

HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

UteamUP Horizon

BSc. Computer Science

Design Report

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1 Introduction

The software company UteamUP is developing maintenance and production software, CMMS (Computerized maintenance management system), The software is deployed to a web server that allows users to access data based on their quality control requirements

The team created a backend and frontend solution along a set of guidelines to ensure the longevity and quality of the solution. Design plays a key part in the quality of the solution, affecting both user experience and usability. To begin the design process, the team constructed a mock-up prototype of the system using Figma. User testing was done using Microsoft Teams due to Covid-19 and was recorded to be reviewed as development began.

In conducting our user testing we had two main goals in mind, to improve the product effectiveness and efficiency, and understand the user's needs. To achieve this goal, we set about quantifying the usability to best understand our areas of improvement. From the usability feedback we received about the structure of the data we strived to create a simplistic but flexible platform for maintenance and production solutions.

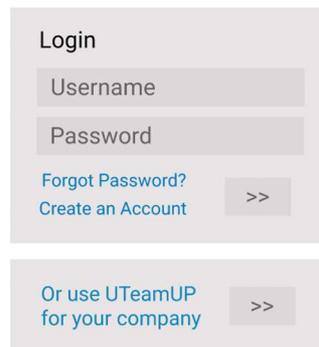
2 Mock-up Prototype in Figma

For our mock-up we opted to use Figma as our prototyping tool as we could build out not only the layout of the pages but also create all the navigation functionality that would be present in the final design. This allowed us to do much more realistic user testing where the feedback would be most relevant to our final product. Figma also allowed us to easily share the prototype to reduce the complexity of the user tests.

For the design process of our mock-up, we opted to make the pages as uniform as possible both in our list and element detail pages to ease navigation. This way once you become familiar with how to understand a single page, all the pages would be equally as easy to navigate as they use the same context clues and layout. This extended to our initial color scheme, which while muted, served to highlight the important items and functionality in the page.

Below you will see all the pages created for this part of the design labelled with their title. Note that the popup for deleting an element (Figure 17) was present on all pages at the time of testing, however including all individual page popups would only serve to bloat this report.

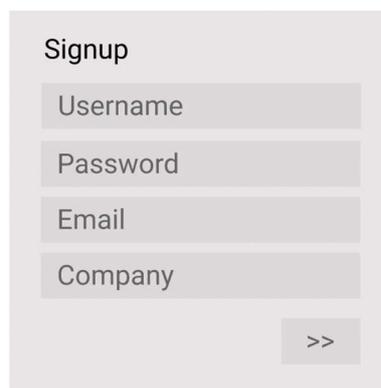
Login page UTeamUp - Horizon



The login form is contained within a light gray box. At the top, it is titled "Login". Below the title are two input fields: "Username" and "Password". Under the "Password" field, there are two links: "Forgot Password?" and "Create an Account", followed by a right-pointing arrow button ">>". Below this section, there is another right-pointing arrow button ">>" with the text "Or use UTeamUP for your company" to its left.

Figure 1 - Login page

UTeamUp - Horizon



The signup form is contained within a light gray box. It is titled "Signup". Below the title are four input fields: "Username", "Password", "Email", and "Company". At the bottom right of the form is a right-pointing arrow button ">>".

Figure 2 - Signup page

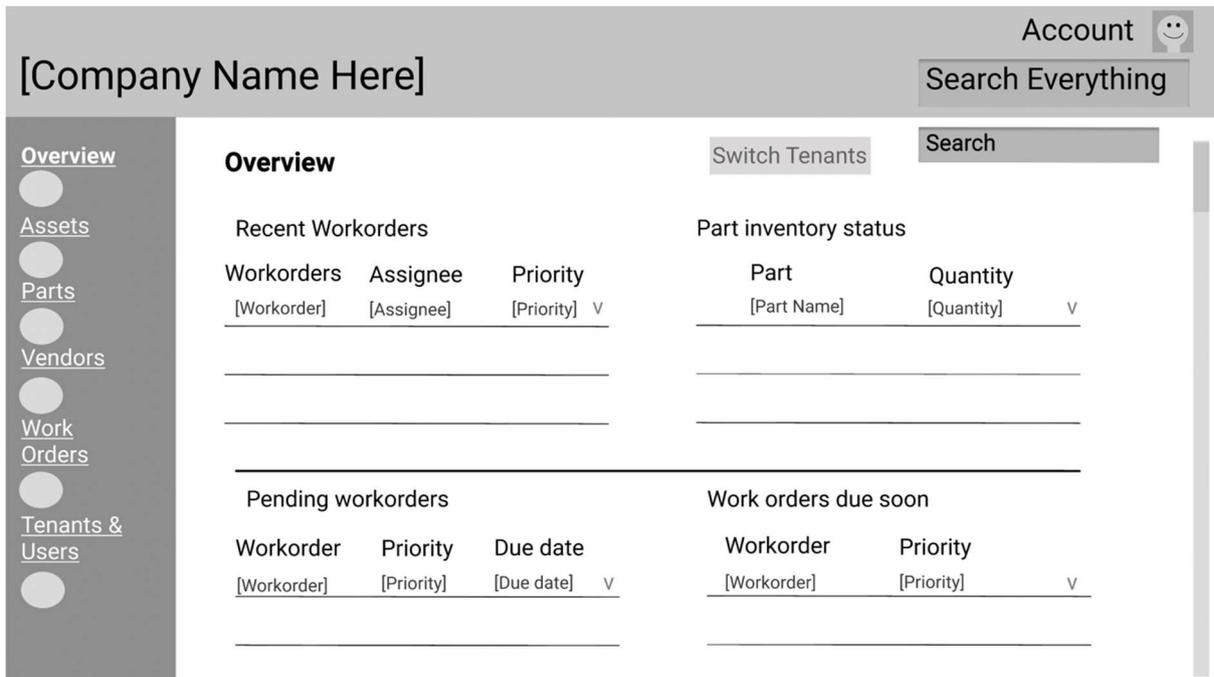


Figure 3 - Overview page

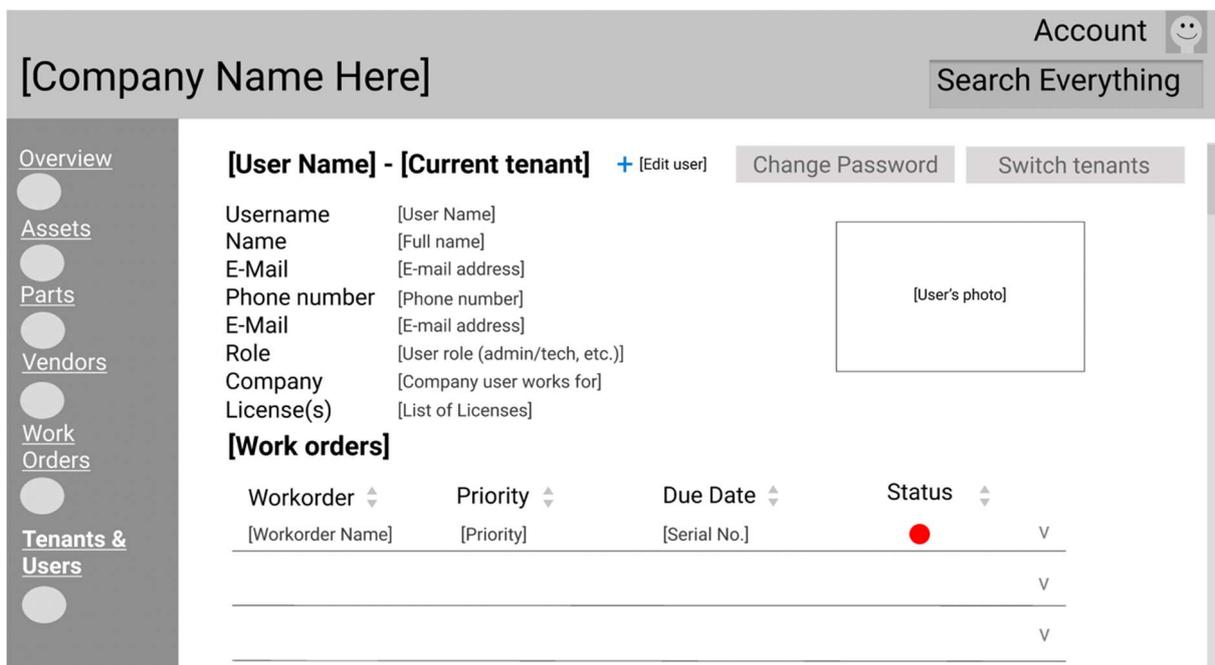


Figure 4 - Account page

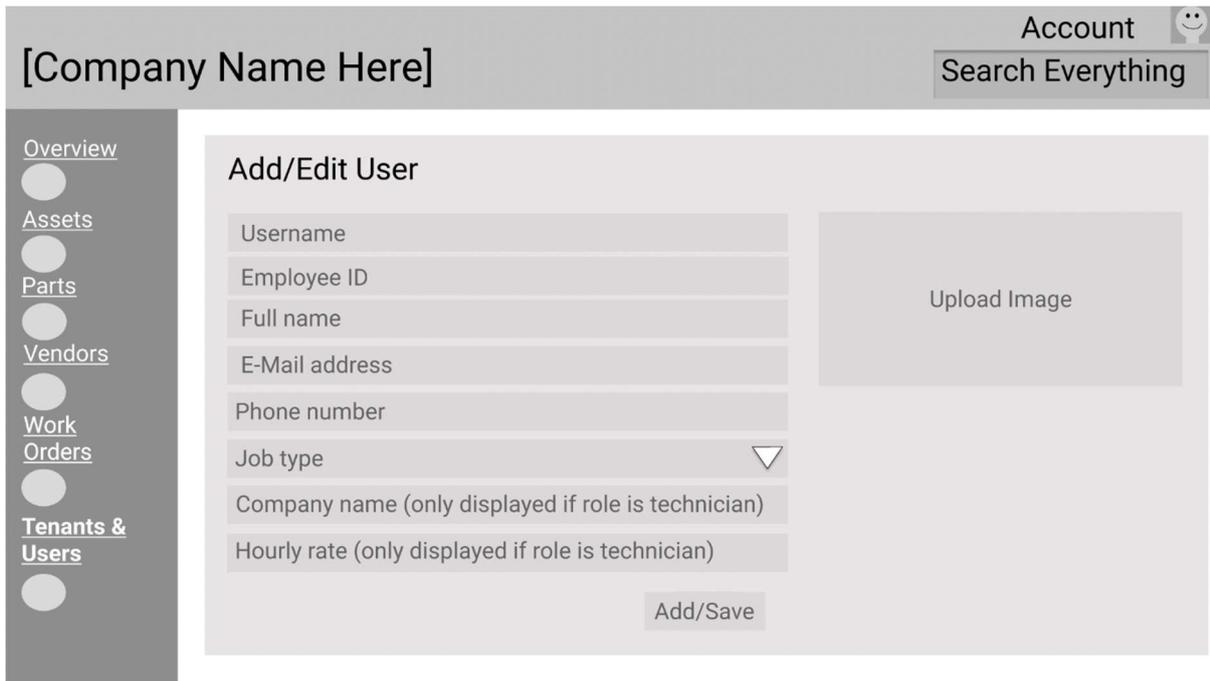


Figure 5 - Edit account / User page

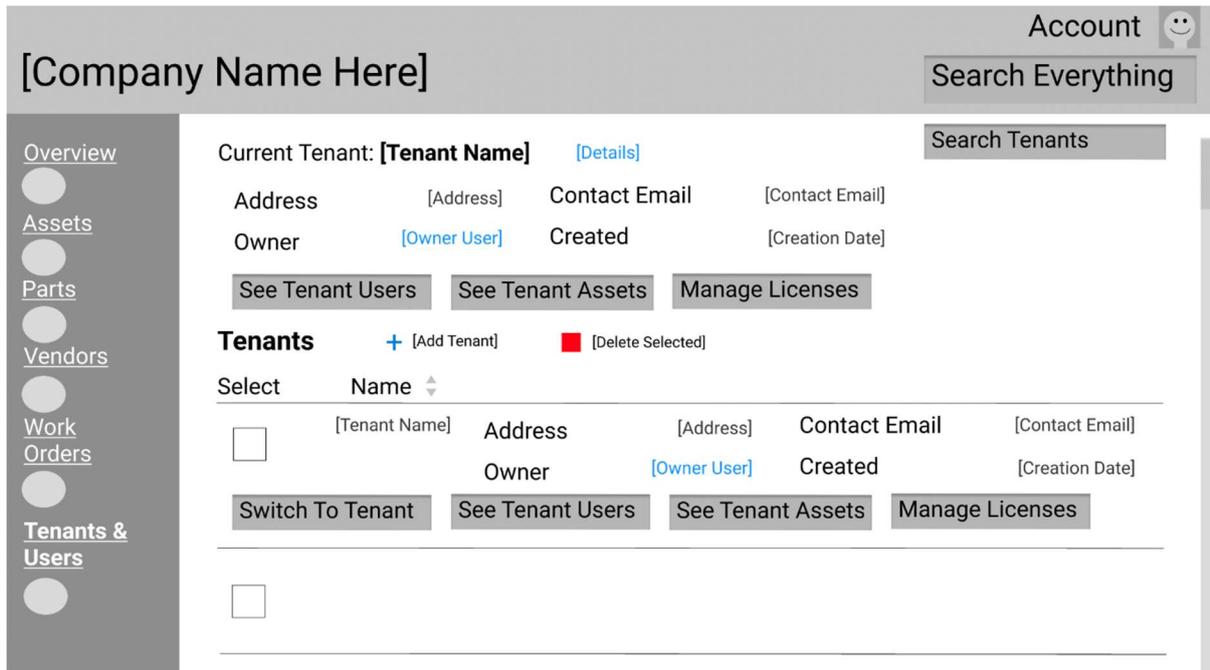


Figure 6 - Tenant page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

[Tenant Name]'s Users

[+ \[Add User\]](#)
[\[Delete Selected\]](#)
[\[Manage Licenses\]](#)

Search Users

Select	Username 	Has License 	Email 	Employee ID 
<input type="checkbox"/>	[Username]	[Has License]	[Email]	[Employee ID] v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v

Figure 7 - Tenant's user's page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

[Tenant Name]'s Assets

[+ \[Add Asset\]](#)
[\[Delete Selected\]](#)

Search Assets

Select	Asset Name 	Category 	Model No. 	Status 
<input type="checkbox"/>	[Asset Name]	[Category]	[Model No.]	● v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v

Figure 8 - Tenant's Assets page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

License management - [X of Y licenses in use]

Active licenes + [Add license] ■ [Delete Selected]

Select	Users <input type="text"/>	Has License <input type="text"/>	E-Mail <input type="text"/>	Employee ID <input type="text"/>
	[Username]	[License Status]	[E-mail addr.]	[Employee ID] v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v

Confirm Cancel

Figure 9 - Manage licenses page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

Assets + [Add Asset] ■ [Delete Selected]

Select	Asset Name <input type="text"/>	Category <input type="text"/>	Vendors <input type="text"/>	Tenant <input type="text"/>
	[Asset Name]	[Category]	[Vendor]	[Tenant] v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v

Figure 10 - Assets page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

Add/Edit Asset

Asset Name	Tenant	[Asset Image]	[Asset Image]	[Asset Image]
Serial No.	Model No.			
Reference No.	UPC No.	[Asset Image]	Click an image to make it the primary image for the asset	
Category	Vendor(s)			
Location	Area			
Description		Additional Notes		

Figure 11 - Add / Edit Asset page

Account 
Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

Parts + [Add Part] ■ [Delete Selected]

Select	Part Name <small>⌵</small>	Vendor <small>⌵</small>	Quantity <small>⌵</small>	Model No. <small>⌵</small>
<input type="checkbox"/>	[Part Name]	[Vendor]	[Quantity]	[Model No.] v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v

Figure 12 - Parts page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

Vendors + [Add Vendor] ■ [Delete Selected] Search Vendors

Select	Vendor ▼	Type ▼	Opening ▼	
<input type="checkbox"/>	[Vendor Name]	[Type]	[00:00]	v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v
<input type="checkbox"/>				v

Figure 13 - Vendors page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

Add/Edit Vendor

Vendor Name

Email

Website

Opening from - to

Address

Description

Phone

Type

Hourly Rate: xx

[Image/Logo]

Add/Save

Figure 14 - Add / Edit Vendor

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

Workorders + [Add Workorder] ■ [Delete Selected] ● [Make Report] Search Workorders

Select	Workorder	Priority	Asset	Due Date	Status	
<input type="checkbox"/>	[Workorder Name]	[Priority]	[Asset Name]	[Due Date]	●	v
<input type="checkbox"/>						v
<input type="checkbox"/>						v
<input type="checkbox"/>						v
<input type="checkbox"/>						v
<input type="checkbox"/>						v
<input type="checkbox"/>						v
<input type="checkbox"/>						v

Figure 15 - Workorders page

Account 

[Company Name Here] Search Everything

Overview

Assets

Parts

Vendors

Work Orders

Tenants & Users

Add/Edit Workorder

Workorder Name

Priority Status Workorder No.

Due Date Start Date End Date

Add User(s) Add Asset(s)

Category (inspection, upgrade, preventative, safety, etc.)

Description

Upload File(s)

Add/Save

Figure 16 - Add / Edit Workorder

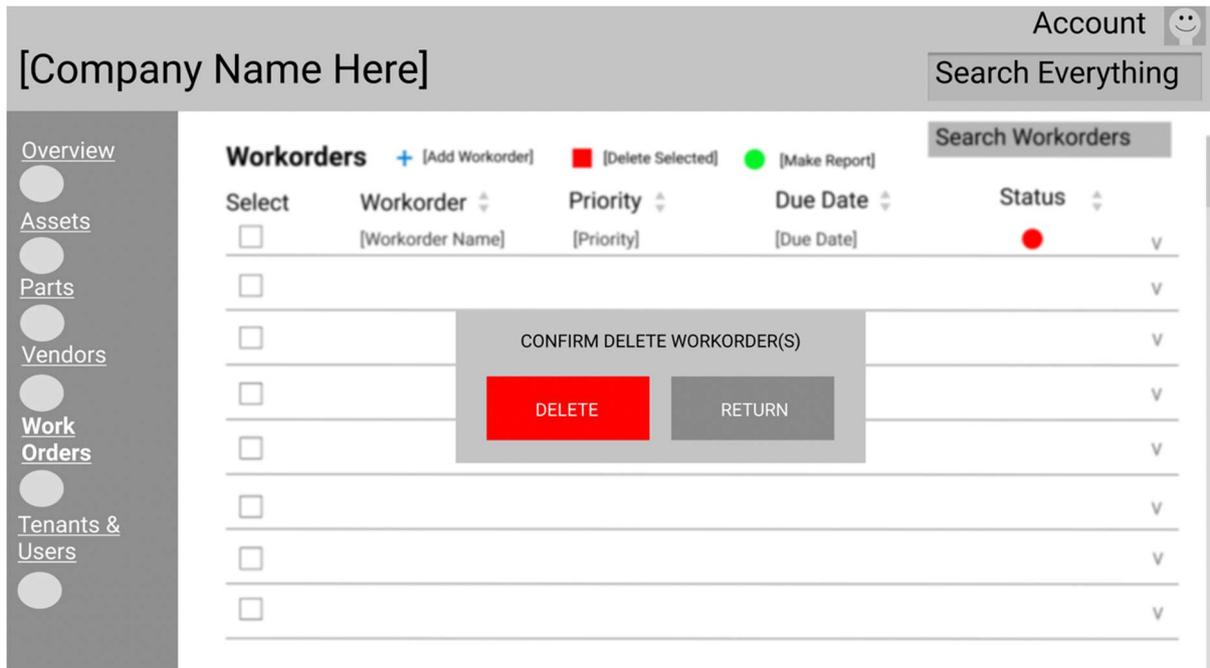


Figure 17 - Delete selected workorder pop-up window

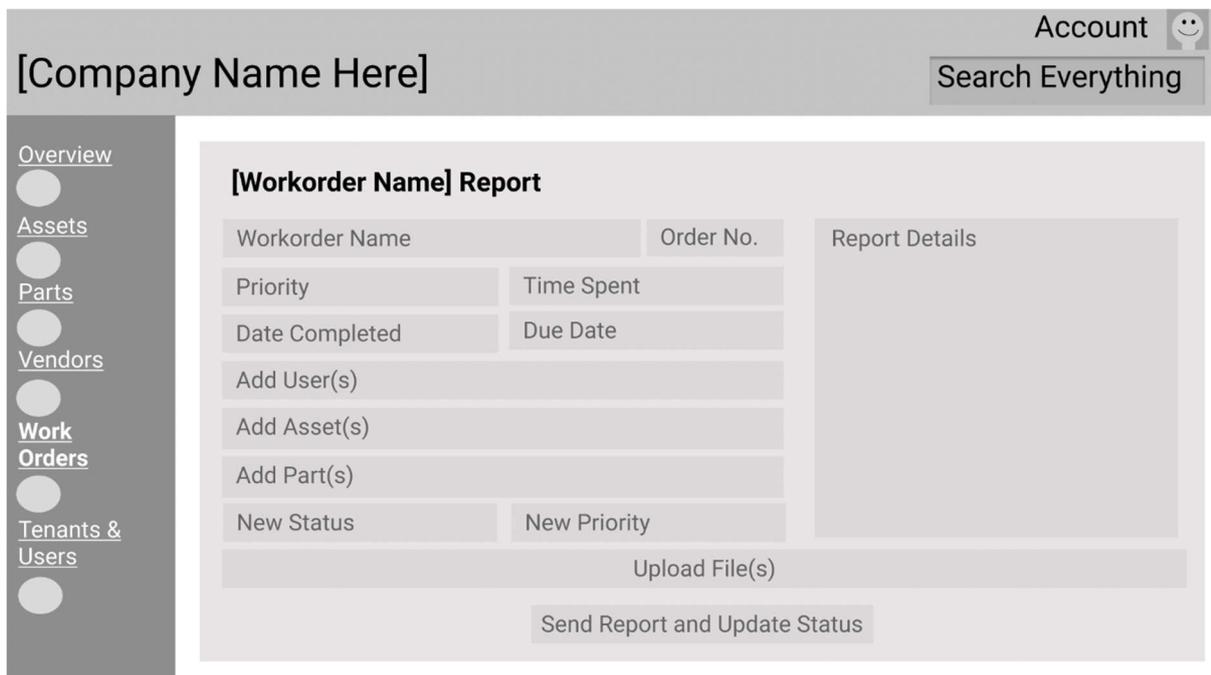


Figure 18 - Workorder Report page

A link to the interactive prototype sketches:

<https://www.figma.com/file/mU6qL5vfUTGA8rpqK2UecV/Website-Draft-v02?node-id=94%3A6>

3 User Testing with Mock-up Prototype

The team conducted user testing with the mock-up prototype on two large companies that were willing to take part, Arnalax and Mjólkursamsalan.

Our first period of user testing was conducted in sprint zero with the use of a prototype mock-up done in Figma.

Before the user testing period, we conducted preliminary tests with members from UteamUP to get their feedback on the product we were presenting to participants. They both have valuable experience working with CMMS systems and they supplied valuable critique on our prototype, resulting in several changes before the user tests on Arnalax and Mjólkursamsalan.

3.1 Test Methodology

Before any testing started, we created a questionnaire for participants to answer as well as tasks for our participants to perform.

The user tests were conducted on the 18th and 19th of September 2021. All tests were conducted remotely through Microsoft Teams due to Covid-19. Participants were asked for permission to be recorded so we could look back on the testing for us to refer to and guide our development.

Participants were sent a link to the interactive Figma prototype and could test on their own device after they were asked specific tasks to solve (see appendix 7.3). Before the user tests began, participants were asked questions about their company, assets, and desires in a CMMS system (see appendix 7.2).

3.2 Test Results and mock-up changes

The first test was administered the 18th of September to a participant from Arnalax, who expressed his belief that the current CMMS system they use is not user friendly and tricky. He gave us valuable feedback on what our prototype was lacking in terms of what he thinks his

company needs. These points included that he would like to have some sort of a report generation and maintenance schedule for machines that require routine maintenance. His testing went well, achieving the majority of the tasks, and the only major hiccup was in finding „create workorder“.

The second user test was conducted on the 19th of September. The participant was from Mjólkursamsalan. His user test followed similarly to the participant from Arnalax, despite some hardware problems necessitating the testing be done on a team members device with screen share and the participant just told what he would click on after given each task. He had a problem finding where to add a user and commented on that it would be good to have a location for assets since his company is very large which makes tracking such assets difficult. Just like the participant from Arnalax mentioned, he would also like to have some way of generating reports in the system.

After the first user testing, we made several changes to our prototype based on participant's feedback.

The following changes are listed below:

- Changed formatting of overview page in order to fit to the most important information
- Refined ALL list pages (adding buttons for list management and sorting, adding more clickables, changing column headers to the most important sortable values as indicated by the testing)
- Expanded file management and viewing system with own pages
- Added full user and settings pages
- Changed organization -> tenant and reformatted the entire structure to more clearly meet expectations and improve user experience.
- Added sub listings for vendors, assets, parts, and tenants in order to better view parent child relationships at a glance.
- Created a subscription management and licensing page along with associated listings.
- Expanded all detail pages in order to better represent the important information at a glance. Detail pages were also overhauled with links to associated items (assets/parts/users/etc.) for the same reason.
- Basic popups and dropdown menus were created.

4 Final design

After receiving feedback on our mock-up and beginning implementation we began to create our final design. This would begin with the template provided by Blazor and its inbuilt navbar. This we used extensively during development creating links to quickly get to pages we were working on, and we liked it for navigation so much we decided to keep it for the final product. It certainly didn't hurt that it was similar to how the mock-up was designed and an element we received no negative feedback on. The main addition to every page would then be the top bar, which was also a concept taken from the mock-up, though our implementation would differ once we discovered dropdowns.

With all the major formatting of the site done, we moved on to the individual pages in order to better layout and present our information with our everchanging models during development. We switched between manually created tables to Syncfusion a couple weeks into the process as their inbuilt functionality served to ease development time and presented the information in a professional format. We attempted to recreate the blocked layouts from the mockup in order to visually organize information as conveniently as possible while updating the design to feature more rounded edges to reduce the harsher feeling of the mock-up. After which we received the branding guide which would inform the final pieces of the design while we cleaned up the existing elements.

From the branding guide we reviewed our mock-up to decide where to include the various logos and colors we were supplied with. This culminated in trying to keep our design minimal while including the branding, utilizing more subtle colors to be easier on the eyes. Beyond the basic logos we also used several icons included with Syncfusion in order to better represent the function of our navigation tabs and toolbar buttons.

Below are screenshots from our final design at the time of this reports creation which displays all the elements described above:

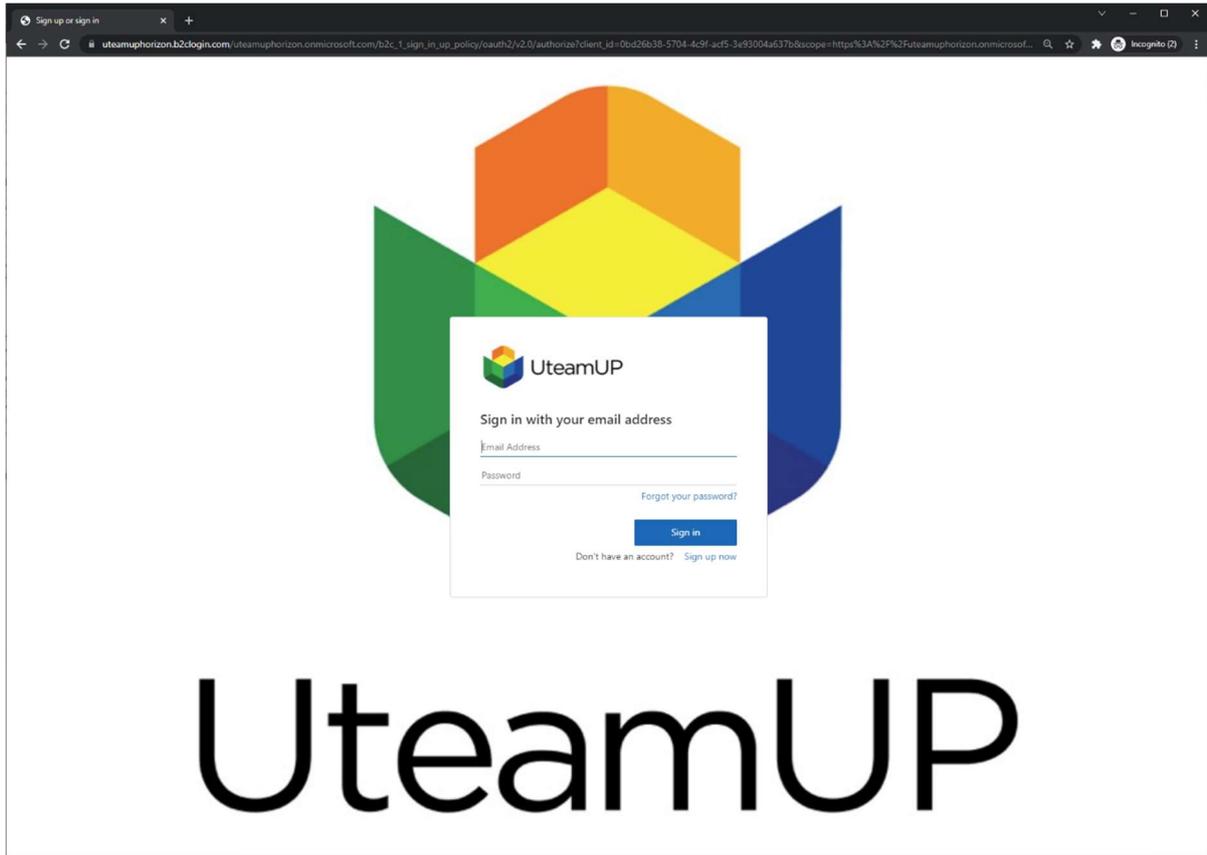


Figure 19 - Final product login screen

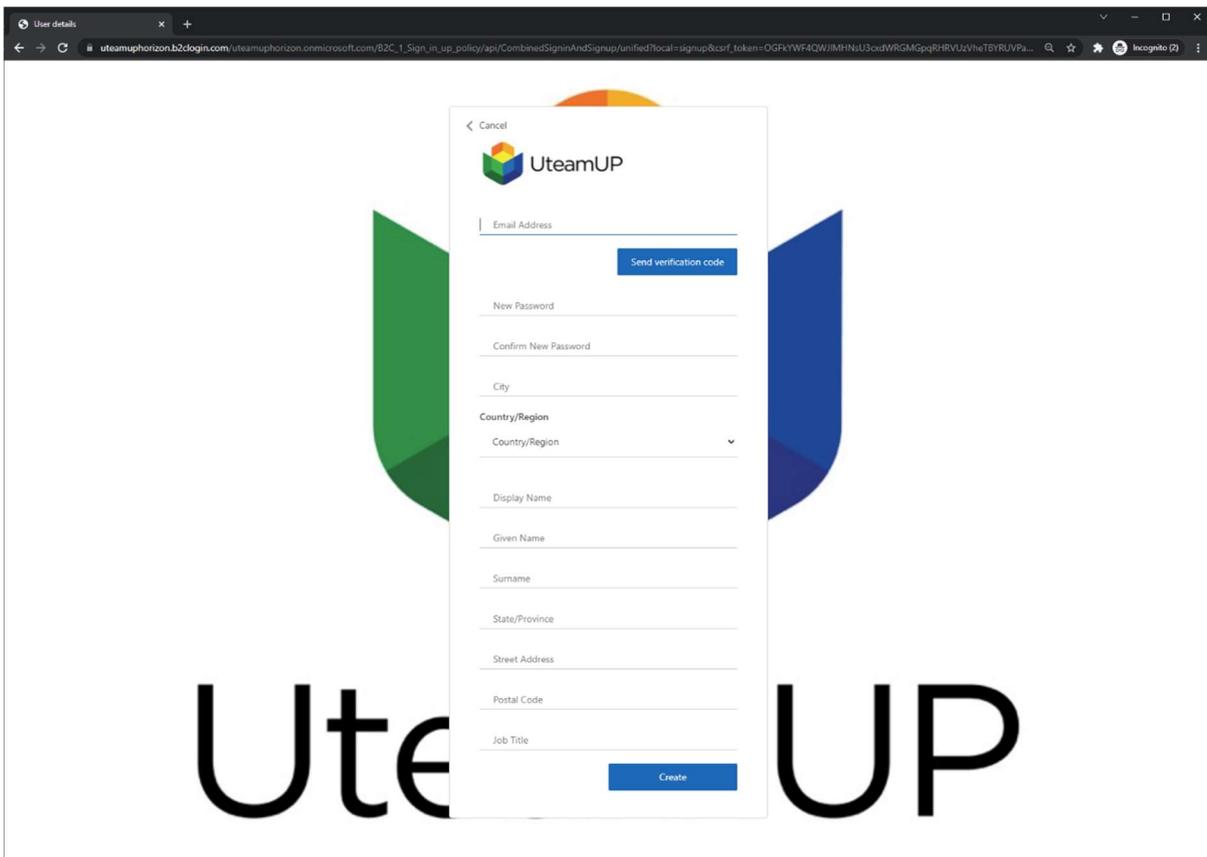


Figure 20 - Final product - create account

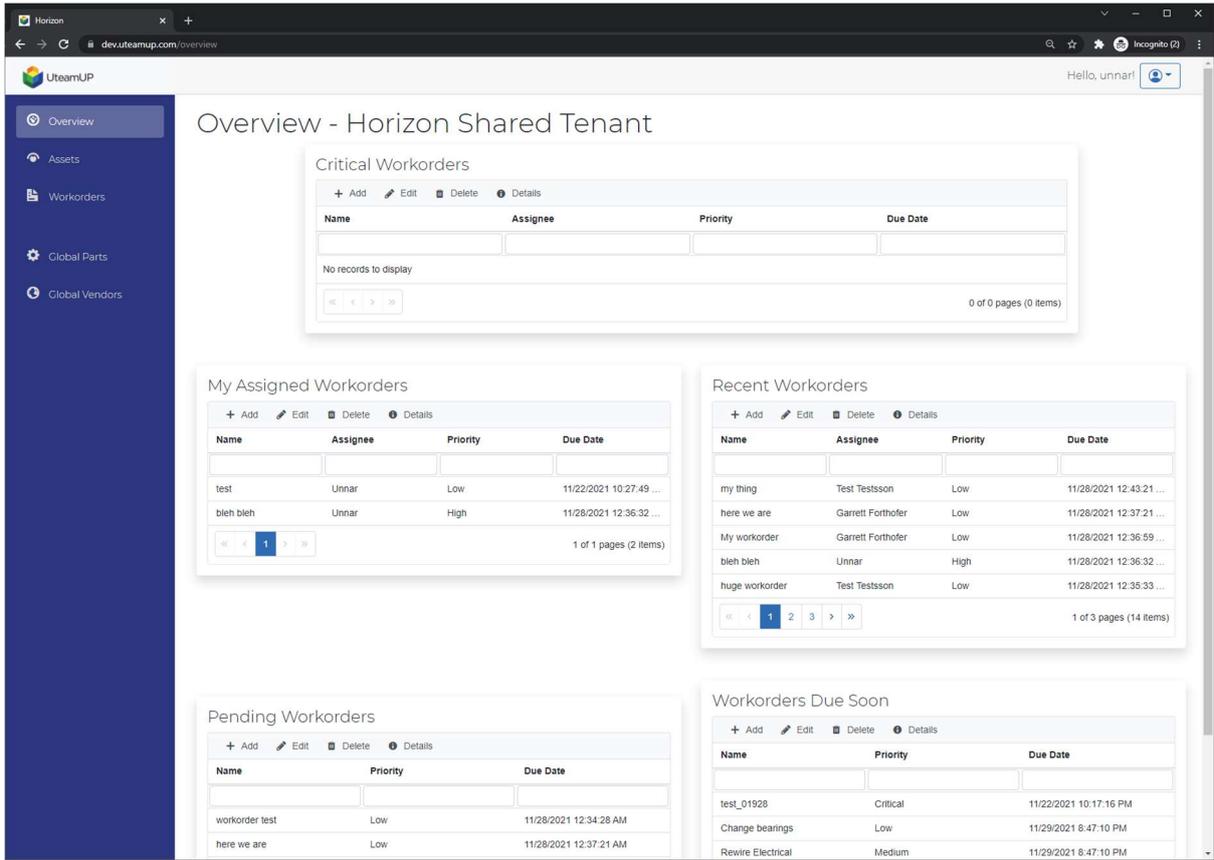


Figure 21 - Final product overview screen

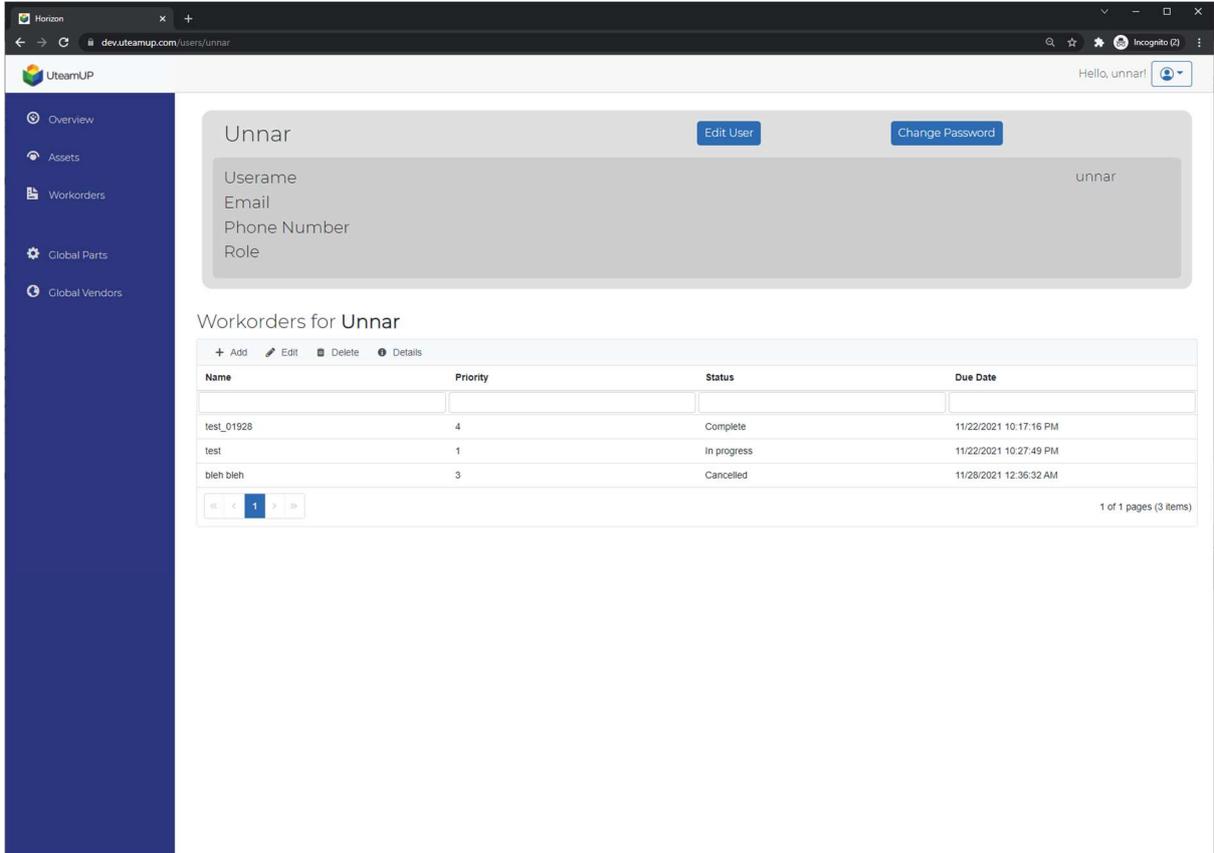


Figure 22 - Final product user account page

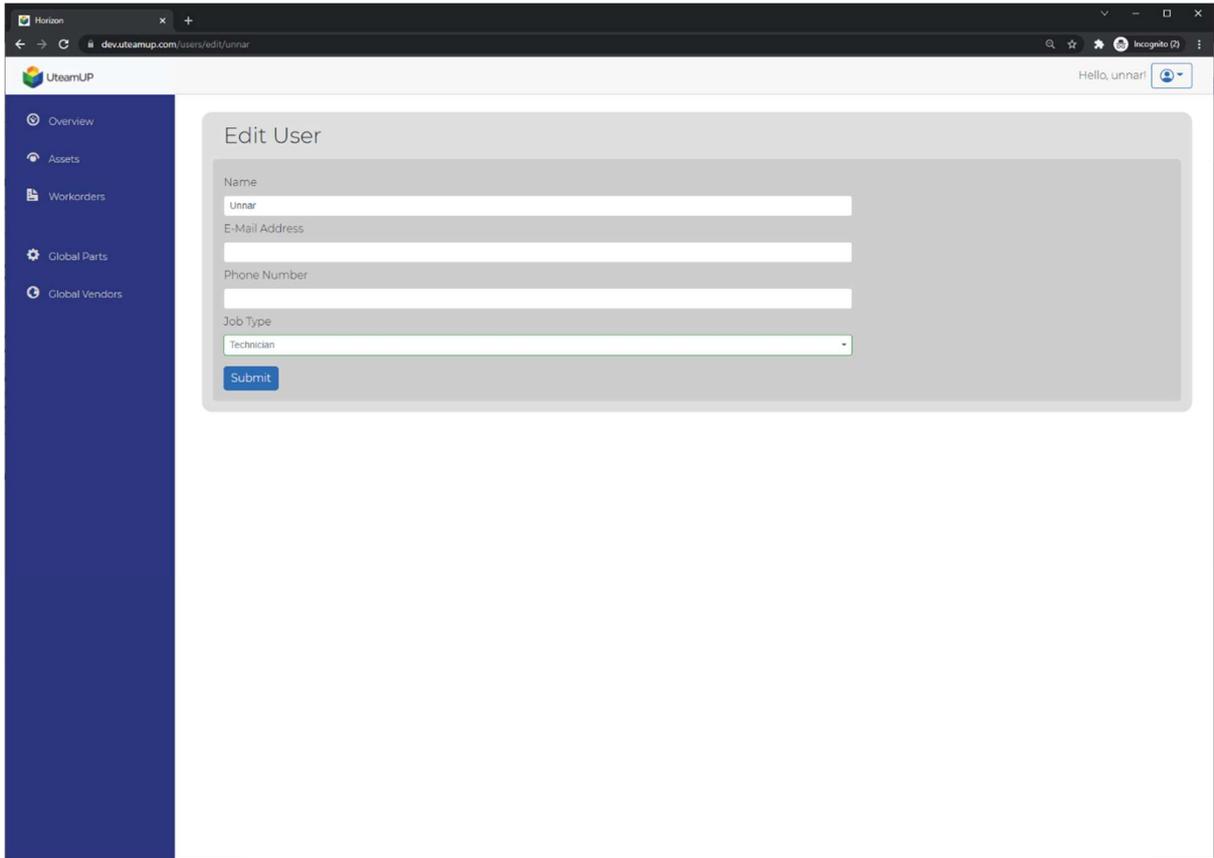


Figure 23 - Final product - edit account page

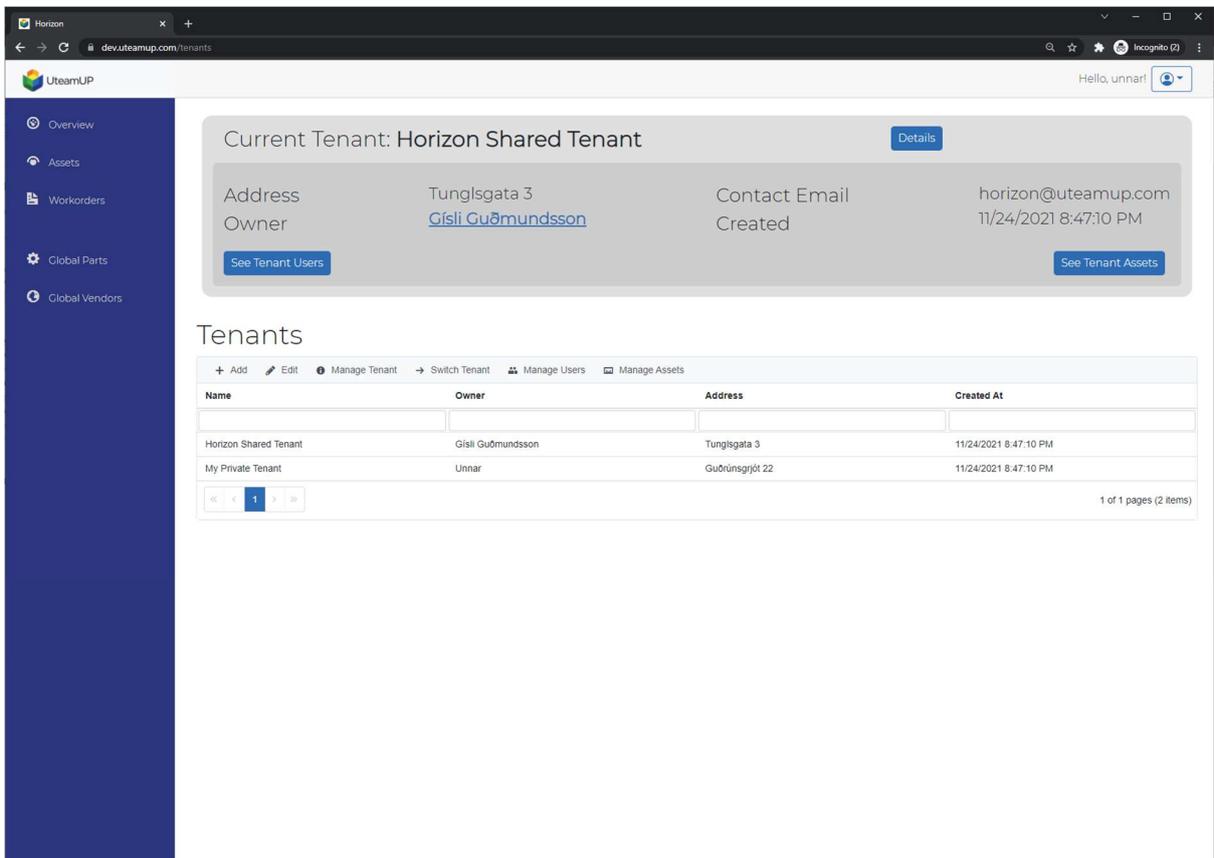


Figure 24 - Final product tenant page

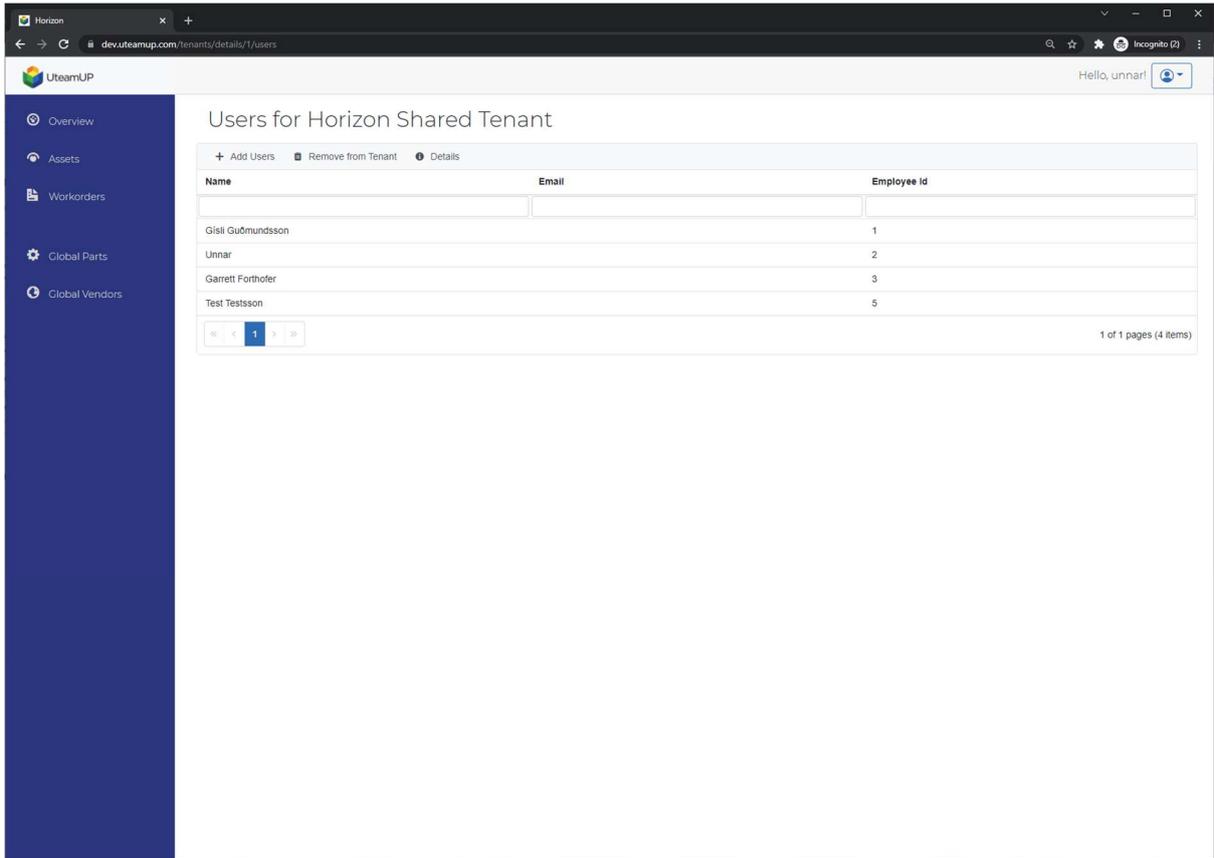


Figure 25 - Final product - manage tenant users

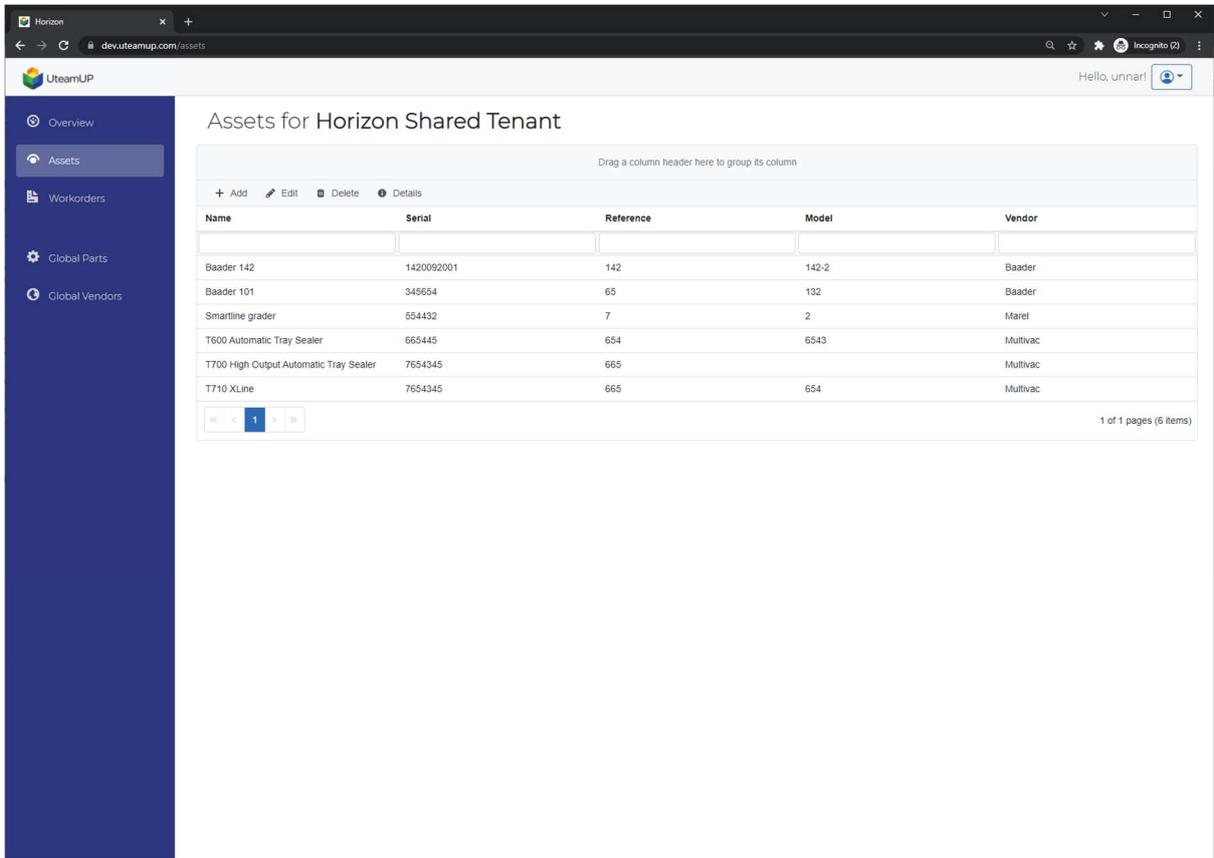


Figure 26 - Final product assets page

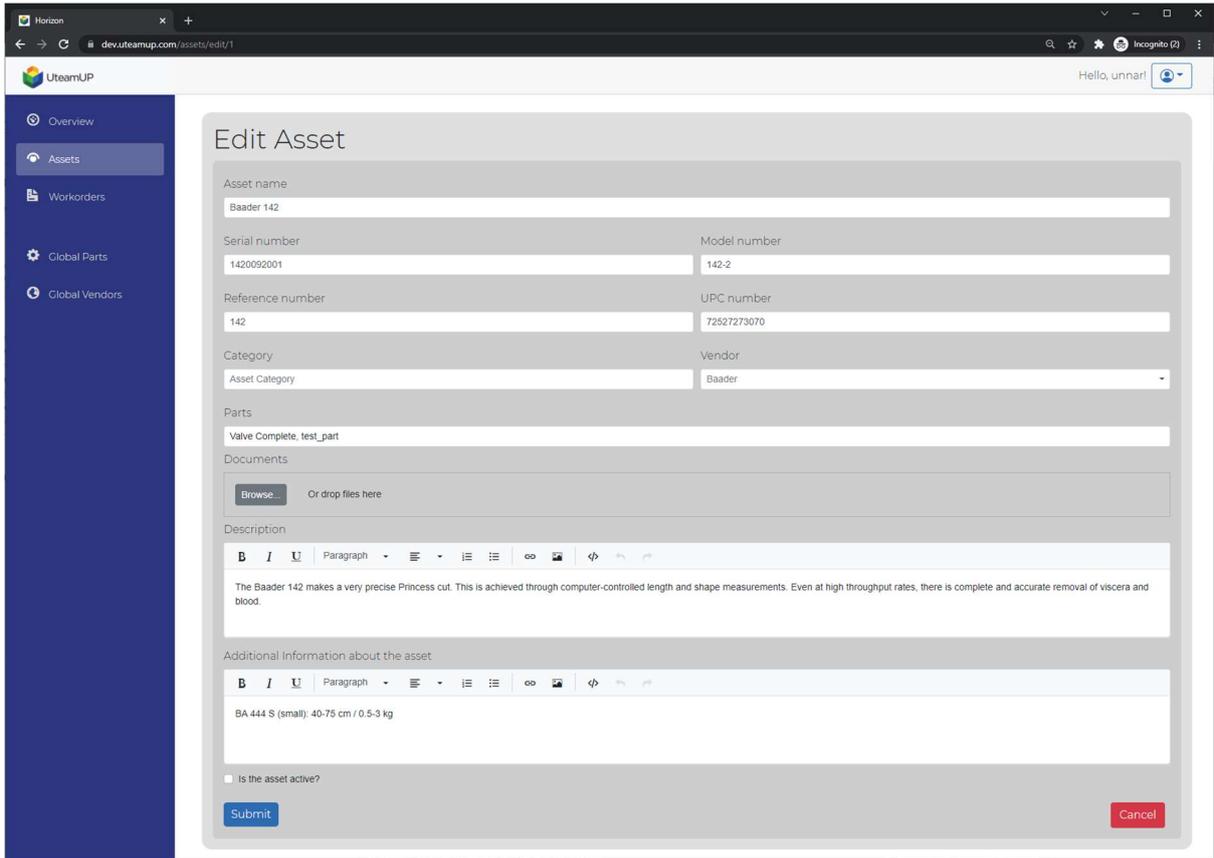


Figure 27 - Final product edit asset

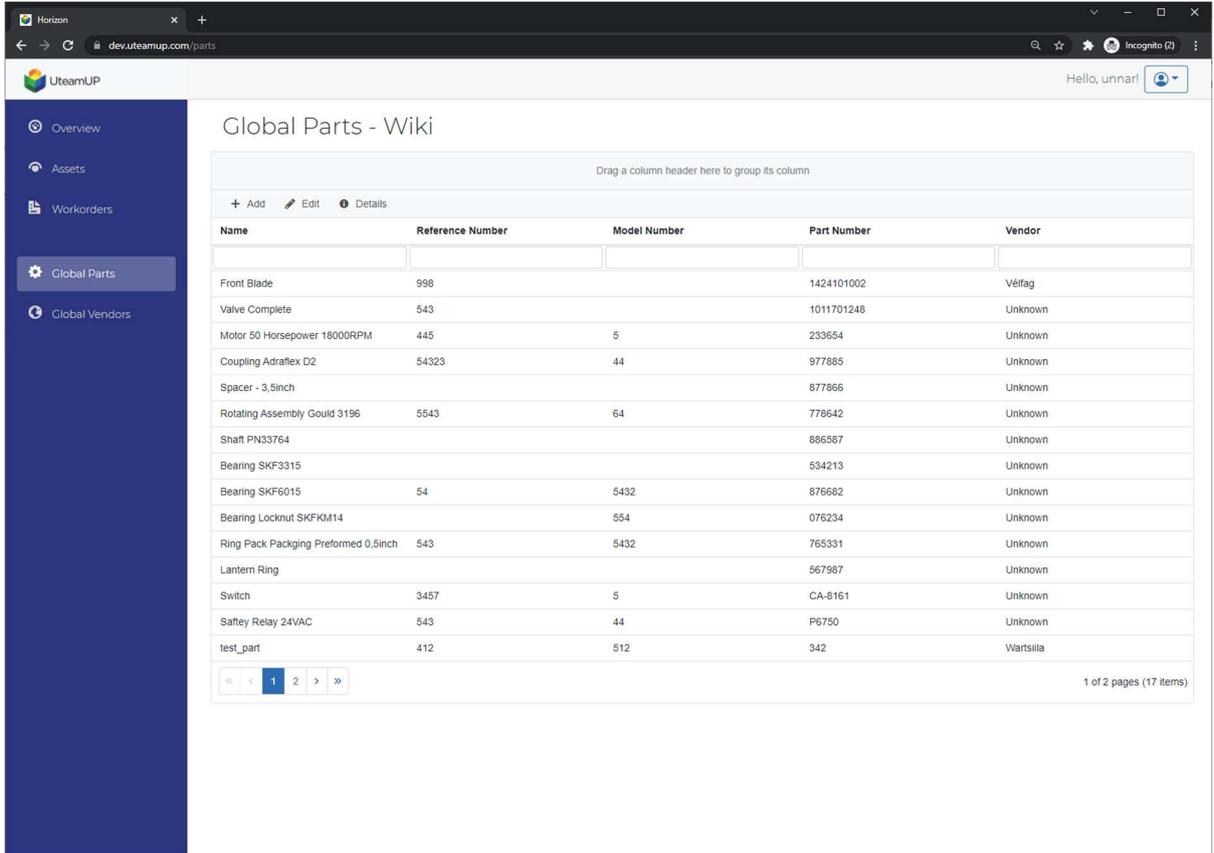


Figure 28 - Final product global parts page

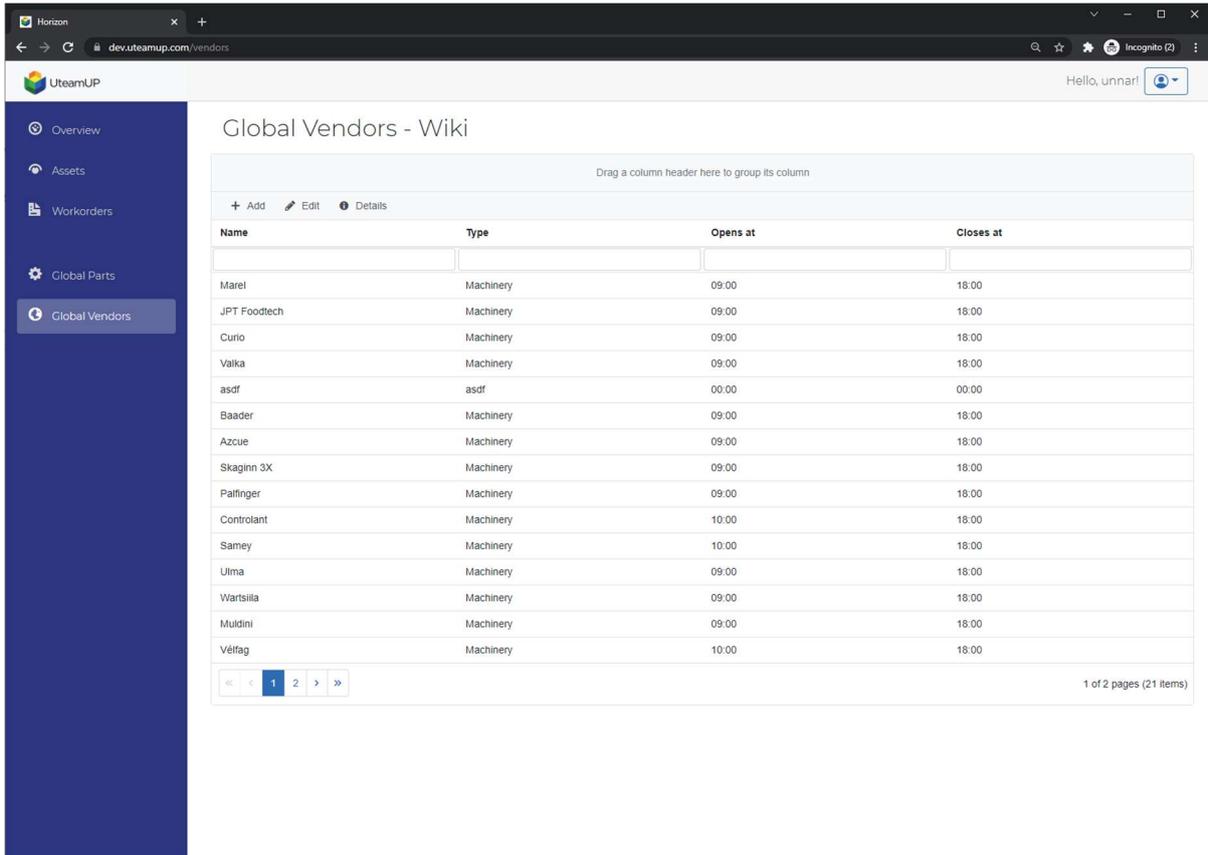


Figure 29 - Final product global vendors page

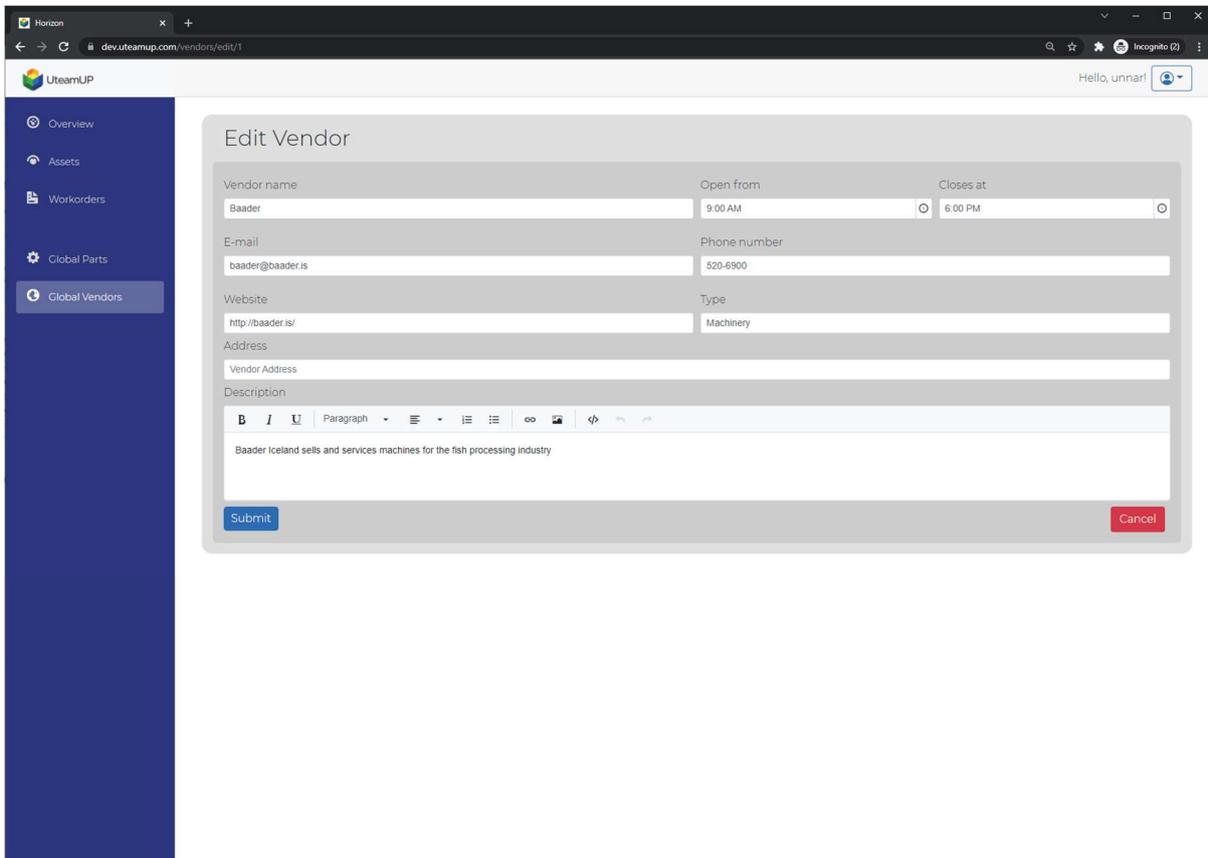


Figure 30 - Final product edit vendor

Workorder Number	Name	Assignee	Priority	Status	Due Date	Stop Required
12	test_01928	Unnar	Critical	Complete	11/22/2021	False
4	Change bearings	Gísli Guðmundsson	Low	In Progress	11/29/2021	True
2	Rewire Electrical	Gísli Guðmundsson	Medium	In progress	11/29/2021	True
3	Rotation assembly broken	Gísli Guðmundsson	High	Complete	11/29/2021	True
6	Knife change	Gísli Guðmundsson	Medium	In Progress	11/29/2021	True
7	Safety relay wiring	Gísli Guðmundsson	High	In Progress	11/29/2021	True
8	Spacer changing	Gísli Guðmundsson	Low	In Progress	11/29/2021	True
1	Knife change in Baader 433	Gísli Guðmundsson	Low	In progress	11/29/2021	True
13	test	Unnar	Low	In progress	11/22/2021	False
5	Motor not running like it sho...	Gísli Guðmundsson	Low	Complete	11/29/2021	True
33	bloby	Test Testsson	Low	Not started	11/27/2021	False
34	workorder test	Gísli Guðmundsson	Low	On hold	11/28/2021	False
35	huge workorder	Test Testsson	Low	In progress	11/28/2021	False
36	bleh bleh	Unnar	High	Cancelled	11/28/2021	False
37	My workorder	Garrett Forthofer	Low	In progress	11/28/2021	False

Figure 31 - Final product workorders page

Figure 32 - Final product edit workorder

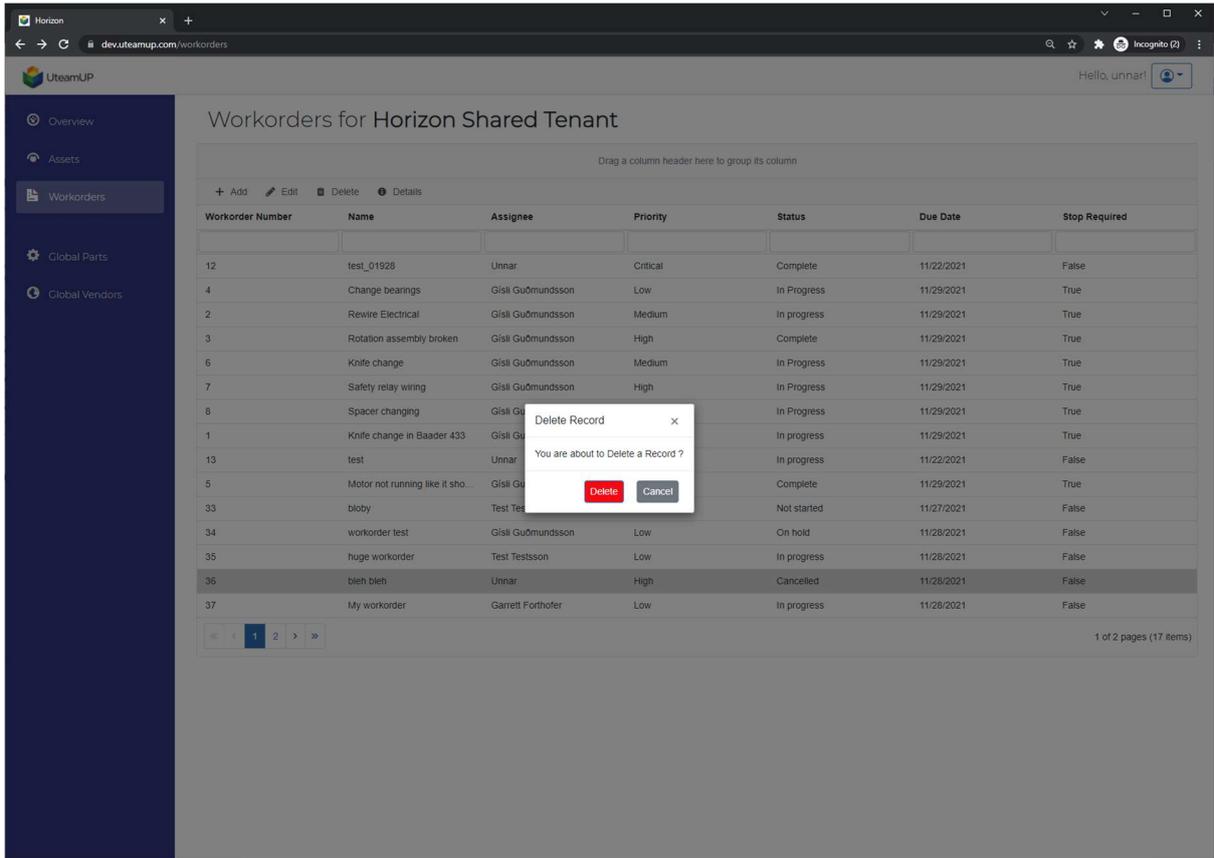


Figure 33 - Final product confirm deletion pop-up

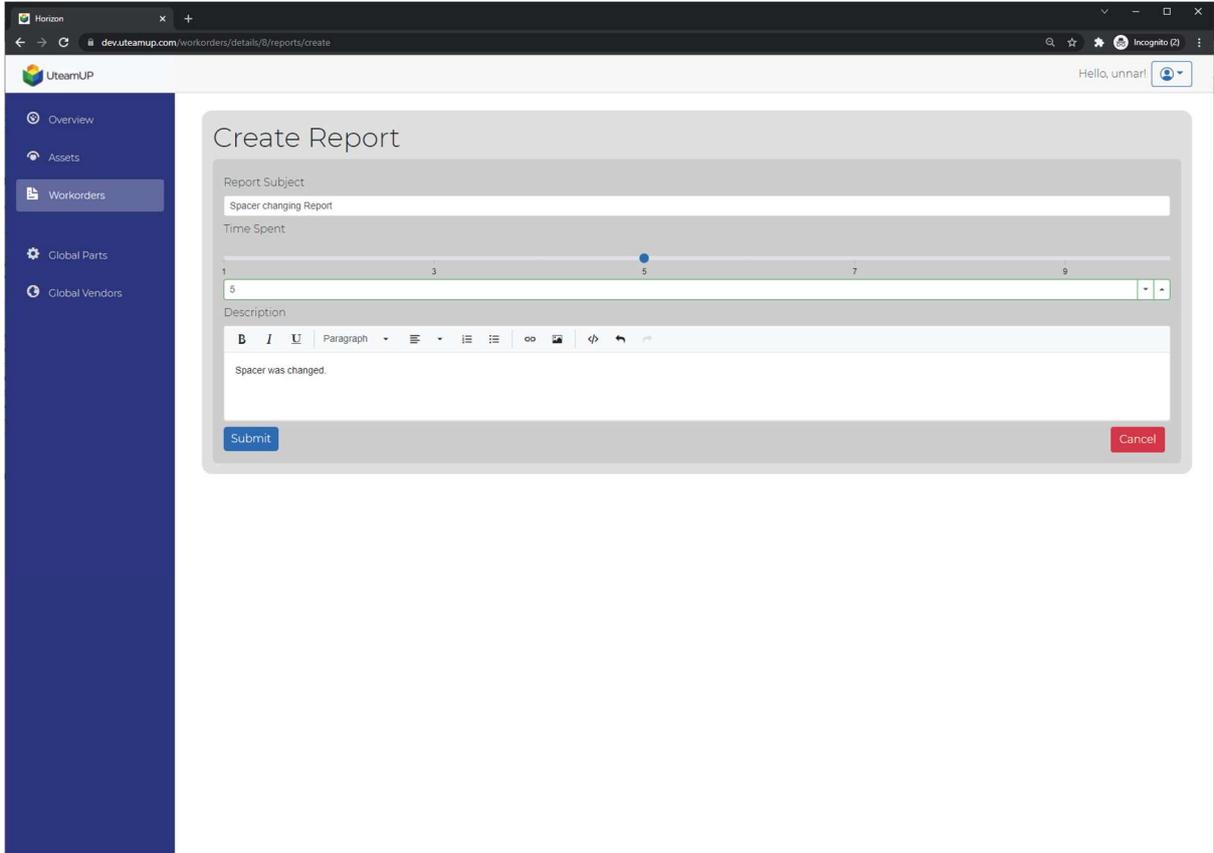


Figure 34 - Final product create report

5 User testing with Final Design

User testing for our final design was conducted in the same manner as our mock-up. We conducted preliminary tests with members from UteamUP to get their feedback on if the product we were presenting to participants was according to their vision.

Tests were conducted on two participants from Atlas Hf. and Marel ehf. with the fully developed product in sprint 4. To get the most out of our user testing we decided to measure usability goals as we tested the final product (see Appendix 1).

5.1 Test Methodology

The user tests with the final product were conducted on the 21st and the 23rd of November 2021. Again, due to Covid-19, all tests were conducted remotely through Microsoft Teams and participants were asked for permission to be recorded so we could use the recording to identify potential usability issues.

Participants were sent a link to the fully developed system and were asked to resolve specific tasks. After participants had completed the tasks, they were asked questions about their experience performing the tasks, design of the system and overall satisfaction.

5.2 Test Results and Changes to Final Design

We first conducted preliminary tests as with our initial user testing session with employees from UteamUP. This was followed by our external company tests, the first being administered on the 21st of November to a participant from the company Atlas hf.

From our tests with UteamUP we found several areas for improvement. We added Azure Blob storage since the results showed us that the images were saved to the server but not centrally and that caused issues such as if the server was updated the images were missing. So, we had to go back to the drawing board to add Azure blob storage solution to save the files. The filtering of parts and vendors was added to help the user to be able to organize and figure out the data he is using.

There were a lot of bug fixes regarding links between the user, part, asset and other data that had to be fixed. The major bug we found coming out of this test was in the user creation of a tenant. The bug related to the user not being able to create a tenant, or if one was provided, not being automatically assigned to it upon login. These we then fixed before we continued with our external company tests.

The focus of our external company testing was to use the environment in real projects. Atlas is a consulting and maintenance company for cranes and big machinery. The software is used for organizing the maintenance of cranes by using the workorders to schedule orders of parts. To begin we had them input some of their own data that they would manage into our system. This began with cranes they were using. The cranes are set as assets and workorders were used for keeping track of when the ordering was created. The objective was to figure out if there were some bugs in the system since the second user testing was not related to the user interface but rather if the application was responding to the user. There were some bugs related to the system such as the parts did not show based on the vendor and there was some information missing such as the images that were added to the workorder notes were saved to the state of the server but not in a centralized form.

The second user test with the final design was conducted on the 23rd of November. The participant works for Marel ehf. which is a leading global provider of advanced processing equipment, systems, software, and services to the poultry, meat, and fish industries. The test was related to installation and setup of an enterprise warehouse in the USA and this software was used to help with organizing the setup of the equipment. There were no big issues regarding this testing since most of the bugs had been fixed, the only issues that the user complained about was missing features that he would like to have had such as having internal stocks and adding documents to the assets and parts to be able to get the data straight away.

Conducting the user testing both with the mock-up and the final product was enlightening to us. Throughout the process we got great feedback both from the questionnaire, discussion with our participants and from members from UteamUP. From this feedback we re-examined the problem areas and redesigned the model where necessary to facilitate the missing or flawed functionality. This concluded our design period after extensive inhouse testing of the fixed features so that the product may be considered done, and any bugs present at least would not impede usage to an unacceptable degree as we could not find them. The measurements on the usability goals were particularly useful in this providing concrete data in the analysis of our

final system. Though as with all software solutions, there may still be bugs present but for the scope of this project we have concluded development in what we feel is a good place.

6 Conclusion

To conclude our design report, we reflect on our process. We began first with our mockup to create an initial model of the system we would create. After several sprints of development, we created a working real-time model to go into our second user testing session. From this we were able to find the remaining bugs in the system and fix them before development was concluded. This entire process design process has been guided by the feedback from these user testing sessions and feedback gleaned from UteamUP in implementing both the visual and functional design of our final system. To this end we have iteratively made our system more accessible and easier to understand. We have concluded the project with our goal of an improvement on existing maintenance and production management systems achieved.

7 Appendix

Task users have to execute:

1. Register yourself
2. Login as a user
3. Create a tenant
4. Create a subscription for tenant
5. Change plan on subscription from basic to standard
6. Change amount licenses for subscription
7. Select/Switch a tenant
8. Find assets
9. Assign a vendor to an asset
10. Create an asset
11. Create vendor
12. Create Part
13. Remove a part
14. View picture of a part
15. Find pdf files on an asset
16. Find owner of tenant
17. If owner change the owner of tenant
18. Search for a workorder
19. Create a workorder
20. Delete a workorder
21. Assign a workorder to a user
22. Change Due Date
23. Change priority of a workorder
24. Add user to a tenant
25. Assign license to a user on tenant
26. Remove a user from a tenant
27. Change password on user
28. Update part

29. Update workorder
30. View all pictures on asset
31. View pictures on workorder
32. Attach pdf file to workorder
33. Remove file from asset
34. Update organizational information such as company name
35. List all workorders by priority
36. View dashboard of the application
37. Find vendor phone
38. Make A Workorder report
39. Close a workorder as complete
40. Find out how to get details on all my tenants that I have access to

Questions users were asked after executing tasks:

What did you like the most about using the system?

What did you like the least?

Was there anything that caused you frustration while using the system?

Was there anything that surprised you while using the system?

What are your thoughts on the design and layout?

On a scale from 1-10 how satisfied are you with the system?

7.1 Measurable goals

Usability/UX goal	Usability factor
Precisely 100% of all users can sign in	Effectiveness
More than 80% of all users can register a user	Effectiveness
More than 80% of all users can create a tenant	Effectiveness
More than 80% of all users can add/edit an asset	Effectiveness
More than 80% of all users can create a vendor	Effectiveness
More than 80% off all users can create a part	Effectiveness
More than 80% can delete selected part	Effectiveness
More than 80% can make a new workorder	Effectiveness
More than 80% can change priority of a workorder	Effectiveness
More than 80% can make a workorder report	Effectiveness
Users are able to create a tenant within 15 seconds	Efficiency
Users can find pdf files on an asset within 30 seconds	Efficiency
Users can view dashboard of the application within 10 seconds	Efficiency
Users can close a workorder as complete within 20 seconds	Efficiency
Overall satisfaction of the system is rated 8 on average on a scale from 1-10	Satisfaction

7.2 Usability / UX Goal table

All data that was gathered to measure the goals are stated below.

Usability/UX goal	Factor	How it was measured	What was measured	Measurements	Value now	Fulfilled
Precisely 100% of all users can sign in	Effectiveness	Task 2 is used	Completed/not completed	C, C	100%	Yes
More than 80% of all users can register a user	Effectiveness	Task 1 is used	Completed/not completed	C, C	100%	Yes
More than 80% of all users can create a tenant	Effectiveness	Task 8 is used	Completed/not completed	C, N	50%	No
More than 80% of all users can add/edit an asset	Effectiveness	Task 10 is used	Completed/not completed	C, C	100%	Yes
More than 80% of all users can create a vendor	Effectiveness	Task 11 is used	Completed/not completed	C, C	100%	Yes
More than 80% off all users can create a part	Effectiveness	Task 12 is used	Completed/not completed	C, C	100%	Yes
More than 80% can delete selected part	Effectiveness	Task 13 is used	Completed/not completed	C, C	100%	Yes

More than 80% can make a new workorder	Effectiveness	Task 19 is used	Completed/not completed	C, C	100%	Yes
More than 80% can Change priority of a workorder	Effectiveness	Task 23 is used	Completed/not completed	C, C	100%	Yes
More than 80% can make a workorder report	Effectiveness	Task 38 is used	Completed/not completed	N, N	0%	No
Users are able to create a tenant within 15 seconds	Efficiency	Time is measured	Time in sec	14, 13	13,5	Yes
Users are able to find pdf files on an asset within 30 seconds	Efficiency	Time is measured	Time in sec	12, 10	11	Yes
Users can view dashboard of the application within 10 seconds	Efficiency	Time is measured	Time in sec	3, 4	3,5	Yes
Users can close a workorder as complete within 20 seconds	Efficiency	Time is measured	Time in sec	15, 18	16,5	Yes
Overall satisfaction of the system is rated 8 on average on a scale from 1-10	Satisfaction	Rating from user	Rating on the scale 1-10	8, 9	8,5	Yes