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A Chalmers University of Technology Master's thesis

User experience enhancement of a complex digital content management platform

Master's thesis in Computer science and engineering

Cajsa Tellström & Linn Österlund

Department of Computer Science and Engineering
CHALMERS UNIVERSITY OF TECHNOLOGY
UNIVERSITY OF GOTHENBURG
Gothenburg, Sweden 2026

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Supervisor: Aris Alissandrakis, Interaction Design and Software Engineering, Computer Science and Engineering
Advisor: Boris Tiutin, Opera
Examiner: Jasmina Maric, Interaction Design and Software Engineering, Computer Science and Engineering

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Department of Computer Science and Engineering
Chalmers University of Technology and University of Gothenburg
SE-412 96 Gothenburg
Telephone +46 31 772 1000

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Abstract

Data-intensive administrative systems support multiple workflows for users with various backgrounds and levels of expertise. When such a system grows organically without a deliberate design strategy, structural complexity can accumulate into an overly complicated user interface that increasingly burdens users and impedes scalable adoption. The purpose of this project was to identify the pain points caused by this complexity in a system, as well as to determine the extent to which iterative design improvements can mitigate them. The system being evaluated and redesigned is the back-office platform developed by Opera's Gothenburg office, for which functional completeness was initially prioritised over usability due to resource constraints. The project followed the Triple Diamond framework, progressing through initial system evaluation, usability problem and requirement definition, iterative low- and high-fidelity prototyping with consequent user studies, prioritisation, and final implementation. The initial and final user studies consisted of semi-structured interviews with think-aloud tasks, followed by the User Experience Questionnaire (UEQ), which captured both qualitative and quantitative data, enabling direct comparison before and after the redesign. The primary pain points identified were navigational structure, information density, and the absence of onboarding guidance. These issues pushed users from efficient, skill- and rule-based interaction toward effortful, knowledge-based reasoning, with a measurably greater impact on novice users, who had developed no compensatory strategies and often avoided the system altogether. The redesign addressed these pain points through a new navigation structure, a simplified main page, and new features including persistent support information and the ability to favourite frequently visited pages. In the final evaluation, qualitative feedback from interviews and UEQ results were in strong agreement. Participants consistently described navigation as noticeably faster and more intuitive, and the majority of UEQ scales reached the *Excellent* benchmark category, with particular improvements in *Perspicuity* and *Efficiency*. The scores from the identified user groups converged in the final round, suggesting that the redesign lowered the threshold for novice users without disrupting established experts' workflows. The results demonstrate that sustained, iterative user engagement is essential when redesigning complex systems with heterogeneous user groups, and that significant usability improvements can be achieved through structural refinement without requiring a complete reimplementation.

Keywords: User Experience Design, Usability Evaluation, Complex Administrative Systems, Cognitive load, User-centered Design, Iterative Prototyping

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Cajsa Tellström & Linn Österlund, Gothenburg, 2026-06-03

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Introduction

The effectiveness and operational efficiency of digital platforms are ultimately determined by the ease with which their administrators can configure, maintain, and manage content (Nielsen, 1993). While functional completeness is the baseline for system deployment, the long-term usability and efficiency of a digital platform are strongly dependent on the quality of the user experience. Managing a digital platform should be an accessible task that imposes a low cognitive load on the user. Usage should not rely on extensive domain knowledge, instead, the application should exhibit high affordance and support intuitive interaction, enabling users to understand available actions and system behaviour with minimal prior training (Balasm et al., 2025; Norman, 2013).

An example of a platform where functional completeness has been the primary priority is the digital content distribution platform developed by Opera's Gothenburg office. It was created to handle configuration, maintenance and content management of the various products deployed by the company. The interface of this platform is colloquially called Opera's back office, or BO for short, and will be referred to as such in this project. Due to resource constraints during initial development, functional completeness was prioritised over user experience and interaction design. The system grew organically and features were added as they were needed, however further development plans were constrained by time and resources. This approach was acceptable as the systems users were limited to a handful of team members who possessed extensive domain knowledge and could overcome user interface limitations through their shared understanding of the platform. However, the platforms scope has expanded to require collaboration with external teams that lack the contextual knowledge of the original users. The current BO user interface is utilised by approximately a few dozen people, with users being added and removed as needed depending on current projects, and presents significant barriers to adoption for new users. This discourages teams from operating autonomously and creates dependency on technical support from the development team. This situation inhibits scalable adoption of the BO, something that could save time across the organisation.

This challenge of managing systems that have grown gradually in many directions is not unique to the present case. Platforms that support multiple products, configurations, and user roles must manage large volumes of interdependent data and rules, which introduces substantial system and project complexity. Research on complex systems has shown that such complexity arises not only from the number of system

components but also from the strength of interdependencies between them, making the effects of local changes difficult to predict and understand (Simon, 1996). From a cognitive perspective, complex systems often exceed users' capacity to form accurate mental models of system behaviour without appropriate representational support, increasing the risk of error and inefficient operation.

1.1 Problem Statement

Designing for complex applications that accommodate diverse user roles and multiple workflows presents a challenge that conventional user experience methodologies are not always suited to address. When such systems grow organically without regulated design evolution, structural complexity accumulates in the interface and the burden of navigating shifts onto the user. To effectively redesign such a system, a comprehensive understanding of the users and their needs is required.

This thesis proposes a systematic approach to improving the user experience of such a complex application, the back office platform developed by Opera's Gothenburg office. The project aims to establish a comprehensive understanding of user needs and pain points through research, analysis, and requirements elicitation, which defines and prioritises focus areas for an iterative cycle of design, implementation, and validation through user testing and feedback. The goal of the project is to improve the usability of BO while preserving the complexity and functional workflows. The insights gained through the practical application of design, research and development methods in the project serve to contribute to the ongoing research on designing and implementing complex applications.

1.2 Research Questions

RQ1 What are the primary user experience pain points and workflow bottlenecks in the current back office platform interface, and how do they impact the usability, efficiency and satisfaction of users with different levels of domain knowledge?

RQ2 To what extent do iterative design improvements mitigate the identified pain points and lead to perceived improvement in usability, efficiency, and satisfaction of the back office platform?

2

Background

Opera's BO is one example of a distinct category of interactive applications, namely data-intensive administrative systems. These systems are focused on the maintenance of data that supports products and internal organisational processes. Their users typically interact with them intermittently but over long periods of time, often in situations where errors may propagate through the system and have consequences later. A defining characteristic of such systems is the density of data and the multitude of relations (Ceri et al., 2003, Chapter 2). They are designed to support business logic and technical implementations and tend to evolve as new requirements emerge in the organisation. However, the interconnectedness of the data in the system introduces a structural complexity that can over time accumulate into an overly complex user interface if the evolution is not regulated.

Furthermore, many back office platforms, particularly developed in-house, originate in technically driven contexts. It is often developers or domain experts who develop and use these systems initially. The shared, almost tacit knowledge based on expertise about both software and the industry's domains mitigates the need to initially have well-defined usability guidelines. However, this becomes problematic as the system scales. Studies of complex and uncertain system development indicate that reliance on expert knowledge and informal coordination may be viable in small, stable teams but becomes increasingly problematic as systems scale and user groups diversify (Olausson & Berggren, 2010). They also demonstrate that tightly coupled systems with evolving requirements amplify coordination costs and create strong dependencies on tacit knowledge, unless complexity is mediated through shared representations and transparent structures. While the work of Olausson and Berggren (2010) focuses on product development projects, it addresses underlying mechanisms such as coordination under uncertainty, reliance on tacit expert knowledge, and the management of tightly coupled system structures, which are not specific to physical product development. These mechanisms are therefore applicable to digital platforms and their supporting administrative systems as well, where users must reason about complex configurations and constraints through the interface.

2.1 Cognitive Load

When the system's complexity is not mediated by the user interface, interaction shifts from simply being able to execute predefined tasks to having to continuously interpret the system's state and make knowledge-based decisions. The system assists the user in completing their task as much as it places extra cognitive and organisational burden on them. To frame the investigation of how users use and experience complex systems such as BO, this study draws on theoretical perspectives that examine how individuals reason about complex structures, interdependencies, and evolving system states over time. How users operate systems is shaped by their ability to form and maintain mental models of system behaviour, internal representations of how a system is structured, and how it behaves (Jones et al., 2011). In cognitive ergonomics, it is possible to categorise mental models according to their characteristics. Preece et al. (1994) writes that depending on the user a mental model can fit into one of two categories; a functional model that has the procedural knowledge about how to use the system, or a structural model that consists of an internalisation of the structure of the system, and how the system works. Hmelo-Silver and Pfeffer (2004) have a similar theory of distinction, but format it so that every user's mental model contains varying amounts of information on different levels of abstraction depending on their expertise, be it an understanding of the system's structure, behaviours or functions.

This project draws on Rasmussen's Skills-Rules-Knowledge (SRK) framework to articulate how different forms of knowledge are enacted during interaction with complex systems. Rasmussen's theoretical framework distinguishes between three distinct levels of behaviour: skill-based, rule-based and knowledge-based. Skill-based behaviour is defined as actions that are performed automatically in response to perceptual cues. Rule-based behaviour, on the other hand, is characterised as the application of learned rules or procedures based on recognised situations. Finally, knowledge-based behaviour refers to actions that require deliberate reasoning and problem solving in unfamiliar or poorly supported contexts (Rasmussen, 1983). As system complexity increases or interface cues fail to adequately represent system state and structure, users are more likely to shift from skill- and rule-based interaction toward knowledge-based reasoning. This transition is associated with increased cognitive load and a higher risk of errors.

In his book *The design of everyday things*, Norman (2013) asserts that true understanding of a product's operation comes from its ability to communicate its proper usage. In the context of a digital system, the extent to which the design facilitates the formation of accurate mental models, for example through visual hierarchy, clear affordances and feedback, dictates how effective the interaction with the system is. The sequence in which information is presented, the grouping of related data, and the visibility of system state must support users with varying roles, responsibilities, and levels of domain knowledge. When such considerations are insufficiently addressed, users are forced to operate at a knowledge-based level, relying on detailed understanding of system internals rather than being guided by the interface itself.

This not only increases cognitive load but also reinforces organisational dependency on a limited number of expert users (Gould, 1988; Janhager, 2005; Margolin, 1997).

How users deal with complexity in practice is further understood with the aid of research on sensemaking, where interaction is described as an iterative process rather than a linear task execution (Pirolli & Card, 2005). During each iteration, the user interprets information, tests assumptions and revises their understanding as the system state changes. When system behaviour deviates from the user's expectations, the user must rebuild their understanding. Studying where the system does not support this re-framing process can pinpoint instances where the likelihood for errors or inefficiency increases.

From the perspective of distributed cognition, reliance on external support is not a limitation of the user but a fundamental characteristic of how cognition operates in complex systems (Hollan et al., 2000). Cognition is understood as distributed between the user and the representations provided by the system, rather than residing solely in internal mental processes. A well-designed interface allows users to offload cognitive effort onto interface elements that externalise the systems structure, state, and history, thereby reducing the need to keep everything in working memory. Visual cues indicating user history serve as cognitive scaffolding that supports the creation and maintenance of mental models. It is therefore important to understand how the user utilises the system and their knowledge about the system to do their tasks. Distributed cognition provides a useful theoretical basis for understanding how the design of the interface can reduce cognitive load by shifting effort from memory-intensive reasoning toward perceptually guided interaction.

This theoretical framing provides a base for the evaluation of the system in this project, aiding in defining the users' understanding and use of the system. The emphasis that effective interaction is highly dependent on how well the system supports sensemaking and enables users with varying levels of domain knowledge to reason about their task execution will guide the elicitation of requirements and guidelines. This theoretical framing is particularly useful for redesign efforts, as it shifts focus from isolated interface elements to how structure, representation, and cognition jointly shape users ability to work effectively within complex systems.

2.2 User Experience in Digital Systems

The theoretical perspectives outlined above establish that cognitive load, mental model formation, and sensemaking shape how users interact with complex systems, yet they do not fully account for how users relate to and evaluate a system as a whole. This broader dimension is captured by the concept of *user experience* (UX). UX is defined by the standard ISO 9241-210 as "a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service" (International Organization for Standardization (ISO), 2019), meaning it encompasses not only task performance but also subjective responses including emotions, preferences, and perceived quality. Usability is a component of UX, which extends further to include qualities not directly tied to functional performance.

This distinction is formalised in Hassenzahl (2018)'s model which separates UX into *pragmatic* quality and *hedonic* quality. Pragmatic quality corresponds to usability, meaning how well the system supports task completion, how learnable it is, and how clearly it communicates available actions. Hedonic quality concerns the system's ability to fulfil psychological needs beyond task execution. This includes satisfaction and novelty. A system can be pragmatically functional while still being experienced as dated or uninviting, and a complete evaluation of UX requires that both dimensions be considered.

Achieving good UX in practice requires that design be grounded in a thorough understanding of both human cognitive limitations and system complexity, best achieved through early and continuous user involvement. User studies serve a dual purpose in this regard. They reveal how users interact with and navigate a system, but also how they experience and perceive it. Since UX is inherently subjective and shaped by individual context, qualitative methods such as interviews and observations are particularly well suited to capturing it. They allow participants to articulate their experience in their own terms and surface nuances that structured quantitative measures alone cannot reach (Hassenzahl & Tractinsky, 2006). Grounding design decisions in this kind of user insight is therefore essential, as poorly elicited or inadequately defined requirements can introduce risks to system quality, maintainability, and long-term usability. In complex administrative systems these risks are amplified, as early design decisions become deeply embedded in system structure and difficult to revise once organisational reliance has formed (More et al., 2011). The complexity of managing multiple products from a single application, combined with diverse user roles and permission structures, places substantial demands on visual hierarchy, affordance, and overall design structure. Determining the appropriate hierarchy requires extensive user studies to establish primary goals, pain points, and workflows (Gould, 1988; Janhager, 2005; Margolin, 1997). Addressing these challenges through user-centred design provides a means of mediating system complexity through the interface rather than displacing it onto users.

The *User Experience Questionnaire* (UEQ) is used in this project to measure UX to complement and quantitatively support the findings from the user studies (Laugwitz et al., 2008). The questionnaire measures both pragmatic and hedonic quality across six scales, covering the perceived usability, efficiency and satisfaction of the users. While pragmatic quality is the primary concern given the functional nature of BO, also measuring hedonic quality provides a more complete picture of the overall user experience. Furthermore, the highly varied workflows among BO users make measuring cognitive load difficult without also accounting for the load of the task itself, something that cannot be meaningfully compared between users. For instance, one user may manage accounts for a product while another manages feed content for for other products, and the cognitive demands of these tasks are too different to yield any comparable data. Therefore, a measurement of the more general experience of the system is of greater value, and the questionnaire can provide a broad overview of the perceived UX that is comparable between participants. This quantitative measurement can thus strengthen and complement the qualitative findings from the user studies.

2.3 Requirement Engineering

The requirement engineering phase operationalises the user-centred principles discussed above by translating user needs, constraints, and organisational goals into explicit system requirements. As previously mentioned, if the requirements are incomplete or incorrect, the project will fail as there are insufficient guidelines defining the expected outcome (More et al., 2011). Requirement engineering functions not only as a technical specification activity, but as a key mediator between system complexity and user experience. In this project, rather than treating requirements as static artefacts defined upfront, they are iteratively refined through continuous engagement with users and systematic evaluation of the existing system.

A combination of established elicitation methods is employed to ensure both breadth and depth of insight. These include documentation review, system evaluation, brainstorming sessions, and user studies, which are further described in section 3. The user studies primarily consist of semi-structured interviews and ongoing dialogue throughout the project. In addition, an initial system evaluation is conducted to establish a usability baseline, enabling comparison with subsequent design iterations. Together, these methods support a requirements process that is grounded in actual use contexts and responsive to evolving user needs.

2.3.1 Project Stakeholders

To define the purpose and goals of the project, the project stakeholders must first be identified. For this project, the main stakeholder is the company Opera, as the performance of the BO impacts the performance of Opera products and therefore their success. More specifically, the development and content management teams that utilise the platform are the primary stakeholders, as they are most greatly affected by the usability. External teams are of particular interest, as they represent user groups with limited prior domain knowledge and therefore provide insight into the accessibility of the system for non-expert use. This project has the following stakeholders:

End users: Internal and External teams at Opera that use BO. The aim is to improve the usability of the system to lower the threshold for users who do not necessarily have previous technological and contextual knowledge currently necessary for the platform, while preserving the established workflows used by expert users.

Industry: Opera and other companies with complex applications such as BO for managing products.

Academic: Chalmers University of Technology and any researcher who might be interested in the empirical research findings.

2.3.2 The Users

Users' ability to effectively interact with a user interface varies depending on the level of expertise they possess. This definition of expertise is largely determined by the depth and structure of their domain knowledge and technical experience, which affects the ease with which a user can form a mental model of a product (Popovic, 2000). For the purposes of this project, these two ends of the spectrum are referred to as *expert* and *novice* users, respectively. Expert users can form stable mental models that allow them to reason about a system at a conceptual level, manage complex data structures, and plan actions based on an understanding of underlying system logic. In contrast, novice users have fragmented mental models, which force them to rely more on trial-and-error when navigating complex workflows. This discrepancy results in differences in interaction behaviours, which are necessary to consider when categorising users into separate user groups when evaluating usability.

Current users of the platform in this project are employees at Opera with varying degrees of technical and domain-specific knowledge. They use the platform in different contexts depending on their different roles, and make use of different features and content on the platform. However, it is possible to group them into three distinct user groups: developers, content managers with a technical background and content managers with little to no technical background. Initially, the BO was created by developers who added features to the BO as needed. As previously stated, this small team of users who functioned in both creator and user capacities allowed for a higher complexity in usability. As time passed, there was an increasing necessity to extend the utilisation of the system to encompass employees who were not developers. This development served to underscore the present usability issues of the system. The platform was found to be challenging for new users to navigate, and effective use often depended on knowledge about the platform to compensate for usability limitations. Consequently, the users who utilise BO and are responsible for the content management of products often possess a technical background, even if they are not involved in the development of BO. The third user group is characterised by its members' current difficulty in using the system, which poses a significant challenge to them. Therefore, they seek to avoid the use of the system by relying on more seasoned users to interact on their behalf.

Throughout this project, the term expert user is used primarily to refer to the users belonging to the developer user group described above, and also encompasses many content manager users as well, since they have the technical knowledge required and extensive history with BO. Novice users refer to the content managers who currently have difficulty using the system independently. While these users are not novices in the strict domain-knowledge sense, they lack the system-specific experience that characterises expert users. The need to reduce the threshold of usage of the platform to allow for more users is a key motivation for the redesign.

2.3.3 System Description

Opera's back office platform is a digital content distribution platform created to ease the management of content in Opera's products. With many of their products displaying non-static content in components and pages, it became a necessity to create a way to modify this content without having to have a new release for each update. This also created an opportunity to allow non-developers to modify the content without having to ask a developer for help. Users of the platform can upload and create new content, manage existing content and content configurations, as well as toggle settings like visibility of features and content through BO for several of Opera's products. The content modified can be displayed anywhere from the main page of *GX Browser* (Opera Norway AS, 2026) to the installation wizard of the cross-platform game engine *GameMaker* (Opera Norway AS, 2025a). The wide variety of content types and products requires a flexible platform architecture that supports multiple workflows and enables users to engage with the system according to their individual goals.

The original version of BO is organised into categories according to products and features. Each product or feature is allocated its own page, which is further subdivided into additional subpages. In certain instances, a feature may be present as a subpage of a product. There is some difference in what content and categories are visible depending on the user's account settings. An *Admin* user can see all products and features, while a *Content Manager* user can only see pages that are linked to managing specific content. However, the overall design and layout are the same for all users. The examples shown in Figures 2.1-2.3 are of an admin user in the test environment. As is the case throughout this report, all sensitive information in figures and text has been censored or substituted in accordance with Opera's guidelines.

Upon opening the platform, the user is directed to the main page view, as shown in Figure 2.1. The main page displays cards for each main category arranged in a grid at the centre of the page, accompanied by a page header at the top. Each card in the grid contains a title text of the product or feature, along with a list of links that direct to the product or feature's subpages. The card itself and the main category text are not clickable. The page header is present in all views of the platform, with menu options changing depending on the selected category and its subpages. It has the BO logo as a clickable home button redirecting to the main page on the left side, with a dropdown menu situated beneath it. The dropdown contains links to all main categories. In Figure 2.1, the subcategories listed as menu options are the same as those listed in the *Product 1* card. Additionally, two cards, one for a product and one for a feature, are not visible without scrolling.

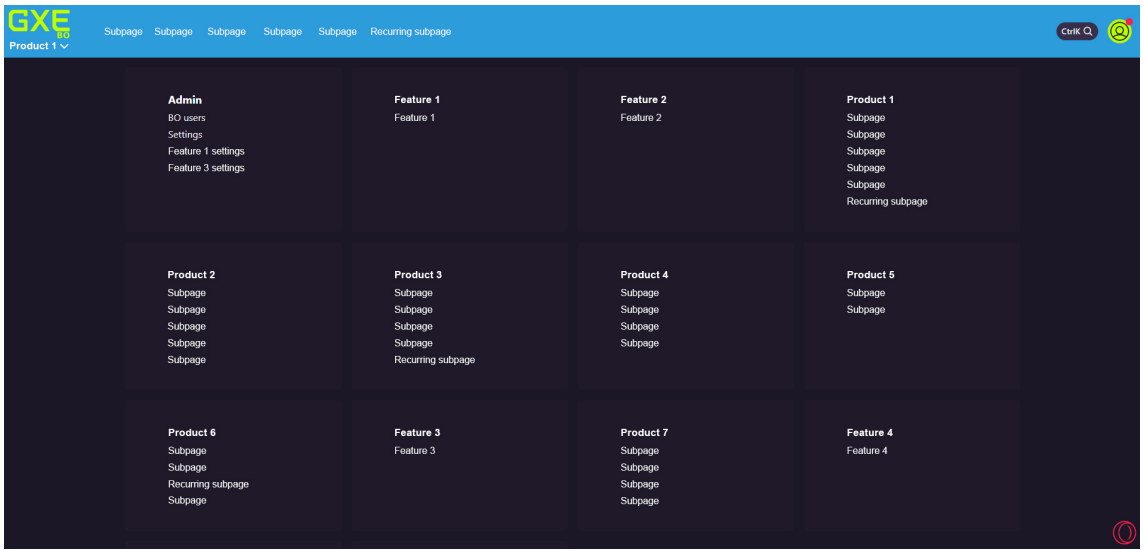

Figure 2.1: The main page of BO in the test environment, where the user has admin access. Information has been censored and substituted according to Opera's guidelines.

To the right of the page header are a search button and a user account button. The search button opens up a pop-up dialogue of a search bar where the user can search for all content within the platform. It is possible to search for both features and products, as well as specific entities or configurations, through this search bar, resulting in multiple search configurations and options to use and remember. The search functionality in the page header is a relatively new functionality for BO. The user account button opens up a page which lists entities and configurations with which the user has interacted and which have been modified in some way, thus requiring attention.

As the quantity of links visible on the main page might allude to, there are numerous page views to look at in the platform. Nevertheless, with some exceptions, there are two types of page structures that these page views adhere to, here called table pages and detail pages. Therefore, in order to illustrate the current design, only one category will be shown as an example. However, it is important to note that there are some differences between the pages. The configuration of search and filter options at the top of each table page differs in both availability and layout. Additionally, the detailed view of entities and configurations has some differentiation between them, which will be further described later on.

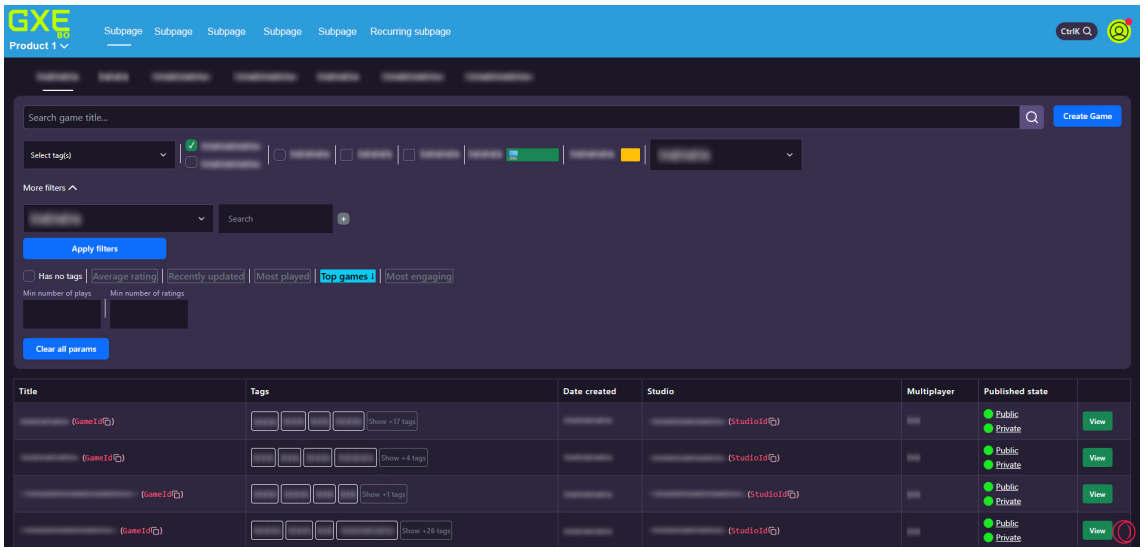

Figure 2.2: The example table page with some filter options selected and sorted by *Top games* in descending order. Sensitive information has been censored and substituted as per Opera's guidelines.

The example table page shown in Figure 2.2 can be navigated to through either the menu option in the page header or the text link in the *Product 1* card. The page has the same page header as the main page, an additional tab bar with further subpages for the current subpage and the page content for the selected tab. The page content can be divided into two parts, a filter container and a table.

The container holds different controls for the page, such as controls for what will be displayed in the table. From the top down, the container holds a search bar for searching via game title and a blue *Create Game* button that opens a dialogue with controls for creating a new game. Beneath is a row of different control options such as dropdown lists with search functions inside, different checkboxes and buttons. The checkboxes have three states: selected as include, selected as exclude or deselected. The buttons have three or more states, with every state having a distinct colour. More control options are exposed by clicking *More filters*, which reveals an expandable menu, such as filtering controls consisting of a dropdown menu and text field, as well as two rows of sorting options. The filtering controls can be added and removed with grey *plus* and *minus* buttons, where minus appears if another filtering control is added. After setting a filtering control, the effects are implemented by pressing the blue *Apply filters* button beneath. The sorting options are either available as checkboxes with two states, an input field, or a button with three states: ascending, descending or deselected. The Figure 2.2 shows the sorting *Top games* as selected in a descending state. The blue button *Clear all params* resets all controls and is visible even when the *More filters* menu is collapsed.

The table lists all of the games that fulfil the filtering and sorting options set. The information available for a game in the table is the title, the identifier, the tags, the date of creation, the studio and its identifier, support for multiplayer, and the published state. This information is divided into different columns, where the title

and identifier of both game and studio are grouped together. At the end of a row is a green *View* button that directs to a detailed view page. On this page, it is possible to copy the identifier of the game and the studio. The user can also sort the table by *title* or *date created*, but the only visual indication of this option is the changing of the cursor from default to pointer when hovering over the column titles.

This layout of two components, a container and a table, is a recurrent theme across the majority of page views within the platform with the function of presenting information about numerous entities. The visual differences amongst these pages are evident in the various combinations and arrangements of sorting and filtering control options within the controls container, different column values, and the placement of sorting options. It has been noted that certain pages are without sorting and filtering controls, while others do not provide the option to sort through column titles. An element that differs between almost every page is the *View* button, which varies in colour, placement and text.

The detailed view of an entity is also a recurring page on the platform, which appears in a number of variations. As an example, the detailed view of a game, as seen in Figure 2.3, consists of two types of components: containers with information and options about the game to the left and a sticky navigation menu to the right. The containers' titles are also visible in the navigation menu for quick scrolling on the page. Each container contains different types of information about the game, such as media for the game, the type of platform it is available on, and the description of the game. It is important to note that almost all of the content here is editable, since the function of BO is to manage this type of content. If a game is available on both desktop and mobile, then this should be visible to users reading about the game in the *GX Games* store. This is set by a *content manager* user in this detailed view in BO. There are multiple ways to control the content on the page, such as toggle switches, checkboxes and text fields. The way to save changes made differs between detailed views, with some variation between where and how often *save* buttons appear. Additionally, some fields require the user to enable editing through a button as an extra step. Most of the editable fields have little to no validation of input, such as code syntax checking. Furthermore, above the top container are breadcrumbs indicating where on the platform the user is, and the breadcrumbs do not always correlate with the path the user took to arrive at the page, since there are many ways to reach the same page.

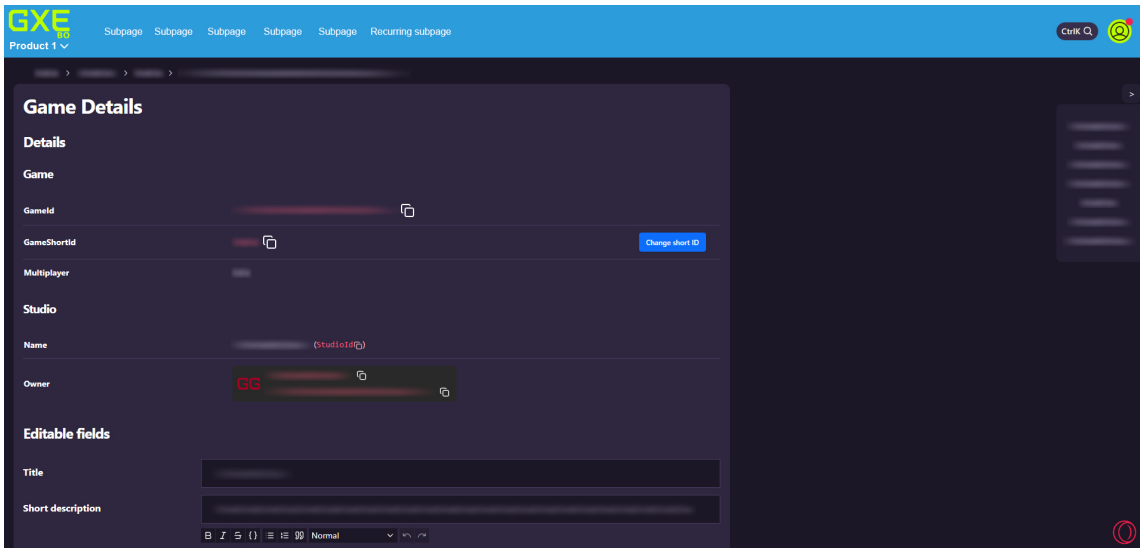

Figure 2.3: The top part of a detailed view page of a game. Sensitive information has been censored and substituted as per Opera's guidelines.

The placement and width of the containers with information content depend on the page. At times, they are full screen width, other times they fill up about two-thirds of the page. At times they are situated to the left, other times at the centre. The breadcrumbs are always featured, but the navigation menu to the right is not always present.

Overall, the current design of BO provides a good foundation for an application with a sovereign posture. The design groups related functions and objects together in clearly divided containers, and the functionality works well to perform intended tasks. One advantage of developing an application in-house is the ability to tailor functionality to specific organisational needs, which is evident in the platform. Common controls are made available across most pages, while the overall number of visible interface elements is kept low to allow sufficient space for data tables. At the same time, however, the overall structure is somewhat incoherent. There are pages and categories for products and features that are both in and not in use by Opera, and many different ways to navigate through them. A user can only navigate to a subpage through the main page, or by first selecting the correct main category from the dropdown, which requires the user to actively remember how pages are grouped together. Furthermore, while there is a high-level definition for page and content structure, variations in placement, component usage, and visual design from page to page make the experience feel fragmented in places. This variation in structural and visual presentation, together with nested category groupings, affects how easily users can utilise the platform. The process of establishing this understanding of the system is detailed in Sections 3.2 and 3.3.

3

Methodology

The study was conducted as a qualitative, design-oriented case study focusing on a single back office platform within one organisation. This approach allowed for in-depth investigation of usability challenges, workflows, and user needs in a complex real-world system. Rather than aiming for statistical generalisation, the study sought analytical insights that could inform design decisions and contribute to understanding how user-centred design methods could be applied in similar complex administrative systems. The process followed an iterative design and development approach, encompassing the full cycle from user discovery through implementation and validation.

3.1 The Triple Diamond framework

The workflow loosely followed the Triple Diamond framework, which was used as a structuring principle rather than a rigid process model. It evolved from the Double Diamond framework introduced by the Design Council (2005) due to the need for a framework better suited for complex problems and was used by many design researchers, such as the designers at Google (Google, 2026). The phases were intended to guide the progression of the work while allowing flexibility for iteration as new insights emerged from user studies and evaluations. The *Ideate* and *Validate* phases were conducted twice: first for low-fidelity prototyping, then for high-fidelity prototyping. The project was conducted within the existing system architecture, evolving it incrementally rather than pursuing a complete redesign.

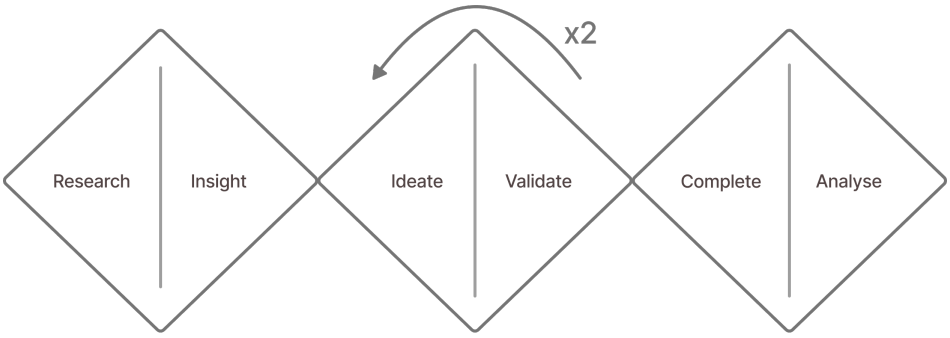

Figure 3.1: Graphical presentation of the triple diamond framework where the *Ideate* and *Validate* phases are conducted twice.

Research

- **Literature review:** Existing research, findings and methods on conducting effective user studies as well as evaluating and designing for complex systems with regard to cognitive load were examined.
- **System evaluation:** An exploratory evaluation of the system was conducted without prior experience with the platform, documenting the system architecture, page structure, and compliance with usability standards.
- **Initial user studies and requirement elicitation:** Different methods of research and elicitation were applied in user studies to gain information and understanding of the back office platform and its role in the users' respective workflows. Both current and potential users were considered. Emphasis was placed on identifying usability issues, cognitive challenges, and dependency on domain knowledge.

Insight

- **Defining requirements:** Knowledge gained from the user studies and literature reviews was summarised to define the requirements and prioritise focus areas. Requirements were treated as evolving artefacts and were refined throughout the project as additional user insights were obtained.

Ideate first round

- **Low-fidelity prototyping:** A low-fidelity prototype was designed to allow for early user studies and feedback. Low-fidelity prototyping allowed for exploration of alternative interface structures and interaction patterns with minimal

implementation effort, allowing early validation of design assumptions before committing to detailed design solutions.

Validate first round

- **First stage of user studies:** User studies were conducted with the low-fidelity prototype to evaluate the design artefact, and data and insights were gained regarding how well the user studies helped in understanding the needs of the users.
- **Analysis of first stage of user studies:** The user studies with the low-fidelity prototype were evaluated and analysed. The data and insights were analysed to lay ground for the development of the high-fidelity prototype.

Ideate second round

- **High-fidelity prototyping:** A high-fidelity prototype of the design artefact was developed based on the insights and data gained throughout the project. This aimed to represent realistic interaction flows and visual hierarchy, enabling more accurate evaluation of usability, learnability, and perceived cognitive load.

Validate second round

- **Second stage of user studies:** User studies were conducted with the high-fidelity prototype to evaluate the final design, and data and insights were gained to further evaluate the methodology and research done throughout the project.
- **Analysis of second stage of user studies:** The user studies with the high-fidelity prototype were evaluated and analysed. The data and insights were analysed to prioritise improvements and lay ground for the implementation.

Complete

- **Realisation:** The design artefact was implemented and realised with possible modifications derived from user studies and limitations of the existing code and framework.

Analyse

- **Final user studies:** Summative user studies were conducted with the implemented redesign, applying the same methods as the initial user study to assess usability and inform the final evaluation.
- **Analysis and final evaluation:** The results of all user studies and tests were evaluated, analysed and summarised; the performance of the methods was reflected upon and key insights that emerged from the process were identified.
- **Deliver the final design:** The final results were presented and handed over to Opera, enabling continued development and implementation.

3.2 Initial Evaluation

In their work on distributed cognition, Hollan et al. (2000) cautioned that a lack of understanding could lead designers to "inadvertently destroying many of the most valuable aspects of current ways of doing things". When a non-expert designer or developer does not grasp the subtle use cases and features that support expert performance, they can mistakenly remove them in an effort to create simpler and more minimalistic digital environments. Therefore, when evaluating and restructuring a complex system, it was important to first strive for a deep understanding of the system architecture, the use cases and edge cases. Some of the best approaches for understanding present work and problems according to Lauesen (2002) are through observation, interviews and task demos. Therefore, as the first observational step of the process in this project, an exploratory evaluation of the system was conducted, in which detailed notes were taken on the system architecture, page structure, compliance with usability standards as well as any questions that arose. Through the evaluation and notes taken, the overarching architecture and UX issues were identified. The initial lack of domain knowledge provided a perspective comparable to that of non-expert users interacting with the system for the first time, offering insights into potential issues related to understandability and ease of use. Furthermore, documenting identified usability issues at this stage established a frame of reference against which subsequent user studies could be interpreted. These preliminary findings helped anticipate potential problem areas and inform the focus of the empirical user studies, enabling the prioritisation of usability issues based on their impact on actual users.

3.3 User Studies

In the following section, the methods used in the user studies are described. The user studies constituted the primary method for requirement elicitation and evaluation in this study, and represented the main source of empirical data. The objective was to identify usability issues, workflow breakdowns, and sources of cognitive load in BO. Furthermore, these studies sought to evaluate how proposed design changes addressed the aforementioned issues across different user groups.

The user studies were conducted in multiple stages throughout the project and were closely integrated with the iterative design process. The initial study focused on eliciting the participants' mental models, existing workflows, user goals, and pain points in the old system design, in order to inform design decisions and ensure alignment between the system's structure and users' expectations. User studies were also conducted to evaluate the low- and high-fidelity prototypes, where the feedback and results formed the continued evolution of the design artefact. Finally, a final user study was conducted to evaluate the implemented design, assessing how well it supported users' mental models and contributed to improved usability. The combination of methodologies and structures utilised in each round of user studies varied in order to align with the overarching objective.

As previously mentioned in Section 2.2, interviews and task demos are among the best methods for eliciting initial information, according to Lauesen (2002). Capturing the dimensions of UX meaningfully requires methods that allow participants to articulate their experience in their own terms, surface issues that were not anticipated by the researcher, and provide the context needed to interpret observed behaviour. Semi-structured interviews are well suited to this. They allow for broad, open questions, exploration of topics that emerge during testing, while still enforcing enough structure to maintain consistency across sessions and ensure adequate coverage. They were conducted individually and in a semi-structured format, with adaptability to each participant's knowledge level. Additionally, a think-aloud protocol was applied during tasks in the interviews, wherein participants were asked to verbalise their thoughts, intentions, and difficulties while interacting with the system or prototypes (Lauesen, 2002; Webber, 2024). This method provides insight into users' mental models and decision-making processes, giving meaning to otherwise small actions.

The data collected from all the aforementioned techniques is qualitative. To gather quantitative data that could be easily compared numerically between the original and final designs, a *User Experience Questionnaire* (UEQ) was completed by participants at the end of the interviews, as introduced in Section 2.2. The questionnaire results were not primarily used for statistical inference, but rather supported qualitative observations and provided an additional perspective on perceived user experience and cognitive load before and after the redesign. UEQ is a well-established tool for capturing users subjective experiences with software systems in a quick and simple way (Laugwitz et al., 2008). It consists of 26 items, each presenting a pair of opposing adjectives on a 7-point scale, such as *obstructive/supportive* or *complicated/easy*, which participants use to rate their experience of the system. The order of the adjective pairs is randomised such that the positive adjective does not consistently appear on the same side of the scale, preventing participants from identifying a favourable direction and responding accordingly. Responses are then recoded to a scale from -3 to $+3$, which is the format used when presenting results. Each item belongs to one of six scales, grouping related adjective pairs into coherent dimensions of the user experience. It measures both pragmatic quality, such as *Efficiency* and *Clarity*, and hedonic quality, such as *Stimulation* and *Novelty*, which made it a suitable complement to the think-aloud tasks and interviews.

The UEQ benchmark dataset contains data from 21175 persons from 468 studies concerning different products (business software, web pages, web shops, social networks), and allows for conclusions about relative quality by contextualising results against a broad reference population rather than evaluating them in isolation. The benchmark categorises results into five levels based on where a score falls within the distribution of the reference dataset, with *Excellent* representing the top 10% and *Bad* representing the bottom 25%. This was particularly valuable given the small sample sizes inherent to this study. Cronbach's alpha coefficients were calculated to assess how closely related the items within a scale are as a group. A value above 0.7 is generally considered acceptable, indicating that the scale items reliably capture a coherent dimension of the user experience (Cronbach, 1951). Confidence intervals are reported for each scale mean to reflect the precision of the estimates. Wide intervals indicate greater uncertainty in the result, while narrow intervals suggest stronger agreement among participants.

Participants were selected from both expert users and novice users. This facilitated the comparison of how varying degrees of expertise influence interaction with the system, thereby highlighting areas where the interface relies on prior knowledge rather than supporting intuitive use. The number of participants was determined by availability and prioritised covering the key user groups described in Section 2.3.2. Each round of user studies aimed to include at least three participants per user group, consistent with prior usability research suggesting that this sample size is effective for uncovering most usability problems (Nielsen, 2000, 2012). The research suggests that although testing with approximately five participants is sufficient for a single user group, this number can be reduced to around three participants per group when multiple user groups are involved. This is due to the fact that, despite users utilising the platform in different ways, there will still be significant similarities between the observations from the different groups. A significant proportion of usability issues could frequently be attributed to the fundamental interaction with the interface. Ultimately, the deciding factor was dependent on practical considerations of participant availability.

Findings from the user studies were continuously synthesised and used to inform the refinement of requirements, the prioritisation of design changes, and subsequent prototype iterations. In this way, user studies served both as an elicitation method and as an evaluation mechanism throughout the design process.

3.4 Data Analysis

Data collected from interviews, think-aloud sessions, and observations were analysed using qualitative thematic analysis as defined by Braun and Clarke (2012). Observations and verbal data were reviewed to identify recurring themes related to usability issues, cognitive load, navigation difficulties, and reliance on domain knowledge. Instances where users' interaction shifted from easy, guided interaction toward more deliberate, knowledge-based decisions were compared, as well as how different levels of expertise influenced and supported users' interactions.

These themes identified during analysis were used to fuel brainstorming sessions, inform design decisions throughout the project, and evaluate the effectiveness of proposed design solutions in relation to the research questions. They were revisited after each design iteration in order to assess whether the proposed design changes address previously identified issues and whether new challenges emerge. The data gathered in the UEQ was used to quantitatively compare the user experience of the final version and the original version.

4

Process

Each stage of this project was informed by the results of the preceding one, and therefore the reasoning behind design decisions are best understood together with what the data at each step revealed. While Chapter 3 provides a methodological outline, the application of those methods varied across each stage of the project depending on its aim. The initial user study, for instance, was concerned not only with understanding the users but also with understanding the system and how the two interact, whereas the prototype evaluations were focused on verifying design decisions through user observation and feedback, which affected what methods the studies included. This chapter therefore follows the chronological order in which the project was conducted, presenting the steps taken to gather data alongside the results and analysis that emerged from each stage.

4.1 Initial Expert Study

In order to build upon the knowledge gathered in the initial evaluation and to obtain a more profound understanding of the system, as well as to identify different use cases, a semi-structured interview with a system expert was conducted. The focus of the interview was to get an understanding of the history, general purpose and structure of the platform, and therefore the initial questions were very open. The expert was asked to introduce the platform as if to an individual who lacks both prior knowledge of the domain and experience of the platform itself. After describing the purpose and background, the expert was asked to sketch and explain the system architecture. The different environments of the platform, the products it manages and the content of each feature were explained in-depth. Lastly, the expert was tasked with defining the different teams that utilise BO and the roles within them, as well as describing the tasks each role performs and how frequently they interact with the system. This provided an initial, loosely defined understanding of the user groups and who falls within each. To properly understand all relevant use cases and user types affected by the system, the aim was to conduct initial interviews with at least one person from each identified team.

4.2 Initial User Study

To evaluate how the platform is used in practice, a user study with participants spanning the initially identified user groups was conducted. Nine users participated, of whom two were developers, three were experienced content managers, and four were content managers with little to no experience with BO. The studies were semi-structured one-on-one interviews conducted in person if possible or online if the participant was unable to meet in person. The interviews contained questions pertaining to the participant and their role, the purpose of the system for them, and their personal thoughts and feelings regarding the system. Each interview served to deepen the understanding of who the users are and how they interact with the system in practice. The interviews also aimed to support and guide participants in openly expressing their experiences with the interface, both their struggles and what they found intuitive. Participants were tasked with sketching and describing their view of the system to get a sense of their mental model. A think-aloud protocol was used while demonstrated one to three tasks in the system, with tasks designed to reflect both representative and critical use cases of BO. Since participant roles varied to capture a wide user base, tasks were tailored to each participant's individual workflow. The interview concluded with the UEQ to gather data that could be easily compared with the results of later studies. Throughout the studies, participants were encouraged to talk about anything they wanted to, regardless of the issue's magnitude. The template used for the study is available in Appendix A

After the studies were completed, the data was reviewed using thematic analysis. The mental model sketches were analysed alongside observations and participant descriptions to identify patterns and notable findings. Given that the guidance for drawing the system was deliberately vague, the models varied considerably in form and detail, with some participants drawing interface mock-ups while others produced mind maps. The goal of the task was nonetheless to extract the underlying understanding each participant held of the system, and this understanding was used to verify and further define the user groups established after the initial expert interview. Feedback and observations from tasks and discussions were broken down into quotes and descriptive phrases to capture the essence of what participants expressed. Positive and negative data were grouped separately, and features and functionality that participants requested be preserved were distinguished. The data was then organised into potential themes, which were reviewed and refined until they were determined to accurately represent the collected material.

4.2.1 Results from Initial User Study

The process of prompting participants to describe and sketch their mental model of the system revealed the differences in their perspectives very clearly and proved instrumental in understanding and further defining the user groups. The system expert thoroughly charted the entire system architecture and its integrations, a frontend developer drew the backend as a black box and focused on the framework and code file structure of the frontend instead, and a quality assurance tester focused on the connections between the features and products of BO. Figures of these mental

models can be seen in Appendix B. This illustrates how different usage patterns and perspectives shape the mental model of the system, with each participant prioritising what is most relevant to their role. Overall, most participants had a high level of understanding, with mental models reflecting strong process- and functional knowledge (Andersson, 2010). The lead developers predictably had the highest structural knowledge, while external, non-technical users had more fragmented mental models built mainly around task-related and situational knowledge. These differences in mental model, technical background and frequency of use formed the basis for distinguishing between the user groups, as described in Section 2.3.2.

The interviews also made clear that how users interact with the system varies considerably depending on their technical background and experience. Some members of the frontend team, for instance, bypassed the search function and filters entirely, opting to modify the URL directly to navigate to specific pages. This strategy requires fewer clicks and is perceived as more time-efficient, but one that a less experienced user would be unlikely to adopt. At the other end of the spectrum, in one user study it became apparent that the participant was largely unaware of the main page of BO. They had initially been given a link to a specific feature page of the one feature they used in the platform, and therefore accidentally going to the main page was experienced as unfamiliar and confusing. To them that feature page was the main page, since that was all they needed. These contrasting behaviours underline how narrowly or broadly a user's interaction with the system is shaped by their role.

The themes defined in the analysis were *Navigation*, *Organisation of Content*, *Clutter*, *Coherence*, *Access Management*, and *Guiding Information*. Across the interviews, the most common points of criticism fell within the themes of *Navigation*, *Organisation of Content*, and *Clutter*. The current main page is dense and lacking in visual hierarchy, as described in Section 2.3.3 and further underscored by participants, making it difficult to navigate without already knowing where to look. This places a high cognitive load on the user, requiring them to rely on memory and intrinsic knowledge rather than on legible system structure. A redesign should therefore strive for clearer navigation in order to support a workflow with low demand for knowledge-based actions. While most participants commented that both the main page and navigation could be significantly improved, their preferences for how to do it differed. As mentioned in Section 2.3.3, there are pages for products and projects which are deprecated or on hold. The possibility of hiding these pages was expressed by multiple participants. While many found the current header and drop-down menu impractical, opinions on alternatives were divided. A collapsible side menu, for example, was seen by most as a practical improvement and by some as something that would just increase the interface's visual density.

The division of pages by product also drew criticism in relation to both *Organisation of Content* and *Clutter*, as it results in subpages being repeated across categories. This not only adds clutter to the main page but also causes confusion when using the search function, as all duplicate entries appear in search results with no indication of which category they belong to. The reasoning behind the current division of categories relates to the theme of *Access Management*. Access handling becomes more straightforward by dividing by product, as a user who only requires access to

a feature in a certain product can easily be granted access to only that product's pages. Continuing on the theme of *Access Management*, it was repeatedly noted that the defined roles does not accurately reflect what pages that role should have access to. Participants commented that they had access to pages they never used, and this caused even more clutter for them.

That said, not all participants were equally affected by these structural issues. One of the less frequent users of BO had few opinions on the main page, navigation and page structure, and instead focused on specific technical issues. This was partly because they only used one or two pages, which they had memorised, but also partly because the UX aspects of the platform were of no interest to them. The combination of high technical knowledge and a narrow use case made their focus much more specific than that of other participants. Additionally, some experienced users had adapted to the structure over time to the point where it supported their workflow, even if they acknowledged it was not beginner-friendly.

An assumption made from the initial evaluation was that using the search function would alleviate the difficult navigation, but it turned out that almost none of the participants made use of it. Many participants did not even know it existed until it was pointed out to them. As noted in Section 2.3.3, the search function is a relatively new component added to the UI, so it is possible that incorporating it into their already established workflow requires a change in habit that seems too cumbersome. The path of least resistance is the one most travelled, and to change a habit requires active decision-making and therefore increased cognitive load (Rasmussen, 1983). Furthermore, the current search functionality is not without issues and complexities, making it confusing and hard to use. The purpose was to allow the user to quickly search and filter in one optimised flow, but previously mentioned issues like duplicate results and unclear levels of filters make it unapproachable or too much of a hassle to learn for most users.

Finally, the theme *Guiding Information* was reflected in several distinct observations. One participant noted that they had previously created a guide for how to create an instance of a project they had worked on in BO, but had no clear means of making it available to other relevant users. Multiple participants pointed out that saving changes on detail pages was error-prone, as save buttons were spread across the page and no warning was shown when attempting to leave a page with unsaved edits. It was also observed that when problems arose in BO or new features were needed, multiple participants turned to the same individual developer for help, placing a disproportionate burden on a single employee.

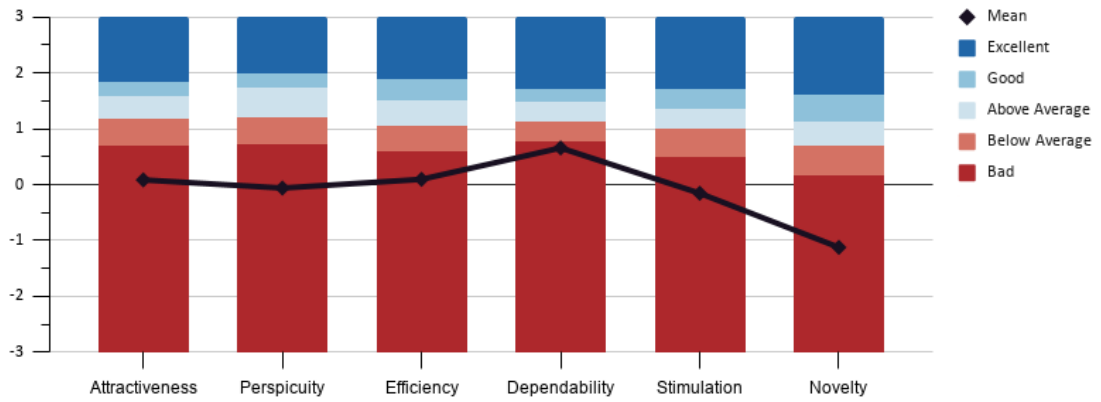

Figure 4.1: The mean scores of the initial UEQ results (n=8) compared with the benchmark dataset.

The UEQ results can be seen in Table 4.1 and align well with the qualitative observations from the interviews. BO scored in the *Bad* category across all six scales when compared to the UEQ benchmark dataset, as can be seen in Figure 4.1, meaning they fell within the range of the 25% lowest results in the benchmark. This shows that, in terms of usability, for both hedonic and pragmatic quality, there is room for improvement. The low scores for *Perspicuity* reflected comments on navigation and structure voiced in interviews, and similarly, the low *Efficiency* score aligns with how some users have developed workarounds to complete tasks quicker by modifying the URL instead of using the UI. The lowest score was noted for the *Novelty* dimension, and corroborates interview feedback about the interface feeling dated and in need of modernisation. The *Dependability* score, while still in the *Bad* category, was notably higher than the other scales, which corresponds with the fact that users' primary concerns focused more on usability and navigation rather than on system reliability or technical failures.

Furthermore, due to an administrative error, one of the expert users' responses was not recorded. Therefore, the result of the initial UEQ is based on the answers from eight participants, as can be seen in Figure 4.1. As the results show in Table 4.1, the confidence intervals are relatively wide, indicating greater uncertainty in the estimates consistent with the small sample size. However, the consistency of responses within each scale suggests that the scales capture genuine patterns in the user experience. This is further supported by Cronbach's alpha coefficients, all of which fall well above the threshold of 0.7, confirming that the scales measured coherent aspects of the user experience despite the small sample size. The distribution of answers also aligns with the qualitative findings. *Perspicuity* items clustered around the neutral midpoint, suggesting that users feel ambivalent about the BO's clarity and indicating that, while they are familiar enough with the system to navigate it adequately, they do not find it very intuitive.

Table 4.1: UEQ results from initial user studies (n=8).

Scale type	Mean	Variance	SD	Confidence	95% CI	Cronbach's α
Attractiveness	0.083	2.20	1.483	1.027	(-0.944, 1.111)	0.93
Perspicuity	-0.063	1.57	1.252	0.867	(-0.930, 0.805)	0.82
Efficiency	0.094	2.53	1.592	1.103	(-1.009, 1.197)	0.91
Dependability	0.656	2.11	1.451	1.006	(-0.349, 1.662)	0.96
Stimulation	-0.156	1.34	1.157	0.802	(-0.958, 0.645)	0.90
Novelty	-1.125	1.00	1.00	0.693	(-1.818, -0.432)	0.83

4.3 Usability Problem Analysis

The results of both the system evaluation and the user studies indicate that the majority of the BO's identified pain points are usability-related rather than caused by functional defects or missing system capabilities (Lauesen, 2002). While isolated cases of missing or incorrect functionality were observed, most complaints concerned navigation structure, layout, clarity, and consistency.

According to Lauesen (2002), usability problems (UP) can be classified into four severity levels. The most severe one is *task failure*, where the user fails to complete the task at all or mistakenly believes they succeeded. No such cases were observed. The BO is functionally well developed, and the interviewed users have a technical background and prior experience with the system. Critical problems are those where tasks can be completed but are experienced as cumbersome or frustrating. For medium problems, the user succeeds but only after lengthy attempts, and for minor problems, the user completes the task after short attempts. Since all interviewed users were already familiar with the system, task completion time and number of attempts were not relevant evaluation metrics. Therefore, the categorisation primarily reflects perceived efficiency, clarity, and subjective satisfaction rather than measured task duration.

The usability problems were identified by synthesising observations from the initial system evaluation and the user studies. Recurring themes were grouped into distinct problems, and each problem was assigned a severity level based on the frequency with which it was raised, the degree of frustration or difficulty expressed by participants, and how many users were affected in general. Problems raised consistently from both expert and novice users and described as directly impeding efficient task execution were classified as critical, while problems that caused friction or confusion were classified as medium. Issues that were raised by fewer participants or described as small inconveniences rather than workflow impediments were classified as minor. The main page and navigation were easily identified as the most pressing issues, and as a result of all issues combined with the growing user base the lack of support was actively preventing autonomous use of the system by less experienced users. The incoherence of elements was an important issue as it added cognitive load to routine interactions, but not as big of an issue as the navigation, which is why it was classified as a medium problem. The other medium problems were all important

to many users and important to address, but again not as pressing as the critical problems. As for the minor problems, most were peripheral to the core workflows of almost all participants, or deemed only slight inconveniences.

Critical Problems

UP1 Dissatisfaction with current navigation options. The main page, header, and dropdown menu are perceived as confusing and inefficient.

UP2 Confusion caused by a cluttered and inconsistently grouped main page overview. Users are overwhelmed by the noise and lack of hierarchy.

UP3 Lack of instructions to guide new users and contact information to support if something does not work.

Medium Problems

UP4 Inconsistency of buttons, editable fields, and recurring components across pages contributes to lack of coherence and unnecessary noise.

UP5 Navigation to detail pages requires too many clicks.

UP6 The main search function is perceived as complicated and confusing.

UP7 There is no integrated means of viewing or navigating to previously visited pages.

UP8 Some users have access to pages they should not have and lack access to features they could use.

UP9 Insufficient information available regarding user roles and permissions when assigning access to new users.

Minor Problems

UP10 The colour scheme and layout are perceived as aesthetically displeasing, particularly the brightly coloured environment header, which is a strain on the eyes.

UP11 Screen elements scale poorly across different display sizes.

UP12 The purpose of notifications in the user profile is unclear to almost all users.

4.4 Derived Requirements

Based on the identified usability problems, user requests, and brainstorming sessions, the following requirements were defined to provide potential solutions to the issues. The requirements are grouped by feature and categorised as functional requirements (FR) and quality requirements (QR). The requirements represent intended improvements on the old version of BO, and since some of the features already exist, only new or changed behaviours and qualities are listed in the new requirements. At this stage, requirements are treated as design hypotheses, intended to be validated through prototyping.

Categories

QR1 The system shall not contain parallel navigation structures that provide duplicate category access.

QR2 The navigation structure shall be organised into a maximum of three hierarchical category levels.

QR3 Each functional page shall have a single primary access point in the navigation structure.

QR4 Pages that configure or manage a specific product or feature shall be grouped within the category of that product or feature.

Information and Support

FR1 A function to provide information and support shall be visible on all pages.

FR2 The information and support function shall be able to redirect the user to the appropriate source of information and mode of communication for support.

Main Page

FR3 The main page shall be the default landing page.

FR4 The main page shall display links to recently visited pages.

FR5 The main page shall display links to starred pages.

QR5 The main page shall visually prioritise primary content over secondary content through consistent use of size, placement, and emphasis.

QR6 The main page shall limit the amount of simultaneously displayed information in order to maintain a low display density.

Start Page

FR6 The start page shall be shown only on first startup.

FR7 The start page shall use the same layout structure as the main page and include additional introductory elements.

FR8 On the start page, the support functions shall be presented with expanded explanatory text.

Header

FR9 All pages shall include a header positioned at the top of the page.

FR10 The header shall contain the logo, which shall act as a home button and redirect to the main page.

FR11 The header shall contain the search bar.

FR12 The user button shall open the user menu.

FR13 The colour of the logo and user icon shall indicate the environment. The header itself shall adhere to the general colour scheme.

FR14 There shall be a text to the right of the logo indicating the environment, except in the production environment.

Search Bar

FR15 Search results shall clearly indicate the hierarchical location of each result within the navigation structure.

FR16 The search function shall support approximate string matching to tolerate minor spelling deviations.

FR17 Each search result shall display contextual information sufficient to help the user understand the nature and relevance of the result.

FR18 When a valid unique identifier is entered, the system shall provide direct access to the corresponding detail page without requiring navigation through intermediate category pages.

Side Menu

FR19 The side menu shall be positioned to the left, be open by default, and be hideable.

FR20 Menu items with children shall have a chevron arrow to indicate their expansion state and expand when clicked.

FR21 Menu items without children shall redirect to a page when clicked.

FR22 The width of the side menu shall be adjustable.

FR23 The state of menu expansion shall be saved if the menu is hidden or the page is reloaded.

User Menu

FR24 The user menu icon shall be positioned on the header and open when clicked. It shall close when the user presses the close button or clicks outside the menu.

FR25 The user menu shall display the user's account name, email, and roles.

FR26 The user menu shall include the notifications page.

FR27 The notifications menu option and the user menu icon shall have a notification indicator if there are unread notifications.

FR28 Notifications shall clearly indicate their source and purpose.

Recent

FR29 Recently visited pages shall be shown on the main page in list view and act as shortcuts when clicked.

FR30 A sequential view of visited pages shall be available in a bottom bar and act as shortcuts when clicked.

FR31 The bottom bar shall be open by default and hideable.

Starred

FR32 Users shall be able to mark any page as starred by toggling a star button on the page.

FR33 Starred pages shall appear on the main page as a list and act as shortcuts when clicked.

Hideable Pages

FR34 Each user shall be able to toggle whether specific pages are shown or hidden from view.

FR35 The hide pages settings shall be shown on the start page as well as in the user menu.

Role and Access Management

FR36 The system shall provide a clearly documented definition of each user role.

FR37 The system shall provide an overview of the permissions associated with each user role.

FR38 A user shall only be granted access to pages and functions permitted by their assigned role.

FR39 Pages and functions for which a user does not have permission shall not be visible to them.

FR40 All users shall have access to the global navigation elements, including the header, side menu, and user menu.

Global Interface Requirements

QR7 Recurring UI components shall follow a consistent design pattern across pages.

QR8 All pages shall adapt to different desktop screen widths without horizontal scrolling and maintain readable, proportionally scaled layouts.

QR9 The colour scheme shall be consistent and avoid high-contrast or highly saturated background elements that cause visual strain.

4.4.1 Traceability Between Usability Problems and Requirements

Table 4.2 presents the traceability matrix linking the identified usability problems (UP) to the derived requirements (FR/QR). The mapping presents how each of the requirements addresses one or more observed issues and ensures coverage of all identified problem areas.

Problem	Derived Requirements
UP1	QR1–QR4, FR4, FR5, FR9–FR14, FR19–FR24
UP2	QR5, QR6, FR3–FR5, FR29–FR35
UP3	FR1, FR2, FR6–FR8
UP4	QR7
UP5	QR2, FR18–FR23, FR29–FR33
UP6	FR15–FR18
UP7	FR29–FR31
UP8	FR38–FR40
UP9	FR25, FR36, FR37
UP10	QR9, FR13, FR14
UP11	QR8
UP12	FR26–FR28

Table 4.2: Traceability matrix between identified usability problems and derived requirements.

4.5 Prototyping

Prototyping was used as an iterative design and evaluation tool to explore, communicate, and test design ideas at two different levels of fidelity. The prototypes were digitally created using Figma (Figma, Inc., 2024), an approach that facilitates rapid creation and modification of interface concepts ranging from low-fidelity representations focused on structure to high-fidelity prototypes that more closely resemble the final design. It simplifies the creation of numerous prototypes with small variations in instances where a range of design solutions are considered. Furthermore, Figma allows linking frames to simulate system interactions and operations, which was utilised in higher-fidelity prototypes.

The prototypes served both as artefacts for discussion and as instruments for user testing, allowing design ideas to be evaluated in isolation as well as in direct comparison with existing design implementations. By iteratively refining prototypes based on user feedback and evaluation results, the prototyping process supports early identification of usability issues and enables systematic assessment of how proposed design changes affect user interaction and experience.

4.5.1 Low Fidelity Prototyping

With two of the most critical usability problems (UP1,UP2) highlighting the need for restructuring navigation and overview of the BO, the first low fidelity prototype focused on a major redesign of the *Main Page* with new features, as well as some changes in structure and *Categories*. To emphasise changes in layout without drawing attention to visual design and styling, the redesign was produced as a wireframe. The wireframe used boxes in shades of grey to represent containers and components such as menus and controls, plain black or white text, and basic icons to give context. One version of the wireframe was coloured using the existing colour scheme of the *GX Games* service (Opera Norway AS, 2026) to illustrate how the redesign would appear when applying a simplified version of Opera GX's visual design.

The most significant change to the *Main Page* was removing the category cards to reduce visual density (QR6) and introducing two new features: *Recent* and *Starred*. *Recent* lists the user's recent page history within BO to ease navigation back to previously visited pages, while *Starred* functions similarly to a bookmarks feature, allowing users to "star" frequently visited pages, which adds a link to them in the *Starred* list. To keep a clear structure to the elements on the *Main Page* (QR5), the first and largest element on the page is the welcome message header, followed by the two features, clearly separated and indicated using icons. As both features build upon prior user interactions with BO, the *Start Page* with no history or *Starred* items was created, and is shown in Figure 4.2. This version displays placeholder text for both *Recent* and *Starred*, as well as settings for *Hideable Pages* to allow users to configure if certain pages shall be hidden from their view in BO. Common to both the *Main Page* and *Start Page* is a *Information and Support*-placeholder positioned in the lower right corner to test the response to this feature, which would later address UP3. The positioning at the bottom of the screen was chosen to avoid adding to the main page's clutter while still being easy and intuitive to locate, since contact information is commonly found in a webpage's footer.

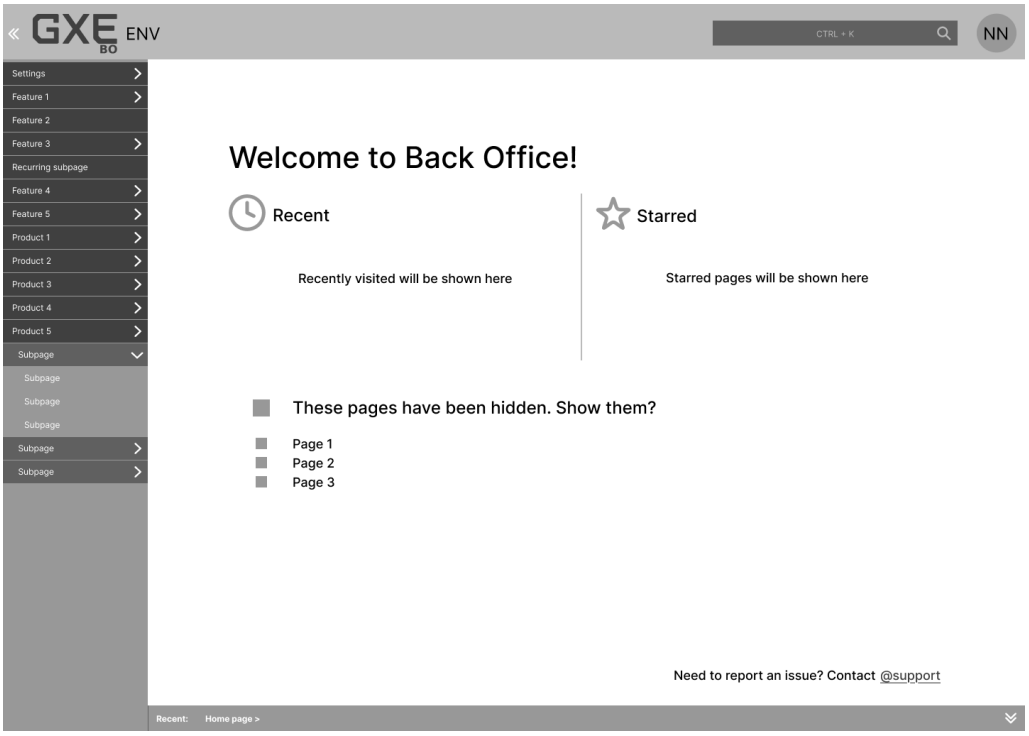

Figure 4.2: A censored view of the wireframe of the start page with the side menu open.

As described by usability problem UP1, the navigation required restructuring. The proposed solution, based on the requirements, as shown in Figure 4.2, introduces the *Side Menu* on the left side of the screen. The menu supports the now three levels of hierarchy within BO (QR2), where each category can be expanded to reveal its subcategories or subpages if there are any. It can be collapsed and hidden by clicking an icon button in the page header, a placement inspired by the *GX Games* service page. This collapse button ensures the menu remains accessible at all times while allowing it to be hidden, thereby supporting flexibility of use and reducing visual density when desired.

In the header, the menu options and dropdown were removed to eliminate duplicate navigation structures (QR1), and the search button was replaced with an integrated search bar for greater visibility. Additionally, a bottom bar displaying the user's recent history was introduced. This bottom bar allows for navigation between visited pages by either clicking the links or using keyboard shortcuts.

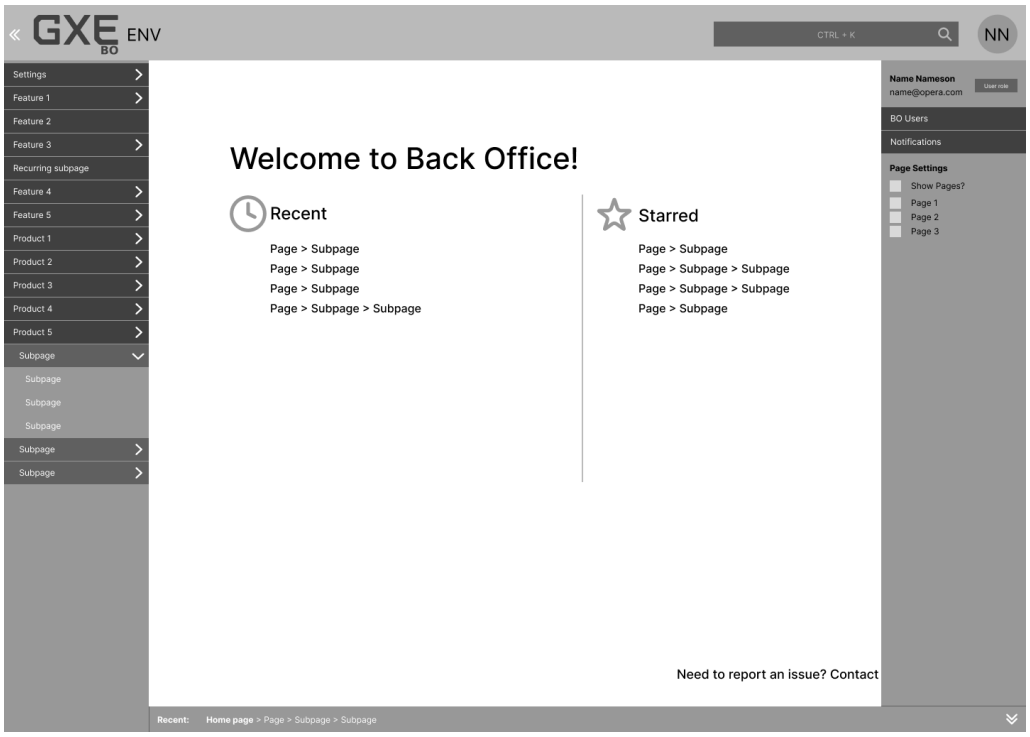

Figure 4.3: A censored view of the wireframe of the main page with side menu and user menu open.

The final layout redesign in the low fidelity prototype was to introduce an expandable side *User Menu* which is visible in Figure 4.3, which opens from the right if the user icon is clicked, and hides again if the user interacts with elements outside the menu. The user menu gives an overview of the user's account information without requiring a redirect to a separate user page, contributing to a flatter, more easily navigated structure of BO. However, the menu also contains menu items that redirect to user-specific pages, like *Notifications*, which had previously been shown on the profile page with no explanation, and the hideable page settings as previously seen on the start page. Putting the notifications page as a separate menu item makes it easy to ignore for users who do not use it, helping to reduce confusion.

Another item in the user menu in this prototype is *BO Users*, which was previously under the *Admin* category, but moved in an attempt to group all BO role-related info and settings to the same menu, and separate them from non-BO account handling in the *Side Menu*. The prototype introduces some further restructuring of categories. The rest of the pages in the *Admin* category were also moved, dissolving its top-level entirely, but access control logic remains unchanged. The *Settings* page was kept as is, now a top-level category with three levels, while the remaining subpages of *Admin* were redistributed to the sections they relate to, in accordance with QR2 and QR4. Additionally, a product sub-feature that was present and identical for three different products was elevated to become a top-level feature, in accordance with QR3.

The regrouping of categories aimed to bring related pages closer together to make the structure more intuitive, and to flatten hierarchy to reduce the number of clicks required to reach subpages, to comply with QR2 and QR4.

Some changes were immediately identified as out of scope or not as prioritised, due to the complexity of the issues combined with the time constraints of this project. Improvements to *Role and Access Management* required extensive changes to the codebase, combined with fundamental restructuring of what roles should exist as well as their access level. The existing roles and the pages they could access were charted to guide the changes made to category structure and page placement, but completely reconstructing the role management system required the expertise and time of a system developer and was therefore deemed outside the scope of this project. As for the *Search Bar*, many of the issues and limitations of it were due to limitations of the codebase itself and the API calls necessary when searching for specific entities of each product. This meant that FR18, which was meant to address the expert-specific behaviour of directly editing the URL to navigate to specific detail pages to save clicks, could not be realised. Although fixing the search bar might result in a major positive impact, the time required to find solutions and address them would greatly impact the possibilities of implementing other features.

4.5.2 Testing of Low Fidelity Prototype

Following the same approach as the initial user studies, testing of the low-fidelity prototype was conducted as a semi-structured interview, but without tasks since the wireframes were not interactive. Eight users participated in the study, five from the "expert" user group and three from the "novice" user group. The expert users consisted of both developers working on the platform and seasoned content managers. The prototype was introduced with a brief recap of the project's goals and focus, along with an explanation of wireframes using a wireframe of the current design as an illustrative example. Participants were first asked to share their initial impressions with little context about the intentions behind the redesign, and were encouraged to comment freely on perceived usability, clarity of interaction, and comparisons between the current and proposed designs. More targeted questions about specific changes were then posed to explore in greater depth how individual design decisions were received. The template used for the interviews is available in Appendix C. Analysis of the gathered data was focused on reflecting on design decisions, and in some cases findings from one interview were carried into subsequent interviews to allow for comparison between different design options. Responses were distinguished between the initial impressions phase and the targeted design discussions, and feedback on individual components and features was compared to identify areas of consensus and points of disagreement. This allowed the data to inform both an overall assessment of the proposed design direction and more specific conclusions about which features required clarification or revision before progressing to high-fidelity prototyping.

4.5.3 Evaluation of Low Fidelity Prototype

The proposed structure of the *Start Page* and navigation was received mostly positively by all participants. Some comments were that it looked more polished, did not overload the user with information, and was less cognitively demanding than the previous version. They liked that it looked thought-out and followed a standard. While the overview and navigational possibilities of seeing and being able to go to all pages and subpages were removed from the *Main Page*, most participants did not see this as a significant issue and considered the improved structure worth the additional clicks required to navigate. The *Side Menu* was seen as simpler and more accessible. Participants appreciated that information was grouped into expandable categories, making the interface easier to scan while still providing access to all sections. Several participants described the menu as containing a lot of information while still remaining easy to understand. Some suggestions were also made, including clarifying the arrow icon of the collapse button, improving visual separation between side menu item groups, and reconsidering the ordering of some items, such as settings and BO users. Participants also suggested that some labels could be more specific and descriptive. An emphasised expectation was that the menu should remember its expanded or collapsed state so that users do not lose their navigation context between page visits.

The *Header* was generally perceived as clear and helpful, particularly regarding the display of the current environment. Several participants appreciated that the environment was explicitly labelled, since it previously could be unclear if they forgot which colour corresponded to which environment. At the same time, it was also requested that the production environment should stand out even more, as changes there are on live data and can have significant consequences. Suggestions included making the environment indicator larger and more visually prominent, or extending the environment colour coding to other header elements, such as the search bar or profile icon. Overall, the colour usage was perceived as visually pleasant and easy on the eyes.

Feedback regarding the *User Menu* focused mainly on content organisation. Multiple participants suggested that BO users should be placed in the *Side Menu* instead to keep functionality grouped with the rest of the navigation. Notifications were considered unnecessary by most, and participants appreciated that they were hidden from immediate view.

When asked about the *Recent* and *Starred* features (Appendix C, Section 2), responses were mixed. The breadcrumb history shown on the main page was positively received and considered useful, but the bottom bar history feature received more varied feedback. Most participants stated they would likely not use it, preferring to rely on browser navigation or multiple tabs. Several found it added unnecessary complexity, and noted that its appearance risked being overlooked as a generic footer. The *Starred* feature was similarly varied in its reception. Some participants valued quick access to frequently used pages, while others stated they would not personally use it.

When asked about the *Hideable page*s feature (Appendix C, Section 2), some confusion arose among participants. Several found the explanation text unclear, too subtle, or too long, requiring them to spend time reading the fine print to understand the functionality. Questions arose about which pages should be hideable and what the meaning of hidden is, particularly regarding whether items were hidden by the user themselves, by an administrator, or by someone else. Some participants pointed out that features like this could create confusion over time if users who rarely use BO forget that items have been hidden. Suggestions included clarifying the wording, indicating who performed the action, or limiting the feature to the user menu rather than placing it on the start page.

Regarding the *Information and Support*, participants suggested including direct links to relevant communication channels, noting that new users may otherwise be uncertain where to seek assistance.

Overall, the low-fidelity prototype response was highly positive. The redesigned navigation structure was appreciated by most participants, who found it cleaner, more accessible, and less overwhelming than the current design. The intuitiveness of individual features varied considerably, which seemed to correlate with how grounded each feature was in established design patterns. The *Side Menu*, for instance, required no explanation. In contrast, the bottom history bar and the hide unused pages functionality caused more confusion, as they drew less on familiar conventions. The feedback from the testing aided in distinguishing what worked without friction from what required clearer affordances or wording and directly informed the evolution of the high-fidelity prototype, where particular attention was given to clarifying the purpose and visual treatment of less self-evident features.

4.5.4 High Fidelity Prototyping

Three high-fidelity design variants were developed in Figma for testing (Figure 4.4, 4.5, 4.6). Due to project time constraints, a full redesign of all pages and components in BO was not feasible. Instead, the prototype variants were based on the existing BO framework, reusing established colours and stylistic elements to maintain visual consistency with current components. Making sure that changes in the design would fit with the unchanged design components eases the transition in implementation. The three variants are all functionally and structurally similar but take inspiration from different sources in visual styling.

The *Dark* design as seen in Figure 4.4 draws inspiration from widely used IDEs such as Visual Studio Code (Microsoft, 2015). It adopts a minimal, flat aesthetic, relying primarily on subtle dividing lines to structure the interface rather than distinct colour blocks to separate components. Figure 4.5 presents the *Classic* design, which draws inspiration from the GX Games (Opera Norway AS, 2026) service with the goal to create a neutral and familiar interface that does not draw unnecessary attention, allowing users to focus on their tasks rather than the design itself.

In figure 4.6, the *Rounded* design is presented, which took inspiration from the browser Opera Air (Opera Norway AS, 2025b). This alternative was intended to convey a more modern and approachable impression, moving away from the traditional technical appearance.

The idea behind the three designs was to provide options ranging from a conventional, technically oriented interface to a more contemporary, product-oriented experience emphasising usability and visual accessibility. Due to time constraints, all three designs were not made fully interactive, only the *Classic* design variant was further developed to include the necessary navigation required for the high fidelity testing. The prototype made use of Figma's interaction function to emulate a functional application, for example allowing the tester to open collapsed menu categories, navigate to the *Main Page* via the home button and hide the *Side Menu* to see the responsiveness of page content. This also allowed the testing of the high-fidelity prototype to include navigational tasks and measure their intuitiveness.

The focus of the low-fidelity prototype was on the reorganisation of major interface components as well as the restructuring of the *Main Page* and *Start Page*. The high-fidelity prototypes largely preserved the structure established in the wireframes, reflecting the predominantly positive reception of the proposed design. Core elements such as the welcome message header, *Recent* history, and *Starred* were retained without significant modification. The *Start Page* and *Main Page* remained two different views, with the first having additional content.

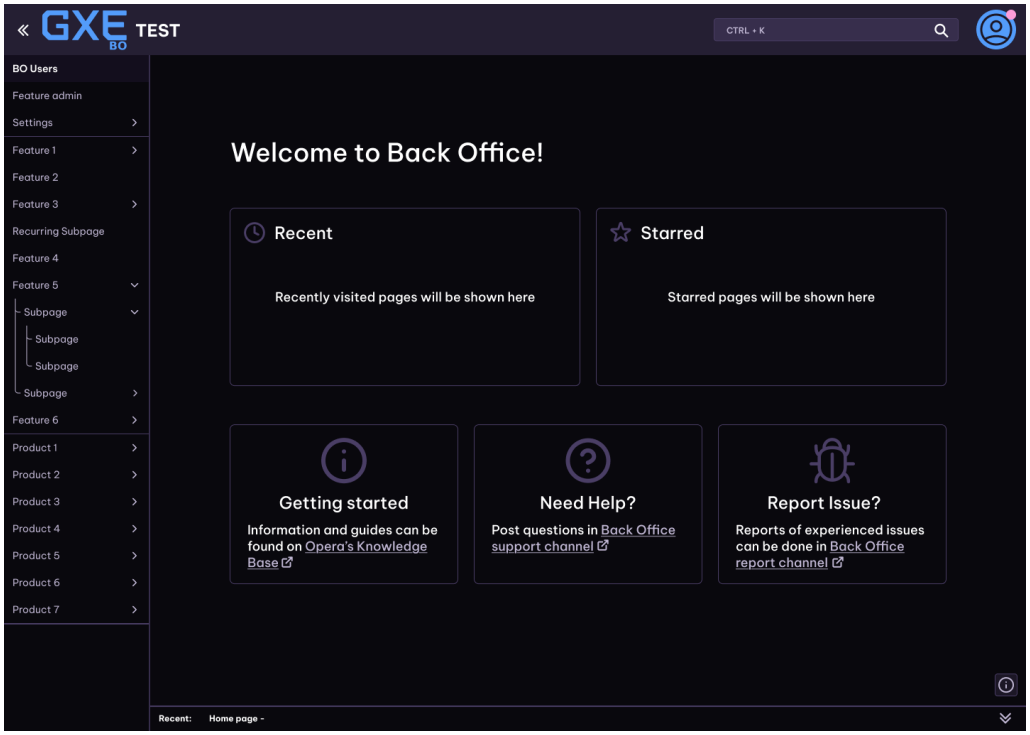

Figure 4.4: Censored view of the start page for the *Dark* design.

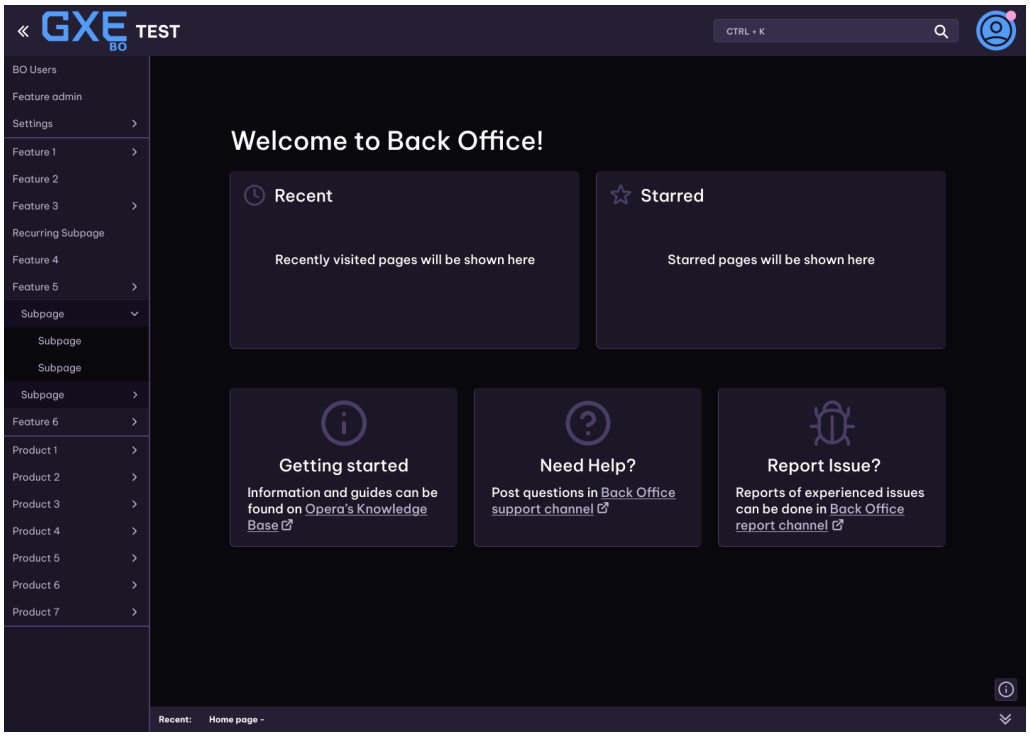

Figure 4.5: Censored view of the start page for the *Classic* design.

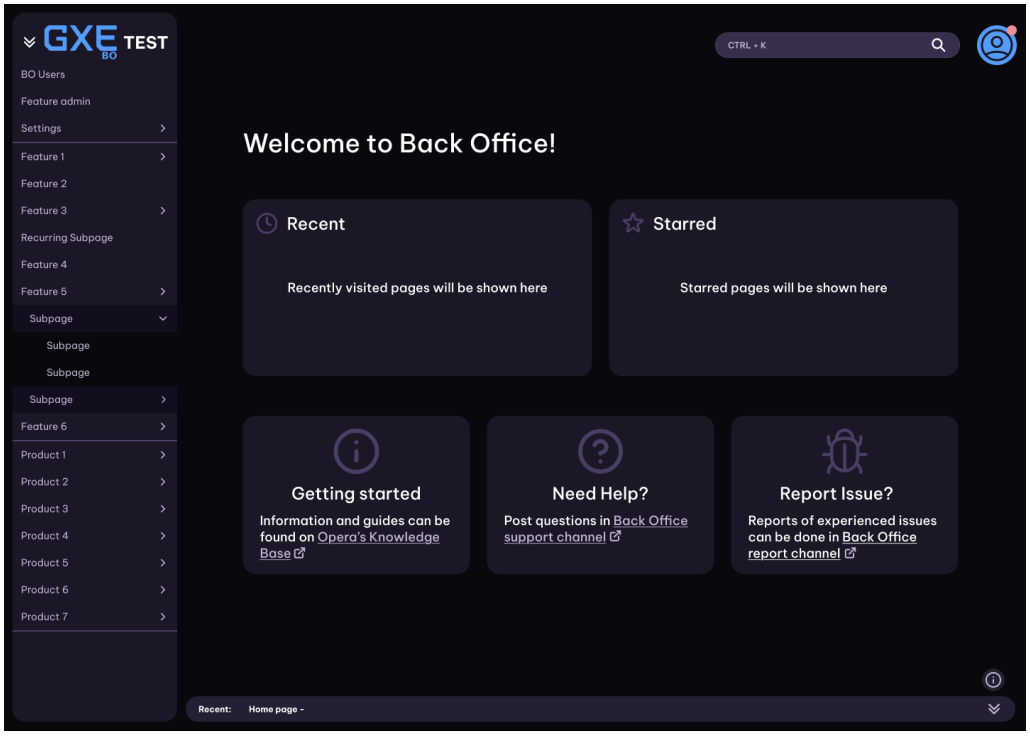

Figure 4.6: Censored view of the start page for the *Rounded* design.

One notable deviation from the low-fidelity prototype is the removal of the *Hideable Pages* feature. This was due to the feedback on the feature from the low-fidelity testing, combined with uncertainty on how and by whom such a feature would be managed. Removing it allowed the *Start Page* to have more focus on the introductory information. The support link introduced in the low-fidelity wireframe evolved into an information button situated in the lower-right corner on all page views, housing hyperlinks to guides, help, and support resources, see Figure 4.10. This information is also displayed in introductory cards on the start page to provide new users with guidance. Incorporating a link to an external user guide provides users with a readily accessible reference for recurring questions when using BO, while also offering a space where experienced users and developers can contribute guides demonstrating how to use specific features for particular work tasks. Additionally, embedding dedicated support channel links ensures users are connected to a broader support audience and can reach the right expertise more efficiently, reducing reliance on individual contacts who may need to redirect them to the right expertise.

The design of the components was updated iteratively based on the results from the low-fidelity prototype testing to better fulfil the requirements of QR6. The three design variants of the components were used to test different styles to indicate hierarchy and differentiations in order to find out what users found to be most clear. These variants were updated iteratively throughout the testing of the high-fidelity prototype based on feedback. Furthermore, the *User Menu* was remade into a dropdown to reduce its visual weight, and the *Starred* feature was added to the menu to be accessible for users from all pages, as seen in Figure 4.9

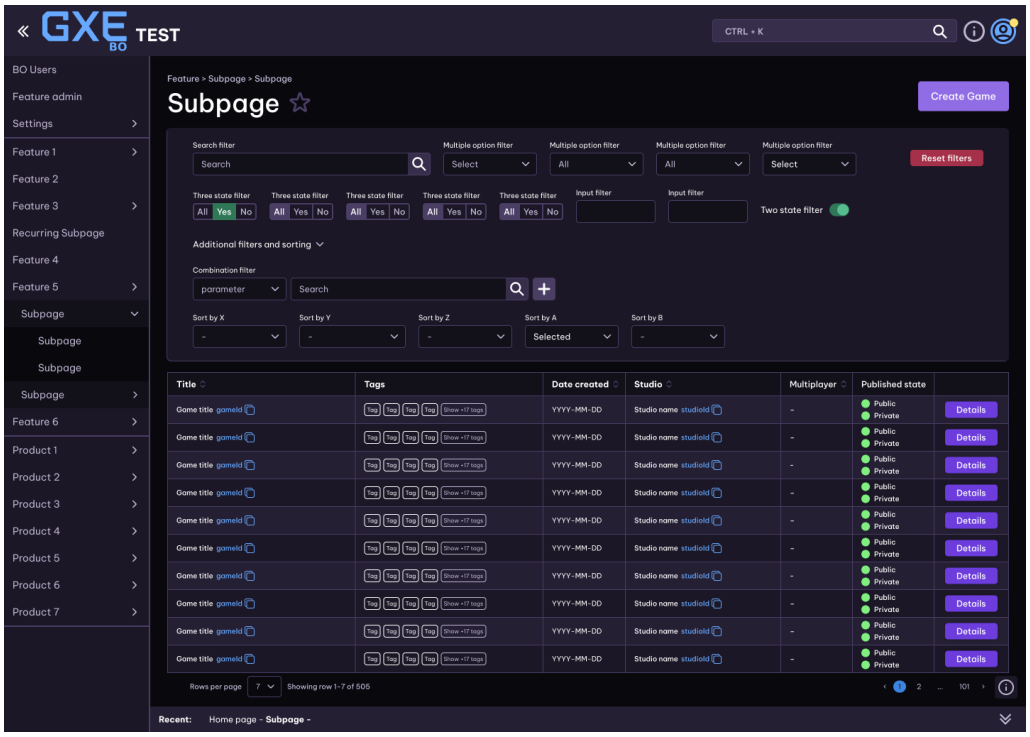

Figure 4.7: Censored view of a table page in the *Classic* design.

The main structure of detail and table pages was largely kept unchanged in the high-fidelity prototype, as a full redesign of these pages was unfeasible within the time constraints of the project. Rather than reimagining their layout or content, the prototype instead demonstrates how enforcing a set of consistent design rules across existing pages can meaningfully improve clarity and usability, which can be seen for a table page in Figure 4.7. This includes, for example, defining which component type to use for a given filter: a toggle switch for binary on/off filters, a three-button group for triple-state filters such as all/yes/no, and a dropdown for filters with more than three possible values. The toggle switch was chosen as it implies immediate application of the new state. The three-button group replaces the original triple-state checkbox, ensuring all options remain visible in a compact layout while preserving the notion of exclusive selection. The component also leverages familiarity, as users commonly encounter it in text editors for actions such as text alignment or font styling. The dropdown was selected for filters with more than three values as it can contain many options in a compact space, and is a widely recognised pattern for selecting a single value from a larger set. Restricting the use of warning colours to destructive actions and warning functionality, as well as defining where to use primary and secondary buttons, contributed to lowering visual clutter and making components more predictable. Small structural adjustments were also proposed, such as moving the create button out of the filter component and anchoring it to the page title instead, since the action is not related to filtering. Together, these changes illustrate that a significant improvement in consistency and usability can be achieved without a complete redesign of what is already implemented.

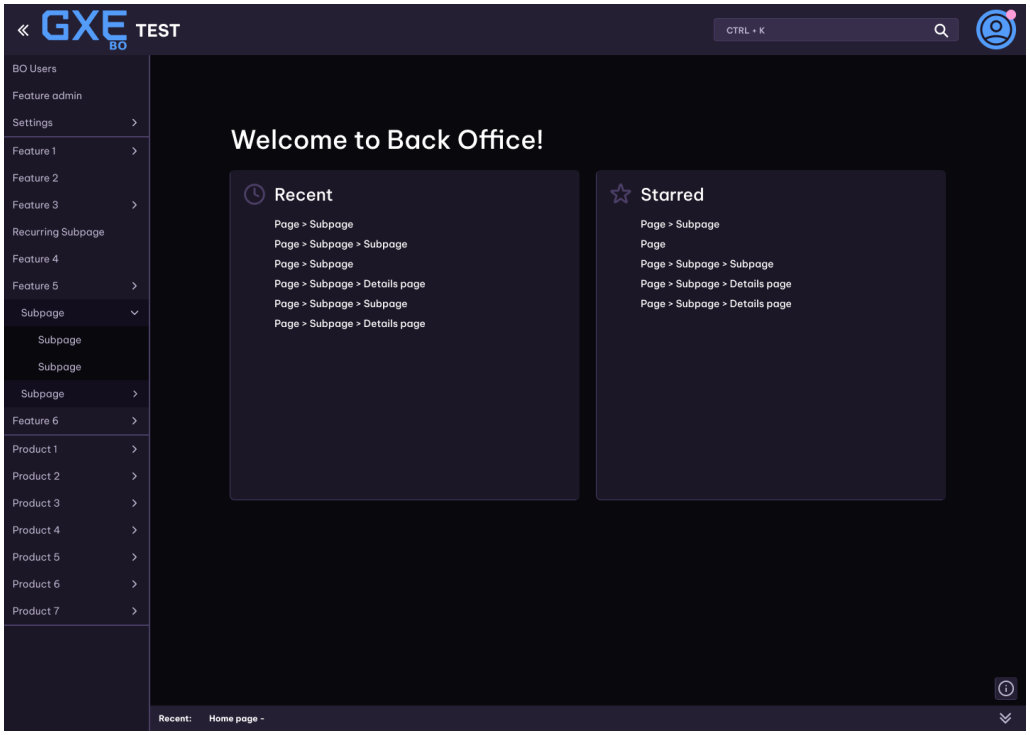

Figure 4.8: Censored view of the main page for the *Classic* design.

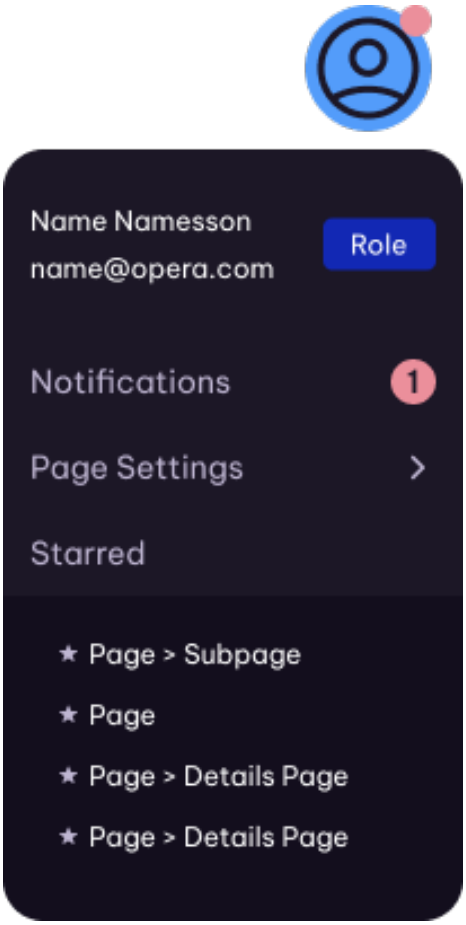

Figure 4.9: Censored expanded user menu.

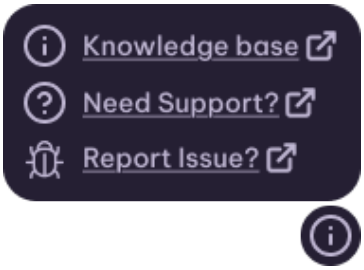

Figure 4.10: Expanded Support menu.

4.5.5 Testing of High Fidelity Prototype

Seven users participated in the evaluation for the high-fidelity prototype, four from the "expert" user group and three from the "novice" user group. The prototype needed to be tested in person, therefore the participants were limited to employees in the Gothenburg office. The expert users of this round consisted of developers and seasoned content managers, and additionally, one of the novice users was a user with no previous experience with BO. The study consisted of three parts: an AB testing of three design variants, a think-aloud while conducting three navigational tasks and concluding with component-specific discussions. Once again, select feedback was carried into subsequent interviews to allow for comparison between different design variations and directions. Analysis of the data gathered was focused on validating and reflecting on design decisions, and in certain instances, the prototype was revised during the evaluation process, where identified design decisions were found to directly contradict established functionality, such as incorrect labelling of page nomenclature.

The AB testing was conducted by introducing the three design variants one at a time with minimal context given. For each one, the participant was asked to vo-

calise their thoughts and reactions, focusing on enjoyment, perceived usability and clarity of interaction (Appendix D, Section 1). Guiding questions helped prompt the participant to formulate their thoughts. Then the three variants were put against each other, and the participant was asked to compare which variant they preferred and why, which one feels like it would be easiest to use, and what elements from each variant they like or dislike. To reduce how much the order of presentation influences the results, the variants were presented in random order for every interview. When analysing the perception of the three design variants, the data gathered from all participants was summarised into concise points for each variant, each assigned a "weight" of *plus* or *minus* depending on whether it represented positive or negative feedback. For each additional participant stating the same feedback, another "weight" was added so that the total weight of a point reflected how consistently it was felt across participants. The variant with the greatest overall positive weight was selected as the basis for the final design. The analysis also identified specific elements from the non-selected variants that received strong positive feedback, and these were carried forward as improvements to the chosen design.

Participants were presented with three structured tasks designed to evaluate the navigability of the prototype (Appendix D, Section 2). The tasks were to navigate to a distinct page within the system: an administrative settings page, a table page and a details page for an entity. Participants were asked to describe their reasoning and spontaneous observations throughout each task. Observational focus was directed toward task completion rates, specifically whether participants were able to complete each task independently and without external assistance.

Upon completion of each task, a targeted discussion was conducted to examine the design of the prototype in greater depth (Appendix D, Section 3). Participants were asked specific questions regarding design changes to individual components, page layouts, and navigational flows relevant to the completed task. For example, participants were asked how the expand and collapse behaviour of the *Side Menu* felt and which interaction model seemed most natural, whether the bottom bar was clear in its purpose and useful for navigation, and if they could locate the *Information and Support* and open the *User Menu*. This sequential structure of task execution followed by design discussion was deliberately adopted to preserve interview continuity and maintain contextual relevance during the evaluation of individual design decisions. Feedback and observations from these discussions were grouped by design element and summarised into concise points, allowing conclusions to be drawn about which decisions were well received and which required further refinement. Where multiple participants raised the same concern or appreciation regarding a specific component or interaction, this was treated as a stronger signal in the subsequent prioritisation of design changes.

4.5.6 Evaluation of High Fidelity Prototype

The three design variants were received differently between the user groups. More experienced and technically oriented participants consistently favoured the simpler, functional *Dark* design, while less technical participants responded more positively

to visually richer *Rounded* design with stronger visual cues. The *Classic* design was well received by both groups and was therefore selected as the basis for implementation, with appreciated elements from the other two variants carried forward where appropriate. This distinction also influenced how feedback was carried between interviews, with clear usability issues prompting immediate revision, while more subjective reactions were noted and, if deemed discussable, brought into subsequent sessions for comparison.

Navigational tasks presented no significant difficulty for any participant, regardless of experience level, suggesting that the proposed structure was intuitive. Notably, several participants had not been involved in earlier testing phases and were therefore unfamiliar with the redesigned layout, yet still responded positively to both the structure and the new functionality. One participant from the expert user group even remarked that they had previously been sceptical of a side menu but were now convinced it was a suitable navigational solution.

The majority of feedback was targeted at lower-level details such as visual hierarchy, colour contrast, filter handling, and interaction consistency. This may reflect a lack of directed probing in the questions, but could equally suggest that the overall layout raised few fundamental issues. The feedback also led to the modification or discarding of some requirements. The *Information and Support* feature is an example of this. In the low-fidelity prototype it had been represented as a simple link in the bottom corner of the page, which was then developed into three information cards on the *Start Page* alongside a floating button opening a support menu in the bottom right corner for the high-fidelity prototype. Responses from the high-fidelity testing indicated that the three cards occupied too much space, and the feature was revised accordingly. The cards were consolidated into a single, lighter introductory card, and the menu was moved into the header. Overall, the results indicate broad acceptance of the proposed redesign, with remaining refinements concentrated at the component and interaction level. The findings informed a final prioritisation of features, determining which to address in the implementation, in what order, and which to set aside.

4.6 Prioritisation

The prioritisation reflects the final assessment of which features to implement. It was based on the severity and breadth of the usability problem the feature addressed as identified in the initial evaluation, the estimated implementation effort relative to the effect and available time, technical feasibility within the scope of a frontend-only redesign, and feedback gathered during low-fidelity and high-fidelity prototype evaluations. The constraints of this project were a great influence in determining which solutions to usability problems and requirements could realistically be implemented. Due to the time constraint, features that gave the perceived biggest positive impact compared to the time needed to implement them were prioritised. This unfortunately meant that features that could have a high impact but were deemed too complex and therefore time-intensive had to be given lower priority. Furthermore, some of the features were out of scope due to the fact that they would require

changes to the backend of BO.

The MoSCoW prioritisation method (Clegg & Barker, 1994) was used to classify the features or areas into four priority levels: Must Have, Should Have, Could Have, and Wont Have, and was chosen because it forces explicit trade-off decisions while remaining lightweight. Requirements associated with a feature or area inherit its priority. Prioritisation was iterative and adjusted during the prototype evaluation phases based on emerging constraints and feedback, and the final prioritisation of features and requirements can be seen in Table 4.3. The clearest adjustment was the removal of the bottom *Recent* bar following negative feedback in the low-fidelity evaluation, where participants found it spatially confusing and redundant given the list is already on the main page. This iterative adjustment reflects the intent behind MoSCoW as described by Clegg and Barker, that priority levels are not fixed at the outset but are updated as new information becomes available.

Must Have features were *Categories*, *Information and Support*, *Main Page*, *Header*, *Side Menu*, *Recent*, and *Starred*, and were assigned the highest priority because they directly addressed the critical and some medium usability problems. Navigation confusion, poor information architecture, and the absence of structural guidance were reported by both expert and novice users, and were directly reflected in the negative or near-zero UEQ scores across *Perspicuity*, *Efficiency*, and *Attractiveness* for novice participants. These features were also assessed as feasible within the project's time constraints as they required no new backend endpoints and could be implemented through restructuring existing UI components.

Should Have features were the *Start Page*, *User Menu*, and *Coherence*. These were important but not critical in the sense that the system would still function meaningfully without them. These features were retained in the design but deprioritised relative to the structural navigation changes. The *Start Page* addresses the absence of an entry point for novice users and maps directly to the onboarding problems identified in the evaluation. However, even without it users are still able to find the guides and support information in the support menu. The *User Menu* improvements address notifications and contextual information that is useful but whose absence does not hinder core workflows. *Coherence* requirements were assigned *Should Have* because fixing inconsistencies in visual design and interaction patterns was important, but time consuming due to the sheer amount of pages in BO, and would therefore be implemented to the extent that time constraints permitted.

Could Have only included the *Hideable Pages*. The feature emerged from specific user suggestions and could provide valuable decluttering in the side menu, but feedback from the low-fidelity prototype evaluation was mixed, and it was concluded that though the feature would offer some benefit, it also ran the risk of introducing unnecessary interface complexity.

Won't Have features were the *Search Bar* and *Role and Access Management*. They were excluded from the scope of this project for distinct reasons. Meaningful search function improvements that addressed the issues identified would require backend changes which was outside the project's scope. *Role and Access Management* improvements were excluded because the restructuring not only required additional

expert developer involvement to determine the specific desired behaviour, but also because it involves changes to both the frontend and backend access control logic. These exclusions do not mean that the features are unimportant, but rather that they could not be meaningfully addressed within the defined boundaries of this project.

Priority	Features	Reqs	Rationale
Must Have	Categories, Information and Support, Main Page, Header, Side Menu, Recent, Starred	QR1–QR6, FR1–FR5, FR9–FR14, FR19–FR23, FR29, FR32, FR33	Core navigation restructuring and main page redesign addressing critical usability problems (UP1–UP3). Essential for reducing clutter, improving hierarchy, and enabling efficient navigation. Bottom recent bar (FR30, FR31) excluded due to negative feedback.
Should Have	Start Page, User Menu, Coherence	FR6–FR8, FR24–FR28, QR7–QR9	Important usability and interface improvements enhancing clarity, consistency, and predictability.
Could Have	Hideable Pages	FR34, FR35	Nice-to-have enhancement that received mixed feedback.
Won't Have	Search Bar, Role and Access Management	FR15–FR18, FR36–FR40	Valuable but excluded due to architectural constraints, beyond project scope.

Table 4.3: Final MoSCoW prioritisation after prototype evaluation.

4.7 Implementing

The last stage of the redesign of BO was to implement the design changes. The order in which the tasks were implemented had to be determined beforehand due to dependencies in addition to the prioritisation, and was planned with the help of system experts to break down the changes into smaller tasks and determine the optimal order. The changes were implemented directly into the BO test environment and were done in collaboration with the development team responsible for the platform. Working alongside the team meant that the implementation followed the same workflow and standards used in regular development. Each smaller task was developed, reviewed, and deployed incrementally, making them immediately visible to the users of the platform. As the changes were deployed continuously throughout the implementation phase rather than all at once, some users of the platform had already been exposed to the new design before the formal usability testing was conducted. This meant that certain aspects of the redesign were not entirely new to some participants at the time of testing.

4.8 Final User Study

The final evaluation assessed the usability of the implemented redesign compared with the original system and followed a similar structure to the initial user studies to enable meaningful comparison. Aligning the methodological approach and structure of the final user study with the initial user study allows differences in results between them to be more confidently attributed to the design changes rather than to variation in study conditions.

Seven participants from the initial round of user studies were interviewed again for the final evaluation, as well as one new user. Interviewing the same participants again made it possible to directly compare individual responses before and after the redesign. The new participant has a similar role as one of the participants from the initial round who was unavailable for the final evaluation, and could give a new perspective with their unfamiliarity with the project. Unlike previous stages of testing, which were conducted on Figma prototypes with varying degrees of interactivity, the final evaluation was carried out directly in the implemented version of BO. This provided a fully authentic testing environment in which participants could interact with the system as they normally would, without the constraints imposed by prototype limitations such as restricted navigation paths or non-interactive elements. However, this also restricted the evaluation to only reflect on what could be implemented within the limited time frame, and some redesigns were therefore not included in the final evaluation. Most notably, full coherence across all pages had only been partially implemented, meaning that the visual and structural consistency achieved in the high-fidelity prototype was not yet fully realised in the implemented design, which was visible throughout the evaluation.

The studies were conducted as semi-structured one-on-one interviews consistent with the format used in preceding rounds, with most being in person where possible and online where not. Tasks were tailored to each participant's individual usage patterns and workflows as established during the initial studies, grounding the evaluation in realistic use cases while enabling direct comparison of results across the two rounds. One task was consistent across all participants, asking them to star a page during an earlier task and then navigate back to it using the *Starred* feature, in order to evaluate the feature's discoverability and usefulness in practice (Appendix E, Section 1). Because the role of the new participant was known and similar to the previous participant, their tasks could be based on the previous workflows as well. A think-aloud protocol was applied throughout each task, after which targeted follow-up questions explored the participant's experience in greater depth, including how certain they were that they were completing the task correctly, whether they experienced any confusion, and whether anything was missing that would have helped them (Appendix E, Section 1). After all tasks had been completed, more general reflective questions about the redesign as a whole were posed, covering overall impressions, clarity and structure, confidence and trust, and intuitiveness, mirroring the discussion from the initial interviews (Appendix E, Section 2). Specific features not already covered during the tasks were also discussed at this stage, including *User Menu*, *Information and Support*, *Recent*, and the unsaved changes indicator.

The interview concluded with the participant filling out the UEQ, providing quantitative data that could be directly compared with scores from the initial user studies to assess the overall change in perceived user experience across the six scales.

After the studies were completed, the data was reviewed and organised against the features defined during the requirements engineering phase (Section 2.3). Feedback and observations from tasks and discussions were summarised into descriptive phrases to allow for easier overview and comparison with the initial user study. As in the initial round, data was grouped into positive and negative, and all feedback relevant to future development was distinguished and compiled for handover to the development team.

5

Results and Discussion

The results of the project include the final implemented redesign of BO, along with findings from the final user study, which are interpreted and discussed in relation to the research questions and the broader design process throughout this chapter. The redesign was implemented in accordance with the prioritised order described in Sections 4.6 and 4.7. As mentioned in earlier sections, the sheer scale of BO made it unlikely that all planned changes would be completed within the project timeline. Additionally, previously unknown dependencies between elements and unforeseen edge cases further increased the implementation effort and, in a few instances, affected the realisation of the design. The changes that were not completed remain as tasks to be addressed in future work (see Section 6.1). Consequently, the participants in the final user study evaluated the implemented version of the redesign, and the findings presented in this chapter reflect that implemented state.

5.1 The Implemented Design

The new *Main Page* is where most of the changes from the implemented redesign are visible. The page no longer displays cards for all categories as in the original design, visible in Figure 2.1, but instead presents a welcome message as a header text alongside the two new features, *Starred* and *Recent*, see Figure 5.1. Upon visiting BO for the first time, an introductory message is displayed containing links to available guides and support resources. This message can be dismissed manually, but also disappears as the user continues to interact with the system as shown in Figure 5.2 where pages have been starred and visited pages can be seen in the *Recent*-list. The information contained in the introductory message remains accessible through the *Information and Support* menu in the header, opened by clicking the information icon on the right side of the header, see Figure 5.4. The *Starred* feature lists all pages the user has saved for quick access and can be reordered by dragging an entry to a new position in the list. The reordering functionality was added after a suggestion by a developer in the team and was inspired by another component in BO. The user can save pages by clicking the star icon next to the page title on every page, as seen in Figure **5.5** (selected) and Figure 5.6 (unselected). Similarly, the *Recent* feature lists pages recently visited, with each entry linking to the corresponding page.

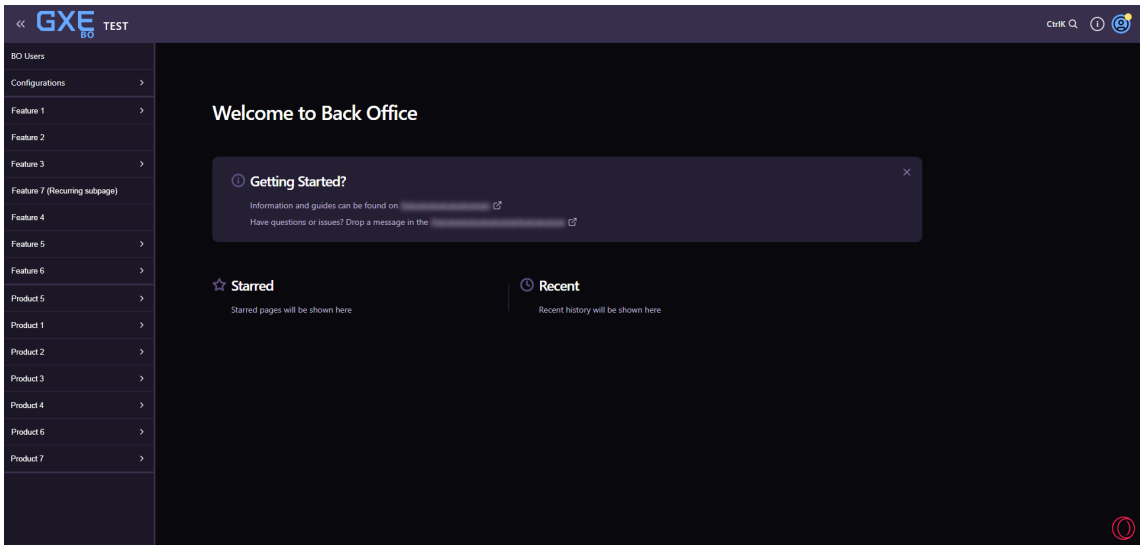

Figure 5.1: Censored view of the main page upon first visit with the final implemented design.

The *Header* and *Side Menu* are present on every page and closely follow the design of the high-fidelity prototype (Section 4.5.4). The BO logo and profile icon reflect the colour of the current environment, which is blue for the test environment, as seen in Figure 5.2. The text to the right of the logo further indicates the current environment. The *User Menu* becomes visible when clicking the profile icon, and contains the profile information, the current backend version of BO, a menu item navigating to the notifications page and the *Starred*-list, see Figure 5.3. The *Side Menu* can be hidden by clicking the icon button to the left of the page logo, and its width can be adjusted by dragging its edge. Clicking a category in the menu redirects to the corresponding page if the category is single-level. If subcategories exist, indicated by a chevron arrow to the right of the menu item, the category expands to reveal them. The search function could not be updated within the project timeline, and the current version therefore retains the same search button as in the original design.

The *Side Menu* in Figure 5.2 also illustrates the restructuring of *Categories*. The *Admin* grouping category was removed, with *BO Users* and *Settings* elevated to main categories in its place. The two feature-specific subpages previously in *Admin* were moved to their respective category. Additionally, *Settings* was renamed to *Configurations* to better reflect the collective nature of its subpages. Finally, a previously recurring subpage was elevated to a dedicated main feature page. The categories in the side menu are divided into three areas: *Admin*, *Features*, and *Products*, and are visually separated by thicker borders.

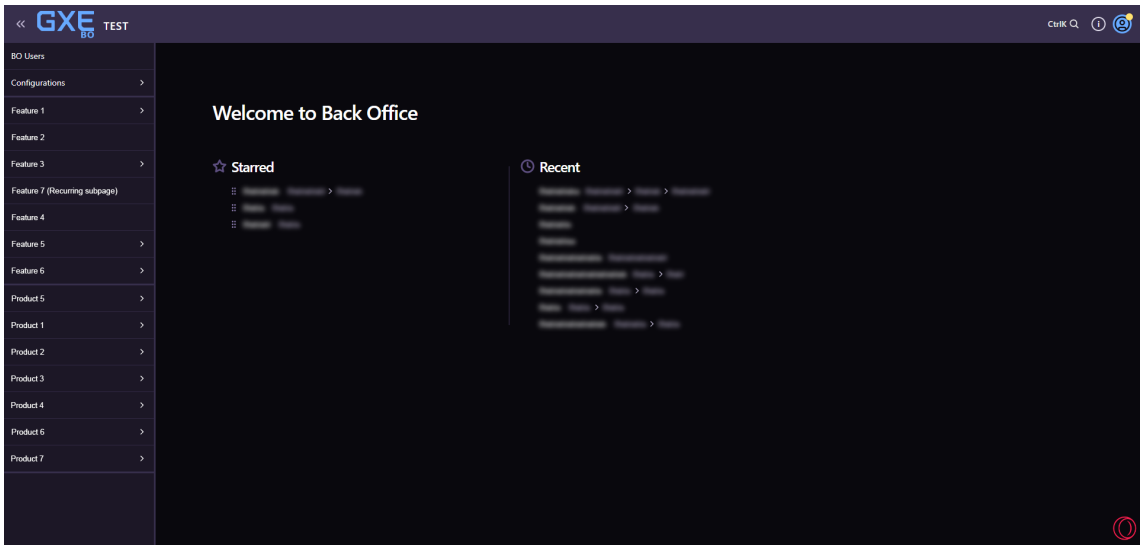

Figure 5.2: Censored view of the main page with the final implemented design, and with recorded history and starred items.

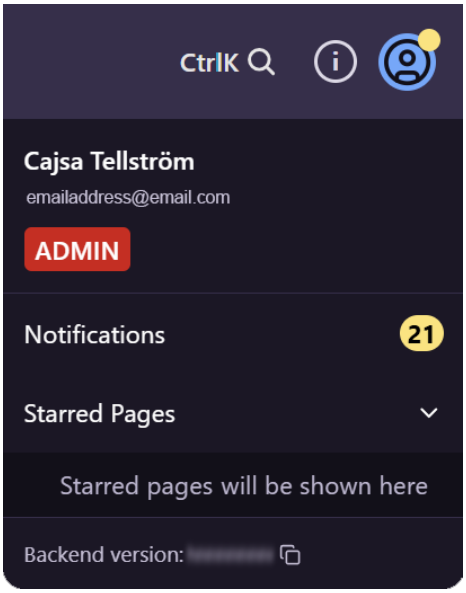

Figure 5.3: Censored expanded user menu, 21 notifications and no starred items.

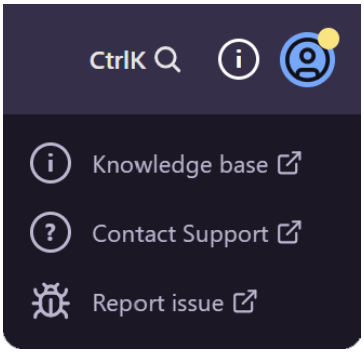

Figure 5.4: Expanded support menu.

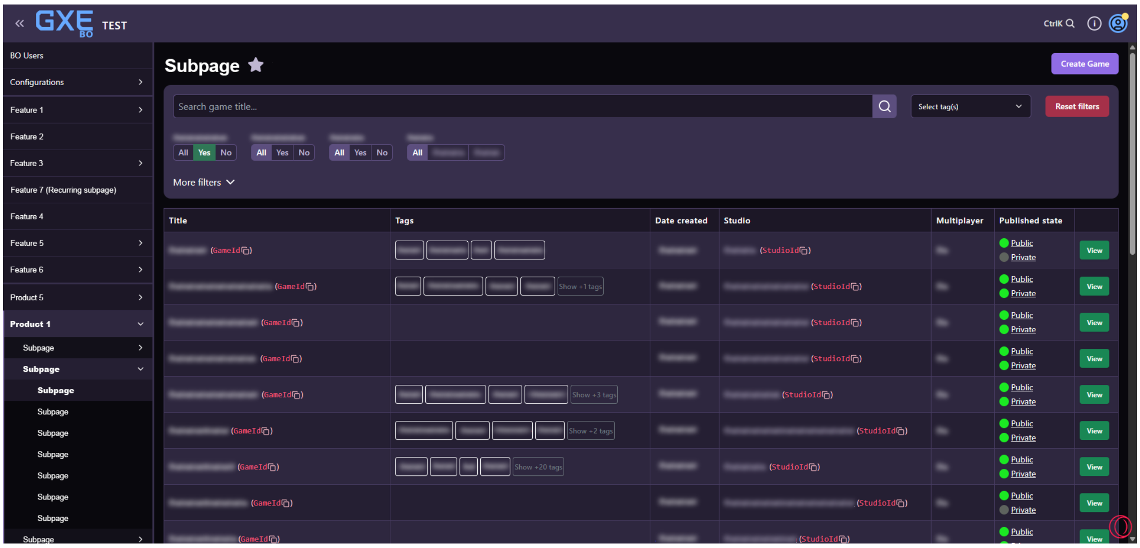

Figure 5.5: Censored view of a table page with the final implemented design.

Work was initiated on updating the table and detail pages with the aim of ensuring coherence across the system, and what was implemented serves as a foundation and guide for future development. The *three-state button group* filter component was developed and implemented, and the design guidelines developed for when and where to use each filter type were enforced on a table page for demonstration purposes, which can be seen in Figure 5.5. Updated button styles for the main button component and its variants were also applied, ready to be adopted across all pages in future work. Additionally, an *unsaved changes* guard was implemented on detail pages, displaying a confirmation dialogue when a user attempts to leave a page containing unsaved changes, prompting them to either discard the changes or remain on the page to continue editing. The user studies identified detail pages as somewhat difficult to navigate, with the presence of multiple save buttons making it easy to overlook saving all required sections and thereby accidentally discarding changes. While the proposed solution was to consolidate all save buttons into a single page-level save button, code constraints made this time-intensive and therefore unlikely to be completed within the project timeline. The *unsaved changes* guard was implemented as a preliminary solution, being more readily achievable within the existing codebase while still providing users with a safeguard against inadvertently losing unsaved work. The guard is a standalone feature that will complement the consolidated save button once it is implemented in future work.

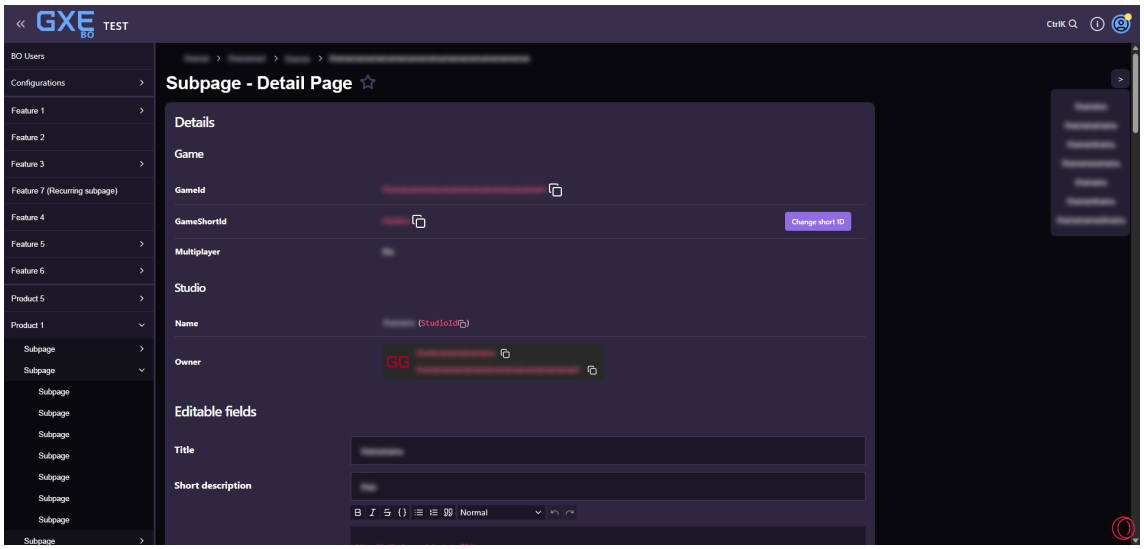

Figure 5.6: Censored view of a detail page with the final implemented design.

It should be noted that components may appear slightly stretched in the figures presented in this section due to the aspect ratio of the screen, which is the same screen used for figures in Section 2.3.3 such as Figure 2.1 to allow for direct comparison. While some adjustment to component sizing was included in the implementation, it was not a main priority of the redesign, and the appearance of pages may therefore vary across screens of different sizes. As a result, optimal sizing has not been ensured for all screen sizes, and QR8 could not be fully addressed. In particular, no adaptations were made for mobile screens, and very small screens may require horizontal scrolling when viewing tables.

Finally, to facilitate the continuation of implementation, design guidelines were created alongside the finalised design. The document follows the structure of Opera's internal design documentation and covers the key aspects needed to guide future development, including which components to use, how to structure pages using those components, and the typography and colour scheme established by the redesign. The document is intended to serve as a reference for developers and designers continuing the work beyond the scope of this project. This document could not be included in this thesis due to Opera's guidelines.

5.2 Results from Final User Study

The final evaluation yielded broadly positive responses across the redesigned features, with participants generally reporting improvements in usability, clarity, and efficiency compared to the original design. The redesigned interface was consistently described as more professional, cleaner, and more inviting, with several participants calling the change substantial. One novice user summarised the impression of the new *Main Page* directly by commenting "This main page looks light years better than the old one I think, the lack of those cards makes it much easier to look at". The reduced visual complexity of the *Main Page* was noted as particularly beneficial

for new or infrequent users, who would be presented with less information to process on arrival. This represents a significant improvement within the *Clutter* theme identified in the initial evaluation and complies with the requirements defined for the *Main Page* feature.

Replacing the previous navigational features with the *Side Menu* feature was consistently highlighted as one of the most impactful changes, reflecting clear improvement across the *Navigation* and *Organisation of Content* themes. Participants described navigation as noticeably faster and more intuitive, with one expert user noting that the new design "feels faster to look around, and I think that is really important". The hierarchical structure of the menu was perceived as clearer and more logical than the previous card-based approach, with participants appreciating in particular that categories could be explored without being redirected. One expert user commented that "it's really nice that I can open categories without being navigated anywhere before actually clicking on a specific page". This enthusiasm was evident across the user groups. For example, one novice user remarked "I really like that we have a side menu now, why did we not have that earlier?". All participants noted that pages were easier to locate overall, but some also reported slight difficulty finding specific subcategories they were less familiar with. Previously, it was easy to use commands like "ctrl + F" to locate second-level subpages on the main page. Now, when they are hidden in collapsible menu sections, users must instead rely on the existing search feature, which was not updated and therefore still has major limitations, not always giving the correct result immediately. While the changes improved the clarity of categories and their hierarchy, some pages with similar names still created ambiguity. One participant suggested that icons could help differentiate entries more clearly, and another observed that the menu could feel crowded when multiple categories were expanded simultaneously, especially on narrower screens, suggesting a collapse-all function as a potential remedy.

The *Starred* feature received consistently positive responses and was one of the most appreciated additions. Participants found the feature easy to discover and use, doing so naturally and without hesitation. The main page was described as the most natural entry point for starred content, as that is where the user is first introduced to the concept, while the presence of starred pages in the user menu was considered a useful addition by some but went unnoticed by others until pointed out. Participants with narrowly defined roles and recurring tasks expressed particular appreciation for the *Starred* feature, recognising it as a convenient shortcut to frequently visited pages. One participant noted that the feature addressed a specific limitation of browser bookmarks, which could not be used for navigation to a specific page. This was a special case for one particular feature in BO, which had tabs for different information of an entity. The user could not bookmark a specific tab through the browser previously, but the new *Starred* feature allowed them to save it inside BO which they greatly appreciated.

The *Recent* feature was generally regarded as a useful complement to *Starred*. Participants appreciated that the list did not occupy excessive space and that the combination of *Recent* and *Starred* on the main page provided a practical overview. Together, the *Recent* and *Starred* features thus also contributed to the *Navigation*

theme by providing shortcuts that reduced the number of steps required to reach frequently or previously visited pages. Furthermore, some refinements were suggested, such as filtering out intermediate navigation steps in the *Recent* list to surface only final destination pages, as multiple visited pages sharing similar names could make the list difficult to parse.

Another greatly appreciated component that received praise was the support menu which addressed the *Information and Support* requirements and the *Guiding Information* theme identified in the initial analysis. Participants found it valuable both for accessing guides and for reporting issues, with one highlighting the practical benefit for users working outside the Gothenburg office who might otherwise struggle to find help quickly. Multiple participants barely read the introductory message on the initial start page and seemed to dismiss it by habit, where one expert participant explained when asked that "I tend to not read these kinds of pop-up messages, [...] I think if I were new I might read it but BO is not new to me". Other participants welcomed the message, and the presence of it was still described as positive and useful for first-time users. Some uncertainty was expressed by one participant about whether the support menu's icon alone was sufficiently descriptive to convey the menu's purpose to unfamiliar users, but overall responses were positive.

Both the updated filter components and the *unsaved changes* guard received brief but consistently positive reactions. The new grouping and clear visual differentiation in filters using colours were appreciated and found helpful. The *unsaved changes* indicator was a welcome safeguard with no reported confusion about its behaviour or placement and contributed to guiding and aiding users.

The *User Menu* was generally well received, with participants appreciating that infrequently needed information and notifications were consolidated in one place. Some felt that since the menu contained items that were not necessarily obviously related to one another, it runs the risk of feeling slightly cluttered. Two participants suggested that version information could be elsewhere, and one raised the possibility of a dedicated menu for the *Starred* feature rather than housing it within the user menu.

During testing, some new minor feature requests and improvement suggestions surfaced, most of which were unrelated to any changes in the design, but rather were purely functional. These were included in the handover to the front- and backend developers for future improvements. Some requests confirmed previously known issues, such as general button incoherence and the lack of a singular, all-encompassing detail page save button, reflecting that the *Coherence* theme remained the most partially addressed of the identified themes, consistent with what was observed throughout the evaluation.

5.2.1 Results from the UEQ

The UEQ results from the final round align well with the qualitative observations gathered during the interviews. In contrast to the initial round, where BO scored in the *Bad* category across all six scales when compared to the UEQ benchmark

dataset, the final round shows a clear improvement. The majority of the scales reach the *Excellent* category, representing the top 10% of results in the benchmark. *Perspicuity* rates *Good* compared to the benchmark, and *Novelty* is the clearest exception, falling in the *Below average* category, as seen in Figure 5.7. This represents a substantial shift in perceived user experience and suggests that the redesign succeeded in addressing many of the shortcomings identified in the initial round.

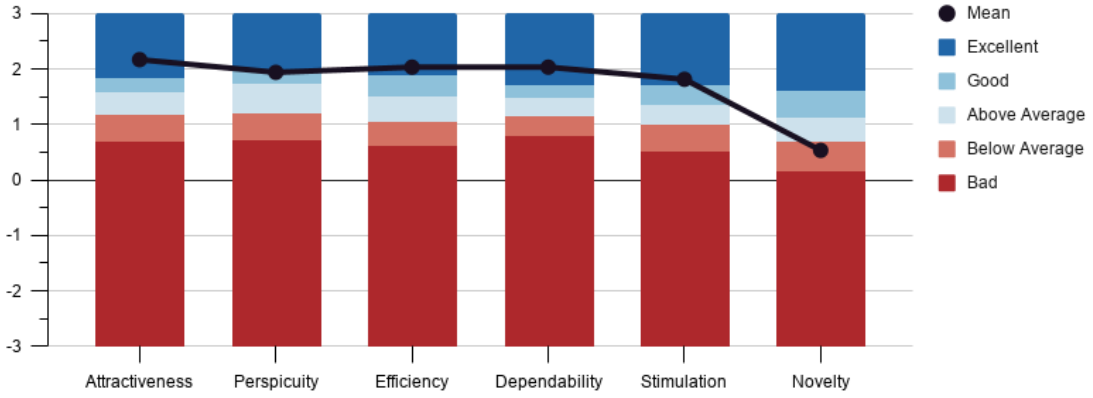

Figure 5.7: The mean of the results from UEQ (n=8) in the final user study compared with the benchmark dataset.

Figure 5.8 shows the comparison of the initial and final results, and confirms the significant improvement in all scores. The *Attractiveness* scale showed the largest absolute improvement, rising from 0.083 to 2.167, which is consistent with participants describing the redesigned interface as more professional and nice to look at compared to the original. The improvements in *Perspicuity* and *Efficiency* are particularly noteworthy, as both scales scored low in the initial round, reflecting the difficulties with navigation and efficiency identified in the initial studies. The substantial increases in both scales align closely with the qualitative feedback gathered in the final interviews, where participants consistently described navigation as noticeably faster and more intuitive following the introduction of the *Side Menu* and the restructured category hierarchy. *Dependability* remained among the stronger scales, and its improvement from 0.656 to 2.031, coupled with a narrower confidence interval, corresponds with participant feedback on how the redesign felt more intuitive for them. It specifically reflects feedback on the unsaved changes guard and the improved filter components, which were described as additions that increased confidence in interacting with the system. As mentioned in Section 4.8, direct comparisons are possible with the results of seven of the participants, and nearly all individual question ratings were either higher or unchanged in the final round. This could indicate that participants broadly appreciated the redesign across all measured dimensions. Only two instances were identified where a participant rated the redesigned interface lower than the original, both of which occurred within the *Novelty* scale, which, considering the focus on refinement rather than reinvention in the project, is not necessarily a negative outcome.

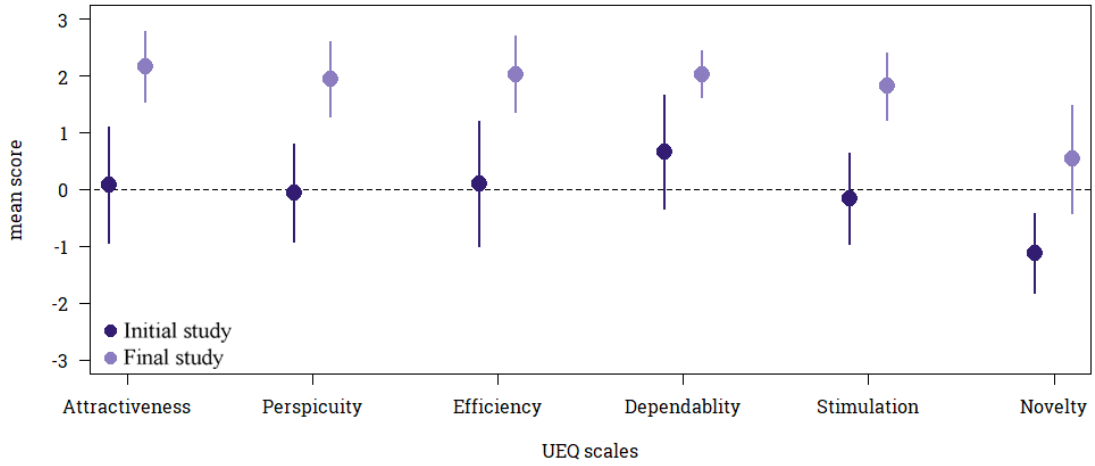

Figure 5.8: The comparison of the scale means from both initial and final UEQ results (n=8 for both groups). Whiskers show 95% CI, all differences statistically significant at $\alpha = 0.05$.

As presented in Table 5.1, the confidence intervals in the final round are considerably narrower than those in the initial round. This can be attributed to reduced response variance, suggesting greater agreement among participants in their assessments of the redesigned interface. As in the initial round, all Cronbach's alpha coefficients exceed the threshold of 0.7, confirming that the scales captured consistent constructs despite the small sample size of eight participants. The near absence of overlap between the confidence intervals of the two rounds further supports the interpretation that the observed improvements reflect a genuine shift in perceived user experience rather than sampling variation. The closest to overlapping is *Dependability*, which also scored the highest of all scales in the initial round, reflecting that many participants, even before the redesign, found the system dependable in operation despite the usability shortcomings of the original interface. *Novelty* remains the only scale whose confidence interval crosses zero in the final round, signifying greater uncertainty in this result. This could indicate that while participants perceived the redesign as more modern than the original, the conservative approach of refining the existing design may have tempered how novel or inventive the interface felt.

5.3 Discussion

The redesign set out to address the structural complexity of BO which had accumulated over time, a complexity that prevented easy onboarding of new users to the system. In the following sections, the extent to which the methods, process, and redesign addressed the identified pain points is reviewed, as well as what the results reveal about designing for complex systems with heterogeneous user groups.

Table 5.1: UEQ results from final user studies (n=8).

Scale type	Mean	Variance	SD	Confidence	95% CI	Cronbach's α
Attractiveness	2.167	0.81	0.900	0.623	(1.543, 2.790)	0.95
Perspicuity	1.938	0.91	0.952	0.660	(1.278, 2.597)	0.87
Efficiency	2.031	0.94	0.968	0.671	(1.361, 2.702)	0.96
Dependability	2.031	0.36	0.604	0.419	(1.613, 2.450)	0.79
Stimulation	1.813	0.73	0.853	0.591	(1.221, 2.404)	0.86
Novelty	0.531	1.90	1.379	0.955	(-0.424, 1.487)	0.79

5.3.1 The Identified Pain Points

The initial user studies identified navigation structure, information density, and the absence of guidance for new users as the most consistently reported sources of friction in the original system, corresponding to the critical usability problems UP1, UP2, and UP3 described in Section 4.3. The *Main Page* placed a high cognitive demand on users. Rather than being guided by the interface, users were required to scan a dense grid and draw on prior knowledge of how content was organised in order to locate what they needed. This is consistent with the theoretical framing that when interface design fails to support the formation of accurate mental models, users are pushed from skill- and rule-based interaction toward knowledge-based reasoning, increasing cognitive load and the risk of error, as previously discussed in Section 2.1. For expert users who had memorised the structure of BO over time, this was manageable, although inefficient. For novice users, it was often prohibitive, and the absence of onboarding guidance or visible support resources left little in the interface itself to bridge that gap. The lack of visible support resources also reinforced organisational dependency on individual colleagues, a pattern that was confirmed in the final evaluation when one participant explicitly described the new *Information and Support* menu as addressing exactly this problem.

The impact of these pain points differed substantially between user groups. Expert users had developed strategies to compensate, bypassing navigation and filters entirely by modifying the URL directly, or relying on memorised navigational paths to frequently visited pages. This masked the severity of the structural issues during normal use, allowing expert users to report functional satisfaction with the system while acknowledging that it was not beginner-friendly. Novice users, lacking these strategies, either avoided the system altogether or depended on more experienced colleagues to act on their behalf. The initial UEQ results reflect this divide. While only having four participants per user group makes general statistical claims impossible, meaningful trends are still visible between and within the groups. The split-up results are shown in Figure F.1 in Appendix F. Novice users initially returned negative or zero means across all six scales, while expert users returned positive means across most scales, with the exception of *Perspicuity* and *Novelty*. The most notable divergence was in *Dependability*, where expert users reported a mean of 1.313 compared to 0.0 for novice users, consistent with the characterisation in Section 2.3.2 where novice users were noted to largely avoid using the system independently. The consistently low novice scores indicate that the problems were not limited to any

single aspect of the experience but affected usability, efficiency, confidence, and satisfaction simultaneously. Notably, the variance in novice scores was also considerably higher than in expert scores across most dimensions, suggesting that novice users not only rated the system more poorly on average but also disagreed more among themselves, possibly reflecting the diversity of use patterns and the varying degrees to which individual novice users had found ways to cope with the interface. For expert users, the relatively stronger *Dependability* score suggests that their primary dissatisfaction was with navigation and efficiency rather than with the reliability of the system itself, which they had come to trust through familiarity, even where they found it cumbersome to use.

Secondary pain points were mainly regarding inconsistency across pages and the absence of navigational aids for returning to frequently or recently visited content, corresponding to UP4 through UP7. The variation in button placement, save behaviour, and filter controls across different pages required users to re-evaluate familiar interactions each time they encountered a new section of the system, adding unnecessary cognitive overhead to otherwise routine tasks. The sensemaking framework introduced in Section 2.1 helps explain why this inconsistency carries a cognitive cost beyond mere inconvenience. When the system behaviour deviates in this way, it forces users back into an iterative cycle of interpretation and re-evaluation. Furthermore, reaching detail pages often required more clicks than users felt was justified, given how frequently they needed to access them, a problem compounded by the absence of a shortcut to return to recently visited content. The search function, while intended to offset some of these navigation costs, was largely unknown to or unused by most participants, as discussed further in Section 5.3.3. Together, these issues meant that efficient navigation through BO depended heavily on memorised paths and workarounds rather than on interface affordances, a dependency that disproportionately affected users who used BO too infrequently to develop that familiarity.

5.3.2 Design Outcomes and Prioritisation

The MoSCoW classification described in Section 4.6 was based on a combination of usability impact, implementation effort, and stakeholder feedback, and the final results suggest it was broadly well-founded. The new *Side Menu, Main Page, Header, Starred, Recent*, and the *Information and Support* menu received the most positive responses in the final evaluation, and were all classified as Must Have in the prioritisation. Their successful implementation within the project timeline supports the assessment that they offered high impact relative to effort. The search function is the clearest case where the prioritisation decision can be questioned, as previously discussed. Given that the general navigation restructuring increased users' dependency on it, an argument can be made that it warranted higher priority than it received. However, this dependency was made apparent during the process and was not initially anticipated. The prioritisation decision was therefore sound given the information available, but improving the search feature is a high priority for future work.

The *unsaved changes* guard is an example of a broader design strategy that emerged from the project as a prioritisation compromise. As described in Section 5.1, the guard was implemented as an intermediate solution, addressing the issue without solving the cause. This kind of constrained design compromise is a valuable strategy for redesign work in live systems with existing codebases. The positive reception of the guard in the final evaluation, with no reported confusion about its behaviour, validates the approach. It also illustrates that partial solutions, when well-scoped and clearly communicated, can provide genuine user value until a complete resolution can be implemented in future work.

5.3.3 The Iterative Design Process

The results of the final user study and UEQ described in Section 5.2 and Section 5.2.1, respectively, suggest that the iterative, user-centred design process was well suited to the complexity of BO and the process of redesigning it. Several of the most consequential insights emerged not from the initial investigation but rather from the process itself and would have been difficult or impossible to anticipate without sustained engagement with users across multiple rounds of evaluation. As previously mentioned in Section 3.2, Hollan et al. (2000) cautions that a lack of understanding can lead designers to inadvertently destroy many of the most valuable aspects of current ways of doing things, which is a risk that is particularly significant in complex systems where expert workflows are often subtle and not immediately visible to an outside observer. The iterative approach provided the depth of understanding necessary to navigate this risk, with each round of user studies refining both the design and increasing comprehension of how the system was actually used by different types of users. The methods chosen with the objective to identify usability issues, workflow breakdowns, and sources of cognitive load proved well suited to both elicitation and evaluation throughout the project, providing breadth and depth of insight while also serving to iteratively verify and refine the design artefact across each round. This continuity between elicitation and evaluation helped connect user insight to design decisions throughout the entire project.

One of the clearest illustrations of incorrect initial assumptions and continuously emerging insights is regarding the search function. From the initial system evaluation, the assumption was made that the existing search feature, though flawed, would serve as a primary navigation aid and partially compensate for the structural complexity of the main page. However, the initial user studies quickly showed this assumption to be incorrect as almost no participants made use of it, and many were unaware it existed at all. This finding could not have been reliably predicted from a system evaluation alone, and demonstrates why observational methods are essential when designing for complex systems where actual use often diverges significantly from assumed use. Improving the search function remained a consideration, however, since the restructuring of the main page introduced a new navigational constraint. Removing the ability to use “ctrl+F” to locate subcategories that had previously been visible on the main page meant users would be more dependent on a functional search tool than before. Ultimately, the effort required to meaningfully improve the search function was assessed as too high relative to the other available changes, and

it was deprioritised in favour of improvements with broader and more immediate impact. The outcome is an acknowledged gap in the current implementation, and one that becomes more consequential as a direct result of the navigation changes made.

The iterative progression from low-fidelity wireframe to high-fidelity prototype to implemented design also allowed the level of analytical focus to narrow naturally. The initial focus was on large structural questions like whether a side menu was the right approach, how the main page should be reorganised, and what the relationship between the start page and main page should be, while later rounds concentrated on component-level decisions, including filter components, button hierarchy and visual differentiation of recurring components. This movement from coarse to fine grit meant that fundamental structural issues would be identified before detailed design work was built on top of them, and that new concerns which only became apparent once a design direction had been established could still be surfaced and addressed. In practice, the structure proposed in the low-fidelity prototype was received positively enough that it carried forward largely intact into implementation, with refinements rather than reversals appearing in subsequent iterations. The evolution of the *Start Page* illustrates this concretely. What began as a page with a welcome message, *Recent* and *Starred* features, *Hideable Pages* settings, and a support link placeholder was progressively refined through feedback. The *Hideable Pages* feature was removed after causing confusion, the support link evolved into support cards and finally into a dismissible introductory message paired with the persistent information button accessible from all pages. Each iteration addressed a specific finding, first what content belonged on the page at all, then how to reduce its complexity, then placement, and finally the implemented design.

5.3.4 Elicitation and Evaluation Methods

Beyond the iterative structure of the process itself, the specific methods employed within each round also proved well suited to their objectives. The semi-structured interviews aided in bringing up contextual knowledge about users' individual workflows and their relationship with BO. This format was particularly effective for capturing the diversity of user roles and the varying degrees of system knowledge the users possessed. The structured elements ensured consistency across sessions and that key topics were covered, while the open-ended format gave the participants space to raise issues and perspectives that had not been anticipated. This was particularly valuable for regrouping the categories, where unprompted comments from participants helped shape the implemented categorisation. This kind of nuanced insight would have been difficult to elicit through more rigid study designs.

Asking participants to describe and sketch their mental model of the system provided a clear insight into the differences in expertise between participants, as described in Section 4.2.1. The contrasting representations directly informed the categorisation of expert and novice user groups, and gave direct insight into how users varied not only in expertise, but also in the type of system knowledge. Additionally, by hearing users describe BO from their own perspective, it became possible to understand not

only where the users' mental models were incomplete, but also what aspects of the system they had come to rely on. This understanding was essential for ensuring that the redesign preserved the workflows of expert users while lowering the threshold for novice users.

Having participants perform tasks while thinking aloud provided observational grounding for insights that did not surface through the interviews alone. In the initial study, this helped reveal breakdowns in navigation and interactions, but also corrected the initial assumption that the search function serves as a primary navigation aid for users. The think-aloud protocol enriched the observations with the users' reasoning behind their actions. The insights from the tasks in the final user study helped answer whether the hierarchy or density actually improved, as it was observed that participants who had struggled to locate specific pages or features in the initial round were able to do so noticeably more efficiently in the redesigned system, and several remarked on the difference without being prompted.

5.3.5 The User Experience Questionnaire

The User Experience Questionnaire served as a well suited complement to the qualitative methods. It was quick to administer at the end of each interview and produced data that could be directly compared between the initial and final rounds. The alignment between the UEQ scale improvements and the qualitative feedback gathered in the final interviews supports the conclusion that both methods captured the same underlying phenomena from different angles. This convergence between methods is precisely what mixed-methods designs are intended to achieve, in which quantitative results provide breadth and comparability, while qualitative data supply the explanatory depth needed to interpret them meaningfully. The near-absence of overlap between the confidence intervals of the two rounds corroborates what the user interviews showed: that the results reflect a genuine shift in perceived user experience.

As described in Section 3.3, UEQ is a widely used and well-validated instrument with a large benchmark dataset, which is particularly useful in a study of this scale since it allows the results to be contextualised relative to a broad reference population instead of being evaluated in isolation. One limitation of using this benchmark is that comparing BO to a mixed dataset that includes consumer applications sets an imprecise baseline. A user evaluating a social network has very different expectations and interaction habits than someone using a back-office content management platform. Business software is represented in the benchmark, but a more homogeneous dataset restricted to administrative or enterprise tools would have provided a closer point of reference. However, the UEQ captures both pragmatic and hedonic quality, and the pragmatic scales are more central to the evaluation of an administrative system. The hedonic scales are less directly relevant but still informative, and the results must be interpreted with this in mind. The UEQ was nevertheless intended as a complement to the qualitative data rather than the primary evidence, which is why the scale results were consistently cross-referenced against the interview findings throughout this project.

As previously stated in Section 5.2.1, the fact that the score for *Novelty* remains low in the final study is not necessarily a negative outcome, and something worth examining. Since the project was framed as a refinement of an existing system rather than a reinvention, the design decisions were deliberately made within the constraints of the existing codebase, visual language, and organisational workflows. A redesign that prioritised novelty through unfamiliar interaction patterns or substantial departures from established conventions would have risked disrupting the workflows of expert users. Drawing on Rasmussen's SRK framework discussed in Section 2.1, expert users operating at the skill-based level execute actions automatically in response to learned interface cues. A design that displaces those cues forces a shift toward knowledge-based reasoning, increasing cognitive load for precisely the users who were previously most efficient. The fact that only two instances were found where a participant rated the redesigned interface lower than the original, both within the *Novelty* scale, suggests the balance between modernisation and continuity was appropriate given the project's goals. The conservative *Novelty* score is therefore better understood as a consequence of a deliberate design strategy than as a shortcoming of the redesign.

More intensive methods such as eye-tracking or formal task timing could have provided physiological and behavioural measures of cognitive load to complement the subjective UEQ data, and their absence is worth acknowledging. Several characteristics of this study made such metrics difficult to apply meaningfully. The novice users in this study are not novices in the general sense but rather users who lack system-specific experience, as described in Section 2.3.2, meaning task performance would reflect familiarity with a specific workflow as much as interface usability. Tasks were also tailored to each participant's individual role rather than standardised across participants, which would make cross-participant comparisons of completion time or number of attempts difficult to interpret. Furthermore, it was not certain at the time of the initial evaluation that the same participants would be available for the final round, which would have been a prerequisite for meaningful before-and-after comparison of task performance. Given these constraints, the semi-structured interviews and think-aloud protocol were the most appropriate primary instruments for capturing usability issues across the diversity of users and workflows in this study, with the UEQ providing the quantitative complement that structured comparison between rounds required.

5.3.6 The Users

The distinction between expert and novice users remained applicable and continued to reflect meaningful differences in how participants interacted with the BO. Interestingly, the difference was also evident in how they responded to the three design variants presented in the high-fidelity prototyping and shown in Section 4.5.4. Novice participants gravitated toward the more modern and novel *Rounded* design (Figure 4.6), while expert participants generally favoured the more traditional and functionality-centred *Dark* design (Figure 4.4). This shows how users tend to favour what they are used to working with, with expert users gravitating toward functional and familiar interfaces, while novice users responded more positively to the simplic-

ity and friendliness of the modern *Rounded* design. It also further underscores that *Novelty* was not a priority for most expert users. The *Classic* (Figure 4.5) design variant was generally liked by all and selected for the final design due to its simplicity, but the responses on the three designs serve as a reminder that visual preferences and usability needs do not always align across user groups, and that design decisions made to suit one group may not translate straightforwardly to another.

Furthermore, what did emerge more clearly over the course of the project was that the use patterns of BO differed considerably between users, especially in how it fits into their individual workflows. Some users interacted with the system daily across a broad range of features, while others accessed only one or two specific pages and had no interest in or awareness of the rest of the platform. This variation added a dimension to the usability challenge that went beyond the expert-novice distinction, as a system that is unintuitive for narrow, infrequent use cases places a different kind of demand on the interface than one that simply requires expertise to navigate broadly. In a sense, this finding reinforced the importance of improving the usability of BO, since the diversity of use patterns means that relying on familiarity or domain knowledge to compensate for interface shortcomings is not a viable long-term strategy across the user base.

One limitation worth acknowledging is that more expert users participated in the study than novice users. In total, 16 users participated in the four rounds of studies. Seven were novice users, and nine were expert users, consisting of five developers and four seasoned content managers. Given that a main goal of the redesign was to lower the threshold for less experienced users, a larger proportion of novice participants could potentially have surfaced additional insights into how well the redesigned interface supports users with limited prior familiarity with the system. That said, the results from the final round suggest that novice users who participated responded positively to the changes. They were observed to navigate with more ease, had a notably more complete picture of BO and voiced their appreciation for new features such as the *Side Menu* and the *Starred* feature.

In addition to the qualitative feedback, the UEQ results from the final user study were broadly consistent between novice and expert users, with the results split up by user group available in Figure F.2 in Appendix F. This consistency suggests that the design changes addressed issues relevant to both groups. The results showed that the mean scores of novice users fall consistently between 1.75 and 2.25 across all dimensions except *Novelty*, which scored 0.5, and the *Dependability* score for this group rose from 0.0 to 1.938. The variance within the group also narrowed considerably, which may indicate greater agreement among novice participants in their assessment of the redesigned interface. Expert users similarly returned higher scores, with means ranging between 1.625 and 2.125, again with *Novelty* as the exception at 0.56. The tendency toward convergence between the two groups in the final round, and the fact that expert scores did not merely remain stable but also improved, is consistent with the qualitative feedback suggesting that the redesign improved the experience for novice users without disrupting the workflows or mental models of those already familiar with the system. While a larger or mostly novice sample may have uncovered further areas for improvement specific to that group,

the current findings provide a coherent and consistent picture that aligns well with the broader qualitative observations, and the overall results give reasonable grounds for confidence in the direction of the redesign.

6

Conclusion

This project set out to improve the usability of a complex, data-intensive back-office platform that had grown organically over time, accumulating structural complexity that was beginning to impede its scalable adoption. It should be noted that Opera's back office platform presented a somewhat unusual starting point for a redesign project. The original system was not only identified through initial evaluation as lacking in usability, but was independently and consistently recognised by its own users as confusing and in clear need of improvement. This shared recognition meant that participants were genuinely motivated to engage with the user studies and prototype evaluations, and that constructive feedback came readily and openly. It also meant that finding problem areas was straightforward and the threshold for improvement was comparatively low, which provided momentum throughout the iterative design process. Redesign projects in systems where usability problems are less visible or less universally felt may face greater resistance and require more targeted methods to surface and validate improvements.

Regarding RQ1, the primary pain points identified were the navigational structure and information density, as well as the absence of guidance for new users. Together, these issues pushed users away from skill- and rule-based interaction and toward knowledge-based reasoning, increasing cognitive load and dependency on memorised paths. In combination with the lack of available guides and support, many users found utilising the system challenging. The issues affected users with different levels of domain knowledge in measurably different ways. Expert users had developed compensatory strategies, including direct URL manipulation and memorised navigation paths, that masked the severity of the structural issues during normal use. Novice users, lacking these strategies, either avoided the system altogether or relied on more experienced colleagues to act on their behalf. The initial UEQ results reflected this divide, with novice users returning negative or zero means across all scales, while expert users returned positive means across most dimensions, except for *Perspicuity* and *Novelty*. The most pronounced divergence was in *Dependability*, reflecting that novice users found the system offered little to inspire confidence, consistent with their characterisation as users who sought to avoid operating it independently. In terms of the specific dimensions named in RQ1, usability and efficiency were most impaired as reflected in the *Bad* benchmark ratings for *Perspicuity* and *Efficiency*, while satisfaction was broadly low across all hedonic and pragmatic scales. Secondary pain points identified were inconsistency across pages and the absence of navigational aids for frequently or recently visited content.

Regarding RQ2, the results suggest that the improvements were substantial and broadly distributed across the user experience. The introduction of the *Side Menu* addressed the navigation complaints of UP1, providing a hierarchical structure that participants consistently described as more intuitive and faster to use than the previous card-based approach. The *Information and Support* menu and introductory message addressed UP3, providing visible guidance and accessible support resources for new users while remaining unobtrusive for experienced ones. The redesigned main page addressed UP2 by replacing the dense category grid with a focused layout centred on the *Starred* and *Recent* features, reducing information density and introducing alternative ways to navigate which addresses the secondary pain point of reducing navigation overhead described in UP5 and UP7. Other secondary pain points addressed were the filter component updates and *unsaved changes* guard, which contributed to improved consistency and confidence on detail pages in line with UP4, and the restructured categories, which reduced the ambiguity and duplication that had compounded navigation difficulty. The UEQ results from the final round reflect this, with the majority of scales reaching the *Excellent* category when compared to the benchmark, including *Perspicuity* and *Efficiency*, the dimensions most directly corresponding to usability and efficiency. Additionally, the hedonic scales reflected overall satisfaction. The convergence of novice and expert scores also suggested that the redesign lowered the threshold for less experienced users without disrupting the established workflows of those already familiar with the system. The most outstanding gaps remaining are the search function and full coherence across all pages.

The iterative, user-centred process proved well suited to the system's complexity and the diversity of its users. The progression from initial evaluation through low- and high-fidelity prototyping to implementation allowed structural questions to be resolved before detailed design work was built on top of them, and sustained engagement with users across multiple rounds ensured that design decisions were grounded in actual use. The methods employed complemented one another effectively, and their combination provided both the breadth and depth of insight necessary to redesign without disrupting existing workflows. The result is a redesigned interface that is more professional, more navigable, and more accessible to a broader range of users, while preserving the functional complexity that the platform requires.

6.1 Future Work

The scope and timeline of the project meant that several planned improvements could not be realised, and the final evaluation surfaced additional areas where the redesign could be extended or refined. The most pressing priority is the search function, which has known limitations in duplicate results and direct detail page access, and whose shortcomings became more consequential as a direct result of the navigation restructuring. Full coherence across table and detail pages remains the largest unfinished area of the visual redesign, with the implemented button styles, filter components, and design guidelines serving as a foundation for continued application across the platform. On detail pages specifically, consolidating the multiple

save buttons into a single page-level save button remains the proposed long-term solution, with the *unsaved changes* guard serving as an intermediate safeguard until that work is completed. Beyond the redesign itself, a collection of smaller features and functionality requests gathered throughout the user studies was forwarded to the relevant development teams for future consideration.

From a broader perspective, this project was conducted in a context where usability problems were widely felt and relatively straightforward to surface through observational methods. Redesign projects in systems where usability problems are less visible or less universally felt may face greater resistance and require more targeted methods to surface and validate improvements. Future research could investigate whether other approaches are better suited to detecting localised workflow breakdowns or expert compensation strategies that standard interview and task-based methods may overlook. Similarly, while the UEQ provided a useful and efficient measure of perceived user experience, further evaluation of how quantitative and qualitative methods for deducing cognitive load complement subjective experience questionnaires in redesign evaluations of complex administrative systems would be a meaningful methodological contribution.

6.2 Ethical and Social Considerations

While BO itself is domain-specific in its content, the concept and usage of a system such as BO is widely used in the industry. As one of the stakeholders in the project, the results will primarily benefit Opera, their product management, employees, and external teams working with the system. More broadly, if the outcomes of this work were adopted across similar contexts, organisations, and corporations relying on complex management applications could benefit from improved efficiency, clarity, and usability. In addition, the analysis and testing of methods used to elicit requirements and derive design guidelines may benefit researchers, designers, and developers by contributing transferable insights into the evaluation and redesign of live data management interfaces. The evaluation of methods used in the project builds upon existing research into the effectiveness and applicability of the methods in different contexts, as well as how they can be used. However, the projects focus on organisational use cases means that end users outside corporate contexts are less directly advantaged, and the findings may be less applicable to consumer-facing applications with different usability constraints.

This project focuses on the enhancement of redesigning a user interface by looking into the visual hierarchy, handling of feedback and affordance. The project does not work towards excluding anyone with developed design solutions, rather the aim is to further include non-expert users with a more supportive design. However, visual design aspects such as colour usage and typography are not evaluated from an accessibility standpoint. All visual design decisions were based on Opera's existing design guidelines for their products to fit their visual branding.

Consequently, no time was dedicated to verifying compliance with accessibility standards such as *Web Content Accessibility Guidelines* (World Wide Web Consortium, 2018), and the needs of users with colour blindness or impaired vision may not be fully addressed in the proposed design solutions.

6.2.1 Consent and Data Handling

Throughout this project, it was essential that ethical considerations regarding the participants of the studies were taken into account at each step. Prior to participation, all participants were clearly informed about the purpose of the study, the procedures involved, and how data related to them and their use of the product were collected and handled. Throughout the project, the participants were continuously informed about the project and the collected data to ensure transparency. Respect for participants was maintained by ensuring that participation was voluntary and that participants could withdraw at any time without consequence.

All data collected during the study, including interview notes, recordings, observation notes, and questionnaire responses, were stored securely and handled in accordance with organisational and academic guidelines. Access to collected data was limited to the authors of the study, and the data were used exclusively for research purposes related to this thesis. Participants confidentiality and privacy were protected throughout the research process to allow for anonymity, and no sensitive data was shared with any external AI tools.

6.3 AI Usage

Opera utilises the AI tool Claude Code when working on BO to maximise efficiency and help in understanding their extensive codebase, the relations, and how everything works. Claude was utilised in this project in the same way. Additionally, AI was used to refine grammar and process the text in this report.

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A

Appendix - Initial User Study

Introduction

Inform the participant that the session will follow a semi-structured format, and though there is a set of prepared questions they are encouraged to diverge and discuss any issues, observations, or thoughts they consider relevant or interesting. Emphasise that there are no right or wrong answers and that honest feedback is valued. Request permission to record the session and inform the participant of applicable data handling practices, including how recordings will be stored, who will have access, and when they will be deleted.

Background

- What is your current role?
- What is your technical background and education?

1. System Purpose

- What is the purpose of the platform in the context of your work?
- How frequently do you use it?
- For how long have you been using it?

2. System Overview

- Could you describe and sketch the system as you understand it? There is no right or wrong way to do it.
- Which parts of the platform do you use regularly, and which parts do you not use or rarely interact with?
- Could you identify two or three tasks you commonly perform in the system?
- Before we move on, are there any major issues that immediately comes to mind that you would like to get out of the way?
- What would you say are the main strengths and weaknesses of the platform as it currently stands?

3. Think-Aloud Tasks

The participant is asked to complete the following tasks while verbalising their thought process. They should describe each step they take, as well as anything they find intuitive, confusing, or worth commenting on. Prompts during observation may include: *What are you looking for? What did you expect to happen? How does this compare to what you anticipated?*

Note how the they interacts with the following interface elements during each task:

- Main page
- Header
- Dropdown navigation
- Content grouping and structure

Task 1

Show us how you would complete the following task, step by step: <task>

Task 2

Show us how you would complete the following task: <task>

Task 3

Show us how you would complete the following task: <task>

4. Specific Follow-Up Questions

- What aspects of the current system do you find most problematic or frustrating?
- What aspects of the current system do you find work well?
- Are there any specific features or areas you would prioritise for improvement?
- Are there any aspects of the current system that you would consider essential to preserve?
- Do you make use of the search function? If so, how?
- Are you familiar with or do you use the deep search functionality?
- Would you be willing to participate in the testing and evaluation of future design prototypes?

5. User Experience Questionnaire

Allow the participant to complete it independently.

B

Appendix - Participants' mental models

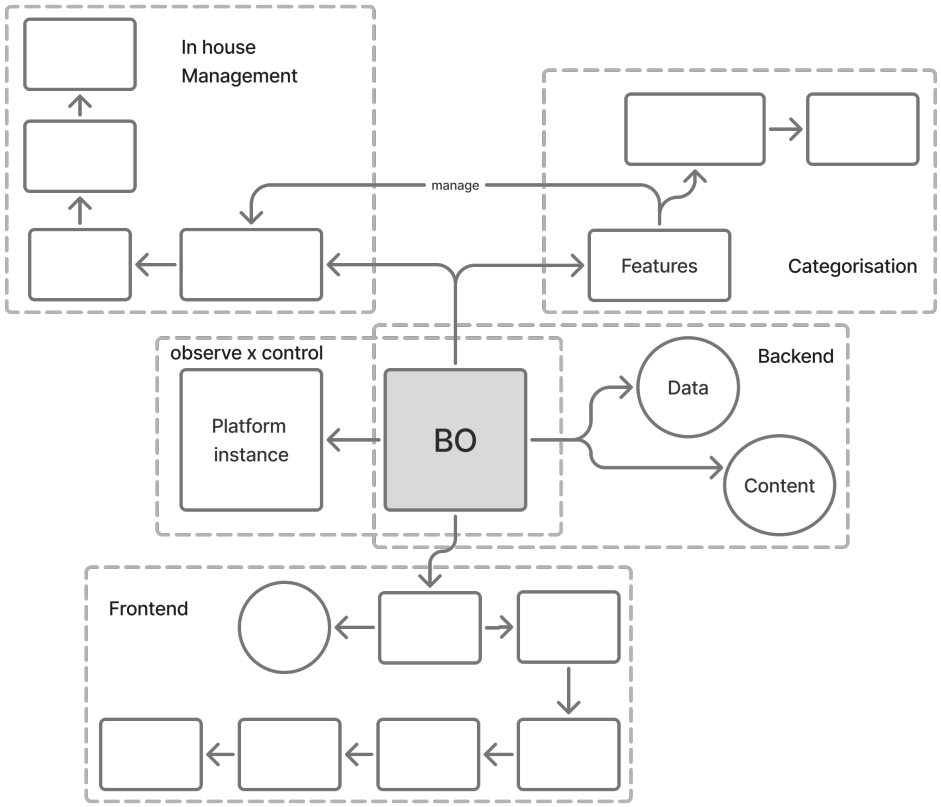

Figure B.1: The mental model drawn by the system expert. Content is censored or rendered empty according to Opera's guidelines.

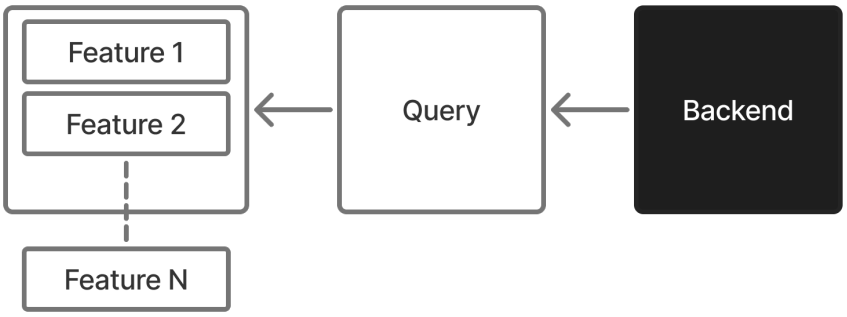

Figure B.2: The mental model drawn by a frontend developer. Content is censored according to Opera's guidelines.

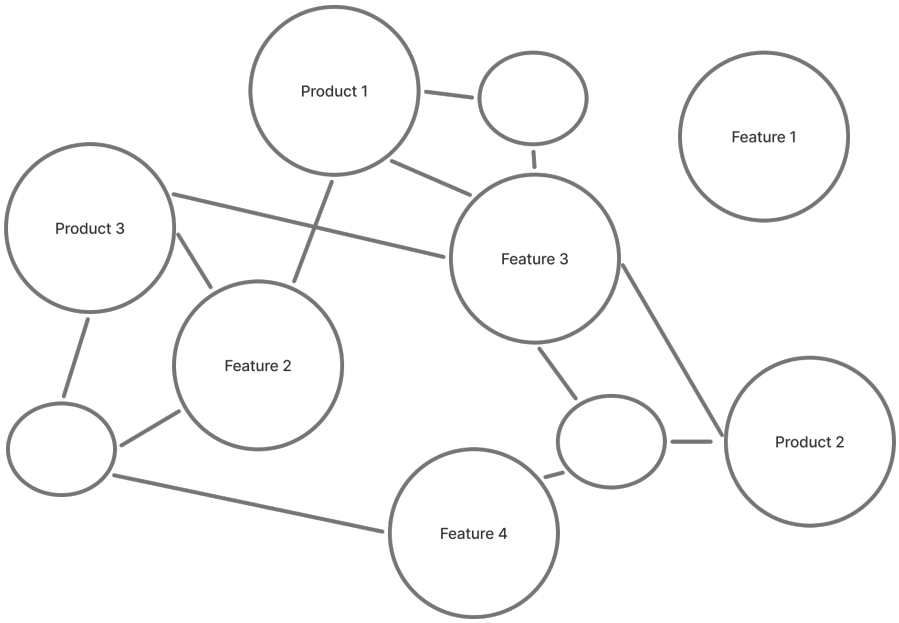

Figure B.3: The mental model drawn by a quality assurance tester. Content is censored according to Opera's guidelines, however here the participant did not fill in all shapes to save time.

C

Appendix - Low-Fidelity Prototype Evaluation

Introduction

Inform the participant that the session will follow a semi-structured format, and though there is a set of prepared questions they are encouraged to diverge and discuss any issues, observations, or thoughts they consider relevant or interesting. Emphasise that there are no right or wrong answers and that honest feedback is valued. Request permission to record the session and inform the participant of applicable data handling practices, including how recordings will be stored, who will have access, and when they will be deleted.

Briefly introduce the concept what a wireframe is, and make it clear that the wireframe uses unstyled elements to communicate layout and structure without implying a final visual design.

1. Initial Impressions

The participant is shown the wireframe with minimal context. Ask them to share their immediate reactions before any explanation of the design intentions is given.

- What is your initial impression?
- What stands out to you first?
- Does the structure feel clear?

2. Think-Aloud Walkthrough

Ask the participant to walk through the prototype and verbalise anything they find intuitive, confusing, or worth commenting on. Ask about each of the following design changes:

- **Main page:** The category overview has been removed. How does this feel? What do you think of the new layout?
- **Header:** Category navigation and environment colour have been removed from the header. What is your reaction to this change?

- **Navigation:** The dropdown menu has been replaced with a collapsible sidebar. Does this feel like an improvement? Are there any concerns?
- **Content grouping:** Pages and categories have been regrouped. Does the new structure feel logical?
- **Hideable pages:** Users can now hide pages they do not use. Is this functionality clear? Would you use it?
- **Recent pages:** A history of recently visited pages is shown on the main page and in a collapsible bottom bar. Does this seem useful? Would you use it?
- **Starred pages:** Users can mark frequently visited pages as favourites. Does this seem useful? Would you use it?
- **User menu:** Account information, BO Users, Notifications, and Hidden pages settings are now grouped in a user side menu. Does this feel like a natural location for this content?

3. User Experience Questionnaire

Allow the participant to complete it independently.

D

Appendix - High-Fidelity Prototype Evaluation

Introduction

Inform the participant that the session will follow a semi-structured format, and though there is a set of prepared questions they are encouraged to diverge and discuss any issues, observations, or thoughts they consider relevant or interesting. Emphasise that there are no right or wrong answers and that honest feedback is valued. Request permission to record the session and inform the participant of applicable data handling practices, including how recordings will be stored, who will have access, and when they will be deleted. Explain that the session consists of three parts: a comparison of three design variants, a set of navigational tasks using an interactive prototype, and a component-level discussion.

1. Design Variant Comparison

The three design variants are presented one at a time in randomised order. For each variant, ask the participant to share their immediate reactions before asking the guiding questions below. Once all three have been presented, ask the comparative questions.

Per Variant: Classic, Dark, Rounded

- What stands out to you first?
- What impression does this design give? Modern/outdated, inviting/repelling, premium/cheap, playful/serious, etc.
- What would you do next if you were using this interface?
- What feels clear?
- What feels unclear?

Comparative Questions

- Which variant gave you the best overall impression?
- Which feels like it would be easiest to use?

- What does each version do better or worse than the others?
- If you could combine elements from all three, what would you keep from each?

2. Think-Aloud Navigational Tasks

The participant is asked to complete the following predefined tasks included in the prototype while verbalising their thought process. They should describe each step they take, as well as anything they find intuitive, confusing, or worth commenting on. Prompts during observation may include: *What are you looking for? What did you expect to happen? Was anything harder than you expected? What would make this easier? How does this compare to what you anticipated?*

Task 1

Show us how you would complete the following task, step by step: <task>

Task 2

Show us how you would complete the following task: <task>

Task 3

Show us how you would complete the following task: <task>

If not already completed during the tasks, ask the participant to locate the support function and open the user menu.

3. Component-Level Discussion

Following the navigational tasks, discuss specific interface components in greater depth. For each component, note the participant's reactions to visual design, functionality, and clarity.

Main Page and Start Page

- Does the order and arrangement of elements feel logical?
- Are the recent pages and starred pages features useful or confusing?
- Are the support elements *getting started, help,* and *report issue* clear? Should all be present on the start page?

Bottom Bar

- Does the order of items feel logical?
- Is the functionality clear?
- Would you use it to navigate?
- Does the collapse mechanic feel intuitive?

Header

- Does the shape and colour feel appropriate?
- Is the order and arrangement of elements clear?

Side Menu

- Does the shape and colour feel appropriate?
- Does the ordering of menu items feel logical?
- Is the expand and collapse behaviour intuitive? Which interaction model feels most natural:
  - Clicking an item always expands it if possible. Navigation only occurs when there are no children.
  - Clicking a top-level item expands it, clicking a subcategory navigates to the first subpage. Expand arrow expands item without navigating.
- Does the collapse mechanic feel intuitive?
- *For relevant participants:* Does the naming of grouped categories make sense?

Filters and Table Pages

- Do toggle switches or checkboxes feel more appropriate for filters in tables and detail pages?

Detail pages

- Should detail pages have their own search bar?
- Would it be better to have a save button for each section or one single save button for the entire detail page?

Search Bar

- Does entering an ID or name and being taken directly to a details page feel useful?
- Is the hierarchical display of search results clear?

User Menu

- Is hiding the notifications in their own page useful?
- Is the hideable pages feature clear and useful?

4. User Experience Questionnaire

Allow the participant to complete it independently.

E

Appendix - Final User Study

Introduction

Inform the participant that the session will follow a semi-structured format, and though there is a set of prepared questions they are encouraged to diverge and discuss any issues, observations, or thoughts they consider relevant or interesting. Emphasise that there are no right or wrong answers and that honest feedback is valued. Request permission to record the session and inform the participant of applicable data handling practices, including how recordings will be stored, who will have access, and when they will be deleted.

1. Think-Aloud Tasks

The participant is asked to complete the following tasks in the implemented redesign while verbalising their thought process. Tasks are tailored to each participant's individual role and workflows as established during the initial user study. After each task, ask the follow-up questions below.

- How certain were you that you were completing the task correctly?
- Was there any point of confusion?
- Was anything missing that would have helped you complete the task?

Task 1

Show us how you would complete the following task, step by step: <task>

- Show us how you would *star* this page (to prepare for task 3).
- Compared to the previous design, did this feel easier, harder, or about the same?

Task 2

Show us how you would complete the following task, step by step: <task>

- Compared to the previous design, did this feel easier, harder, or about the same?

Task 3: Starred Feature

Show us how you would navigate to a page you have previously starred.

- Would you make use of this feature in your regular workflow?
- Does it seem helpful?

2. Follow-Up Questions

- Overall, how does the new interface make you feel compared to the previous version?
- How does the interface feel in terms clarity and structure?
- How does the interface feel in terms of inspiring confidence and trust?
- How does the interface feel in terms of intuitiveness?
- Are there any aspects of the new design that you find problematic or less effective than before?

The following specific features should be discussed if not already covered during the tasks:

- User menu
- Information and help function
- Recent pages
- Unsaved changes indicator

3. User Experience Questionnaire

Allow the participant to complete it independently.

F

Appendix - UEQ results split by user group

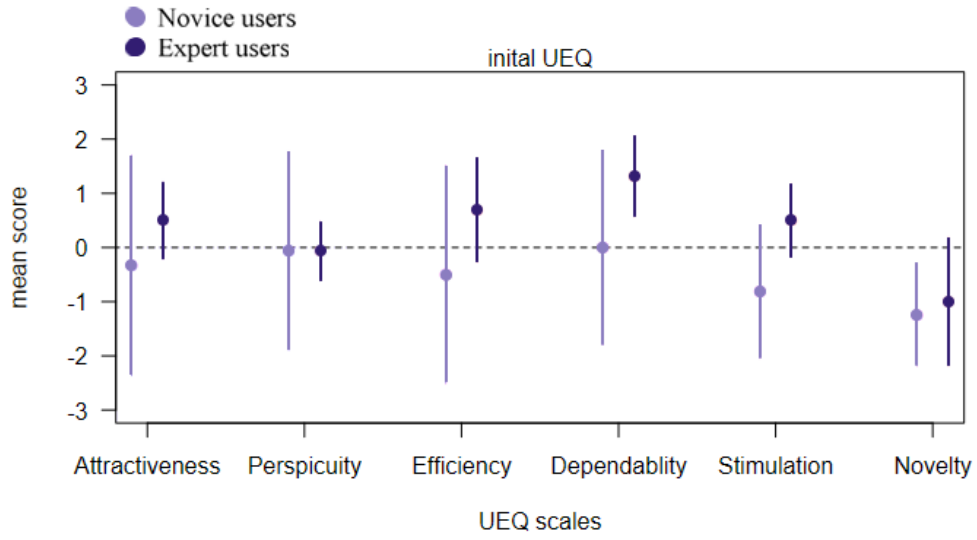

Figure F.1: The comparison of the scale means for novice users and expert users in the initial user study (n=4 for both groups), and whiskers represent ±1 SD.

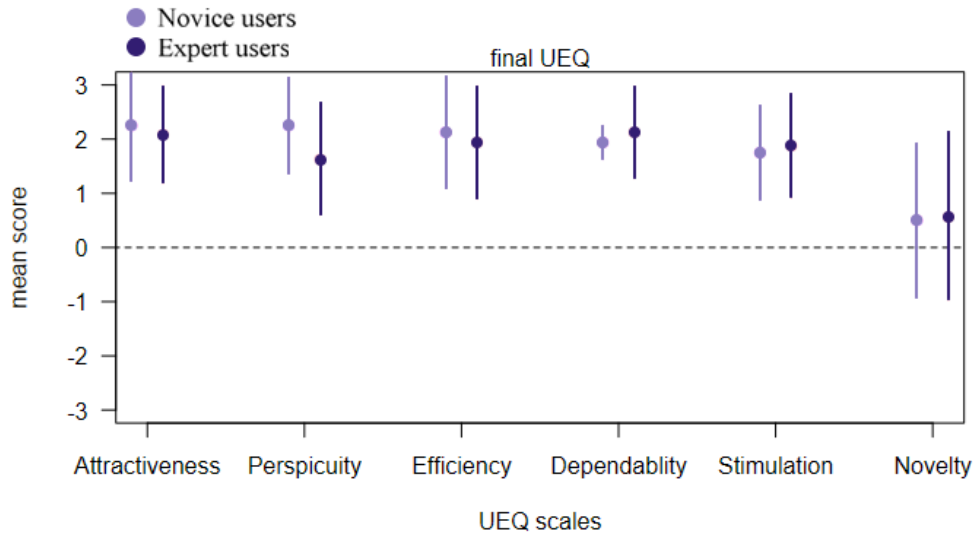

Figure F.2: The comparison of the scale means for novice users and expert users in the final user study (n=4 for both groups), and whiskers represent ±1 SD.