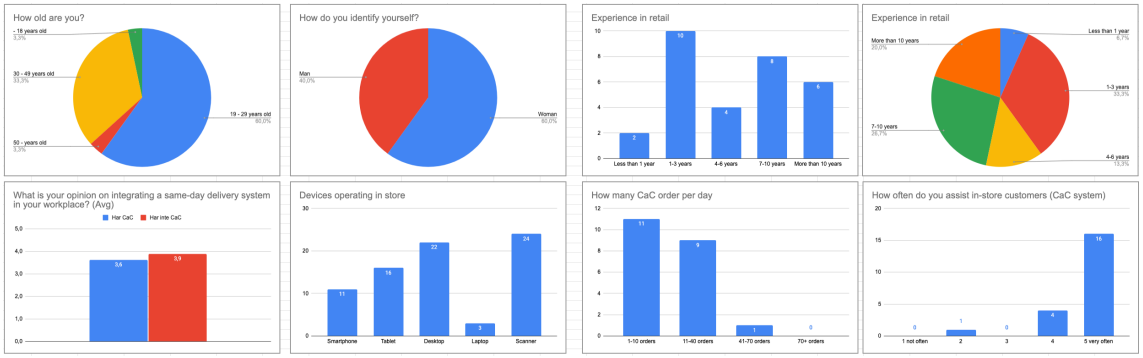


Figure 6.7: Examples of graphs from the quantitative analysis

Furthermore, correlation analyses were conducted to explore potential relationships between different parameters. For instance, correlations between the size of the store and opinions on implementing a new system were investigated, as well as associations between age and perceived challenges in the current system.

The quantitative analysis methodology employed in this study facilitated a comprehensive exploration of the data collected in the questionnaire. By using statistical techniques and data visualization tools, insights were gained into various aspects of the research topic, enabling a nuanced understanding of the relationships and dynamics inherent in the dataset.

6.3.5 Requirements and Wishes

Then a Requirements and Wishes list was crafted based on insights collected from various analyses, including the thematic analysis, quantitative analysis, hierarchical task analysis (HTA), and customer journey mapping. This comprehensive approach ensured that the resulting list effectively captured the user's needs.

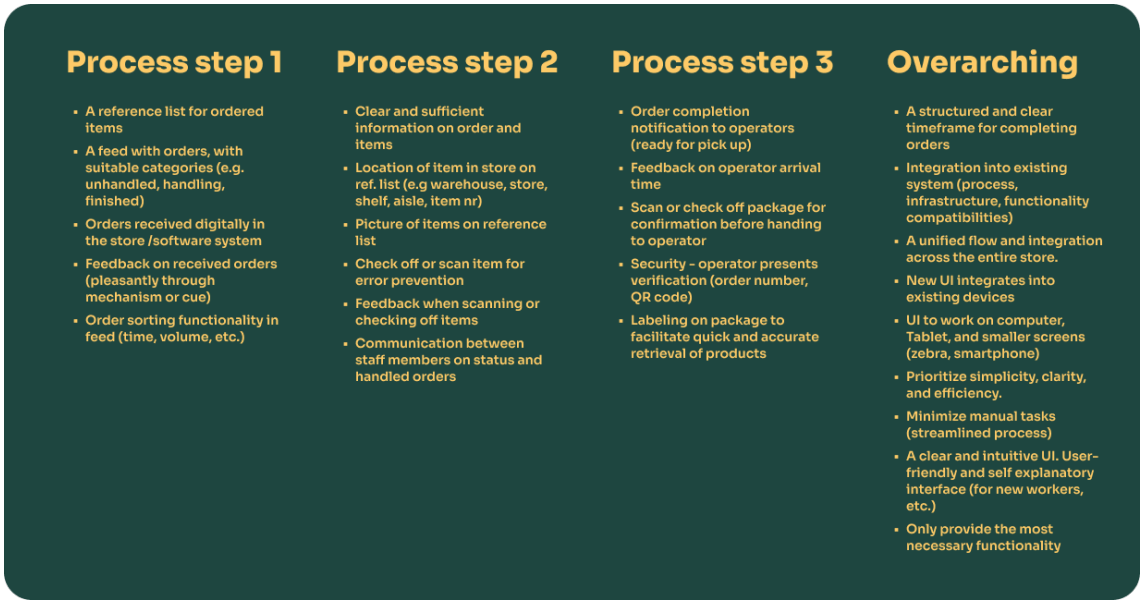


Figure 6.8: The requirements with highest prioritisation score

The Requirements and Wishes list was structured into four distinct categories corresponding to different stages of the order fulfillment process: *Process Step 1 - Receiving Order*, *Process Step 2 - Handling and Packing Order*, *Process Step 3 - Handing Over Order*, and *Overarching System Pointers*. This categorization facilitated a systematic organization of requirements and wishes, aligning them with specific process steps and overarching system considerations.

Under each category, relevant requirements and wishes were entered based on the insights derived from the preceding analyses. These requirements and wishes encompassed a spectrum of considerations, ranging from functional specifications to user experience enhancements, thereby ensuring a comprehensive coverage of the user's expectations.

Moreover, each requirement and wish was assigned a numerical importance rating ranging from 1 to 5, with 1 indicating the least important and 5 denoting the highest priority. This prioritization scheme facilitated the identification of critical needs and allowed for strategic decision-making regarding resource allocation and system design. The needs with a 5 or 4 of importance level score were extracted from the list, see figure 6.8. For a holistic view of the list, see appendix C

By synthesizing insights from multiple analytical approaches and stakeholder perspectives, the *Requirements and Wishes* list served as a guiding framework for the subsequent phases of system design and implementation.

6.4 Ideation

Ideation marks a pivotal phase in our process, where concepts are shaped and refined to align with project objectives and user needs. In this section, we explore our ideation methodology, encompassing various techniques including moodboarding, semantic keywords, brainstorming, prototyping, sketching, and 3D modeling. Through these methods, we aim to generate innovative ideas and concepts that inform the design and development of our same-day delivery system.

Understanding the user landscape is fundamental to tailoring solutions that resonate with the intended audience. The semantic Keywords provided a structured approach to distilling key attributes from our data into actionable design insights. Brainstorming served as the starting point for generating innovative solutions and refining project scope. Crucial for the project was prototyping, to refine user experience and interface design. Sketching was essential in conceptualizing the design and functionality of the envisioned bi-product. To further visualise the bi-product with clarity and fidelity, we employed 3D modeling techniques using Blender software.

In the next sections, we delve into each ideation methodology in detail, presenting the process and execution of our creative endeavors.

6.4.1 Moodboard

With the aim of refining the creative ideation process, the utilization of moodboards was used as a tool in visualizing diverse thematic atmospheres. In the context of this study, four distinct moodboards were crafted, each representing a unique mood. Following, a selection process ensued, aimed at identifying the most resonant moodboards for further development. Two moodboards were chosen from the initial pool. Through iterative deliberation, one final moodboard emerged, see figure 6.9.

The final moodboard became our guide for the next steps in our creative journey. It helped us stay focused on the themes and feelings we wanted to convey, making sure our ideas stayed on track.

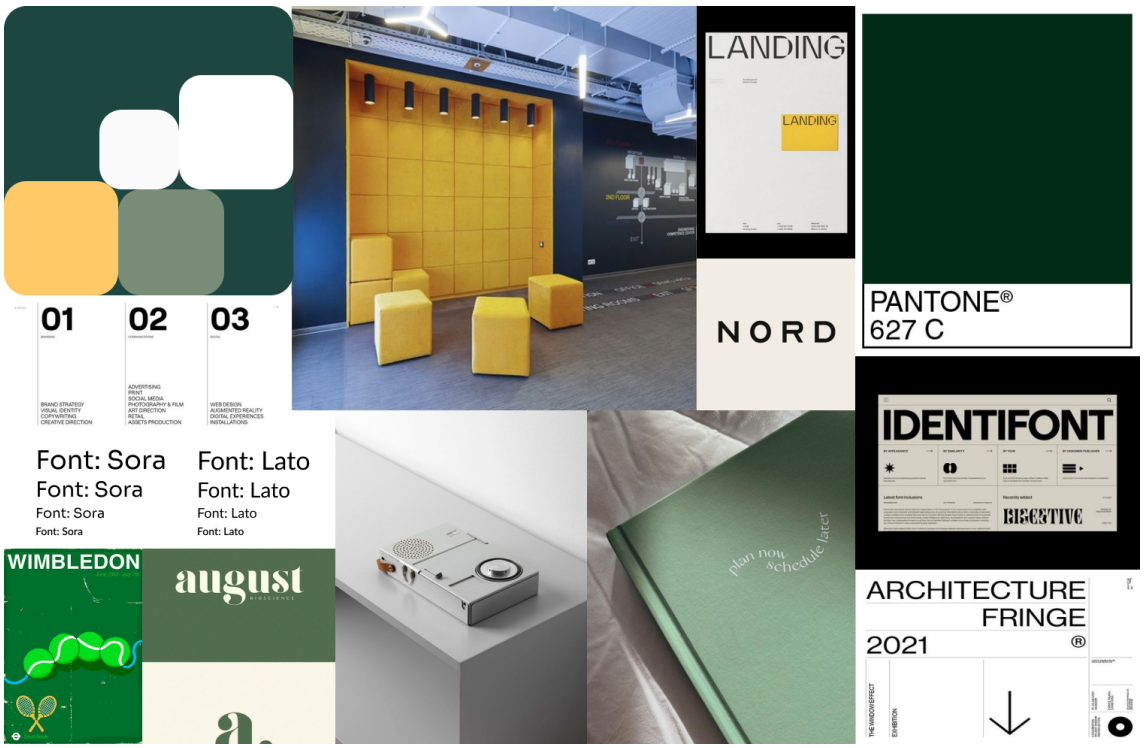


Figure 6.9: Moodboard

6.4.2 Semantic keywords

In our pursuit of methodical design ideation, we turned to the Semantic Keywords method as a means to distill key attributes from our gathered data into actionable design insights. Leveraging the digital design platform Figma, we constructed a blank page filled with adjectives that resonated with the essence of our collected data.

Later we started grouping similar adjectives to unveil overarching thematic threads. For instance, descriptors like *Professional*, *Serious*, *Reliable*, and *Dependable* formed into a singular conceptual cluster.

Subsequently, from each group, we carefully cherry-picked a representative keyword,

culminating in a concise yet comprehensive set of five pivotal words: *Professional*, *Agile*, *Coherent*, *Obvious*, and *Fulfilling*, see figure 6.10 for visual representation.

Figure 6.10: Semantic Keywords

Professional: The aesthetics are serious and the design feels reliable and dependable.

Agile: The system is quick and flexible, promoting the accessibility.

Coherent: Consistent throughout the system with purposeful features that act logically.

Obvious: Unmistakable and clean-cut information that creates a seamless human-computer interaction.

Fulfilling: Satisfying or rewarding, encouraging meaning, success, and engagement

Each word served as a guiding principle, informing and shaping our design decisions, ensuring alignment with the core values and aspirations gleaned from our semantic exploration.

6.4.3 Brainstorming

To initiate the ideation and concept phase of this study, brainstorming emerged as the primary catalyst for generating innovative solutions and refining project scope. The initial brainstorming session aimed to delineate strategies for narrowing down the scope of the project to render it more manageable and feasible. Various approaches were deliberated upon, including the selection of specific subsystems for focused attention or the exploration of broader, but less intricate, conceptual frameworks.

The choice ended up in conceptualization of a user interface that encapsulated the three phases identified in the data gathering phase, receiving an order, handling and packing an order and handing over an order, see figure 6.11. The goal was to develop a comprehensive UI covering all phases while dedicating particular attention to one phase, such as the order receiving process. Later, the idea of complementing the UI with a physical product or bi-product to enhance efficiency and user experience was brought to life.

Throughout the concept phase, intensive discussions and brainstorming sessions were conducted to refine the characteristics of the UI, discussing aspects such as color schemes, font selection, and structural composition. The requirements and wishes

with highest priority score was written on a whiteboard to serve as a guide, see figure 6.11.

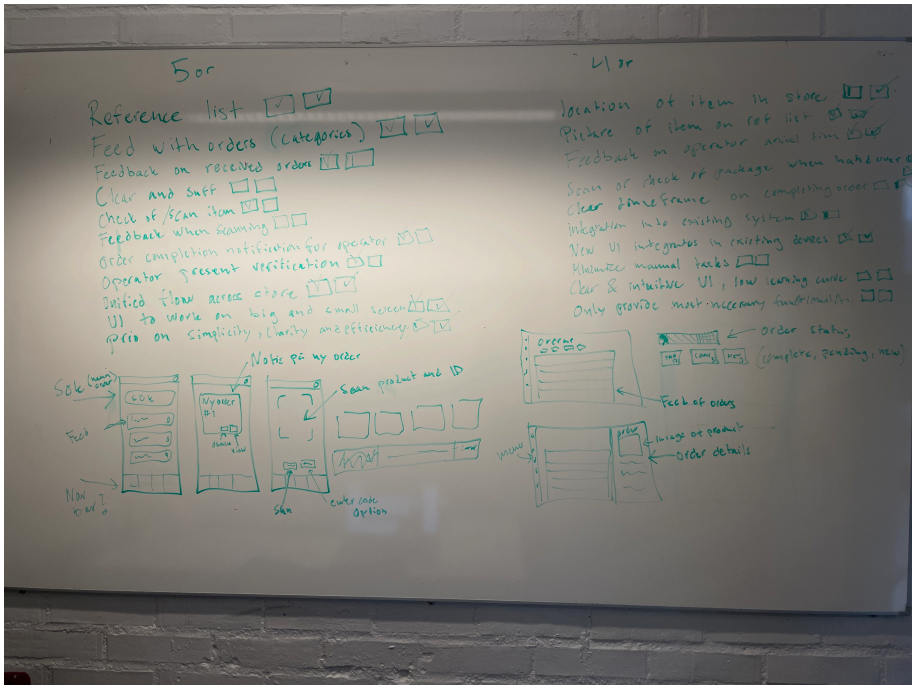


Figure 6.11: Brainstorm process of UI

When the first draft of the UI was done, attention shifted towards brainstorming the design, functionality, and aesthetics of the envisioned bi-product, see figure 6.12. Whiteboard sessions facilitated collaborative ideation, providing a visual platform for creating ideas and iteratively refining conceptualizations.

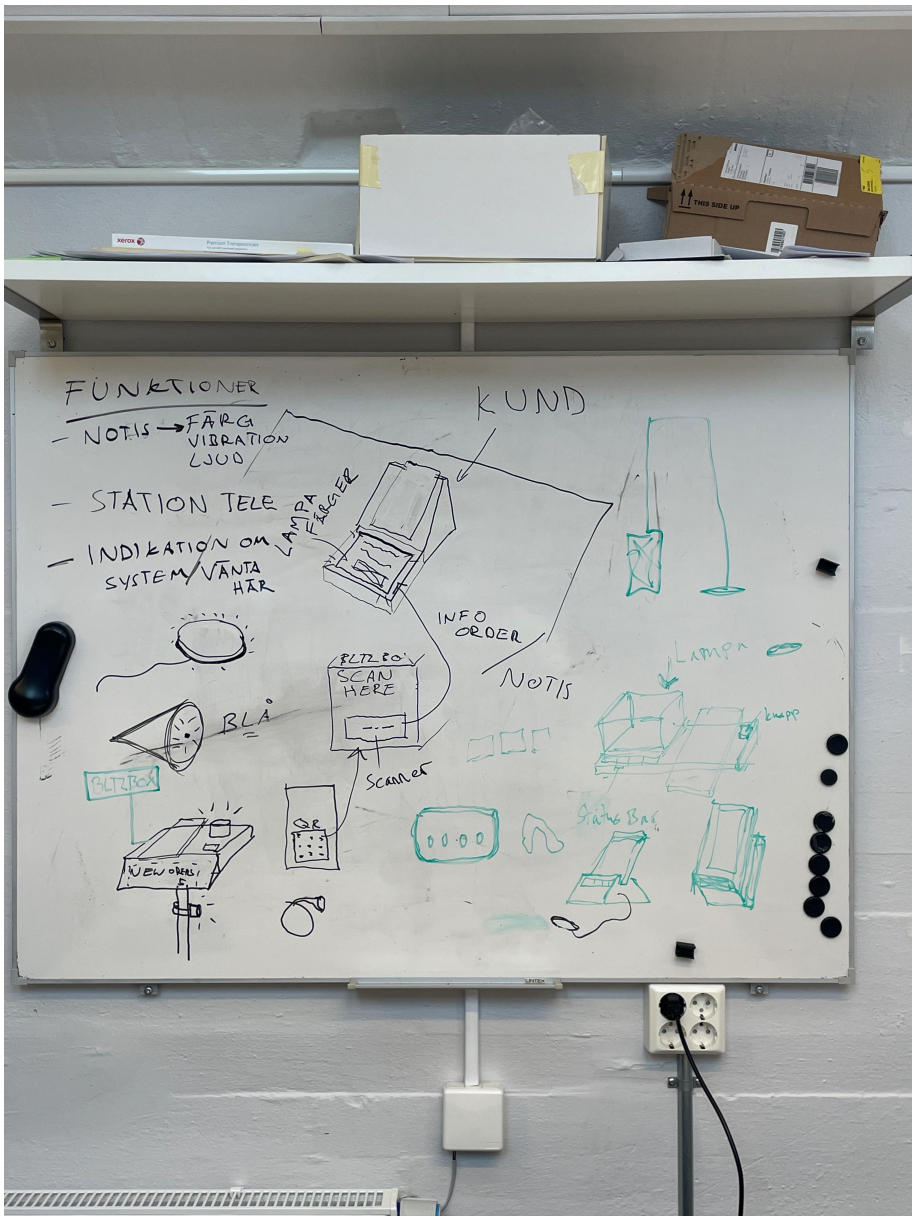
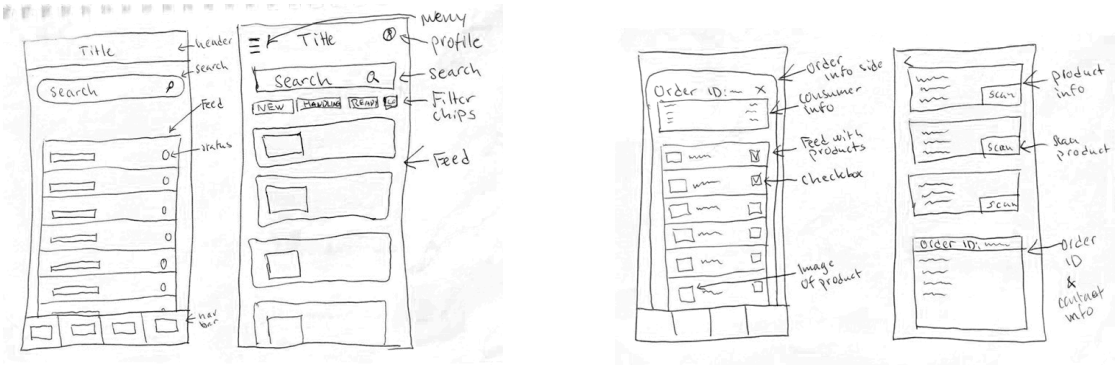


Figure 6.12: Brainstorming session of bi-product

6.4.4 Prototyping

In the pursuit of refining user experience and interface design, we adopted a systematic approach leveraging prototyping methodologies. Our journey began with the creation of paper prototypes, see figures 6.13a and 6.13b, a foundational step aimed at visualizing and iterating upon the core elements of our application's "home screen" and "order information" screens. These paper prototypes provided a tangible canvas for exploring diverse design concepts tailored for both smartphone and desktop interfaces, serving as guide for subsequent development phases.

Building upon the insights accumulated from our paper prototypes, we transitioned to digital platforms, with Figma serving as our primary tool for crafting low- and



(a) Mobile (b) Mobile

Figure 6.13: Paper prototypes

high-fidelity prototype.

The prototyping process emerged as essential in our design methodology, enabling us to transcend conceptualization and manifest tangible, user-centric interfaces imbued with aesthetic elegance and functional integrity.

6.4.4.1 Low Fidelity Prototyping

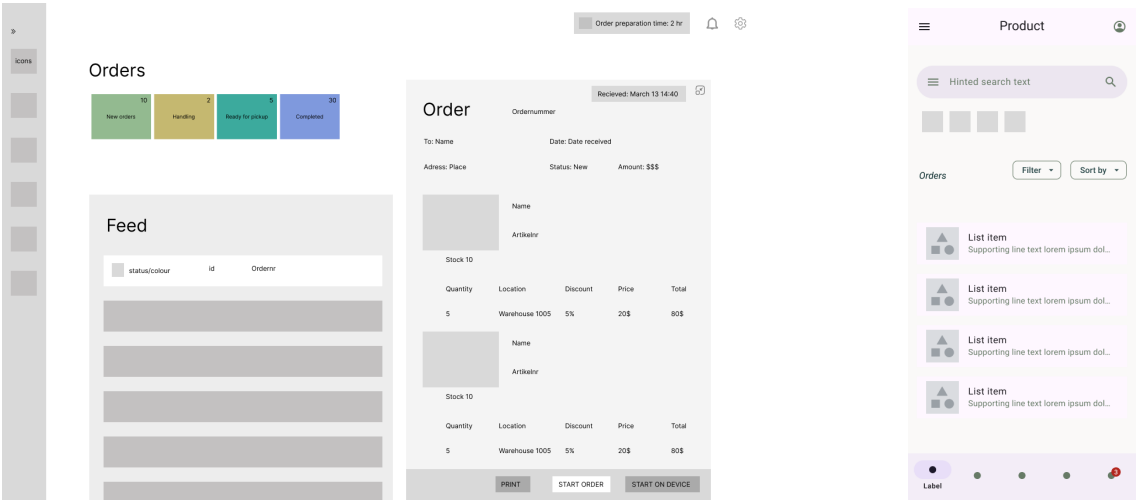
The low-fidelity (lo-fi) prototype evolved as a successor to the early wireframes created on paper, with the aim of establishing a more accessible starting point for the UI. Two variants were developed: one tailored for larger screens, such as desktops and laptops, and another optimized for smaller screens like smartphones or zebra scanners, see figure 6.14.

To elevate the fidelity level from the preceding wireframes, we turned to the invaluable guidelines outlined in *Material M3*, a comprehensive resource detailing best practices for crafting intuitive user interfaces. These guidelines cover various aspects including padding, margins, buttons, menus, grids, and other components, offering a robust framework for ensuring consistency and coherence across our interface design.

In preserving a lo-fi quality, our focus remained on crafting a tangible design with placeholder boxes and text, with size and functionality as a priority, see figure 6.14. This approach allowed us to view the different screens holistically and assess their coherence with each other. By ensuring that all essential functionality was in place, we facilitated a smoother transition into a high-fidelity prototype.

6.4.4.2 High fidelity prototyping

During the high-fidelity stage, our focus shifted towards transforming complete functionality and wireframe structures into a cohesive visual experience characterized by a distinct design identity. To accomplish this, our companyts subsidiary provided us with guidelines aligned with their existing design profile. Additionally, "Material M3" complemented these guidelines by offering insights into color selection, facilitating further exploration of how to utilize primary, secondary, and tertiary colors across various contexts. By adhering to both the subsidiary's design profile and

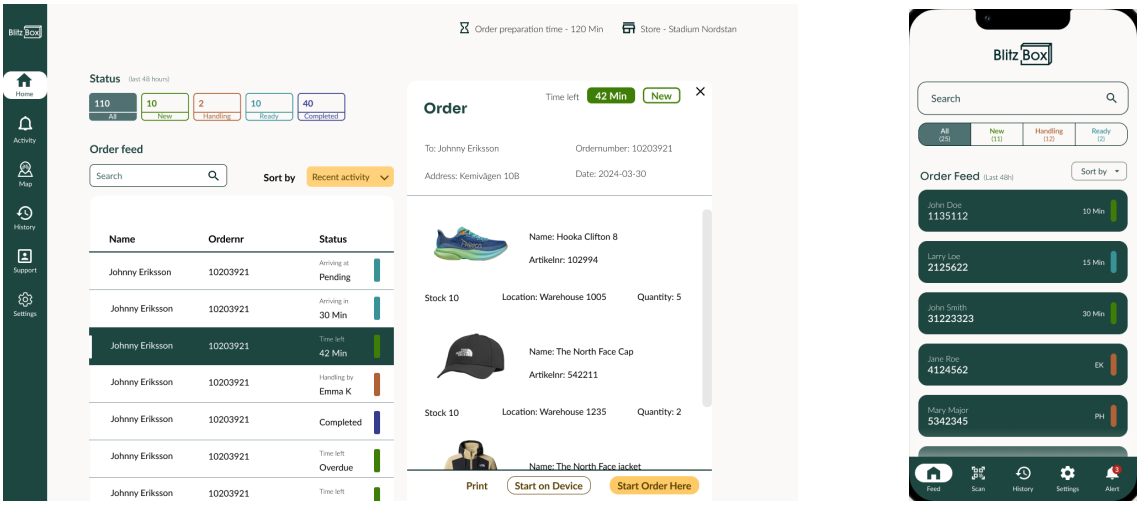


(a) Desktop (b) Mobile

Figure 6.14: Low fidelity prototypes

the guidance from *Material M3*, we curated a harmonious color theme that not only elevated visual appeal but also encouraged user engagement and streamlined navigation, see figure, see figure 6.15.

In our pursuit of creating a clear design and brand identity while optimizing user experience, significant effort was dedicated to maintaining design consistency throughout the UI. This consistency extended to text hierarchy, button designs, and color schemes, effectively signaling the importance of different elements within the interface, see figure 6.15.



(a) Desktop (b) Mobile

Figure 6.15: High fidelity prototypes

Throughout our prototyping journey, we embraced a culture of iteration and refinement, continuously iterating on the UI, integrating emerging functionalities, and

incorporating newfound insights. Each iteration propelled us closer to our design objectives, fostering a dynamic dialogue between design theory and real-world application. This iterative approach also facilitated the establishment of coherence across interfaces of different sizes, particularly in determining the functionality to include on smaller screens.

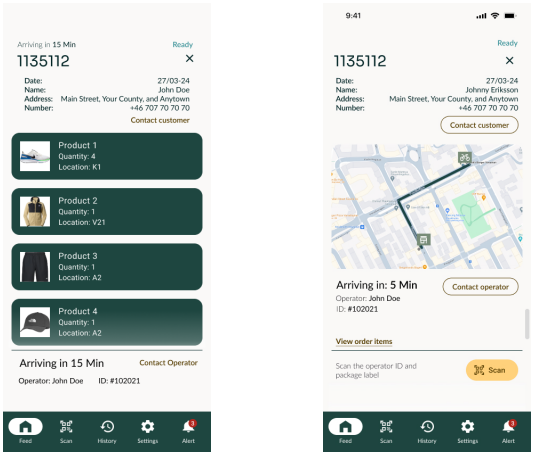
6.4.4.3 High fidelity iteration

For the prototype iteration phase of our project, we focused on refining the initial prototypes based on the feedback received from the user testing phase. The process involved several key steps:

Firstly, we gathered the feedback obtained from the evaluation and categorized it into two text sections, one containing negative feedback and suggested improvements, and another containing positive feedback.

Next, we reviewed all 56 pointers of potential improvements identified during the evaluation process. This comprehensive review helped us identify areas for enhancement across the entire concept.

After analyzing the feedback, we created new suggestions and improved versions of various elements, such as text clues, the addition of a map feature, buttons, notifications, and the integration of a customer contact option, see figure 6.16. These enhancements were aimed at addressing the identified usability issues and enhancing the overall user experience.



(a) old version

(b) Iterated version

Figure 6.16: iteration: order completion view

During discussions within our team, new functionalities were discovered, and some features were excluded based on their relevance and feasibility. For instance, it was determined that notifications should disappear automatically without requiring user dismissal in the smartphone version, streamlining the user experience.

Finally, we grouped the feedback, suggestions, and improvements to develop an

improved concept and a high-fidelity prototype. This prototype represented the culmination of our iterative design process, incorporating user feedback and innovative ideas to create a more refined and user-friendly interface.

By following this iterative approach, we ensured that our final prototype addressed the needs and preferences of our target users, leading to a more effective and usable solution for the project.

6.4.5 Sketching

When the needed funtionality for the bi-product was set, a sketching phase was started. The sketches was made with pen and paper and the goal was to create as real a concept as possible.

Since the idea of how the product would work was concrete, the sketches served as a tool to create different designs that all of which met the requirements. Three different suggestions was created and the dot-voting method was used to select one concept to further develop. One of the examples can be viewed in figure 6.17

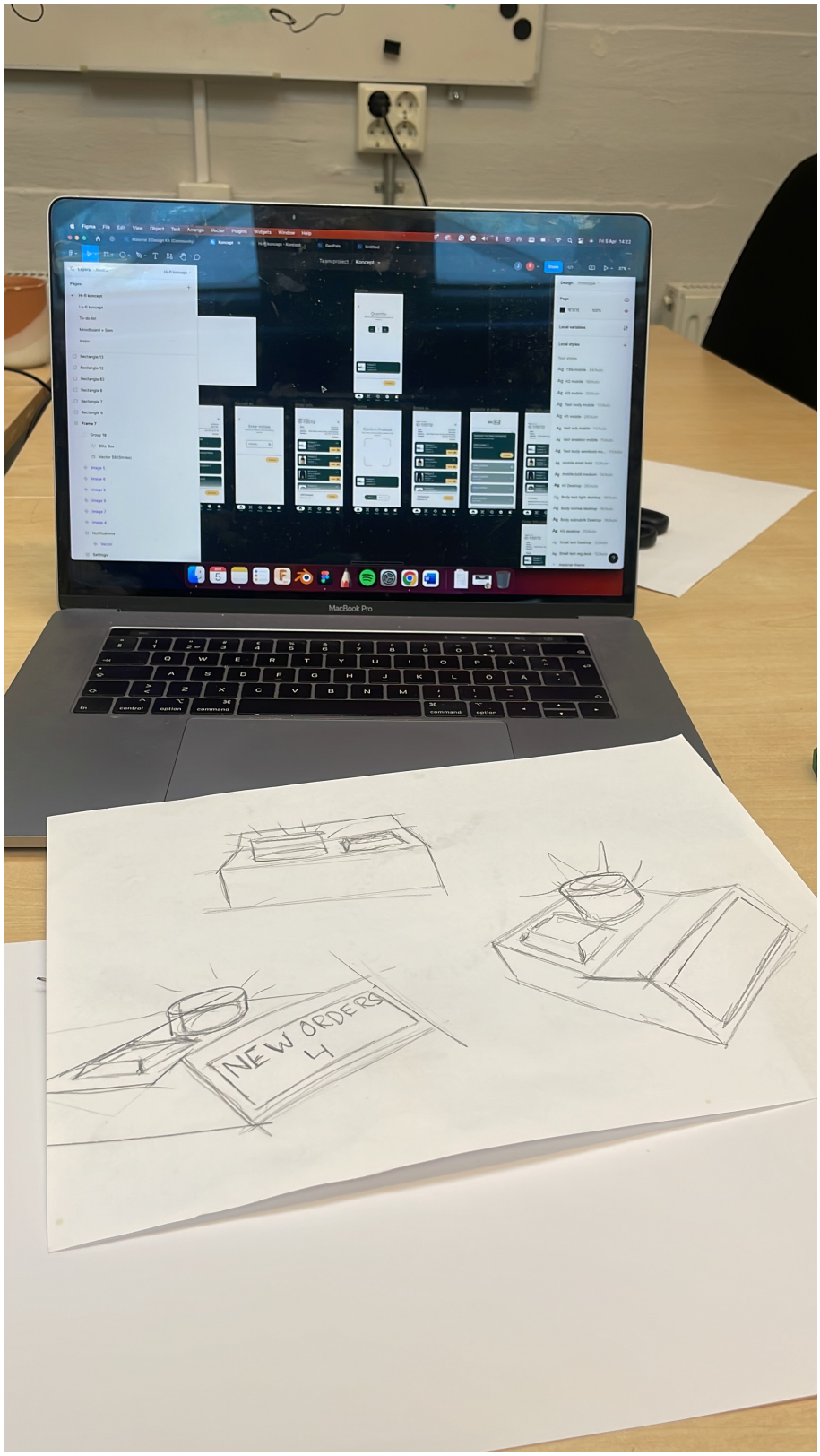


Figure 6.17: example of bi-product sketch

6.4.6 Computer aided sketching

In the process to visualize the envisioned bi-product with clarity and fidelity, the method of 3D modeling emerged as the preferred approach, leveraging the capabilities of Blender software. The 3D modeling process started with the creation of rudimentary shapes, serving as foundational prototypes to decide the spatial dimensions and relative placement of the product components. This initial phase facilitated a tangible comprehension of scale and spatial relationships, laying the groundwork for subsequent refinements.

Following the establishment of basic geometries, refine and iterating upon the product's aesthetic attributes. Through the manipulation of materials, colors, and sizes, the appearance of the bi-product underwent iterative enhancements, culminating in a refined visual representation that aligned with project objectives and design aspirations, see figure 6.18.

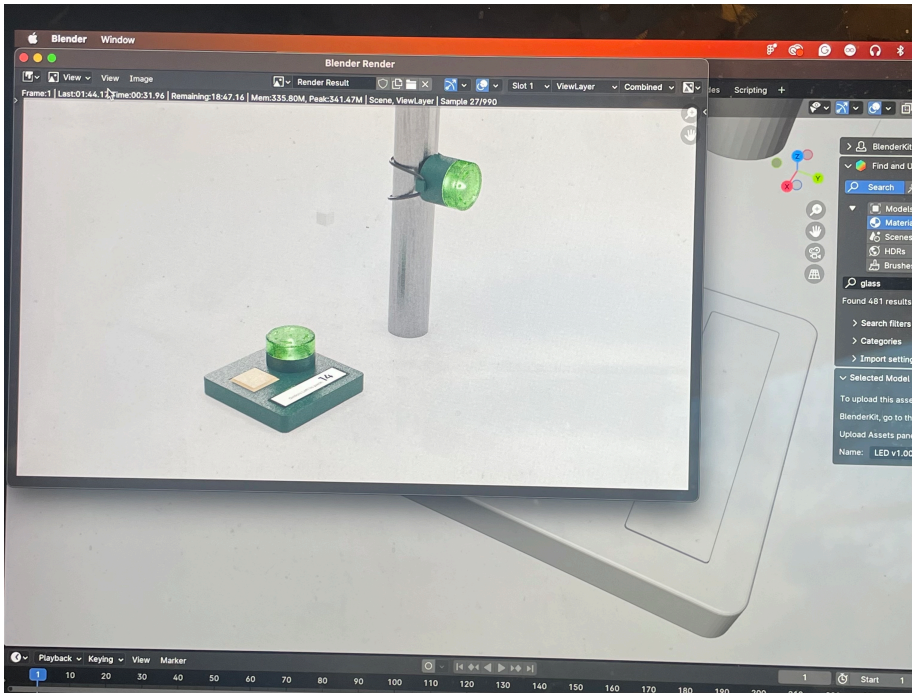


Figure 6.18: Final visual design of bi-product

In the final phase of 3D modeling, renditions of the bi-product were generated within varied environmental contexts and compositions. These renderings served to contextualize the product within diverse scenarios, offering insights into its visual impact and functional integration within different settings.

6.4.7 Mockups

As part of our process, mockups were carefully crafted using Adobe Photoshop, see figure 6.19 to represent the mobile and desktop versions, as well as displaying the physical product. These mockups underwent a high-fidelity transformation, integrating them into environments with appropriate screen sizes. The mockup assets used

were pre-made and consisted of 3D renders with empty screens, ready for manipulation within Photoshop. Adjustments were made to background colors, lighting, and shadows to ensure consistency and realism. These mockups were essential in providing viewers with the context needed to understand the prototypes effectively, thereby enhancing the overall comprehension and tangibility of our project's progress and objectives.

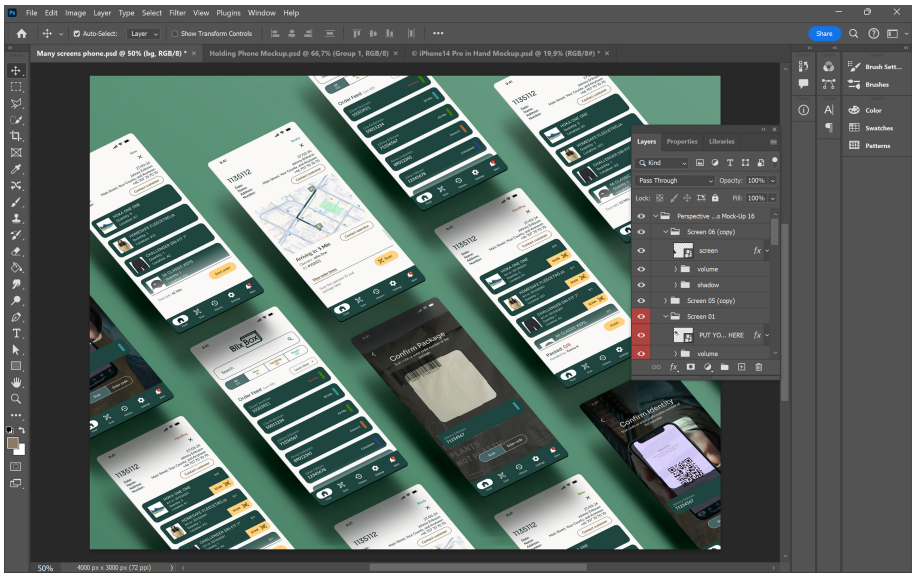


Figure 6.19: Workflow in creating mockups

6.5 Evaluation

During the evaluation stage, the concept was tested against the user requirements and wishes. This stage examines the outcomes against predefined criteria to determine the success in achieving a concept that will enhance the user experience.

6.5.1 User testing

User testing was conducted as a crucial part of evaluating the effectiveness of the proposed prototypes for our user interface. The aim was to gather feedback on the usability and functionality of the interface from a diverse group of participants.

To conduct the user testing, we first created a scenario that mimicked real-world usage of our prototypes. This scenario was divided into three phases: *Receiving Order*, *Packing and Handling Order*, and *Handing over Order*. These phases were identified as natural steps in the user research process.

Participants were shown prototypes from both desktop and smartphone devices. The prototypes were divided so that participants first interacted with the desktop version before moving on to the smartphone version. This approach ensured that each participant experienced both interfaces before providing feedback.

During each phase, participants were encouraged to think aloud, articulating their thoughts, and expressing what they found to be both positive and negative aspects of the UI. Following the thinking-aloud session, participants filled out a Google Form with questions assessing various aspects such as feedback, error prevention, satisfaction rate, and efficiency, see figure 6.20. For a complete view of the form, see appendix F

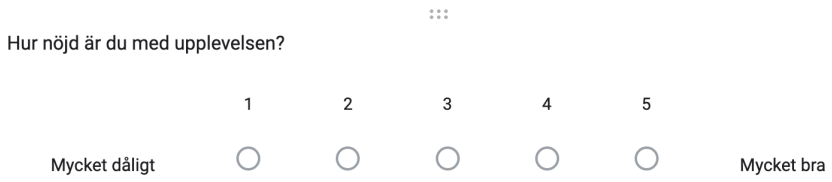


Figure 6.20: Example of google form question

After completing evaluations for all three phases, participants answered additional questions regarding the correspondence of the UI to semantic keywords and the consistency between the desktop and smartphone UIs as a joint system.

A total of four participants completed the evaluation, divided into novice and experienced users. This division was intentional to ensure that our UI would cater to both new and experienced users. Given the commonness of new users, it was crucial that the system be easy to learn and navigate.

By employing this methodology, we were able to gather valuable insights into the usability and user experience of our prototypes, informing further iterations and improvements.

6.5.2 Heuristic evaluation

The Heuristic Evaluation conducted in this study aimed to assess the usability of the *Handing over Order* process step within the conceptual framework. This decision was made based on the initial evaluation, which revealed that this step accumulated the most comments and suggested improvements.

To execute the evaluation, we utilized the Nielsen Norman Group Heuristic Evaluation Workbook [48], see figure 6.21. This workbook integrates Jakob Nielsens 10 usability heuristics, providing a structured framework for participants to document their issues and thoughts. Prior to the evaluation, participants were familiarized with the heuristics to ensure they understood what aspects to assess.

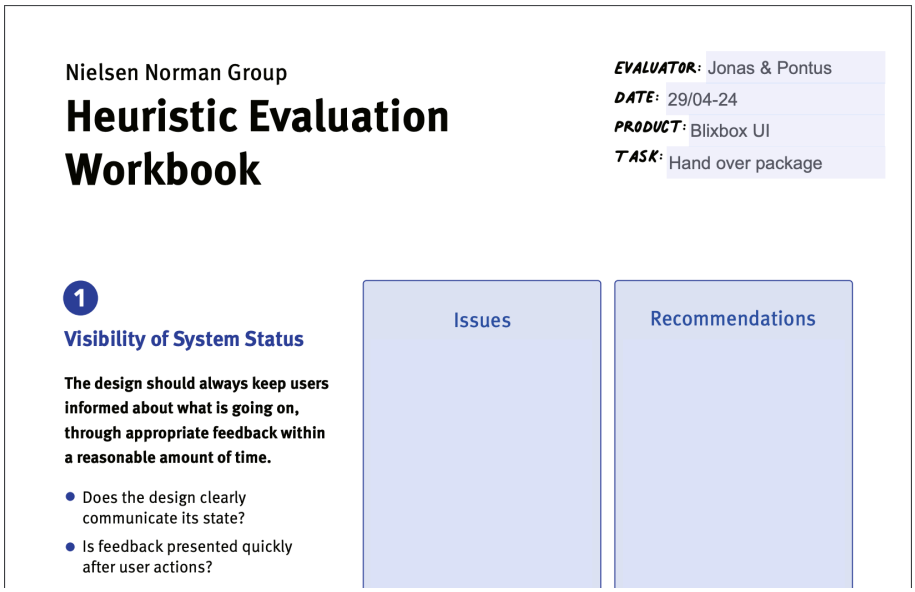


Figure 6.21: Nielsen Norman Group Heuristic Evaluation Workbook

Five participants were recruited for the evaluation, each selected based on their lack of prior experience with the task. This ensured that their feedback was unbiased and provided fresh perspectives on the usability of the process step.

During the evaluation, participants systematically compared the design against the predefined heuristics, identifying potential usability issues and areas for improvement. The data collected from the evaluation is then to be analyzed in future work to gain insights into the strengths and weaknesses of the *handing over order* process step within the conceptual framework.

7

Results

The following chapter will give a comprehensive view of the result based on the stated research questions.

7.1 RQ 1 - User Research

Based on the data analysis and the previous work, our result is divided in to four categories, that each describes a part of the system.

7.1.1 Process Step 1 - Receiving Order

In the process of receiving orders, whether in the current Click-and-Collect (CAC) system or the proposed same-day delivery system, efficiency is important for retail workers. Familiarity with the process exists among workers, who seamlessly integrate order management into their daily routines, emphasizing communication and coordination to ensure prompt attention to orders.

"probably wouldn't be a huge difference for us" - interview participant 3

Orders in the current CAC system typically arrive either at the counter or in the warehouse, prompting various methods of receiving orders, see figure 7.1 . These methods range from email notifications to alerts on specialized devices like a light, sound notification or through designated software programs.

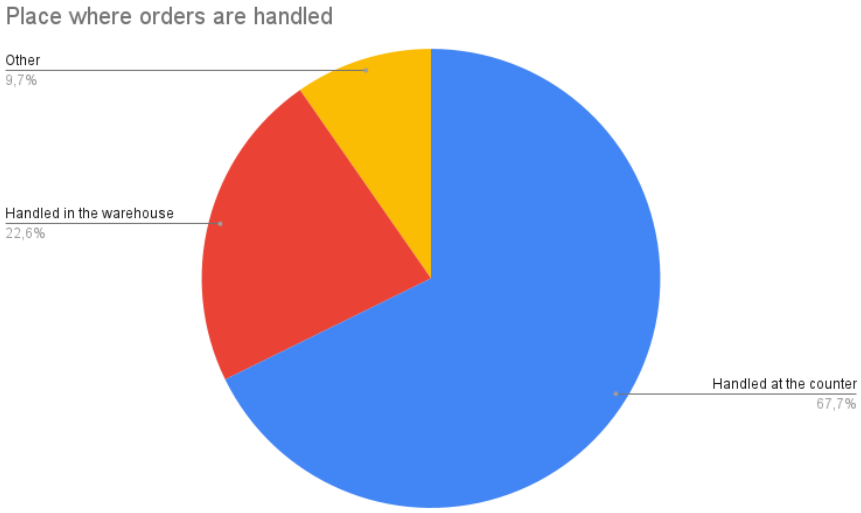


Figure 7.1: Pie chart: Where orders are handled

However, challenges persist, including the potential for orders to be lost among other emails, manual intervention to reset notification systems, and the reliance on staff to actively monitor for new orders. One interview participant mentioned that they had a schedule for monitoring the order feed to see if any new orders had arrived. While some mentioned the issues related to the system's sound alerts drew attention, with participants describing disruptive notifications and their impact on the working environment.

> "It can also easily disappear among other emails" - interview participant 1

As a result, the new same-day delivery system, centralized order receipt, separate from other communications and systems, is preferred to avoid confusion, with clear feedback mechanisms considered essential. Challenges arise in the current system when orders arrive through different channels, underscoring the need for a unified flow and integration across the entire store to maintain consistency and efficiency when completing orders.

> "Must have some form of feedback for newly received CAC orders" - interview participant 7

Flexibility in order processing, such as the ability to print A4 lists for easy retrieval, is highly valued by workers, streamlining tasks and enhancing efficiency. The lack of a direct cancellation option for personnel and automatic forwarding of orders without customer confirmation emerged as points of dissatisfaction, contributing to potential customer frustration.

Issues with unclear order details, including images and location, added to the operational difficulties, requiring additional checks on the website.

> "Would have liked a picture, and where it was located" - interview participant 4

A clear feed with orders, with suitable categories (e.g. unhandled, handling, finished) that supports an order sorting (time, volume, etc.) functionality is wanted. The questionnaire states challenges such as time consuming, limited functionality, difficulty in accessing and interpreting data, and accessibility issues in the current system, See figure 7.2.

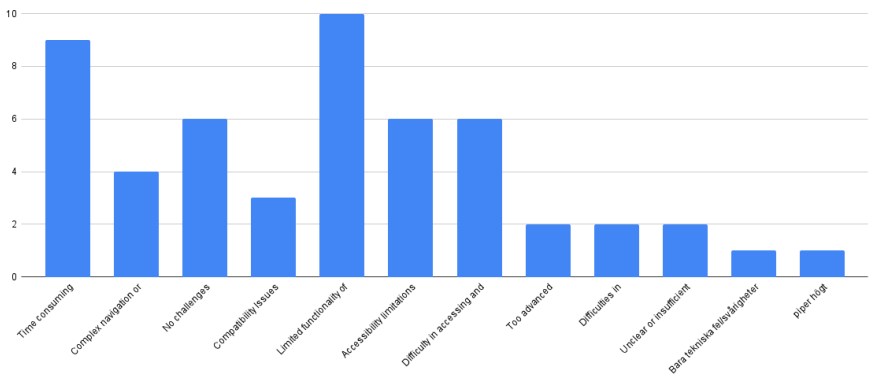


Figure 7.2: Bar chart: Difficulties in current system

In contrast, the proposed same-day delivery system should aim for a streamlined process similar to CAC, emphasizing clear communication, easy access to order information, and integration with existing workflows. Clear communication will assist in error prevention, to give the personnel options to either contact customer service, colleagues or the customer that placed an order. This could be beneficial when there is a order difference and the inventory states that the product should be in the store but actually is nowhere to be found. Several recipients explained how they wished for a self explanatory interface with sufficient information about the order. This could be information such as product location in the store, customer information, size and quantity of the product, etc.

> "communication between operator and store and customer is important"
> - interview participant 6

Since there is a considerable amount of different systems in the different stores, the need for a stable integration into the existing workflows is key for a successful system. This could for instance involve the existing technology used in the store. The questionnaire showed that most stores used some sort of larger screen as a desktop computer or tablet accompanied with a smaller device such as a smartphone or handheld scanner, see figure 7.3.

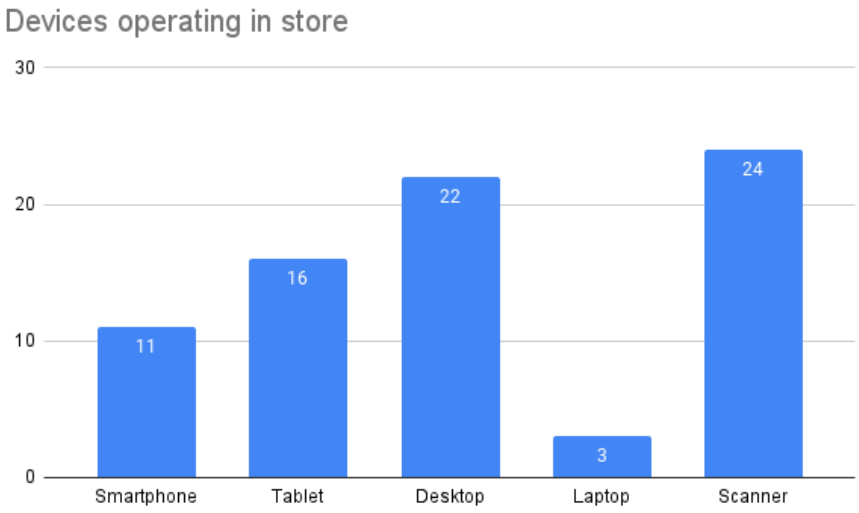


Figure 7.3: Bar chart: Devices operating in store

It is clear that the new system should work smoothly with the stores already existing system. Recipients stated resentment towards learning new systems, adding to the workload.

> "So I know we just felt like, damn one more thing to do now." - interview participant 7

Workers express a desire for greater flexibility in managing orders, including the ability to accept or update items based on availability, along with practical features like the ability to print multiple orders simultaneously or prioritize orders for packing. One recipient talked about that he sometimes as a period of time that he wants to pack several orders at the same time, creating a bulk of orders.

> "Being able to handle several orders at the same time would be good, especially printing" - interview participant 7

And on the other hand, when there is no time for packing orders, for example during campaigns, The ability to pause incoming orders was wished for. Overall, a cohesive workflow, clear communication, and efficient order management are essential for optimizing retail operations.

7.1.1.1 Summary of Factors - Receiving Order

To summarize the previously mentioned information and data that the user studies provided, factors that will assist when developing a future system will now be presented. The interviews conducted with personnel revealed a strong desire for a feedback mechanism that is both clear and non-intrusive. Participants emphasized the importance of receiving timely and accurate feedback without it becoming a source of distraction or annoyance. Additionally, there was a unanimous call for an easy-to-navigate order overview system. These factors support the optimization of

cognitive ergonomics within the system, enhancing the overall efficiency and experience for personnel. Being a vital aspect when designing the system, as discussed in the related works chapter. The participants also highlighted the necessity for an intuitive interface that allows them to manage and structure orders efficiently, thereby reducing the cognitive load and improving overall workflow.

> "when you receive the order, it is important that you know what is to be picked." - interview participant 3

The questionnaire results indicated a significant preference for a system that integrates seamlessly with the existing technological infrastructure. Participants expressed a strong need for compatibility with their current systems, devices, and electronics. This compatibility is crucial not only for ensuring a smooth transition but also for maximizing the utility of the new system without necessitating extensive changes to the current setup. These logistical factors were previously known desires for implementing a same-day delivery service, presented in the background chapter as being one of the major obstacles.

> "Easy to use, Easy to connect with other platforms/devices." - Questionnaire respondent 15

The following presents a summary of factors from the part, Receiving Order.

1. Order Management - Easy handling and categorization of orders to streamline processing and prioritization.

2. Order Documentation - Comprehensive and accessible records of all orders for reference and tracking.

3. Order Integration - Seamless integration of order reception and addition within the store's digital systems.

4. User Feedback - Ensuring users receive clear and pleasant feedback regarding their orders.

5. Order Prioritization - Tools and functionalities to prioritize orders based on different criteria to optimize delivery efficiency.

7.1.2 Process Step 2 - Handling and Packing Order

As previously mentioned, in the current CAC system, workers rely on a combination of manual processes and technology to manage orders efficiently. The process typically involves locating the items in the store or warehouse and verifying the accuracy of the selection. Once the items are gathered, workers proceed to pack them securely, often using standardized packaging materials and labelling methods to ensure clarity and professionalism.

Clear communication and coordination among staff members are essential, in this step as well, for smooth operation. This includes establishing task roles and clear procedures for order picking, packing, and quality control, as well as effective communication channels to address any issues or discrepancies that may arise.

As mentioned in the related works, technology plays a significant role in streamlining the handling and packing process. The questionnaire showed how majority of the participants used a analog way of handling and packing orders, see figure 7.4, when for example locating

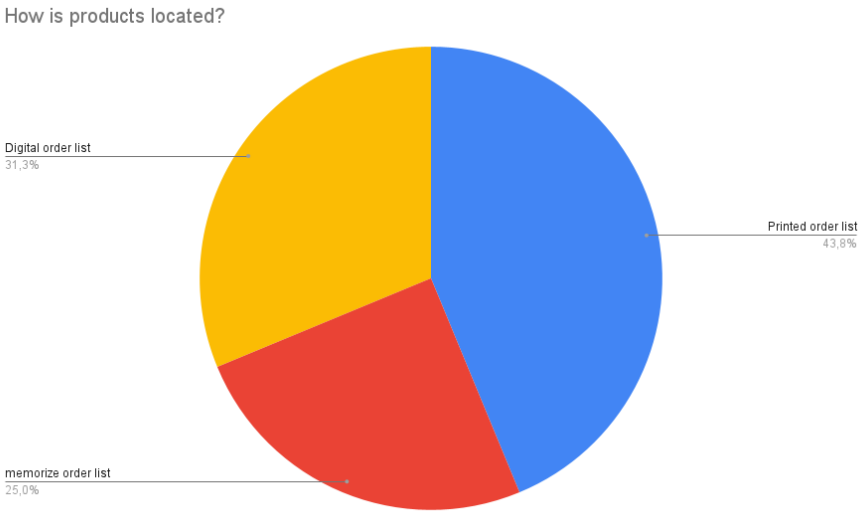


Figure 7.4: Pie chart: How is products located

or keeping track of located items, see figure 7.5. Depending on the stores utilities and system, workers employ different approaches to handling orders. Some workers may utilize handheld devices or specialized software to reduce errors and improve efficiency while others rely on more analogue systems.

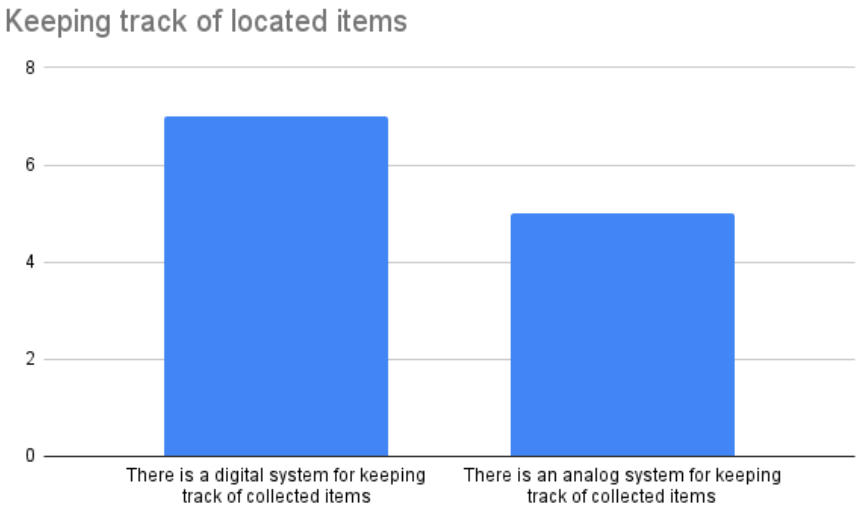


Figure 7.5: Bar chart: Keeping track of located items

When searching for items in the store, there was unanimous agreement that having a reference list of the correct items was highly desirable, see figure 7.6.Workers who used Zebra scanners for inventory management and order processing expressed their satisfaction with the efficiency of this tool. In contrast, participants who used systems on the more analogue side of the spectrum reported divided experiences. Some were experiencing mishaps more frequently in selecting correct items. This was often attributed to over-confidence in memory or a lack of clear information on the reference list. Some stores implemented preventive measures, such as indicating specific shelf numbers for items, to mitigate these issues.

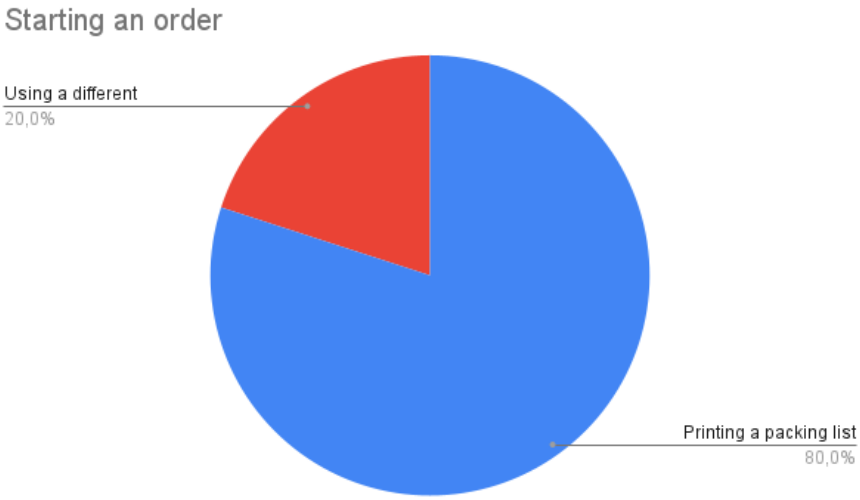


Figure 7.6: Pie chart: Starting an order

Additionally, to address concerns regarding picking incorrect items, participants suggested the importance of having some form of feedback during the collection process.

This feedback could take the form of digital notifications or simply physically checking off items on a list with a pen.

> "We had the benefit that it gives out if you scan wrong item." - interview participant 7

Given the possibility of in-store interruptions from customers, having feedback was crucial for workers to remember where they left off in the process. However, the digital feedback cue proved suboptimal. When a scanning error occurred, it emitted a disruptive noise described by employees as reminiscent of a security alarm, startling customers.

Additionally , in the final stage of this process section, the ability to verify and scan items before packing is also highly valued in the aspect of minimizing inventory inconsistencies. This underscores the significance of error prevention in the handling and packing process. However, some felt that it was an unnecessary step in the process.

A big concern for retail stores is regarding product availability and correct inventory levels due to theft and inaccurate inventory checks. This impacts order fulfillment times and may lead to extended searches for items. Consequently, it is, as previously mentioned, essential to establish a clear communication strategy with customers, which involves offering options to proceed with the remaining order or cancel it accordingly.

7.1.2.1 Summary of Factors - Handling and Packing Order

To summarize the previously mentioned information and data that the user studies provided, factors that will assist when developing a future system and more specifically when handling and packing orders will now be presented. Interviews with personnel highlighted the need for enhanced communication between colleagues and customers, particularly the future operators responsible for package pickup. Clear and efficient communication channels were deemed vital for operational success. Additionally, participants stressed the importance of ease in locating items, suggesting the inclusion of images and precise storage locations to facilitate this process. Error prevention during the item checking phase was another significant concern, with personnel seeking robust mechanisms to minimize mistakes and ensure accuracy. Due to the complex and multi-tasking requirements retail personnel are faced with, these factors are important to consider, especially to minimize cognitive load and errors, discussed in the related works chapter.

> "communication between operator and store is important" - interview participant 7

The questionnaire data reinforced these findings, revealing a strong preference for a system that integrates seamlessly with inventory management to prevent errors. As also mentioned in the previous process step, was identified as a major successful factor from initial research.

> "The store has limited warehouse space and the inventory balance isnt

always adding up" - Questionnaire respondent 4

Respondents additionally emphasized the necessity for a clear and coherent packing list and system. The cognitive ergonomics theories support the implementation of these desires from the participants.

> "Better packing list where you can check off everything separately " - Questionnaire respondent 11

Furthermore, the review of related works underscored the growing importance of electronics in contemporary store environments[20]. Developing a future system that aids digital solutions is key.

The following presents a summary of factors from the part, Handling and Packing Order.

1. Order Documentation - Detailed and organized documentation of orders to ensure clarity and accuracy.

2. Inventory Management - Clear information of item locations and statuses to streamline order fulfillment.

3. Communication and Feedback - Effective communication and feedback mechanisms to ensure smooth operations and error prevention.

4. Order Handling Processes - Procedures for managing and processing orders to ensure personnel and customer satisfaction.

5. Error Prevention and Correction - Systems and processes to minimize and manage errors during order fulfillment.

7.1.3 Process Step 3 - Handing Over Order

In the current CAC system, customers are typically notified via SMS or email when their orders are ready for pickup. Upon arrival at the store, customers may present their order number or a QR code for verification. Retail workers then locate the order, scan it for confirmation, and hand it over to the customer. In some cases, customers may be required to show identification before receiving their orders.

Retail workers emphasize, in the phase as well, the importance of clear communication and coordination to ensure smooth order handovers, whether to customers or operators. The arrival of Click-and-Collect order customers before the designated pickup time proved inconvenient, with some expressing difficulties in handling the situation smoothly. This unexpected scenario placed unnecessary pressure and stress on the staff, impacting their ability to handle tasks efficiently.

> "Difficult when customers arrive earlier than expected time" - interview participant 8

For the future same-day delivery system, participants expressed their desire for the system to include an order completion notification sent to the operator after they have finished preparing the order, signalling that it's ready for pickup. Additionally, participants suggested further enhancements in this area, such as operator status updates or information on the operator's arrival time, to aid in better preparation, and later a status update on when the package have been delivered, see figure 7.7.

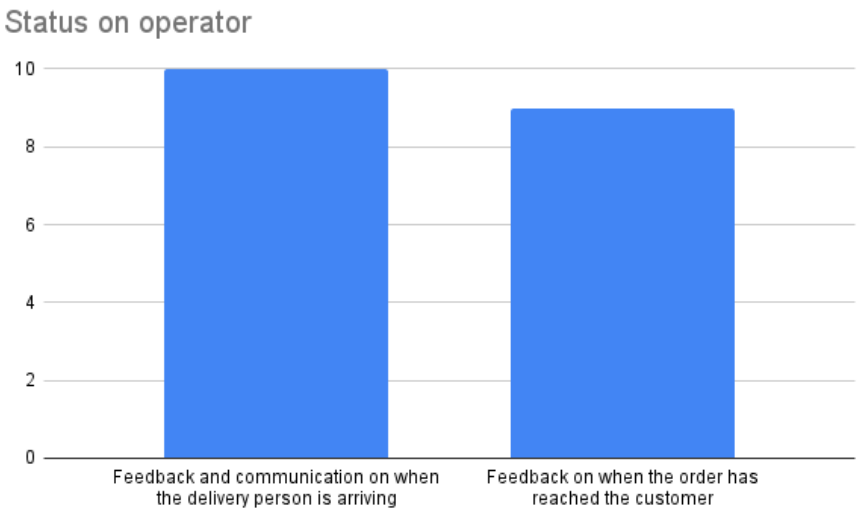


Figure 7.7: Bar chart: Status on operator

When customers arrive at the store, the staff assists them at the counter with their Click-and-Collect (CaC) order, requesting a QR code, order number, or ID based on store guidelines. This protocol aims to enhance security and prevent theft by ensuring that the right person collects the order.

The majority of participants expressed a preference for maintaining the same system, even if it involves an operator collecting the package, see figure 7.8. However, some participants suggested that an interactionless system might be preferable as it wouldn't consume valuable time that could be spent assisting in-store customers.

> "interactionless would have been nice like a box system" - interview participant 7

Workers emphasized the importance of ensuring that operators are well-informed about the staff's priorities, with in-store customers being the top priority. They expressed concern that having an operator present could create a sense of stress and make in-store customers feel less prioritized.

Figure 7.8: Bar chart: Preference when handing over the packaged items to the delivery person

Workers emphasize the wish for designated storage areas to hold items awaiting pickup. These storage spaces should be well-organized and easily accessible to facilitate the retrieval of orders when customers arrive. For CAC orders, workers mention the use of shelves with different sections or compartments to categorize orders based on their pickup time or duration they have been waiting for collection. During peak periods when a high volume of orders is present, the storage areas could become cluttered and disorganised. This highlights the importance of clear labeling for easy retrieval of the correct package. Uncollected orders are returned to the inventory if they are not picked up within a certain timeframe.

> "after an approved order, a note is printed and attached to the package"
> - interview participant 3

When handing over the order, the package is either scanned or manually marked in the system as completed. This process facilitates a comprehensive overview of orders, as emphasized by the participants. During the They underscored the importance of having a clear and accessible view of the status of orders to maintain organization and efficiency. Additionally, a clear overview enables the ability to backtrack errors that may surface later, ensuring smooth operations and customer satisfaction.

7.1.3.1 Summary of Factors - Handing Over Order

To summarize the previously mentioned information and data that the user studies provided, factors that will assist when developing a future system and more specifically regarding handing over order will now be presented. Interviews with personnel highlighted several critical needs. Foremost among these was the desire for clear and effective communication with the operator to ensure seamless coordination and time management. This aligns with one of the key factors in successfully implementing a same-day delivery service, presented in the related works chapter. Personnel also emphasized the importance of robust error prevention mechanisms to guarantee the correct package is delivered every time. Additionally, they expressed the need

for a confirmation process on order acceptance, ensuring that orders are accurately acknowledged and processed.

> "scan the order and ID before the bag is handed over to the customer" - interview participant 5

The questionnaire results reinforced these findings, with respondents indicating a strong preference for clear and comprehensive documentation, such as detailed package labels.

> "when the order is approved, a package label should be printed" - Questionnaire respondent 2

Furthermore, the review of related works revealed significant trends in the industry. With the increasing implementation of next-day or even same-day delivery services by retailers, the last-mile delivery personnel face considerable challenges, including time pressure and tight deadlines[24]. To make the process of integrating with the operator as pleasant as possible is important.

The following presents a summary of factors from the part, Handing Over Order.

1. Operator Communication and Feedback - Clear communication and feedback mechanisms to keep operators informed and operations running smoothly.

2. Order Delivery Confirmation - Ensuring proper verification and confirmation of orders at key stages to maintain accuracy and security.

3. Error Prevention and Security - Systems to prevent errors and ensure security during the pick-up process.

4. Package Labeling and Retrieval - Effective labeling and tracking of packages to ensure quick and accurate retrieval.

5. Order Documentation - Organized and accessible documentation for streamlined order processing and retrieval.

7.1.4 Overarching System Pointers

In analyzing the overarching system of the Click-and-Collect process, several key insights emerged from retail workers, shedding light on crucial aspects that impact the efficiency, adaptability, and overall effectiveness of the system.

7.1.4.1 General Thoughts

One participant emphasized the ease of handling straightforward orders, where the customer pays, and the item is readily available in the store. Another noted the simplicity in scenarios where customers haven't paid yet; the item is picked, hung in the store, and the payment is completed upon the customer's arrival.

> "Everything works great and easy if it just goes straight ahead." - interview participant 4

Efficiency concerns prompted a reevaluation of communication, suggesting potential refinements for a smoother operational workflow. Experiences with third-party delivery services, like Foodora, showcased both challenges and successes, emphasizing the need to align external partnerships with the store's operational capacity. One recipient stated that the system's adaptability shone through in coordination with external platforms like Foodora. Stated that unclear guidance on dealing with third-party delivery services, like Foodora, added to the complexity of the Click-and-Collect process.

> "if you take Foodora as an example, then it was a friction." - interview participant 5

While the system's overall functionality received positive feedback, ongoing opportunities for refinement were identified, particularly in the time optimization of order receipts. Smooth customer interactions during Click-and-Collect processes were noted, with strategic planning helping to mitigate stress during high customer volume.

The system's capability to process orders swiftly and provide e-commerce items within minutes received unanimous positive acknowledgment. Customers, in particular, appreciated the system's speed, efficiency, and the overall positive experience it facilitated. In the context of the COVID-19 pandemic, the system emerged as a practical solution to address customer reluctance to enter physical stores.

The majority of workers that were interviewed emphasized the importance of prioritizing customers who are physically present in the store, especially during busy periods or weekends when foot traffic is high.

> "focus from management to prioritize store customers" - interview participant 9

This involves dedicating time and attention to assisting in-store customers promptly and efficiently. One recipient resonated that giving service to the people who had taken their time to come to the store, felt like the most important task. Despite the workload associated with online order fulfillment, workers acknowledge that customers in the store should always be given priority.

Picking and restocking orders from shelves became an additional task, with some expressing the stress of managing empty shelves, creating a negative in-store experience for customers. Additionally, there was a consensus that excessive time spent on tasks such as looking for a product in the warehouse, might not be justified.

Operational details, such as designated areas for leaving orders, contributed to the overall effectiveness of the Click-and-Collect system. Technological integration, including notification systems and designated printing processes, added efficiency to the workflow. Clear and flexible processes for handling discrepancies, demonstrate a commitment to customer satisfaction. The store's adaptive approach to changes, such as extending order pickup timeframes, reflected a positive outlook toward system adjustments.

While recognizing potential benefits in third-party systems, there was reluctance among one recipient, who works at the headquarters, to outsource, with a strong preference for maintaining control and integration within internal systems. While he stated the necessity for an overarching system that seamlessly ties together various offerings, streamlining operations and managing fast deliveries, he also said that participants expressed contentment with delivery times ranging from one to four days. He noted that customers, in general, did not express a pressing need for immediate delivery. On the other hand, the in-store personnel recognize the growing demand for swift delivery services, with expectations from customers for prompt fulfillment of orders. Retail workers envision the system as a means to meet these expectations and potentially attract more business by offering a convenient and timely delivery option.

7.1.4.2 Cognitive Ergonomics

Efforts are actively made to simplify processes for the store and integrate systems. This is especially crucial for accommodating weekend orders, contributing to smoother operations. Positive experiences were reported in smaller shops, highlighting the system's effectiveness in environments with less pressure compared to larger stores.

Some respondents noted a generally low frequency of orders, perhaps receiving just one or two per day. The potential impact of a moderate increase, around 10-15 orders per day, was questioned, with uncertainty about how it would significantly alter their workflow and several stated that it might bring the necessity of more personnel.

Significant spikes in order volume that were for example associated with promotional campaigns, reaching up to 400 orders in the feed. This perpetual upward ticking of orders during weekends and holidays created a continuous workload challenge.

For some recipients, during high seasons, the order volume could reach around 40 orders per day, prompting considerations for additional staffing. During peak periods, retail workers found themselves managing multiple tasks simultaneously.

The absence of a pause option in the system during high-stress periods was, by some recipients, noted as a limitation, with implications for the overall stress levels among staff. The inability to halt the system during high-demand periods added to stress, with instances of arriving at work to find a substantial number of orders, requiring immediate attention. The potential negative impact of missing Click-and-Collect orders over a weekend underscored the importance of a streamlined and efficient process.

> "We cannot stop the system. it can also be stressful" - interview participant 9

Managing large orders posed logistical challenges, involving navigating different sections of the store efficiently. While orders typically consisted of two to seven products, concerns were raised about potential strain with a higher order frequency.

Short timeframes for order fulfillment, particularly during peak periods and weekends, posed operational challenges for retail workers. One viewpoint emphasized the importance of flexibility, suggesting that stores would benefit from the ability to adapt the pace of order processing to match their workflow.

> "Then I would say that the shops would like to be able to accelerate and brake more with it." - interview participant 4

This sentiment was echoed by others who felt that the system should allow for acceleration and deceleration in response to varying demands. Despite the challenges imposed by reduced staffing, some employees successfully maintained a quick order processing pace. Suggestions were made to extend the time span for packing orders, potentially alleviating stress and creating a more manageable workload.

Overall, high stress levels can impact cognitive performance, leading to decreased accuracy, slower processing speed, and reduced overall efficiency.

7.1.4.3 UI and Tech

Participants provided valuable insights into their experiences with the current Click-and-Collect system and their expectations for a future same-day delivery system. One common thread that emerged was the emphasis on the need for a clear and intuitive user interface, underlining the significance of simplicity and coherence. The dated design of the current system was critiqued, with comments about the lack of hierarchy in design, coupled with large, differently colored buttons, suggesting an aesthetic disconnect and potential usability challenges.

Many workers expressed contentment with the existing system and emphasizing the importance of maintaining the current technological setup. The diversity in viewpoints among the nine individuals reflects the range of experiences and preferences within the level of comfort with technology.

Multiple voices echoed the importance of a self-explanatory system, particularly within the in-store environment. They stressed the critical role of clarity in the current system and the challenges posed by orders arriving through diverse channels. The consensus pointed towards a unified and streamlined interface as the ideal solution and a desire to eliminate additional steps after picking items.

> "It must be a self-explanatory system." - interview participant 4

Efficiency in order management and the avoidance of unnecessary complexities emerged as shared concerns. Participants discussed challenges associated with handling orders from various systems, the time-consuming process of explaining procedures to new staff, and a collective preference for a unified and user-friendly interface. Participants expressed concerns about the high turnover of staff in retail stores and the necessity for a system that accommodates this dynamic environment. The emphasis on clarity in the operational systems of stores was repeatedly stressed, particularly in the context of managing orders efficiently and the need for seamless error prevention mechanisms.

> "One of the most important parts is the interface to the store." - interview participant 8

In summary, the diverse viewpoints within the "User interface design" sub-category collectively underscore the importance of simplicity, coherence, and efficiency in the system. Participants envision a user-friendly interface seamlessly integrated into existing processes, minimizing unnecessary steps, and providing clear feedback. These insights contribute to the vision of a streamlined and effective same-day delivery system.

7.1.4.4 Communication

Workers express the importance of clear communication and coordination among team members to manage workload distribution effectively. This involves recognizing when additional support is needed and being able to delegate tasks appropriately to alleviate stress and maintain productivity. The recipients mentioned that some sort of communication or status update on who is completing an order and how it is going with that order is important.

Ensuring clear communication with customers regarding order status and wait times is crucial to managing expectations and minimizing potential frustration. Workers aim to provide transparent and timely updates to customers, especially if there are delays or issues with their orders. In cases where items are not available in the store, workers must have the ability to reject or cancel orders promptly to prevent delays and customer dissatisfaction. This requires clear communication with customers regarding order fulfillment.

Lastly, direct communication with system providers, for example, facilitated by having a direct number, was reported to enhance the overall efficiency of the process. One recipient emphasized gratitude for the possibility of contacting and getting help from customer service when something was not working.

7.1.4.5 Error Prevention

Participants shared key perspectives on crucial aspects such as error handling, traceability, and the availability of logs for personnel. A recurring theme was the necessity for a clear system, both in terms of order destination and overall user guidance. Participants provided valuable insights into the challenges they face, emphasizing the need for clarity, effective communication channels, and technology-driven solutions to enhance error prevention in future same-day delivery systems.

Issues related to error prevention varied from product disparities between online and in-store, the absence of a scanner leading to the possibility of selecting incorrect items, and problems with theft, inaccurate stock levels, and time-consuming searches. Firstly when the customer orders products not in stock, causing synchronization issues between store inventory and the Click-and-Collect system, sometimes leads to setting aside orders temporarily, causing delays and potential order rejections. Some stores promptly redirect in-store unavailable items to the e-commerce channel, to optimize service and in some cases prioritize valuable in-store customer interactions.

The recipients emphasize the need for seamless error prevention mechanisms as a role in the system in minimizing errors. This could for example mean allowing the scanning of products before packing and ensuring a swift turnaround time were highlighted as significant advantages.

7.1.4.6 Implementation

Several recipients mentioned that the transition to the current system introduced operational complexities, involving the management of multiple programs simultaneously. Issues with outdated cashier systems were highlighted, emphasizing the misalignment between the old infrastructure and the requirements of effective Click-and-Collect functionality.

> "I think we had a checkout system that was very old" - interview participant 8

The initial thoughts regarding the new same-day delivery system suggest a perception of similarity to existing processes among retail workers. There's an expectation that the new system will operate in a manner familiar to them, with minimal differences in order handling and workflow. Some workers anticipate minor adjustments, such as potentially needing to package items differently, but overall, they do not foresee significant changes in their daily routines or responsibilities.

The recipient's impressions indicate a sense of continuity and ease of integration with existing practices, which could contribute to a smoother transition and adoption of the new system. There's optimism about the potential impact of the new system on both customer satisfaction and business performance. Workers believe that it could be a valuable addition to the retail experience, offering convenience, efficiency, and flexibility to both customers and staff alike.

There's also acknowledgment of the potential benefits for specific customer groups, such as those who prefer to avoid crowds or individuals with accessibility issues. This aspect of inclusivity resonates with workers, who see the system as a way to cater to diverse customer needs and preferences.

One recipient expressed doubts about the demand for immediate delivery, suggesting that customers may not prioritize speed and may be unwilling to pay extra for it. This skepticism extends to concerns about the potential complexity added to the checkout process, which could lead to customer dissatisfaction.

Some worry about the potential stress of managing interactions with delivery operators, especially during busy periods, and the added burden of monitoring orders and coordinating pickups. The wishes and suggestions regarding the new same-day delivery system reflect a desire for improved functionality, efficiency, and ease of use.

In addition, there are reservations about the practicality and effectiveness of alternative delivery methods, such as interaction-less handovers or box systems. Retail workers question the feasibility of these approaches, citing potential logistical challenges, space constraints, and concerns about customer confusion and dissatisfaction. The questionnaire states that, when handing over orders wished for clear feedback

in several steps such as when the operator arrive, feedback on the operator's identification, and lastly feedback when the package has arrived to the end customer. One recipient stated that it could look bad on the store if the delivery was not handled properly.

There's a consensus on the importance of user-friendly design, with workers advocating for features like drag-and-drop lists, minimal data entry requirements, and audible feedback for confirmation. They emphasize the need for tools that integrate seamlessly into existing workflows and minimize disruption to daily tasks.

7.1.4.7 Summary of Factors - Overarching System Pointers

To summarize the previously mentioned information and data that the user studies provided, factors that will assist when developing a future system and more specifically regarding overarching pointers that affect the whole system will now be presented. Interviews with personnel revealed several crucial requirements for the new system. First and foremost, there was a strong demand for clear time frames for order completion to ensure timely deliveries. This aspect is vital for maintaining operational efficiency and meeting customer expectations, showcased previously in the related works chapter.

> "What was a bit tricky was that you had such a short time to fix it when it arrived." - interview participant 1

Additionally, participants emphasized the need for a clear, intuitive, and user-friendly interface. They highlighted the importance of streamlining processes and minimizing manual tasks to reduce workload and enhance productivity. Moreover, ensuring that the system is easy to learn was identified as a significant factor to facilitate quick adoption and effective use by all personnel. These factors would promote everyday life for retail personnel through meticulously designed interactions of the system, improving user experience. As showcased in the related works chapter, interaction and UX design is important to consider.

> "Simple design that is easy to learn as a new user" - interview participant 5

The questionnaire results further supported these findings, underscoring the need for seamless integration of the new system with existing processes and infrastructure. Respondents indicated that compatibility with current systems is essential to avoid disruptions and ensure a smooth transition. This integration is critical for maintaining workflow continuity and leveraging existing technological investments.

The following presents a summary of factors from the part, Overarching System Pointers.

1. Order Time Management - Establishing and adjusting clear time frames for order completion to ensure timely deliveries.

2. System Integration - Seamless integration of the new system with existing processes and infrastructure to maintain compatibility and efficiency.

3. User Interface (UI) Design - Designing a clear, intuitive, and user-friendly interface that works across various devices and screen sizes.

4. Usability and Training - Ensuring the system is easy to learn and use, reducing the need for extensive training.

5. Streamlining and Functionality - Streamlining processes and minimizing manual tasks to enhance operational efficiency.

7.1.5 Summary of Results

The end of this phase was the a requirements and wishes list, which encapsulated the key findings and insights derived from user research and data analysis, see appendix C for entire list. This list outlined the specific needs and desires of personnel involved in order packing, serving as a guide for the development of innovative concepts aimed at addressing these requirements in the subsequent phase.

7.2 RQ 2 - Design Concept

The concept encompasses a user interface that adapts to various screen sizes and breakpoints, as well as a complementary physical bi-product that conveys notifications through visual feedback. Collectively they form the concept Blix Box, see figure 7.9.

Figure 7.9: Overview of concept Blix Box

7.2.1 UI

In this section, a thorough and transparent assessment of the results from the User Interface is provided. For easier understanding of the user journey of the retail employee, the order management system has been divided into three critical process steps: *Receiving Order*, *Handling and Packing Order*, *Handing Over Order*, and a *Overarching System Pointers* which encompasses the whole system. Each subsection reveals how the UI supports the user throughout different phases of the order management process. From the initial order receival to the final handover to an operator, the interface facilitates efficient navigation and task execution. This approach to UI design and functionality aims to deliver a seamless and productive user experience, reflecting the systems capability to address both specific operational needs and broader usability standards. For an overview of the UI visualisations in context, see mockups in figure 7.10.

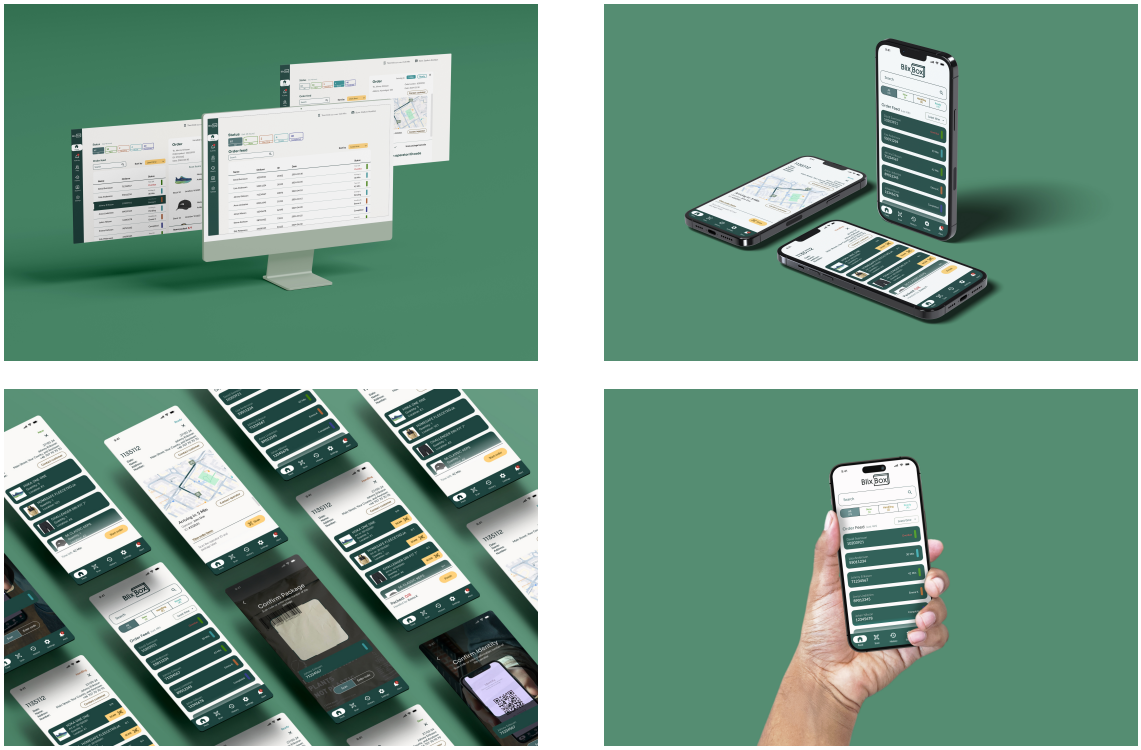
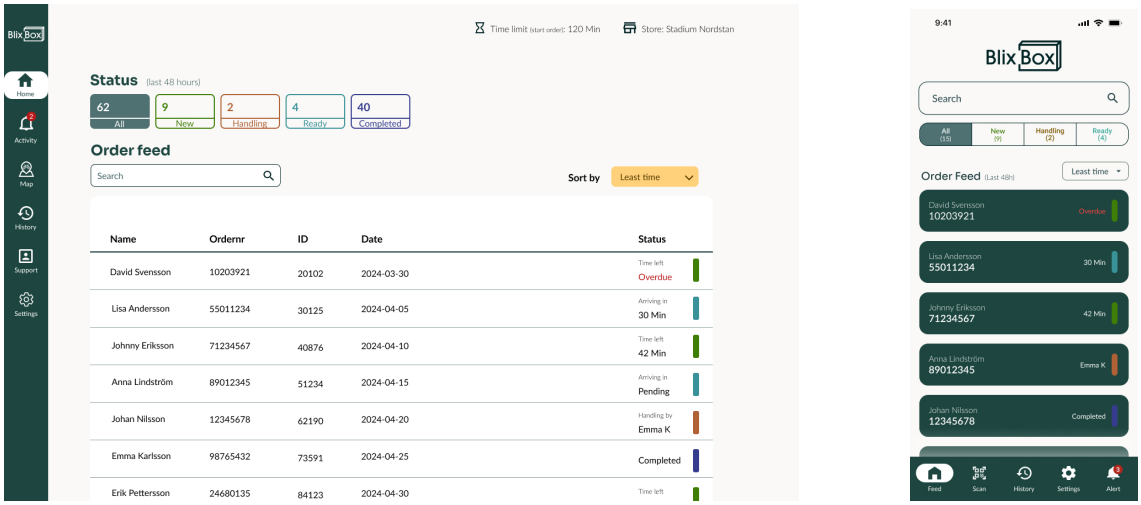


Figure 7.10: UI overview in mockup context

7.2.1.1 Process Step 1 - Receiving Order

In the first phase of the 3-step scenario, named *Receiving Order*, the system aims to streamline the process of order management through a user-centric approach. This process step encompasses receiving notifications, viewing an overview of orders, identifying new orders, accessing detailed order information regarding included items, and initiating order processing. See figure 7.11 for a visualisation of the UI home screen. Drawing insights from comprehensive user research, it became evident that efficient categorization of orders was essential to enhance productivity and facilitate seamless navigation within the system.



(a) Desktop (b) Mobile

Figure 7.11: UI: Home screen

To address this need, we implemented a filtering system in the form of chips under the headline *Status*, allowing users to effortlessly sort and categorize orders based on predefined parameters, see figure 7.12. Each order is assigned a distinct status, which is visually represented through color-coded indicators within the filtering system. Additionally, supplementary information associated with each order further aids in distinguishing between different categories, thereby minimizing cognitive load and optimizing decision-making processes for users.

(a) Desktop (b) Mobile

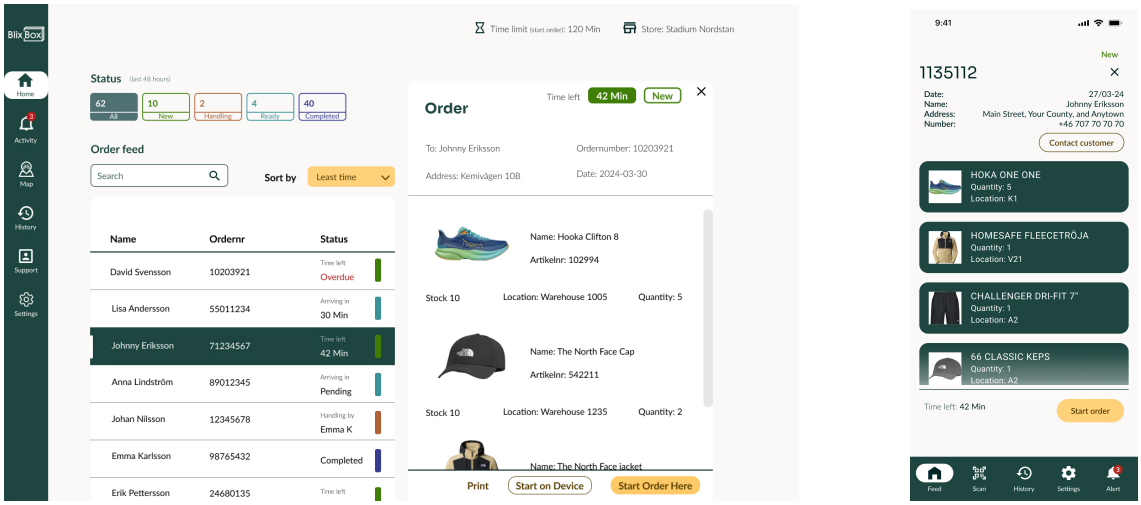
Figure 7.12: Category filtering system

Furthermore, to enhance accessibility and assist order retrieval, a search bar feature was integrated, enabling users to quickly locate specific orders based on relevant keywords or identifiers. Complementing this functionality is the *Sort by* option, which empowers users to prioritize orders based on various criteria, such as urgency or recent activity. Based on user feedback from the evaluation session, the default is set to *Least time*, showcasing orders in a ascending time fashion. This dynamic sorting capability enhances user control and customization, aligning the system with diverse operational preferences and requirements.

On the web application, at the interface's topmost section, crucial contextual information is prominently displayed to provide users with essential guidance and situational awareness. This includes a designated time limit, offering a clear overview of the available packing time frame and enabling employees to effectively manage their tasks within established deadlines. This time limit is adjustable and determined by the store, upon many wishes from the user research. Additionally, the indication of

the current store within the system reinforces user confidence and reassurance, ensuring alignment with operational objectives and minimizing the likelihood of errors or confusion.

Upon accessing a new order within the system, users are presented with a comprehensive overview of pertinent information to facilitate efficient processing and fulfillment, see figure 7.13. On the web application it is presented as a new pane, creating a two-pane window with the overview of orders being minimized and the order information taking focus. On the mobile application it can be seen as a new window, with the ability to back-track to the initial home/overview page. Central to this display is detailed customer information, including the customer's name, address, order number, and date of submission. This contextual data serves as a reference point for users, enabling them to accurately identify and associate orders with respective customers, thereby fostering personalized service and communication.



(a) Desktop (b) Mobile

Figure 7.13: UI: New order selection screen

Furthermore, each new order is categorized, providing users with clear organization within the interface. The status of new orders is dynamically indicated, with a prominent display of the remaining time available for processing, denoted as *time left: xx min* or *Overdue* in cases of exceeded time limit. This real-time countdown mechanism serves as a visual cue for users, highlighting the urgency and priority associated with each new order and enabling proactive management of packing and handling tasks.

In addition to customer details and order status, the contents of the order are meticulously documented, offering a comprehensive breakdown of items and quantities requested by the customer. Each item is accompanied by essential information, including its location within the store or warehouse, article number, and a visual representation in the form of a picture. This rich contextual data equips users with actionable insights, facilitating efficient retrieval and fulfillment of ordered items while minimizing errors and discrepancies.

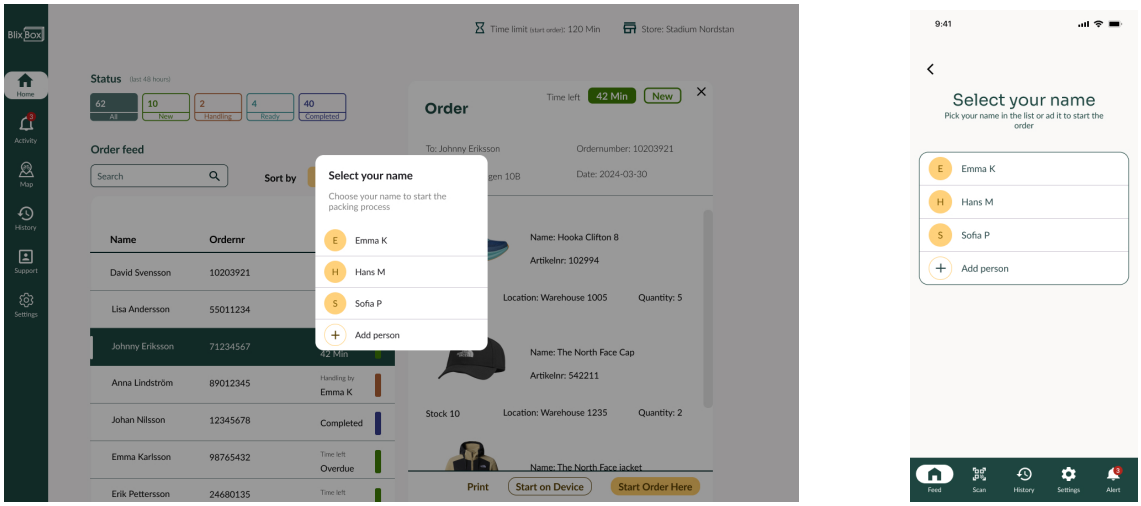
Empowering retail personnel to seamlessly navigate and execute order processing tasks, intuitive user interface elements are strategically positioned, allowing for streamlined workflow management. Upon reviewing the order details, users are presented with interactive buttons that enable them to initiate the order processing workflow with a single click. The web application also gives the option to *print* an order list, as well as "start on device" which allows the user to continue the order handling on the mobile device. The buttons appearance have been designed in accordance with their importance in the choice hierarchy from the users perspective. This intuitive interface design promotes efficiency and reduces cognitive load, empowering users to focus on executing tasks effectively and expeditiously.

By incorporating these features and design considerations into the *Receiving Order* phase of our system, we have effectively addressed key user needs and operational requirements, fostering efficiency, accuracy, and user satisfaction within the order management process. This user-centric approach serves as a cornerstone for the subsequent phases of the scenario, laying the groundwork for a cohesive and intuitive user experience across the entire system interface.

7.2.1.2 Process Step 2 - Handling and Packing Order

In the phase of *Packing and Handling Order*, the system facilitates a seamless transition from order receival to efficient handling, ensuring clarity, accountability, and effective communication throughout the process.

Upon initiating the order by pressing *start order*, users are directed to select their name from a predefined list, alternatively, they have the option to add their name if not present, establishing a clear association between the user and the order for future reference. See figure 7.14.



(a) Desktop (b) Mobile

Figure 7.14: UI: Person handling order screen

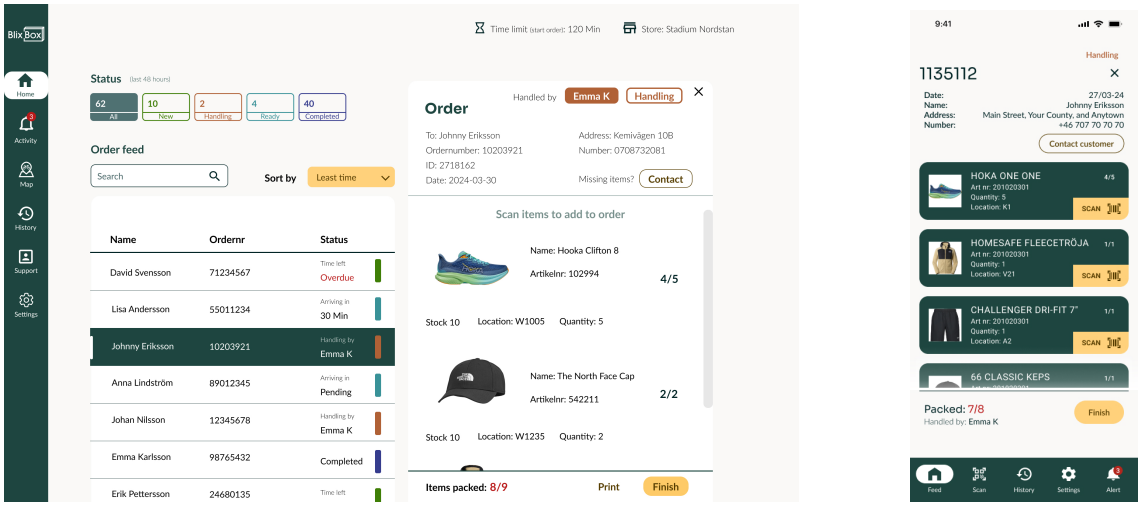
As the order enters the *handling* status, visual cues within both the order feed and order info are employed to signify this transition, see figure 7.15. Changing in color

and status not only enhance user awareness but also streamline the monitoring of order progress.

Furthermore, the system enhances customer communication by integrating a feature to directly contact the customer from the order info interface, particularly beneficial in cases of discrepancies due to inventory inaccuracies. The button utilizes a colour which has a low hierarchy to maintain focus on the ordered items.

To ensure accuracy in item handling, the system provides a clear overview of scanned versus ordered quantities for each item. This information is prominently displayed, aiding users in fulfilling orders accurately and efficiently.

For item scanning, the desktop version offers a straightforward directive, while the mobile version employs intuitive design elements such as dedicated scan buttons with a distinct visual hierarchy by using the secondary colour, yellow, optimizing user interaction.



(a) Desktop (b) Mobile

Figure 7.15: UI: Ongoing order screen

Upon engaging with the scan button within the mobile interface, users are redirected to a dedicated screen featuring a camera overlay, see figure 7.16. Positioned at the center is a target area designated for aiming the product barcode. Within this interface, users can view the selected item along with the desired quantity.

Additionally, the system offers feedback mechanisms to mitigate errors in the order completion process such as scanned quantity on each item and a prominently displayed total item quantity at the bottom, promptning users to take necessary actions. The desktop version includes the option to print orders, adding flexibility without compromising efficiency.

In the event of missing items, whether stemming from discrepancies or errors, the system presents an error prevention screen alerting users to the missing items, see figure 7.17. Users are given the option to proceed with the order despite the unfulfilled quantity, thereby notifying the customer of the missing items while still

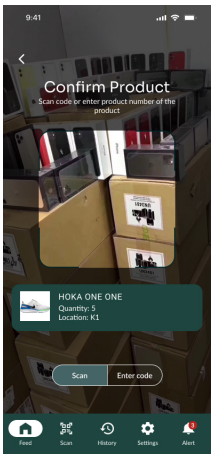
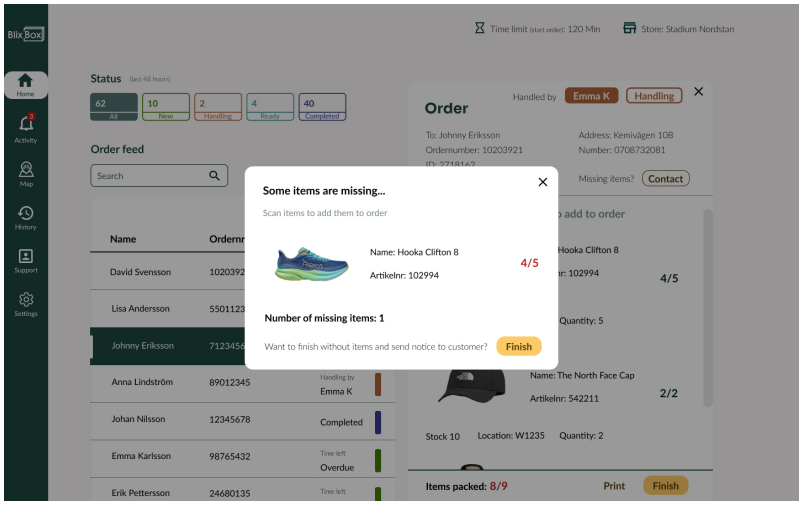
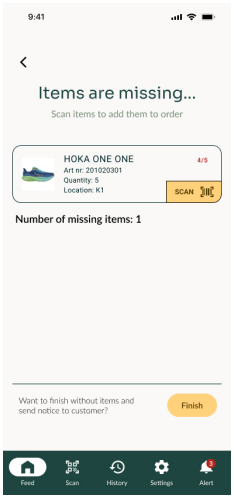


Figure 7.16: UI mobile: Scan barcode screen

finalizing the order. Alternatively, they can opt to contact the customer directly to address the issue, ensuring proactive communication and customer satisfaction.



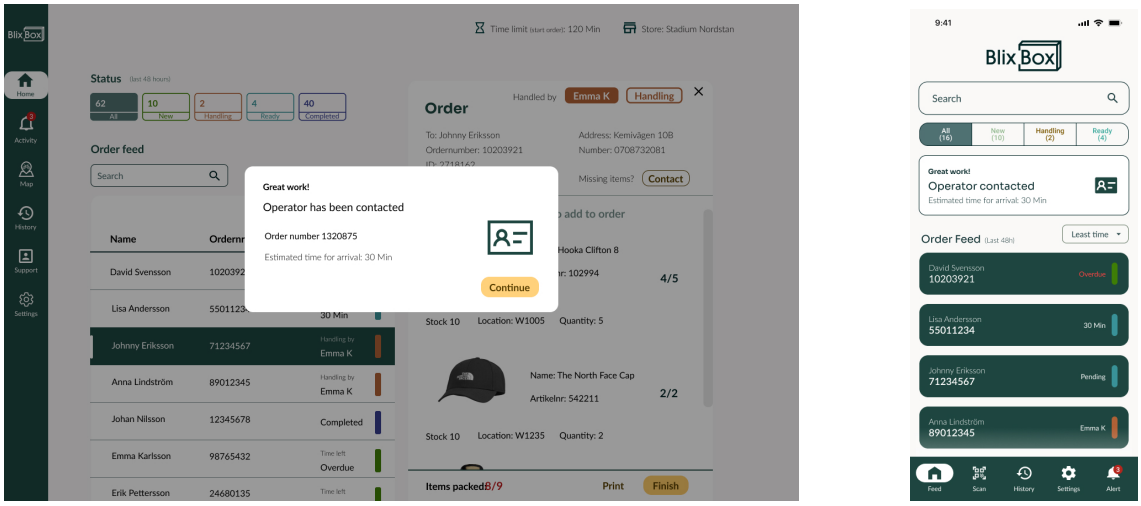
(a) Desktop



(b) Mobile

Figure 7.17: UI: Missing items screen

Upon completing the order packing and scanning process, users are greeted with positive reinforcement through a notification acknowledging their efforts, see figure 7.18. This notification simultaneously informs users that an operator has been notified, indicating that the package is prepared for pick-up, along with an estimated time of arrival. Subsequently, the system broadcasts a notification to nearby operators, offering them the opportunity to accept the order and facilitate its delivery to the customer.



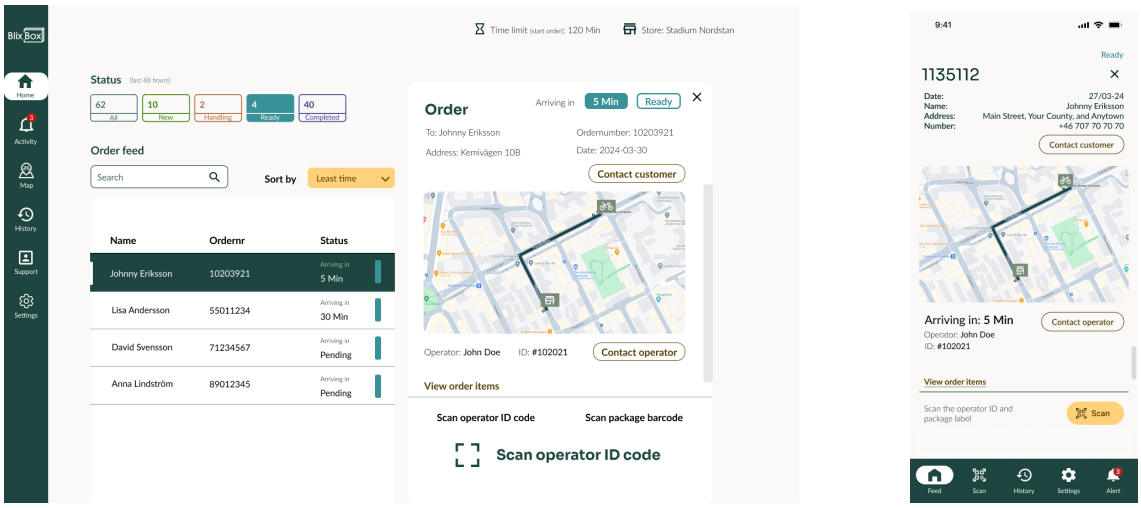
(a) Desktop (b) Mobile

Figure 7.18: UI: Ready for pick-up notification

7.2.1.3 Process Step 3 - Handing Over Order

In the last phase of the order processing journey within our UI framework, the "Handing over order" phase acts as a pivotal point where seamless communication and intuitive functionality converge to enhance user experience. Through meticulous design and iterative refinement, this phase showcases a smooth exchange between the operator and the user, ensuring efficient coordination and transparency throughout the final part of the transactional process.

Central to the interface's effectiveness is the visualization of order status within the order feed, allowing for easy information retrieval and quickly differentiating the various orders. Upon completion of the previous steps, the order transitions to a "ready" status denoted by a distinctive bright blue colour, signaling its readiness for pick-up, see figure 7.19. If the order hasn't been accepted yet, it's labeled as "Pending". Once an operator accepts it, the feed shows how many minutes until the they arrive.



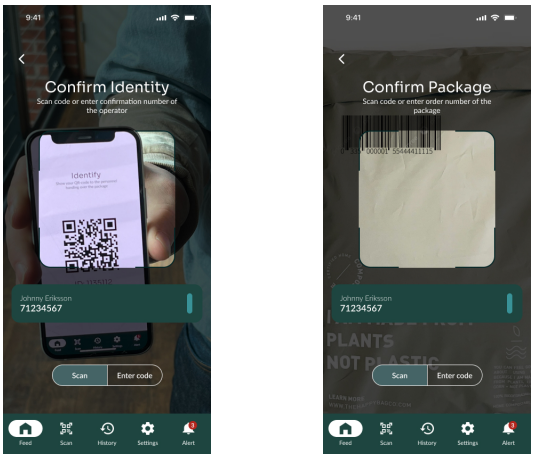
(a) Desktop (b) Mobile

Figure 7.19: UI: Ready for pick-up screen

Conveniently, the interface facilitates real-time monitoring of the operator's proximity through an integrated map feature, seamlessly embedded within the order information interface. Empowered with location data, users gain visibility into the operator's trajectory as well as the stores position, thereby showcasing the process with a tangible sense of time pressure. To complement the map, notifications serve as reminders at essential time points, alerting users at critical junctures such as the operator arriving in 5 min or arrival at store, thus enabling timely preparation and minimizing potential delays.

Similar to the customers information section, the operator's identity and estimated time of arrival are prominently showcased beneath the map interface. Alongside this information is a button with the ability to contact the operator regarding any issues.

Alongside with the previously mentioned features, the interface streamlines the finalization process through intuitive scanning mechanisms, tailored to the affordances of desktop and mobile platforms. The latter Utilizes QR code technology where users seamlessly authenticate both the operator and the package, see figure 7.20, thereby beginning the transition to a conclusive *complete* status. Notably, while the desktop interface includes *complete* as a filtering category on the home screen, the mobile counterpart integrates this functionality within the history section, treating it as less prioritized in the hierarchy of information.



(a) Mobile (b) Mobile

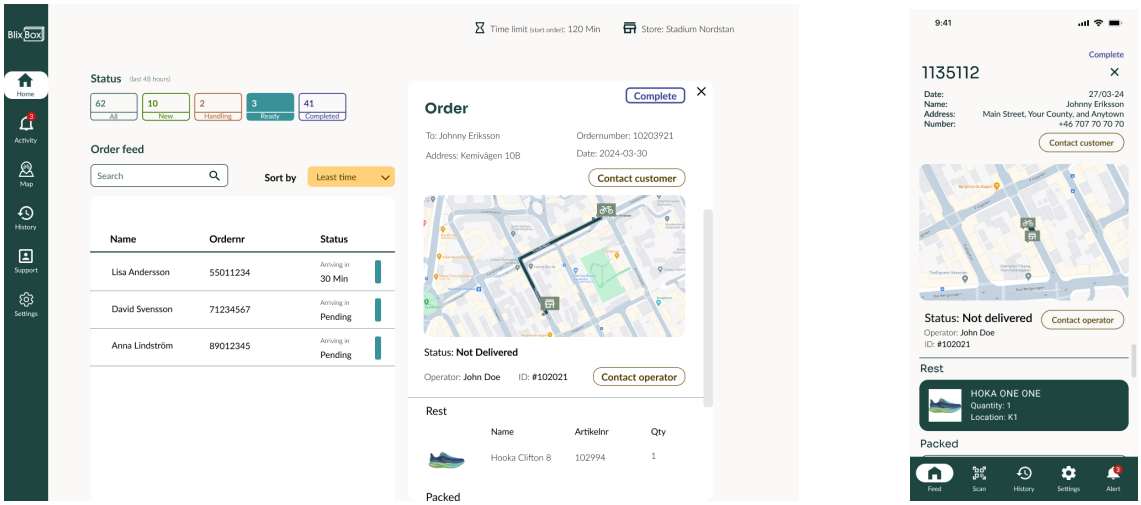
Figure 7.20: UI mobile: Authenticating screen

After the package leaves the store and the order is marked as *complete*, users can access the order to check important details, see figure 7.21. This includes the delivery status, the operator's location if the delivery hasn't been completed yet, the packed items, and the user who handled the order. This acts as a central source of information for future reference or in case any errors arise.

7.2.1.4 Overarching System Pointers

In developing the user interface (UI) for both the mobile and web platforms of our project, comprehensive design decisions were made to ensure a seamless user experience that aligns with the corporate identity of the collaborating company. These design choices encompass a broad spectrum of elements from color schemes and typography to the forms and navigation systems used across different device formats.

The color palette was meticulously selected to reflect the brand's visual identity while ensuring optimal usability across various application contexts, see figure 7.22. The primary color, a dark green, provides a robust visual anchor, complemented by a vibrant yellow as the secondary color and a soothing light green as the tertiary. The background color was chosen as off-white to enhance readability and ease of use. These colors were applied thoughtfully in contexts such as *on-primary* or *on-secondary* to achieve high contrast and legibility according to color theory, thereby maintaining a consistent design identity.



(a) Desktop (b) Mobile

Figure 7.21: UI: Completed orders screen

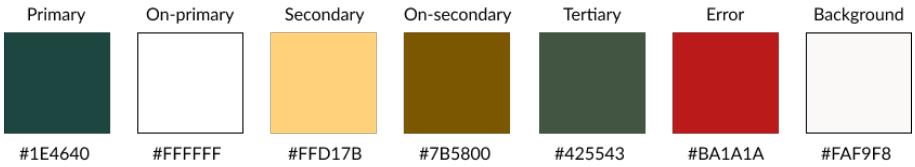


Figure 7.22: Colour profile

Typography in the UI was approached with similar strategic consideration. Two typefaces, Sora and Lato, were chosen for their distinctive suitability to different text functions within the interface, see figure 7.23. Sora for headers and titles and Lato for body text and subtitles. This decision supports visual hierarchy and textual clarity, integral to guiding user interactions smoothly and efficiently.

(a) Desktop (b) Mobile

Figure 7.23: Typography selection

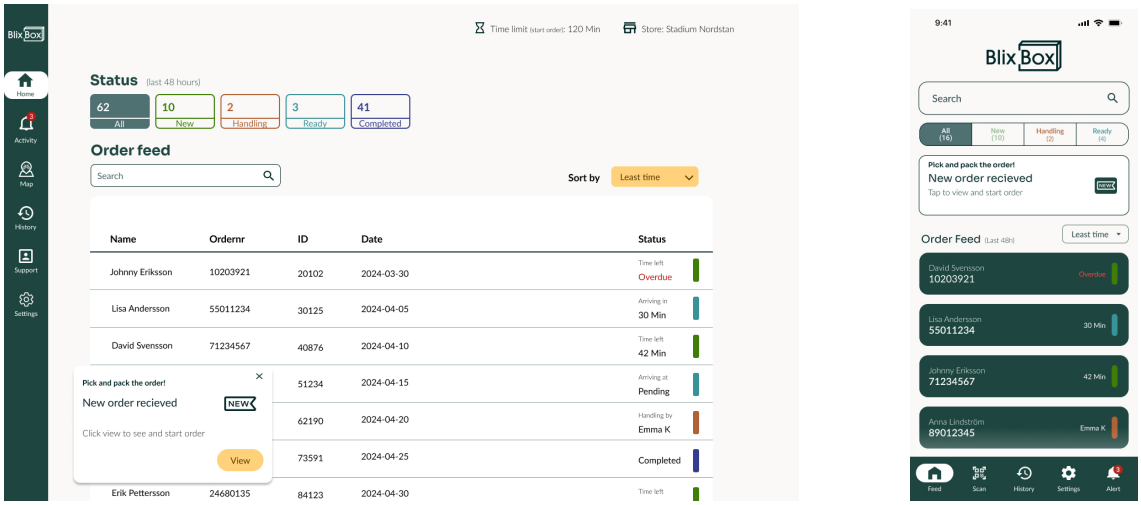
The UI's form design features rounded corners for all interactive elements like buttons and input fields. This choice not only modernizes the aesthetic but also creates a friendly and approachable environment across platforms, enhancing user comfort. Originally the two versions had different styles but insights from the user evaluation pointed towards being consistent across all devices for a more holistic feel. This was thereafter changed in the design iteration.

Icons play a critical role in the navigation and overall user interaction, chosen for

their ability to convey function quickly and intuitively. The incorporation of well-designed icons helps in reducing cognitive load and speeding up user task completion.

In the user interface development, particular attention was given to the notification system, designed to enhance user engagement and satisfaction through timely and relevant updates. See figure 7.24 for the placement of notifications on the two devices. The three key notifications integrated into the system are *New order received*, *Operator is arriving in 5 minutes*, and *Operator has arrived*, see figure 7.25. These notifications are critical as they not only inform but also reassure users at each crucial step of the process.

Originally, while the notifications were clear and fulfilled their informational purpose, user feedback suggested a lack of fulfillment upon receiving these alerts. This insight emerged from a user evaluation where users expressed that while the notifications were effective in communication, they did not contribute significantly to a sense of achievement or positive reinforcement, which are vital for sustained user engagement and satisfaction. To address this issue, we iterated the design of the notifications to include text with more positive feedback.



(a) Desktop (b) Mobile

Figure 7.24: UI: Placement of notifications example

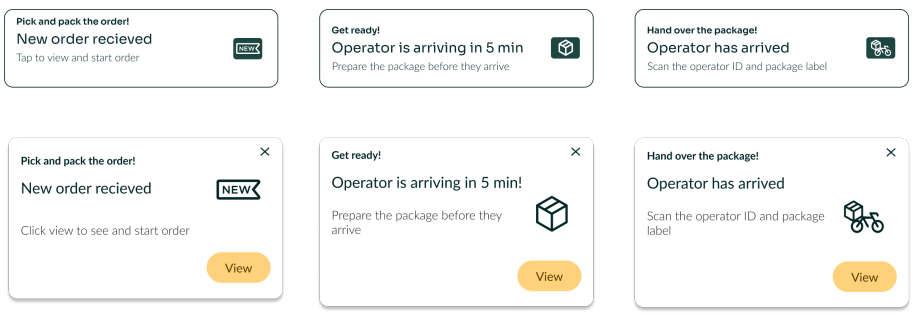


Figure 7.25: Notifications: Top - mobile, Bottom - Desktop

Navigation was carefully tailored to the device contexts. The mobile UI employs a simplified navbar to accommodate the limited screen size, focusing on essential functionalities. In contrast, the desktop version utilizes a more comprehensive navbar, which accommodates additional options appropriate for the broader display and enhanced capabilities of desktop environments, see figure 7.26. This approach has been applied throughout the UI for the different screen sizes, ensuring that the mobile version remains uncluttered and direct, while the desktop interface can afford to provide expanded functionality and information.

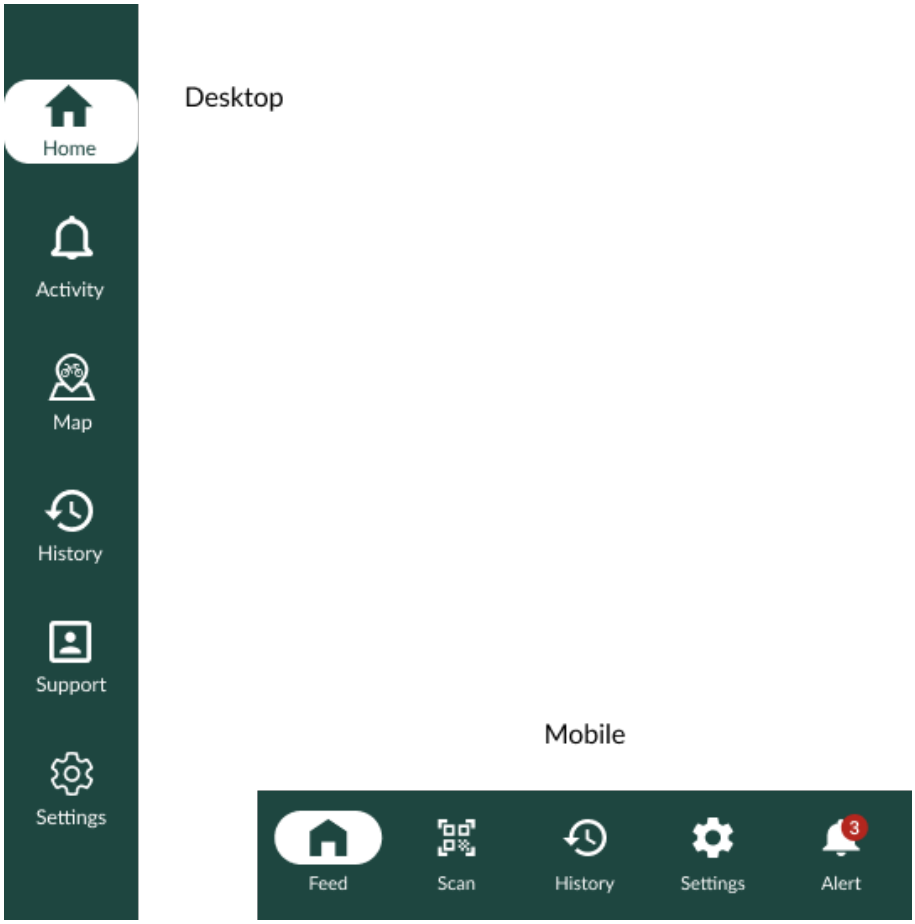


Figure 7.26: Navigation bar: Left - Desktop, Right - Mobile

Despite the differences necessitated by device type, there is a strong emphasis on maintaining consistency across both mobile and desktop versions. This is evident not only in the visual designwhere the same colors, typefaces, and icons are usedbut also in the uniformity of the scenarios and process steps displayed. Such consistency is crucial for enhancing user recognition and learning, making transitions between mobile and desktop platforms as seamless as possible.

Overall, the UI design for both platforms has been crafted with a keen eye on brand alignment, user-friendliness, and functional adaptability, ensuring that all users, regardless of the device they choose, experience a coherent and engaging interaction with the system.

7.2.2 Physical Product

The implementation of the physical product concept aimed to complement the existing system and User Interface, enhancing the overall user experience for personnel. Through a process of sketching and brainstorming, key functions were identified, including alerting personnel to new orders or that there is operator waiting, facilitating operator-to-personnel communication, and providing quick access to order status. A context render of the bi-product, on a retail store counter, can be viewed in figure 7.27

Figure 7.27: Bi-product context render: Placed on a counter

The first solution devised was a light alert system. Feedback from interviews and questionnaires revealed a preference for non-disruptive alerts, with one participant suggesting a disco light as an effective solution. Inspired by this feedback, a lamp resembling a bike light was developed, capable of signaling different alerts with various colors. Multiple lamps can be distributed, see figure 7.28, throughout the store to ensure personnel awareness regardless of their location, thus preventing missed orders and reducing waiting times.

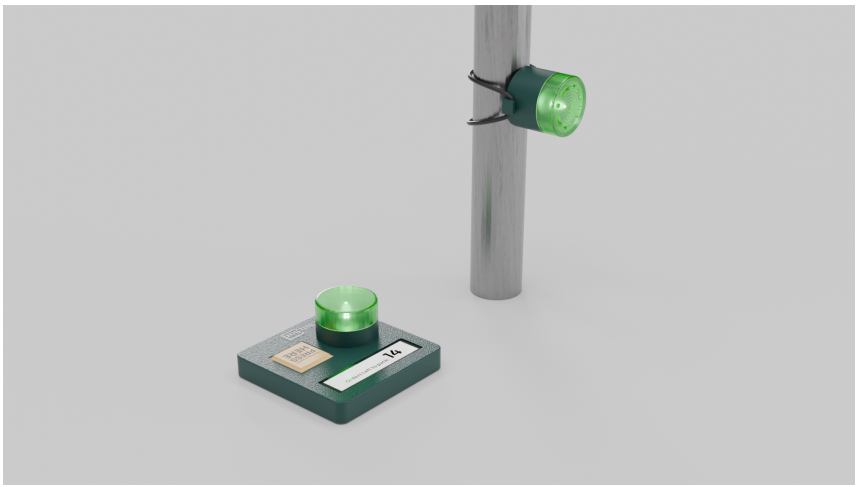


Figure 7.28: Bi-product context render: Extra light on a pole

For operator-to-personnel communication, a button was implemented. When pressed, the button activates the lamp, notifying both personnel and devices throughout the store. Clear complementary text guides the user, ensuring ease of operation.

To provide personnel with quick access to order status, a display was designed. The display, allows personnel to instantly see the number of orders awaiting processing, improving clarity and efficiency without the need to open additional software. The screen has taken the "New order" status from the user interface and presents it to the user.

The physical product complements the existing system and User Interface, following the same color schedule, seamlessly integrating into the store environment. Its functionality enhances communication and efficiency for personnel, ensuring a streamlined workflow at the store counter.

8

Discussion

This section will elaborate on what worked and what was challenging, whether our findings are aligned with user needs or not, and with existing literature and related work.

8.1 Result and Research Questions

The aim of this project was to explore the two proposed research questions by utilising different research and design methodologies. How well they were examined within the projects result will be discussed in the following paragraphs.

What are the factors for a successful and satisfying performance of the activity packing orders in-store, whilst maintaining a high level of customer service towards visiting customers?

The first research question aims to answer the requirements and wishes for personnel regarding how to process picking and packing orders whilst do other more traditional in-store tasks, as well as investigating which factors might lead to frustration and challenges for a future system.

This question was approached with comprehensive user research and data analysis. The distribution of interviews aimed for diversity in gender, age, and experience levels, ensuring a broad range of perspectives. Various analysis methods, including thematic analysis, quantitative analysis, and journey mapping, were employed. While some methods, such as Hierarchical Task Analysis (HTA) and journey mapping, may have been extensive, they did contribute valuable insights into requirements and wishes. Overall, the results provided a solid foundation for developing a concept to improve order packing processes.

Different challenges occurred throughout the first phase of the project. For starters, when trying to investigate how current Order Management Systems (OMS), work and look like. Stores and personnel showed hesitation towards showing their systems. This resulted in relying on the systems that could be found online through research. Finding participants to answer our questionnaire turned out to be challenge. We tried various methods such as calling, emailing and posting on different social medias. In the end we got a amount of responses that we were able to analyse and get a comprehensive result from.

How could the resulting insights be visualized in a concept implemented in order to enhance order picking and handling?

This part of the project led to an ideation phase characterized by extensive brainstorming and sketching based on user research findings. Stakeholder input, including feedback from the company, was incorporated into the concept iterations. Departing from the conventional approach of focusing solely on a user interface, the team opted to create a physical product to complement the UI, driven by user feedback emphasizing the need for clear order notifications.

The final concepts were meticulously developed, with high-fidelity visuals lending realism to the proposed solutions. However, while the concepts were well-defined, there is a recognition of the need for more comprehensive evaluation to ensure all user needs and demands are met. Despite this, the project outcomes exceeded initial expectations, providing valuable insights and potentially transformative solutions for order packing processes in-store.

The process of creating a User Interface was complicated but rewarding. It felt natural to imagine that the design were going to be obvious to conceptualise, although, new functions, fields or information occurs during the process. We realised after creating the first Low-fidelity prototype that the system is bigger and more demanding then we thought. Small details and pointers is constantly fixed. Gathering information from the Google M3 guidelines proved to be helpful when creating all the components.

Something quite unexpected and interesting was the discovery of the possibility to add a physical bi-product to the system. In the beginning of the project we envisioned that the result would be a stand alone User Interface. The discovery turned out to be successful and integrated into the system with ease.

This phase of the project went on quite fluently and without any big challenges. The main and possible the only challenge was time limitations and the possibility to recruit participants for evaluation before the next step of the project had to be initiated.

8.2 Physical Bi-product

The addition of physical bi-product stemmed from insights given by participants in the user study. A clear and obvious mechanism for feedback when a new order has arrived was desired. The implementation of a complementary product to the system could eliminate the active monitoring of incoming orders, missing operators when they have arrived or loosing orders in the system. The necessity of the physical product could although be questioned since the Company only investigate digital solutions and does not primarily work with physical products. The fidelity of the physical concept should also be taken to consideration since no evaluation has been performed on its functionality.

8.3 Participants

The amount of participants in the evaluation process plays a crucial role in obtaining comprehensive and representative feedback. In our study, we aimed to have a similar number of participants as in the interviews conducted earlier. Initially, we invited 9 individuals, and while 6 responded positively to participate, only 4 attended the evaluation sessions.

The question arises whether this number is sufficient for a thorough evaluation. Despite the 4 participants providing consistent feedback, the limited number left us wanting more diverse perspectives. Consequently, the completeness of the iteration made after this evaluation could be called into question due to the insufficient sample size.

To address this limitation, we decided to conduct another evaluation later in the process. This time, we focused on a specific aspect that had raised numerous questions among the participants from the initial evaluation. The second evaluation involved 5 participants, allowing for a more focused examination of the concerned area. The feedback obtained from this additional evaluation will be presented in future work, and it is anticipated that another iteration of the concept could be developed based on the insights gained.

8.4 Related Works

The following will handle the relationship between the related works and the result from this project.

8.4.1 Same-Day Delivery

Data gathered from the user research in this project confirms Salehs [17] statement that same-day delivery has emerged as a pivotal focus, expanding beyond food services to encompass a diverse range of products in traditional retail stores. The interviews and questionnaire stated the implementation of a same-day delivery system is the future and even in some cases, already being a part of the current system. Talking to personnel gives the perception that they are prepared for it and some even states that it would not be that different from how the system operates in the moment. Saleh provides the view of the customer and their desire for same-day delivery and our result explains how personnel working with the orders have the same perception.

Voccia et. al. expressed how [18] the key factors that contribute to problems with same-day delivery for online purchases include the need to meet time constraints, the uncertainty of future requests, the need to optimize routing decisions, and the potential need to involve third-party delivery services. Time constraints has been a large talking point in our research. Personnel mentioned multiple times how the time was uncertain and that this caused stress. Not knowing when the operator would arrive or how much time they had to prepare the order before it was cancelled or sent

to another store contributed to a stressful environment. The two people working at the head quarters of one store talked about how difficult it could be to involve third-party delivery services and how they mostly wanted to keep it in-house, as well as they acknowledged that third-party services was necessary for the system to operate correctly.

8.4.2 Cognitive Ergonomics

Hollnagel [12] suggested that a big concern within cognitive ergonomics is lowering the risk of unwanted outcomes and also the impact if such outcomes do occur. Although unwanted outcomes is a broad section, our concepts have aims to eliminate as much of the plausible amount of unwanted outcomes that could occur in the system. Focusing heavily on error prevention creates a clear and effortless way of troubleshooting. Finding a balance between implementing only the most necessary functions and preventing errors was difficult and in some cases we had to compromise. Wickens [13] expresses that in order to optimize the quality of work, it is essential to break down the cognitive tasks the user must perform and making the process of completing an order as streamlined as possible was a major focus.

8.4.3 Technology and Mobile POS

The decision to implement the User interface on a mobile device was discussed heavily. At first the possibility of implementing it on a Zebra hand scanner felt like the most reasonable choice since it was used by multiple stores. Extended research provided the realisation that the Zebra scanner had its limitations and might be outdated. The questionnaire showed that mobile devices also was a common device and Grewal et. al. [21] stated that mobile devices and applications have become essential tools for retailers to deliver personalized offers, facilitate mobile payments, and engage with customers throughout their shopping journey. Getting an understanding how mobile POS systems are designed and implemented can provided insights into integrating our concepts technology for efficient and effective operations in a same-day delivery system which Lestariningati also stated[19].

It was further clear that technology was under development and that new systems was continuously tested in stores, with different ways of proceeding inventory, delivery or other important services. This was again supported by Shankar et. al. [20] who stated that shoppers are nowadays more engaged in omnichannel and multichannel shopping, utilizing services such as click-and-collect, mobile check-in, and mobile payment.

8.5 Ethical Problems

During and before the project started, some ethical concerns and pointers was presented. It is highly important to take these into consideration when performing a project of this kind and when creating a concept or product that will effect a system, whether it is on the smaller or larger scale.

8.5.1 Sustainability

There is a concern regarding the sustainability in a system that revolves around same-day deliveries. Therefore it is vital that the system design is meticulous and takes aspects such as environmental impact, consumerism, and urban congestion into consideration.

Since same-day deliveries require rapid transportation which makes it essential to be aware of the carbon emission of traditional vehicles that contribute to worse air quality within urban areas [49]. However, opting for more modern and eco-friendly transportation alternatives can therefore be beneficial in this problem. Noise pollution is also a factor that can affect the life quality of citizens within an urban environment, if more vehicles are placed in traffic [49]. Increased urban congestion may also lead to more limited roadspace, which can affect public transport and raises concerns regarding well-designed urban planning. The coexistence of various road users within urban streets introduces safety considerations, particularly for vulnerable groups such as pedestrians and cyclists [49].

Being aware that a new system that offers same-day deliveries can affect consumerism behavior and advocate overconsumption [50]. The convenience of same-day deliveries can encourage impulse buying and overconsumption, contributing to a throw-away culture and to a linear economy rather than a more sustainable circular economy [51]. Increased consumption often results in higher levels of waste, putting additional pressure on waste management systems [52].

8.5.2 Ethics in User Studies

Ethical aspects play a crucial role in the execution of the user studies in this project, particularly in the chosen methodologies. These concerns include obtaining informed consent, confidentiality, and transparency.

Acquiring informed consent in the beginning of the study from participants is important to respect their right to self-determination [53]. An informed consent form can be employed, if necessary, to communicate this information, allowing participants to sign it before participating in the study [53]. This was heavily considered when performing the questionnaire, interviews and observations, to ensure that the participants felt respected and gave consent to use their opinions. Mortensen states that, if there is a risk of disclosing private information, limiting the number of participants at a given time is advisable [54].

The participants involved in the various methods must be informed about the significance of their involvement and how the potential data will be stored. Following the General Data Protection Regulation (GDPR) is essential, especially when dealing with participants providing personal and sensitive information [55]. In our project, it was made it clear how the information would be stored and what purpose it would be used for. In user studies, participants should be informed about the tasks they will perform, the conditions under which data will be collected, and the subsequent handling of the data [14]. It was made sure that, before the different types of user studies, a short introduction was written. This was then read out to the

participants to ensure that they understood what was happening. Additionally, participants should be assured that their opinions and private information will not be forwarded to interested parties[14] and in this project we stated that the information was for research purposes only and would not be disclosed to anyone.

Mortensen explains that in the study report, quotes from participants should be presented verbatim, alongside information about the number of individuals expressing similar opinions [54]. Quotes has been important to explain the result from the project and has been handled delicate to ensure it is presented correctly. This approach ensures the accurate representation of participant perspectives while upholding ethical standards. Video or audio recordings are and was solely used for analyzing or transcribing to gain a deeper understanding.

To meet the ethical standards in user research requires committing to being honest and clearly communicating the research purpose to participants [54]. Also, emphasizing participants rights, including the option to quit any time, is essential [14]. A critical aspect of user research is anticipating how participants might perceive specific situations such as during testing with prototypes [54]. Individuals may become nervous, which underscores the importance of alleviating any pressure of the participants beforehand [54].

8.6 Is Same-Day Delivery Wanted?

The discussion surrounding the desirability of same-day delivery presents varying perspectives from both customers and retail personnel.

The head of sales expressed skepticism regarding the demand for same-day delivery, suggesting that people are generally not in a rush to receive their items and are reluctant to spend extra money for faster delivery. Furthermore, there is a preference for alternative methods such as booking and pick up. The perceived inconvenience of same-day delivery was also highlighted as a potential drawback from a managerial standpoint.

> "People are not in such a hurry to get things" - interview participants 5

Conversely, the overall attitude among store personnel tends to be positive or neutral towards same-day delivery. They view it as a service of the future and appreciate the luxury of having items delivered to their homes. Observations made during the pandemic underscore the importance of such services, especially for vulnerable populations like the elderly.

> "I can imagine it feels like it's very much the future." - interview participants 6

Supporting these qualitative insights are quantitative findings. Saleh (2018) indicates a growing desire among online shoppers for same-day delivery services, with nearly half expressing increased interest in online shopping due to its availability. Our questionnaire results align with this trend, showing that 46.7% of participants view same-day delivery as a great idea. While a significant portion (20%) disagrees,

there is also a notable percentage (16.7%) who are neutral or slightly positive about it.

In conclusion, while opinions on the necessity and feasibility of same-day delivery may vary, there is a substantial portion of both customers and retail personnel who see value in its implementation.

8.7 Conflicting Requirements and Functionality

The discussion on conflicting requirements and functionality reveals several challenges encountered during the development and implementation of the proposed system. These conflicts primarily arise between different stakeholders involved in the process, as well as within the requirements and desires of the system itself.

One conflict arises between in-store personnel and the store owner regarding the installation of cabinets for storing and automatically handing over packages in the store. While the personnel see the benefits in terms of streamlining package handover processes and having dedicated storage space, the store owner may view this as valuable display space that could potentially increase sales. Additionally, tensions arise during peak seasons or campaigns when stress levels are high, as the store owner may prioritize maximizing orders while personnel may seek the ability to pause the system to manage workload.

Another conflict arises between in-store personnel and the operator regarding decision-making processes for package pickup. Determining who decides the time span until arrival can be challenging due to various factors at play, leading to ambiguity and potential inefficiencies in the system.

Similarly, conflicts can arise between in-store personnel and customers regarding delivery times and cancellation policies. While customers may desire more flexibility and choice in delivery times, personnel may struggle to accommodate these requests, especially during busy periods. Discussions around cancellation and pausing the system may further exacerbate tensions between these parties.

Internally, the system faces conflicts between requirements for efficiency and error prevention. Balancing the need for speed with the need for accuracy presents a difficult decision-making process. Ultimately, the assumption was made that both personnel and customers prioritize order correctness to avoid returns or customer dissatisfaction, even if it means adding extra steps to the process.

Addressing conflicting requirements and functionalities in the proposed system requires careful consideration of the needs and perspectives of all stakeholders involved, as well as finding a balance between efficiency, functionality, and user satisfaction.

8.8 Future Work

Due to time limitations, the feedback from the Heuristic evaluation will serve as guidance in eventual development of the concept. Based on the result from the

project as well as the previously mentioned feedback from the heuristic evaluation, the project can be further developed and next follows suggestions on how.

8.8.1 Heuristic Evaluation Feedback

The results obtained from the heuristic evaluation have provided valuable insights into potential areas for improvement and development in the future. Participants highlighted several key points, including the need for a way to input package size to ensure compatibility with various delivery methods and vehicles. Additionally, concerns were raised about the absence of operators and the ability to cancel and reassign orders in such instances.

One significant suggestion from the evaluation was the desire for a more interactive prototype, as participants believed it would provide a clearer understanding of the project. Therefore, the next step in the project's evolution involves creating a more interactive prototype to be evaluated with both new and additional participants. This iteration aims to address the identified concerns more effectively and gather further feedback for refinement.

8.8.2 Next Steps

Furthermore, it is suggested that the next evaluation takes place in the envisioned operational environment, likely within the store itself. Conducting the evaluation while personnel are working will provide invaluable insights into how the system operates in real-world scenarios and allow for more accurate assessment of its effectiveness.

Following the evaluation of the interactive prototype and its validation in the store environment, the final phase involves coding and integration into existing systems, such as Android or iOS platforms. This step ensures that the developed solution can be seamlessly integrated into the daily operations of the store and accessed by both personnel and operators.

Focus in the next steps could pivot towards the physical bi-product. Performing evaluations and testing with the potential users to investigate the requirements and wishes regarding a complementary product to the system.

In summary, the future work will focus on refining the prototype, both the UI and the physical product, conducting evaluations in the store environment, and ultimately implementing the solution into existing systems to improve order handling processes effectively. These steps will address the identified issues and further enhance the efficiency and functionality of the developed concept.

9

Conclusion

Throughout this project, we have delved into the intricate details of the factors that personnel require for a future same-day delivery system, exploring its various facets, challenges, and implications. The following chapter will present the conclusion of the journey.

9.1 Conclusion

The aim of this thesis was to investigate the potential of same-day delivery as the future of e-commerce, focusing on essential factors for successful and efficient order packing in-store while maintaining high customer service levels. The research questions guiding this investigation were:

What are the factors for a successful and satisfying performance of the activity packing orders in-store, whilst maintaining a high level of customer service towards visiting customers?

How could the resulting insights be visualized in a concept implemented in order to enhance order picking and handling?

Data collection involved visits to stores with various order picking systems and methodologies, along with interviews and observations. This comprehensive approach yielded valuable insights, categorized into factors essential for successful order picking, efficient handling, pleasant user experience, and general insights and limitations. Through an exploration three main process steps occurred and later, one more underlying yet important section.

Process step 1 - receiving an order, which includes the factors affecting the step of receiving an online order to the store.

Process step 2 - handling and packing order , which includes the factors affecting the step of handling and packing an online order in the store.

Process step 3 - handing over order, which included the factors affecting the step of handing an online order to the operator.

Overarching System Pointers, which includes the factors affecting the whole system.

These four section was then thoroughly analysed with various methods. The analysis phase resulted in aspects that needed improvement and factors that would make the process of completing an order more pleasant for the personnel in each of the previously mentioned steps. These could be taken into consideration when moving to the next phase. Based on these findings, two concepts were developed:

- *A user interface accessible via desktop and smartphone, serving as the central hub for information and task management.*

- *A physical bi-product acting as a shortcut to main functions and enhancing user experience.*

These concepts were designed to complement existing systems and workflows, enabling users to efficiently handle same-day delivery orders. The potential for innovation in same-day delivery and order handling processes is evident, with a continued focus on enhancing efficiency and user experience to meet the demands of evolving e-commerce practices.

The loss of concept evaluation was complemented with a second evaluation that provides guidelines for future work and what the next steps could be. Further prototyping will create a final comprehensive product. Despite this, as mentioned in the discussion chapter, the two presented research questions have been thoroughly investigated, explored and answered. Factors that impact the different process steps has been discussed and determined. The important factors varied from clarity, ease in communication, error prevention and the wish for the system to provide feedback in arrival of orders or arrival of operator. Later design suggestions that take the mentioned factors into consideration has been developed and presented.

Same-day delivery is with great possibility the future of e-commerce. It has started integrating into stores with different varieties of systems. Participants show a positive attitude towards the system and what it might bring.

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A

Appendix

A.1 Questionnaire form

Working with same-day delivery in retail

Looking for: Retail experienced workers

We are two students from Interaction Design at Chalmers who are carrying out a master's thesis with the aim of investigating problems and possibilities connected to same-day delivery from stores, with the hope of developing a concept that meets new requirements that arise. We therefore need help from you who work in retail and have some knowledge about the topic (click-and-collect). By completing this survey, you will help us immensely in further work. Many thanks in advance!

Please note that all responses provided in this questionnaire will be treated as anonymous. The data collected will be solely used for analysis purposes in a master thesis report and will not be utilised for any other purpose.

* Anger obligatorisk fråga

1. How old are you? *

Markera endast en oval.

- ◯ - 18 years old
- ◯ 19 - 29 years old
- ◯ 30 - 49 years old
- ◯ 50 - years old

2. How do you identify yourself? *

Markera endast en oval.

- ◯ Woman
- ◯ Man
- ◯ Non-binary
- ◯ Other
- ◯ Don't want to answer

3. In what city is your work located? *

Markera endast en oval.

- ◯ Göteborg
- ◯ Stockholm
- ◯ Malmö
- ◯ Övrigt: _____

4. What is your current position or role within the store? *

Markera endast en oval.

- ◯ Store Manager
- ◯ Sales Associate
- ◯ Inventory Manager
- ◯ Customer Service Representative
- ◯ Övrigt: _____

5. What specific tasks and responsibilities are associated with your role? *

Markera alla som gäller.

- ☐ Packing orders
- ☐ Customer service
- ☐ Warehouse
- ☐ Organizing
- ☐ Working at the register
- ☐ Handling returns
- ☐ Managing inventory levels
- ☐ Övrigt: _____

6. How many years of experience do you have working in the retail industry? *

Markera endast en oval.

- Less than 1 year
- 1-3 years
- 4-6 years
- 7-10 years
- More than 10 years

7. What is the size of the retail store where you work? *

Markera endast en oval.

- Small (1-10 employees)
- Medium (11- 30 employees)
- Large (31 - 100 employees)
- Very Large (101+ employees)

8. How frequently do you assist customers in your current role? *

Markera endast en oval.

	1	2	3	4	5	
Nev	◯	◯	◯	◯	◯	Very frequent

9. What devices are operating in your store? *

Markera alla som gäller.

- [ ] Smartphone
- [ ] Tablet
- [ ] Desktop computers
- [ ] Laptops
- [ ] Barcode scanners
- [ ] Övrigt: _____

10. Are there any challenges or frustrations associated with the existing tools or devices? *

Markera alla som gäller.

- [ ] Too advanced
- [ ] Time consuming
- [ ] Compatibility Issues
- [ ] Limited functionality of certain devices.
- [ ] Accessibility limitations
- [ ] Difficulty in accessing and interpreting data from devices.
- [ ] Complex navigation or menu structures.
- [ ] Unclear or insufficient feedback during interactions.
- [ ] Difficulties in communication and teamwork
- [ ] No challanges
- [ ] Övrigt: _____

11. What features do you find most helpful in the current system of tools and devices? *

Markera alla som gäller.

- [ ] Easy to use
- [ ] Efficient and time saving
- [ ] Compatibility with other in-store systems
- [ ] Necessary functionality
- [ ] Offers personalisation
- [ ] Easy to access and interpret data
- [ ] Easy to navigate
- [ ] Good feedback
- [ ] Allows for communication and teamwork
- [ ] Nothing positive
- [ ] Övrigt: _____

12. How comfortable are you with technology and digital tools in your daily work? *

Markera endast en oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very comfortable

13. Does the store have click-and-collect, same-day delivery or similar delivery systems? *

Markera endast en oval.

- ◯ Yes *Fortsätt till fråga 18*
- ◯ No *Fortsätt till fråga 15*

14. If you selected yes and have a similar system, can you briefly describe it

_____

No Click-and-Collect (or similar) system

15. What is the reason for not employing such a system? *

16. Are you planning on implementing this kind of delivery system? *

Markera endast en oval.

- Yes
- No
- I don't know

17. Do you pack and ship other orders from the store? *

Markera endast en oval.

- Yes, we pack and ship orders
- No, we only have in-store purchases

Fortsätt till fråga 28

Click-and-collect (or similar)

18. Does your store pack and send Click-and-Collect orders using in-store inventory? *

Markera endast en oval.

- Yes
- No
- Partly
- I dont know

19. How are orders recieved for click-and-collect orders? *

Markera alla som gäller.

- [ ] Through a webshop and received digitally in the store system
- [ ] Customers call via phone and place orders
- [ ] In-store purchase but would like to pick up later
- [ ] Övrigt: _____

20. Who is responsible for handling click-and-collect (or similar) orders? *

Markera alla som gäller.

- [ ] Store Manager
- [ ] Sales Associate
- [ ] Inventory Manager
- [ ] Customer Service Representative
- [ ] Övrigt: _____

21. Which of the following statements are true regarding your store's click-and-collect (or similar) when **receiving orders**? *

Markera alla som gäller.

- [ ] Orders are handled at the counter.
- [ ] An order packaging list is printed for reference.
- [ ] Staff members can use an additional device (e.g., phone) for view and handle orders.
- [ ] Click-and-collect orders need to be prepared immediately upon recieval.
- [ ] There is a designated area for processing click-and-collect orders.
- [ ] Staff members choose orders themselves
- [ ] Staff members get assigned to a specific order
- [ ] We have a feed with received orders
- [ ] Övrigt: _____

22. Which of the following statements are true regarding your store's click-and-collect (or similar) when **packaging/handling orders**? *

Markera alla som gäller.

- [ ] Employees use digital tools (Phone, scanners) to locate and scan items for click-and-collect orders.
- [ ] Employees memorize the items for click-and-collect orders.
- [ ] Employees us a printed order list with the items for locating
- [ ] Certain staff members only focus on click-and-collect orders
- [ ] Employees can abort the click-and-collect task midway through and resume it later.
- [ ] Other employees can continue the click-and-collect task where it was left off.
- [ ] There is a digital system for keeping track of collected items
- [ ] There is an analog system for keeping track of collected items
- [ ] Övrigt: _____

23. Which of the following statements are true regarding your store's click-and-collect (or similar) when **handing over orders**? *

Markera alla som gäller.

- [ ] Packages are placed in a special area specifically allocated for click-and-collect orders.
- [ ] There is a seperate counter for dealing with click-and-collect orders
- [ ] Staff members verify the customer's identity during the pickup process.
- [ ] Contactless hand over with the customer
- [ ] Övrigt: _____

24. How does interacting with in-store customers negatively impact your **performance** when packing click-and-collect deliveries? *

Markera endast en oval.

	1	2	3	4	5	
Notł	◯	◯	◯	◯	◯	Significantly

25. How does interacting with in-store customers negatively impact your **stress level** when packing click-and-collect deliveries? *

Markera endast en oval.

	1	2	3	4	5	
Nott	◯	◯	◯	◯	◯	Significantly

26. How many Click-and-Collect orders would you estimate leaving the store everyday? *

Markera endast en oval.

- ◯ 1-10
- ◯ 11-40
- ◯ 41-70
- ◯ 70+

27. Are there any other challenges you face when carrying out a click-and-collect order?

_____

_____

_____

_____

_____

Fortsätt till fråga 28

Future delivery system

Read:
Imagine implementing a same-day delivery system at your workplace. A customer places an order online that she wants to be delivered to her home later that day. You have the mission to pick and pack the order and prepare it for the delivery person who is responsible for transporting the package from the store to the customer.

28. What is your opinion on integrating a system like this in your workplace? *

Markera endast en oval.

	1	2	3	4	5	
Wou	◯	◯	◯	◯	◯	Would be a great idea

29. Are there any specific features or functionalities that you believe would enhance performance? *

_____

_____

_____

_____

_____

30. Are there any potential challenges you see in adopting a new system like this? *

_____

31. What would you prefer when handing over the packaged items to the delivery person? *

Markera alla som gäller.

- [ ] Feedback and communication on when the delivery person is arriving
- [ ] Verify the delivery person's identity during the pickup process.
- [ ] Have a seperate counter for dealing with same-day delivery orders
- [ ] Bring the packaged items to the delivery person waiting in a designated waiting area
- [ ] Contactless hand over with the delivery person
- [ ] Feedback on when the order has reached the customer
- [ ] Övrigt: _____

Further Studies

By providing your name and email for further studies, you consent to the use of this information exclusively for contacting you regarding additional research, ensuring compliance with GDPR regulations.

32. Would you be interested in participating in further interviews or observation sessions? If yes, please fill out the next two questions, name and e-mail, so that we can contact you :) *

Markera endast en oval.

- ◯ Yes
- ◯ No

33. Name

_____

34. Email

_____

35. Location (if, yes)

Markera endast en oval.

- ◯ Göteborg
- ◯ Övrigt: _____

B

Appendix

B.1 Interview form

	Background
*	Detta kommer att vara anonymt - Är det okej om vi spelar in samtalet, för vår egen skull för att minnas vad som sagts och vart du arbetar - All information som samlas in kommer att användas för vår egen skull och inte delas
1	Namn
2	Ålder
3	Nuvarande roll/titel/arbetsuppgifter
4	Hur länge har du arbetat med detta?
	Introduction to click and collect (or similar)
5	Hur ser din arbetsplats nuvarande status med click and collect ut?
6	Hur länge har din arbetsplats erbjudit/erbjöd click-and-collect tjänster?
7	Kan du ge en sammanfattning över hur click-and-collect systemet fungerar på din arbetsplats?
7.1	Hur ser det ut när ordrar kommer in? Vad är det första du kollar efter?
7.2	Hur ser det ut när ordrar hämtas och packas? (hur dubbelkollas/checkas det av att man hämtat allt och rätt)
7.3	Hur ser överlämningen av ordrar ut?
7.4	Vad använder ni för verktyg under denna process? eg. följesedel, kassasystemet?, mobil, padda…
8	Vad brukar det finnas för tidspress att packa ett paket
9	Hur prioriterar butiken click-and-collect kontra kunder som handlar i butiken?
10	Hur hanterar butiken returer?
	Thoughts on the system
11	Vad är dina övergripande tankar om systemet?
12	Tror du att det nuvarande click-and-collect systemet kan förbättras?
13	Finns det några särskilda aspekter av det nuvarande click-and-collect systemet som du tycker är särskilt effektiva eller smidiga?
14	Har du fått någon feedback från kunder angående click-and-collect tjänsten?
15	Hur tror du att click-and-collect systemet gynnar både kunder och personalen i butiken?

16	Har det förekommit några fall där click-and-collect systemet har överträffat eller fallit kort på förväntningarna?
17	Har du några knep eller metoder du använder för att förbättra hanteringen av ordrar?
	Health, Cognitive ergonomics
18	Påverkar interaktionen med kunder i butiken din prestation när du packar click-and-collect leveranser negativt?
18.1	På vilket sätt? kan du utveckla…Hur påverkar det prestationen?
19	Påverkar interaktion med kunder i butiken din stressnivå när du packar click-and-collect leveranser negativt?
19.1	På vilket sätt? kan du utveckla…Hur påverkar det stressnivån?
19.2	Hur hanterar du den mentala ansträngning av att samtidigt hjälpa kunder i butiken och fixa click-and-collect beställningar?
	Future system
	Beskrivning av samma dag leveranser
21	Vad är dina första tankar om ett sådant system? Och vad är dina förväntningar på det systemet?
22	Tror du detta nya systemet kommer påverka arbetsbelastningen och dagliga rutiner annorlunda?
23	Tror du detta nya systemet kommer påverka arbetet med logistik annorlunda? (Förvaring, Saldohantering, etc.)
24	Hur skulle du föredra att överlämningen av paket till postmänniska sker? (via låda, lämna över själv)
25	På vilka sätt tror du att ett leveranssystem med leverans samma dag kan förbättra den totala kundupplevelsen?
26	“Du nämde i tidigare att ni hade (dessa verktyg)….” Hur kan den nuvarande “teknologin” användas i det nya system?
26.1	Önskar du att det skulle användas eller se ut på något annat sätt?
26.2	Finns det andra verktyg som skulle underlätta för dig att effektivt plocka och packa en order för samma-dag leverans?
27	Vilka funktioner skulle du prioritera i ett nytt gränssnitt och system för leverans samma dag? (anpassbart, snyggt, effektivt, aviseringar/notiser, påminnelser, lagerplacering etc.)

28	Kan du beskriva några (galna) drömfunktioner som du skulle vilja se i ett framtida leveranssystem med leverans samma dag?

C

Appendix

C.1 Requirements and wish list

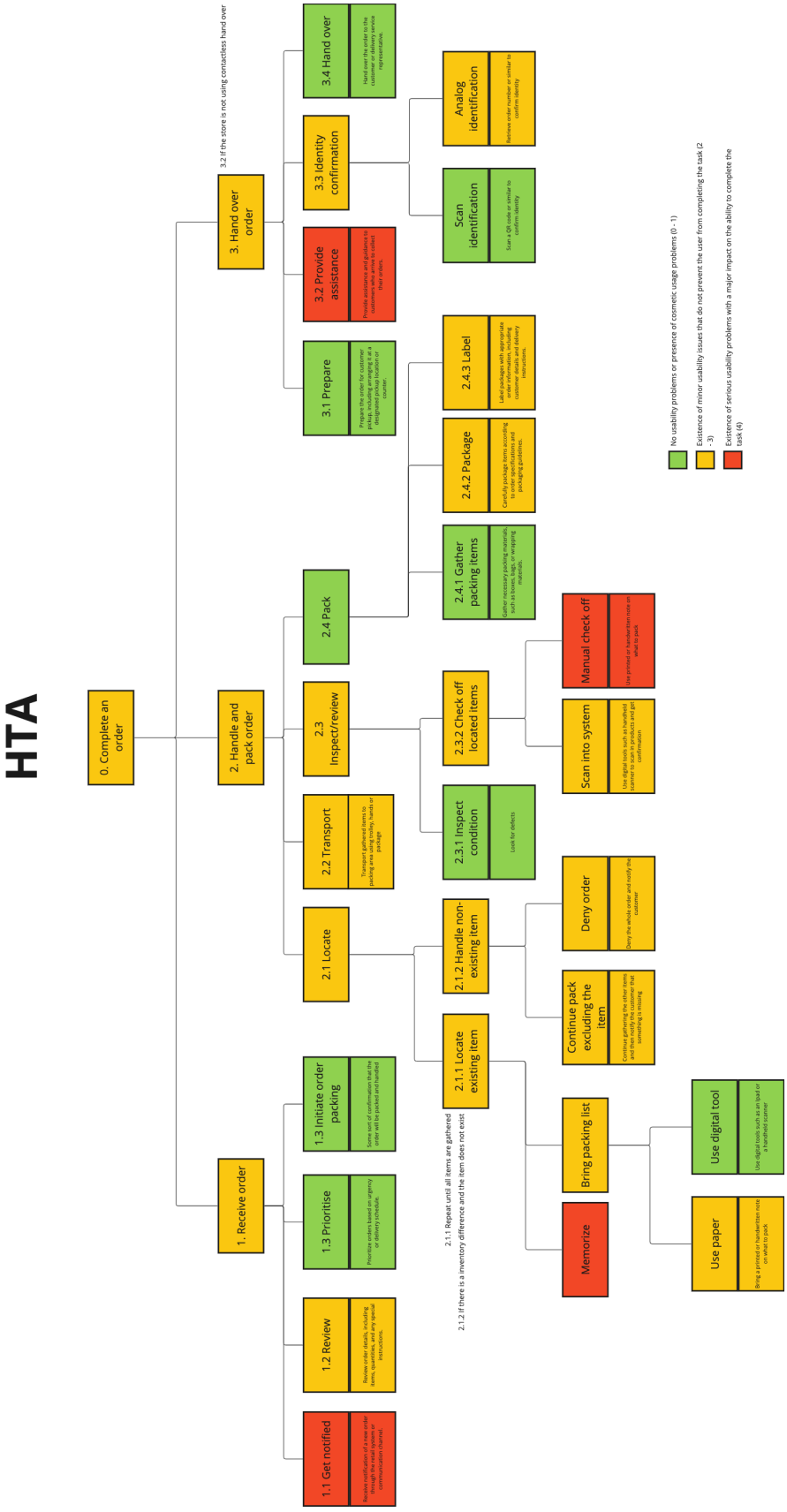
Nr	R / W	Description	Importance - 1-5 scale
1		**Process step 1 - receiving order**	
1.1	R	A reference list for ordered items	5
1.2	W	Printable reference list	3
1.3	R	A feed with orders, with suitable categories (e.g. unhandled, handling, finished)	5
1.4	W	Order sorting functionality in feed (time, volume, etc.)	3
1.5	R	Orders received digitally in the store /software system	5
1.6	W	Orders can be manually added in the system	3
1.7	R	Feedback on received orders (pleasantly through mechanism or cue)	5
1.8	W	Ability to pause incoming orders (for example during high-demand)	2
1.9	W	Flexibility in picking, managing, and prioritize orders	3
2		**Process step 2 - Handling and packing order**	
2.1	R	A reference list for ordered items	5
2.2	R	Clear and sufficient information on order and items	5
2.3	W	Location of item in store on ref. list (e.g warehouse, store, shelf, aisle, item nr)	4
2.4	W	Picture of items on reference list	4
2.5	R	Check off or scan item for error prevention	5
2.6	W	Communication between staff members on status and handled orders	3
2.7	W	Feedback when scanning or checking off items	5
2.8	R	Process for handling orders with inventory miss items (contact customer OR canceling order)	2
2.9	W	Status on the quantity of items packed in order (e.g 1/1 or 0/1)	3
2.10	W	Ability to bulk orders (print and handling) to increase efficiency	1
3		**Process step 3 - Handing over order**	
3.1	W	Printable reference list	2
3.2	R	Labeling on package to facilitate quick and accurate retrieval of products	3

3.3	R	Order completion notification to operators (ready for pick up)	5
3.4	R	Feedback on operator arrival time	4
3.5	R	Feedback on operator accepted status	2
3.6	W	Feedback on when the order has reached the customer	2
3.7	R	Scan or check off package for confirmation before handing to operator	4
3.8	R	Security - operator presents verification (order number, QR code)	5
4		**Overarching**	
4.1	R	A structured and clear timeframe for completing orders	4
4.2	W	Customizable and real time adjustments to timeframe for completing orders	3
4.3	W	Clear contact information for customer service	1
4.4	R	Integration into existing system (process, infrastructure, functionality compatibilities)	4
4.5	R	A unified flow and integration across the entire store.	5
4.6	W	Easy learning curve to new system	3
4.7	R	New UI integrates into existing devices	4
4.8	R	UI to work on computer, Tablet, and smaller screens (zebra, smartphone)	5
4.9	R	Prioritize simplicity, clarity, and efficiency.	5
4.10	R	Minimize manual tasks (streamlined process)	4
4.11	R	A clear and intuitive UI. User-friendly and self explanatory interface (for new workers, etc.)	4
4.12		Hierarchical and aesthetic design with consistency throughout system	3
4.13		Only provide the most necessary functionality	4
5		**Limits**	
5.1		Customer updates from operator on their status (picked up, on the way)	
5.2		Eliminate time pressure for high volume orders and management decisions	
5.3		Synchronization between store inventory and same-day delivery system	
5.4		Exclude concern regarding designated storage areas for orders	

D

Appendix

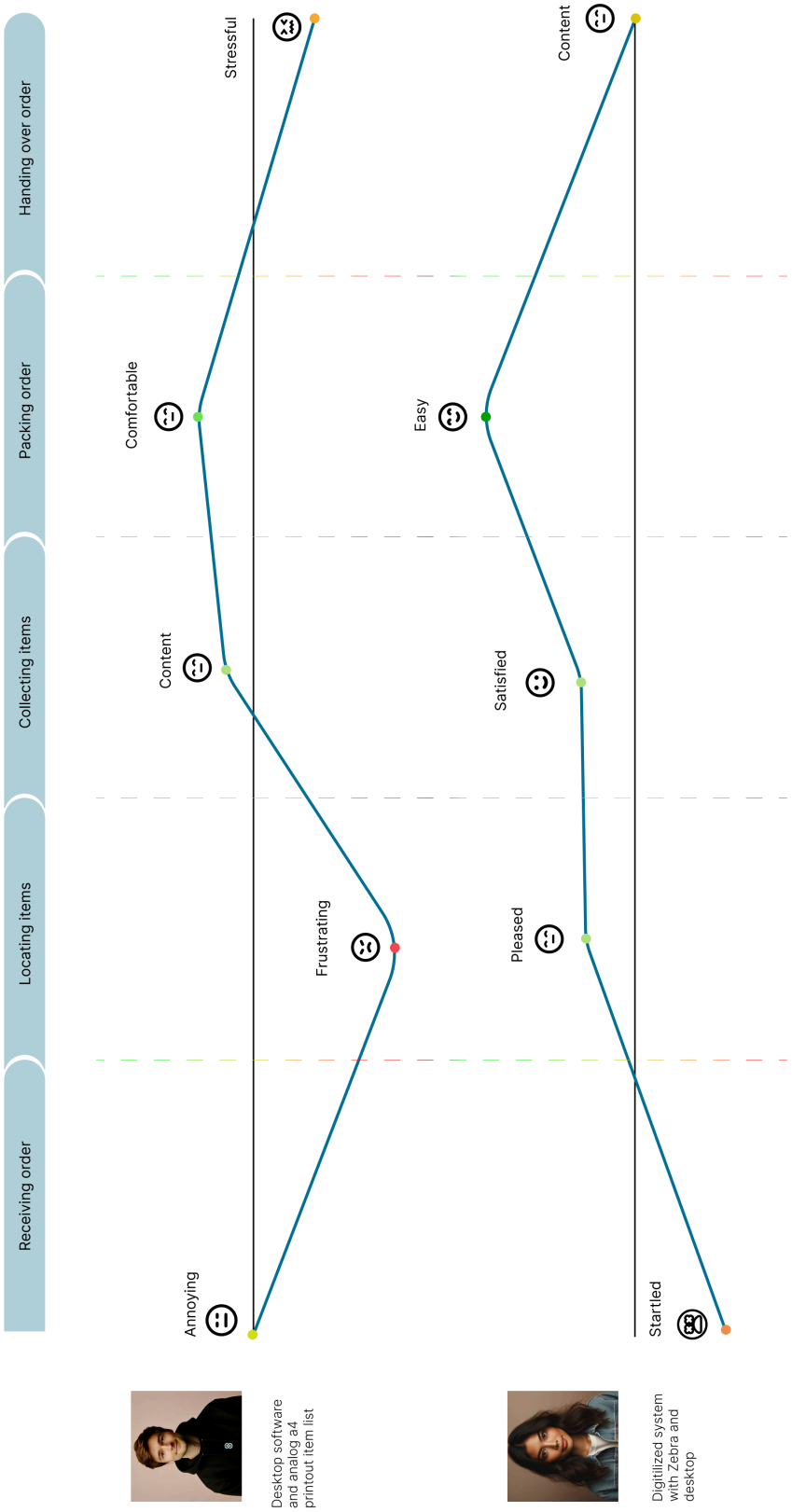
D.1 HTA

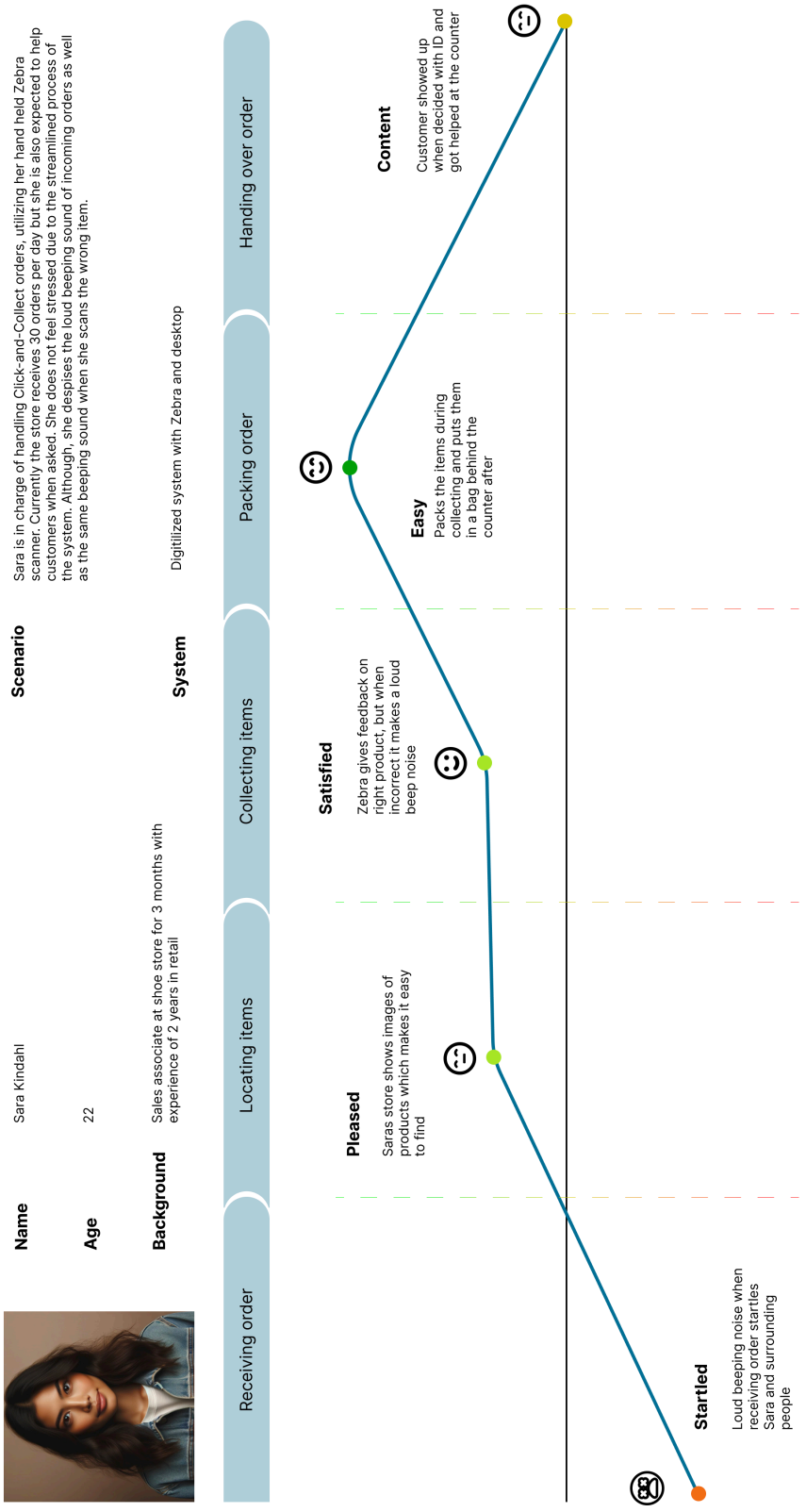

HTA
0. Complete an order
1. Receive order
1.1 Get notified
Receive notification of a new order through the retail system or communication channel.
1.2 Review
Review order details, including items, quantities, and any special instructions.
1.3 Prioritise
Prioritize orders based on urgency or delivery schedule.
1.3 Initiate order packing
Some sort of confirmation that the order will be packed and handed
2. Handle and pack order
2.1 Locate
2.1.1 Repeat until all items are gathered
2.1.2 If there is a inventory difference and the item does not exist
2.1.1 Locate existing item
Bring packing list
Use digital tool
Use digital tools such as an ipad or a handheld scanner
Use paper
Bring a printed or handwritten note on what to pick
Memorize
2.1.2 Handle non-existing item
Deny order
Deny the whole order and notify the customer
Continue pack excluding the item
Continue gathering the other items and then notify the customer that something is missing
2.2 Transport
Transport gathered items to packing area (assembly, trucks or pack)
2.3 Inspect/review
2.3.1 Inspect condition
Look for defects
2.3.2 Check off located items
Scan into system
Use digital tools such as handheld scanners to scan in products and get confirmation
Manual check off
Use printed or handwritten note on what to pack
2.4 Pack
2.4.1 Gather packing items
Gather necessary packing materials, such as boxes, bags, or wrapping materials.
2.4.2 Package
Carefully package items according to order specifications and packaging guidelines.
2.4.3 Label
Label packages with appropriate order information, including customer details, and delivery instructions.
3. Hand over order
3.2 If the store is not using contactless hand over
3.1 Prepare
Prepare the order for customer pickup, either at the counter or a designated pickup location or counter.
3.2 Provide assistance
Provide assistance and guidance to customers who arrive to collect their orders.
3.3 Identity confirmation
Scan identification
Scan a QR code or similar to confirm identity
Analog identification
Retrieve order number or similar to confirm identity
3.4 Hand over
Hand over the order to the customer or delivery service representative.
No usability problems or presence of cosmetic usage problems (0 - 1)
Existence of minor usability issues that do not prevent the user from completing the task (2 - 3)
Existence of serious usability problems with a major impact on the ability to complete the task (4)

E

Appendix

E.1 Customer journey maps


Receiving order
Locating items
Collecting items
Packing order
Handing over order
Annoying
Frustrating
Content
Comfortable
Stressful
Startled
Pleased
Satisfied
Easy
Content
Desktop software and analog a4 printout item list
Digitilized system with Zebra and desktop


Name
Sara Kindahl
Age
22
Background
Sales associate at shoe store for 3 months with experience of 2 years in retail
Scenario
Sara is in charge of handling Click-and-Collect orders, utilizing her hand held Zebra scanner. Currently the store receives 30 orders per day but she is also expected to help customers when asked. She does not feel stressed due to the streamlined process of the system. Although, she despises the loud beeping sound of incoming orders as well as the same beeping sound when she scans the wrong item.
System
Digitilized system with Zebra and desktop
Receiving order
Locating items
Collecting items
Packing order
Handing over order
Startled
Loud beeping noise when receiving order startles Sara and surrounding people
Pleased
Saras store shows images of products which makes it easy to find
Satisfied
Zebra gives feedback on right product, but when incorrect it makes a loud beep noise
Easy
Packs the items during collecting and puts them in a bag behind the counter after
Content
Customer showed up when decided with ID and got helped at the counter

F

Appendix

F.1 Usability test form

Usability test

* Anger obligatorisk fråga

1. Expertisnivå

Markera endast en oval.

- ◯ Novis
- ◯ Använt tidigare system
- ◯ väl bekant

Fas 1

2. Vad kändes bra?

3. Vad kändes dåligt?

4. Var det något som var förvirrande?

5. Hur nöjd är du med upplevelsen?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

6. Hur effektivt kändes systemet?

Markera endast en oval.

	1	2	3	4	5	
Inte	◯	◯	◯	◯	◯	Väldigt

7. Hur kändes systemets feedback?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

8. Hur kändes systemets error prevention?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

Fas 2

9. Vad kändes bra?

10. Vad kändes dåligt?

11. Var det något som var förvirrande?

12. Hur nöjd är du med upplevelsen?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

13. Hur effektivt kändes systemet?

Markera endast en oval.

	1	2	3	4	5	
Inte	◯	◯	◯	◯	◯	Väldigt

14. Hur kändes systemets feedback?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

15. Hur kändes systemets error prevention?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

Fas 3

16. Vad kändes bra?

17. Vad kändes dåligt?

18. Var det något som var förvirrande?

19. Hur nöjd är du med upplevelsen?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

20. Hur effektivt kändes systemet?

Markera endast en oval.

	1	2	3	4	5	
Inte	◯	◯	◯	◯	◯	Väldigt

21. Hur kändes systemets feedback?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

22. Hur kändes systemets error prevention?

Markera endast en oval.

	1	2	3	4	5	
Myc	◯	◯	◯	◯	◯	Mycket bra

Övergripande

23. **Hur väl stämmer systemet in på orden nedan?** *

Markera endast en oval per rad.

	Mycket dåligt	Dåligt	Medel	Bra	Mycket bra
Professional	◯	◯	◯	◯	◯
Agile	◯	◯	◯	◯	◯
Coherent	◯	◯	◯	◯	◯
Obvious	◯	◯	◯	◯	◯
Fulfilling	◯	◯	◯	◯	◯

24. **Hur sammanhängande och lika var mobil respektive desktop versionen, i termer av:** *

Markera endast en oval per rad.

	Annorlunda	Ganska annorlunda	Neutral	Ganska lika	Lika
Utseende	◯	◯	◯	◯	◯
Funktionalitet	◯	◯	◯	◯	◯
Process	◯	◯	◯	◯	◯