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Improving usability of a licencing management portal

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Abstract

Software licences are used to restrict usage of a software according to the owner of the intellectual property (IP). In commercial licencing, the usage of a specific software often requires payment, and hence the user might require information about their licence, such as its possible expiration date and what products it covers. In a case where a singular distributor has multiple software, its often beneficial to manage them all in a singular place, referred to as a licence management portal. The thesis aims to assess one licence management portals usability and make suggestions for future development based on data gathered from a usability study.

The usability study was conducted utilizing task-based usability testing, with both qualitative and quantitative metrics. The emphasis was on qualitative aspects, and the sample size was seven people, divided into two groups of three and four. The first group consisted of licence users, while the second group contained licence administrators. The data gathered from these groups was analyzed separately, since their tasks differed. The data was gathered into data collections which were inspected and visualized.

The results show that the level of usability differs between the two groups, with administrators having more requests and negative observations compared to specialists. In order to improve the licencing management portal further, information clarity and advanced functionality, such as managing large user and licence pools should be emphasized. Both groups found the portal's outlook, minimalism and basic functionalities satisfying. Prototypes of possible development direction are shown in the Appendix.

To understand whether the prototypes improve usability, an identical study with similar participants and the new design should be conducted.

Keywords Usability, Licence Management, Prototype, User Experience, Testing

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Tiivistelmä

Ohjelmistolisenssejä käytetään rajoittamaan ohjelmiston käyttöä immateriaalioikeuden omistajan mukaisesti. Kaupallisessa lisensioinnissa tietyn ohjelmiston käyttö vaatii usein maksua, ja täten käyttäjä saattaa tarvita tietoa lisenssistään, kuten sen mahdollisesta vanhenemispäivästä ja siitä, mitä tuotteita se kattaa. Tapauksessa, jossa yhdellä jakelijalla on useita ohjelmistoja, niiden hallitseminen yhdessä paikassa, esimerkiksi lisenssihallintaportaalissa, on usein hyödyllistä. Tämä tutkielma pyrkii arvioimaan yhden lisenssihallintaportaan käytettävyyttä ja antamaan ehdotuksia tulevalle kehitykselle perustuen käytettävyystutkimuksessa kerättyihin tietoihin.

Käytettävyystutkimus suoritettiin tehtäväpohjaisella käytettävyystestauksella, johon sisältyi sekä laadullisia että määrällisiä mittareita. Painotus oli laadullisissa tuloksissa, ja osallistujamäärä oli seitsemän henkilöä, jaettuna kahteen ryhmään, joissa oli kolme ja neljä osallistujaa. Ensimmäinen ryhmä koostui lisenssin käyttäjistä, kun taas toisessa ryhmässä oli lisenssinhallinnan järjestelmänvalvojia. Näiltä ryhmiltä kerättyä dataa analysoitiin erikseen, koska heidän tehtävänsä erosivat toisistaan. Data kerättiin tietokokoelmiin, jotka tarkistettiin ja visualisoitiin.

Tulokset osoittavat, että käytettävyyden taso eroaa kahden ryhmän välillä, järjestelmänvalvojien esittäessä enemmän kehitystoiveita ja kielteisiä havaintoja verrattuna asiantuntijoihin. Lisenssihallintaportaan parantamiseksi tulisi korostaa informaation selkeyttä ja laajempia toiminnallisuuksia, kuten suurten käyttäjä- ja lisenssiryhmien hallintaa. Molemmat ryhmät pitivät portaalin ulkoasua, minimalismia ja perustoimintoja miellyttävinä. Mahdolliset kehityssuunnan prototyypit esitetään tuloksissa ja liitteenä.

Jotta ymmärrämme parantavatko prototyypit käytettävyyttä, identtinen tutkimus samankaltaisilla osallistujilla ja uudella käyttöliittymällä tulisi toteuttaa.

Avainsanat Käytettävyys, Lisenssihallinta, Prototyyppi, Käyttäjäkokemus

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1 Introduction

1.1 Research Goal

Software licences are a way to make sure an intellectual property is protected. Having set terms for licences protects both the provider and the customer from possible unwarranted use. It also allows the provider to monetize or enable further development of set software and future products. It is also important for the customer to understand the exact type of licence agreement they enter and have the ability to efficiently view and manage their licences.

Licence management has adapted to current technological advancements, and there are a variety of web-based licence management platforms available mainly hosted in the cloud (Future Market Insights, 2023). Additionally, the way software are encrypted has increased in complexity, deterring and prolonging unwanted use. The ability to host your own licence management system in the cloud which scales with use has made the development of licence management portals more feasible and viable for companies with a wide array of products. Previously this would have required dedicated servers.

Hosting one's own licence management solution allows one to develop and maintain features customers might request, such as specialized reports, and removes costs associated with using a third-party licence provider. Having a centralized hub makes it easier for customers to manage licences for their orders, and possibly reduce the threshold of them adding additional products. If the customer can manage their own licences, it removes the need to have constant support staff to manage and guide the customer with licence use. For the customer to agree to this, the licence management should be effective, efficient, and satisfying to use, or in other words have a high usability.

The goal of this thesis is to gain an understanding of a specific licence management web portals current usability. This is done by conducting a usability study emphasising qualitative methods, while also collecting quantitative data to possibly support the claims made. The study is divided into two separate groups, since the two users use-cases and needs differ drastically. One of the groups requires the ability to view their own licences, and utilize the functionality related to that. The other group utilizes the portal to manage licence orders and allocate the forementioned group to their correct orders. However, in the web portal the given user interface is the same for both groups. Hence this raises the first research question:

- **RQ1: How do the two groups view the current usability of the portal?**

Since most of the tasks between the two groups differ, the direct comparison between the two groups is not meaningful. This does not mean that the functionality provided to one group might not impact the usability of the other and is something to consider when evaluating the site.

The licence management web portal studied is a relatively new tool and new products are added to its catalogue continuously. Therefore, it is important to gain an understanding of whether it has all the features the users expect. This is especially relevant for users that have previous experience utilizing other licencing management tools. The second research question is therefore:

- **RQ2: Does the portal contain all the functionality that the users expect to be there?**

The current functionality of the site for clients is shown in Table CFN. To summarize, currently the users can view their accounts licences and manage their orders and the available users for those orders. Additionally, the site supports six different languages, and contains the ability to change account passwords. To understand whether this meets the user expectations, we need to have participants with enough experience utilizing licence management tools to reflect and compare this to other similar portals. This thesis leaves out certain areas of the portal, such as licencing files and computer specific licences which are not used in the Finnish market, and only utilizes functionality accessible for the customers.

1.2 Structure of the Thesis

The thesis contains six chapters. In the second chapter, we will be looking at necessary definitions related to software licencing and usability, and how the two are linked. Additionally, we will look into the characteristics of a usability study in order to design one and introduce the case study. The third chapter contains the detailed structure for our usability study, and motivation for the choices made.

In the fourth chapter we will be looking at the results in three different subchapters. First, we look at the task specific feedback and highlights comments given by the participants. In the second subchapter we look at how these comments and different metrics collected reflected to the overall usability for the portal. In the third subchapter, we propose a prototype for the redesign of the portal, which was done based on the usability study feedback.

In the fifth chapter we reflect on the content of the thesis and address the possible limitations. The sixth and closing chapter is the conclusion, where we conclude the thesis, and summarize the results. The Appendixes contain the forms used in the study, and the full redesign with comparisons to the original design of the portal.

2 Background

2.1 Software Licencing

2.1.1 What is Software Licencing?

To accurately be able to assign tasks or evaluate the licensing portal, one must know its purpose. Software licences are used to set terms on how a specific software can be distributed, used, or modified (Morin, Urban and Sliz, 2012). These terms are important both in paid and free software, since they allow the holder of the intellectual property (IP) to avoid cases where the software's use-cases are left unclear, and possibly result in unwanted distribution or use.

Software licenses can be used to either grant access or restrict it (Morin, Urban and Sliz, 2012). In this paper the focus is on proprietary licencing, which is often used in commercial software and aims to restrict the user by limiting the use of the software. This is done by for example requiring the distributor of the software to grant access to it in exchange for a fee. These types of software are closed source, meaning they have been encrypted by the distributor to make reverse engineering these programs much harder. This is opposed to for example open-source licencing, which is often used to encourage the user to modify and reuse parts of the software. Currently as data is being scraped to build massive knowledge databases which can be used to train different machine learning models, there are attempts to create standardized data licence policies, which would help protect data that otherwise might be used to train different artificial intelligence models (Lee et al., 2022).

2.1.2 Types of Commercial Licences

Many commercial software providers, such as Adobe (Adobe, 2023) utilize web-based portal for clients, where users can check which licenses they currently have active, when they expire and possibly activate and register their products. Web-based portals make it easier for the providers and the users to manage their licenses and are considered secure (Ferrante, 2006). Web-based portals for licence management often tie the licence to specific account, but can also support device specific node-locks, such as license management files that grant access to the software for a set time without requiring internet connection.

Ferrante (2006) highlights a few licencing methods, out of which modern desktop software mostly utilize single licences, network-based and subscription-based. In this paper subscription-based licences will be considered more

as a business model than its own standalone licencing. This is because the functionality between permanent and subscription-based licences is similar if they are managed through a website. Ferrante also mentions server and utility-based licencing, similar to cloud computing's server and serverless models. In utility-based licencing, the software tracks the total time the software was used, and charges the customer based on that (Shrivastava, Kumar and Pandey, 2014).

Single licences often mean a personalized licence for a specific machine or account, also referred to as node-locked licence (Ferrante, 2006) (Shrivastava, Kumar and Pandey, 2014). These can either be considered permanent, where there is no expiration date, or for a set time, also referred to as subscription based. The main difference between paying for a permanent or a subscription licence is often in the number of updates the product receives. Subscription based models are often accompanied by updates that include new features or fixes, justifying continued support through subscription.

Two common network-based licensing models are floating (also referred to as concurrent) and network-named (Ferrante, 2006). Network licences are often purchased for a certain amount of time and must be renewed, meaning they are subscription based. These types of licences are more common in large companies and corporations, where a batch of licences are given to be shared between a large number of employees. Network-based licences do not require companies to assign individual licences to specific users like the single licences model, but instead might utilize a pooling system, where a set limit of licences can be used at the same time by given user group. This is demonstrated in Figure 1.

Network-based licenses, and these days often also single licences require an internet connection at least periodically. Since constant polling between the servers and the clients can cause a large amount of traffic, and possibly denial of service, most modern licencing providers allow borrowing the licence for a specific amount of time (Ferrante, 2006). Borrowing a licence allows for a grace period where no validations are done between the server and the client and it is often automatic. The amount of time you can borrow a licence for depends on the type of licence and provider used. Single licences are more stagnant and often allow longer periods, such as a year. Network licences can check for a valid licence hourly since the user pool and availability change more rapidly.

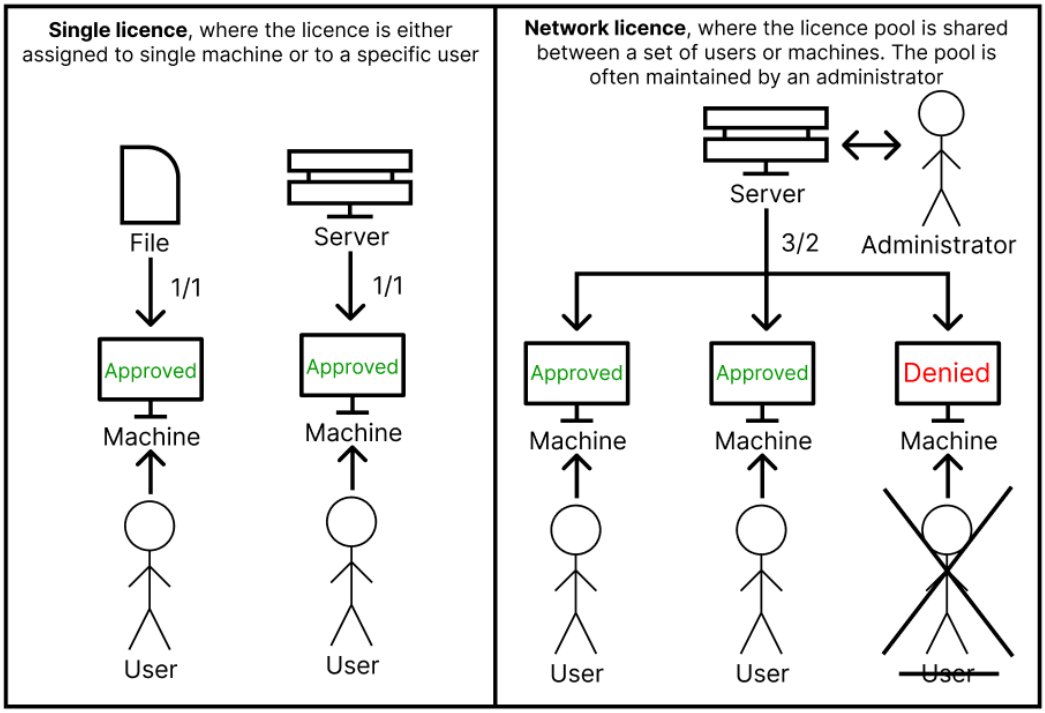


Figure 1: Simplified version of how single and network licences work in most licencing systems.

2.1.3 Types of Users

In Figure 1 we can see two types of clients for these types of systems, those who utilize the licence referred to as users, and those who maintain the licencing pool, referred to as administrators. Administrators can either be from inside the client's company, often working as a technical support, or from the licence distributor. However, most of the time companies which utilize networking licences manage it in-house, since communicating user changes with a third party can be time consuming, especially if the pool of possible users is large.

Web-based portals, such as Adobe's (Adobe, 2023) offer tools for both users and administrators. This is the same for our usability study's portal. These tools include the ability to check for active licences, allocate them to users and revoke access.

Outside of Figure 1, there are the users who create the licencing packages and distribute them, often working at the licencing distributor company. These people can also be serving as the administrators if the client does not have their own. These users from the distributor company might be using the

portal daily but are outside the scope of this work. This is because they have access to internal training and clear documentation of the step-by-step process, which the customers might not have. They also have specialized tools that are not available to administrators outside the company, such as changing the contents of a specific licencing package.

2.2 Usability, User Experience and Security in a Licencing Portal.

Considering our goal is to understand the current usability of the case study portal, we need to make sure our research questions are aligned with the way we understand usability and user experience. Since security is a key part of licencing systems and a highly relevant aspect in the current climate, it is also considered alongside usability and user experience. Defining these concepts clearly can help us guide our usability study's metrics and choose the type of tasks we want our users to complete.

2.2.1 Usability

Usability is a key factor in modern software development and might decide whether a product is received well. When a product has a high usability, it will require less training and maintenance to operate efficiently (Lodhi, 2010). Hence usability testing is an important part of validating whether a current product will have longevity against competing products and track existing problems that might be hard to pinpoint otherwise.

The ISO 9421-11:2018 defines usability as "extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". In the case of licencing portal, the specified use is managing licences, and the users include licence allocated users and administrators. In the case of managing licences, the use can be quite infrequent. Hence according to the ISO, it is crucial that the users can meet the given usability requirements during each reuse.

The ISO 9421-11:2018 mentions that when usability is considered, it is important that the system can be used by people with the widest range of capabilities. In the case of licence management, users and administrators can have high variance between their ICT capabilities. This makes it a highly relevant aspect of usability in our study. The ability to be effective and efficient with a site is highly dependent on how well it caters to both inexperienced and experienced users (Nielsen, 2020). Having the ability to take shortcuts allows experienced users to speed up their workflow, while allowing the novice user enough information and steps to utilize the system correctly.

Satisfaction considers how the user perceives the system. These include their comments during and after using it, and whether they accept the system as a solution. Satisfaction and hence usability can be linked to security (Cranor and Buchler, 2014), and therefore improve the correct usage of the system. If the user takes shortcuts for the sake of avoiding frustration and confusion, it can lead to vulnerabilities. In a licencing system in which the whole idea relies on being secure, having the system be satisfying to use is key. A concept brought up in the security chapter is smart defaults (Goldstein et al., 2008), which provide the users with the most secure and applicable default values.

Usability is often measured utilizing different attributes such as the aforementioned efficiency, effectiveness and satisfaction. Besides these, the attributes can include learnability, cognitive load, and ease of use (Weichbroth, 2020). While the ways to measure these are vast and often standardized, there are still a lot of choices to be made when the goal is to study a specific systems usability. These choices are addressed later in the usability study chapter.

2.2.2 User Experience

User Experience (UX) is defined by the ISO 9421-11:2018 as "user's perceptions and responses that result from the use and/or anticipated use of a system, product or service". While usability is often considered to be a part of the UX, they should be distinguished as different aspects. UX includes multiple different angles, such as perceptions (emotions, behaviour, beliefs etc.) that according to the ISO are not defined as a part of usability.

While our main goal is to improve usability, both UX and usability help to determine whether a product is successful. UX covers a broad variety of different aspects to consider, and in our usability study we have aimed to consider as many as can be done meaningfully. Users' perceptions are a key factor we are considering when looking at the entirety of the usability study.

2.2.3 Security

According to Cranor and Buchler (2014) security and usability go hand in hand. The paper argues that if a system is secure while also considering the user and their decision making, security features do not hurt the usability. Guiding the user in a way where critical errors and confusing security protocols are avoided without them being inconvenience is a key challenge. The paper mentions that if a security feature is burdensome, it most likely will be avoided to increase user satisfaction and efficiency.

The most concrete example of this is error handling. When providing the user with an error message that is short, non-technical but also descriptive of the type of error they have encountered, the chance of the error message being exploited by an attacker is reduced (Merdanoğlu and Onay Durdu, 2018). For example, returning detailed status codes can reveal unwanted information about the system (Srinivas, 2020). A further example is giving the error “the user does not exist” as opposed to "the login and password is wrong”. One of these is vaguer while not sacrificing usability and reduces the chance of exploitaition.

Another method is smart defaults, which allows the users and the companies to customize or opt out of specific features (Goldstein et al., 2008). This allows the system to have customizability, but also security in the sense that the chosen defaults are aimed to be the most secure options. When considering a licencing portal, a smart default could be only showing the essential information about an order on the screen or having the confirmation dialogs on by default when managing a user pool.

2.3 Usability Study

The term usability testing and usability study seem to be used in some sources almost interchangeably. Therefore, it is important to note the distinction when comparing the two. NN/g (Moran, 2019) defines the usability study as the entire process of gathering usability information that contains multiple user research methods, while the usability test is the subprocess which involves the actual participants such as task-based evaluation and outputs specific improvements based on the tests. Other sources utilize the terms in a similar context (Tullis and Albert, 2013). Hence usability tests are aimed to identify existing problems in a product or a service. They are suitable for learning about participants behaviour, such as how they would solve problems, possibly prompting new opportunities to improve service design (Moran, 2019).

The recommended usability testing methods depend on the available resources and desired outputs. Tullis and Albert (2013, pp. 61-62) summarize the factors to consider when designing a usability study. Initially it is important to understand whether you are trying to measure or improve the current design. This changes the focus between finding improvements or comparing it to another system or iteration. Secondly consider whether you want to assess how the user performs on the system or assess how they felt and thought about the system while using it. This decides the metrics one wants to utilize. If the goal is to understand performance and factors such as effectiveness and efficiency, quantitative metrics are the ideal option. Quantitative metrics aim to show in numerical values how well the site and the

participants performed but require relatively large sample size to be representative of the demographic. If one desires to understand satisfaction, they should aim for qualitative feedback, which allows observing mannerisms, observations, and spoken thoughts. The timeline and availability of participants will also have an impact on the choice of metrics.

There are different thresholds provided for the optimal sample sizes of usability studies, and their respective confidence thresholds (Tullis and Albert, 2013, p. 18). Qualitative and quantitative thresholds are often very different, because quantitative studies aim to emphasize statistical significance (Budiu, 2017). This means that the numerical values measured are representative of a larger population. Because of the nature of qualitative data and its aim to allow deeper insights into how users see specific designs and features, it requires a lower number of participants to be deemed meaningful.

The possible research methods for a study are often perceived to lie on a plane, as shown in Figure 2. If one axis is qualitative and quantitative, the other is behavioural and attitudinal. Behavioural aims to measure how a participant behaves, and attitudinal how they feel (Rohrer, 2022), similar to performance and satisfaction These user research methods can and should be combined within a user study to gain a wider insight into the different aspects of usability.

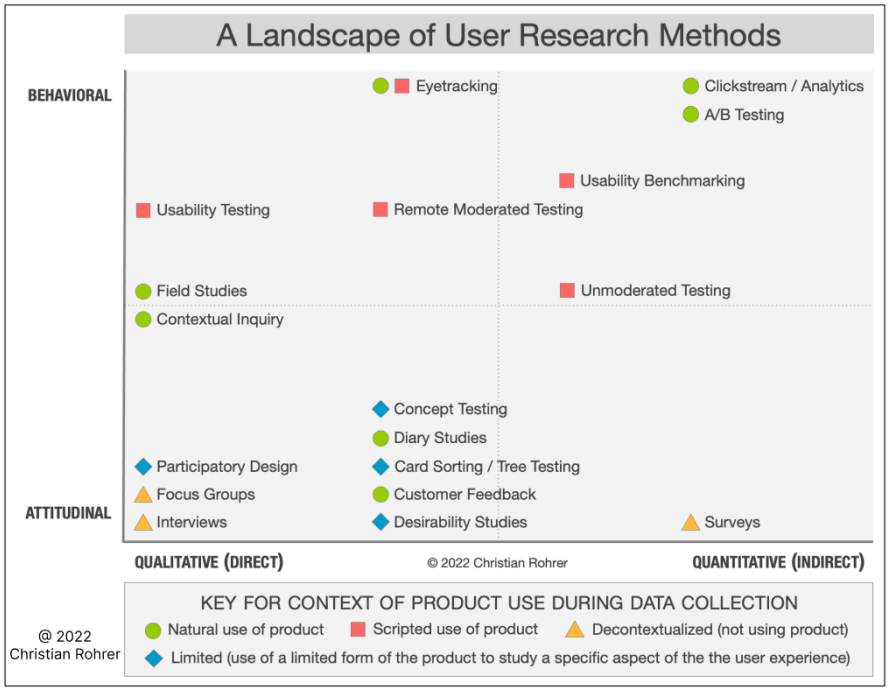


Figure 2: Examples of user research methods shown on a plane from NN/g (Rohrer, 2022).

There are disadvantages to usability testing and studies, and a lot of factors one must consider when planning and executing a study as explained above. Planning and running a study takes considerable amount of time and money, and how representative it is of the general opinion is highly dependent on the participants, especially in qualitative research. If the moderator or the observer has preconceived notions about the topic or product studied, they can create a bias by steering the users towards that outcome consciously or subconsciously. Bias can be caused by a variety of things, such as the environment, tasks, or the chosen method (Tullis and Albert, 2013, p. 116). While there are some disadvantages to usability testing, it is still a widely applied method of gaining an advantage in a competitive market. A large part of the possible problems can be minimized by following established guidelines and with experience.

To guide design and choices, a few examples of successful usability studies on web-based portals were examined. The first is a case study paper by Rosmasari et al. (2018) where quantitative and qualitative methods were combined to gain an understanding of the current usability for a student academic portal. The study consisted of two groups of which first contained five UI/UX designers, and the second containing 15 students. The two groups had different sessions, where the first group ran a heuristic evaluation of the portal, meaning they examined the sites usability utilizing a questionnaire checklist of 59 items gathering quantitative data. The second group ran a think aloud usability testing, where observations and interviews were used to gather additional qualitative data. The paper also contains a segment where the results are presented to the developer, and further explanation to the usability issues are presented. The study succeeds finding usability issues and highlights the combination of the two methods.

The second case study paper (Margolin, Miller and Rosenbaum, 2013) examined a community college website, where the goal was to understand whether the site provided enough relevant information related to completing a degree. The study had 10 participants, and utilized the think aloud method as well, meaning the focus was on the qualitative aspects. The participants had to complete 10 given tasks, for example “Schedule online courses”, and give numerical clarity values for certain tasks. The interviewer guided the participants if they were unable to find the required information to complete the task. This study was also able to find multiple usability improvement suggestions, and successfully combine qualitative and quantitative methods, while also considering both behavioural and attitudinal aspects.

2.4 Case Study

Case studies are used to gain insight into a specific phenomenon in a real-life setting. The three common types of case studies are descriptive, explanatory, and exploratory (Priya, 2020). Descriptive aims to describe a specific phenomenon, while explanatory aims to explain that phenomenon. In this thesis we are utilizing the third option, exploratory, which aims to explore a phenomenon, in this case the usability of a specific licencing management portal. While case studies help the thesis scope down the research and generate the most value for the stakeholders interested in a specific phenomenon, it can be quite hard to generalize the results in a wider setting. How well the results of this thesis can be generalized are explored in the discussion chapter.

The Holixa licencing portal is a web-based licence management site mainly used to manage the software developed by Arkance Systems. Originally the product was developed to be used locally in France, but after realizing the need for a centralised licencing platform throughout all the branches across Europe, the product was developed further to meet the needs of the European market. The need arose from the cost and the dependency on external tools, and the desire to improve operational efficiency. The basic functionality of a licencing system is explained in software licencing chapter. To protect the security of the portal, no technical explanation on how certain features function will be given.

Holixa licencing allows the creation and management of both single and network-based licencing. The type of network-based licencing used is the floating licence, which functions by allowing a set number of concurrent users at once by borrowing and releasing licences from a set pool of users (Ferrante, 2006). Additionally, the portal supports trial licences, which allow the user to have a trial version of a specific software for a set amount of time. The licencing validation utilizes either file or server-based authentication. Since server-based authentication requires the user to authenticate using the Holixa licencing account and hence utilizing the portal itself, this method will be used in the study over the file authentication.

Figure 3: The Holixa licence portal homepage.

The exact way the licence management portal is utilized differs slightly between company branches. The study was conducted with Finnish personnel and utilizes the most common methods of licencing in Arkance Systems Finland, which are single and floating licences. Therefore, some of the observations might or might not be reflective of the user experience in other countries.

The **RQ2** asks whether "the portal contains all the functionality the users expect to be there". To answer the question, we need to look at the current functionality in the portal at the time of writing the thesis. In Appendix B we can find the original designs, marked with an even figure number up to Figure B.14. In the original design, the users have the following functionality presented in Table 1.

Page	Functionality	Figure
Homepage	The initial landing page, contains a logo and a navigation bar for finding submenus.	B.2
My licences	Contains the ability to view the current accounts licences, with the following information: Package name, licence type, download link and management page. The management page contains licence managers name, licence type in addition to start and end dates for the currently allocated licence for the account.	B.4
My orders	Management page for controlling orders. Contains information about the package, such as its id, name, start and end date, number of licences used and in	B.6

	total, licence type and management screen for controlling users.	
My users	Management page which allows adding multiple and deleting singular users from a user list. This user list is used to add new accounts under an order. Also contains a computer list, where administrators can add computers to add to their orders, working in a similar manner as a user. The my computers functionality is not covered in the study.	B.8
Licence information	Management page used to view, add, and remove users from a specific order. Users are added using a dropdown user list, where a singular user can be added at once. Also allows adding new users to the user list with an "Add users" button.	B.10 / B.12
Adding a user	A page which can be accessed from my users and licence information pages. Allows adding multiple users at once, with the syntax for this method shown in the placeholder text.	B.14
Profile dropdown	Allows creating an API key used mainly by developers and to change the account's password.	-
Language	Allows changing language to one of the six supported languages.	-

Table 1: Current functionality of the Holixa licence management portal, where important pages are mentioned along their Figure.

3 Methodology

When the aim of the study is to gain an understanding of the current state of usability, we should utilize methods where the users are heard and observed. However, the available user research methods of assessing usability are vast as shown in Figure STN. One must consider factors such as participants, metrics, and the specific goals. To guide these decisions, a variety of different guides for measuring usability have been written, of which the study's design relies mostly on the book by Tullis T. and Albert W. (2013) "Measuring the User Experience" combined with the sites usability.gov (2023) and Nielsen Normal Group (NN/g) (2023). When deciding the type of usability study, it is important to understand what the study is trying to achieve. In our case, we are trying to gain an understanding of the current state of usability on the given web portal as stated by **RQ1**, and find possible improvements as stated by **RQ2**.

3.1 Designing a Usability Study

3.1.1 Participants

Having two separate user groups with their own goals and requirements raises unique challenges when designing a user study. One of these was to find roughly the same number of participants that met the criteria for both respective groups from a limited pool of available candidates. The participant requirements were the following:

- Adults aged between 18-67
- Finnish-speaking
- Good familiarity with computers
    - Active usage of computers (work use)
    - Familiarity with Windows 10 OS and web browsers
- Minimal previous usage of this specific licencing portal, usage of other portals is noted.
- For role 1: works as a specialist in-house or for a client.
- For role 2: works or has done administrative duties in-house or for a client.

The term specialist in this context refers to a person who has specialized knowledge in a certain field related to digitalization, and hence has knowledge about operating specialized software for different tasks. This allows us to have a consistent and realistic baseline, since the software licenced through the portal are aimed at very specific digitalization tasks. This role represents the user in Figure 1 and is referred also as role 1 or group 1.

Role 2, containing administrators aimed to incorporate people who have or might have to manage in-house or client software licences. This was considered as a separate user-group, since as shown in Figure 1, while these participants might utilize licences, their primary task is to manage licences of others. This is something that specialists are not required to do. When designing the study, it was assumed that the administrators have higher understanding of concepts such as user management, and more experience operating licencing management software.

One option would have been to utilize a singular group, where users from either background performed similar tasks. Considering the tasks themselves do not require understanding that could not be taught in an hour to someone who is familiar with computers, this could have been a viable option. The reasoning for the divide was to understand how the portal is perceived from only one point of view without conducting both tasks, since that is the real use-case scenario. This way we were also able to go more in depth with each participant during the interviews about how they saw the usability based on their previous experiences, or the lack of.

As mentioned before, qualitative research does not require as many participants as quantitative. Since we had two user groups, the minimum number of participants had to be considered with this in mind. The classic five participant minimum idea has been challenged by some researchers (Tullis and Albert, 2013, p. 119). Still Tullis and Albert recommend utilizing “five participants per significantly different user class”. This is because after the fifth or sixth session it can be very rare that something new is uncovered. This meant that our starting requirement goal was roughly five subjects for both roles.

However, after contacting possible participants, it was quickly uncovered that in the timeframe we were conducting the study, getting this amount was not possible. This meant that we had to reduce the number to N=7 participants, N=3 for our specialists (Role 1), and N=4 for our administrators (Role 2). Initially our goal was to have the amounts reversed, meaning that we had more specialists than administrators, but after the 4th participant, I realized that administrators had a lot more comments and requests than specialists. Hence one of the participants allocated as a specialist was asked to take the administrator study instead, since they had previous licence management experience.

Because of the small sample size, we were going to face selection bias, meaning that factors like age, gender, ethnicity, and education would be homogenic. While our goal was to target the demographic of our customers e.g., highly educated working in IT, it was apparent that some of the

demographics would not be considered in this study, possibly leaving out certain points of views.

3.1.2 Research Design

Because of the limited participant pool, the main user research methods focused on the qualitative aspects. This meant that usability metrics such as satisfaction were prioritised over factors like efficiency (Tullis and Albert, 2013). That does not mean that quantitative factors can be ignored, since they can still be used to validate results. The study also could not be used to observe participants in a natural setting, since the usage of the licencing management tool in a real scenario predictably is hard.

Guided by Figure 2, the most suitable methods for the study are usability testing, focus groups and interviews (Rohrer, 2022). While focus groups are an interesting method in this type of study, they were left out because of the small sample size, the difficulty of scheduling a time that would have worked for all participants and the focus on the initial user experience with the portal. Therefore, usability testing where the participants were observed one-on-one conducting tasks was chosen. While Rohrer (2022) groups usability testing as purely qualitative, it can be combined with usability benchmarking to also measure quantitative data. Interview was added to balance both behavioural and attitudinal qualitative research, and to focus on aspects that the participant raised during tasks.

Because of the success of the user studies covered in the background chapter including both qualitative and quantitative aspects, user research method aimed specifically at quantitative data was included. In our case study we are however working with a smaller sample size for both groups as opposed to examples, which means that we cannot claim similar statistical significance for certain tasks. We can however take lessons from both studies and use these to possibly support the claims made. The best perceived method for quantitative research was surveys according to Figure 2. When it comes to usability assessment, the number of pre-established surveys makes it easy to pick a specific one to suit our study. The way these were collected is addressed in the metrics chapter.

3.1.3 Tasks

Designing a task correctly is crucial to gain as much information as possible, while avoiding bias. Alshamari and Mayhew (2008) mention that task design can change the result of usability testing. Structured tasks are better for discovering a variety of problems, which often are considered minor, while

unstructured tasks discover the major problems better. This means that if the task is left open ended, it is more likely to result in more eminent usability issues. To gain as much insight on the pressing issues, the tasks utilize unstructured descriptions.

The impact of choosing correct tasks is especially important in complex products (Tullis and Albert, 2013, p. 116). In the licencing portal studied in the thesis, we can cover most of the functionality with only five tasks. Therefore, more emphasis is put on how the tasks are presented, and in which order they are conducted in. For this study, the tasks are conducted in an order that matches the use case of the portal. In the case of specialists, from gaining access to utilizing their licence. For administrators starting with gaining access, but instead ending with managing more complex scenarios that they would face in real use.

The study consists of five computerized tasks for both groups. Of the five tasks, one is a practice task which is same for both roles. Excluding the practice task, one additional task is the same for both roles, hence giving us N=7 participants for that task. Tasks are chosen based on the development teams understanding of the most common operations by the users. Tasks consist of finding information and utilizing it the portal and for specialists briefly in a desktop software. These tasks represent possible scenarios users must go through while managing their own licence. All the computerized tasks are done in Finnish. This meant that the user interface of the portal uses Finnish elements, but in case of confusion of a word choice, users were asked to change to English at the end of the task, and to confirm if that word was still unclear.

Computerized Tasks Specialists Role 1

Task 1: Using credentials (practice task)

At the start of the study, participants are given credentials to the Holixa licencing portal. The participants are tasked to log in to the portal.

Task 2: Changing password

Participants are tasked with changing their password from the default one into a new one (given in the document).

Task 3: Downloading licencing software

Participants have a few active licences (both single and floating) in the portal. The participants are tasked with finding a specific licence by

name and navigating to a download page related to that licence utilizing the portals user interface.

Task 4: Basic licence information

Participants are tasked with finding out which licences are currently active in the portal (by expiration/start dates), and whether any of them are expiring in 2023.

Task 5: Licence usage

Participants are tasked with entering the credentials into desktop software already installed in the workstation, hence activating the licence.

Computerized Tasks Administrators Role #2

Task 1: Using credentials (practice task)

At the start of the study, participants are given credentials to the Holixa licencing portal. The participants are tasked to log in to the portal.

Task 2: Basic licence information

Participants have a few active personal licences (both single and floating) in the portal. Participants are tasked with finding out which licences are currently active in the portal (by expiration/start dates), and whether any of them are expiring in 2023.

Task 3: Licence management

Participants are tasked with adding two accounts to a single licence package and five accounts to a floating licence package they are managing. Accounts are given in the document in plain text by their email address. The single licence package already contains a user, while the user list contains multiple, to make this task more representative of a real-world scenario.

Task 4: Advanced licence information

Participants are asked to check how many of the single and floating licences they manage are currently used, and how many are available, and how many have been allocated. These packages are different from the ones used previously on task three.

Task 5: Advanced licence management

Participants are asked to change the email of one of the users under the floating licence, and revoke another users' rights to all the products they previously had access to.

The benefits of using a practice task are to alleviate the nerves of taking part in the usability study. The fact that the two groups share a task allow us to inspect the basic licence information retrieval in more detail, which can be assessed to be one of the most important functions in the licencing portal. Other specialist tasks mainly utilize other common courses of action, such as finding when their licences expire.

For administrators the emphasis was placed on user management and inspecting active orders. These are necessary operations for example to assess the current usage of orders to possibly increase user pools. If the company has changes in personnel, the administrator should be able to alter the user pool with ease or allow access to a new product introduced to workflow.

3.1.4 Metrics

The study focuses mainly on qualitative aspects. However, quantitative is used to support the claims done with qualitative data. Participant comments during and after the task were prompted by the observer if they did not come naturally, meaning that if the user seemed to be struggling with a specific part of the task, the observer asked what is it that they are trying to achieve, and where would they expect to find this specific functionality. Qualitative feedback is easier when the participant is social and relaxed, so the process of gathering of gathering these comments was slightly adjusted according to the participant.

The metrics were chosen on the total picture they paint of the usability, not necessarily how they function alone. Since our aim was to understand the current usability of the licence management portal, there were no baselines to compare it to, or requirements that should be met. These requirements, such as meeting certain numerical benchmarks do not function in qualitative research in general. Hence the metrics could be chosen in a way where we could answer our research questions as well as possible. All the metrics collected are summarized in Figure 4.

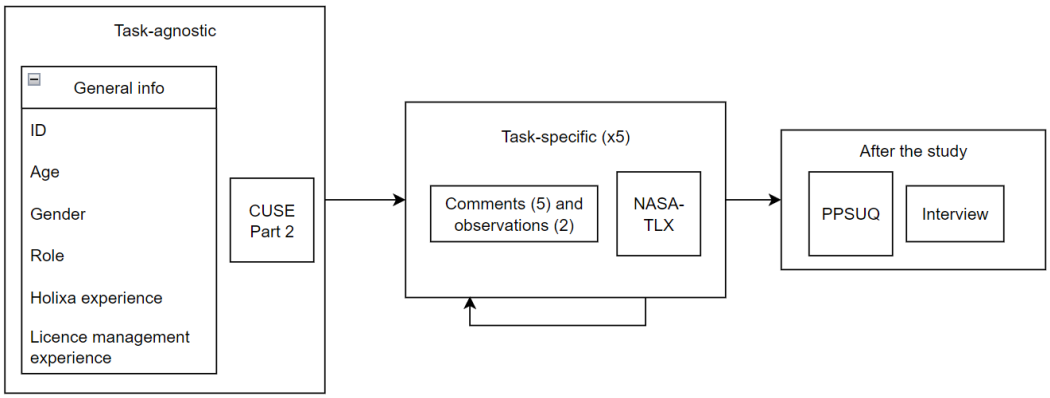


Figure 4: Summary of all the metrics collected in the study.

Before diving into specific metrics and their reasoning, the overall picture that the metrics represent should be considered. In the book by Tullis and Albert (pp. 48-55, 2013), a variety of different usability study scenarios are presented, where each comes with the recommended metrics. The book however highlights the importance of developing metrics for a specific study. In our case the study could be labelled as a combination of "problem discovery" and "creating an overall positive user experience" (Tullis and Albert, pp. 52-54, 2013).

Problem discovery is recommended framework when the product has not gone through usability testing but has already been built (Tullis and Albert, pp. 52-54, 2013). The goal is to leave tasks open ended and tailored for specific scenarios and consider possible usability issues by their frequency and impact for each participant. This combined with the strive to create an overall positive experience, means that it is important to also measure the final thoughts, to show how the participants felt about the system after all the tasks were completed.

Task-specific (during or after each task):

Success rate:	**{No problem, Minor problem, Major problem, Failure/gave up}** (Tullis and Albert, 2013, pp.70–71)
Time elapsed	**$t \in \{0,..,tasktime\}$**
Mental load	**$x \in [0,100]$ NASA-TLX in Finnish Appendix A.3**

Lostness	**x ∈ {Not lost, Slightly lost, Very lost}**
User comments during task	**Verbal feedback encouraged during and after the task collected by the observer.**
Observations	**Observer notes participant behavior during task like Appendix A.6.**

Success rate was utilized to gain an understanding of how many problems the participant encountered during a task. There are a variety of ways to define success, and in this study, we utilized a 4-point scoring system, where each level is clearly distinguished (Tullis and Albert, 2013, pp. 71-72). No problem meant that the user did not encounter any issues while completing the task. Minor problem meant that the participant encountered small problems but could manage to solve the issues without observer comments. Major problem meant that the participant encountered issues that required guidance from the observer, gave partially wrong answers because they could not find the required information, or spent a lot of time going back and forth finding a specific functionality. Failure in this study meant giving up the task. This parameter was aimed to measure effectiveness regarding usability, which is a common way to measure it (Weichbroth, 2020).

Time elapsed was the amount of time the participant took from reading the task description to claiming it complete, aiming to gain an understanding of the efficiency of the portal. This was derived from the recordings and was rounded up in 15 second intervals. This was because in the context of the study, we did not consider it of great importance how long exactly the task took, and only wanted a rough estimate. The task time contained the possible discussion during the task if the participant was encountering major problems. Therefore, it should not be assumed to reflect the exact time the participant would take to complete the task in a normal setting.

Mental load utilized a NASA-TLX (Appendix A.3) in order to gain a grasp of the participants required effort to complete a specific task (Hart and Staveland, 1988). While not always recommended in UX or usability studies because of its complexity, NASA-TLX allows task specific feedback that considers a variety of variables and allows combining them with different prioritization in the form of weights (Laubheimer, 2018). Since we had only five tasks to complete, the number of times one had to fill out NASA-TLX was quite low, and allowed a slight cooldown period between tasks, where the observer could finish writing their notes.

While in licencing management errors do not have as high consequences as in the medical or aerospace field, when done with a large user pool and a variety of software can have a companywide impact. Hence the possible errors can also mean that parts or an entire company is locked out of a specific tool, which they might need to use daily. If the portal requires high mental demand to use, and the process is frustrating, errors and misuse of the tool are more prominent.

The weights used for NASA-TLX were the following: Mental Demand 35%, Physical Demand 10%, Temporal Demand 10%, Performance 10%, Effort 15%, and Frustration 20%. These weights were chosen to gain insight into satisfaction aspect of Usability. Since NASA-TLX contains variables for a variety of factors, it can also be considered when looking at other parts of usability.

Lostness was inspired by a measurement mentioned by Tullis and Albert (2013, pp. 89), but tracking the exact number of pages to calculate a numerical value proved tedious, since the study often required the user to visit multiple pages multiple times. Hence the thresholds were defined as follows: Not lost meant that the user only went to the pages that had to be visited to complete the task. Slightly lost meant that they for example confused two pages, or misremembered a location of a functionality, which resulted in unnecessary pages visited. Very lost meant that the user had to be guided to find the right functionality, and often had major problems or failure at completing the task. This along **time elapsed** gave an insight into efficiency.

User comments during task and **Observations** were a key focus of task-specific metrics. Utilizing Appendix A.6 outline, most of what the participant said was written down as task specific notes on a tablet by the observer. Observations included physical and verbal cues about how the participant was feeling during the test, for example frustration, confusion, lots of clicking or delight. Depending on the task, comments ranged from two to ten, of which the most relevant were moved into a spreadsheet, explained in more detail at the data-management section. Observations for each task contained one to two notes. These are used to measure especially the satisfaction aspect of usability.

Comments were gathered utilizing the concurrent think-aloud method, where participants were asked to narrate their actions and choices while conducting tasks. The think-aloud method allows participants to express why they assume a functionality is behind a specific element, or what they assume will happen after clicking a button. The method is flexible and robust, allowing the observer to gain valuable insight even if the study was otherwise

unsuccessful (Nielsen, 2012). This is why a large fraction of qualitative research utilizes it.

The think-aloud method also has drawbacks (Nielsen, 2012). Utilizing this method puts most people in an unfamiliar situation, since they most likely have not been speaking aloud about their actions for long periods of time. The thoughts they express might not be their actual thoughts, and instead a filtered version because of the social situation they are in. On top of this clarifying questions during the study might cause the user to change the way they see the task or situation, altering user behaviour and creating a bias.

Therefore, during the task itself we did not ask clarifying questions and saved them for after each task. The only comments the observer gave were if the participant was stuck or if they did not utilize the think-aloud method enough. In the case of an observer comment related to problems, it was written down and had an impact on other task-specific metrics. Prompts to speak more about functionality were rarely required, since most of the tasks were so short that the users managed to keep the monologue going for the entire duration.

Task-agnostic (single time):

Before the study:

Age	**x ∈ {18,..,67}**
Gender	**{Male, Female, Other}**
Role	**{Specialist, Administrator}**
ICT self-efficacy	**x ∈ {30,..,180} CUSE Part 2 in Finnish Appendix A.2**
Previous experience using Holixa	**{none, < 1 hour, > 1 hour}**
Previous experience related to licence management:	**{none, novice, professional}**

The general information about the participant was collected in a singular form shown in Appendix A.1. This contained **Age, Gender, Role, Previous experience using Holixa** and **Previous experience related to licence management**. This information was collected to gain an understanding of the participant background and see how wide of a range of possible users the study covered. Since the study had only seven participants, the differences, for example between different age groups, will not be very

representative. The experience with Holixa range was chosen in this manner, because during the initial screening, none of the participants were allowed to use Holixa in their current roles actively. The previous experience with licence management was used to gain an understanding of whether the Role 2, administrators, had used licencing management software. The novice was defined as having to at one point or more in their career to control in-house or client licences. Professional meant that it was something they did at least monthly.

The **ICT self-efficacy** was used to gain an understanding of how the participants viewed their work with computers. For this purpose, the Computer Self-Efficacy Scale (CUSE) was used. The CUSE is in two parts, out of which we only utilized the Part 2 questionnaire (Appendix A.2). Part 1 in CUSE is basic information collection, like what we collect in general information form. The exception being that CUSE part 1 also collects information about what type of software participants have used, such as databases, spreadsheets etc. This was not necessary for this study, and instead the general information form served a similar purpose, where our goal was to gain understanding of licencing specific experience.

Part 2 of CUSE has 30 questions, each utilizing a scale of 1 to 6 (strongly disagree to strongly agree) Likert scale. Out of these questions roughly half are reverse coded, and when calculated give a value between 30 and 180, of which for example software engineers reach mean of 159 (standard deviation ≈15), and nurses reach 101 (standard deviation ≈30) (Cassidy and Eachus, 2002). These benchmarks are 20 years old and might not be as accurate in the current digitalization heavy climate. They are merely used as a guiding value in the study of how sure or unsure the participant is with their ICT skills. The questionnaire is also translated into Finnish, and while the wording was kept the same, the exact context could change slightly between languages.

After the study:

Usability of the site	**$x \in \{1,..,7\}$ PPSUQ Survey in Finnish Appendix A.4**
Verbal system feedback	**Short, semi-structured interview (< 5 mins) in Finnish Appendix A.5** • How did they find the Holixa portals user interface and outlook in general?

	• Compared to other licence management systems they have used, how did Holixa perform? Ask whether or not they can mention these systems? • Do they have any requests regarding the portals' features or general feedback not already covered? • Would they consider using the portal on a mobile device? (Sample size of N=5 participant).

After all the tasks had been completed, the participants were asked to fill out a Post-Study System Usability Questionnaire (PPSUQ) in Finnish (Appendix A.4), that measures the overall usability of the system (Lewis, 1992). The PPSUQ utilizes 16 questions (Version 3), with 7 options to choose from (and N/A). Because the tool that we used to create PPSUQ did allow eight values with one being a string, the users were asked to mark the N/A as four and notify the observer when this happened. This was used only in questions about error handling, and the subject did not encounter any errors.

PPSUQ can be further divided into three parts, System Usefulness (SYSUSE), Information Quality (INFOQUAL) and Interface Quality (INTERQUAL). This allows observing how each part of the usability rated compared to one another. The PPSUQ score and its subparts are all rated on the 1 to 7 scale, where 4 is neutral, but scoring above or below 4 does not make the system worse or better than average system. Instead, merely that the lower the score is, the better the usability (Lewis, 1992).

System usefulness (SYSUSE) contains questions directly related to the subjective effectiveness and efficiency of the portal, such as *"I believe I could become productive using this system"*. It also considers satisfaction with the performance of the portal, helping to create an understanding of the collective performance on the portal at the end of the study.

As the final metric, participants were asked to answer a few questions about the licencing portal in the form of **verbal system feedback**. The questions were chosen based on the general questions thrown around when designing the study and gathering information about the portal. The first question is used to get an understanding of the general feeling of the user interface and

outlook, which allows the participants to express whether they find it visually satisfying. The second and third questions are aimed to get their views on the current functionality of the portal compared to the previous licencing management tools they have used, and to provide additional requests that can be considered in the thesis. Interviews covered effectiveness and efficiency by asking questions about the current functionality, and if there were any additional features the participants would like to request.

Lastly midway through the study, we started asking questions whether a mobile UI is important to the possible users, since the current mobile UI does not scale very well on different devices. This interview also provided opportunities to return to earlier suggestions and re-raise them after all the tasks had been completed.

3.1.5 Experiment Design

The testing was designed to be conducted in person at the company's office. Each session except the initial pilot was conducted in the same sound proofed room, which was seen as the best available option. The study session was designed in a way where it could have been conducted in any modern office, for example at a client location, but this was not necessary at the end.

The whole structure of the study was designed to take an hour, where administrators (Role 2) were expected to take slightly longer to finish the tasks. The workstation was the same for each participant, and the only thing they were asked to bring along to the study was their mouse. This was to give at least some sense of familiarity while operating the system.

The workstation was the observers work laptop, where we had a remote desktop running utilizing Windows 10 OS. For recording we utilized ShareX (ShareX, 2023), an open-source screen capturing software. The tasks used were written in a LibreOffice Writer (LibreOffice, 2019) document, which allowed the user to note things such as their generated ID and mark the consent box for the usability study. For the observations, a Samsung Tablet combined with Microsoft OneNote was used. The OneNote also contained Appendix A.6 for each task. All the used forms were created utilizing Microsoft Forms, which operates through a web browser and allows exporting the data in a .CSV file.

The benefit of using a modern office room for the usability study was the availability of a television, which could be used to mirror the content of the laptop screen as shown in Figure 5. This made observations and discussions a lot easier as opposed to standing behind the participant and observing their screen. Having the ability to stand on the right side of the room without

invading their personal space and blocking their view made the study setting less tense from the observers' point of view. The room itself allowed the participants to turn off the display to the television as they answered questionnaires and surveys, which could reduce the amount impact the observer would have on the results.

Figure 5: The room the usability testing was conducted in, highlighting the ability to turn the display on and off.

3.1.6 Data Processing

After each participant had completed the user testing, the results were processed during the same week into separate spreadsheet files. Because of the way we collected forms, we could export the results as separate .CSV files for each form. This however meant that our two roles' data would have to be separated later by id and role, since they used the same template. The comments were analysed by reading the notes, viewing the recording, and filling out task-specific metrics into a spreadsheet. For each task, we had two observation columns, and five comment columns, which did not have a set word limit. Since our sample size was small enough that we did not have to conduct mood analysis or similar, we could have a single comment contain both positive and negative remarks about a specific functionality.

The semi-structured interviews were collected as separate rows inside the same spreadsheet as other comments and task specific values. They were however marked with a T instead of a task number, which allowed them to be identified as interviews, and extracted separately when creating the data tables for further analysis. After that data had been processed into the spreadsheet, the recordings were deleted, along with the original notes.

To analyse the spreadsheets and make visualization easier, we utilized Python Jupyter notebooks. This open-source environment allows us to import libraries such as Pandas that can be used to convert spreadsheets into data frames. These data frames can be manipulated easily to combine all the results, which can form views that only contain one of the roles, and for example only certain task.

The CUSE Part 2, NASA-TLX, PPSUQ and general information (A.1-A.4) forms were created utilizing Microsoft Forms. The form values were calculated from the exported .CSV using a Python script. As a result, we gain numerical values for each participant.

Each of the surveys used that have an output have a specific function implemented utilizing the guidelines given in each of the respective literatures. These are quite simple things to implement, such as checking if the question number is in the reverse coded list, and then changing the way its value is applied to the total score of each participant. Therefore, no existing libraries were used to grade these implementations. Each of the function's outputs were checked on a few random participants, to make sure the implementation is correct. There are a total of four final data frames, two for each role, one consisting of all the task related data and one containing the interview related data. Both contain the general information, such as PPSUQ score, experience with Holixa and participant specific id as shown in Table 2.

ID	Task	Success	Lostness	Observation1
Observation2	Comment1	Comment2	Comment3	Comment4
Comment5	Time elapsed	NASA-TLX	Gender	Role
Age	Licence exp.	Holixa exp.	ICT-score	PPSUQ
SYSUSE	INFOQUAL	INTERQUAL		

Table 2: All the columns of the task specific data frames, which are then split into smaller views for easier analysis.

3.1.7 Data-Analysis and Modelling

Since the nature of the data is both qualitative and quantitative, we need to analyse both. Regarding qualitative analysis, we will look at specific quotes by the participants and how they relate to other forms of collection with the

triangulation method. For the quantitative data, we will be running the Mann-Whitney U tests when applicable and visualize the data, showing statistics such as standard deviation, mean and deviance.

Taking the general themes around the comments and observations that repeat across participants can help us gain an understanding of the most pressing issues. We will be looking at what point of the tasks the participants got lost and what caused the problems. These are written in the observations and comments of each task. To analyse the final data overall, we can use methods such as triangulation (Whitenton, 2021) to see how the different metrics compare to one another.

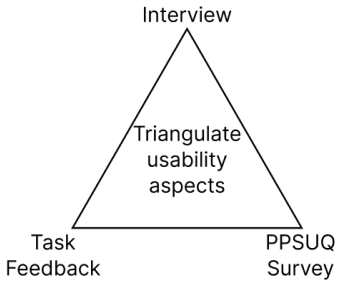


Figure 6: Triangulation uses multiple methods to increase credibility of the claim (Whitenton, 2021).

The semi structured interviews can be used in the triangulation method (Whitenton, 2021) to confirm the assessments done by surveys and qualitative/quantitative aspects collected during the study. This is shown in Figure 6. While the source of the data is the same on each corner of the triangle, which is the participants of the study, applying multiple methods should provide credibility to the claims made. Usability's aspects are tightly linked together, but we can start by considering the state of usability from the point of view of effectiveness and efficiency. The interviews were done after all the tasks were completed, and the participant had filled out the PPSUQ survey.

Mann-Whitney U test is a way of assessing whether given test groups are from the same population. Opposed to for example students t-test, the Mann-Whitney does not require the population to be normally distributed, which makes it easier to utilize for lower sample sizes and hence our thesis. The test is meant to be done for independent samples and looks for a mean difference between the two groups rank sums, meaning when the samples are ranked by their order, is there a difference in the mean. The output p value shows whether the two populations mean are statistically different, and the null hypothesis can be rejected e.g., that the samples are drawn from the same population. It should be noted that because of our low sample sizes (N=3 and

N=4), even if the p value is low enough, it might not be representative of the same phenomenon on bigger sample sizes.

4 Results

The goal of our study was to find what the current state of usability is for the Holixa licence management portal. The study was divided into two roles and five tasks, of which three tasks were unique to each role, and two were shared, one of which was a practice task. By conducting the study in this manner, we can look at these two roles as independent entities with their own requirements. Our secondary goal was to gain an understanding whether the portal contains all the functionality the users except to be there. What each users excepts is highly subjective and depends on a variety of factors. All the data collected was in Finnish, hence the answers the participants gave have been translated into English.

The results are divided into subchapters. In the first chapter we explore the qualitative feedback from each of the tasks combined with some quantitative data. In the second chapter, we investigate how these observations from the tasks combined with the definition of usability, the obtained PPSUQ scores and the interviews come together to give us an overall assessment of the usability. Finally, in the third chapter, we look at possible alterations and additional functionalities that could be implemented to improve the usability of the site. It should be noted that the quotes presented in this chapter are translated from Finnish, and are not word of word, instead paraphrasing as close to source as possible from the comments written during the study. The original quotes in Finnish are not shown, since the while the th

4.1 Analysing Tasks

The study contained N=7 participants, of which N=2 were female, and N=5 male. Specialists (Role 1) contained a sample size of N=3, of which all were male. Administrators (Role 2) contained N=4 participants, of which N=2 were female, N=2 male. The rest of the basic information collected is shown in Table 3 and 4. Because of the small sample size, these values are not representative of the population or the demographic and are merely there to gain an insight into the type of participants this study contained.

Role	Age	Gender	ICT self-efficacy	Exp. with Holixa	Exp. with licence management
Specialist	28	Male	172	< 1 hour	None
Specialist	26	Male	160	None	None
Specialist	26	Male	110	< 1 hour	None

Table 3: Each specialists general information.

Role	Age	Gender	ICT self-efficacy	Exp. with Holixa	Exp. with licence management
Administrator	25	Male	156	< 1 hour	Novice
Administrator	37	Female	167	None	Novice
Administrator	25	Male	142	< 1 hour	Novice
Administrator	27	Female	156	None	Professional

Table 4: Each administrators general information.

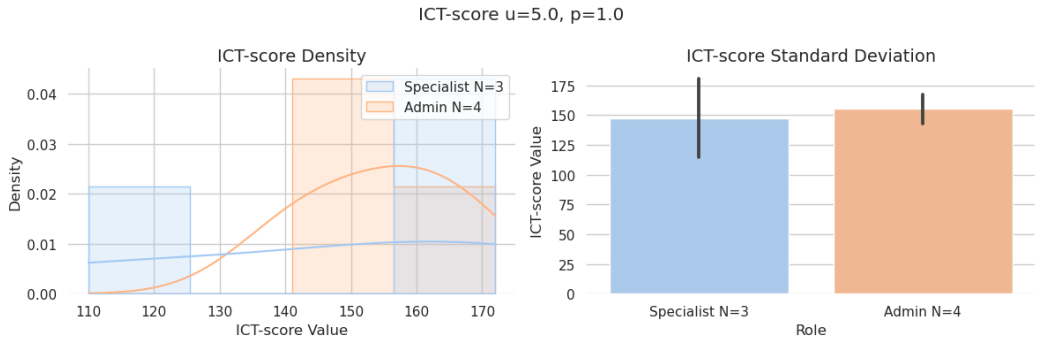


Figure 7: ICT self-efficacy scores visualized and the Mann-Whitney U test results.

As expected for participants working in digitalization, the self-evaluated ICT scores are quite high. This is roughly in line with the benchmarks provided along the CUSE (Cassidy and Eachus, 2002). The gender distribution is skewed towards men, which can partly be attributed to only 20% of IT-field employees in Finland being women (Parkkonen, 2021), with the number being even lower in most of the European countries.

The Figure 7 shows that the Mann-Whitney U test ranked it with a score of 1, implying there is no significant difference between two groups. However, because of our small sample size, this does not imply that generally the two groups are identical in their ICT-skills. We can see that the standard deviance for specialists is much higher, which can be attributed to the smaller sample size, but also to the singular person who scored themselves quite low compared to all the other participants. This assumption is supported by the high U value. Therefore, the ICT self-efficacy score can be used on a singular participant level but should not be used to make broader claims about the two groups.

The somewhat low mean age in my opinion can be attributed to younger workers being more eager to take part in research, and their schedule allowing it at the beginning of their careers. This also means that the study is biased towards the younger demographic, creating a clear weakness in representing the entire clientele using the portal.

When the information about the participants is displayed in the following chapters, their order differs from the Table 3 and 4. This is so a singular comment or value cannot be attached to a specific person taking part in the study.

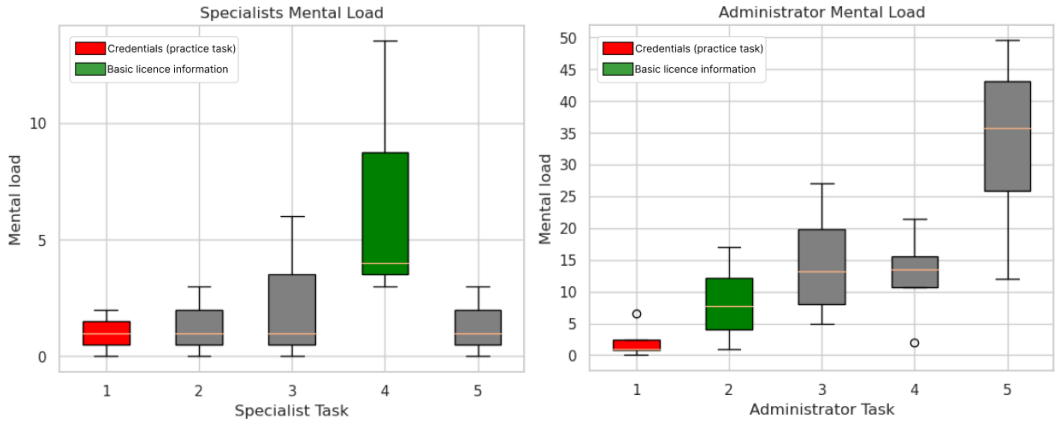


Figure 8: Mental load distribution for each task for both specialists and administrators. The same tasks are colored on both plots.

Figure 8 shows us the distribution of mental load for each task. Since the tasks were different, the two groups cannot be compared directly, but the values give us a vague understanding of how the two groups perceived their respective tasks. The shared tasks are marked with specific colors and explored further below. We can however state from the plot that administrators found their tasks harder than specialist. Especially task five stands out, showing that for these administrator participants, this is the task they struggled most with. In the following chapters, we will look into whether this was because the tasks themselves were more difficult and required more effort, or if there were specific problems with the tasks that increased these values.

4.1.1 Specialists (Role 1)

When looking at the participants of the study in Table 3, we can see that all of them are quite similar, with one outlier having a much lower ICT score than others. This could be explained as a confidence or awareness factor, since this participant actually did tasks faster and more successfully than either of the two other specialists. When it comes to previous experience with the licencing management portal, the two with less than an hour of

experience had opened the portal with their account, but never used it to check or manage licences.

In the shared tasks chapter, we go through the specialist tasks 1 and 4. Hence this subchapter addresses tasks 2, 3 and 5. Task 2, where participants had to change password through navigating to their profile, did not raise any requests. Everyone assumed that the passwords would be changed from the profile section, with one participant stating, *"I would first go to the profile on the top-right corner, I will be surprised if it is not there"*. One of the other participants mentioned that they initially thought that changing a password would be under the profile submenu, instead of its own button in the dropdown. The mental load as shown in Figure 8 was considered very low on average.

The same trend followed with task 3, where participants had to find the download button under my licences. All three participants located the button with ease, stating that my licences was the most obvious submenu: *"The placement and the text in my licences is good"*. Two of the participants were surprised that the portal had this functionality, but saw it as a good thing. One of the participants wished that the *"...download link could open as a separate tab, now it replaced the existing window"*.

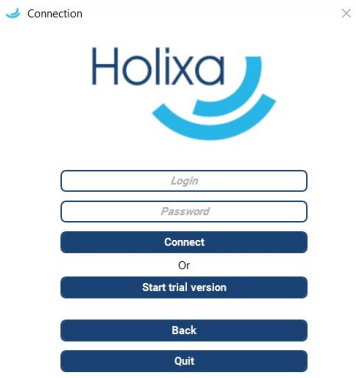


Figure 9: The desktop login for the licencing software.

The 5th task, where participants had to utilize their licence using desktop software was also completed quickly by all participants, with one stating *"No insights here, pretty straightforward"*. The only idea that was raised during the tests was that *"the login should be done using the web browser as many other software do"*. This would allow the passwords to be automatically filled out there, as many modern browsers do. Currently as seen in Figure 9, the desktop login is a separate entity. Having the desktop login linked directly to

the web-based portal would remove the need to dig around a password and login details and move them manually. However, the software users only need to input their login information once, which is then saved as a token on the local machine. The web-based authentication is a valid request and should be considered when the licencing system is developed further.

The specialist took roughly 45 minutes to complete the entire study. No strongly negative comments were stated in the three tasks addressed here. The task four for specialists however did raise some more negative comments and observations, stated in the next chapter.

4.1.2 Shared Tasks Between Roles

Both roles had two of the same tasks, the initial practice task, and the retrieval of basic licence information task. For both groups, the licence page contained the same products required for this specific task, and their user interface was the same. The difference was that for specialists this was task 4, and for administrators this was task 2. Specialists did not gain any additional information about the site from their second task since it was about account management, but the third task could have helped them, since the download functionality is found in the same view as task 4 is conducted. These additional tasks could also have helped specialists get more familiar with the process of the study. This might have led them to rate their mental load a bit differently, or allow them to be more relaxed, hence more verbal.

The shared tasks allow us to have a sample size of N=7, which makes quantitative metrics more significant. Therefore, they are stated in this chapter in more detail, as opposed to 4.1 and 4.3. The focus in this chapter is still on qualitative observations, and trying to explain why most of the participants were faced with similar issues.

The initial practice task does not contain any observations and took roughly one minute for each participant. The mental load measured by NASA-TLX was very low, hence the task did not require much of an effort from the given participants. Most of the observations during this task were about the initial mood of the study, such as stating whether someone was anxious, talkative, relaxed, or nervous. Two of the participants initially changed the site to be side by side with the task document, but only one of them kept it the entire session. The other participant stated that *"The navigation bar looked off"*, hence they returned to the original view.

Task 4 / Task 2: Basic licence information

Participants have a few active personal licences (both single and floating) in the portal. Participants are tasked with finding out which licences are currently active in the portal (by expiration/start dates), and whether any of them are expiring in 2023.

Task 4 for specialists and task 2 for administrators was the first one for both where large number of comments and observation were written. Out of the seven participants, N=5 encountered major problems, and N=2 encountered minor problems. Figure 8 shows us that the mental demand was roughly the same for both groups. None of the participants answered a part of this task correctly. This however was not considered as a failure since the subtask was somewhat impossible to answer without knowing the full context.

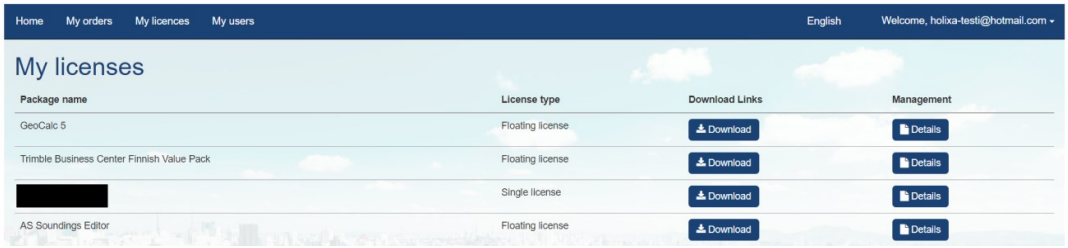


Figure 10: My Licences page in Holixa portal.

In Figure 10 we can see the initial view the users are greeted with when entering this submenu. All the participants chose the right menu on the first try, despite later confirming that the difference between my orders and my licences in the navigation bar was confusing, with one asking after the task *"So what was the difference between my orders and licences? They look the same"*. The fact that all participants chose it right but got confused later could be attributed to the fact that the question contained the word "your licences", which prompted them to choose the right menu. The initial observation by many of the participants was the lack of dates or any sort of label whether the licence was active *"So the dates are probably under details"*. This led to one participant making the remark that *"So most likely all the licences shown in here are currently active"*.

After navigating to the page shown in Figure 10, participants clicked open the "Details" submenu under "Management" column in Figure 10. Depending on the type of licence, they were either greeted with the single licence view, or the floating licence view. These are shown as Figure 11 a) for single, and b) for floating.

Figure 11 a) View of "Details" when choosing a single licence type.

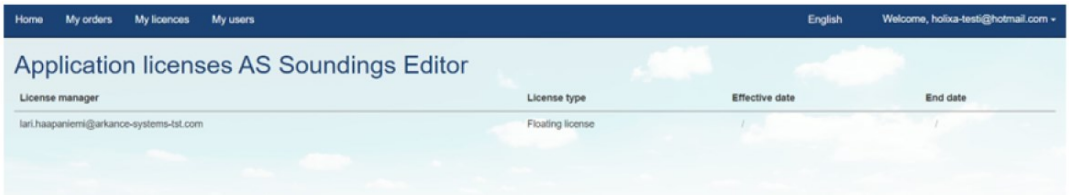


Figure 11 b) View of "Details" when choosing a floating licence type. Note the missing dates.

The single licence Figure 11 a) activation caused no problems, though most participants wished that there was an easier way to find out which licences were active and which not, instead of trying to figure out if today's date is between the start and end: *"I think there could be some green light or similar if the licence is active or not, instead of having to check the date"*. The suggestions included *"have an additional column in my licences which include the current state of licence or a toggle for inactive and active licences in the table"*. Some participants also thought that the details panel is not necessary, since all the current information could be displayed on the my licences page with some rearrangement.

The biggest problem that arose was the floating licence start and end date, or the lack of such a date as shown in Figure 11 b). This led five out of seven participants to believe that the licence was always active, and two to believe that it had yet to been activated. One participant stated confusion by pondering *"So there are no dates for some of these while others have them, what is the difference..."*. Some participants at this point navigated to my orders page, which did not contain any additional information about this specific functionality and looked drastically different for specialists and administrators stating, *"I should probably not be here right now"*. This was because administrators had orders they needed to manage, while specialists did not. A lot of theories were put forth about what these meant, but no one guessed the exact meaning.

The dates in Figure 11 b) meant that the licence was not currently being borrowed by them, and they had no access to the actual start and end date of the licence, hence no way of knowing whether the licence was active. This might appear as a way to mislead the participant, but since it was a feature of the site, we felt that it should be included in the study.

Despite the major problems and the slight lostness, the participants did not feel like this task was particularly demanding, which was reflected by low mental demand shown in Figure 8. There was no meaningful difference between specialists and administrators on this specific task, although administrators later had questions about the exact nature of my licences and my orders.

4.1.3 Administrators (Role 2)

As shown in the Table 4, the administrator sample size was N=4, with an equal number of both men and women participants (N=2). Of those, two had used Holixa before (but not to manage customer licences), and two had never used Holixa. Three of the participants had novice levels of experience licence management, while one was considered a professional. This meant that one of the users managed customer or internal licences for others at least once a month.

Administrators on average took 60 minutes to complete the study, which was 15 minutes longer than the specialists. This is both because the tasks they undertook were more difficult, but also required more time to complete. The tasks required the participants to manage user lists and explore multiple submenus. This is also reflected in the amount of data collected from administrators compared to specialists.

Task 3: Licence management

Participants are tasked with adding two accounts to a single licence package and five accounts to a floating licence package they are managing. Accounts are given in the document in plain text by their email address. The single licence package already contains a user, while the user list contains multiple, to make this task more representative of a real-world scenario.

Figure 12: The view of my orders, which is used to manage pools of users.

Figure 12 shows the functionality of managing orders under the my orders submenu. Most of the participants had trouble understanding the exact difference of my orders and my licences. This was because Figure 10 and Figure 12 can appear similar, but my orders are meant to control the access to packages, and my licences simply shows what products the active account has licences for. One of the participants stated: *"I had to continuously consider whether I had to click on my orders or my licences"*.

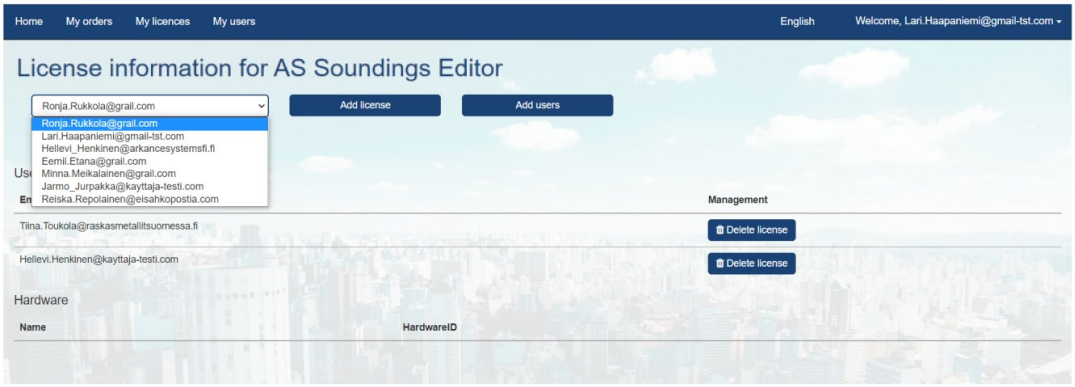


Figure 13: The sub functionality found in each package, under Manage my licences, where the dropdown represents my users list.

All the participants found the view in Figure 13 with ease, but two of the participants found it difficult to understand, stating *"I am not sure which button to click here"*. The problem was understanding the exact nature of adding a user, since there were two buttons: "Add licence" and "Add users". The correct usage was realizing that the current functionality of the site requires you to first add a user to the user list, after which you can add them to the licence by choosing them from the dropdown and pressing "Add licence".

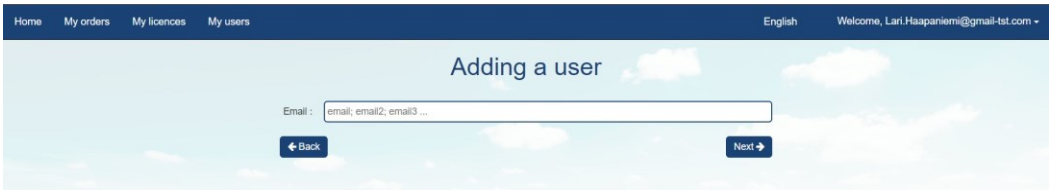


Figure 14: The view of adding a user under a specific licence, which is required if they are not found on the my users list (dropdown on Figure 13).

Every participant felt that adding a user from the Figure 14 should have added them straight to the licence, instead of requiring the extra step of choosing them from the dropdown. Some quotes included *"There is no need for the extra step if I add users this way", "This is a lot of clicking", "And now to find if the user is on the list or not..."*. Two participants confused by the view felt like there should be a clearer distinction between the two buttons in

the form of colors, placement, or icons, even if the functionality was kept the same.

Out of the four participants, one of them realized you can add multiple users at once, which was the administrator with professional levels of experience. This realization was marked with a quote *"Ok good, you can add multiple users, makes this easier"*. However, after they had used the syntax shown in Figure 14, they still had to choose each added user from the dropdown stating, *"Why did that not add the users?"* after adding users. They felt this was frustrating since the dropdown did not contain the ability to add multiple users at once. All participants felt like there should be more information about how to add multiple users on the page shown in Figure 13, including the one that found that functionality. One of the participants stated that "*There definitely should be a clearer way that you can add multiple users, maybe use a notification or something"*. Another stated: *"I would have never realized you can add multiple users"*. One participant also mentioned: *"The fact that when I add this licence to max capacity, and then the buttons disappear, is going to confuse some clients"*. This happened when a participant added the maximum users to a single licence.

For those that did not realize the adding multiple users' functionality, struggled with finding out which users were already in the dropdown, and which had to be added there, one participant stating: *"It is really hard to figure out who I have added to this list and who is still missing"*. This comment was accompanied by a frustrated chuckle. Each participant raised concerns about how the current functionality would work with larger user pools, where even tens of users could cause problems for the administrators, not even mentioning hundreds. Comments related to this included: *"It would be impossible to add 100 users with this", "Simple right now, but would be hard to do the same with like 20 people"*. Some of the participants also visited my users page, explored more in task 5, but did not use any of its functionality.

Task 4: Advanced licence information

Participants are asked to check how many of the single and floating licences they manage are currently used, and how many are available, and how many have been allocated. These packages are different from the ones used previously on task three.

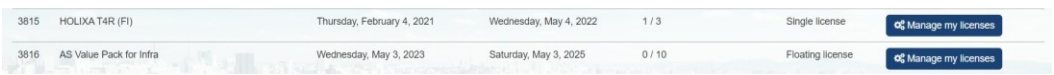


Figure 15: Difference between single and floating licence, which both contain one user.

To complete this task, the participants had to utilize Figure 13 and Figure 15 views. Even though there were some problems with the task, most participants had positive observations about this functionality. The positive observations were caused by the functionality shown in Figure 15, where the portal clearly shows how many licences are taken for a single licence, and how many are available. One participant mentioned that this was *"Easy to figure out"*.

The floating licences faced more negative comments, since it did not directly show how many people had been added to the licence, opposed to single licence. Additionally, there is no way to know in the licence management view which of the floating licence users are currently using the software, hence reserving it from the pool. The term floating also caused slight confusion. This can be partly attributed to the fact that floating licence and network licence are connected (Ferrante, 2006), and some of the participants were familiar with the term network licence. Some comments related to this task included: *"So can you explain again why the floating licence does not show the users, but the single does?", "This task was easy, but I wish there was some kind of explanation for the terms", "There should be three numbers on the floating licence or is that wrong?"*.

Task 5: Advanced licence management

Participants are asked to change the email of one of the users under the floating licence, and revoke another users' rights to all the products they previously had access to.

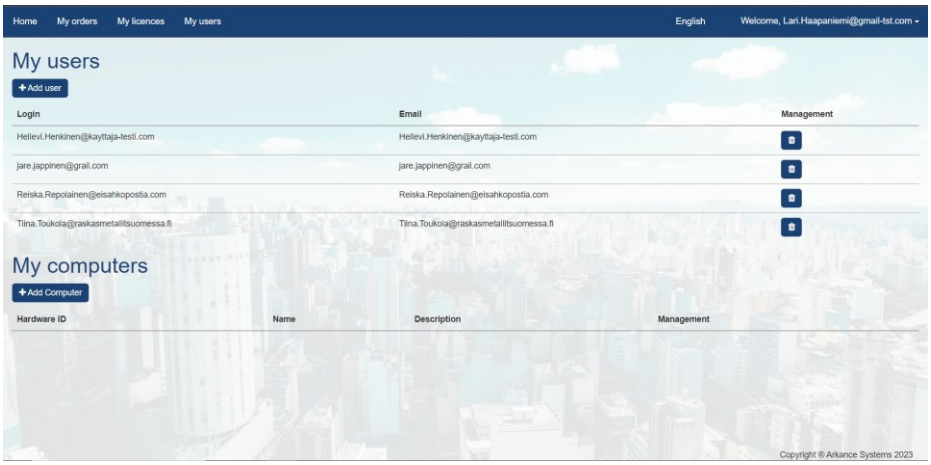


Figure 16: A list of users that the participants had at the start of the study.

In this task the users had to delete a user's access to all the software they had been given access to by the participants administrator account. This required the participant to delete them from my orders by checking inside each order, and then manually deleting them if the name was there. However, the users assumed my users page, shown in Figure 16, functioned as a tool where you

can manage users across orders: *"So here I can delete users from all orders, or does it give me a selection?"*. Hence they assumed deleting it from my users would be enough to revoke their access to the products. This however is not the case, my users list simply works as a preset list, which contains the information in the drop down shown in Figure 13.

Some participants would have outright failed at this point without the next part of the task, since not everyone checked if the user had been removed from my orders page. The next part of the task required the participants to update an email of one of the users. However, the functionality in Figure 16 does not provide this feature. This meant that for the administrator to update an email, they had to add the new account with the new email and manually switch the new account with the old account in each order. This is when the participants realized that the account that they assumed was deleted, still showed up under the licences. Some of the observations and comments are shown in Table 5, where each is from a singular participant. Most of the participants brought up usability problems.

Observation	Comment
The participant was frustrated, and wished there was mass movement of accounts and licences	*"There should be the ability to tag specific users, so you can move them in the groups. Obviously this would require the movement between licencing orders to work better, but X licence management software has this, and it is very useful".*
Asked whether they had to fully complete the task, since they understood what they had to do.	*"It is really hard to know what orders I have already visited and which I have not."*
Initially thought the task was easy, but realized that it was not after they found no way to change the email.	*"I wish there was a way to interact with specific users more. Like a user specific page, where I can see their licences, change their info and stuff."*
The participant was visibly annoyed.	*"There should at least be a notification, or something related to the nature of my users page. Like when I delete something, it should mention that this actually does nothing to the orders."*

Table 5: Observations and comments given by administrators related to task 5.

When talking to the participants, it is *"not unusual for licencing manager to not allow changing an email address of a user"*, even though it is somewhat

common occurrence. Changing an email might be required when someone gets married, or the company changes domains. What made this frustrating for the participants was the fact that there was no way to move the licences of one account to another, or even see what licences a specific account had. Since the delete dialog does not mention that any licences are left behind for this specific account, or that there is no mention of the exact nature of my users page, left many frustrated: *"This combined with adding users makes this really difficult to use for large orders"*. This task raised a lot of requests, which are visualized in the chapter where we propose possible changes to the interface.

Out of the administrative tasks, this one took the longest to complete for this et of participants. Mental demand was the highest with a mean value of 33.3 shown in Figure 8. Each of the participants faced major problems and were very lost. While our sample size is small not does not imply that its representative of a larger sample size, highlighting these should back up the verbal feedback received in this task when it comes to this participant sample.

4.2 Usability of the Site

The usability as per the ISO 9421-11:2018 includes effectiveness, efficiency, and satisfaction. The tasks completed by the participants and their feedback shows that there is a clear difference of usability between specialists and administrators. Obviously having a more challenging task requires more of an effort, but that combined with negative feedback, multiple functionality requests and clear signs of frustration such as sighing, excessive clicking and groans proves that this difference cannot only be explained only by the difficulty of the task, but the tools and functionalities for completing them.

Role	ICT self-efficacy	PPSUQ	SYSUSE	INFOQUAL	INTERQUAL
Specialist	172	1.86	1.83	2.25	1.33
Specialist	160	1.79	1.0	3.25	1.33
Specialist	110	1.36	1.16	1.75	1.33

Table 6: Each specialists respective scores. Note that the lower the PPSUQ scores are, the better the usability.

Role	ICT self-efficacy	PPSUQ	SYSUSE	INFOQUAL	INTERQUAL

Admin-istrator	156	4.38	4.67	3.83	4.67
Admin-istrator	167	3.06	2.83	2.67	4.00
Admin-istrator	142	5.75	5.17	6.33	5.67
Admin-istrator	156	4.71	4.5	4.75	4.67

Table 7: Each administrator's respective scores.

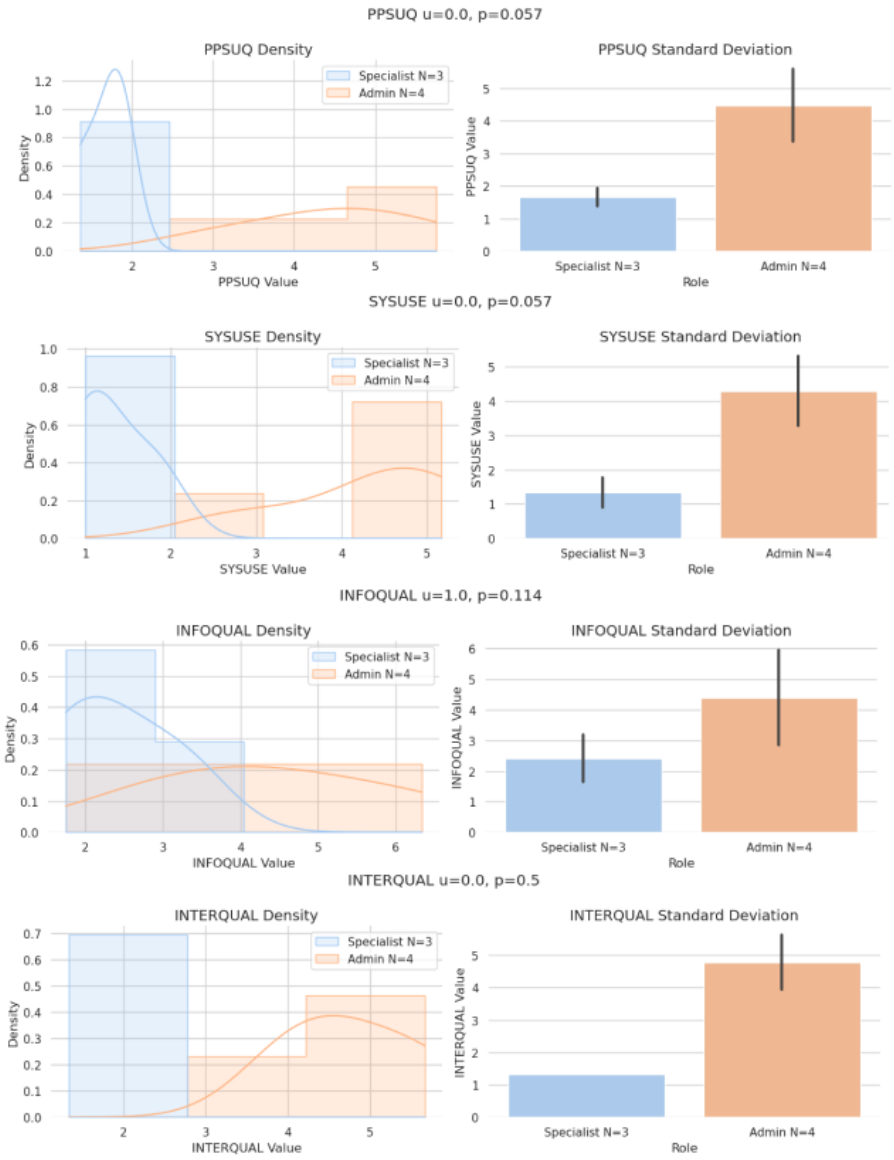


Figure 17: The difference between the specialist and admin PPSUQ values accompanied by results from Mann-Whitney U test. None of the statistical

tests give us high enough p value to imply statistical significance if the threshold is set at $p < 0.05$.

When looking at the Table 6, Table 7 and Figure 17, it is important to note that because of the limited sample size, these are not representative. They are merely used to highlight how differently the two roles view the usability of the site. The lower the PPSUQ and its sub scores (SYSUSE, INFOQUAL and INTERQUAL), the better the site's usability according to that specific participant.

When looking at the difference between the two groups, and the difference between each sub value, it would suggest that in this sample the usability is better for specialists than the administrators. This is reflected for example by the SYSUSE score, which also had a p value of 0.057 and a low U value, bordering the 0.05 threshold which would allow us to claim that there is a significant difference between the two groups, and hence would work as statistical proof that the state usability of the groups is different. This would have been also backed by requests to allow easier methods to manipulate user lists in tasks 3 and 5 for administrators. To evaluate different aspects of the usability, we will employ the triangulation method shown previously in Figure 5.

The problem with these claims is the fact that administrative tasks were objectively harder. They require more of a mental effort as shown in Figure 8. Therefore, the question is asked whether the fact that the site tasks were more demanding is because of the workflow being more difficult, or if it was because the portal made them more difficult than what the participants perceived as reasonable. The observations given in the tasks section and at the beginning of this chapter give concrete examples of how the participants felt like the portal could be improved to make these tasks easier, which would support the claim that the portals usability issues increased these values. Next, we will look at effectiveness, efficiency, and satisfaction, which should allow us to further understand what went into these values.

4.2.1 Effectiveness and Efficiency

While the aspects of effectiveness and efficiency differ, in the case of the licencing portal, it is hard to talk about one without the other. To be effective, you must accomplish the goal accurately and completely. To be efficient, you must be effective while also using only resources required for that specific goal. Therefore, we will look at how finding information and utilizing it can be improved in the licencing portal.

The main ideas from specialists were related to how to improve the system information retrieval, such as the currently active licences. This is also

supported by INFOQUAL at Table 6, also weighing heavily on the perceived effectiveness and efficiency. The information quality from the perspective of administrators was worse than specialists in both observations and numerical values but does not stand out in a similar way from the other issues raised by administrators.

Information retrieval and quality is crucial when trying to achieve a goal. In the case of Holixa licencing portal, some information simply was not available to users, which made the tasks hard to complete effectively without prior knowledge or guidance. By following one of the definitions for success rate explained in metrics (Tullis and Albert, 2013, pp. 71-72), we established the effectiveness for both roles on each task. The lostness and success rates are shown in heatmaps in Figure 18 and Figure 19.

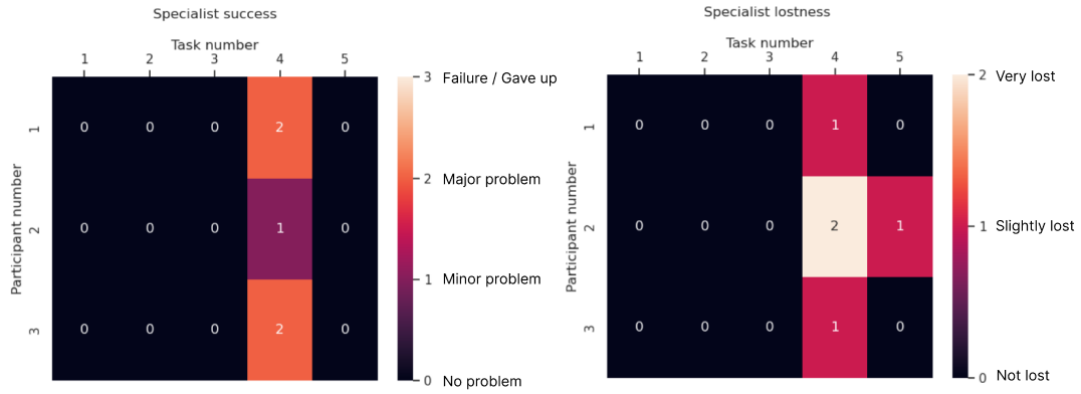


Figure 18: Heatmaps for specialist success and lostness for each task.

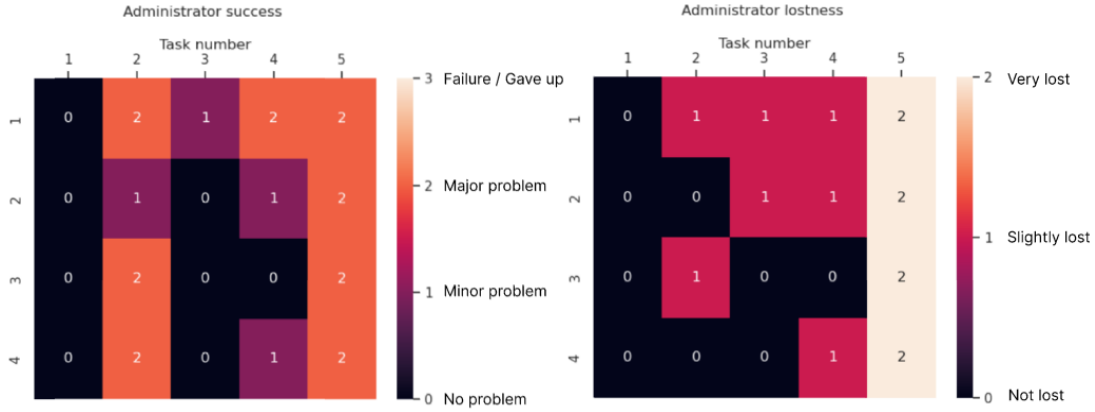


Figure 19: Heatmaps for administrator success and lostness for each task.

Holixa portal had positive feedback from the participants on the foundations and most of the basic features. In the interviews participants felt that it was *"easy to learn"* and *"there is no visual clutter"* or *"number of menus is makes this easy to digest"*. This allowed participants to complete most of the basic tasks efficiently and effectively. However, some participants wished for more

information on the landing/home page stating: *"The homepage has no real purpose at least on this account, maybe it could contain some information about terms or show statistics?"*.

A few participants (N=4) from both specialists and administrators questioned the purpose of the homepage of the site, and the button designated for opening it, instead of just a logo of the portal. Since the homepage was not customizable, and contained no information, the participants felt that *"it could do a better job at guiding to the portal's functionalities"*. This most likely also had an impact on the given INFOQUAL values.

Since licencing tools can be used quite infrequently, with as long as a year between use, the users might have to often start fresh. This means they can no longer recall exactly where each functionality was, hence relying on recognition (Nielsen, 2020). For this purpose, home page should be repurposed to guide users to correct areas of the site. Exactly how this would be done is left outside of the thesis, since it would require more user interviews and observations to be accurate.

The submenus related to my orders and my licences seemed to cause confusion on five out of seven administrators and specialists, since those menus do not explicitly say what they are for. The concept of order is not defined on the site, and neither is its relation to licence. Therefore, participants drew their own conclusions between the of two, largely based on the way other licencing management software have divided their submenus. Most of these assumptions were based on *"my licences show active licences, my orders expired"* or that *"single order contains multiple licences"*. Neither of these are correct, instead the difference is that my orders contain the licences you manage, while my licences contain the products you currently have access to. This is something that should be reflected more clearly.

Another area where the lack of information caused confusion was the floating licences. This problem was for both specialists and administrators, explained in the shared tasks chapter. As a result, the participants made false assumptions. To improve usability, prioritizing clarity and quality of the system information is important, especially if the interpretation leaves room for error.

Requests made by the participants to have an easier way to move, add, update, and remove users need to be improved by considering both novice and experienced users' perspective, as stated by Nielsen (2020). Currently both those with novice and professional amount of licence management encounter similar issues. While participants could complete tasks efficiently from the perspective of current available functionalities, many compared the portal to other licencing management tools they had used, which *"offered shortcuts"*

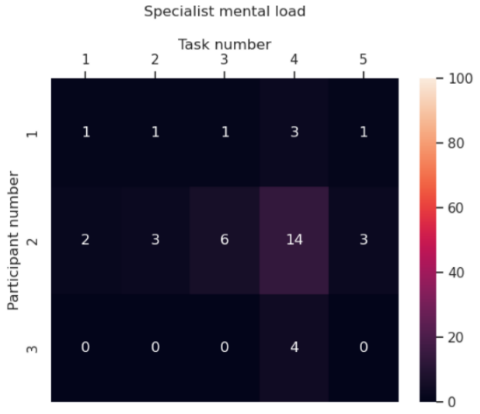
and *"better clarity on networking licences"*. That is not to say that Holixa did not have benefits over others, such as it being a centralized licence management tool, as opposed to many others of the licence management tools being built inside a larger system, which creates complexity.

In a large part of the other licencing management tools, the amount of information and functionality can be difficult to grasp. These tools have existed most likely longer than Holixa, and hence have had their share of requests from users, slowly growing in complexity. Therefore, it is important that when the site gains new features, it aims to keep the current appeal, which was the minimalism and clearness of the user interface. This can be done with shortcuts, or by separating functionality that is only for specific type of users in their own user interface. Currently Holixa does support user types, but these are mainly for internal use. It is worth considering expanding this concept to clients, since specialists often do not require the orders or the users' tabs, while administrators require these functionalities to be expanded further, growing in complexity.

The current state of effectiveness and efficiency leaves small clarity improvements with specialists but requires either an overhaul or additional functionalities implemented in the case of administrators. This is reflected in the comments given by the participants and supported by the PPSUQ figures and lostness and success rate heatmaps. When looking at the individual participant PPSUQ scores, information quality stands out for specialists, while administrators require improvements across the board. The possible courses of action are considered in the chapter 4.3, after we have looked at another important aspect of usability, satisfaction.

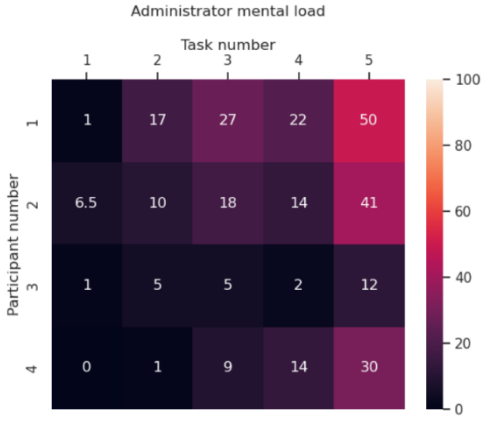
4.2.2 Satisfaction

Satisfaction can be considered with the same triangulation method we utilized for the other aspects of usability. Satisfaction is composed of the observations made during the study, such as visible frustration or confusion, the mental effort required to complete the task, how the users perceived the general usability in the interviews, and the overall rating of the PPSUQ. Figure 20 and Figure 21 show the mental load along with selected interview quotes from both roles which address how satisfied they were with the outlook and the general feel of the portal.



Participant Num.	Source	Comment
Specialist 1	Interview	"Maybe too much functionality considering the tasks"
Specialist 2	Interview	"Had a good basic functionality, and it was easy to learn"
Specialist 2	Interview	"There were a few things I would like to have clarification on the site"
Specialist 3	Interview	"Compared to other licence management systems, this was clearer"

Figure 20: Heatmaps for specialist on mental load and selected quotes related to how the participants perceive the satisfaction of the portal.



Participant Num.	Source	Comment
Administrator 1	Interview	"I am happy with the basic features, and the general outlook is clean. However, the edge cases need work."
Administrator 2	Interview	"The interface is clear, and there are no pointless functionalities or menus. But there is also functionality missing"
Administrator 3	Interview	"I feel like the usability in specialized tools in general is kind of problematic, this included. However, the outlook is simple"
Administrator 4	Interview	"Interface is fresh, but I wish there were some changes to few areas, such as ..."

Figure 21: Heatmaps for administrator on mental load and selected quotes related to how the participants perceive the satisfaction of the portal.

As seen in Figure 20, specialists had both negative and positive comments. The negative comments were mainly about specific information not being visible or easily found. Specialists in our sample size had a low mental demand and thought that the site was easy to use. When compared by the participant to other licencing tools, this was seen as an equal among them. The overall average score of 1.67 in the PPSUQ could be considered very good, since the score of 1 is a "perfect system", if one were to exist. One should note that because of the small sample, this value is not representative of the portals actual PPSUQ score. The interview provided positive feedback on the

outlook of the portal, where the minimalism, lack of clutter and the strong foundation for features was seen as a positive aspect.

As with the other aspects of usability, administrators had more issues with satisfaction, as can be seen in Figure 21 mental demand heatmap. When asked with "Overall, I am satisfied with this system", they rated it an average of 6, which could be considered as "I disagree". The interface quality (INTERQUAL) on Figure 17 accounts for this question and can be seen as arguably the most negative aspect of the portal with these participants. The overall observations of the administrators contained clear signs of frustration, annoyance, and confusion.

Administrators did agree with specialists about the clear outlook and strong foundations with a lack of clutter, but they did feel like those foundations should be expanded. Some of the administrators felt like the product wasn't *"necessarily created with administrators in mind",* since some of what is a standard on a licencing management system was missing. Those who had previous experience with Holixa mentioned that *"I feel like the previous usage of the system did not really help, since I can't remember these menus or how they work*".

Most of the satisfaction problems can be improved by tackling the other aspects of usability. Having the ability to complete a task effectively and efficiently will help the users perceive the portal in a more positive light. According to the study, there is no need to change the entire interface of the portal since that is perceived across the roles as a positive thing. This makes implementing additional features easier from both the design and development standpoint. In the next chapter, the entire results as well as singular comments done by the participants are considered which were not addressed here, as we propose how the systems usability could be improved.

4.3 How can the usability be improved?

The benefit of qualitative user studies are the tangible improvement suggestions given by the participants. According to the user study, our focus should be improving the administrator's usability of the portal, focusing especially on the shortcut like functionalities, which allow the users to complete their tasks more effectively and efficiently. On top of this, we will be addressing some issues with information quality, which leave certain terminology unnecessarily ambiguous. The goal of the thesis is to understand the current state of usability of the Holixa portal, and showing concrete visualizations of user suggestions can help establish this goal.

Because of the scope of the thesis, doing a fully detailed (high-fidelity, HIFI) redesign does not further our goal of understanding usability. Instead, we will be focusing on creating a basic prototype (low-fidelity, LOFI) of the pages using Figma, a tool created for interface design. These prototypes can be used to guide future designs, but ideally, they should be tested with another identical or slightly improved user study. This would allow us to gather whether the improvements are implemented in a way that alleviates the issues highlighted in the thesis. We will also be adding a high-fidelity page to Appendix B.17 to help understand whether these changes slot into the current implementation of the portal. Additionally, we will be using these to improve the site's accessibility and clarity by adding some common industry standards. These include things such as icons in the navigation bar (shown only in B.17) and consistent capitalization and wording. Every redesigned page can be found in the Appendix B along the original designs. In this chapter we will be highlighting only the most prominent issues raised.

The redesigns have been implemented in a way where minimal changes need to be implemented to improve the problem areas. Most of the added information is already in the databases, which was confirmed by utilizing development tools. Those that are not included, can either be created utilizing browser cookies or calculated utilizing already stored information. The only exception to this is user description, but since this functionality already exists with computer user objects, implementing it should be somewhat trivial. Computer user objects are ways to identify users (specialists) who do not utilize Holixa portal accounts, and instead utilize their machine information to authenticate.

One of the interview questions asked from five of the participants was whether they would use Holixa on a mobile device. Out of the five interviewed, only one could see using the management portal on a mobile device. Even they were somewhat hesitant since: *"I rarely go anywhere without a laptop where they might have to do work related tasks"*. Therefore, the prototypes do not actively consider mobile scalability.

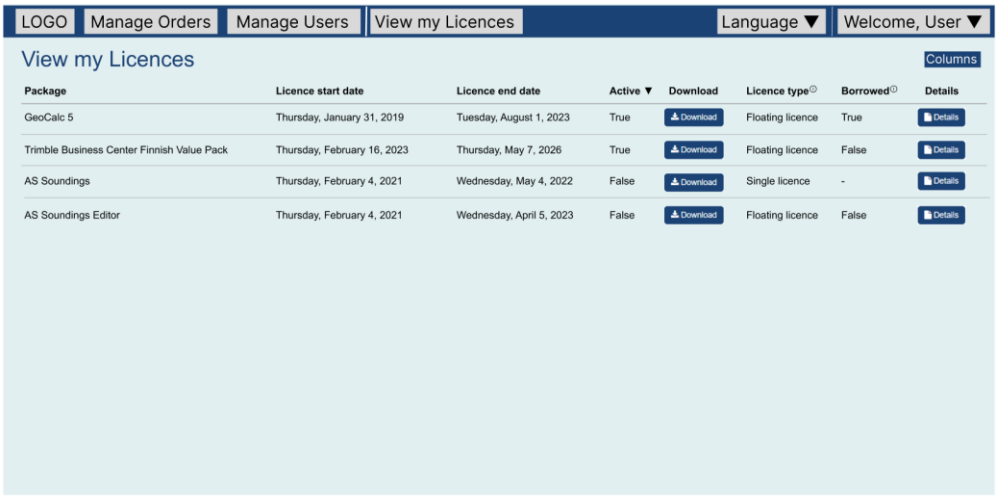


Figure 22: Redesign of the my licences view.

In the Figure 22 we can see how my licences page has changed in the prototype. The original can be found in Figure 10, or in the appendix, where the new design is B.3 and original is B.4. The navigation bar has been reordered and renamed. Now the menus that are used mainly by administrators have gotten the “manage” prefix and grouped together, while my licences view has been renamed to “view my licences”.

These changes were implemented to alleviate the confusion many users had between my orders and my licences and to improve recognition. If so desired, the manage pages could be hidden by default if the user has no orders or users to manage and allow to be turned on in the profile page. Besides that, language button has gotten an indicator that it opens a submenu similarly to the profile button in the original design.

The licences page has been designed in a way that it contains similar information that was only available previously in my orders page. This should improve information quality for both specialists and administrators. These include licence start date, end date and as a column that shows whether licence is active or not. In the original design the date information had to be retrieved from behind the details panel. The active row can be calculated from the start and end dates shown in the original design.

Next to the active column name, the site notifies that the licences are sorted by their activity state, pushing the inactive licences to the bottom. Having the ability to change which column is used to sort the rows by clicking columns would be a welcome addition, which could be indicated in the same way.

The licence type and the new borrowed column have had an information indicator added next to them, allowing the users to hover over them for

additional information. While this could be beneficial on each column name and element on the site, these two are the ones that require it the most. The borrowed column is used to show whether the floating licence is currently in use, functionality explained in software licencing chapter. Therefore, the single licences have no value for these columns.

The details column was left to allow viewing information such as licence manager, and possibly allow information about when the borrow time started for a floating licence, and when it expires. On the top right corner, there is a new columns button, which allows the user to choose what columns are displayed in this view. The same button has been added into each view with a data table. This allows each user to easily tailor these views to their preference. This functionality could possibly remove the need for the details panel if the same information is added utilizing the columns button.

In the Appendix B.5 and B.6 we can see that my orders (now manage orders) has remained largely the same, with the addition of showing borrowed licences along the previous allocated and total licences, and a tooltip for additional clarity. The wording for these has also been changed compared to Figure 12. Some clarity additions including the active column has been added, which are also included in view my licences functionality shown in Figure 22.

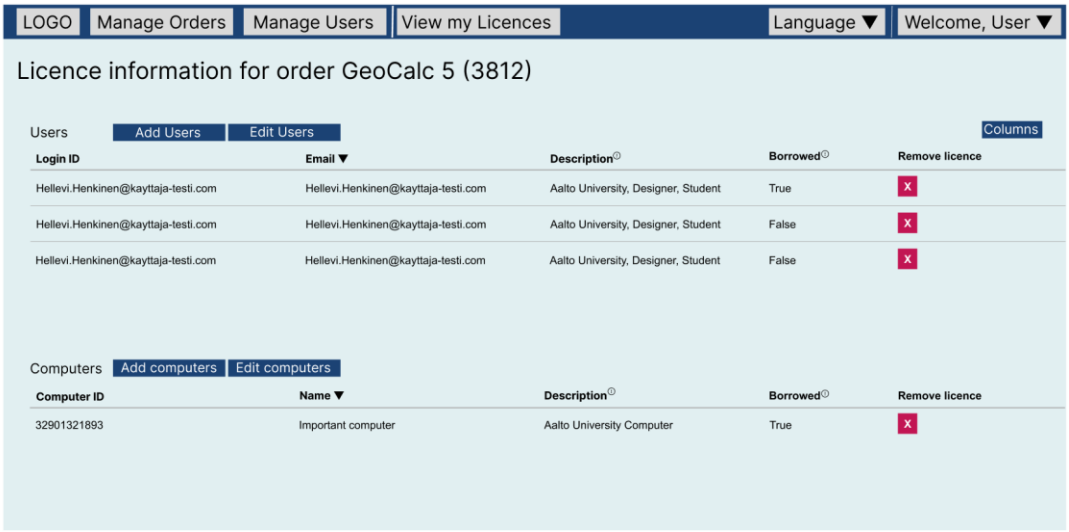


Figure 23: Redesign of the order specific licence information.

The redesign shown in 23 adjusts the licence management screen from my orders to a version that allows administrators to have better control of the licences and users they manage. Original and the new design are shown in Appendix B.9 and B.10. By considering the most requested features during the user testing, we have created a screen that removes the dropdown menu and removed add licence button, with add users taking over its functionality.

This disables the need to first add a user, then find them from the dropdown, and adding them again. The two data tables users and computers have their own columns administrators can edit. The additional columns include borrow start date and end date, to allow administrators a better idea which users are currently utilizing the floating licences.

Users' data table has a new description field, which was requested by two administrators taking part in the study: *"... licence management tool allows you to tag users, which makes recognizing them easier"*. Both would have liked a way to describe specific users, for example if the person is an architect or an engineer. This allows the administrator to easily remove and add users from a licence. The information is tied to the user list that the administrator controls, meaning that these are not tied to a specific user account. The user list uses the instances of a user object, which are then linked to the actual account. Adding a search functionality to the data tables could elevate this functionality further but was not added at this point of the redesign.

The manage users shown in Appendix B.7 along its original B.8 replaces the old functionality of my users. This is largely like Figure 16 design but contains confirmation dialogs for deleting singular users. When deleting a user from the list, they are revoked of all their licences under the administrator's management. The new functionality for the manage users is shown in Figure 24, but also in Appendix B.15.

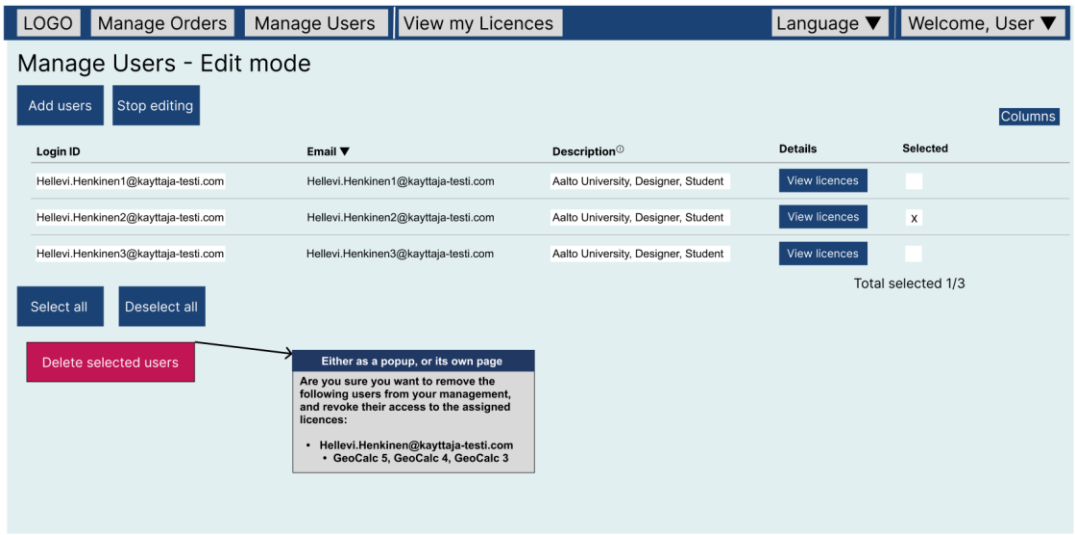


Figure 24: Edit mode added to manage users, previously known as my users.

In the Figure 24 we can see the ability requested by administrators to delete and change multiple users simultaneously. Here you can add user specific descriptions or change the login id of a specific user. It should be noted that the changing of the login id assumes that this is the main identifier for each

user. Hence changing this creates a new account or references an instance of an existing one, and automatically updates the email in the next column. This would simply change the account the licence information is tied to, as opposed to updating the account itself. This removes a possible issue where the administrator would update a specialist's email without them knowing.

In the case where there are many users, the buttons and the counter would move to the bottom of the site in a footer manner, and the user's data table would be behind a scrollbar. If required, these buttons could in the footer by default as their own component. Identical view would exist for managing computers.

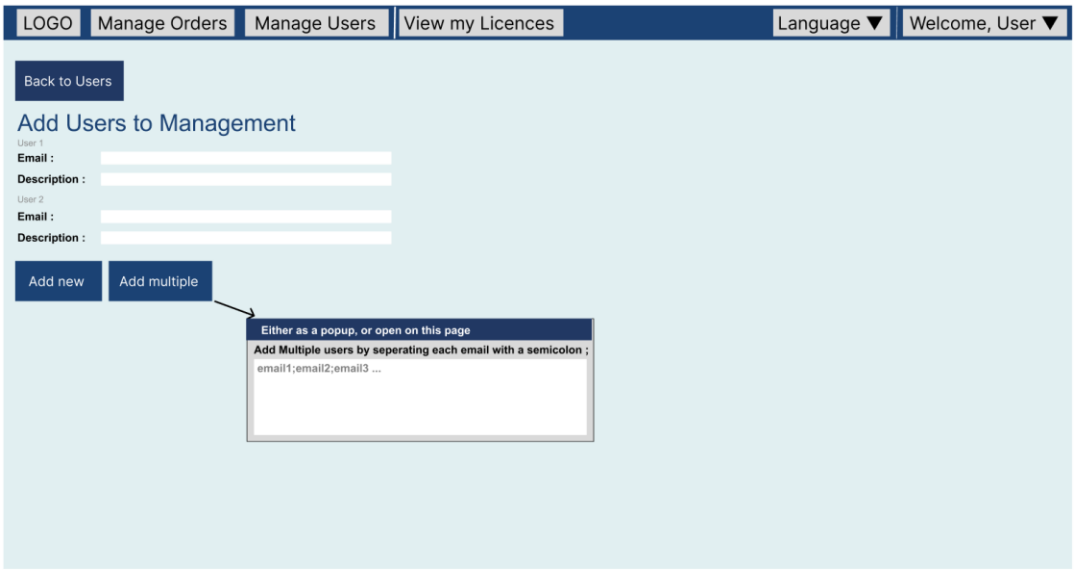


Figure 25: Redesigned add users' screen.

The new add users screen is shown in Figure 25 and can be compared with the original in the Appendix B.13 and B.14. The add users now allows adding descriptions per user and has separated the multiple user addition to its own button and popup. Adding users this way leaves their description blank, and they are previewed in the same as the single ones, leaving a list navigated using the scroll bar. This is done according to the participant request, where they wished for better clarity to adding multiple users, including having the syntax visible. If this operation is done inside an order management like Figure 23, the added users are given licences.

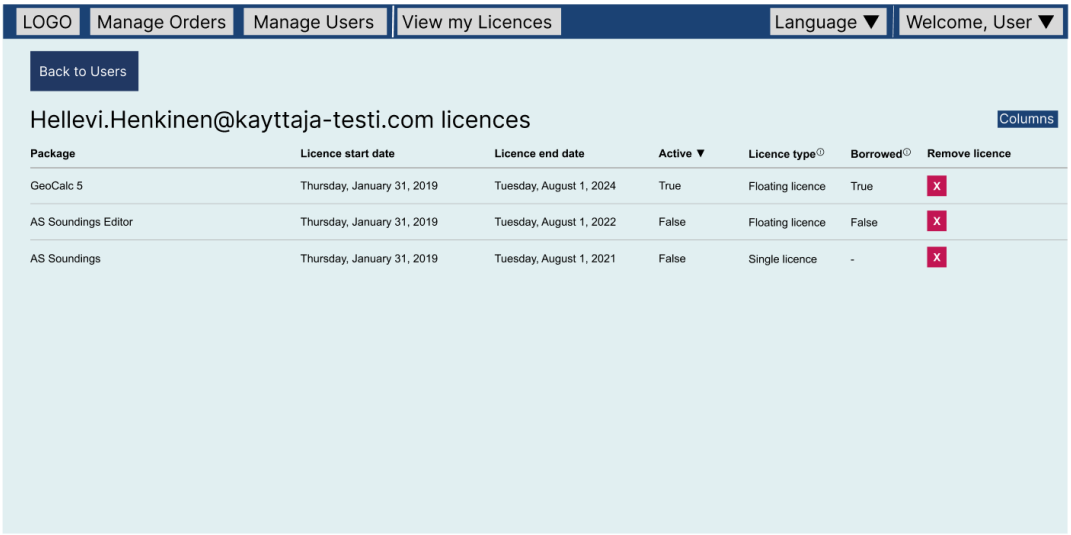


Figure 26: The new user specific licence view for administrators.

A request given by each administrator was the ability to view user specific licences shown in Figure 26, which can be found by clicking view licences button in the manage users page shown in Appendix B.11. Some quotes included: *"I wish there was a way to view what licences this user has"* and *"User specific list would be nice where we can change their information"*. This allows removing individual licences from the user, if required. This list only shows orders that the administrator manages. The redesigns are done with general usability guidelines in mind, but since they were not the focus of the thesis, require further analysis before implemented.

5 Discussion

RQ1 asks how the two groups perceive the usability of the portal. The results of the usability study showed quite conclusively that the current implementation of the Holixa licencing portal performs well for specialists but requires usability improvements for administrators. This is reflected by the all the metrics, and there are no major inconsistencies in the data collected. When considering the three aspects of usability, efficiency and satisfaction related aspects generated the most requests. Since none of the tasks conducted were a failure, the study shows that effectiveness is not necessarily as big of a problem.

To improve efficiency, we can also answer the **RQ2**, which aims to understand whether the portal contains all the expected functionality. To complete the tasks efficiently, both groups expected more and clearer information, and administrators a better way to change existing and new users. The administrator tools introduced in chapter 4.3 such as descriptions of users, confirmation messages and specific edit mode would allow the participants an easier way to control large user groups. These tools would hence improve the effectiveness.

The improvements suggested in the chapter 4.3 can be used to summarize the findings of the usability study. While they played a secondary part in creating the thesis and the exact implementation was not researched as strongly, they still in my opinion show the improvements well. As a software developer, I would estimate implementing most of these changes should be possible in a timely manner. However, some of the changes proposed to the data tables would most likely require reworking the way they are currently implemented, possibly increasing the development time from the initial estimate. Ideally these improvements would be implemented in the test environment used in the study, and then another identical study with new participants would be ran, hoping to show improved results.

The thesis does not consider how these changes would perform in other countries, where licence management portal could be used in a different manner. The Arkance Systems Finland branch does not at the current time use computer-id-based licencing for Holixa, which was left out of the scope of this work. Implementing the redesign might require that functionality to be moved to its own tab, since the new options take considerable amount of space. Additionally, the participant demographic is not as diverse as the customer base, especially when it comes to age. This creates a clear bias towards the younger users, and its implications are hard to predict without running additional tests on a wider demographic.

The study could have been designed in a way where a heavier emphasis would have been placed on qualitative metrics. While most of the notes are qualitative, the quantitative metrics analyzation and transcription took away time that could have been used to improve other parts of the thesis. Additionally in hindsight the specialists group provide little usability improvement suggestions that we were not able to gather from administrators. However, the fact that the study shows that the specialist participants were mainly happy with the portals design is also valuable, considering its contrast to administrators.

Because the observer of the study had used Holixa quite a bit before starting to work on the study, it is possible that the tasks and qualitative observations were chosen in a way where their personal bias had an effect. This was actively avoided by trying to reduce any sort of leading of the participants, but because many of the tasks contained dialogue between the observer and participant, the observer could have had an impact. The quantitative results however show that similar areas were observed as problematic in PPSUQ, comments and interviews. To be sure of the results, one would have to run similar study again with a different observer, sample and different task descriptions.

When looking at the implications of results in larger context, we could use the comments here to implement or improve other licencing systems. In the case of a licencing management portals, most of them seem to utilize the same principles and methods, according to both the participants with previous experience and the literature used in the thesis. To generalize the thesis, licencing management portals should give users tools for both novice and experienced users, while also enabling the movement of large user pools, that are easily identifiable. Ambiguous terms should be avoided and explained to the user clearly in the user interface, while also showing as much information as can be revealed without compromising the system.

The generalization here can be hard to apply to other systems outside licencing portals or to drastically different licencing systems, such as those built into a product. This is because the study was specifically tailored to this type of licencing portal, that contains the described functionalities. If there was a takeaway from this study to those areas, one could use a similar method as the thesis did in the background, pick the parts that worked for this and apply it to your own study.

6 Conclusion

In the thesis we conducted a usability study for software licencing portal. The study was conducted utilizing two roles, which had separate tasks and were looked at as separate entities. The respective participant size was N=3 for role 1, and N=4 for role 2. Role 1 consisted of the licence receivers, referred to as specialists. Role 2 was used to describe licence managers, referred to as administrators. The hour-long study focused on qualitative aspects, while also collecting supporting quantitative data. Based on the observations, participant comments, surveys, and other metrics, we inspected each tasks results separately and together to identify possible problem areas.

The task result analysis showed that the portal performs worse for administrators compared to specialists. For specialists, there were only information clarity problems, while administrators felt that there was functionality missing that would help them manage licencing packages more efficiently. The overall foundation and outlook of the portal were perceived to be pleasant. This allowed us to slightly alter and add to the original design of the site in the form of low-fidelity prototypes. These were used to summarize usability issues, such as the lack of information, the difficulties to manage large user groups and ability to view and alter existing users in more detail. The functionality added in the redesign did not cover all the suggestions or usability guidelines. Instead, it was used to visualize the specific aspects brough up most commonly in the study.

Overall, the study's results were consistent across the metrics, and most of the observations by each participant were about the same aspects. The observers bias could have had a noticeable impact on the study, but the tasks used were created in a way that they common operations in the portal, with as wide variety of features as possible. Some of the features however were excluded, since they were not used in the Finnish software, such as licencing files. To confirm that the usability issues were perceived correctly, the study should be run again using the redesigned version of the licence management portal and compare the results.

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Appendixes

Appendix A. Forms

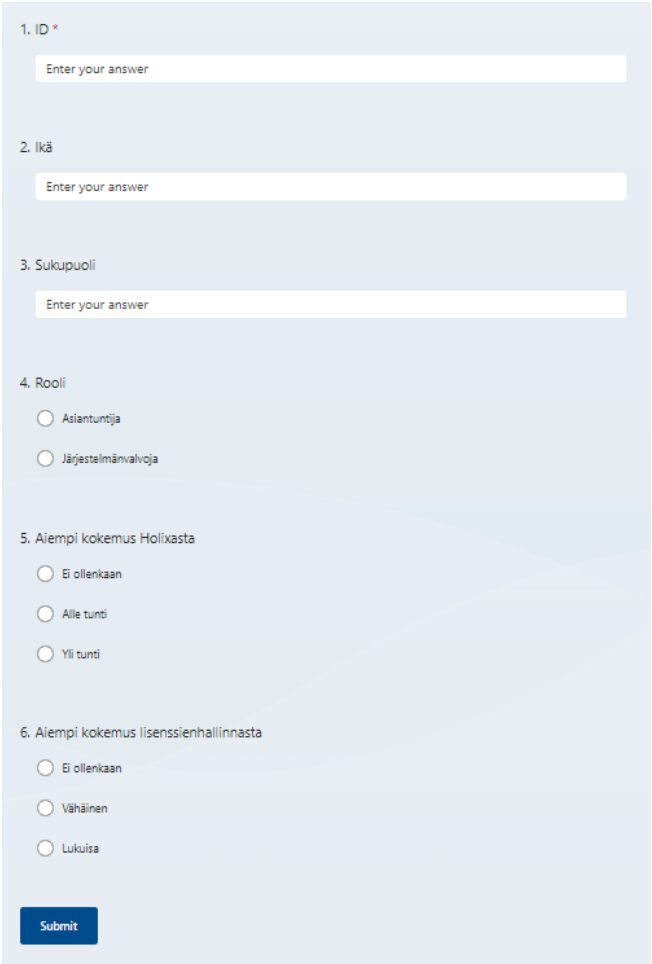


Figure A.1: General information survey

Käyttäjätutkimus Holixa CUSE

1

ID *

Enter your answer

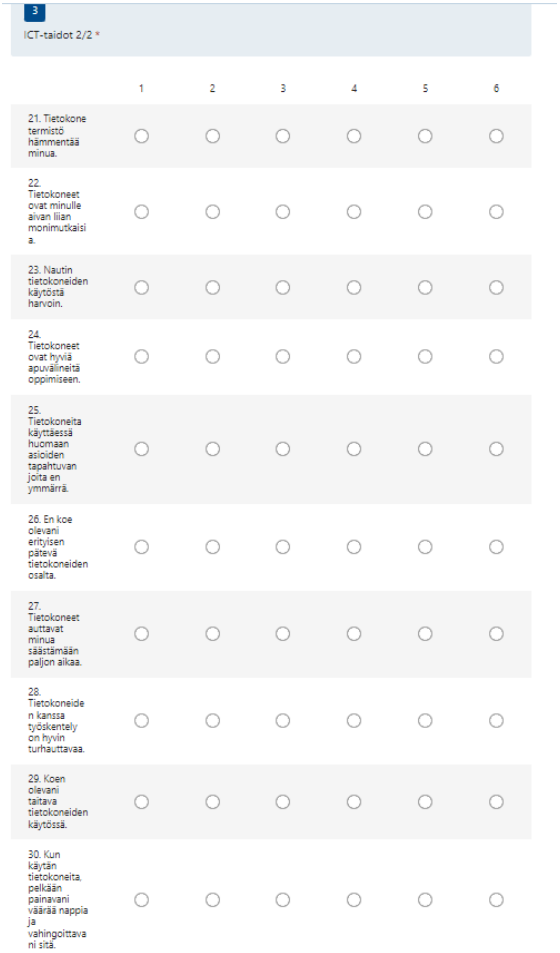
2

ICT-Taidot 1/2. *

Alta löydät 30 väittämää liittyen tuntemuksiisi tietokoneista ja niiden käytöstä. Valitse numeroskaalasta 1-6 sinun tuntemuksiasi lähinnä oleva numero. 1 tarkoittaa vahvasti eri mieltä, ja 6 vahvasti samaa mieltä. Väittämiin ei ole olemassa oikeita tai vääriä vastauksia, vaan omat näkemyksesi asiasta ovat tärkeitä.

	1 (eri)	2	3	4	5	6 (samaa)
1. Pystyn hoitamaan suurimman osan vaikeuksista jotka kohtaan tietokoneen käytössä.	○	○	○	○	○	○
2. Mielestäni tietokoneiden käyttö on helppoa.	○	○	○	○	○	○
3. Olen hyvin epävarma taidoistani käyttää tietokonetta.	○	○	○	○	○	○
4. Minulla on ollut ongelmia suurimman osan ohjelmistoista kanssa mitä olen yrittänyt käyttää.	○	○	○	○	○	○
5. Tietokoneet pelottavat minua.	○	○	○	○	○	○
6. Nautin tietokoneilla työskentelyst ä.	○	○	○	○	○	○
7. Koen, että tietokoneet haittaavat oppimistani.	○	○	○	○	○	○
8. Levyaseman kautta toimivat ohjelmistot eivät aiheuta minulle ongelmia.	○	○	○	○	○	○
9. Tietokoneet saavat minut paljon tehokkaamm aksi.	○	○	○	○	○	○
10. Minulla on usein vaikeuksia oppia käyttämään uusia tietokoneohje lmia.	○	○	○	○	○	○

11. Suurin osa tietokoneohjelmista mitä olen käyttänyt, ovat olleet helppoja käyttää.	○	○	○	○	○	○
12. Luotan kykyihini käyttää tietokonetta.	○	○	○	○	○	○
13. Koen vaikeaksi saada tietokoneet tekemään haluamiani asioita.	○	○	○	○	○	○
14. Joskus työskentely tietokoneiden kanssa on hyvin hämmentävää.	○	○	○	○	○	○
15. Suosisin sitä, että meidän ei tarvitsisi oppia käyttämään tietokoneita.	○	○	○	○	○	○
16. Uudet ohjelmistot ovat minulle helppo oppia.	○	○	○	○	○	○
17. Tuhlaan paljon aikaa tietokoneiden kanssa kamppailuun.	○	○	○	○	○	○
18. Tietokoneiden käyttö tekee oppimisesta mielekkäämpää.	○	○	○	○	○	○
19. Minulla tuntuu aina olevan ongelmia tietokoneiden käytössä.	○	○	○	○	○	○
20. Jotkut tietokoneohjelmistot tekevät oppimisesta huomattavasti helpompaa.	○	○	○	○	○	○



3

ICT-taidot 2/2 *

	1	2	3	4	5	6
21. Tietokone termistö hämmentää minua.	○	○	○	○	○	○
22. Tietokoneet ovat minulle aivan liian monimutkaisia.	○	○	○	○	○	○
23. Nautin tietokoneiden käytöstä harvoin.	○	○	○	○	○	○
24. Tietokoneet ovat hyviä apuvälineitä oppimiseen.	○	○	○	○	○	○
25. Tietokoneita käyttäessä huomaan asioiden tapahtuvan joita en ymmärrä.	○	○	○	○	○	○
26. En koe olevani erityisen pätevä tietokoneiden osalta.	○	○	○	○	○	○
27. Tietokoneet auttavat minua säästämään paljon aikaa.	○	○	○	○	○	○
28. Tietokoneiden kanssa työskentely on hyvin turhauttavaa.	○	○	○	○	○	○
29. Koen olevani taitava tietokoneiden käytössä.	○	○	○	○	○	○
30. Kun käytän tietokoneita. pelkään painavani väärää nappia ja vahingoittavani sitä.	○	○	○	○	○	○

Figure A.2: ICT self-efficacy survey (CUSE Part 2) in Finnish with slight rewording (package replaced with software).

Figure A.3: Nasa-TLX survey in Finnish.

1

ID *

Enter your answer

2

Rooli *

- Asiantuntija
- Järjestelmänvalvoja

3

PPSUQ käytettävyys *

Alta löydät 16 väittämää liittyen juuri käyttämääsi Holixa portaaliin. Valitse numeroskaalasta 1-7 sinun tuntemuksiasi lähinnä oleva numero. 1 tarkoittaa vahvasti samaa mieltä, ja 7 vahvasti eri mieltä.

	1 (samaa)	2	3	4	5	6	7 (eri)
1. Olen kokonaisuudessaan tyytyväinen kuinka helppo sivua on käyttää.	○	○	○	○	○	○	○
2. Sivun käyttäminen oli simppeliä.	○	○	○	○	○	○	○
3. Sain tehtävät suoritettua nopeasti sivua käyttämällä.	○	○	○	○	○	○	○
4. Koin sivun käyttämisen mukavaksi.	○	○	○	○	○	○	○
5. Sivun oppiminen oli helppoa.	○	○	○	○	○	○	○
6. Koen, että oppisin nopeasti tehokkaaksi sivun käytössä.	○	○	○	○	○	○	○
7. Jos kohtasin virheitä, sivu ilmoitti selkeästi miten virheen voi korjata.	○	○	○	○	○	○	○
8. Jos tein virheen sivua käyttäessä, pystyin palautumaan siitä nopeasti ja helposti.	○	○	○	○	○	○	○

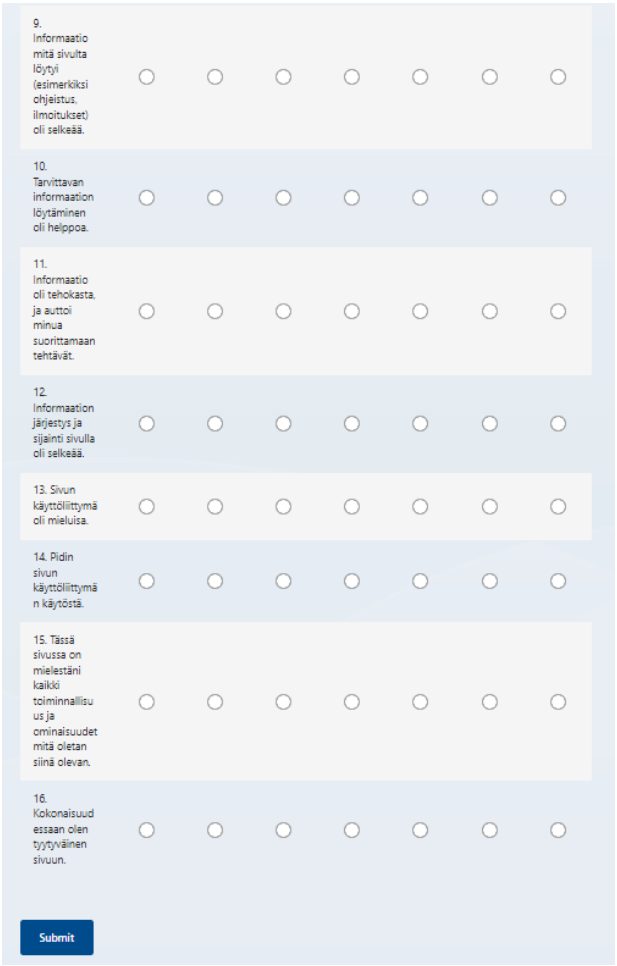


Figure A.4: PPSUQ Survey in Finnish, where if the participant answered N/A, it was written down by the observer.

Figure A.5: Interview in Finnish

1. Miten koit käyttöliittymän yleisellä tasolla, nousiko jotain kommentteja aiheesta?
2. Verrattuna muihin lisensointi työkaluihin, miten Holixa mielestäsi pärjäsi? Mitä lisensointityökaluja vertaat?
3. Tuleeko mieleen vielä toiveita mitä haluaisitte portaalissa nähtävän, tai muuta kommenttia?
4. Uskoisitko käyttäväsi Holixa portaalia puhelimellasi tai tabletilla joissain tilanteissa?

Figure A.6: Procedure introduction in Finnish

Tavoitteena saada selville Holixa lisensointiportaalin nykytila. Vaikka tuote on Arkancen, itse en ole ollut kehittämässä kyseistä tuotetta. Eli kommentit, olkoon ne positiivisia tai negatiivisia eivät ole kumpikaan vääriä. Tutkimus

on anonyymi, tämä selitetään myöhemmin. Tutkimus käyttää standardoituja metriikoita.

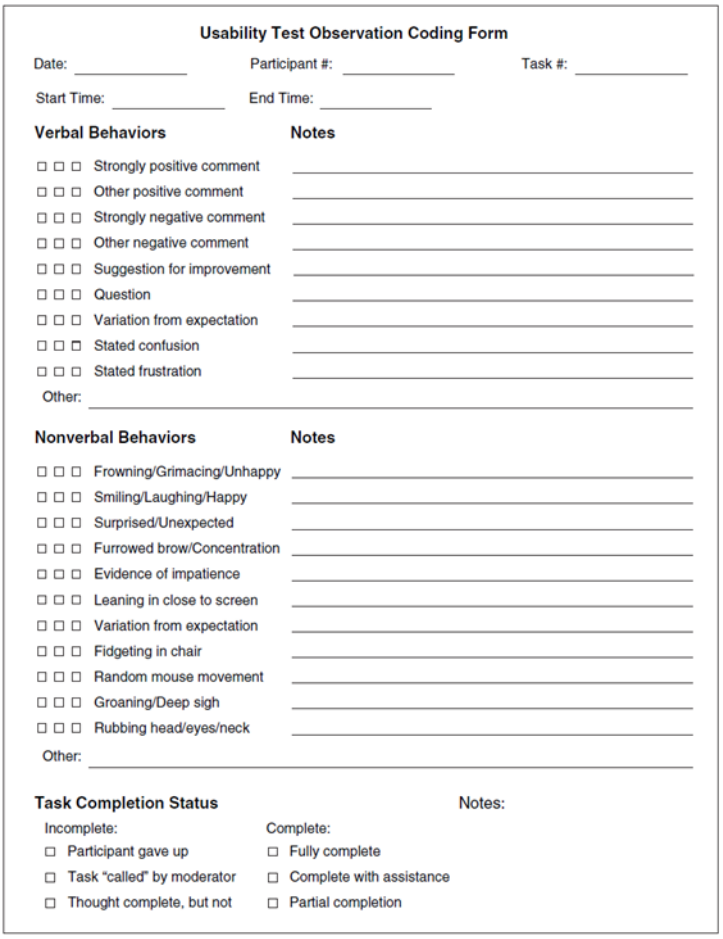
Prosessi:
Aloitetaan täyttämällä esitiedot.

Viisi tehtävää, ensimmäinen on harjoitus. Ideana, että tehtävien aikana ns. Ajatellaan ääneen. Tavoitteena sanoa esimerkisi, "oletan että tämä toiminnallisuus löytyy täältä". "Tämä valikko on selkeä/epäselvä". Kannustan tehtävien aikana tekemään, ja saatan kysyä lisäkysymyksiä.

Ruutua kuvataan koko tutkimuksen ajan windowsin toimesta, jotta erilaisten muuttujien, kuten onnistumisen mittaaminen olisi helpompaa.

Jokaisen tehtävän jälkeen täytetään formi. Lopuksi täytetään loppukysely, ja viimeiset kysymykset. Selvennyksiä jos nousee jotain asioita tutkimuksen aikana esille.

Tutkimus on anonyymi, eli sen jälkeen kun on allekirjoittanut (checkannut boxin), sinulle luodaan ID, jota ei linkitetä nimeesi. Haluttaessa sinulla on oikeus kerättyyn dataan, mutta tällöin anonyymiys voidaan taata vasta kun data on kokonaan prosessoitu.
Hanki allekirjoitus (koneellinen)



Usability Test Observation Coding Form

Date: _____ Participant #: _____ Task #: _____

Start Time: _____ End Time: _____

Verbal Behaviors **Notes**

- ☐ ☐ ☐ Strongly positive comment
- ☐ ☐ ☐ Other positive comment
- ☐ ☐ ☐ Strongly negative comment
- ☐ ☐ ☐ Other negative comment
- ☐ ☐ ☐ Suggestion for improvement
- ☐ ☐ ☐ Question
- ☐ ☐ ☐ Variation from expectation
- ☐ ☐ ☐ Stated confusion
- ☐ ☐ ☐ Stated frustration

Other: _____

Nonverbal Behaviors **Notes**

- ☐ ☐ ☐ Frowning/Grimacing/Unhappy
- ☐ ☐ ☐ Smiling/Laughing/Happy
- ☐ ☐ ☐ Surprised/Unexpected
- ☐ ☐ ☐ Furrowed brow/Concentration
- ☐ ☐ ☐ Evidence of impatience
- ☐ ☐ ☐ Leaning in close to screen
- ☐ ☐ ☐ Variation from expectation
- ☐ ☐ ☐ Fidgeting in chair
- ☐ ☐ ☐ Random mouse movement
- ☐ ☐ ☐ Groaning/Deep sigh
- ☐ ☐ ☐ Rubbing head/eyes/neck

Other: _____

Task Completion Status Notes:

Incomplete:
- ☐ Participant gave up
- ☐ Task "called" by moderator
- ☐ Thought complete, but not

Complete:
- ☐ Fully complete
- ☐ Complete with assistance
- ☐ Partial completion

FIGURE 7.2

Form for coding observations during a usability test. This form is designed to be completed for each task that the participant attempts. It helps to have multiple observers complete the form independently and then reach a consensus later.

Figure A.6: The observation form (Tullis and Albert, 2013, p. 170).

Appendix B. Final redesign

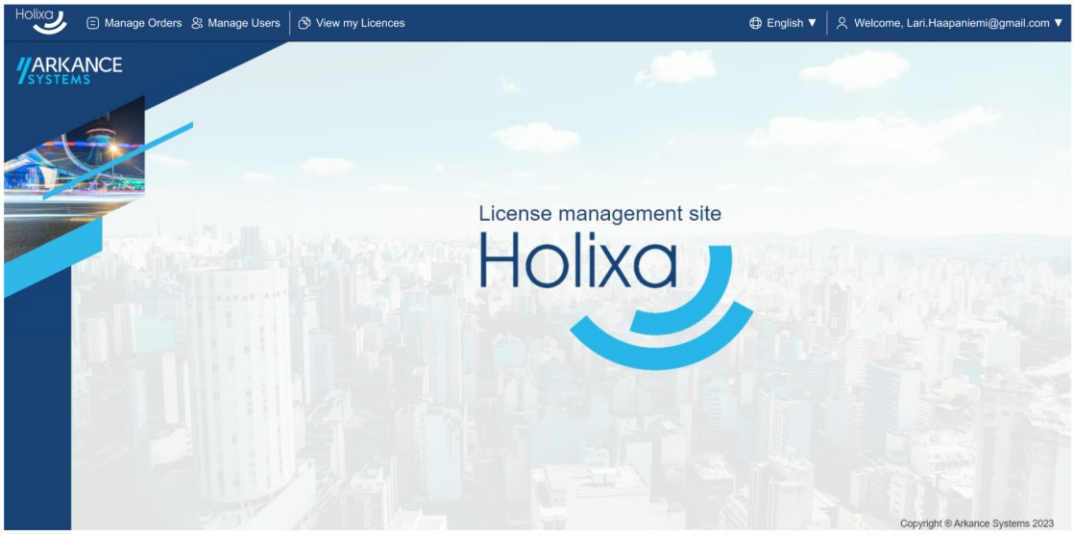


Figure B.2: The new look of the homepage.

Figure B.2: The original design of the homepage.

Figure B.3: The redesign of My licences (View my Licences).

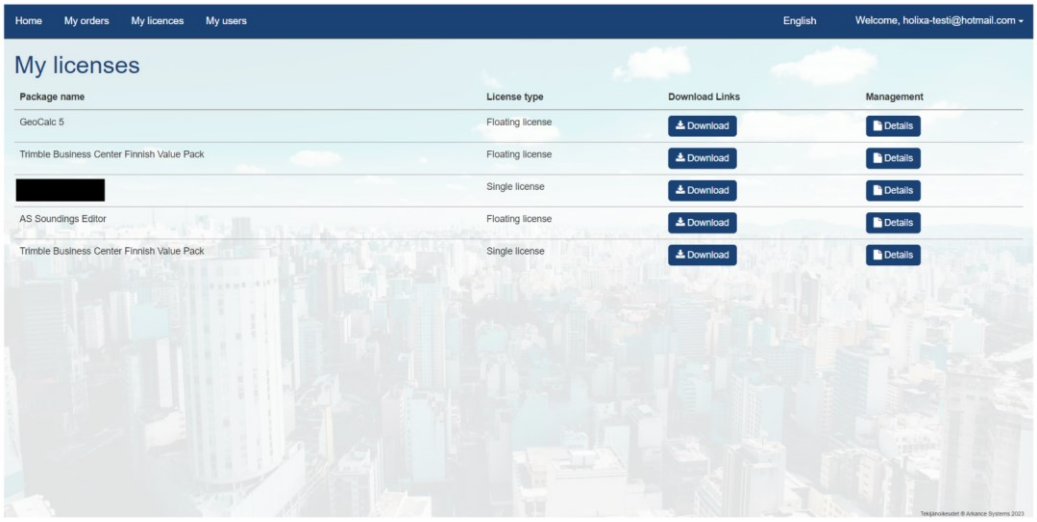


Figure B.4: The original design of My licences.

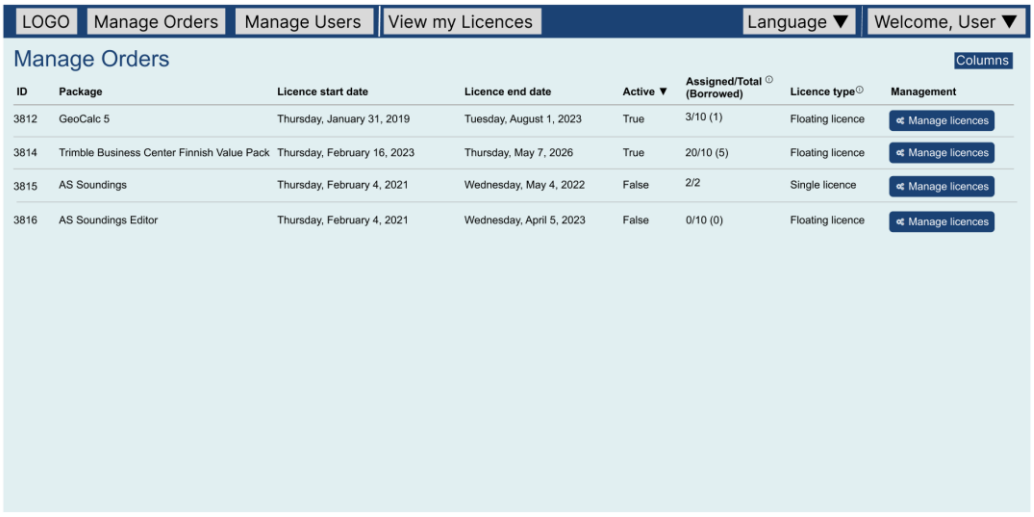


Figure B.5: The redesign of My orders (Manage Orders).

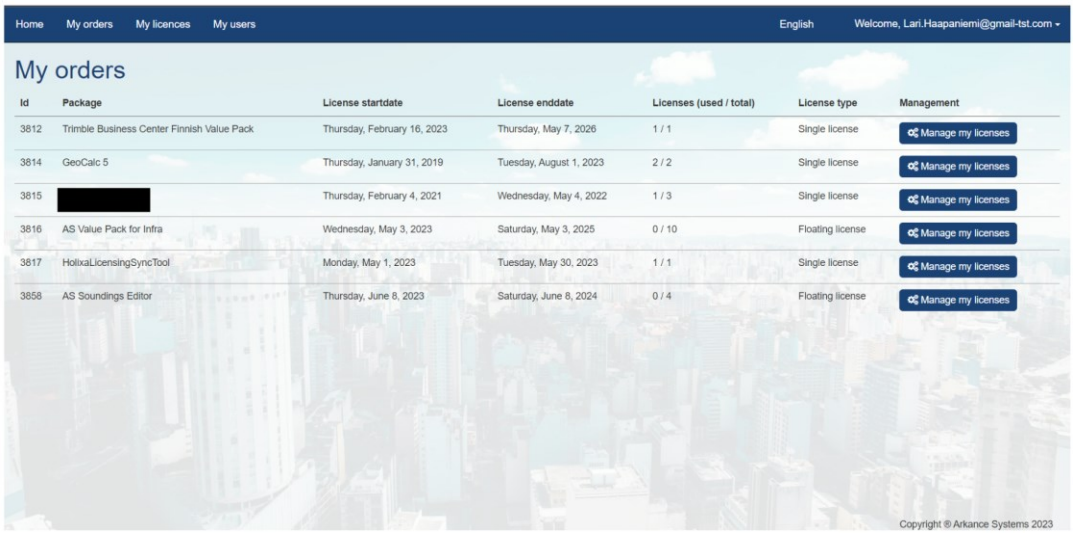


Figure B.6: The original design of My orders.

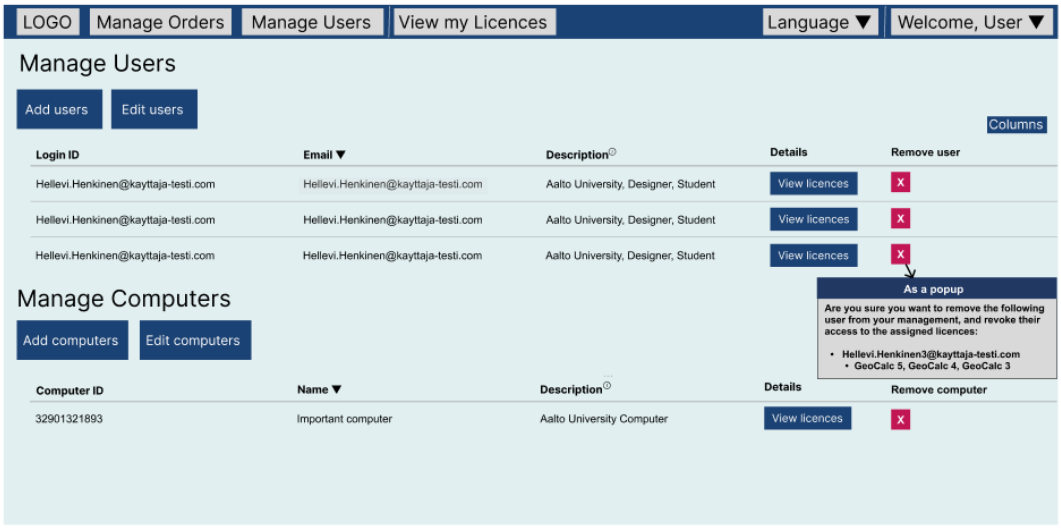


Figure B.7: The redesign of My users (Manage Users).

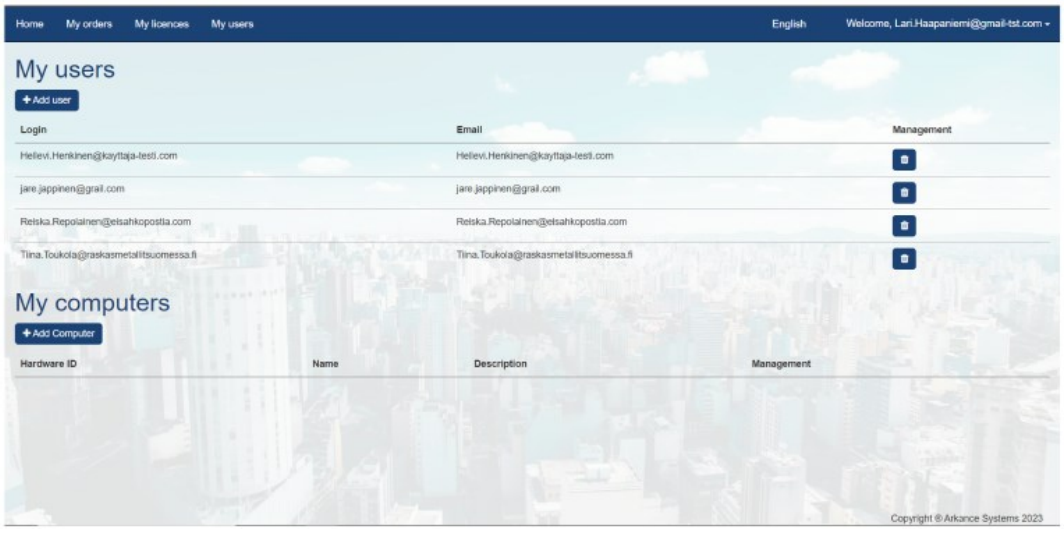


Figure B.8: The original design of My users.

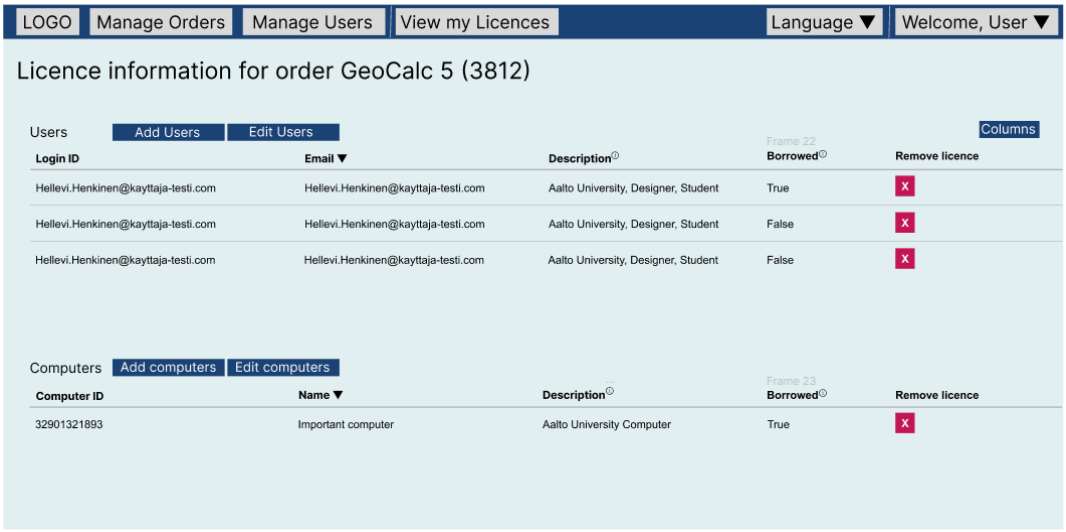


Figure B.9: The redesign of Licence information.

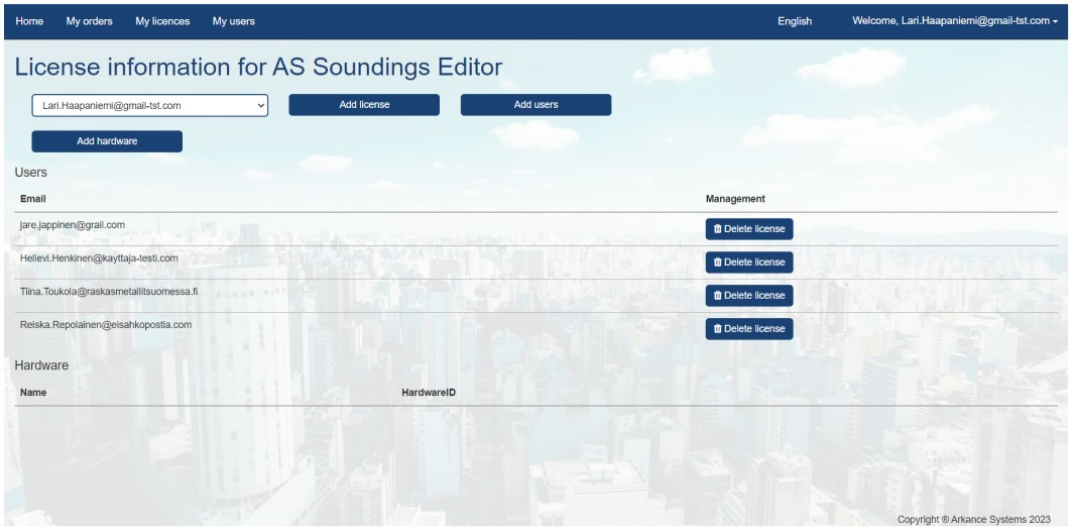


Figure B.10: The original design of Licence information.

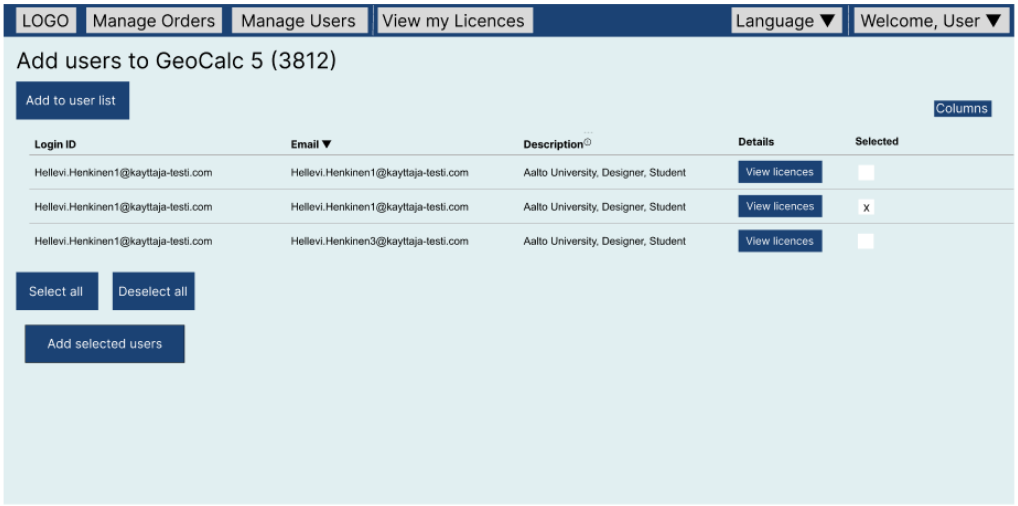


Figure B.11: The redesign of adding existing users to licence.

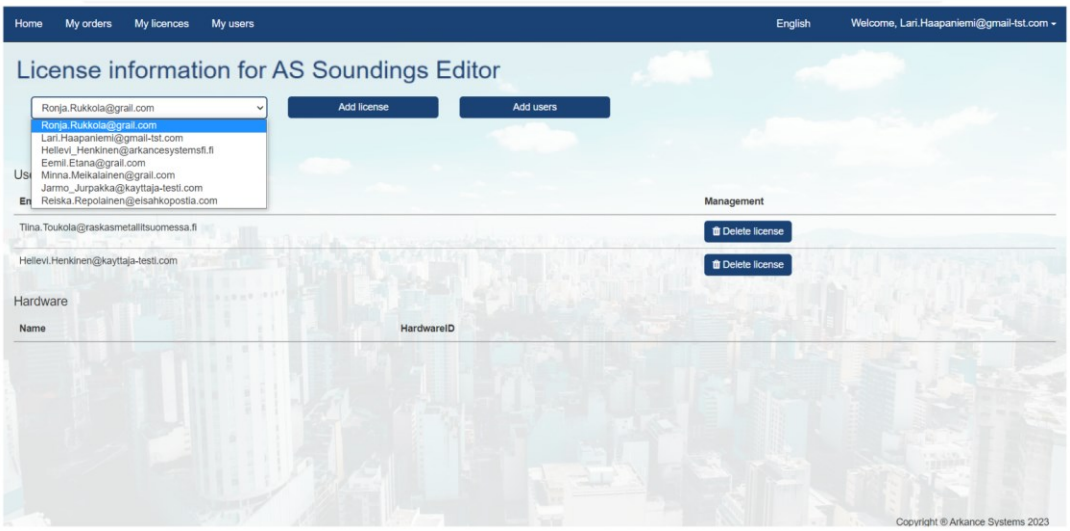


Figure B.12: The original design of adding existing users to licence.

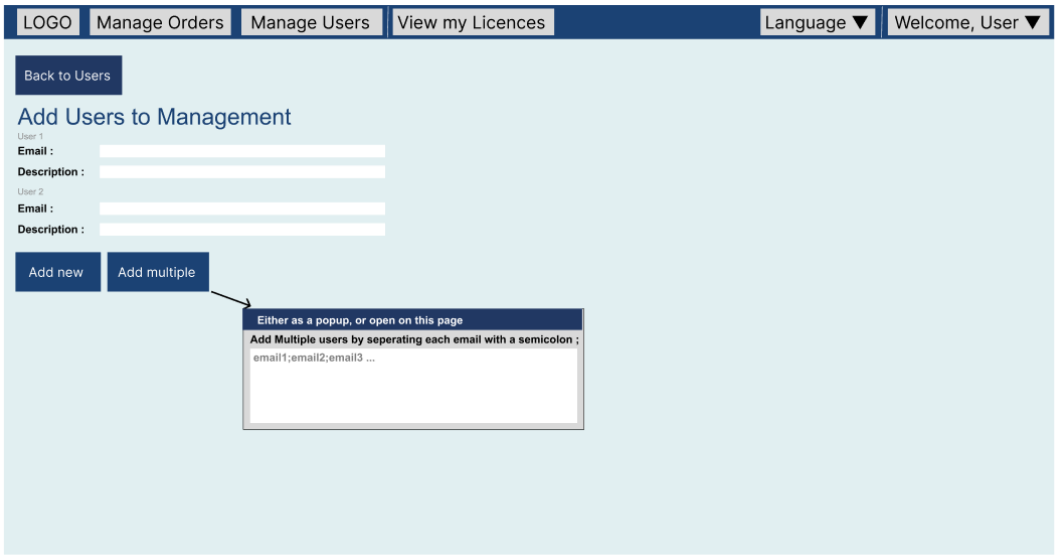


Figure B.13: The redesign of adding new users to management.

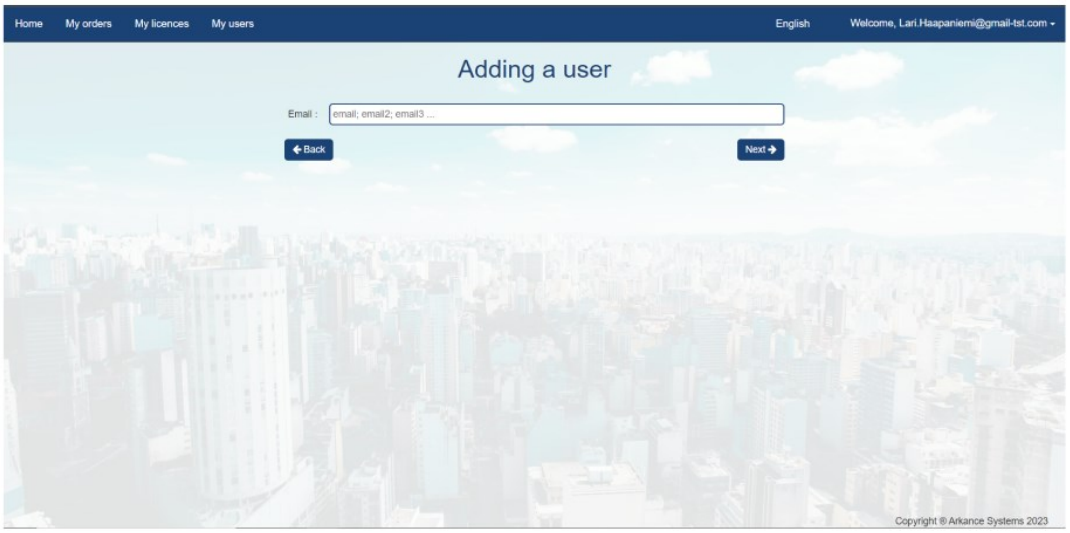


Figure B.14: The original design adding new users to management.

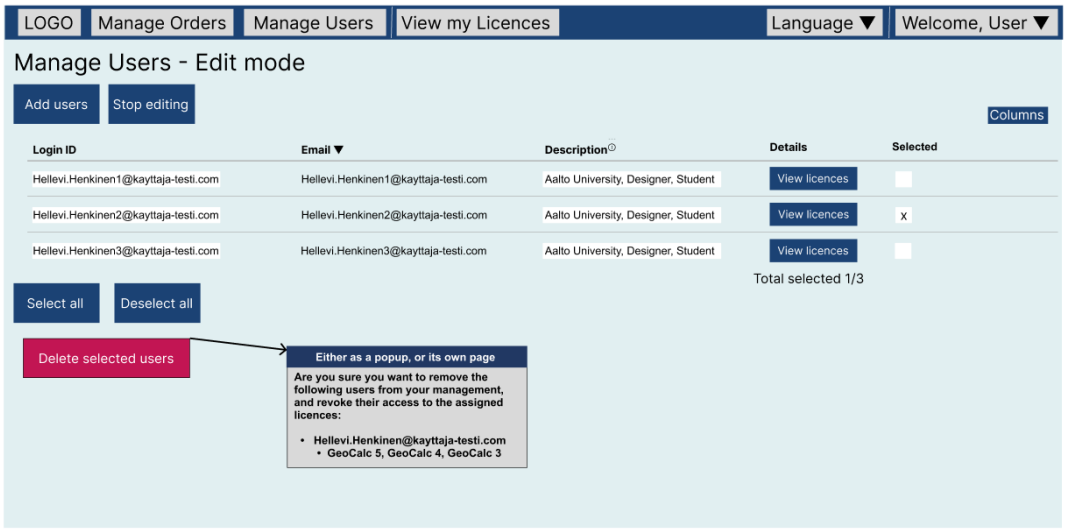


Figure B.15: New page for Manage Users – Edit mode.

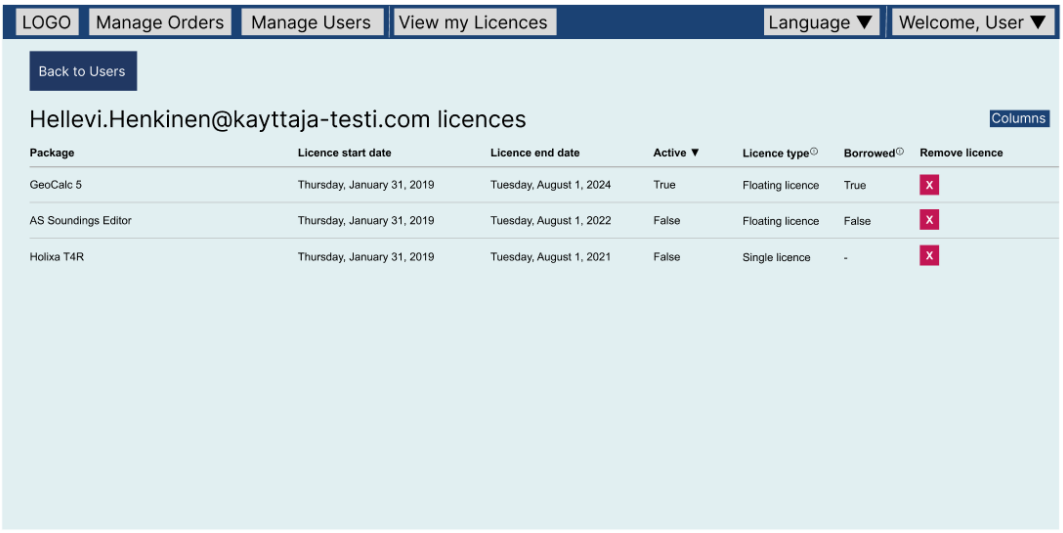


Figure B.16: New page for checking user specific licence information.

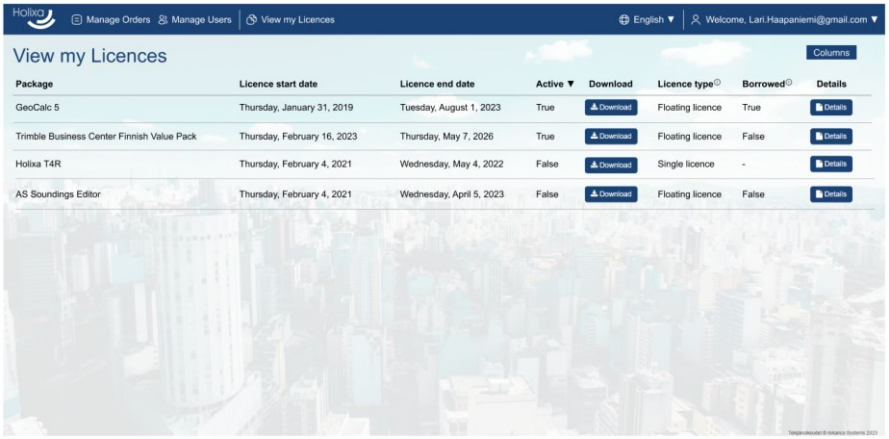


Figure B.17: High-fidelity example of My Licences (View my Licences) with the original background.