

User-Centered Design of a Context-Aware Driving Mode for Safe and Accessible Transportation

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User-Centered Design of a Context-Aware Driving Mode for Safe and Accessible Transportation

A Case Study of Sortera's Driver Application

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Abstract

Driver applications are increasingly used in professional driving to support route planning, order management, documentation, and communication. When drivers need to read, interpret, or interact with information in close proximity to driving, these systems can also create visual, manual, and cognitive distractions, increasing traffic safety risk. This master's thesis was conducted in collaboration with Sortera Group AB and investigates how the company's driver application can be redesigned to better support drivers during their daily work.

The aim of the thesis was to develop a context-adapted interface concept that improves readability, reduces unnecessary interactions, and provides drivers with faster access to task-critical information. The project followed a User-Centered Design (UCD) process, combining theory, user research, stakeholder needs, and iterative prototyping to guide the design. The work was based upon traffic safety research, Swedish legislation, cognitive load theory, and design principles for driving-related interfaces.

The result was a UX framework demonstrated through a high-fidelity prototype with two main use contexts: handheld mode and car mode. Handheld mode supports more detailed interaction, while car mode focuses on simplified access to important information with fewer interaction steps. The final evaluation indicated that the overall concept was understandable to participants. Task-critical information was found faster in the prototype than in the current interface, the prototype received a high SUS score, and an AI-based eye-tracking analysis indicated clearer visual hierarchy in the car mode views.

The result supports the design direction of separating use contexts, prioritizing important information, and reducing unnecessary visual and manual interaction. Further testing with actual drivers in realistic vehicle contexts is needed before stronger conclusions about traffic safety can be made.

Keywords: User-Centered Design, driver application, cognitive load, traffic safety, UX design

Sammanfattning

Förarapplikationer används i allt större utsträckning hos yrkesförare för att stödja företags ruttplanering, orderhantering, dokumentation och intern/extern kommunikation. När förare behöver läsa, tolka och/eller interagera med information i situationer kopplade till körning kan dessa system även skapa visuell, manuell och kognitiv distraktion, vilket ökar risken för trafikrelaterade skador. Detta examensarbete genomfördes i samarbete med Sortera Group AB och undersöker hur företagets förarapplikation kan omformas för att bättre stötta deras förare i det dagliga arbetet.

Syftet med examensarbetet var att utveckla ett kontextanpassat gränssnittskoncept som förbättrar läsbarheten, minskar onödig interaktion och ger förare snabbare tillgång till viktig information för uppgifter. Projektet följde en användarcentrerad designprocess där teori, användarstudier, intressentbehov och ett iterativt prototypskapande kombinerades. Arbetet grundade sig i forskning inom trafiksäkerhet, svensk lagstiftning, kognitiv belastningsteori och designprinciper för körrelaterade gränssnitt.

Resultatet blev ett UX-ramverk som uppvisades genom en high-fidelity-prototyp med två huvudsakliga användningsområden: handhållet läge och körläge. Det handhållna läget stödjer en mer detaljerad interaktion, medan körläget fokuserar på förenklad tillgång till viktig information med färre interaktionssteg. Den slutliga utvärderingen visade att det övergripande konceptet var förståeligt för deltagarna. Uppgiftskritisk information kunde hittas snabbare i prototypen än i det nuvarande gränssnittet, samt fick prototypen ett högt SUS-resultat.

Detta visar på att designriktningen gav goda resultat att separera användningskontexter, prioritera viktig information och minska onödig visuell och manuell interaktion. Framtida forskning med tester utförda av faktiska förare i realistiska fordonskontexter behövs innan tyngre slutsatser om trafiksäkerhet kan dras.

Nyckelord: Användarcentrerad design, förarapplikation, kognitiv belastning, trafiksäkerhet, UX-design

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List of acronyms and abbreviations

CL	Cognitive Load	13
CLT	Cognitive Load Theory	13
CTA	Call to Action	74
DP	Density-independent pixel	22
ERSO	European Road Safety Observatory	8
ISO	International Organization for Standardization	3
LD	Liftdumper	31
LTM	Long-term memory	13
LVX	Lastväxlare	31
SDG	Sustainable Development Goal	5
UCD	User-Centered Design	3
SUS	System Usability Scale	79
UI	User Interface	22
UX	User Experience	6
VTI	Swedish National Road and Transport Research Institute	15
WM	Working memory	13

1. Introduction

This chapter introduces the background and purpose of the thesis. It presents the practical problem in Sortera's driver application, the research questions, the relevance for sustainable development, ethical considerations, and related work.

1.1 Background

Mobile applications are increasingly used in professional driving to support route planning, order management, documentation, and communication. In logistics work, these tools can make daily work more efficient, but they can also introduce safety risks when drivers need to read, interpret, or interact with information close to or during driving. Driver distraction can be understood as attention being diverted away from the driving task and can include visual, manual, auditory, and cognitive distraction (ERSO, 2026a). This makes the design of driver-facing interfaces important in relation to distraction, cognitive load, and legal restrictions on mobile device use.

Swedish legislation does not define how a driver application should be designed, but it does restrict how mobile phones and communication equipment may be used while driving. The driver must not hold the device in the hand, and use is only allowed if it does not negatively affect the driving (Sveriges regering, 1998). Swedish case law further shows that the assessment depends on the driving conditions and whether the activity can be performed in a traffic-safe manner (Göta hovrätt, 2015). This means that a logistics application intended for drivers should not only support operational efficiency, but also reduce the need for visual and manual interaction in situations where driving safety may be affected.

Sortera currently uses a web-based driver application to manage orders, route information, documentation, and communication (Sortera Group, 2026). Drivers use the application in work situations that can involve time pressure, vehicle movement, changing lighting conditions, vibration, narrow streets, construction sites, and the need to coordinate with clients or the transport planner. In these situations, unclear information structure or unnecessary interaction steps may increase cognitive load and make the application harder to use safely. This is relevant because both cognitive and visual load can affect driving performance, while unnecessary demands on working memory can make complex tasks harder to complete efficiently

(Östlund, Nilsson, Törnros, & Forsman, 2006; Paas & Van Merriënboer, 2020).

This thesis investigates how a User-Centered Design (UCD) approach can be used to redesign Sortera’s driver application for mobile and driving-related work situations. The focus is on creating a context-adapted interface that improves readability, reduces unnecessary interaction, and supports access to task-critical information without removing the functions drivers need. This is also relevant from an ergonomic perspective, since transport information and control systems should support interaction that is understandable, efficient, and appropriate for the driving context (“Road vehicles — Ergonomic aspects of transport information and control systems — Dialogue management principles and compliance procedures”, 2017).

1.2 Sortera

Sortera is a leading partner in the transition toward a circular economy, providing essential services in recycling, aggregates, soil management, remediation, and water treatment. The company primarily serves the construction industry and enables clients to lower emissions through specialized operational services and environmental education. Utilizing a large infrastructure of vehicle fleets, processing facilities, and analytical reporting, Sortera assists businesses in reducing their carbon footprint and promoting resource circularity. Although Sortera operates in Finland, Sweden, and the UK (Sortera Group, n.d.), this study focuses specifically on the company’s Swedish operations within Sortera Group AB.

1.2.1 Current web application

Sortera’s current web application is used to manage daily orders in a predefined sequence as determined by the transport planner. The primary purpose of the system is to support the driver and improve routing efficiency by providing quick access to operational details, reducing manual work, and replacing paper-based documentation. The application is therefore a key component in the digitalization of the transportation workflow (Sortera Group, 2026).

1.2.1.1 Driver view

The Driver view provides a restricted interface intended for order execution. Drivers are limited to a high-level overview of their assigned schedule for the day, where each order can be opened individually. Orders are presented in a predefined order to support efficient execution from both a logistical and geographical perspective (Sortera Group, 2026).

When viewing an order, the driver is presented with essential operational information, including the ordering party (client-facing and internal references), the assigned contact person, and associated phone number. The interface displays the order contents and supports documentation through photo capture, enabling the driver to take images both before and after pickup or delivery. The driver can also register weight measurements through a concealed option and report deviations related to the order, such as differences in material type or quantity compared to the original request. Each order includes a clickable address which opens Google Maps and automatically provides navigation directions to the destination (Sortera Group, 2026).

1.2.1.2 Transport planner view

The transport planner view provides an extended interface with administrative access. In addition to viewing assigned routes, the planner can modify scheduled dates, select between drivers, and monitor progress across active routes (Sortera Group, 2026).

1.3 Purpose and goals

The purpose of this thesis is to investigate how Sortera's driver application can be redesigned to better support drivers in mobile and driving-related work situations. The goal is to develop a context-adapted interface concept that improves readability, reduces unnecessary cognitive and visual load, and gives drivers faster access to critical order information such as address, contact details, order status, and task-specific instructions.

The thesis does not aim to create a fully implemented production system. Instead, the goal is to develop and evaluate a high-fidelity prototype that can act as a design foundation for future development of Sortera's driver application.

1.4 Research questions

The study will focus on the following research questions:

- How can the user interface in Sortera's driver application be reshaped to improve readability and usability in a mobile driving environment?
- In what ways can a simplified "car mode" for Sortera's driver application be designed to support safe and efficient access to critical information (e.g., address, client contact, order status) while driving?

- How can a user-centered design (UCD) approach contribute to reducing cognitive load and improving context-adapted use?

1.5 Relevance for sustainable development



Figure 1.1. Sustainable Development Goals 3, 8, 9, and 12, which are used to frame the thesis in relation to health, work conditions, innovation, and responsible production (United Nations Department of Economic and Social Affairs, n.d.).

The primary Sustainable Development Goals (SDGs) addressed in this study are SDG 3 (Good Health and Well-Being) and SDG 8 (Decent Work and Economic Growth). These goals support the creation of a safer work environment for drivers by reducing cognitive workload, while also providing a more effective digital assistance tool (United Nations Department of Economic and Social Affairs, n.d.).

In addition, SDG 9 (Industry, Innovation and Infrastructure) is supported through improved digitalization that enables innovation and strengthens operational efficiency. SDG 12 (Responsible Consumption and Production) is addressed by enhancing the effectiveness of the assistive device, allowing drivers to work more productively, spend less time on standby, and continue their routes more efficiently to recycling facilities and other destinations (United Nations Department of Economic and Social Affairs, n.d.).

1.6 Ethics

This project involved ethical considerations related to participant privacy, data protection, and the safety implications of designing an application intended for use in vehicles. To protect test participants, the survey questions were intentionally formulated so that responses could not be connected to individual participants. This was done to allow participants to answer

more freely, since driver behaviour may be subject to legal assessment and participants might otherwise hesitate to answer truthfully. For example, questions about gender were avoided, since a female participant could potentially be identifiable based on gender alone due to the very low number of women in the workforce.

The same anonymization principle was applied to the other tests in the study. However, since these tests were simulated rather than conducted in real driving situations, the main purpose was to protect the integrity of the test participants rather than to address potential legal implications of actual driver behaviour.

The use context of the product also raised ethical considerations. Since the application is meant to support work in vehicles, the consequences of interaction are not limited to the individual user, but may also affect other road users. The project was therefore conducted with the aim of minimizing potential harm to both the user and others in the traffic environment.

1.7 Related work

A UX review of the Uber Driver application analyses a redesign of the driver "offer screen", the interface where drivers decide whether to accept or reject a trip request. The review examines how the interface was restructured to support faster interpretation of trip information in situations where the driver has limited time to process available information.

The redesign focuses on clearer visual hierarchy, grouping of related information, and the use of colour and iconography to guide attention toward the most relevant details of a trip request. The review also highlights the importance of reducing context switching, where drivers must shift attention between different pieces of information or interface elements while driving (Banning, 2025).

These observations are relevant to the present study, which similarly examines how information presentation and workflow structure in a driver application influence usability and interaction during operational tasks.

2. Theory and technology

This chapter presents the theoretical and technical foundations used in this thesis. It covers relevant legislation on mobile phone use while driving, cognitive ergonomics and cognitive load theory, design principles, and the design process methodology. These foundations inform the requirements and design decisions applied in the subsequent chapters.

2.1 Legislation

Swedish law regulates the use of mobile phones and other communication equipment while driving through a two-part rule: the driver may only use such equipment if it does not adversely affect the driving, and the driver must not use the equipment in a manner that involves holding it in the hand (Sveriges regering, 1998).

Trafikförordningen (1998:1276), 4 kap. 10 e §

Vid färd på väg med ett motordrivet fordon får föraren ägna sig åt aktiviteter som användning av mobiltelefon och annan kommunikationsutrustning endast om det inte inverkar menligt på förandet av fordonet. Föraren får inte använda denna utrustning på ett sådant sätt att han eller hon håller den i handen. Förordning (2017:1284).

Unofficial translation: When travelling on a road in a motor-powered vehicle, the driver may engage in activities such as using a mobile phone or other communication equipment only if it does not adversely affect the driving of the vehicle. The driver must not use such equipment in a manner that involves holding it in the hand.

2.1.1 Case law

2.1.1.1 Handheld interaction is prohibited even for brief handling

Svea Court of Appeal (Svea Hovrätt) has interpreted the prohibition on holding the phone broadly. In RH 2023:25, a driver who moved his phone from a pocket to a charger while stopped at a traffic light was held to have used the phone in the sense of the ordinance, since

the act involved holding the device in the hand (Svea Court of Appeal (Svea hovrätt), 2023).

2.1.1.2 Risk is assessed by driving conditions

Regarding what "adversely affect the driving of the vehicle" means, Göta Court of Appeal (Göta Hovrätt) held, in case RH 2016:8, that the assessment of the effect depends on the driving conditions and whether the activity can be performed in a traffic-safe manner. The court further concluded that liability may arise not only where the use creates a concrete danger, but also where the circumstances imply an abstract risk to traffic safety (Göta hovrätt, 2015).

2.1.2 EU regulations, directives and decisions

There is no EU-wide legislation prohibiting mobile phone use while driving. Road traffic rules in this area are set at the national level (European Union, 2025).

2.1.3 Traffic safety risks and mitigation

Research from the European Road Safety Observatory (ERSO) has made several findings related to mobile phone use and professional driving of heavy vehicles. These are presented and discussed below.

2.1.3.1 Driver distraction and crash risk

During naturalistic driving, drivers tend to self-regulate depending on the driving context and traffic conditions. This can be observed for hands-free phone use (talking/listening), which has a relative odds ratio of 0.4 compared to the baseline of no distraction. However, younger drivers still show higher risk, and initiating a hands-free call requires visual and manual interaction (ERSO, 2026a).

In contrast, interacting with in-vehicle systems has a higher odds ratio of 4.6, reaching for a phone 4.8, and interacting with other objects 9.1. Reading and writing text messages have an odds ratio of 6.1, while prolonged glances away from the road are associated with 7.1. This indicates a generally increased crash risk, particularly for tasks involving visual and manual engagement (ERSO, 2026a).

Lower odds for interaction with digital systems compared to physical objects may be related

to driver self-regulation, where drivers adapt their behavior by slowing down or increasing following distance. However, ERSO also notes that voice-based interactions can still have negative effects due to remaining cognitive load, as well as poorly designed systems that require visual confirmation (ERSO, 2026a).

It is also noted that older drivers experience more difficulties when interacting with built-in systems. As a mitigation strategy, ERSO suggests restricting certain types of interaction, such as manual text input while driving, and limiting systems to essential functions only. This aligns with Euro NCAP's 2026 rating scheme, which emphasizes shallow menus, reduced glance time, and simple one-touch interactions (Euro NCAP, 2025).

2.1.3.2 Types of distraction

Driver distraction can be understood as a diversion of attention away from activities required for safe driving and towards a competing activity. ERSO distinguishes between visual, auditory, physical/manual, and cognitive distraction. Visual distraction occurs when the driver looks away from the road, auditory distraction when attention is drawn by sound, physical distraction when the driver removes one or both hands from the driving task, and cognitive distraction when mental attention is directed towards another task (ERSO, 2026a, 2026b).

In practice, many activities involve several types of distraction at the same time. Texting while driving, for example, combines visual distraction from looking at the screen, manual distraction from handling the device, and cognitive distraction from reading or writing the message. Similarly, interaction with in-vehicle systems may require the driver to look away from the road, interpret information, and perform manual input. This makes digital interaction particularly relevant in a driving context, since even short tasks may combine several forms of attention demand (ERSO, 2026a).

ERSO further notes that the risk level depends not only on the type of distraction, but also on timing, duration, complexity, frequency, ability to pause and resume, and the surrounding traffic context. A task that may appear simple in low traffic can become more problematic if the driving situation changes quickly. This is especially important for mobile or in-vehicle interfaces, where the driver may need to shift attention between the road, the interface, and the current work task (ERSO, 2026a, 2026b).

The safety impact of distraction is connected to poorer lateral control, longer reaction times, and missed information from the traffic environment. Although drivers may try to compensate by reducing speed or increasing the distance to the vehicle ahead, ERSO notes that such behaviour is generally not sufficient to fully counteract impaired driving performance (ERSO,

2026b). This supports a design direction where the interface should reduce visual and manual interaction during driving and make critical information available with as little interpretation as possible.

2.1.3.3 Work-related driving risks

Work-related road safety concerns crashes and injuries connected to driving as part of work. This includes professional driving tasks and work-related journeys, while the inclusion of commuting may vary between definitions and reporting systems. ERSO highlights that work-related travel remains one of the most dangerous activities carried out by employees, and that official statistics may underestimate the real scale of the problem because road crashes during work journeys are not always classified as workplace fatalities (ERSO, 2026c).

For professional drivers, the vehicle is not only a transport environment but also a workplace. This creates a situation where driving tasks and work tasks can overlap. The driver must maintain attention to traffic while also managing operational requirements such as route information, client contact, task instructions, and order documentation. When these work-related demands require interaction with a digital system, they may increase distraction risk by adding visual, manual, and cognitive load to an already safety-critical activity (ERSO, 2026a, 2026c).

ERSO's work-related road safety report also emphasizes that road safety should be managed as an organizational responsibility, not only as an individual driver issue. This is consistent with the Safe System approach, where human error is expected and system design should support safe behaviour rather than relying only on perfect individual performance ((ERSO, 2023; ERSO, 2026c). For a driver application, this means that safety should be considered part of the work system itself. The interface should therefore reduce unnecessary interaction, support clear decision-making, and avoid placing the driver in situations where work efficiency competes with safe driving.

This is particularly relevant in logistics contexts where time pressure, route changes, client communication, and documentation requirements may occur close to or during driving. If the system requires the driver to search, interpret, or manually enter information while the vehicle is in motion, the application can become part of the work-related risk environment. A safer design should therefore prioritize essential information, reduce interaction steps, and allow tasks to be paused and resumed when the traffic situation allows it (ERSO, 2026a, 2026c).

2.1.3.4 Safety measures and standards

ERSO presents several countermeasures for reducing distraction-related risk. These include enforcement of handheld phone bans, awareness and education, safer infrastructure, and vehicle technologies such as Advanced Driver Assistance Systems (ADAS), Forward Collision Warning, Automatic Emergency Braking, and Driver Monitoring Systems. The report also notes that the EU General Safety Regulation makes advanced driver distraction warning systems mandatory for new vehicles, indicating that driver attention is increasingly treated as a central safety concern in vehicle design (ERSO, 2026a).

From a design perspective, the most relevant countermeasure is to reduce the need for distracting interaction in the first place. ERSO suggests that manual text input while driving should be restricted and that systems should be limited to essential functions. This aligns with the broader Safe System principle that road users will make mistakes and that the system should be designed to anticipate and accommodate these errors. In this context, an application used by drivers should not depend on sustained visual attention, complex navigation, or repeated manual interaction during driving ((ERSO, 2023; ERSO, 2026a).

The Euro NCAP Safe Driving Driver Engagement Protocol further illustrates how driver attention is becoming formalized in vehicle safety assessment. The protocol includes driver monitoring as a major assessment area and evaluates long distraction, short distraction, and phone use. Long distraction is defined as a gaze away from the forward road view for between three and four seconds, while short distraction concerns repeated glances away from the road within a limited time period. Phone use is treated as a specific distraction case where the driver's repeated gaze is directed towards a mobile phone (Euro NCAP, 2025).

Although Euro NCAP primarily evaluates vehicle systems rather than mobile web applications, its criteria are still relevant for interface design in a driving context. The protocol shows that both single long glances and accumulated shorter glances are safety-relevant. Therefore, a driver-oriented interface should support very short glances, reduce the need for repeated checking, and avoid interaction patterns that encourage the driver to look away from the road for several seconds (Euro NCAP, 2025).

Taken together, ERSO and Euro NCAP support a safety-first design approach where the application should prioritize essential driving-related information, minimize visual and manual interaction, and make tasks easy to interrupt and resume. This does not mean that all information should be removed, but rather that information should be structured according to the driving context. Critical information should be immediately visible, while non-critical actions should be delayed, simplified, or made available only when the driver is stopped or

parked ((ERSO, 2023; ERSO, 2026a; Euro NCAP, 2025).

2.2 The last mile problem

In logistics, the last mile (or last kilometer) refers to the final stage of a delivery, from the distribution point to the client. Despite being the shortest part of the journey, it can account for a significant share of total delivery cost, and is often described as one of the most complex and expensive stages of transportation. This complexity is influenced by factors such as the delivery environment (urban versus rural settings), traffic conditions, client availability, and the level of service expected by the client (Bell, n.d.).

Because the last mile represents the final interaction between a company and its client, it plays a critical role in client satisfaction and trust. Delays, failed deliveries, or poor communication can negatively impact the perceived reliability of the service, making last-mile performance a key factor for maintaining client expectations and overall service quality (Bell, n.d.).

2.3 Cognitive ergonomics

Cognitive ergonomics focuses on how people interact with technology and how digital systems can be designed to match human perception and mental processing. It includes how the senses (such as vision, hearing, and touch) are used to understand information, as well as how people think, analyze, and make decisions (Fagerlönn & Sirkka, n.d.).

A central aspect is the mental effort required to perform a task, often referred to as cognitive load. This can be evaluated by examining how clearly information is presented, how well sensory cues support the user, and how efficiently a user can reach a correct decision based on the available input (Fagerlönn & Sirkka, n.d.).

2.3.1 Don Norman's model framework

Don Norman describes how users understand and interact with products through the relationship between the designer's intentions, the information presented by the system, and the user's interpretation (Norman, 2013).

2.3.1.1 Conceptual models

A high-level explanation of how a system works. It communicates what consequence a user action will produce (Norman, 2013).

2.3.1.1.1 Design model

The designer's intended way for the product to work and be used. It reflects how the system is structured and what the designer expects the user to understand. A well-designed product aligns the design model with the user's mental model (Norman, 2013).

2.3.1.1.2 Mental model

The user's internal understanding of how a system works, formed through prior experience, memory, and learned patterns. Mental models are shaped by culture, context, and familiarity with similar systems, which influences how users interpret functions and predict outcomes. For example, a restroom icon showing a chair-like toilet may not match the expectations of users from regions where toilets are designed differently, which can cause a misunderstanding (Norman, 2013).

2.3.1.2 System image

The information the system presents to the user through its interface and behaviour, such as visual layout, labels, feedback, and physical affordances. The system image is the bridge between the design model and the mental model, since users can only build their understanding based on what the system shows them (Norman, 2013).

2.3.2 Cognitive Load Theory (CLT)

Originally introduced in psychology as a term describing the amount of mental resources required to acquire and process new information, cognitive load (CL) has become highly relevant within design research. Since human cognition shares similarities with information processing systems and is limited in capacity, design can be adapted to support the user's mental resources rather than compete with them (Whitenton, 2013).

Human memory is commonly divided into two main systems: long-term memory (LTM) and working memory (WM). LTM can store large amounts of information with minimal cognitive

effort, whereas WM is responsible for processing new information and is highly limited in both capacity and duration. WM can typically hold approximately 5-9 elements at a time for around 20 seconds before information begins to fade unless it is rehearsed or encoded (Paas & Van Merriënboer, 2020).

Because of this, complex tasks are often performed by relying on information stored in LTM rather than placing excessive demands on WM. This is enabled through cognitive schemas, which organize multiple related memory elements into structured units. When a schema is well developed, it can be retrieved from LTM and treated as a single element in WM, allowing users to handle complex tasks with lower cognitive load (Paas & Van Merriënboer, 2020).

2.3.2.0.1 Intrinsic cognitive load

Intrinsic cognitive load refers to the mental effort required by the task itself and is determined by the inherent complexity of the information (Paas & Van Merriënboer, 2020). For example, when a user reads a manual to learn how to build a shelf, they must process and combine multiple elements (parts, steps, and sequences). This load is necessary for understanding the instructions and learning the task.

2.3.2.0.2 Extraneous cognitive load

Extraneous cognitive load is caused by how information is presented rather than the task itself. It represents unnecessary working memory effort that does not contribute to learning or task completion (Paas & Van Merriënboer, 2020). Using the same example, extraneous load would occur if the manual is difficult to read (e.g., poor layout, unclear wording, or crumpled pages), forcing the user to spend extra effort interpreting the text instead of focusing on the instructions.

2.3.2.1 Effects of cognitive load

Cognitive load can create different effects depending on how information is presented and how much support the user needs. Two relevant effects are the split-attention effect and the guidance-fading effect.

2.3.2.1.1 Split-attention effect

The split-attention effect occurs when a user must divide attention between multiple sources of information that need to be mentally integrated, either spatially or temporally. This increases extraneous cognitive load compared to presenting the information in an integrated or single-source format (Paas & Van Merriënboer, 2020).

2.3.2.1.2 Guidance-fading effect

The guidance-fading effect describes how instructional support is most beneficial for novices, but should be gradually reduced as a learner gains expertise. If guidance remains too detailed for experienced users, it can become redundant and may increase cognitive load rather than support performance (Paas & Van Merriënboer, 2020).

2.3.2.2 Minimizing cognitive load

According to the Nielsen Norman Group, there are three effective ways to reduce CL for the user: reducing visual clutter by displaying only essential information, leveraging existing mental models, and minimizing extraneous cognitive load by simplifying how information is presented (for example, by replacing unnecessary text with clear icons or visuals) (Whitenton, 2013).

2.3.2.3 Visual and cognitive load in driving contexts

A report by Statens Väg- och Transportforskningsinstitut (VTI) indicates that system-initiated interactions can impose higher cognitive load than user-initiated interactions. In practice, this implies that attention-demanding notifications should be minimized, particularly during active driving. The report also shows that visual distraction, such as repeated glances at a phone, may increase lane swerving by up to 25%.

The findings further distinguish between visual and cognitive load. Under primarily visual load, drivers may partly compensate by reducing speed, but traffic safety risk remains elevated. Under primarily cognitive load, a similar compensatory behavior is less evident, suggesting that mental processing demands can remain hidden while still affecting driving performance.

Taken together, these findings support a design approach where critical information is immediately glanceable and simple to interpret. Reducing visual complexity and limiting unnecessary attention shifts can therefore lower traffic safety risk in mobile driving contexts

(Östlund, Nilsson, Törnros, & Forsman, 2006).

2.3.3 Typography, readability, and glanceability

Typography is not only a matter of visual style, but also of perceptual clarity and task performance. In glance-based contexts, such as driving, typeface and text presentation influence how quickly users can identify information, how long their eyes are directed away from the road, and how accurately they interpret interface content. Since interaction in these contexts relies on brief visual attention and limited cognitive resources, the efficiency of text presentation becomes particularly important.

A study on in-vehicle interface typography showed that a humanist typeface significantly improved performance compared to a square grotesque typeface. In pooled analyses across two studies, response time was significantly reduced ($p < 0.001$), with improvements of approximately 13% observed among male participants. Total glance time was also significantly lower ($p < 0.001$), with reductions of around 10.6%, and participants required fewer glances to complete tasks ($p = 0.001$), with reductions of approximately 10.1%. Additionally, the humanist typeface resulted in a lower overall error rate (17.0% compared to 21.1%), indicating improved accuracy. No significant change was found among female participants (Reimer, Mehler, Dobres, & Coughlin, 2014).

Regarding gender distribution among drivers within Recycling at Sortera, the distribution by region is presented in Table 2.1.

Table 2.1. Gender distribution among Sortera Recycling drivers by region. The table shows that the driver group is predominantly male, which is later considered when discussing typography and glanceability findings.

Region	Men	Women	Share women
Stockholm (Sthm)	60	5	8%
Malmö	7	3	30%
Gothenburg (Gbg)	28	3	10%
Örebro	4	2	33%
Total	99	13	12%

These findings suggest that typographic design can influence how efficiently users process

information in time-constrained contexts, since around 88% of drivers are men. In glance-based interaction, where both visual attention and cognitive resources are limited, typography that supports faster recognition and shorter glances may contribute to more efficient and reliable task performance.

2.4 Design principles

Design principles provide general guidance for creating systems that are understandable, usable, and consistent. They help explain how users interpret interfaces, how actions are communicated, and how design can reduce confusion and unnecessary effort (Connell et al., 1997; Norman, 2013).

2.4.1 Universal design

Universal Design focuses on designing products, environments, and communication so they can be used by as many people as possible without requiring special adaptation. The approach emphasizes inclusive use and aims to reduce barriers for users with different abilities, experiences, and needs. The seven principles of Universal Design are equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use. Together, these principles support designs that are accessible, understandable, and usable across a broad range of users and situations (Connell et al., 1997).

2.4.2 Norman's principles of design

Norman's design principles describe how products communicate possible actions and system behaviour to users. These principles help explain why some designs are easy to understand, while others create confusion or require unnecessary interpretation.

Affordances describe the possible actions that an object or interface allows. Signifiers communicate where and how these actions should be performed. While affordances concern what is possible, signifiers make these possibilities visible and understandable to the user.

Mapping describes the relationship between controls and their effects. Good mapping makes it easier for users to predict what will happen when they act. Feedback communicates the result of an action and helps the user understand the current state of the system.

Constraints limit possible actions and can reduce the risk of errors. Conceptual models describe how users understand how a system works. A clear conceptual model helps users predict system behaviour and understand the consequences of their actions (Norman, 2013).

2.4.3 Norman's seven stages of action

Norman's seven stages of action describe the process users go through when interacting with a system, from forming a goal to evaluating the result. The model is divided into two parts: execution and evaluation.

The execution side includes forming a goal, forming an intention, specifying an action, and executing the action. These stages describe how the user decides what they want to do and how they attempt to do it. The evaluation side includes perceiving the system state, interpreting the system state, and evaluating the outcome. These stages describe how the user understands what happened after the action was performed.

Norman also describes two gaps that may occur during interaction: the gulf of execution and the gulf of evaluation. The gulf of execution refers to the distance between the user's goal and the actions made available by the system. The gulf of evaluation refers to the distance between the system's state and the user's ability to understand that state. A well-designed system reduces both gulfs by making available actions clear and by providing understandable feedback (Norman, 2013).

2.4.4 The 10 usability heuristics

The 10 usability heuristics are widely used as general guidelines rather than strict rules (Nielsen, 1994). They support designers in creating interfaces that align with principles of cognitive ergonomics by reducing unnecessary cognitive load and improving clarity. In this way, the heuristics help structure the system image so that the conceptual model is communicated effectively and the user's mental model is more likely to match the intended design (Chan, 2024).

H1 Visibility of System Status

By providing clear feedback at the right time, the system communicates what is happening and helps users understand the outcomes of their actions. This supports planning and decision-making, while also building trust by ensuring the user is continuously informed about the current state of the system (Nielsen, 1994).

H2 Match Between the System and the Real World

The system should communicate in terms that are familiar to the user and reflect real-world conventions. By using appropriate terminology, natural mapping, and a presentation that matches the user's experience within the specific field/domain, the interface helps align the user's mental model with the intended design model (Nielsen, 1994).

H3 User Control and Freedom

Users should feel in control of the system, even when they make unintended selections or start actions by mistake. The interface should therefore provide clear ways to exit, reverse, or recover from actions with ease. Common implementations include "Cancel", "Back", and "Undo / Redo" functions, which allow users to leave a process and return to the previous state (Nielsen, 1994).

H4 Consistency and Standards

Jakob's Law is closely related to H4 and suggests that users bring expectations from other products they have used before.

Jakob's Law

Users spend most of their time on other sites. This means that users prefer your site to work the same way as all the other sites they already know. Design for patterns for which users are accustomed.

(Nielsen, 2017).

In practice, this means they will apply familiar mental models when interacting with a new interface. Consistency should therefore be maintained both within the product (i.e. similar elements behave the same across screens) and with established platform and industry standards (Nielsen, 1994).

H5 Error Prevention

Good design aims to prevent errors before they occur, but errors may still happen. Errors are divided into slips and mistakes. Slips are typically unintentional execution errors that occur when users are on "autopilot", such as typos or selecting a nearby wrong option. Mistakes, on the other hand, are conscious errors that stem from an incorrect goal or an inaccurate mental model of how the system works (Laubheimer, 2015).

To support error prevention, interfaces should be forgiving and reduce the cost of

errors (primarily high-cost errors), especially for high-impact actions. Practical strategies include applying constraints to limit invalid input, offering suggestions and guidance at the point of action, using sensible defaults, and providing clear exits (Laubheimer, 2015).

H6 Recognition Rather than Recall

Reduce cognitive load by minimizing the need for users to hold and recall information in working memory across steps. In line with Cognitive Load Theory, interfaces should favor recognition by keeping relevant options, system status, and instructions visible in context, supported by consistent layouts and timely in-place guidance rather than lengthy manuals or standalone tutorials (Nielsen, 1994).

H7 Flexibility and Efficiency of Use

Interfaces should support both novice and experienced users by offering accelerators, personalization, and customization. Providing multiple ways to achieve the same goal (e.g. guided flows for beginners and shortcuts for experts) allows users to choose the interaction style that best matches their experience and supports efficient work according to their needs (Nielsen, 1994).

H8 Aesthetic and Minimalist Design

Interfaces should avoid irrelevant or rarely needed information, where these elements otherwise compete for the user's attention and therefore increase their cognitive load. By removing unnecessary distractions and prioritizing essential content, the design better guides users towards their primary goal (Nielsen, 1994).

H9 Help Users Recognize, Diagnose, and Recover from Errors

Error messages should be expressed in language that matches the user's mental model and clearly communicates what went wrong. Familiar conventions from other systems (see Jakob's Law) can support interpretation, for example by using consistent visual cues to indicate severity, such as color mappings similar to a traffic-light metaphor (green-yellow-red). However, messages should not be arbitrary; they should explain the problem and provide actionable steps for recovery so the user can resolve the issue and continue their task towards the primary goal (Nielsen, 1994).

H10 Help and Documentation

Ideally, an interface should be usable without external guidance; however, no design can fully eliminate the need for support for all users and situations. Therefore, help and documentation should be available when needed, easy to find, and presented

in context. The help should be both proactive and reactive while staying concise, task-oriented and effective (Nielsen, 1994).

2.4.5 Google's design for driving foundations

Google's heuristics for car mode, referred to as core principles, are intended to improve design and interaction for Android for Cars in order to support safe driving. The framework primarily targets developers building in-car applications and interfaces. Since this study does not design a native in-car application, but rather a mobile web application intended for use in a driving context, not all recommendations are directly applicable (Google, 2024c). Nevertheless, the principles listed below capture general design considerations for in-vehicle use and are therefore highly relevant to this study.

G1 Interaction principles

Support safe driving by minimizing distraction and cognitive load through simple, predictable actions, immediate feedback, and soft exits that allow interactions to be paused and later resumed when driving conditions are safer (Google, 2024a).

Information current and glanceable Content should be readable within two seconds, and system feedback should be immediate. Information presented to the driver should be concise and updated in real time.

Encourage hands-on driving One-handed touch and voice interaction are recommended where possible. Where interactions require multiple steps, they should be designed to reduce cognitive load and help the driver maintain focus on the road, for example by breaking tasks into short, confirmable actions.

Prioritize driving tasks Interactions should be easy to pause and resume without causing stress. Driving-related tasks should be prioritized, and nonessential tasks should be minimized or removed. Audio feedback should follow the same principles as visual feedback, and volume should be appropriate and not cause distress or mask important sounds from the environment.

Discourage distraction Avoid dynamic visual effects such as scrolling text, animations, or other attention-grabbing elements, as these reduce glanceability and increase distraction risk.

G2 Visual principles

Support safe driving by making information readable at a glance and interactions reliable under motion. Visual structure should reduce search time and minimize touch errors in time-constrained situations (Google, 2024b).

Make content easy to read Use clear hierarchy, minimum contrast of 4.5:1, and short text blocks (maximum of 2 lines) so critical information can be understood quickly.

Display legible fonts Typography should remain legible in driving contexts to reduce cognitive load. Primary text should use 32 dp and secondary text should use 24 dp.

Make targets easy to touch Use touch targets of at least 76 dp × 76 dp with at least 23 dp spacing to reduce accidental taps when the vehicle is in motion.

Keep UI elements consistent Keep placement, iconography, and behavior consistent across screens, and keep quick-action groups to a maximum of 4 actions per card to preserve predictability.

G3 Writing principles

Support safe driving through short, direct, and consistent language that helps drivers understand and act quickly (Google, 2024d).

Make content glanceable Put the most important information first. Keep messages around 120 characters (or 24 words), and keep each line under 80 characters.

Use consistent language Use standardized terminology and similar sentence patterns across screens. This reduces interpretive ambiguity and supports faster comprehension under time pressure.

Write with situational awareness When the vehicle is moving, keep text to 1 short line. Use longer text only when parked (up to 3 lines in scrolling templates).

Follow best practices for writing component text Start button labels with clear action words (for example: Start, Call, Confirm). Keep preview text to 40 characters or fewer, and make status/error messages include one clear next step.

2.5 Design process

2.5.1 User-centered design

User-Centered Design (UCD) is an iterative design approach where the needs, limitations, and context of the users are considered throughout the development process. Instead of treating the interface as a purely technical solution, UCD focuses on understanding who the users are, what they need to accomplish, and under which conditions the system will be used.

The process can generally be described through four recurring activities: understanding the context of use, specifying user requirements, producing design solutions, and evaluating those solutions against the requirements. These activities are not strictly linear, since evaluation may reveal new needs or problems that require earlier decisions to be reconsidered (Norman, 2013).

In this study, UCD is used to connect theory, stakeholder needs, and practical design decisions. The contextual inquiry and user survey are used to understand the drivers' work environment and interaction needs. These findings are then translated into requirements, explored through prototypes, and evaluated through feedback and iteration.

2.5.2 MoSCoW analysis

MoSCoW analysis is a prioritization method that groups requirements into four categories: Must have, Should have, Could have, and Will not have (Gibbons, 2021). In this study, the method is used to rank stakeholder needs and define scope boundaries for the current iteration.

Must have Requirements that are vital for the solution to function. Can be seen as requirements for other requirements, without which they cannot function.

Should have Important requirements that support core functionality, but are not strictly mandatory.

Could have Desirable requirements with lower impact if omitted from implementation.

Will not have Requirements that are not included in the current scope. The value of which is not high enough and therefore can be deprioritized.

The MoSCoW analysis process typically requires a workshop with people who have a deep understanding of the system at hand. Each need is written on a post-it note, and each person

is given 3 weighted voting dots (1-3). These are the points. Each person will vote for the need they deem most important. From this, an agreement is made if the need is a must-have, and then it is moved to a separate space with the MSCW criteria listed. This process is then repeated until all needs have been categorized. While there is no clear rule on how many items a criterion should contain, the "Must have" should, in a normal setting, have the least amount. A workshop methodology, however, is not required for applying MoSCoW itself.

2.6 Digital tools

Digital tools are relevant to interface design, prototyping, code-supported development, and visual attention analysis. They can support different parts of a digital design workflow, from creating interface layouts to analysing how visual elements may be perceived.

2.6.1 Figma design

Figma Design is a collaborative interface design tool for creating user interface layouts, reusable components, and interactive prototypes. The tool supports visual interface construction, prototyping, feedback, and developer handoff (Figma, n.d.-b).

2.6.2 Figma Make

Figma Make is an AI-supported prototyping tool connected to the Figma ecosystem. It can generate functional prototype concepts from prompts or design files. The tool is positioned between visual prototyping and implementation, since it can be used to explore interaction behaviour and prototype logic without requiring a complete production system (Figma, n.d.-a).

2.6.3 Cursor AI

Cursor AI is an AI-assisted code editor for software development. It supports code generation, editing, and codebase-aware assistance through natural language interaction. This places the tool in the development part of the workflow, where interface concepts can be translated into, or explored through, code (Cursor, n.d.).

2.6.4 Attention Insight

Attention Insight is an AI-supported visual attention analysis tool. It generates predictive eye-tracking outputs such as attention heatmaps, focus maps, clarity scores, contrast maps, and percentage-of-attention measurements. These outputs are intended to estimate how visual attention may be distributed during the first seconds of interaction. The tool is based on predictive eye-tracking technology and uses a deep learning model trained on data from eye-tracking studies (Attention Insight, n.d.).

3. Establishing stakeholder needs

This chapter describes how stakeholder needs were identified and prioritized. It covers stakeholder mapping, user flow analysis, contextual inquiry, a user survey, and the resulting user needs and interaction requirements that guided the design process.

3.1 Stakeholder identification and stakeholder map

In order to better understand the stakeholders and their respective needs for further development, several approaches were used. These included a workshop where a stakeholder map was created, and a user flow mapping was conducted.

3.1.1 Workshop approach

Stakeholders were identified and mapped during a time-limited workshop (10 minutes per step). The workshop was solely conducted by the author in accordance with information provided by product owner of the driver application, as well as the SORTERA internal information database. The method used was a brainstorming session utilizing a modified version of the methods outlined in a Mural template for stakeholder mapping. Instead of inviting all stakeholders to the workshop, the author conducted the session alone due with later confirmation from the product owner. Step 1 focused on stakeholder identification, and Step 2 on placement within the map and defining relationships (Mural, n.d.). The values used in the map were therefore approximate and based on personal judgement rather than measured data. Figure 3.1 presents the completed stakeholder map from the workshop.

3.1.2 Primary stakeholders

Primary stakeholders were defined as those with the greatest potential benefit from improvements to the current web application's user experience. As visualised in Figure 3.1, the primary stakeholders identified were drivers (internal) and regulatory/compliance (external).

3.1.3 Secondary stakeholders

Secondary stakeholders, as seen in Figure 3.1, included the union (external), contacts at the delivery destination (internal and external; e.g., recycling facility staff or pickup location staff), the operations team (internal), and the product manager (internal). These stakeholders were placed as secondary due to their close relationship to the primary stakeholders and their indirect impact on, or benefit from, changes to the application.

3.1.4 Tertiary stakeholders

Tertiary stakeholders included the main client (external), media (external), designers (internal), development teams (internal), finance (internal), and the client relations team (internal) as visualised in Figure 3.1. These stakeholders are affected more indirectly, for example through reputational impact (media) or operational consequences (finance), and through supporting functions such as order handling and driver communication (client relations).

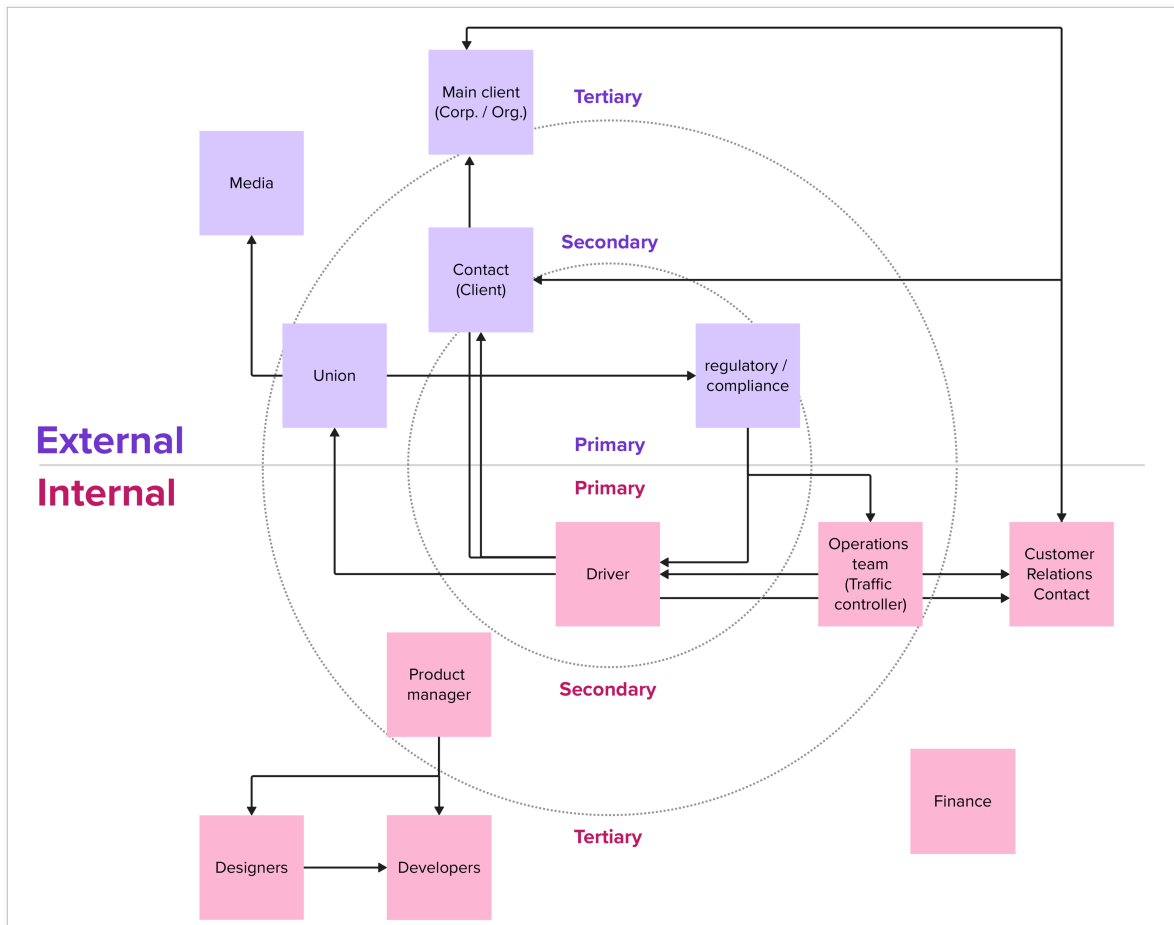


Figure 3.1. Stakeholder map showing primary, secondary, and tertiary stakeholders and their relationships. The arrows indicate identified dependencies and communication paths relevant to the driver application.

3.1.5 Stakeholder relationships

As shown in Figure 3.1, drivers interact directly with the client and contacts at the delivery destination, and they are also connected to regulatory/compliance both directly and through the operations team. Drivers are additionally linked to the union, which may escalate broader issues to the media in cases of significant or repeated compliance concerns. Lower-level issues are more likely to be handled internally between the company and the driver, with union involvement occurring as needed. Finally, the product manager has direct relationships with the design and development teams, acting as a key link between stakeholder needs and implementation.

3.1.5.1 Key dependencies

Several critical dependencies were identified within these relationships. Drivers depend on accurate and timely information (e.g., predetermined delivery locations and instructions) to complete deliveries efficiently and in compliance. If such information is missing or unclear, the operations team may need to intervene manually, increasing workload and introducing delays. This can raise operational costs, creating a downstream dependency between operations and finance. Conversely, operations depend on drivers providing correct and complete input in the system to enable coordination, documentation, and potential automation.

3.2 User flows

To understand how drivers interact with the application in practice, it is useful to first consider the broader operational flow surrounding a delivery order. At a high level, the process begins when a client places an order through either a phone call or the client application. The order is then processed in the order management system, where it is prepared and assigned for execution.

The driver then carries out the assignment using the driver application, which provides the operational information required during the route. Once the material reaches its destination, the facility application supports handling and documentation at the receiving facility. Finally, the completed order proceeds to invoice management, where the collected information forms the basis for billing.

This overview illustrates the operational context in which the driver application is used. The driver application is highlighted in the diagram because it represents the part of the system directly used by the driver and is therefore the primary focus of this study.

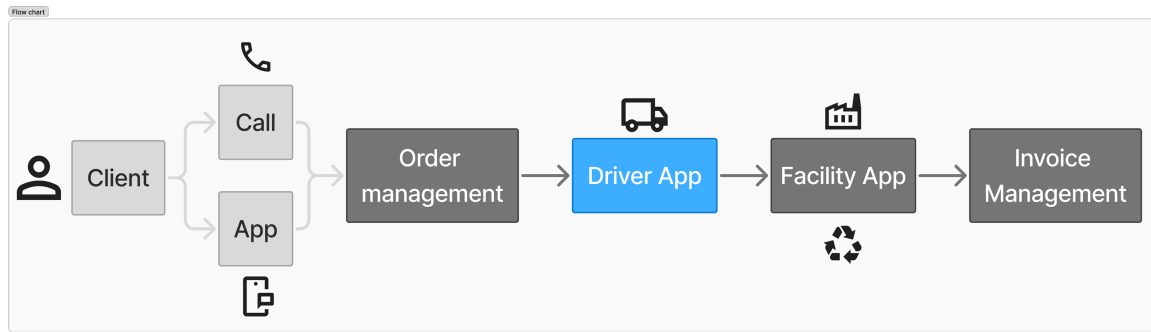


Figure 3.2. High-level operational flow from client contact to invoice management. The driver application is highlighted because it represents the system component directly used by the driver and is therefore the focus of this study.

3.2.1 Application user flow

To better understand how drivers interact with the application during a typical workday, the current user flow of the driver application was mapped based on observations from the contextual inquiry. The mapping documents the sequence of interactions required to navigate the application, access order information, and complete an order in different operational contexts.

The analysis revealed that completing an order involves a relatively large number of interaction steps distributed across several screens. In addition to the core order workflow, drivers occasionally leave the application to access external tools such as navigation or phone calls, introducing additional context switching. These transitions were included in the flow mapping to capture the full interaction sequence experienced during real-world use.

The mapping also highlights several points where interaction complexity increases, particularly during order completion tasks such as registering materials, documenting the pickup, or confirming the task. Some of these stages require multiple inputs or repeated confirmation steps, which may increase cognitive load during time-constrained work situations.

As illustrated in Figure 3.3, completing an order requires multiple transitions between screens and interaction steps.

In addition, the flow mapping was used to identify points of contact between the driver and the phone that may influence traffic safety. These points were later analysed in relation to vehicle state and environmental complexity (see Figure 3.4). The resulting flow diagram therefore served both as documentation of the current interaction structure and as a basis for identifying potential usability and safety issues in the existing design.

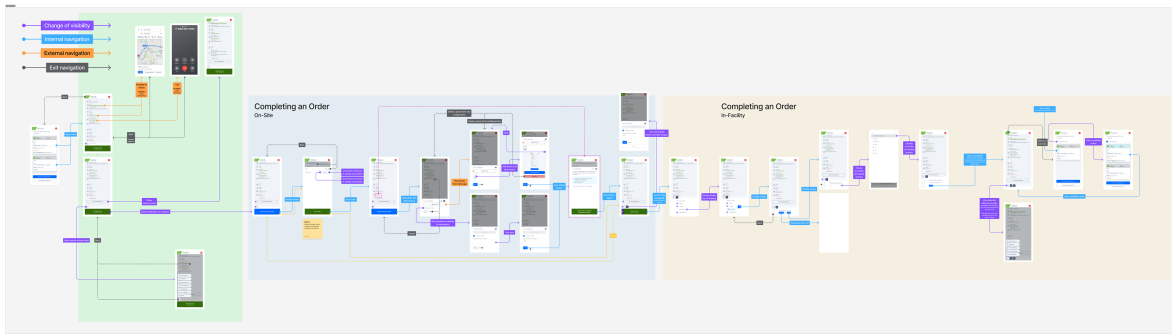


Figure 3.3. Mapped user flow of the current driver application. The diagram illustrates the interaction sequence required to review orders, navigate to locations, and complete order documentation. The mapping also includes interactions with external applications (e.g., navigation and phone calls) and highlights stages with higher interaction complexity during order completion.

3.3 User study and data gathering

3.3.1 Contextual inquiry

The contextual inquiry was conducted through in-situ shadowing of Sortera drivers during their regular routes, with observations covering both physical work activities and interactions with the current web application. In total, two drivers were observed across four sessions in three operational contexts. The investigated contexts represented distinct transportation types: LD containers (comparable to LVX containers), sack transport using a crane, and industrial wheelie bins.

The primary aim of the inquiry was to establish a basic understanding of the work context and current application use in order to inform the design of a subsequent user survey. The survey was planned as a complementary method to capture more personal and potentially sensitive user information in an anonymized setting, such as the presence of colour blindness, visual impairments, or other accessibility-related conditions that may influence user needs and interaction with the interface.

Across contexts, the workday followed a similar structure. A typical shift began with a short morning briefing, followed by collection of any required paper documentation (as indicated by the application), and then route execution. The application was often checked prior to the start of the shift to gain an overview of the planned sequence and workload for the day. A standard workday duration was approximately eight hours.

The two participants' mean age was 28.5 years. One driver was relatively new to the company,

only been there for a few months, with prior experience in long-haul transport, and operated a truck without a phone mount. This constraint influenced interaction with the application, which was primarily performed during stops and when the vehicle was parked. The second driver had long-term experience at the company (at least five years) and extensive experience operating trucks, which influenced both routine and efficiency in task execution.

Data collection combined observation with opportunistic interviewing during naturally occurring interactions with tools, documentation, and application functionality. Questions focused on why actions were taken, how decisions were made, and what attention was directed toward in the moment (a light-weight think-aloud approach). To reduce disruption and maintain ecological validity, assistance was provided during stops when appropriate, including securing loads, loading and off-loading containers/bins/sacks, and supporting manoeuvring at constrained delivery sites not well suited for heavy vehicles. Photographs were taken selectively when application behaviour was uncertain or when details needed to be verified during later analysis.

By analysing the perceived actions of the drivers, a qualitative assessment was made of perceived traffic safety during the different stages where the driver used the phone, as shown in Figure 3.4. The assessment was based solely on observation and the following criteria:

- Vehicle state during interaction (parked, stopped in traffic, or moving).
- Duration and frequency of phone interaction.
- Visual attention shift away from the road environment.
- Manual interaction load (number and complexity of touch actions).
- Environmental complexity at the moment of interaction (e.g., narrow streets, pedestrians, heavy traffic).
- Ability to pause and resume the task safely.

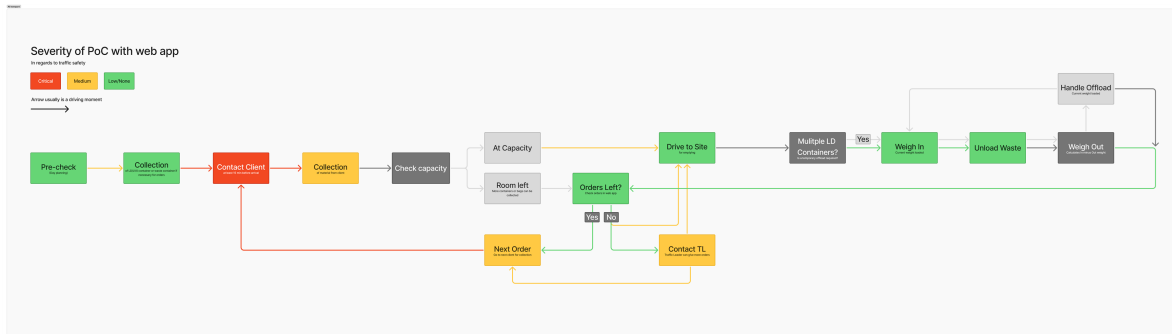


Figure 3.4. Severity of points of contact with the application with regard to traffic safety risk. Green is no or low risk, yellow is medium risk, and red is high risk. Gray means the state is not applicable to the current analysis.

The analysis identified several usability issues related to information presentation and workflow in the driver application. Order information was at times unclear, making it difficult for drivers to quickly determine what to collect. Special notes could also be overlooked when not sufficiently prominent in the interface. In addition, switching to external applications for navigation or phone calls disrupted the workflow and may have increased cognitive load. Other difficulties concerned task registration, particularly estimating weight, counting sacks, interpreting the meaning of “extra lift”, and handling multiple orders at the same location. The findings also indicated gaps in the documentation process, as some information was recorded after task completion rather than during the task itself. At the same time, the existing use of colour coding appeared to support rapid interpretation of order types.

3.3.2 User survey

A user survey was conducted to gather more detailed information about the drivers’ experience with the driver application. The survey was conducted via an online form and consisted of 15 questions. The full questionnaire, including all answer options, is listed in Appendix 6. Three of these questions gathered background information about the respondents, while the remaining twelve focused on truck driver specific situations which can be improved upon for increased traffic safety, such as information reduction for increased glanceability, and touch target redesigns.

Table 3.1 summarizes anonymized respondent information from the survey regarding operational base, self-reported driving experience, and primary work type.

Table 3.1. User survey results for background information, showing the number of respondents per answer. Background information is operational base, driving experience, and work/vehicle type. Three separate distributions shown side by side.

Base	Count	Experience	Count	Work type	Count
Rosersberg	21	<1 år	1	Kranbil	14
Jordbro	3	1–3 år	7	Liftdumper (LD)	14
Örebro	3	3–7 år	6	Lastväxlare (LVX)	12
Göteborg	6	7–15 år	10	Kärl	6
Malmö	1	15+ år	9	Farligt avfall	1

Beyond demographics, the survey focused, as previously stated, on situations where the driver application may be used under time pressure, during movement, or in close connection to driving tasks. These situations are relevant in order to establish current difficulties and needs, since glanceability, cognitive load, visual hierarchy, and reliable touch interaction are central concerns in mobile driving contexts. These areas warrant further investigation to identify what works and what does not in the current design.

3.3.2.0.1 Vibration and readability in motion

Drivers were asked whether vibration or uneven surfaces make it harder to read information in the driver application while the vehicle is moving. The mean agreement score was 3.1 ($n = 33$), slightly above the neutral midpoint. The question used a Likert scale where 1 represented *do not agree at all* and 5 represented *completely agree*.

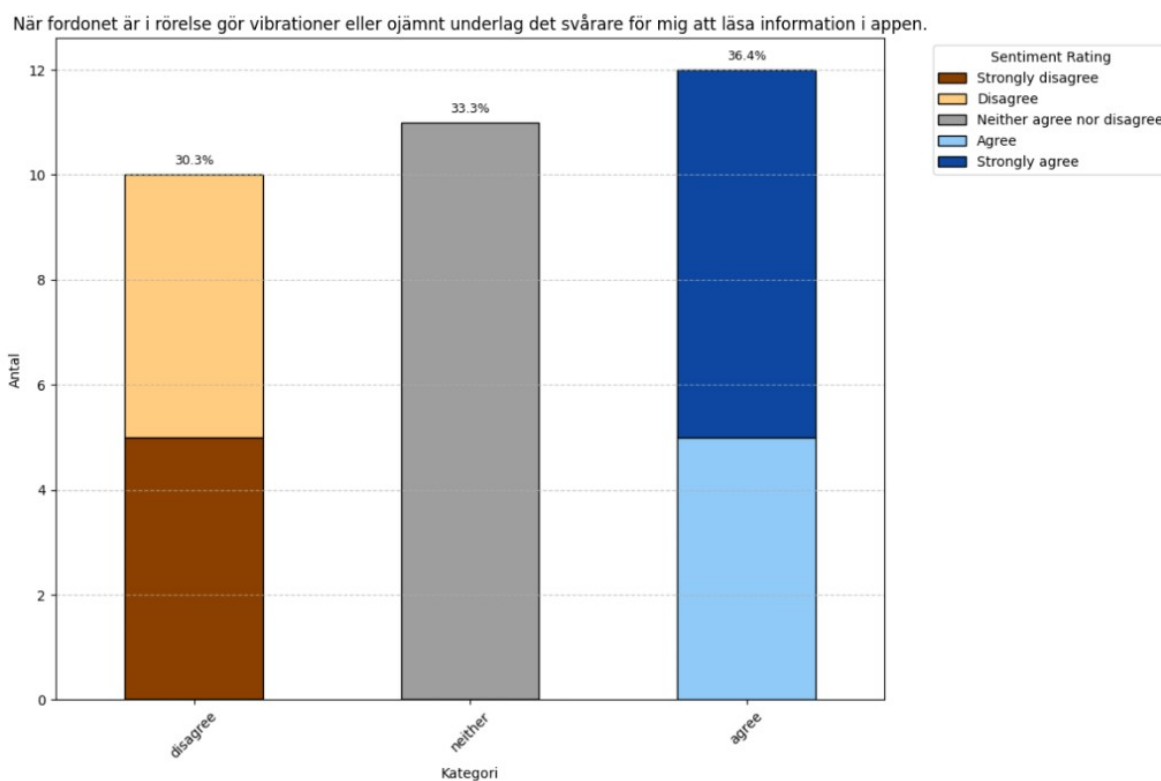


Figure 3.5. Perceived difficulty reading driver application information when the vehicle is in motion due to vibration or uneven surfaces.

As shown in Figure 3.5, responses were distributed across disagreement, neutrality, and agreement. While a large portion of respondents did not agree with the statement, it is still a relevant design concern to consider since a majority did agree with the statement. This means that the impact of vibration and uneven surfaces on readability is a significant issue for a considerable part of the driver group.

3.3.2.0.2 Touch errors during motion

Drivers were also asked whether they more often tap incorrectly in the driver application while the vehicle is moving. The mean score was 2.5 ($n = 33$), below the neutral midpoint.

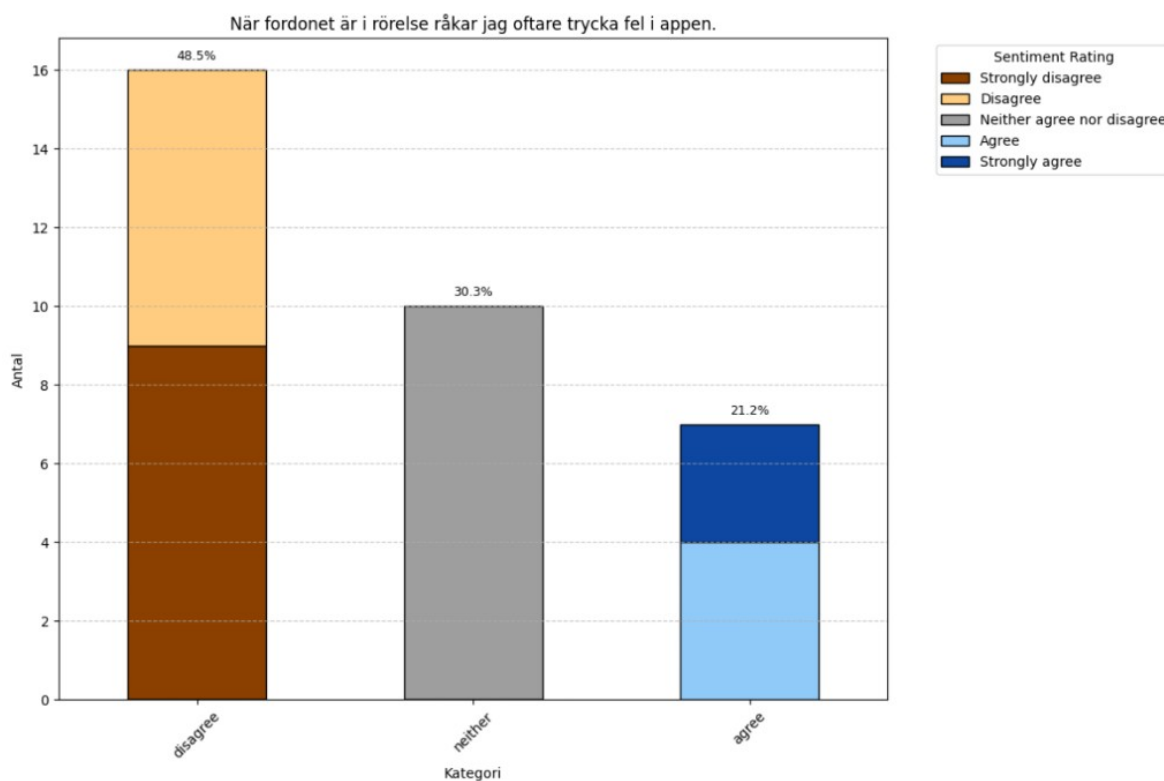


Figure 3.6. Perceived frequency of incorrect taps in the driver application while the vehicle is in motion.

Figure 3.6 shows that respondents overall did not strongly report frequent mistaps in motion. However, 21% still agreed with the statement, suggesting that touch reliability remains relevant when designing for use in unstable or time-constrained situations.

3.3.2.0.3 Context switching in driving situations

Furthermore drivers were asked if they sometimes need to switch between several views, pages, or apps to reach needed information in driving situations. The mean score was 2.6 ($n = 33$), again slightly below neutral.

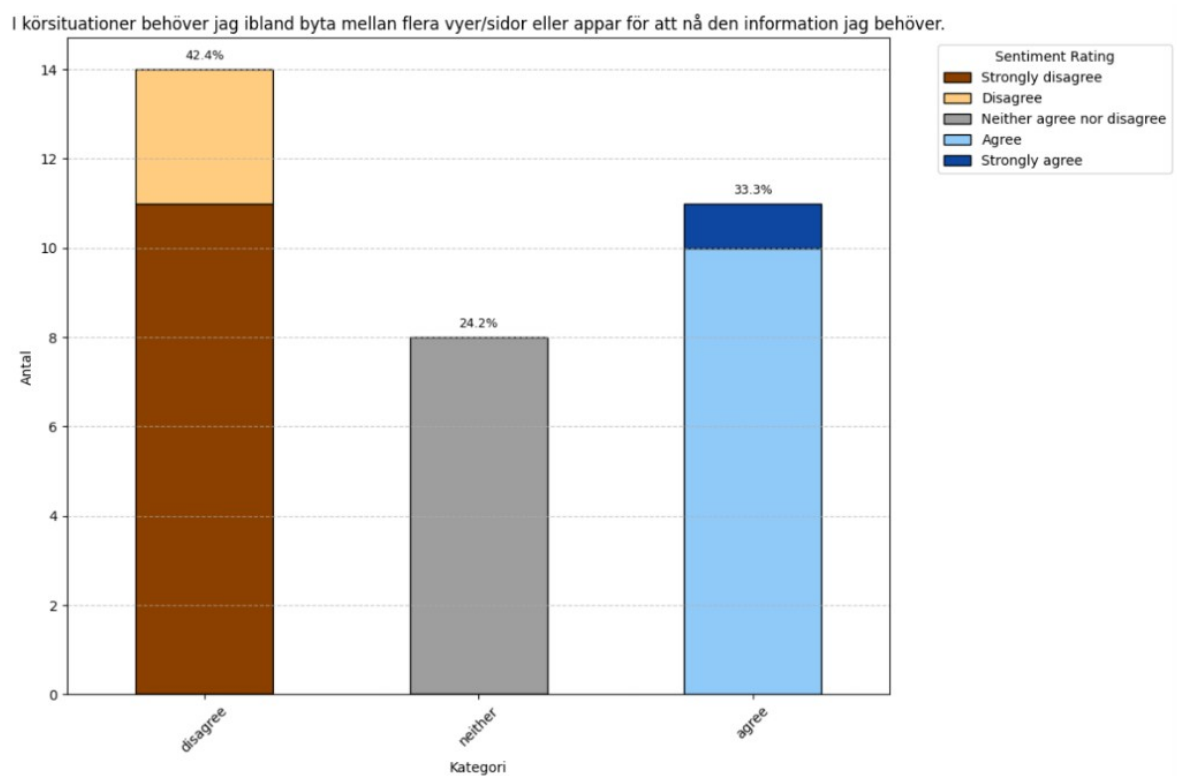


Figure 3.7. Survey responses: need to switch between views, pages, or apps to access needed information in driving situations.

As shown in Figure 3.7, disagreement was the largest single category (42%), while agreement remained substantial (33%). This suggests that context switching is not experienced uniformly across respondents, but that it is still a meaningful issue for a considerable part of the driver group.

3.3.2.0.4 Perceived time to complete a task

Drivers were asked to estimate the perceived time required to complete a representative task in the driver application. The drivers could select a time ranging from less than one second to more than six seconds. Each band was mapped to a representative duration, using the category midpoint, before averaging across responses. The resulting mean perceived time was 3.5 s ($n = 33$).

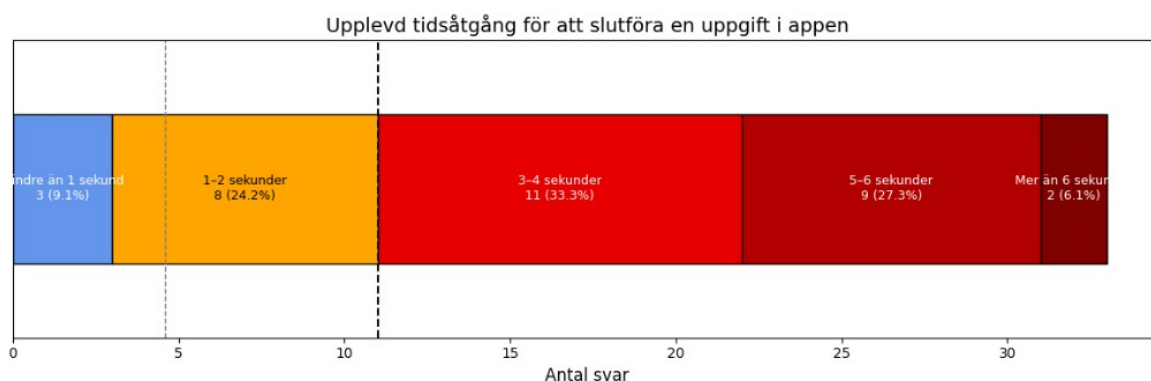


Figure 3.8. Perceived time required to complete a representative task in the driver application, shown as a time-range distribution. The first dashed line represents the 1.2 s limit for glanceability, and the second the 2 s limit. The dashed lines are unrelated to the x-axis.

Figure 3.8 shows that most responses are above the 2 s limit for glanceability. This indicates that even relatively simple tasks may require more than a brief glance, which supports the need to simplify and prioritize information in driving-related views.

3.3.2.0.5 Survey-based MoSCoW prioritization

To translate the survey results into actionable design input, qualitative survey questions were analyzed using a MoSCoW prioritization structure. The purpose was to identify which information elements drivers most consistently considered important in different operational situations.

Since these questions were multiple answer questions, each question was prioritized according to the share of respondents selecting that option. The thresholds were adjusted to fit the size and distribution of the dataset, while also taking into account that many of these items are all at least on a Could level since the Will not have category has been eliminated in the process of selecting questions for what needs to be considered. A *Must* threshold of 50% was therefore used, meaning that an item had to be selected by at least half of the respondents to be treated as a core requirement. A *Should* threshold of 15% was used for important but less universally selected items, while a *Could* threshold of 0% was used for lower-priority findings. The complete MoSCoW breakdown for all analysed survey questions is presented in Appendix 6.

Table 3.2. MoSCoW weighting values used for prioritizing survey results.

Threshold	Weight
Must	50%
Should	15%
Could	0%

The results show that address, client phone number, important information, contact person, and information about what should be collected or delivered repeatedly appeared as high-priority information in driving-related contexts (Appendix 6). For example, when en route to a client, address was selected by 97% of respondents, client phone number by 79%, important information by 58%, contact person by 55%, and what should be collected or delivered by 55%. Similar patterns appeared in questions concerning finding the correct entrance or place near the client, when preparing for the next client, and in the order overview.

The MoSCoW analysis therefore supports a driving-oriented interface where the most task-critical information is shown first and made easy to interpret quickly. Less frequently selected information can still be available, but should be placed lower in the hierarchy or accessed through secondary interaction or made context-aware. In this way, the survey results provide a bridge between the theoretical focus on glanceability and cognitive load, and the concrete user needs and interaction requirements.

3.3.3 User needs and interaction requirements

Based on theory with regards to traffic safety and legislation, contextual inquiry and user survey, the following user needs and interaction requirements were identified:

R1 Workflow and task sequence

Supports the driver in reviewing, opening, understanding, and completing orders in the correct sequence.

- Review the daily schedule and overall order sequence.
- Open an individual order from the order overview.
- Read key order information, such as client details, references, material type, and

continued on next page

R1 Workflow and task sequence

continued

special notes.

- Check address information and destination details.
- Review task-specific instructions before pickup or delivery.
- Check whether paper documentation is required and manage it alongside the digital workflow.
- Confirm task completion and proceed to the next order.

R2 Order documentation

Supports the documentation and documentation of tasks required before, during, and after pickup or delivery.

- Capture photos before pickup or delivery.
- Capture photos after pickup or delivery.
- Document collected or delivered material.
- Document additional services or conditions, such as “Number of times truck had to be moved by order of the client”.

R3 Navigation and communication

Keeps route guidance and stakeholder contact within the driver workflow.

- Launch internal navigation through Google Maps.
- Contact the client or other relevant stakeholder by internal app phone, not the native app.
- Prohibit switching between the driver application and external applications, such as navigation or calling.

R4 Driving safety and compliance

Reduces interaction patterns that may create distraction or unsafe use while driving.

- Hands-free interaction.
- Safety-first in-app navigation.
- No animations, except simple ones for context switching.
- Do not rely on verbal communication.

R5 Context-aware workflow

Allows the workflow to adapt to traffic conditions, route progress, and user experience level.

- Pause and resume the workflow when the traffic situation requires it.
- Use GPS-based phase changes, e.g. from going to client, to close to client, to at client.
- Use accelerators for experienced users, while allowing beginners to also use the system.

R6 Information design and cognitive load

Makes operational information easier to recognize, interpret, and act on during driving.

- Make information glanceable.
- Use a dynamic view where only essential operational details are displayed.
- Support recognition rather than recall.
- Use one-line information during driving.
- Reduce all information during driving.
- Reduce the amount of glances.
- Use clear action words.
- Use constrained language.
- Interpret colour coding and other visual cues used to categorize orders.

R7 Visual design and accessibility

Defines visual and interaction properties that support readability, touch accuracy, and accessibility.

- Use touch targets at 76 dp.
- Use typography at 32 dp primary and 24 dp secondary.
- Use a contrast ratio of at least 4.5:1.
- Use colors which work for color-blind users.
- Use clear hierarchy.
- Use 23 dp spacing to reduce accidental taps during driving.
- Use a humanistic font.

R8 Consistency and usability principles

Supports predictable interaction and alignment with established usability principles.

- Keep system status visible at all times.
- Ensure consistency across views.
- Utilize standards according to Jakob's Law.

4. Prototyping

This chapter describes the iterative prototyping process used to explore and evaluate design concepts derived from stakeholder needs.

4.1 First iteration - functionalities

The first iteration focused on taking the previously identified user needs and interaction requirements and turning them into early concepts. The goal at this stage was not to create a finished interface, but rather to explore which functions and interaction patterns could support the driver in a driving context. Therefore, the concepts were mainly connected to the needs regarding workflow, navigation and communication, driving safety, context awareness, information reduction, and visual accessibility.

The most important focus was to reduce the amount of information and actions needed while driving. This connects especially to the requirements for making information glanceable, reducing cognitive load, supporting recognition rather than recall, and avoiding unnecessary context switching. The concepts were therefore evaluated based on how well they could support the driver in quickly understanding the next task, reaching navigation or contact functions, and continuing the workflow without needing to search through several views or external applications.

4.1.1 Low-fidelity prototypes and concept exploration

The initial step consisted of a rapid diverging sketching-based ideation workshop lasting 20 minutes. The purpose of the workshop was to generate several possible concepts for how the driver application could be adapted to a driving context. Since the previously defined needs covered both functional requirements and traffic-safety-related interaction requirements, the workshop did not only focus on what information should be shown, but also on when and how the driver should interact with the system.

The printed user needs and interaction requirements were used as support after the ideation. This made it possible to evaluate the concepts directly against the needs. Notes were written

directly on the sketches to show which needs were supported, which were only partly supported, and which were not addressed. In cases where a concept did not address a relevant need, this was marked with an “X”. This was useful since it made the connection between needs and early design decisions more visible.

Three main areas were explored during the first iteration. These were the order overview, GPS- and velocity-based constraints with communication support, and the individual order view. These areas were selected because they are closely connected to important parts of the driver workflow. The order overview supports the driver in understanding the order overview of orders. The GPS and communication concepts support safer interaction while driving and reduce the need to leave the application. The individual order view supports the driver in accessing the right information depending on the current order situation.

The paper sketches from the workshop, shown in Figures 4.1 to 4.3, represent the first exploratory results from the ideation session. The concepts were not intended to solve all requirements completely, but rather to test how different needs could be translated into interface behaviour.

4.1.1.1 Order overview

The order overview mainly connects to the needs for workflow and task sequence, information design and cognitive load, visual design and accessibility, and consistency. The driver needs to quickly understand the daily order sequence, open the correct order, and see the most important information without having to search for it. Because of this, the concept focused on reducing the amount of visible information and creating a clearer hierarchy.

Figure 4.1 explores how drivers could interpret the day’s workload at a glance before and during a route. The sketch shows a clear hierarchy of information, where the most important information is displayed first. This includes information such as address, basic order information, and important notes. This connects to the survey results, where address and what should be collected or delivered were prioritized as important information. By showing this information directly on the order card, the driver does not need to open each order to understand the basic task.

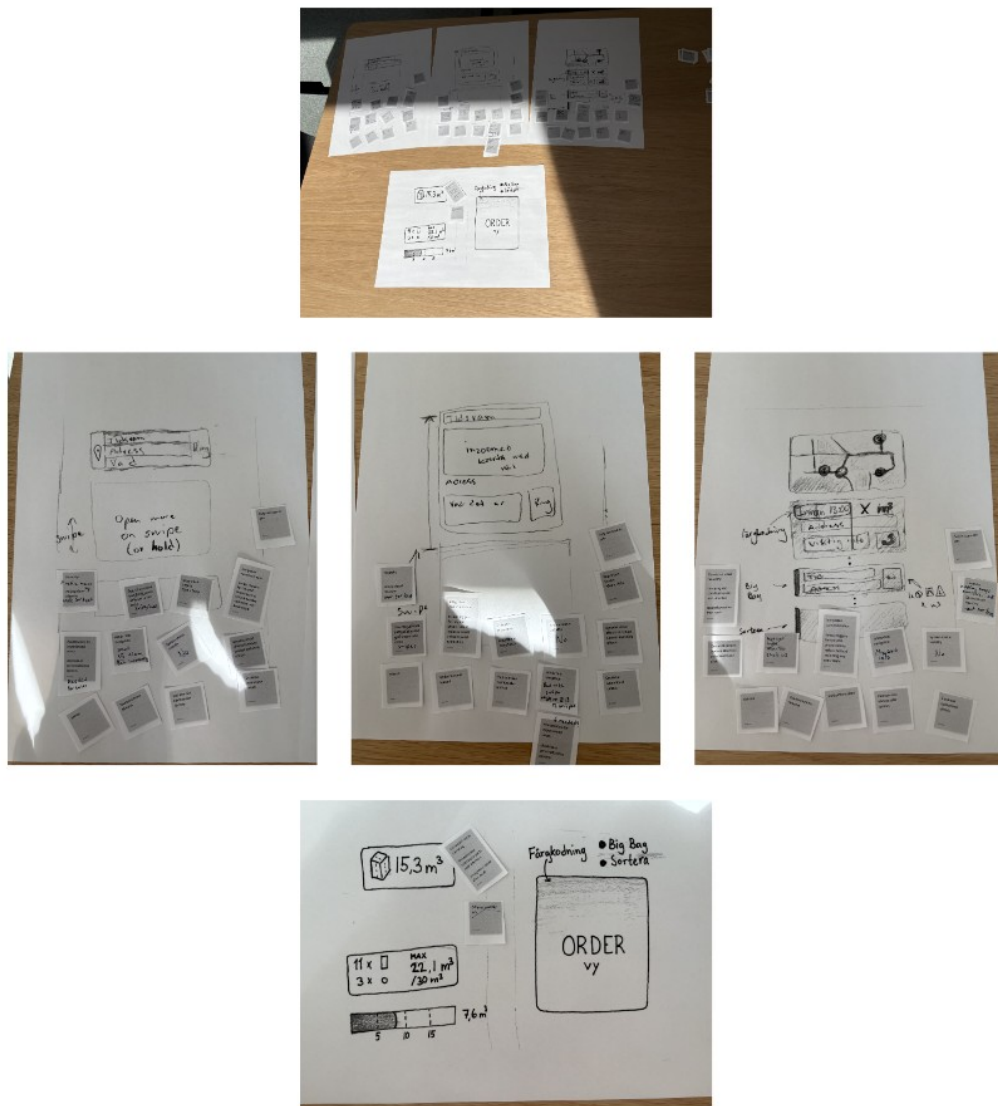


Figure 4.1. First paper sketch of the order overview from the ideation workshop. The concept explores how daily workload can be summarized at a glance through volume indicators, container counts, a capacity bar, and colour coding for order types, aligning with the requirements to reduce cognitive load and support recognition rather than recall when performing an order.

The use of clear grouping and colour coding was included to support recognition rather than recall. Instead of forcing the driver to read and interpret every order from the beginning, the visual structure can help the driver recognize the type of order and understand the status more quickly. This connects to the requirement to use visual cues to categorize orders, while also

supporting consistency across views.

The concept also includes a function for showing the current space left on the trailer in volume units. This was included because the driver may need to quickly estimate whether another order can fit before continuing the order at hand. By making this information visible in the overview, the driver does not need to mentally calculate or search for this information elsewhere. This connects to the need to reduce cognitive load and support faster decision-making.

Another important concept in the order overview was assisted scrolling. This functionality allows the user to scroll freely, while ensuring that when the user releases the screen, a card snaps into a fully visible position. If the currently visible card is mostly in view, it remains fixed at the top. Otherwise, the next card is brought into focus. This connects to the need to reduce the amount of glances and unnecessary manual interaction. Since the driver may use the application in a moving vehicle or in a time-constrained situation, the interface should not require exact manual adjustment.

The assisted scrolling also connects to visual accessibility and usability. A normal scroll interaction can leave information partly hidden, which may force the driver to adjust the view again. By snapping the order card into a complete position, the interface helps the driver keep one full order in focus. This reduces the risk of missing information and makes the interaction more predictable.

The concept also explored expandable order cards. The current card could expand when it is snapped into view, showing more information about the order. When another card is selected, the previous card collapses back to its original state. This was used as a way to balance information reduction with access to more detail. In the collapsed state, only essential information is shown. In the expanded state, more order information can be accessed when needed. This connects to the requirement for a dynamic view where only essential operational details are displayed during driving, while still supporting the full workflow.

4.1.1.2 GPS velocity constraints and SMS communication

The GPS velocity constraint and SMS communication concepts connect mainly to the needs for navigation and communication, driving safety and compliance, context-aware workflow, and information design. The purpose was to explore how the application could reduce unsafe interaction while still allowing the driver to complete necessary work tasks.

Figure 4.2 explores two related concepts. The first concept is a velocity-based interaction lock using GPS data. The second concept is an on-request SMS workflow for client communication.

Both concepts were based on the need to reduce interaction during driving.

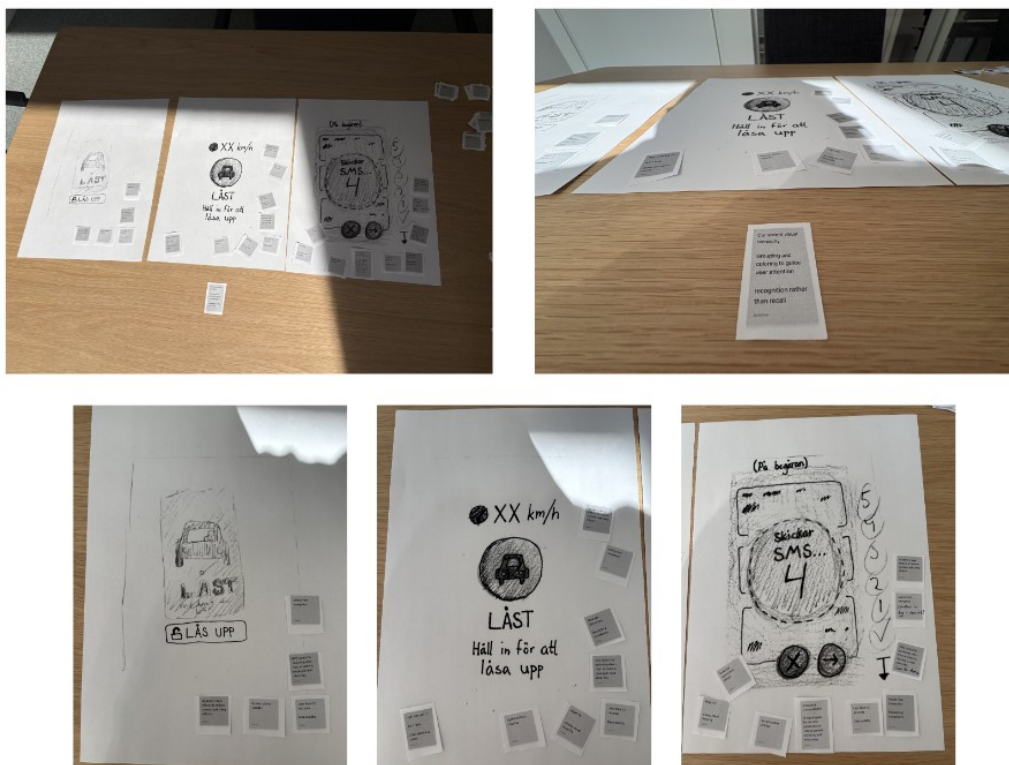


Figure 4.2. First paper sketches of core functionalities from the ideation workshop. The concepts include a velocity-based interaction lock using GPS data to limit use while the vehicle is in motion, and an on-request SMS workflow with a visible countdown, cancellation, and immediate-send options to balance automated client communication with driver control.

The velocity-based interaction lock was based on the need to limit interaction while the vehicle is moving. This connects directly to the safety requirements, where the application should reduce visual and manual interaction during driving. By locking parts of the interface at higher speeds, the concept aims to prevent the driver from performing actions that require too much attention. The intention was not to remove all functionality, but to restrict interaction that is not suitable while driving.

A hold-to-unlock function was added because GPS data may sometimes be inaccurate. For example, the driver can be located in a tunnel, near tall buildings, or in another area where the GPS signal is weak. In these cases, the application may incorrectly assume that the vehicle is moving or in another state than it actually is. The hold-to-unlock gesture gives the driver

a way to override the lock when needed. At the same time, the gesture is deliberate and therefore less likely to be triggered accidentally. This connects to the need for a context-aware workflow, where the system should adapt to the situation while still allowing the driver to stay in control.

The on-request SMS workflow connects to user control and freedom. The concept includes a visible countdown, a cancel option, and an immediate-send option. This means that the driver can start the action, review what is happening, and still cancel or confirm the action. The countdown also gives feedback about system status, which supports predictability and trust.

While Section 2.3.2.3 describes attention-demanding, system-initiated interactions as problematic during driving, the SMS countdown may still be suitable because it starts only after the driver has initiated the action. The system does not interrupt the driver unexpectedly. Instead, it supports an action that the driver has already chosen. This distinction is important because it keeps the driver in control and reduces the risk of unwanted attention shifts.

4.1.1.3 Context-aware individual order

The context-aware individual order concept connects mainly to the needs for workflow and task sequence, navigation and communication, context-aware workflow, information design and cognitive load, and visual design and accessibility. The driver needs to access different information depending on where they are in the current workflow phase. Therefore, the concept explored how the order view could change depending on the driving situation.

Figure 4.3 explores how information for a single order could be presented while also adapting to the driver's current context. The concept uses GPS location tracking to change which information is shown depending on whether the driver is on the way to the client, close to the client, or at the client location. This connects to the requirement for GPS-based phase changes, where the application changes from one workflow phase to another.

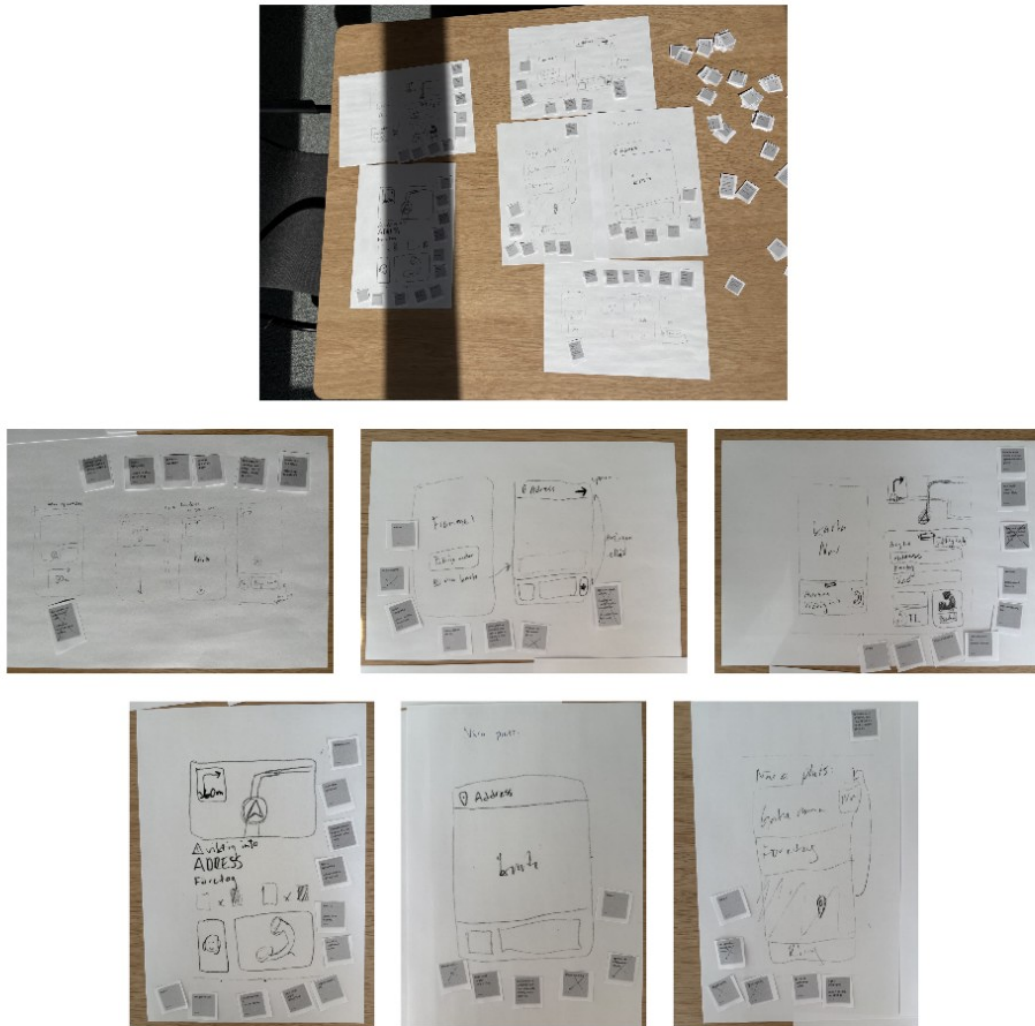


Figure 4.3. First paper sketches of a framework for an individual order with context-aware information. The concepts explore how the interface can adapt to workflow phases, such as when approaching a client.

When the driver is closer to the client, other information may become more important, such as entrance details, gate codes, exact drop-off location, or special instructions. This connects to the survey results, where client phone number, contact person, address, and important information were prioritized when approaching a client. The concept therefore tries to show information based on when it is the most useful.

The context-aware information swap was also intended to reduce cognitive load. If all order information is shown at the same time, the driver must search through the information and

decide what is relevant in the current situation. By changing the visible information depending on the workflow phase, the system can reduce the amount of interpretation needed. This supports the requirement to show only essential operational details and to make information glanceable.

The concept also includes an “At client” view. This view allows the driver to continue to the next step of the workflow when they have arrived. It also allows the driver to return to the previous navigation view if the GPS position is inaccurate or if the system changes phase too early. This connects to the need for pause and resume, and to the need for user control when context-aware automation does not match the real situation.

A pull-out menu was included to give access to more information without overloading the navigation view. In the collapsed state, the view only shows the most relevant context-aware information. In the expanded state, the driver can access more detailed order information when the situation allows it. This connects to the requirement to reduce information during driving, while still supporting the full order workflow.

The concept also included a quick-access call button for contacting the transport planners or another relevant stakeholder. This connects to the need for navigation and communication to stay inside the driver workflow. Instead of searching through the order details or leaving the application, the driver can reach communication functions directly from the order view.

Large text and large touch targets were also part of the concept. This connects to the requirements for typography, touch target size, spacing, contrast, and clear hierarchy. Since vibration, movement, and time pressure can make interaction more difficult, the interface needs to reduce the risk of mistakes and make information easier to read quickly.

4.1.2 Static mid-visual fidelity prototypes

The selected concepts were developed into more visually refined prototypes using Figma Design. While the layouts were structured to resemble a mid-fi interface, including hierarchy, typography, and spacing, the prototypes remained non-interactive and therefore retained low functional fidelity.

The increased visual clarity aimed to reduce ambiguity when presenting the concepts, making it easier for stakeholders to interpret layouts and intended interactions. At the same time, the prototypes remained quick to produce and modify, allowing continued iteration without introducing unnecessary development effort.

The representations focused on conveying key aspects such as information hierarchy, action

prioritization, and interaction concepts, rather than simulating detailed system behaviour.

4.1.2.1 Order overview

Figure 4.4 shows the static mid-visual fidelity prototype of the order overview. It includes settings, the order list, a map with order markers, and the on-request SMS countdown workflow.

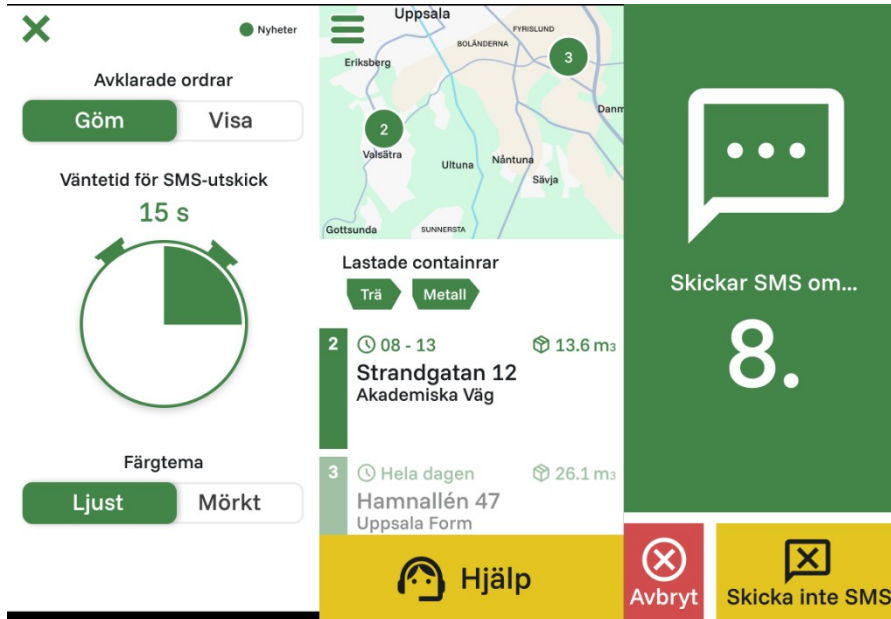


Figure 4.4. Static mid-visual fidelity prototype of the order overview, including settings, the order list with a map with order markers, and the on-request SMS countdown workflow.

To reduce context switching, the settings menu was designed to slide in from the left and slide back on exit. This keeps the user in the same view instead of changing to a separate settings page.

The hierarchy is created by making the address the largest information item. The time window and volume are placed above the address and shown in green, since these are important metrics. The green spine groups the order card as a whole, while the remaining information stays visible against the white background.

A space is left underneath each order card. This space is saved for orders where an important note needs to be shown. The space was left intentionally to make the card height more predictable. This can reduce the need for extra glances, since the user can learn to navigate the view with the same distance between each item.

The SMS delay is activated when an order is selected. It can be cancelled easily. The action

items also allow the user to not send the SMS at all, or to send it immediately by pressing the large green container.

4.1.2.2 Individual order view

Figure 4.5 shows the static mid-visual fidelity prototype of the individual order view. The same visual hierarchy and context switching reduction principles from the order overview were also applied here.

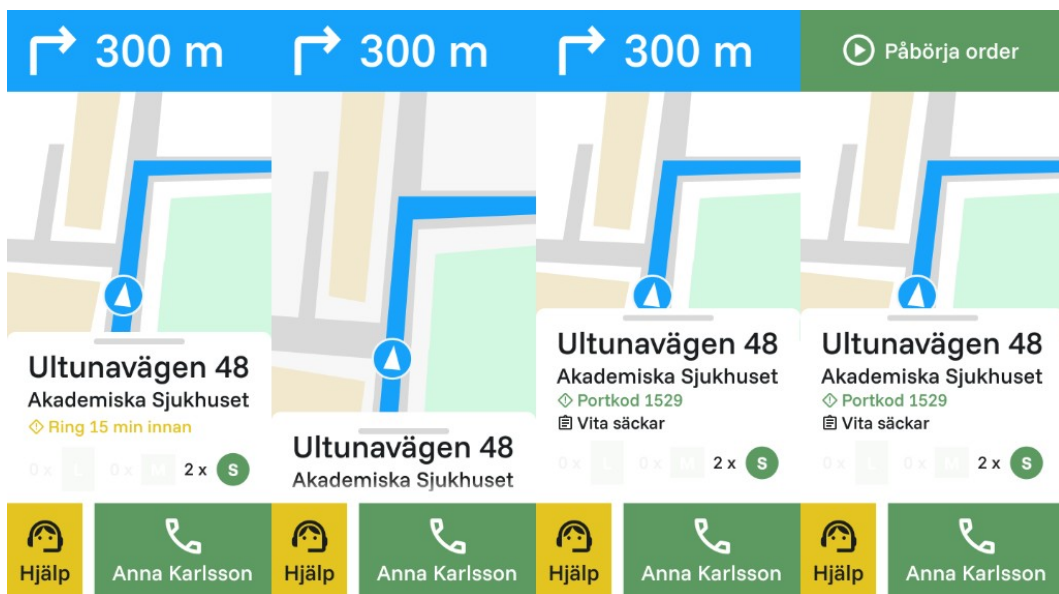


Figure 4.5. Static mid-visual fidelity prototype of the individual order view, showing how order information is presented during approach and arrival, with context-aware details revealed as the driver gets closer to the destination.

The navigation map is also slightly tilted instead of being shown only from a top-down view. This was done to better match the road ahead and make the navigation view easier to relate to while driving.

The pull-up menu follows the user’s finger movement when it is opened or closed. This keeps the interaction direct and predictable, since the menu moves together with the user action.

The two final views on the right side of the figure show how different context-aware information can be displayed based on the driver’s location. In these views, information has been swapped in the pull-up menu depending on the current situation.

The final view shows a situation where the user has arrived, but selects “not there yet” to return to the previous view. This allows an easy exit if the GPS position is incorrect.

At the top part of the navigation view, the header changes from direction instructions to an action button for performing the order on-site. In the footer, the previous large help button for the transport planner is split into two call actions: one for the transport planner and one for the client.

4.1.2.3 GPS-based context-aware views and constraints

GPS-based context-aware views and constraints were explored as a way to reduce the number of actions needed while driving. The purpose was to let the application show information based on the driver's current location and movement state.

Figure 4.6 shows a prototype of how this could be implemented. The navigation directions cover almost the entire display, except for the footer. This was done to clearly show the next direction, such as an upcoming turn, when this information is needed.



Figure 4.6. Static mid-visual fidelity prototype of GPS-based context-aware views and constraints, including turn-by-turn navigation guidance, a velocity-based interaction lock, and an arrival state with a start-order action.

The arrival view, marked as “framme”, gives immediate feedback that the driver is now at the client. From this state, the driver can continue to the on-site order workflow. As described in the individual order view, the “not there yet” button allows the driver to exit the arrival state and return to the navigation view if the GPS position is incorrect, as shown in Figure 4.5.

A velocity-based constraint was also included. At higher speeds, the display is disabled entirely. This locks the user out of the interface and is intended to signal that the phone should not be viewed or used in that situation. This connects to the traffic safety discussion in Section 2.3.2.3, where visual distraction and repeated glances at a phone are described as increasing traffic safety risk.

To still support user control, the constraint can be overridden through the unlock function in the footer. This was included because GPS and velocity data can sometimes be incorrect, and the system may therefore lock the interface in a situation where the driver needs to regain access.

4.1.2.4 Off-loading flow

The off-loading flow was designed for use at the recycling facility. In this flow, the user first needs to choose which facility they are at. The user then chooses which action should be performed, such as off-loading a container or placing it temporarily for someone else to pick up. Finally, the user chooses which material location the action should be performed at.

Figure 4.7 shows the static mid-visual fidelity prototype of the off-loading flow.



Figure 4.7. Static mid-visual fidelity prototype of the off-loading flow, covering facility selection, action choice, and material or location selection before completing the tip-off task.

When the user selects a facility, they are directed to the navigation view. This was included because the driver may be at an unfamiliar facility and may need guidance to the correct location.

Touch targets and font sizes remain large in this flow, since these actions may still be performed while the vehicle is moving. This connects to the contextual inquiry, where application use was

analysed in relation to vehicle state, visual attention, manual interaction, and environmental complexity. The traffic safety assessment in Figure 3.4 also shows that several points of contact with the application can become more safety-critical when they occur during movement or in complex traffic situations.

At the same time, this flow could also be used after the driver has exited the vehicle. In that case, a smaller interface could be suitable, since more information could be shown without the same driving-related constraints.

Similar to the order overview, the option items also use assisted scrolling. This supports car mode use, where large items and predictable scrolling are useful. However, assisted scrolling is not needed in the same way in handheld mode.

4.1.3 Expert evaluation through interviews

The visually refined prototypes were presented to two company supervisors in a structured interview setting. The participants were selected based on their domain expertise and familiarity with both operational workflows and the current system. One participant was the product owner, while the other was the main IT manager responsible for the driver application.

The purpose of the evaluation was to get early feedback on whether the concepts were understandable, useful, and realistic to develop further. Since the prototypes were static, the evaluation focused on the intended interaction and workflow rather than exact interaction performance.

The order overview in Figure 4.4 received positive feedback, especially regarding the assisted scrolling concept. The idea of keeping one full order card visible was seen as useful, since it could reduce manual adjustment and make the order list easier to read. This supported the direction of using predictable card positions and fixed spacing between orders.

Alternative navigation between order cards was also discussed. Swipe-based navigation was considered, but concerns were raised about short swipe gestures in a driving context. Vehicle movement and vibration could make short gestures less reliable, and could lead to unintended taps or actions, such as opening an order or starting navigation. Because of this, longer and more deliberate gestures were considered more suitable.

The GPS-based context-aware views in Figure 4.6 were also discussed. The idea of using GPS-based triggers as shortcuts was received positively. One example was the velocity-based lock, where certain interactions are disabled when the vehicle is in motion. The temporary override was also seen as important, since it allows flexibility if GPS data is inaccurate or if

user intervention is needed.

However, the IT manager also highlighted limitations with this approach. In urban environments, low speed does not always mean low risk. For example, the vehicle may move slowly near pedestrians, crossings, or narrow streets. GPS-based solutions may also be unreliable or difficult to calibrate across different contexts. Therefore, the concept was seen as useful, but not as a complete solution for all situations.

The individual order view in Figure 4.5 was discussed in relation to navigation and communication. Keeping order information, navigation, and call actions in the same workflow was seen as relevant, since the current workflow can require the driver to switch between applications. Reducing this switching could lower the number of steps and reduce visual attention shifts.

The supervisors were skeptical regarding the feasibility of fully integrated solutions, particularly in relation to connectivity constraints. In some operational contexts, such as construction sites or remote areas, both data and cellular coverage may be limited. This affects the reliability of solutions based on Voice over IP or continuous data connectivity. As a result, traditional telephony through LTE networks was considered necessary for reliable communication.

This insight suggests that a native application approach may be required to access device-level telephony services, rather than relying only on the current web-based solution.

Overall, the evaluation showed that several concepts were relevant for further development, especially assisted scrolling, GPS-based triggers, and reducing context switching. At the same time, the feedback showed that technical limitations, such as GPS accuracy, connectivity, and access to native phone functions, needed to be considered in the next iteration.

4.2 Second iteration - mid-fi

4.2.1 Prototyping

The second iteration developed the selected concepts from the first iteration into a more functional mid-fi prototype. Since several design principles were already described in the first iteration, this section focuses on what was implemented, what became functional, and which details were added in the second iteration.

From the first iteration, the following concepts were selected for further development:

- Assisted scrolling.
- GPS-based triggers.

- Integrated navigation and communication.
- Native application approach for telephony.

These concepts were first refined into more functional and visually developed prototypes in Figma Design. The prototypes were later imported into Figma Make to create a more interactive prototype with correct functionality, mainly for assisted scrolling.

However, Figma Make did not support the creative process as well as expected. It rather restricted the process, since views were not easy to alter except through AI prompts. This led to a conversion into a true web application prototype through Cursor AI. This allowed both AI prompting and a more flexible design process, where views could be changed without only relying on prompts.

From here, the prototype was developed to handle the following areas:

- Full car mode application with native integrated navigation and communication for use while mounted and in handheld mode.
- Order overview with assisted scrolling and minimized information load for reduced cognitive load.
- Individual order view with all information needed to complete the order, including navigation and communication. This also included context-aware swaps of information based on GPS location tracking, for example when closing in on the client.
- Less focus on the order completion view, since this view is handheld only and does not require the same traffic safety considerations.
- Fully implemented off-loading view for use at the recycling facility.

One difficulty was implementing the density-independent pixel requirements for both font size and touch target size. These requirements are adapted to an in-car navigation system, rather than a mobile display, which means that they assume a larger screen area.

For a mobile screen, the implementation instead became to keep text and touch targets as large as the display allows, up to the recommended point, while still keeping the views consistent. This was difficult, since larger text and touch targets reduce the amount of space available for information. With larger text, there is also a higher risk of overflow, where text can become harder to read.

4.2.1.1 Order overview

The order overview kept the assisted scrolling and reduced information structure from the first iteration, but implemented it as part of the working prototype. The card snaps into a fully visible position when the user releases the screen, which reduces the need for manual adjustment and keeps one order in focus.

The order overview shows the order number, client name, address, material type, and important notes. These items were kept visible because they are needed to quickly understand the order. A new addition was the green dots for container cargo, which indicate the number of containers for a specific order.

The order card can also be expanded before the order is started. In the expanded state, the driver can see more task-specific information, such as the material to be collected and its volume. A direct call action is also shown on the card, so the driver can contact the client without opening the full order workflow first. The order itself is still started through a separate action on the order item.

Figure 4.8 shows the implemented order overview, including the slide-in settings menu, the daily order list with map markers, and an expanded order card.

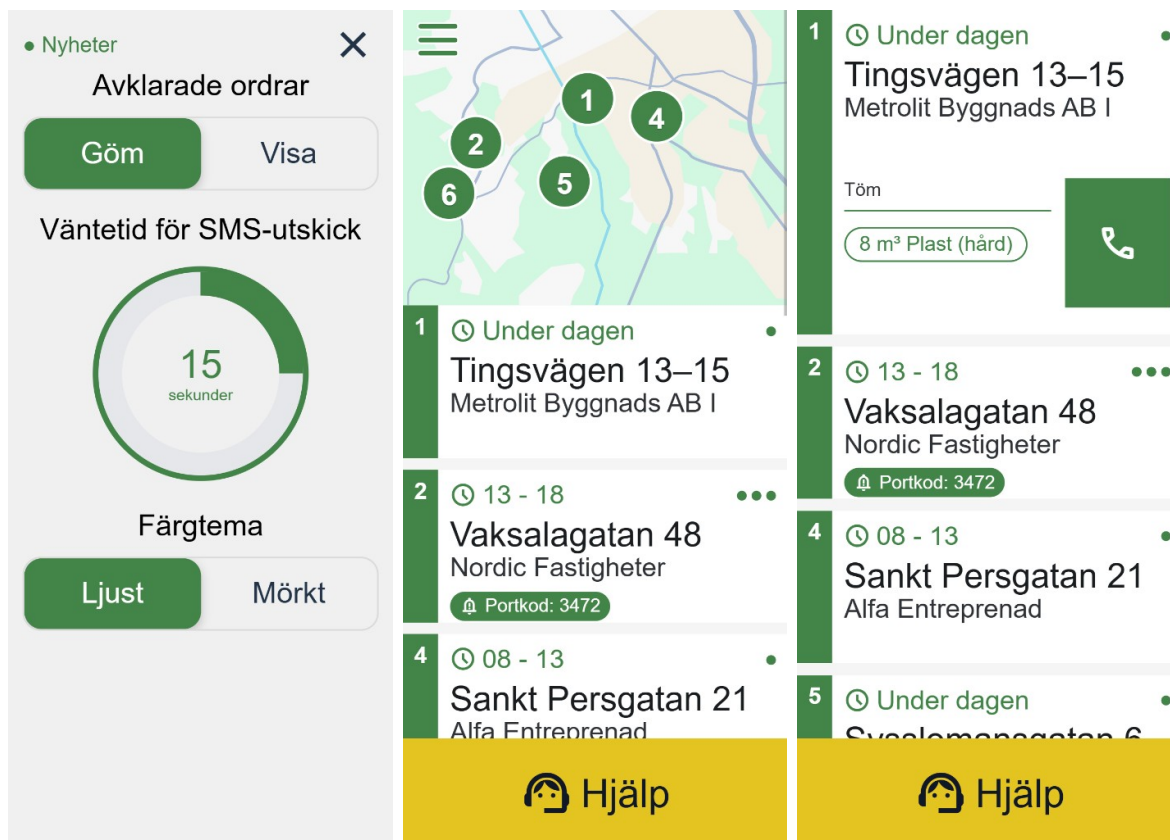


Figure 4.8. Second-iteration prototype of the order overview: settings (left), order list with map (centre), and expanded order card with material details and call action (right).

4.2.1.1.1 Integrated communication

Integrated communication was implemented as part of the native application approach. Figure 4.9 shows the integrated call flow, including calling the transport planner from the order overview, an expanded order card with an active client call, and the in-call keypad. Similar to how navigation uses a pull-out menu, the in-call keypad is also a pull-out menu that can be opened and closed by the user. The call is an overlay, and will stay for every view.

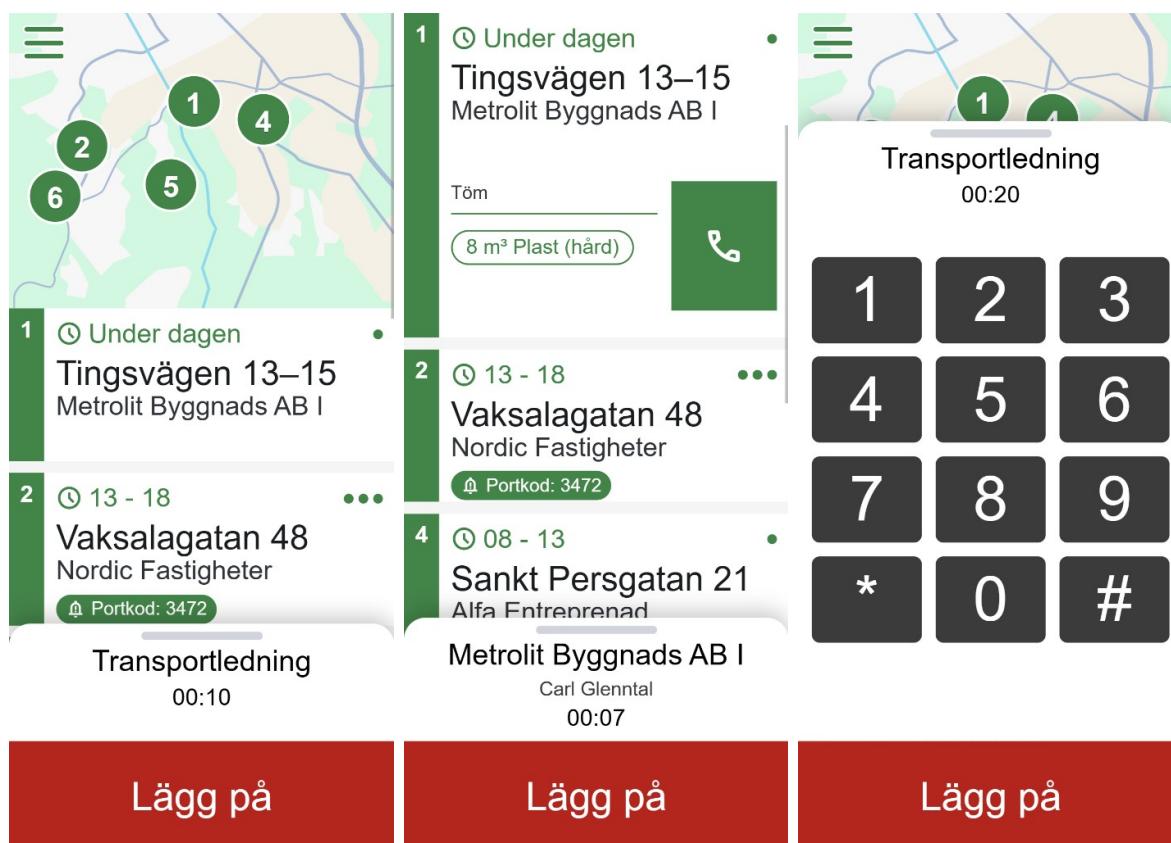


Figure 4.9. Second-iteration prototype of integrated communication: call to the transport planner (left), expanded order with client call (centre), and in-call keypad for IVR interaction (right).

4.2.1.2 Individual order view

The individual order view implemented the context-aware navigation concept from the first iteration. Figure 4.10 shows the individual order view during navigation, both at pull-out and pull-down state. The navigation map was changed to a top-down view in order to work functionally in the prototype. The slightly tilted version is still the recommended option to use.

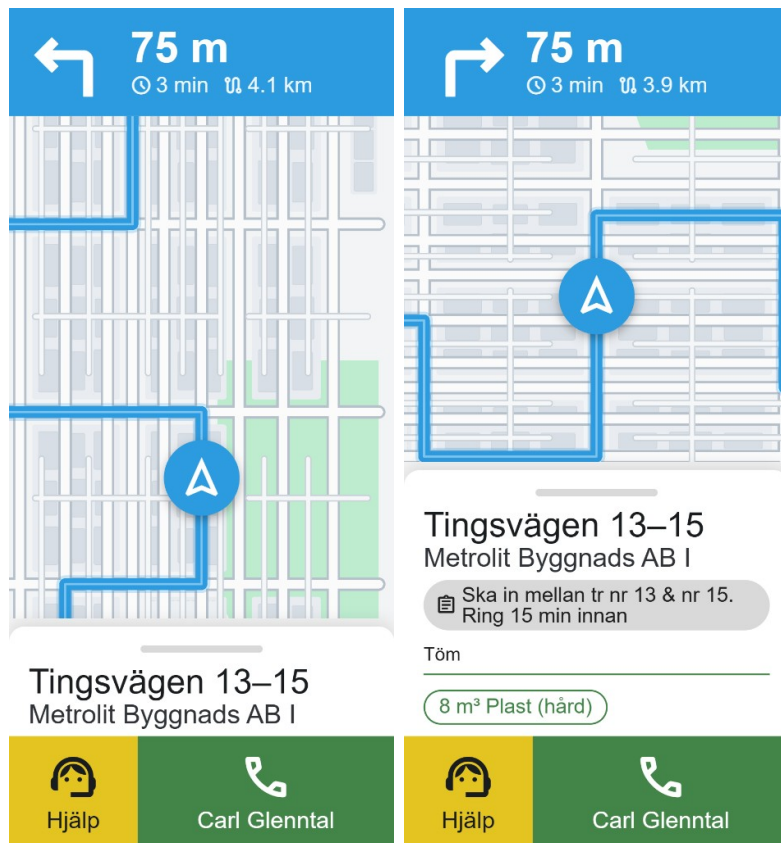


Figure 4.10. Second-iteration prototype of the individual order view during navigation: basic order information (left), and expanded context-aware details (right).

Figure 4.11 shows the arrival and action states, including GPS-based arrival feedback, the not arrived yet view in navigation, and the on-request SMS countdown.

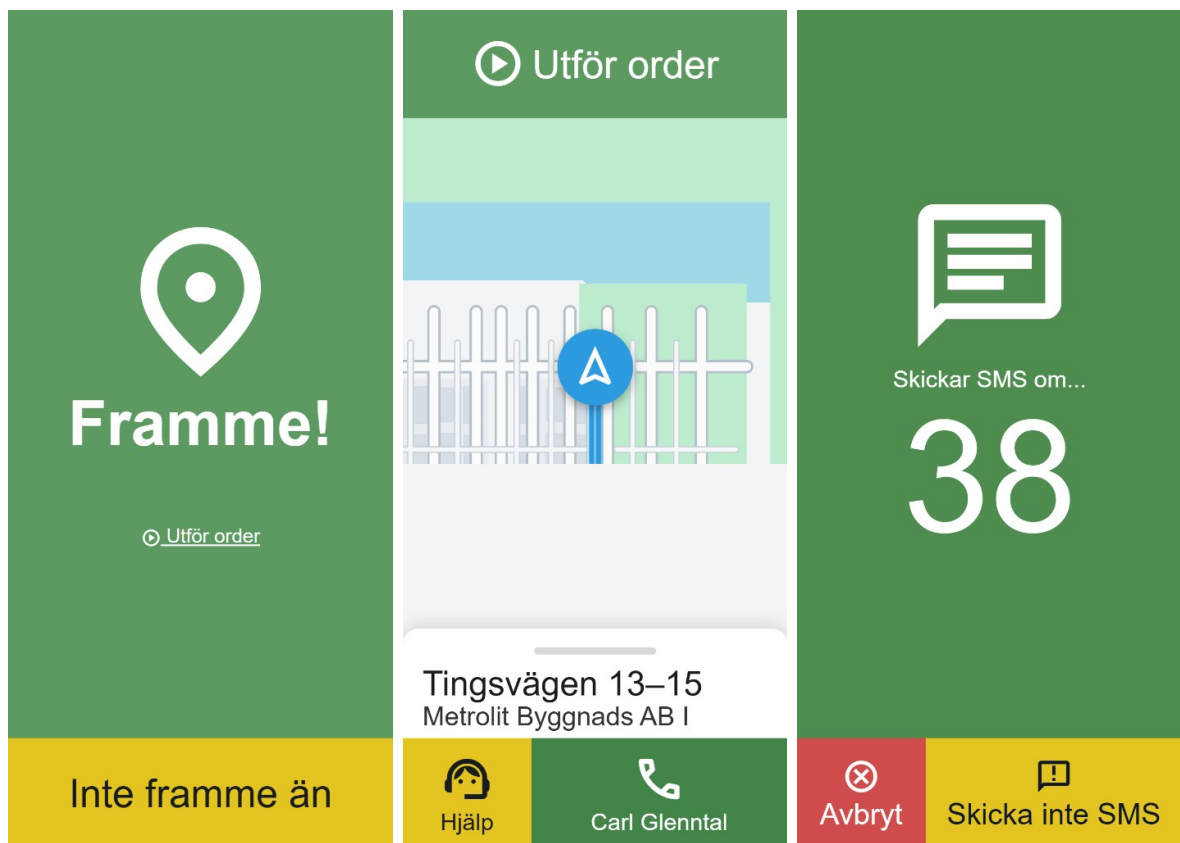


Figure 4.11. Second-iteration prototype of arrival and action states: GPS arrival state (left), not arrived yet view in navigation (centre), and on-request SMS countdown (right).

A user can always choose to exit the current phase and return to order view by swiping left to right. This in turn will mark the order as paused for the user with a yellow dot marked at the bottom of the spine.

4.2.1.3 On-site order completion

The incomplete on-site order completion view is intended for handheld mode after arrival. It supports reporting work performed at the client, including optional photo documentation and exceptions when photos cannot be taken.

Figure 4.12 shows the completion workflow, including counters for supplementary tasks and the option to explain why a photo cannot be captured.

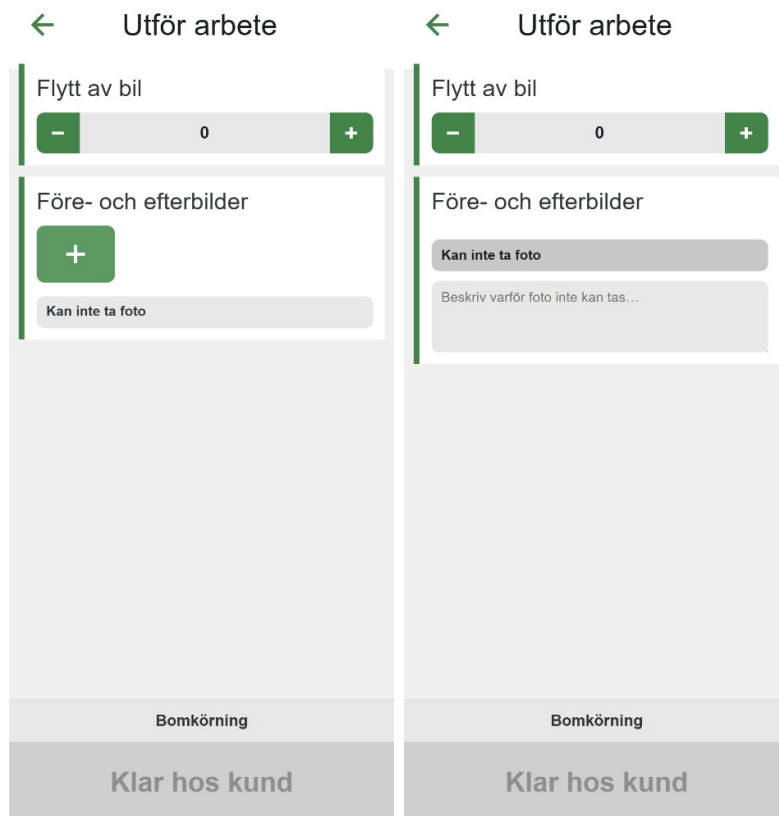


Figure 4.12. Second-iteration prototype of on-site order completion (*Utför arbete*): default state with counters and photo capture (left), and exception state with a text field when a photo cannot be taken (right).

4.2.1.4 Off-loading flow

Current visual implementation of the static images which has been made functional. Figure 4.13 shows facility selection and the off-loading overview for a paused order. The current flow does not allow for multiple orders being loaded at the same time, except via pausing the first order.

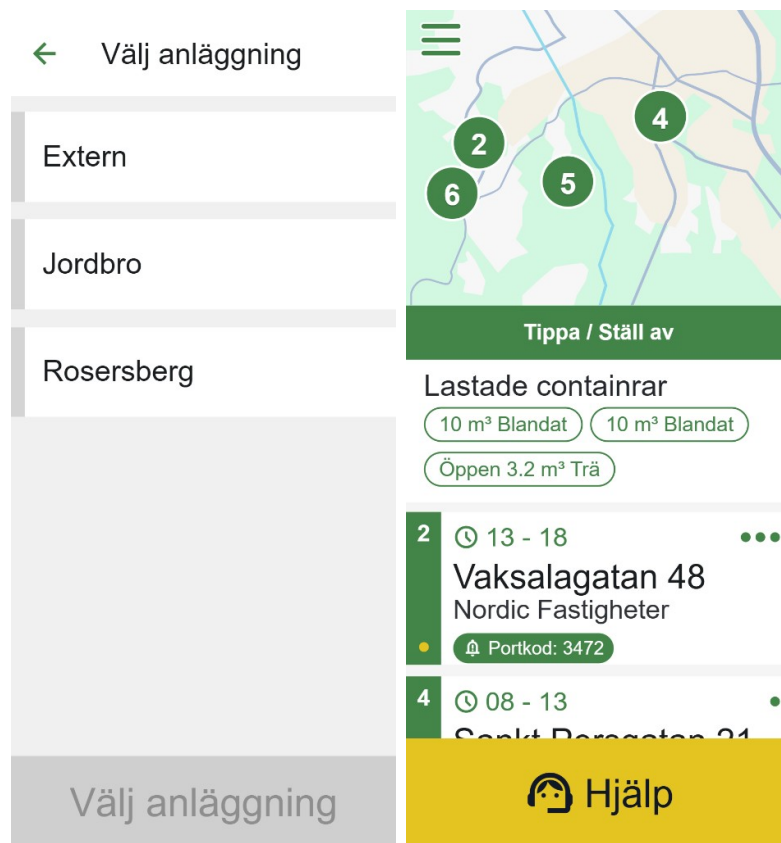


Figure 4.13. Second-iteration prototype of the off-loading flow: facility selection (left) and off-loading overview with loaded containers and order list (right).

4.2.2 User flow

The second iteration connected more of the selected concepts into a functional prototype. The flow starts in the order overview, where the driver can review the order list, open settings, call the transport planner, and see order locations on the map.

An order is first expanded from the order overview when it is at the top of the display. In the expanded state, the driver can see more order information and access actions such as calling the client. The order is then started through a separate click on the order item, which moves the driver into the individual order view.

The individual order view combines navigation, communication, and order information. The pull-out menu gives access to more details, while the collapsed state keeps the view focused on the current driving task.

GPS-based phase changes are used to move between navigation, approaching the client, and arrival. If the GPS position is wrong, the driver can use the “not there yet” option to return to

the navigation view.

After arrival, the flow continues to the on-site order completion view. This part is mainly intended for handheld mode and supports counters, photo capture, and photo exception handling. The off-loading flow was also implemented for use at the recycling facility.

Compared to the first iteration, the main change is that the concepts were implemented as a functional prototype rather than only shown as static views. Overall, the second iteration reduces context switching and separates driving-related interaction from on-site handheld interaction.

4.2.3 Evaluation

4.2.3.1 Focus group

A focus group was conducted to evaluate the second iteration prototype. The group consisted of one moderator and three participants from different stakeholder areas: IT management, transport planner/truck driver experience, and social sustainability related to truck drivers.

Figure 4.14 shows the focus group setting. IT denotes the IT manager, TP the transport planner (with truck driving experience at SORTERA), and SS the social sustainability representative.

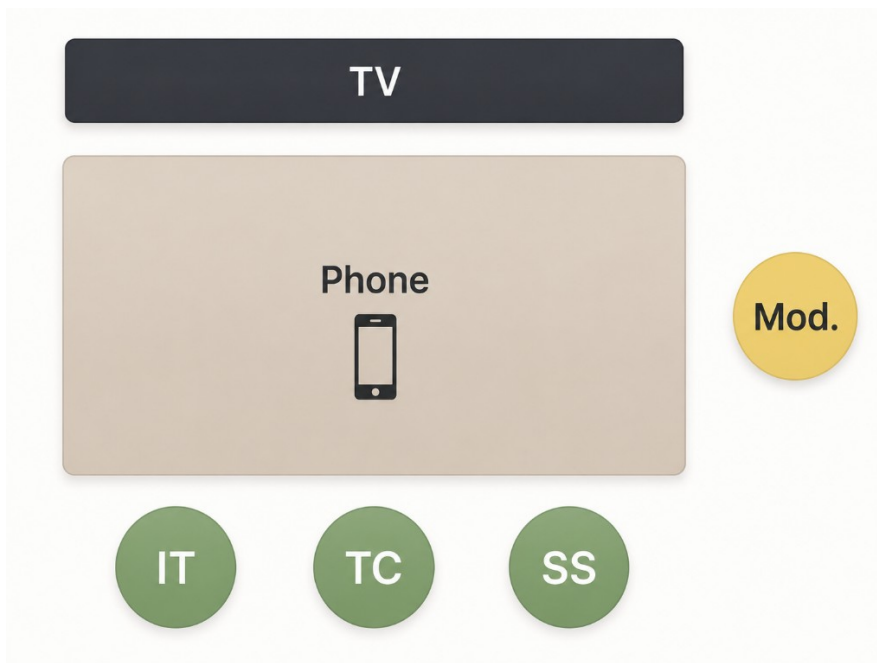


Figure 4.14. Focus group room setup. IT: IT manager; TP: transport planner (with truck driving experience at SORTERA); SS: social sustainability representative; Mod.: moderator.

The focus group started with a common introduction to the work, a short playthrough of the prototype functionality, and a short explanation of current laws regarding phone use while driving. After this, the focus group continued as an open discussion around different points and scenarios.

The prototype was shown through a live view on a mobile phone. The phone was placed against a surface to simulate use in a vehicle phone holder. Participants took turns discussing each point. The discussion was moderated around real use situations, with questions about whether the prototype would work in the drivers' environment, especially with regard to stress, large text, button size, and reduced distraction.

4.2.3.1.1 Use during driving

When discussing use during driving, the participants said that the text was easy to read and that the buttons had a good size. The distance between buttons was also discussed, especially in relation to the native bottom menu. It was discussed that buttons placed too close to each other could lead to accidental presses, which can create frustration.

The participants also discussed which information should be visible at different points in the workflow. A main issue was the current use of notes and notifications in the system. The discussion showed that there is overlap between different note types and that there is no clear standardization. This makes it difficult to decide which information should be shown in a context-based interface.

It was also mentioned that using the phone while navigation is active may feel distracting, since the interface moves during use. This can be a cause of stress during use.

A missing function was also discussed. In addition to the contact person, there is sometimes also a phone number to the person who placed the order. This number is used as a backup when the contact person does not answer. Possible solutions discussed included making it possible to copy a number by holding a call button, or letting the system call the next person if the first call is busy or declined.

4.2.3.1.2 Use at the client

The overall design was discussed. The social sustainability representative stated that the design was not fully consistent and that it lacked a common base for how information is shown and where it is placed. The transport planner/truck driver representative stated that the design gave a feeling similar to an iPhone and liked the use of large phone buttons.

The structure of the view was also discussed. Since the driver is no longer driving when at the client, it was seen as more acceptable that the view changes. It was also discussed whether the view should use a mix of the old and new system, for example through tabs or a dashboard. The social sustainability representative stated that if the choice is between showing too little or showing more information, they would rather see a view where everything is available. It was also noted that the view was missing order information.

The number of steps and the need to scroll were also discussed, but the response was not fully clear. If all information is included, the view may become too crowded. At the same time, tabs or a dashboard could make it easier to access more information without showing everything at once.

Status feedback was also mentioned as a problem. One participant stated that it was not always clear when a step was completed. A wizard-like structure was seen as clearer in this regard, since it shows progress more directly. One possible solution discussed was to fill the green spine as the user moves through the workflow.

The group also discussed what is mandatory and how this should be shown.

4.2.3.1.3 Problems and limitations

GPS errors were discussed as a possible problem. If the GPS position is wrong, this can cause several errors in the application. Because of this, the driver needs a way to move past these errors. One possible solution discussed was to allow the user to swipe forward manually to bypass a GPS-based phase change, for example from navigation to arrival.

The group also discussed driver behaviour and possible dependency on the application. It was discussed that when the map is easily available, drivers may become dependent on it. A similar issue had been noticed when the company moved from paper to digital systems, where fewer drivers kept track of addresses because information was provided digitally.

This was also connected to the call button for the transport planner. It was mentioned that such a button had been requested by the transport planner/truck driver representative, but the social sustainability representative was not fully convinced that it should be very accessible. The concern was that it could create a dependency on the transport planner, instead of supporting drivers in working independently. At the same time, it was still important that drivers can call when help is needed.

Stress was also discussed. It was described that the transition from paper to digital systems had generally improved the work process and reduced problems. The main problems occurred

during the transition period, when the system was new and UI/UX, bugs, responsiveness issues, and different mobile devices had to be handled.

The participants also commented on what worked well. Large buttons and clear text were seen as positive and as an improvement. The assisted scrolling was also received positively, even if it was not always discussed directly by name. One participant also noted that they had not previously thought much about the importance of showing the correct information at the correct time, especially in relation to how notes are currently used.

After the focus group, additional discussion concerned navigation and the difficulty of designing for new work sites where roads may not be available in map data. There was also discussion about users who may not want navigation visible all the time. One possible solution was that the driver could pull the information box up fully to hide or mute the navigation view.

Finally, swipe gestures were discussed in relation to the target group. There was some concern about whether all drivers have enough technical experience to understand swipe-based interaction. This is especially relevant for external drivers who may only use the application for one day. A possible solution discussed was a context-based tutorial, for example during the first order, although this could also risk covering important information.

4.2.3.1.4 Key takeaways

While some parts of the prototype were working as intended, other parts were found to be lacking. The key takeaways from this session were a need for better status feedback to users, better consistency in visual elements, and missing functionality and/or information. It was also discussed that there is an imperative need for a greater change in how notes are used. Currently four different notes exist, with one simply being a different format of the entire order, similar to a JSON formatted as comma separated text. The other three are important note, project note, and general note. Important note and general note both are individual to each order, while project note is on a higher level being on the entire construction project itself, meaning all orders on that address/project. The use case of each currently overlaps a lot, meaning there is no simple way to handle a context-aware change of information in the current system of notes. Therefore, without a change of the note system, there cannot be a contextual switch of raw information during the drive towards a client, since the change needed are within the notes, from time constraints to ex. code for unlocking gate, to knowing more on-site knowledge, such as “bags are white” instead of the otherwise normal green color.

4.3 Third iteration - high-fi

4.3.1 Mode separation and layout framework

Based on the focus group findings from the second iteration, the third iteration was reworked around a clearer separation between handheld mode and car mode. This separation became the main structural change in the high-fi prototype.

Handheld mode was used for portrait orientation and general or on-site use, while car mode was used for landscape orientation when the phone is placed in a holder. The modes use the same base styling, but differ in information density, touch target size, and font size. Handheld mode shows more information but is restricted for driving-related order work. Car mode contains most of the driving-related functionality, but reduces the amount of visible information to support glanceability and lower cognitive load.

The car mode layout was built around three main panels. The left panel is used for the dynamic menu, the middle panel is used as the main content area, and the right panel is used as a secondary panel for CTAs and supporting elements, such as the order list. This structure was used across the car mode views to make placement and interaction more consistent.

4.3.2 Handheld mode for general views

4.3.2.1 Landing screen

When the driver application is opened, a safety-oriented landing screen is shown, as seen in Figure 4.15. The screen reminds the driver to work safely, use a helmet, and follow on-site routines before entering or exiting the vehicle at a construction site. While not all sites require these specific safety precautions, the reminder was included as a general support for work safety.



Figure 4.15. Onboarding screen with safety reminder before entering the application for the third iteration prototype.

4.3.2.2 Order overview

After continuing from the landing screen, the user reaches the order list, as shown in Figure 4.16. The view follows the same content structure as the second iteration, but is adapted for handheld mode by reducing touch target and font sizes. Assisted scrolling is still used in this view, despite it being handheld, in order to keep the interaction more consistent with car mode.

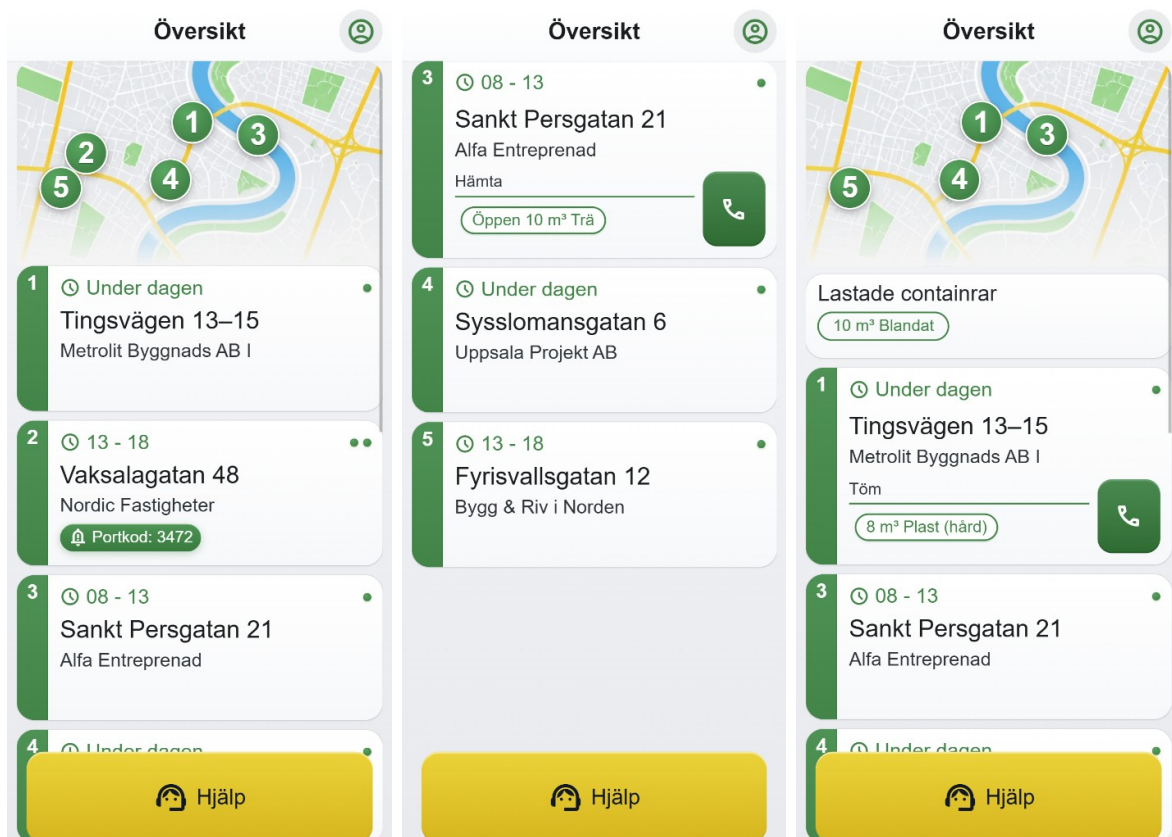


Figure 4.16. Third-iteration prototype of the handheld order overview with a map with numbered stops (left), expanded order item (centre), and overview with loaded-container summary (right).

If a container has been loaded, the order overview displays this in the same style as the pickup information inside the order card, using a green bordered pill.

When the user selects an expanded order, the system prompts them to rotate the device for order work in landscape mode. Figure 4.17 shows this transition prompt. The prompt keeps the driver in the portrait order overview, but requires landscape mode before the user can proceed with the order.



Figure 4.17. Place-phone-in-holder prompt shown when the system needs to switch from handheld mode to car mode.

4.3.3 Car mode for order management

The car mode layout was built around three main panels. The left panel is used for the dynamic menu, the middle panel is used as the main content area, and the right panel is used as a secondary panel for CTAs and other supporting elements, such as the order list.

4.3.3.1 Order overview

The order overview in car mode uses a large order card in the main panel. This card mirrors the expanded order view, while the order list remains separated in the secondary panel. To better connect the selected order with its related action, the call button is placed below the order panel instead of being placed inside the order list.



Figure 4.18. Order overview with the expanded order view in the main panel and the order list in the right panel.

4.3.3.2 Steps for beginning an order

The order begins when the user selects the main panel containing the order item from the order overview. The system then informs the user that an SMS will be sent, as shown in Figure 4.19. The user can cancel the action, choose not to send the SMS, or skip the timer delay by using a shortcut. After this step, navigation begins.

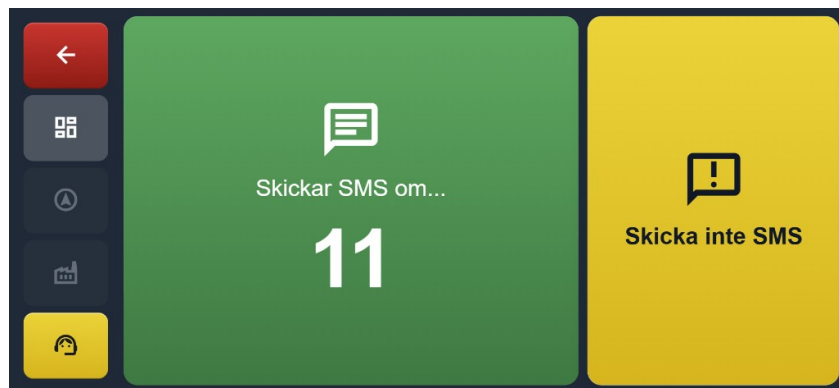


Figure 4.19. SMS delay view for third iteration prototype.

Figure 4.20 shows the arrival state when the user has reached the destination, either a client location or a facility.

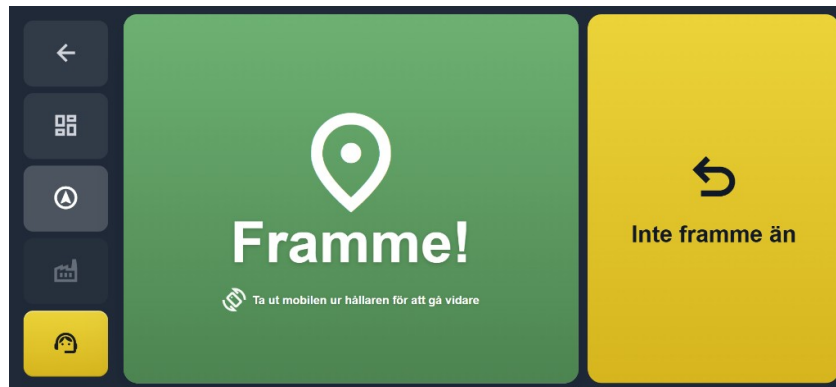


Figure 4.20. Third-iteration prototype of arrival view during navigation.

4.3.4 Handheld mode - On-site order completion

When the device is rotated, the system switches to handheld mode. This mode supports the full on-site workflow and provides more information, as well as options for reporting details such as the number of vehicle moves ordered by the client, photo documentation, and time delays. Figure 4.21 shows the main on-site performance view, which acts as a dashboard with full order information and a CTA grid.

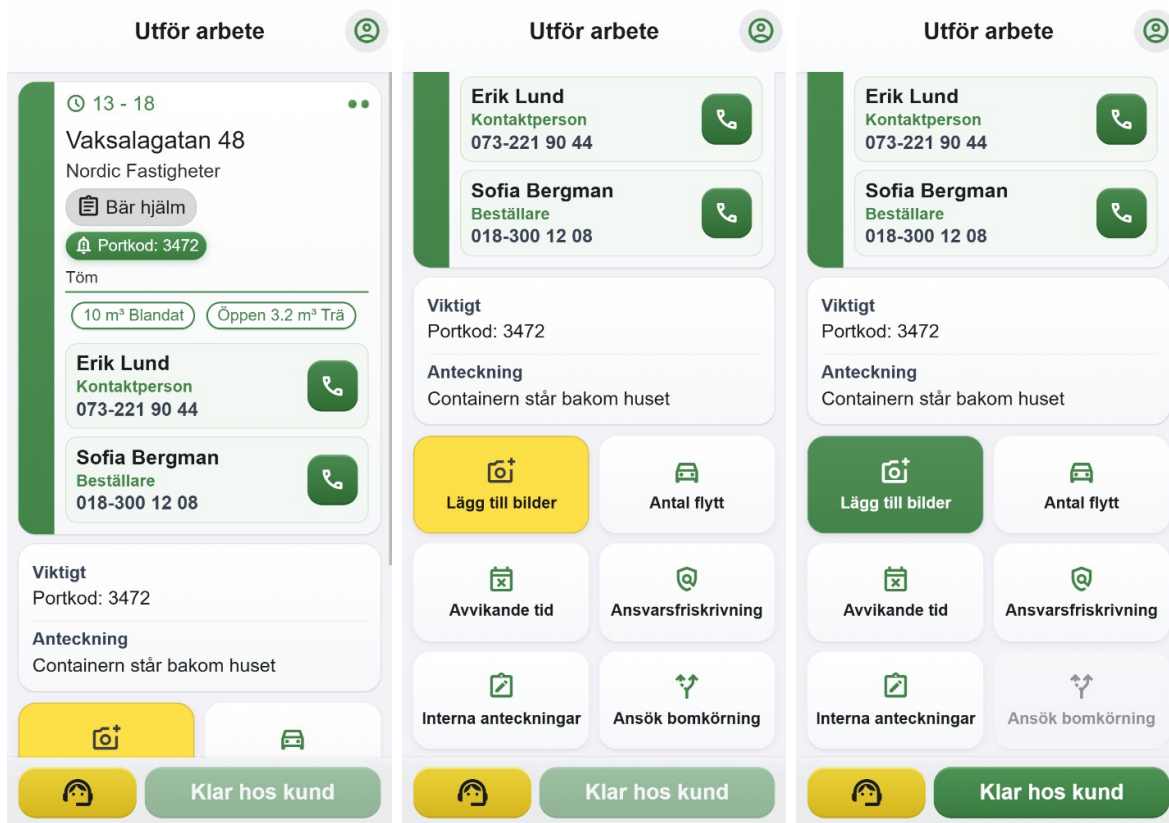


Figure 4.21. Third-iteration prototype of on-site order completion in handheld mode: dashboard view (left & centre), and a CTA highlighted as feedback to show completion of task (right).

4.3.5 Car mode - Off-loading

The off-loading flow was adapted to the new car mode layout. Figure 4.22 shows the newly added navigation toward the facility, the selection of load type to off-load, and the selection of dump location and material.

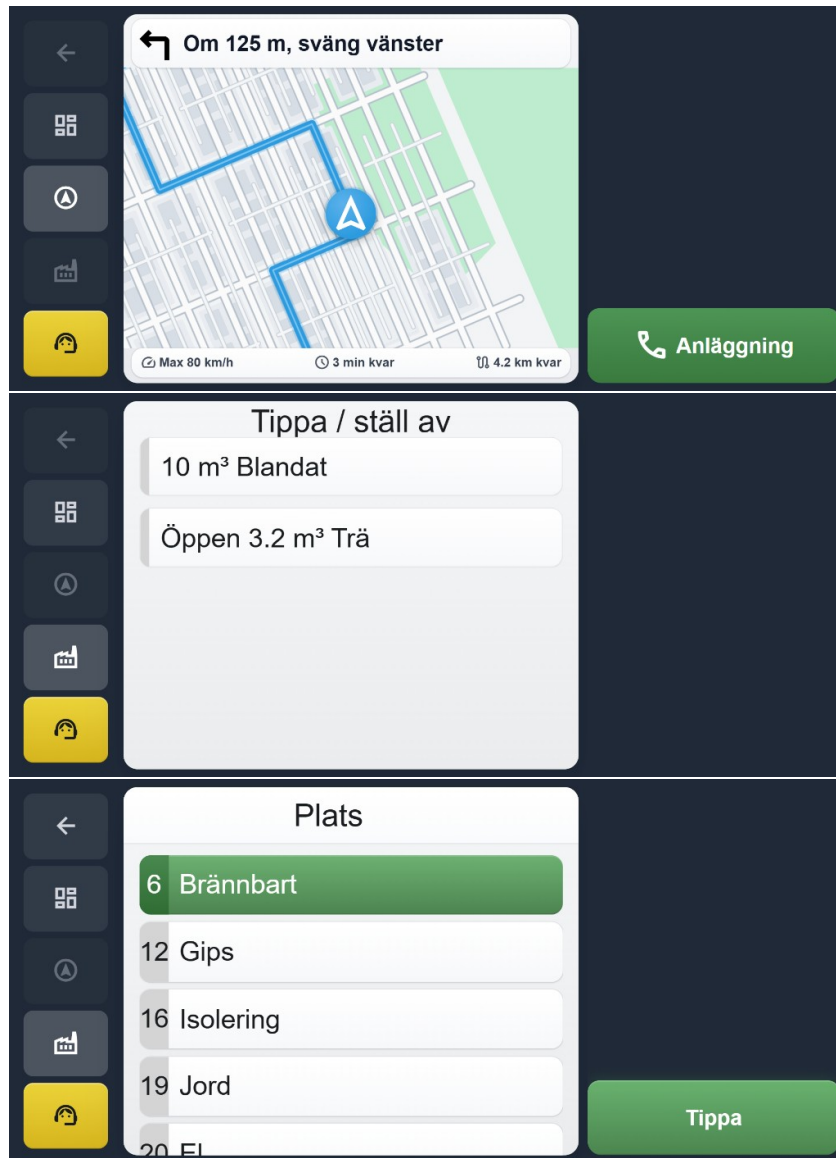


Figure 4.22. Third-iteration prototype of the off-loading flow with navigation to facility (left), load selection to off-load (centre), and off-loading location selection (right).

4.3.6 Integrated communication

The function was designed differently in handheld mode and car mode because the two modes support different use contexts. In handheld mode, the driver can interact more freely and has more vertical screen space available. Communication was therefore placed in a pull-out interface, shown in Figure 4.23. This allows call controls to be accessed when needed without replacing the full order overview. The keypad can be expanded when the driver needs to interact with an automated phone menu, and collapsed again when only the active call status

needs to remain visible.

Integrated communication introduced both design and technical challenges. From a design perspective, the interface had to remain consistent across handheld mode and car mode while still adapting to different screen orientations, information densities, and interaction contexts. In handheld mode, the call interface could behave more like a temporary overlay. In car mode, it needed to fit into the fixed three-panel structure without hiding navigation or current order information.

4.3.6.1 Handheld mode

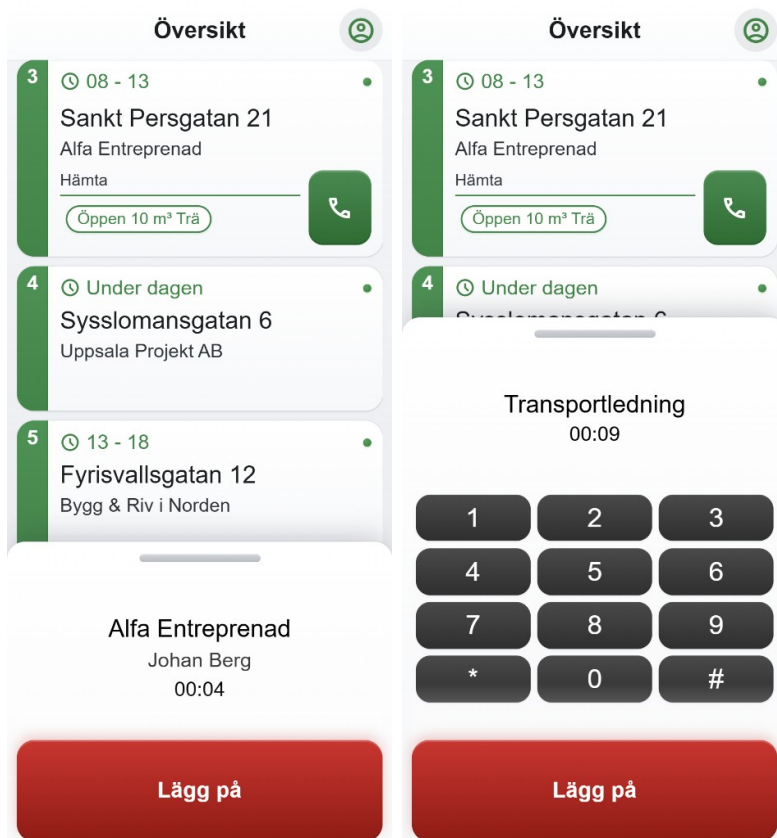


Figure 4.23. Third-iteration prototype of integrated communication during a client call from the order overview. The pull-out keypad menu is shown in its collapsed state (left) and expanded state (right).

In car mode, communication was integrated more directly into the three-panel layout. When a call is active, the call interface occupies the secondary panel, as shown in Figure 4.24. This allows the driver to keep the main order or navigation information visible while the call remains available in the interface. If the driver needs the keypad, the phone menu item can be selected and the keypad is shown in the main panel.

4.3.6.2 Car mode

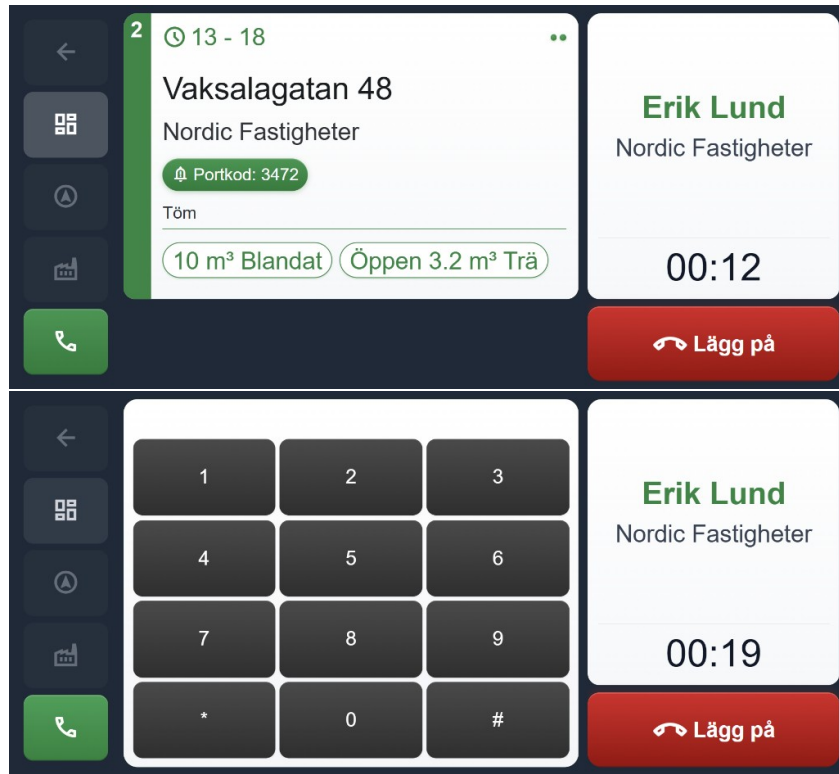


Figure 4.24. Third-iteration prototype of the active call state. The call information covers the secondary panel (left), while the keypad is shown after selecting the phone menu item during the call (right).

4.3.7 Evaluation

The third iteration was evaluated through user testing with four participants. The participant group consisted of two men and two women, with a mean age of 28.5 years. All participants had knowledge of Sortera and the current system context, but they were not truck drivers. Because of this, the test should mainly be seen as an evaluation of interface understanding, first-time usability, and whether the concept was easy to follow. It should not be seen as a full validation of the real driver workflow.

Before the tasks started, the participants were introduced to the prototype and its main functions. They were also asked to think aloud during the test. In order to give the participants a basic work context, they were asked to take on the role of a Sortera container driver. This role included using the phone in a holder during driving, not handheld.

The test was built around the same main situations as the prototype. These included reviewing

the daily orders, starting another order than the first one, navigating to a client, finding the correct entrance or container at the client location, performing the work on-site, navigating to the facility, and handling a situation where the driver cannot enter or reach the correct working area at the client location.

4.3.7.1 Test plan and setup

A test plan was created for the third-iteration evaluation in order to structure the session and make the tests more comparable between participants. The test plan included an introduction, a short walkthrough of the prototype, scenario-based tasks, follow-up questions, a comparative glanceability test, and a SUS questionnaire. They were also encouraged to think aloud during the test. This was important because several parts of the evaluation focused on understanding how participants interpreted the interface, where they hesitated, and which parts of the workflow were unclear.

The test was built around a user persona setup. Participants were asked to take on the role of a Sortera container driver who had worked at the company for three years and used the phone in a holder while driving. This role was used to give participants a more concrete work context, since none of the participants were professional drivers. The purpose was not to make the test fully realistic, but to help participants reason from the perspective of the intended user group.

The scenario-based test covered the main workflow in the prototype. The scenarios included reviewing the daily order overview before a shift, starting a different order than the first one, navigating to a client, finding the correct entrance or container at the client location, performing the work on-site, navigating to a facility, tipping a container, and handling a situation where the driver could not access the client location. After scenarios, participants were asked follow-up questions about readability, navigation, mode switching, accidental taps, frustration, and whether the system guided them in the expected direction.

The test plan also included a comparative glanceability test. This part compared static images from the current interface and the prototype in order to measure how quickly participants could locate selected task-critical information. Finally, participants completed a SUS questionnaire to provide a standardized measure of perceived usability.

For remote testing, a short setup guide was also provided. Participants were instructed to use both a mobile phone and a computer, and to place the mobile phone horizontally on a raised surface to simulate a phone holder. This setup was a simplified approximation of mounted-phone use in a vehicle and was used to make the test possible outside a real truck environment.

4.3.7.2 Scenario-based user test

The scenario-based test showed that the main structure of the prototype was generally understandable. Participants were able to move through the main parts of the flow, including the order overview, car mode, navigation, on-site work, and the facility flow. This indicates that the overall concept was understandable, even though some parts of the prototype were still affected by bugs and incomplete behaviour.

In the first scenario, the participants used the order overview to understand the day. The overview made it possible to see the different addresses and order types, and to get a basic understanding of what needed to be transported. However, the test also showed that some transport terms and task meanings were not fully clear for users who are not drivers. This was especially visible when participants had to reason about whether containers needed to be brought along. This means that the overview supported the intended purpose, but that the interpretation of some information still depends on driver knowledge.

The safety reminder at the start of the application was generally accepted. It was not described as a major problem, but participants also indicated that such reminders may lose effect if they appear too often or always look the same. This suggests that the reminder can support safety awareness, but that it should vary or appear in a more context-aware way so that the user does not automatically ignore it.

The assisted scrolling was received as useful when it was understood in relation to driving. Some participants first compared it to normal scrolling, which is more familiar. However, when the interaction was discussed as something used in a mounted driving context, the function was seen as helpful because it keeps a full order card visible. This can reduce the need for small manual corrections and makes it less likely that the driver stops between two order cards.

The transition between handheld mode and car mode was also mostly understood. The participants understood that the phone should be turned to landscape mode when placed in the holder, and that handheld mode uses portrait orientation outside the vehicle. This supports the idea of using orientation as a clear separation between driving-related interaction and on-site interaction. At the same time, the test showed that the transition after completing work was not always clear. In some cases, participants expected to return to the order overview instead of being moved directly toward the facility flow. This suggests that the system should better match the driver's likely next step after finishing an order.

The navigation view was generally understood and participants could use it together with order information. The combination of navigation and order details therefore supported the

goal of reducing context switching. However, the moving map could also draw attention, which means that the balance between navigation and order information remains important. The order information must be visible enough to support the task, while the navigation should not make the view feel too visually active.

When participants arrived at the client location, they looked for information that could help them enter the area and find the correct container. This included contact information, internal notes, gate-related information, and container information. In several cases, calling the contact person was the natural next action when the gate was closed or when information was missing. This supports the design choice of keeping contact actions close to the order information.

The on-site work view was mostly understandable at a general level. Participants could use the photo function or the photo exception flow and then continue by selecting that they were done at the client. The yellow marking for mandatory actions and the green completed state also helped communicate progress. However, some parts of this view were harder for participants to judge because they required knowledge of how the driver work is actually carried out. This was especially clear for tasks related to container handling and other work-specific actions.

The off-loading and facility flow was the least clear part of the scenario test. Participants understood the general idea of navigating to a facility and tipping a container, but the sequence was not always as obvious as the order and navigation flow. In some cases, participants expected to return to the order overview before deciding whether to go to a facility. This means that the facility flow needs further iteration, especially in relation to when it should appear and how it should connect to the driver's next task.

4.3.7.2.1 Key takeaways from the scenario-based test

The main takeaway from the scenario-based test is that the overall structure of the prototype was understandable. Participants could move between the order overview, car mode, navigation, on-site work, and facility-related views without the concept itself becoming unclear.

The separation between handheld mode and car mode was also understood. This supports the design decision to use handheld mode in portrait orientation and car mode in landscape orientation when the phone is in the holder. However, the transition after finishing work at the client needs to be clearer, since participants did not always expect the system to continue directly toward the facility flow.

The order overview supported the goal of giving the user a quick understanding of the day. Participants could identify addresses, order types, and what needed to be transported. At the same time, some transport-specific terms were harder to interpret for participants due to them

not being drivers. This shows that the view was understandable as an interface, but that some interpretation still depends on driver knowledge.

The assisted scrolling was seen as useful when discussed in relation to driving. Since it keeps a full order card visible, it can reduce the need for small corrections and make the view easier to read in a mounted context.

The integrated navigation and contact functions supported the goal of reducing context switching. Participants used the navigation view together with order information and treated calling the contact person as a natural action when access or information was missing at the client location.

The weakest part of the scenario test was the facility and off-loading flow. Participants understood the general idea, but the sequence was less clear than the order and navigation flow. This part therefore needs further iteration and should be tested with real drivers.

Overall, the scenario-based test supports the main design direction of the third iteration, but it also shows that the prototype needs clearer post-order guidance, better handling of important notes, and further refinement of the facility flow.

4.3.7.3 Comparative glanceability test

A comparative glanceability test was conducted to examine whether task-critical information could be located faster in the prototype than in the current interface. The test focused on two information-seeking tasks: finding contact details and identifying which container was to be loaded.

Before the timed tasks, participants were shown two images from both the prototype and the current web application. This was done to give them a basic understanding of the interfaces before the measurements began. The test then used a simple keyboard-controlled timing sequence: SPACE to begin the assignment, SPACE to reveal the interface image and start the timer, and SPACE to stop the timer once the requested information had been found.

In total, seven test conditions were performed instead of eight. This was because the order overview in the current web application did not contain contact details, meaning that this specific condition could not be tested. Since the test was based on static images and a simplified interaction setup, the absolute execution times should not be interpreted as representative of real-world use. Instead, the relevant result is the difference between the current interface and the prototype under the same test conditions. Due to the small number of participants, the results should also be treated as indicative rather than conclusive.

Figure 4.25 shows the distribution of measured completion times for the current interface and the prototype. The prototype produced lower mean times for both task types, with a mean reduction of 1.40 s for the container task and 0.84 s for the contact task.

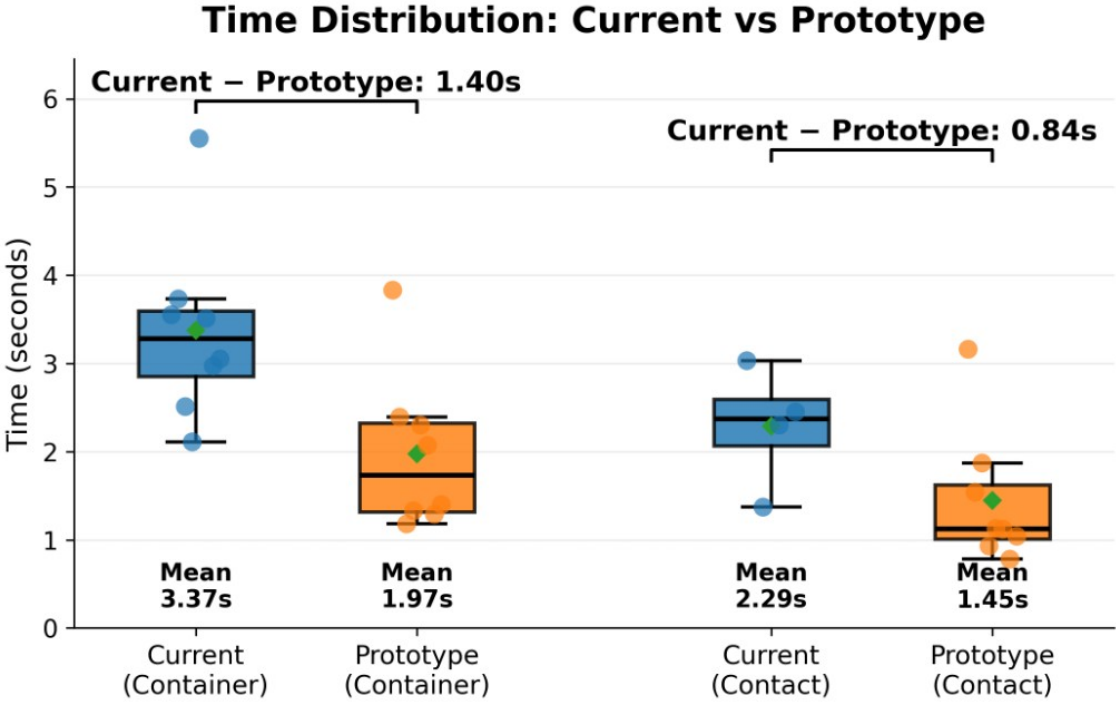


Figure 4.25. Execution time distribution for the current interface and prototype. Circular markers represent individual measured runs, while green diamonds indicate the mean time for each condition. Because the test used static images and a simplified timing setup, the absolute times should not be interpreted as real-world task times. The relevant comparison is the difference between interfaces under the same conditions, where the prototype shows shorter completion times for both container and contact tasks.

The difference between the two interfaces suggests that the prototype made the information easier to locate within the tested images. The reduction was larger for the container task, where all participants completed the task faster with the prototype. This indicates that container-related information was more consistently visible in the prototype than in the current interface. The contact task also showed an overall reduction in execution time, although the result was less consistent across participants. This suggests that the prototype improved access to contact information overall as well.

Table 4.1. Per-participant execution time results for the current interface and prototype. The table should be interpreted through the differences between current and prototype, rather than through the absolute time values. The container task improved for all participants, while the contact task improved for three out of four participants. This suggests that the prototype improved glanceability overall, but the result remains indicative due to the limited number of participants and the simplified test setup.

ID	Container			Contact		
	Current	Proto.	Diff.	Current	Proto.	Diff.
1	3.64s	3.11s	0.53s	3.03s	2.35s	0.68s
2	2.31s	1.26s	1.06s	1.37s	1.40s	-0.03s
3	4.53s	2.19s	2.35s	2.30s	1.13s	1.18s
4	3.01s	1.35s	1.67s	2.45s	0.91s	1.54s
Mean	3.37s	1.97s	1.40s	2.29s	1.45s	0.84s

Taken together, the results indicate that the prototype improved glanceability in the controlled test setting. The clearest effect was found for the container task, while the contact task showed a smaller and less consistent improvement. The findings should therefore be used as supportive evidence that the prototype can reduce visual search time, rather than as a precise measurement of real-world task duration.

4.3.7.4 SUS Analysis

A System Usability Scale (SUS) questionnaire was administered at the end of each user test to evaluate the perceived usability of the prototype. The purpose of this analysis was not to compare the prototype with the current system, since no SUS data was collected for the current interface. Instead, the SUS score was used as an indication of whether the prototype remained usable despite the design changes introduced to support traffic safety and reduce cognitive load.

This is relevant because the prototype includes several changes that could otherwise risk making the interface feel more restrictive or difficult to use, such as larger touch targets, larger typography, reduced information density, and a stronger separation between car mode and handheld mode. A high SUS score would therefore support the interpretation that these design choices did not create a major usability problem for the participants.

Table 4.2 presents the SUS results for each participant. The prototype received a mean SUS

score of 88.75 on the standard 0–100 SUS scale.

Table 4.2. Per-participant SUS results for the prototype. The standardized SUS questions are abbreviated as Q1–Q10 (see Appendix 6), and the final score is reported on the standard 0–100 SUS scale. Since no SUS score was collected for the current interface, the results should not be interpreted as a direct comparison. Instead, the high mean score indicates that the prototype was perceived as usable despite design changes such as larger touch targets, larger typography, reduced information density, and a stronger separation between car mode and handheld mode.

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS
1	4	2	4	1	3	2	5	2	5	2	80
2	5	2	4	1	4	1	5	1	5	2	90
3	5	1	5	1	5	1	5	1	5	5	90
4	5	1	5	1	5	1	5	1	4	2	95
Mean	4.75	1.50	4.50	1.00	4.25	1.25	5.00	1.25	4.75	2.75	88.75

The high SUS score suggests that the traffic safety-oriented design changes did not make the prototype difficult to use for the participants. This is important because reducing cognitive load in a driving context should not come at the cost of creating a frustrating or unclear interface. While the SUS result cannot directly prove a reduction in cognitive load, it supports the broader evaluation by showing that the prototype was perceived as usable while incorporating design decisions intended to make key information easier to find, read, and use.

4.3.7.5 Eye-tracking analysis of glanceability

An AI-based eye-tracking analysis was used as an additional comparison between the current web application and the third-iteration prototype. Two views from the current system were analysed: the individual order view and the order overview. These were compared with two car mode views from the third-iteration prototype: the car navigation view and the car order view. The analysis was not performed with real participants, but with an AI model trained on eye-tracking data. The results should therefore not be interpreted as actual driver eye movement. Instead, the analysis was used as indicative support for understanding which panels and information elements are likely to attract attention during the first seconds of interaction.



Figure 4.26. AI eye-tracking analysis of the third-iteration prototype car navigation view: original view (top left), attention heatmap (top right), focus map (bottom left), and contrast map (bottom right).

The prototype car navigation view, shown in Figure 4.26, received a clarity score of 60%, which was classified as optimal clarity. The attention distribution showed that the navigation panel received the largest share of attention, at 55.3%, while the order panel received 27.6%. The menu received 11.5%, and the call action received 3.7%. When the analysis was broken down further, the directions received 18.5%, while the address received 7.9%, the container information 6.1%, the client 5.5%, the location arrow 4.4%, and the time window 2.3%.

This suggests that the view mainly guides attention toward the navigation task, while still keeping order-related information visible. This fits the intended use of the view, since the

driver is primarily navigating while also needing access to order information. However, the call action receives relatively little attention in this state, which means that it is available but not visually dominant.



Figure 4.27. AI eye-tracking analysis of the third-iteration prototype car order view: original view (top left), attention heatmap (top right), focus map (bottom left), and contrast map (bottom right).

The prototype car order view, shown in Figure 4.27, received a clarity score of 64%, also classified as optimal clarity. In this view, the main order panel received 56.8% of attention, while the list of other orders received 40%. The menu received 3.1%, which was below the average value used in the report. The more detailed breakdown showed that the container information received 12.9%, the call action 11%, the address 10.2%, the client 7.1%, and the

time window 2.3%.

This indicates that the current order becomes the main visual focus in this view, while the order list is still visible in the side panel. This supports the design direction where the driver can focus on the active order, but still keep the order overview available without leaving the view.

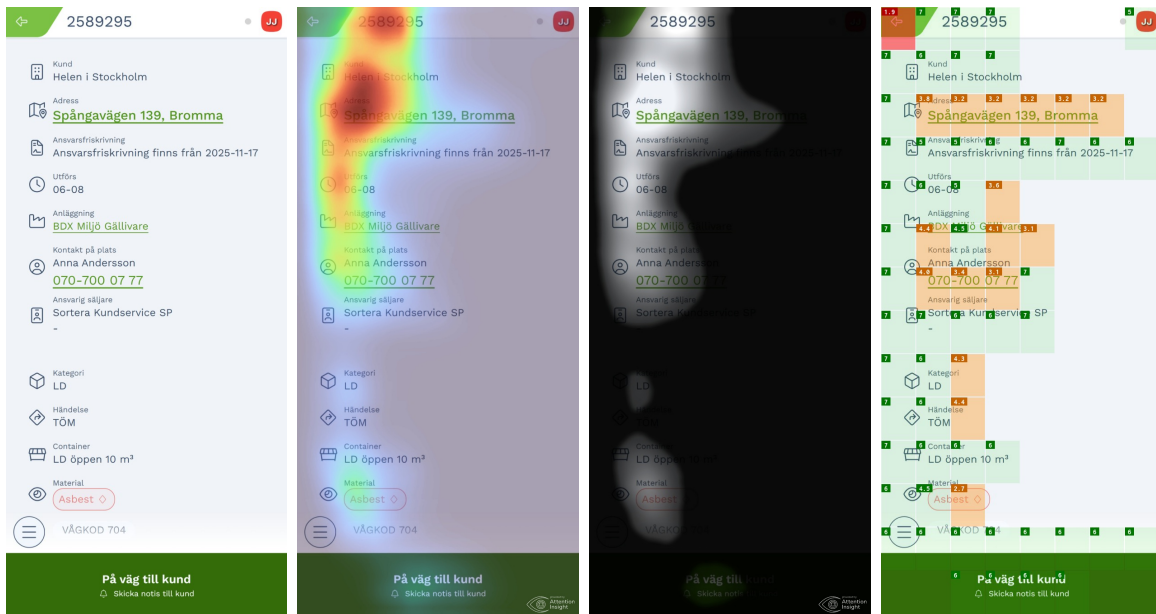


Figure 4.28. AI eye-tracking analysis of the current web application's individual order view: original view (left), attention heatmap, focus map, and contrast map (right).

The individual order view in the current web application, shown in Figure 4.28, received a clarity score of 48%, which was classified as moderate difficulty. The attention values showed that the address received 9%, the container information 5.7%, the time 4.5%, the client call information 3.1%, and the begin order action 1.8%.

This shows that the address is one of the stronger information elements in the current individual order view. However, the overall layout is less clear than the prototype car mode views. This supports the previous design direction, since the current system presents more complete order information at once, which can increase visual complexity and make the view harder to process quickly.

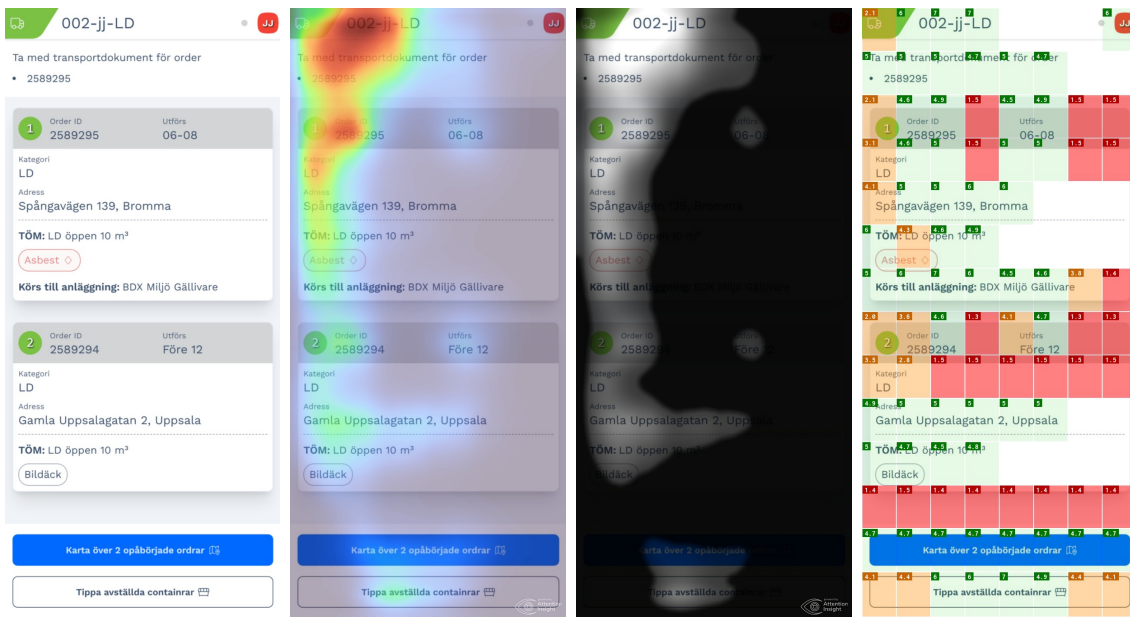


Figure 4.29. AI eye-tracking analysis of the current web application's order overview: original view (left), attention heatmap, focus map, and contrast map (right).

The order overview in the current web application, shown in Figure 4.29, received a clarity score of 44%, which was also classified as moderate difficulty. The first order item received 30.2% of attention, while the second order received 17.4%. The container information received 6.2%, the address 3.9%, the off-loading action 3%, the map action 2.2%, and the time window 0.7%.

This suggests that attention is mainly drawn to the first order card, while secondary actions and some detailed information receive less attention. The lower clarity score also supports the idea that the current order overview is visually more demanding than the prototype car mode views.

Taken together, the AI eye-tracking analysis suggests that the third-iteration car mode prototype views were clearer than the current web application views included in the analysis. Both prototype car mode views were classified as having optimal clarity, while both current system views were classified as moderate difficulty. This supports the design direction of reducing information density and creating a more task-specific car mode.

The analysis also shows that the visual hierarchy changes depending on the intended task in the prototype. In the car navigation view, attention was mainly directed toward navigation, while order information was still visible but secondary. In the car order view, attention shifted toward the current order and container information. This supports the goal of showing different information depending on the situation, instead of showing all order information at

all times.

At the same time, the current system views show that presenting more complete order information at once can increase visual complexity. This does not mean that the current information is unnecessary, but that it may be less suitable for quick interpretation in a driving-related context. The AI eye-tracking results should therefore be interpreted as supportive evidence rather than as a direct measurement of real driver attention. They indicate that the third-iteration prototype has a stronger visual hierarchy in car mode than the analysed views from the current system.

5. Discussion

This chapter discusses the design process, the resulting framework and prototype, and the evaluation findings in relation to the research questions. It also presents the limitations of the study and areas for future work.

This thesis investigated how Sortera's driver application can be redesigned to better support drivers in work situations before, during, or after driving through an iterative UCD process. The final prototype explored a separation between handheld mode and car mode, with the goal of reducing unnecessary interaction, improving glanceability, and making critical order information easier to access.

5.1 The process

The user-centered design process was useful because the problem was not only connected to the interface itself, but also to the drivers' work context, and the psychology around traffic safety and driver behaviour. The contextual inquiry helped identify how the application is used during real work, while the survey provided broader input on which information drivers need in different situations.

The MoSCoW analysis helped translate these findings into priorities for the prototype. These findings guided the information hierarchy in the later design iterations.

There were some difficulties with the task as a whole. In many cases, solutions to different issues meant a compromise had to be made since they were opposites. One such instance was the need to reduce the number of actions taken, while those flows added more complexity in how the user then interacts with the software, a complexity which does not fit the intended user group. Another issue was the difficulty of keeping the design consistent across views, where each view demanded solutions for which consistency was very difficult to maintain.

The three prototype iterations made it possible to first explore concepts, then test them with stakeholders, and finally evaluate high-fidelity prototypes. The most important design change in the final iteration was the separation between handheld mode and car mode. This made it possible to reduce information density during driving-related use while still allowing more detailed interaction in handheld mode during on-site work.

Regarding the prototyping itself, this has been a task which, in my own belief, took me outside of the premise of the research questions itself as the solutions cannot be made simply within the use of a standard Figma prototype. The prototyping required programming in order to implement functions such as the assisted scrolling. This in itself required me to utilize AI tools such as Figma Make and Cursor AI, rather than the UX standard which is Figma Design.

5.2 Results

The result from the three iterations was a UX framework demonstrated through a high-fidelity prototype. The framework was based on separating use contexts, prioritizing task-critical information, reducing visual and manual interaction, and structuring information according to the driver's current work situation. These principles were applied through two main interface modes: handheld mode and car mode.

Car mode was designed for use when the vehicle is in motion, where the driver may need access to important order information with limited attention and interaction. The layout was inspired by in-car infotainment systems and divided the interface into three main areas: navigation/menu, main content, and actions or secondary information. This made it possible to keep navigation, current order information, contact actions, and task progress close together in one view.

Handheld mode was designed for situations where the driver can interact more freely with the application, such as before driving, during stops, or while completing task-related work on-site. It used the same general visual language as car mode, but allowed more detailed information and smaller interface elements in order to support more complete order handling. This created consistency between the two modes while still adapting the amount of information and interaction to the use context.

The prototype also explored context-aware information through GPS-based workflow phases. Instead of showing all information for an order at the same time, the order view was adapted to the driver's current phase in the workflow. This reduced the amount of information shown at once and made it possible to highlight information that was relevant before arrival, on-site, or at the facility.

The final evaluation supported the overall design direction, but also showed remaining weaknesses. The order overview, navigation flow, and separation between handheld mode and car mode were generally understood by participants. The comparative glanceability test showed faster completion times for the selected tasks in the prototype than in the current interface, and

the SUS score indicated high perceived usability. The AI-based eye-tracking analysis further supported these findings by indicating that the third-iteration car mode views had stronger visual hierarchy and higher clarity scores than the analysed views from the current system. In particular, the prototype car navigation view directed most attention toward navigation while still keeping order information visible, and the prototype car order view directed attention toward the active order and container information. This suggests that the prototype not only helped participants find information faster in the timed test, but also structured visual attention more clearly in the analysed screens. However, the facility and off-loading flow remained less clear and should therefore be developed further.

5.3 Research questions

How can the user interface in Sortera's driver application be reshaped to improve readability and usability in a mobile driving environment?

The interface can be reshaped by reducing visual density, improving hierarchy, increasing text and touch target size, and making the most important information visible earlier in the workflow. The survey showed that drivers repeatedly prioritized address, client phone number, contact person, important information, and what should be collected or delivered. These findings were used to guide the information hierarchy in the prototype.

The prototype also improved readability by separating handheld mode from car mode. In car mode, fewer elements are shown at once and the layout is designed around larger components. In handheld mode, more information can be shown because the driver is expected to use the application outside the driving-related context.

The use of humanist font types reduces cognitive load for the user, especially males, who also constitute the main demographic of Sortera drivers.

The comparative glanceability test supports this design direction. Participants found task-critical information faster in the prototype than in the current interface, which is consistent with CLT predictions that reducing extraneous load and mitigating the split-attention effect should lower visual search time. However, the test was conducted with static images and a small number of participants, so the result should be seen as supportive rather than conclusive.

The AI-based eye-tracking analysis also supports this interpretation. The current interface views received lower clarity scores and were classified as moderately difficult, while the prototype car mode views were classified as having optimal clarity. This suggests that the

redesigned visual hierarchy made the interface easier to scan and helped guide attention toward the most relevant areas of the screen. The result is especially relevant for readability in a mobile driving environment, since the driver may only have short opportunities to glance at the interface.

In what ways can a simplified "car mode" for Sortera's driver application be designed to support safe and efficient access to critical information (e.g., address, client contact, order status) while driving?

A simplified car mode can be designed by prioritizing only the information and actions that are most relevant during driving-related use. In the prototype, this was implemented as car mode, where navigation, order information, contact actions, and current task progress are kept close together, without the need to exit the current view.

Car mode also reduces context switching by integrating navigation and communication into the same view. This means that the driver does not need to move between several applications or views to access common functions such as navigation or calling the client. The larger interface elements and assisted scrolling were also intended to reduce the need for precise manual interaction.

At the same time, the design should not be understood as making driving interaction fully safe. The prototype is designed to reduce unnecessary visual and manual interaction and support safer access to information, but it would need to be tested with real drivers in realistic vehicle contexts before stronger safety claims can be made.

How can a user-centered design (UCD) approach contribute to reducing cognitive load and improving context-adapted use?

The UCD approach contributed by connecting theory, driver needs, stakeholder feedback, and prototype evaluation. The contextual inquiry showed how the application is used in practice, while the survey helped identify which information drivers need most in different situations. These findings were then translated into requirements and tested through prototype iterations.

Cognitive load was addressed by reducing information density, supporting recognition rather than recall, using larger text and touch targets, and keeping related information closer together using grouping. Context-adapted use was addressed through the separation between handheld mode and car mode, and through GPS-based, context-aware workflow phases.

The process also showed that reducing cognitive load is not only a visual design issue. It also depends on workflow structure, data quality, note structure, technical feasibility, and whether the system behaves in a way that drivers understand and trust.

5.4 SUS, glanceability, and visual attention

The comparative glanceability test showed shorter completion times for both tested task types in the prototype. The clearest improvement was found for the container task, while the contact task also improved overall but less consistently. These results can be interpreted through the lens of Cognitive Load Theory (CLT): by reducing information density and increasing visual hierarchy, the prototype likely lowered extraneous cognitive load, allowing participants to allocate more working memory to the actual search task rather than to parsing the interface layout. The improvement in the container task, where related information was grouped within the same visual area in the prototype, also aligns with the split-attention effect as described under Cognitive Load Theory. In the current interface, container-related details are distributed across different parts of the view, requiring the user to mentally integrate spatially separated information, which is precisely the condition that increases extraneous load according to CLT. By integrating this information into a single visual group, the prototype reduced the need for such mental integration, which is consistent with the observed reduction in search time. However, the test used static images and only four participants, so the results should be seen as indicative rather than conclusive.

The SUS questionnaire resulted in a mean score of 88.75. This suggests that the prototype was perceived as usable despite design changes such as larger touch targets, larger typography, reduced information density, and a stronger separation between car mode and handheld mode. Since no SUS score was collected for the current application, the result should not be interpreted as a direct comparison, but rather as a confirmation that the design changes, which were motivated by CLT principles such as reducing extraneous load and supporting recognition rather than recall, did not introduce a perceived usability cost.

The AI-based eye-tracking analysis adds a third perspective to these findings by focusing on predicted visual attention rather than task completion time or subjective usability. The prototype car mode views received higher clarity scores than the current interface views, which supports the interpretation that the prototype reduced visual complexity and created a clearer hierarchy. This is consistent with the comparative glanceability test, where participants located selected task-critical information faster in the prototype.

The eye-tracking results also help explain why the prototype may have performed better in

the glanceability test. In the prototype car order view, attention was concentrated around the active order, container information, address, and call action. In contrast, the current interface views distributed attention across more competing elements and received lower clarity scores. From a cognitive load perspective, this suggests that the prototype reduced extraneous visual search effort by making the most relevant information more visually dominant.

However, the eye-tracking analysis should not be interpreted as evidence of actual driver attention. The analysis was based on static images and an AI prediction model, not on real eye-tracking data collected from drivers in vehicles. Its value is therefore mainly comparative and indicative. It supports the design direction by showing that the prototype screens are likely to guide attention more clearly than the current interface screens, but it does not prove that drivers would look at the interface in the same way during real driving.

5.5 Limitations

The study has several limitations. The contextual inquiry was based on two drivers, which gave useful insight but cannot represent all driver groups, vehicle types, or regional differences. The final user test was conducted with participants who had knowledge of Sortera, but who were not truck drivers. Therefore, the test mainly evaluated interface understanding and first-time usability, not real driver performance. However, for traffic safety evaluations, that does not necessarily mean the data is untrustworthy; rather, it implies that the system functions as intended, even for first-time users.

Furthermore, the amount of participants in the questionnaire for the mapping phase was only 33, which is a very small sample size. This means that the results may not be generalizable to the entire driver population at the company. This is especially relevant since the participants were mostly from one specific facility (Rosersberg). This means that the results may be more representative of Rosersberg drivers than of the driver population as a whole.

The test setup was also limited. The phone was placed horizontally on a raised surface to approximate a vehicle holder, but the test was not conducted in an actual truck. This means that vibration, traffic, lighting changes, stress, and the real placement of the phone were not evaluated. The test itself was also limited to four participants, which means that while the results are indicative, they are not conclusive.

The AI-based eye-tracking analysis also has limitations. It was based on static interface images and a predictive model rather than real eye-tracking data from drivers. The results therefore do not show actual gaze behaviour, glance duration, or attention shifts in a real vehicle context.

They should instead be interpreted as an additional design evaluation method that indicates likely visual attention patterns and relative clarity between screens. Real eye-tracking with drivers in a simulator, parked vehicle, or controlled driving context would be needed to make stronger claims about glance behaviour and traffic safety.

The prototype was also not a production-ready system. Functions such as integrated communication, GPS-based phase changes, and context-aware information would require further technical development and testing before implementation.

The users were not asked to test the current implementation, which means that during the glanceability test, participants may have performed better on the already familiar views due to longer prior exposure. Since participants had prior exposure to the current implementation, familiarity may have influenced the glanceability comparison. If anything, this may have favoured the current interface, meaning that the prototype's faster results should still be interpreted carefully but are unlikely to be explained by familiarity alone.

5.6 Future work

Future work should include testing with actual Sortera drivers in realistic work situations. This should include mounted-phone use in different vehicle types and work contexts. The facility and off-loading flow should also be further developed, since it was less clear than the order and navigation flow in the final evaluation.

Future evaluations should also include more direct measures of visual attention. The AI-based eye-tracking analysis used in this thesis provided indicative support for the visual hierarchy of the prototype, but future work should use real eye-tracking data if possible. This could help measure glance duration, number of glances, and whether drivers can locate task-critical information without extended attention away from the road.

Another important area is the note structure. For context-aware information to work reliably, Sortera would need a clearer separation between gate codes, entrance information, time constraints, project notes, and material-specific instructions.

Technical feasibility should also be investigated further, especially regarding native communication, navigation, GPS-based triggers, low-connectivity situations, and possible implementation in a native or hybrid application.

Further iterations of the current concept are also needed in order to compare alternative design solutions. This could include evaluating similar prototypes against each other, for example by comparing light and dark mode, alternative colour choices, different UI elements, and other

interface-level design decisions.

5.7 Relevance for sustainable development

In the introduction, four Sustainable Development Goals (SDGs) were identified as relevant to this thesis: SDG 3 (Good Health and Well-Being), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure) and SDG 12 (Responsible Consumption and Production). Looking back at the final result, the strongest connection is still to SDG 3 and SDG 8. The prototype was designed to reduce unnecessary visual and manual interaction, improve readability, and make important information easier to access in situations connected to professional driving. This can support a safer work situation for drivers, which relates to both health and well-being, and decent work conditions.

SDG 9 is also relevant because the thesis explores how a driver application can be further developed to better support logistics work. The prototype focused on clearer information structure, fewer unnecessary interaction steps, and better access to route information, order information, communication, and documentation. Since the driver application is part of a larger operational system, improvements to the interface can also support more efficient and reliable transport work.

The connection to SDG 12, Responsible Consumption and Production, is more indirect. Sortera works with recycling, waste handling, and material flows, and a driver application that supports drivers in completing orders and accessing correct information can also support these processes. However, the thesis did not measure environmental effects such as reduced emissions, fewer failed orders, or improved resource efficiency. This means that the contribution to SDG 12 should be seen only as potential, and not directly shown by the results.

6. Conclusion

This thesis investigated how Sortera's driver application can be redesigned to better support drivers during their daily work. The focus was on improving readability, reducing unnecessary interaction, and making important order information easier to access without removing the functions drivers need to complete their work.

The project followed a user-centered design process where user needs, traffic safety concerns, and cognitive load were used to guide the design. The result was a UX framework shown through a high-fidelity prototype with two main use contexts: handheld mode and car mode. Handheld mode supports more detailed interaction, while car mode focuses on simplified access to important information with fewer interaction steps.

The final evaluation showed that the overall concept was understandable to participants. The prototype also performed better than the current interface in the comparative glanceability test, received a high SUS score, and showed clearer predicted visual attention patterns in the AI-based eye-tracking analysis. Together, these findings support the design direction of separating use contexts, prioritizing important information, and reducing unnecessary visual and manual interaction.

The prototype can work as a design foundation for future development of Sortera's driver application. However, further testing with actual drivers in realistic vehicle contexts is needed before stronger conclusions about traffic safety can be made.

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Appendix

User survey questionnaire

Question 1

Hur länge har du kört lastbil?

Possible answers: <1 år; 1–3 år; 3–7 år; 7–15 år; 15+ år

Question 2

Vilken typ av fordon kör du oftast?

Possible answers: Kranbil; Lifthumper (LD); Lastväxlare (LVX); Kärl; Farligt avfall

Question 3

Var utgår du oftast från?

Possible answers: Rosersberg; Jordbro; Örebro; Göteborg; Malmö

Question 4

När du är på väg till kund, vilken information behöver du oftast direkt kunna se först?

Possible answers: Adress; Telefonnummer till kund; Viktig information; Kontaktperson; Vad som ska hämtas eller lämnas; Beställare (Ex. företagsnamn); (Allmän) Anteckning; Telefonnummer till transportledning; Projektnotering

Question 5

När du närmar dig kund, vilken information behöver du för att hitta rätt infart, port eller exakt plats?

Possible answers: Telefonnummer till kund; Kontaktperson; Adress; Viktig information; Vad som ska hämtas eller lämnas; Beställare (Ex. företagsnamn); Projektnotering; (Allmän) Anteckning; Telefonnummer till transportledning

Question 6

När du är på väg till nästa kund, vilken information behöver du oftast direkt kunna se först?

Possible answers: Adress; Telefonnummer till kund; Vad som ska hämtas eller lämnas; Kontaktperson; Viktig information; (Allmän) Anteckning; Beställare (Ex. företagsnamn); Projektnotering; Telefonnummer till transportledning

Question 7

När du öppnar orderöversikten, vilken information behöver du se direkt?

Possible answers: Adress; Vad som ska hämtas eller lämnas; Alla kommande stopp; Mellan vilken tid det ska utföras; Telefonnummer till kund; Viktig information; Kontaktperson; Bara nästa stopp; Beställare (Ex. företagsnamn); Order ID; (Allmän) Anteckning; Uppskattad vikt

Question 8

Varför använder du telefonen medan fordonet rullar?

Possible answers: Jag behöver ringa kunden; Jag behöver snabb åtkomst till navigation; Jag behöver hitta rätt infart eller plats; Jag behöver ringa transportledning; Fordonet rör sig knappt eller står stilla kort i trafik; Jag känner tidspress att snabbt komma vidare till nästa kund; Jag använder aldrig telefonen medan jag kör

Question 9

Vad gör det svårt att snabbt hitta rätt information?

Possible answers: Rörelse, vibrationer eller underlag gör det svårt; För mycket information visas samtidigt; Den viktigaste informationen framgår inte tydligt; Jag måste scrolla för att hitta rätt; Texten är för liten eller för tät; Jag måste byta vy/sida i appen; Jag måste öppna en annan app; Knappar eller tryckytor är för små; Inget

Question 10

Vibrationer eller ojämnt underlag gör det svårare att läsa information i appen när fordonet rör sig

Possible answers: 1 = Instämmer inte alls; 2; 3; 4; 5 = Instämmer helt

Question 11

Jag trycker oftare fel i appen när fordonet rör sig

Possible answers: 1 = Instämmer inte alls; 2; 3; 4; 5 = Instämmer helt

Question 12

Jag behöver ibland byta mellan flera vyer/sidor/appar för att hitta rätt information i kör-situationer

Possible answers: 1 = Instämmer inte alls; 2; 3; 4; 5 = Instämmer helt

Question 13

Hur lång tid uppskattar du att det tar att hitta den information du behöver i appen?

Possible answers: Mindre än 1 sekund; 1–2 sekunder; 3–4 sekunder; 5–6 sekunder; Mer än 6 sekunder

Question 14

I vilka situationer behöver du oftast kontakta transportledning eller säljare/kundansvarig?

Possible answers: När instruktioner eller orderinformation saknas eller är otydlig; När jag behöver fler ordrar; När jag behöver hjälp med bomkörning, avvikelse eller annan situation; Jag behöver sällan kontakta dem; Other

Question 15

Om du kör och märker att informationen du behöver inte går att förstå med en snabb blick, vad gör du oftast?

Possible answers: Jag väntar tills fordonet står helt stilla innan jag läser vidare; Jag tar en eller flera extra blickar medan fordonet fortfarande rullar; Jag trycker vidare för att snabbt få fram rätt information medan fordonet rullar; Jag ringer hellre kund eller transportledning i stället; Det beror helt på situationen; Other

SUS questionnaire

The following table maps the abbreviations Q1–Q10 used in Table 4.2 to the Swedish translation of the System Usability Scale (SUS) items administered at the end of each user test. Responses were given on a 5-point Likert-type agreement scale from 1 (*instämmer inte alls*) to 5 (*instämmer helt*).

Item	Question (Swedish)
Q1	Jag tror att jag vill använda systemet regelbundet.
Q2	Jag tycker att systemet är onödigt komplext.
Q3	Jag tycker att systemet är enkelt att använda.
Q4	Jag tror att jag behöver stöd av någon tekniskt kunnig person för att kunna använda systemet.
Q5	Jag tycker att de olika delarna i systemet är välintegrerade.
Q6	Jag tycker att det är för mycket inkonsekvens i systemet.
Q7	Jag tror att de flesta snabbt skulle lära sig detta system.
Q8	Jag tycker att systemet är besvärligt att använda.
Q9	Jag känner mig trygg i att använda systemet.
Q10	Jag kommer att behöva lära mig många nya saker innan jag blir produktiv med detta system.

MoSCoW analysis results

The following tables list the full MoSCoW prioritization for each analysed multiple-answer survey question ($n = 33$). Priority is assigned from the share of respondents selecting each option, using the thresholds in Table 3.2.

På väg till kund - info först

Option	Count	Share	Priority
Adress	32	97%	Must
Telefonnummer till kund	26	79%	Must
Viktig information	19	58%	Must
Kontaktperson	18	55%	Must
Vad som ska hämtas eller lämnas	18	55%	Must
Beställare (Ex. företagsnamn)	4	12%	Could
(Allmän) Anteckning	2	6%	Could
Telefonnummer till transportledning	2	6%	Could
Projektnotering	1	3%	Could

Nära kund - hitta rätt infart/plats

Option	Count	Share	Priority
Telefonnummer till kund	25	76%	Must
Kontaktperson	24	73%	Must
Adress	23	70%	Must
Viktig information	18	55%	Must
Vad som ska hämtas eller lämnas	14	42%	Should
Beställare (Ex. företagsnamn)	4	12%	Could
Projektnotering	3	9%	Could
(Allmän) Anteckning	2	6%	Could
Telefonnummer till transportledning	2	6%	Could

På väg till nästa kund - info först

Option	Count	Share	Priority
Adress	32	97%	Must
Telefonnummer till kund	26	79%	Must
Vad som ska hämtas eller lämnas	20	61%	Must
Kontaktperson	17	52%	Must
Viktig information	15	46%	Should
(Allmän) Anteckning	5	15%	Should
Beställare (Ex. företagsnamn)	5	15%	Should
Projektnotering	2	6%	Could
Telefonnummer till transportledning	2	6%	Could

Orderöversikt - direkt synligt

Option	Count	Share	Priority
Adress	28	85%	Must
Vad som ska hämtas eller lämnas	27	82%	Must
Alla kommande stopp	17	52%	Must
Mellan vilken tid det ska utföras	15	46%	Should
Telefonnummer till kund	11	33%	Should
Viktig information	9	27%	Should
Kontaktperson	5	15%	Should
Bara nästa stopp	2	6%	Could
Beställare (Ex. företagsnamn)	2	6%	Could
Order ID	1	3%	Could
(Allmän) Anteckning	1	3%	Could
Uppskattad vikt	1	3%	Could

Varför telefonen används medan fordonet rullar

Option	Count	Share	Priority
Jag behöver ringa kunden	28	85%	Must
Jag behöver snabb åtkomst till navigation	18	55%	Must
Jag behöver hitta rätt infart eller plats	13	39%	Should
Jag behöver ringa transportledning	10	30%	Should
Fordonet rör sig knappt eller står stilla kort i trafik	3	9%	Could
Jag känner tidspress att snabbt komma vidare till nästa kund	3	9%	Could
Jag använder aldrig telefonen medan jag kör	4	12%	Could

Vad gör det svårt att snabbt hitta rätt info

Option	Count	Share	Priority
Rörelse, vibrationer eller underlag gör det svårt	11	33%	Should
För mycket information visas samtidigt	9	27%	Should
Den viktigaste informationen framgår inte tydligt	9	27%	Should
Jag måste scrolla för att hitta rätt	10	30%	Should
Texten är för liten eller för tät	8	24%	Should
Jag måste byta vy/sida i appen	7	21%	Should
Jag måste öppna en annan app	5	15%	Should
Knappar eller tryckytor är för små	2	6%	Could
Inget	1	3%	Could

När transportledning/säljare kontaktas

Option	Count	Share	Priority
När jag behöver hjälp med bomkörning, avvikelser eller annan situation	21	64%	Must
När jag behöver fler ordrar	15	46%	Should
När instruktioner eller orderinformation saknas eller är otydlig	13	39%	Should
Jag behöver sällan kontakta dem	6	18%	Should

Om information inte går att förstå med snabb blick

Option	Count	Share	Priority
Jag väntar tills fordonet står helt stilla innan jag läser vidare	13	39%	Should
Det beror helt på situationen	7	21%	Should
Jag ringer hellre kund eller transportledning i stället	9	27%	Should
Jag trycker vidare för att snabbt få fram rätt information medan fordonet rullar	3	9%	Could
Jag tar en eller flera extra blickar medan fordonet fortfarande rullar	1	3%	Could

Application user flow mapping

