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Usability study:

E-commerce admin panel

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ABSTRACT OF MASTER'S THESIS

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Today, it's easy to create a web shop using one of the generic open source e-commerce platforms. These platforms are usually ready-to-use solutions equipped with a lot of features. The problem is that modifying and managing them may be difficult for the inexperienced users because of the high amount of features. This is why Floweb ltd has developed a new web shop platform which is designed to be light and as easy to use as possible.

This thesis presents the main features of this web shop platform's admin panel and focuses on admin panel's usability. The idea is to find out what kind of usability problems the admin panel has, what causes them and find solutions to these problems. Furthermore, the thesis studies which of the usability inspection methods would be preferred for the usability inspection.

In the usability inspection, I used three inspection methods: The cognitive walk-through, heuristic evaluation and user testing. For the inspection of the user interface, I used the basic tasks considering setting up and managing a web shop. In addition to the inspection, I compared the methods I used by considering the amount and severities of the recognized problems and my experiences of the methods.

Many usability problems were found from different parts of the user interface by using the methods. The significant amount of the problems were related to unclear or unnoticed things. The conclusions were that guidance should be generally improved and there should be more testing with real users. Also, even though heuristic evaluation recognized more problems than user testing, the most effective method was user testing after all, because it found more relevant problems. Finally, the amount of the usability problems emphasizes the importance of the usability inspection as a part of the software development process.

Keywords:	Usability inspection, heuristic evaluation, cognitive walk-through, user testing, e-commerce platform, comparison of evaluation methods
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Nykyisin oman verkkokaupan perustaminen on helppoa valmiiden avoimen lähdekoodin verkkokauppa-alustojen avulla. Ongelmana kuitenkin on, että ne ovat luonteeltaan yleiskäyttöisiä, joten niiden muokkaaminen ja hallinta voi olla hankalaa kokemattomille käyttäjille suuren ominaisuusmäärän takia. Tästä syystä Floweb Oy on kehittänyt uuden verkkokauppa-alustan, joka on pyritty tekemään mahdollisimman kevyeksi ja helppokäyttöiseksi.

Tämä diplomityö esittelee Flowebin kehittämää verkkokauppa-alustaa, jonka hallintapaneelin käytettävyys on tutkimuksen kohteena. Tarkoituksena on selvittää minkälaisia käytettävyysongelmia hallintapaneelissa on, mistä ne johtuvat ja etsiä näille ratkaisut. Lisäksi työssä pohditaan mitä arviointimenetelmiä käytettävyystutkimuksessa kannattaisi käyttää.

Käytettävyystutkimuksessa käytin kolmea arviontimenetelmää: kognitiivista läpikäyntiä, heuristista arviointia sekä käytettävyystestausta. Käyttöliittymän arvioinnissa käytin menetelmien apuna verkkokaupan perustamiseen ja ylläpitoon liittyviä tehtäviä. Lisäksi vertailin käytettyjä menetelmiä sekä niiden tunnistamien ongelmien määrien ja vakavuuksien että omien kokemuksieni avulla.

Arviointimenetelmien avulla havaittiin paljon käytettävyysongelmia käyttöliittymän eri osista. Merkittävä osa ongelmista liittyi epäselviin tai huomaamattomiin asioihin käyttöliittymässä, joiden avulla todettiin, että ohjeistusta tulisi parantaa sekä testausta oikeiden käyttäjien kanssa lisätä. Lisäksi ongelmien perusteella selvisi, että vaikka heuristinen arviointi tunnisti eniten ongelmia, käytettävyystestaus todettiin tehokkaimmaksi sen löydettyä eniten oleellisia ongelmia. Käytettävyysongelmien määrä korostaa myös käytettävyystutkimuksen tärkeyttä osana ohjelmistokehitysprosessia.

Asiasanat:	Käytettävyystutkimus, heuristinen arviointi, kognitiivinen läpikäynti, käytettävyystesti, verkkokauppa-alusta, arviointimenetelmien vertailu
Kieli:	Englanti

Abbreviations and Acronyms

B2B	Business to business
B2C	Business to customer
LAMP	A web service solution stack model which consists of Linux, Apache, MySQL and PHP
MVC	Model-View-Controller software architecture model
AJAX	A group of web development techniques: asynchronous JavaScript and XML
JSON	A format for interchanging data between client and server: JavaScript Object Notation
HE	A heuristic evaluation
CW	The cognitive walkthrough
UI	A user interface
DOM	The Document Object Model

Contents

Chapter 1

Introduction

In the company called Floweb, we have used the e-commerce platform called PrestaShop for B2B shop purposes for a while. Last year, there was a need for a B2C shop so we started planning on which e-commerce platform to use. Since PrestaShop hadn't turned out to be an easy platform to customize the way we wanted, we decided to start developing our own platform instead. Now, the development process has reached the point where the basic functionality has been implemented, so we decided to start testing it with real users.

The purpose of this research is to evaluate the usability of our new e-commerce platform's user interface using three usability evaluation methods: the cognitive walkthrough, user testing and heuristic evaluation. Also, the idea is to compare the methods and figure out which one is the most effective. The platform is being developed also during the research, so only most of the main features of the admin panel are currently implemented. The focus of this study is on the admin panel because it has more complex functionality and it gives a chance to present the platform for our future customers: the flower shopkeepers.

In order to get customers, we need to make the user interface look good without reducing usability. Also, we need to know that the basic functionalities needed to manage a shop are found from our platform. Furthermore, we'd like to know what the users think of our platform, e.g., is there something missing from the shop and what kind of improvements would be useful for the shopkeepers. In addition to the experienced shopkeepers, we are trying to introduce e-commerce to new ones without earlier experience on administering an online shop. The goal is to make the creation of an online shop as easy as possible with positive first impressions. Therefore, we want the admin panel to be intuitive and easy to use.

The research questions of this study are:

1. What kind of usability problems were found from the user interface and why?

2. Which of the usability inspection methods would be used next time?

The study starts with going through the background information about the open source e-commerce platforms and the features of our custom platform. Then, the selected methods are presented along with an overview about usability. After going through the methods, comes the inspection process. It includes presenting the methodology, the usage of usability methods, the analysis part including the comparison of methods and finally presenting the results. Finally, there are conclusions with some observations of the process.

Chapter 2

Background

This chapter gives an overview of e-commerce platforms, focusing mostly on open source solutions, and presents the current implementation of a custom platform.

2.1 E-commerce

E-commerce enables purchasing products on business transactions online, usually over the Internet. It improves efficiency and reliability of business processes in companies by automatizing the handling of transactions [26]. E-commerce is usually divided to two main types: B2B, meaning transactions between businesses and B2C, transactions between a business and a consumer [26]. Since individual customers are easier to reach, B2C is simpler to achieve of these two types [26]. According to the research by Frost & Sullivan [28], B2B online transactions are predicted to be globally a worth of 6,7 trillion dollars in the year 2020, while B2C transactions are expected to have a half of B2B transactions' value. Especially the amount of B2B online transactions has been increased due the continuously increasing usage of open source e-commerce platforms instead of legacy systems.

Today, there are over 60 different kind of solutions for starting an online shop, so starting businesses have various options to choose from. The challenge in choosing the right platform, is finding out which of the e-commerce platforms meet the specific needs best. Since it's likely that none of these platforms meet the requirements perfectly, there are various extensions available for adding more features to the platforms. [1]

There seems to be three very popular e-commerce platforms, despite of the dozens of alternative solutions, which have over a half of the market share:

A Wordpress plugin called WooCommerce[1] with 22% share and two open source e-commerce platforms, Magento[2] (23,7%) and PrestaShop[3] (6,7%) [5]. WooCommerce requires an installation of the Wordpress and offers commercial extensions in addition to the core features. Magento and PrestaShop include the platform with core features and also offer free and commercial extensions to the platform. [1]

2.2 Open source e-commerce platforms

An open source e-commerce platform is a software which provides many features for building an online shop at a low cost. For customizing the shop, most of the platforms offer different kind of add-ons or modules for adding more features to the usually already feature-rich platform. The application itself is often free but there might be some costs in the extra features. [29]

The advantage of customizing shop is that extending shop with add-ons is quite easy and it doesn't usually require programming skills. Of course, having programming skills enables developing of add-ons in most of the platforms. On the downside, adding and removing features can make the shop more complicated and needing more maintenance. Also, there's always a possibility that there's no add-on for a certain need or the selected add-on might not work as intended. [3]

Like many other software, these platforms require updating too. Updates include usually different kind of fixes and improvements, considering, e.g., security, so updating is generally recommended. After updating the platform, some of the installed add-ons require updating since the required code may have been changed. The problem is that all of the add-ons might not have a new version to support the platform's update, so those must be either fixed manually or replaced with another one. [3]

After browsing various popular open source e-commerce platforms like Magento, PrestaShop and Zen Cart[4] [6], we chose PrestaShop for our B2B shop. PrestaShop offered an easy and quick way to build an online store with over 250 000 shops already online [23], so it seemed the way to go. It offers various modules for customizing the shop and should be suitable for different kind of products.

While it's probably suitable for most cases, we have noticed during the period of almost two years, that it does not properly meet our needs. We

[1] http://www.woothemes.com/woocommerce/
[2] http://magento.com/
[3] https://www.prestashop.com/
[4] https://www.zen-cart.com/

have found that our customers use only a small amount of the provided features (especially on the admin side) and the platform is quite complicated in the developer's point of view. In addition to the provided features, there is a feature library which offers various modules from different developers for extending the shop. We tried some of them, but unfortunately most of the tested features had bugs and few didn't even work at first. For us, the fact is that PrestaShop offers too many features already in the beginning without adding any other modules which makes the platform too heavy and complicated for our use. Also, customizing the PrestaShop modules has turned out to be too much work considering the benefit.

After experiences from PrestaShop and knowing the features we need for the B2C shop, we started thinking of our own shop platform.

2.3 A custom web shop platform

We decided to design a new e-commerce platform to replace PrestaShop after the two-year struggle with updates and customizing. Our goal is to develop a simple, light and easy-to-use platform to be used in B2C purposes in the beginning. On the technical side we use the basic LAMP model combined with MVC model. To improve user experience, all data is transferred using AJAX technology. This affects the user experience since data is transferred asynchronously. In addition to the simplicity on the technical side, we are focusing on the looks, intuitivity and usability of the user interface.

Since the development is currently focused more on the admin panel, the usability inspection process will be done by using most of its features.

2.3.1 Main features

At this point, the platform's admin panel includes the very basic functionality needed to manage a shop. The main features, which can be seen from the navigation bar in Figure 2.1, include for instance the handling of products and orders. In addition to those, there's some custom features particularly

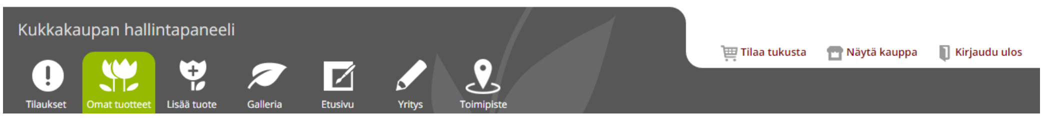

Figure 2.1: Admin panel's navigation bar.

designed for our needs like the image gallery. Also, some features are still missing from the UI which will be cut out from the usability inspection.

2.3.1.1 Add products

Adding products is done by using a popup-like form, described in Figure 2.2, in a separate page from handling products. A product can have one product image which can be selected from the shop's local image gallery. Other basic product information include name, description, category and visibility. While name and description are set via traditional input fields, category is selected from a predefined list. In addition to these, it's possible to add up to three versions of the product. Each version has a description, a price and a possibility to set a limit for sale. At this point, the only optional information is the product image. After the product has been saved, product information can be copied to the next product.

Figure 2.2: The add products form.

2.3.1.2 Edit products

Products can be edited from the product list page, which can be seen in Figure 2.3. Product's details are shown in the list view and they can be edited via the product popup by clicking the edit button. While all information can

Figure 2.3: Product list.

be changed using the popup, the product's visibility can be edited straight from the list view. Also, the removal of the product straight from the list will be possible in the near future.

2.3.1.3 Customize front page

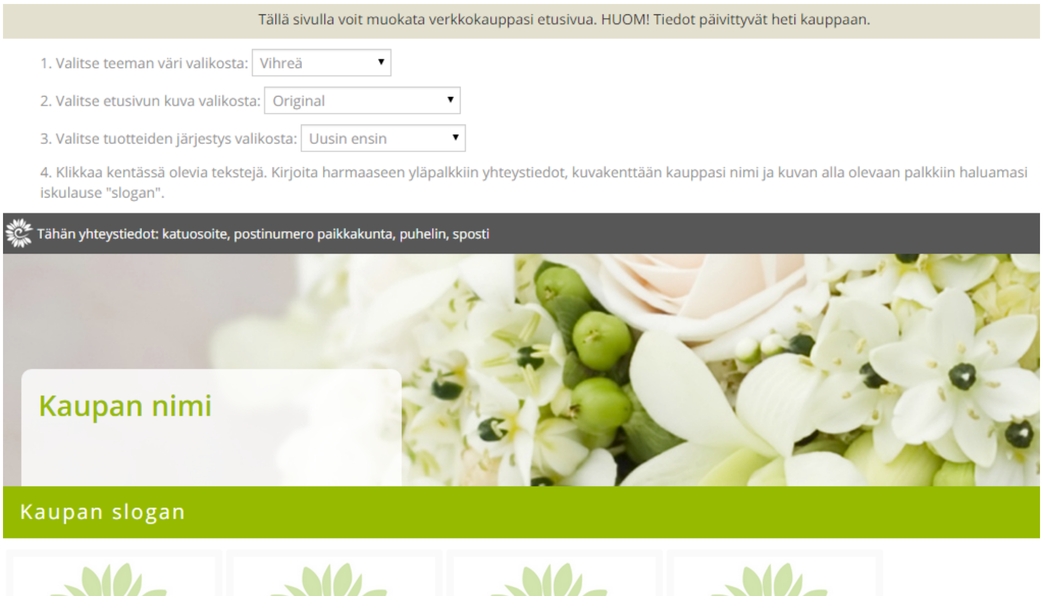

Figure 2.4: Customize front page.

This feature, described in Figure 2.4, enables the customizing of the shop's front page. A shop administrator can choose a main color for the site and a main banner image from the predefined options. In addition to a theme, the administrator can select the product order for the front page. Also, it's possible to set the main texts including contact information, a page header and a shop slogan in the front page. Finally, this feature offers a preview of the front page and all changes are automatically saved.

2.3.1.4 Image gallery

A shop administrator can upload, view and remove images in the shop's gallery, shown in Figure 2.5. Images can be uploaded from the user's computer by using the basic upload form or dragging image to the UI. After selecting the image it's possible to crop images if they are in a wrong aspect ratio. Also, the user can give a description for the image. Images are shown in separate tabs according to their type. In addition to viewing earlier uploaded images, user will also be able to view images from the global gallery (which is not yet implemented) and use them as product images.

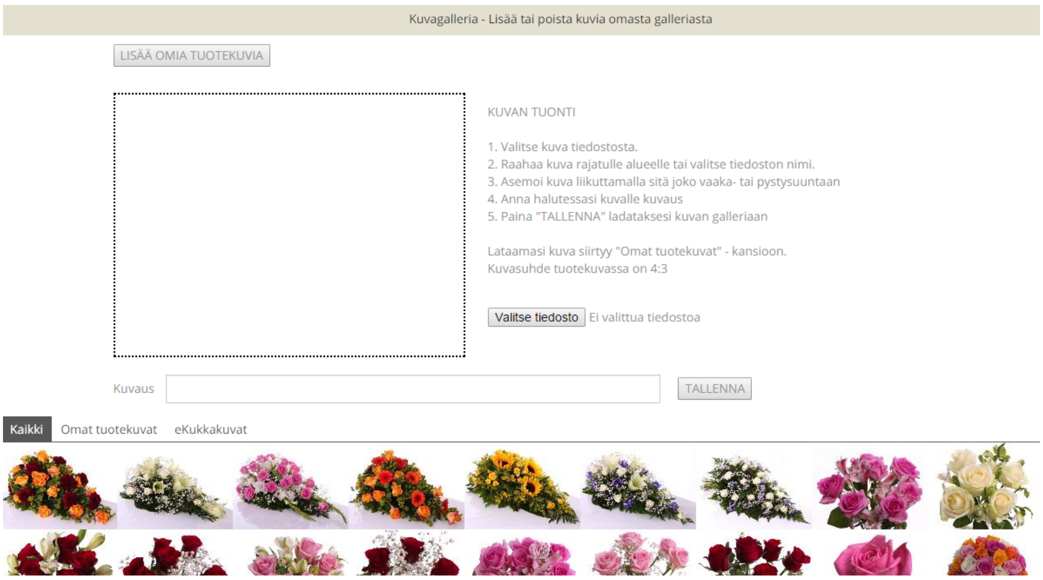

Figure 2.5: Image gallery.

2.3.1.5 Manage orders

Shop's orders are shown in a list view. The most important order details are in the list and all details can be seen by clicking an order. At this moment the administrator can change the order status straight from the list view.

2.3.1.6 Office information

The physical office's information is separated from the company information to this page, described in Figure 2.6. The shop admin is able to edit the office's information which also serves customers over the counter.

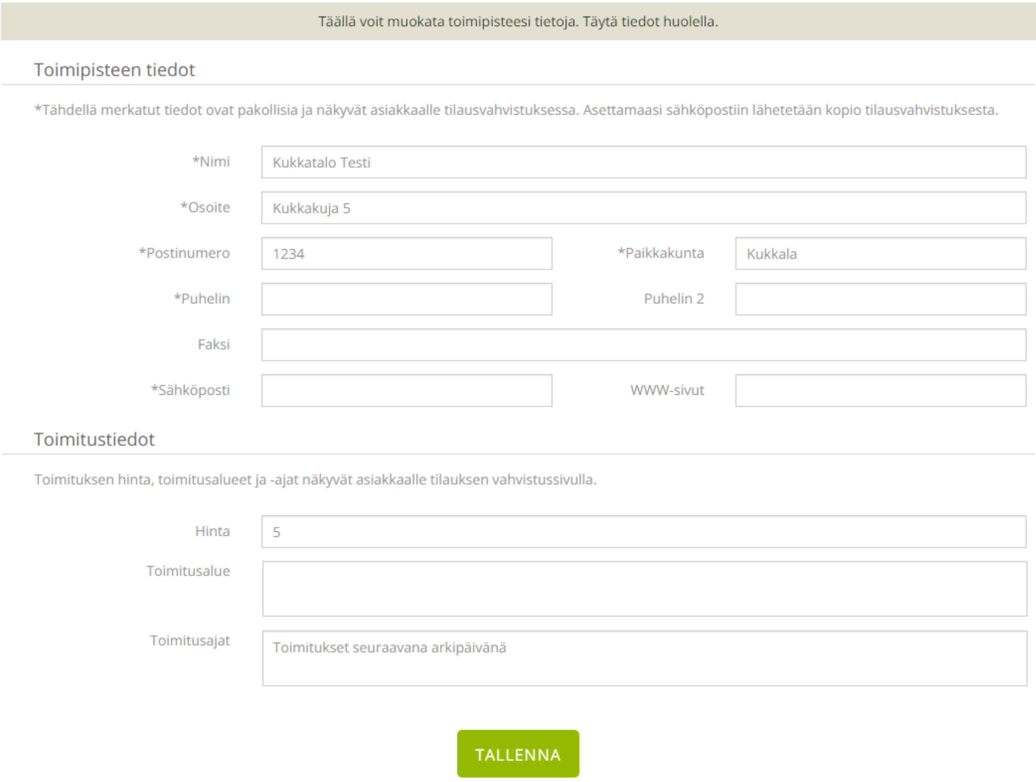

Figure 2.6: The office form.

2.3.1.7 Company information

This page contains details about the company and the company contact persons. The form for the company information is almost similar to the office form. This information has been initially set via the customer registry and can be updated by the shop administrator. This version of the shop supports only one contact person per company.

2.3.1.8 Missing features

The following list contains some important features still missing from the shop:

- An instruction page which includes instructions for the shop administrators and the guidelines of shop keeping.
- A helpdesk, where administrators can contact Floweb Oy with technical issues via a chat window or an email.
- A report page for sales statistics.
- A delivery area page, where the shopkeeper can adjust delivery settings and set delivery areas.

2.3.2 Technical overview

The shop platform is developed using a pure LAMP stack without any frameworks. The platform's architecture is based on MVC-model where we use controllers to handle data modelled on database as can be seen in the figure 2.7. Controllers are also used to communicate with client side for instance for transferring data asynchronously.

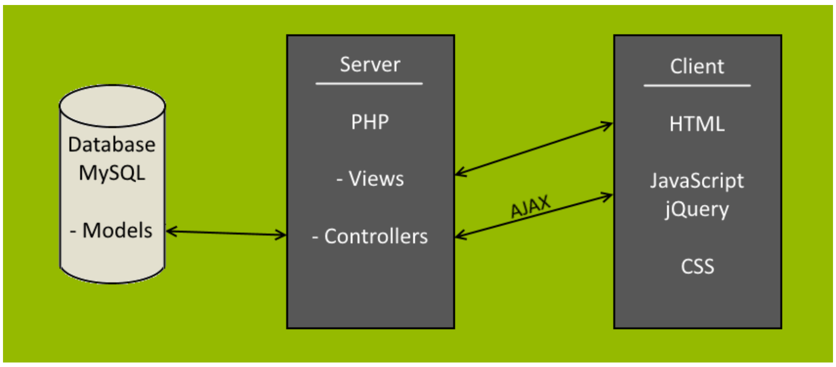

Figure 2.7: The technical overview of the system.

2.3.2.1 Server

On the server side, we use PHP language combined with MySQL database. In order to read and write data to database, we use controller files for each object which loosely correspond to tables in database. The controller files receive requests from clients, read or write data to database and respond by sending correct data in JSON form. Also, the site's structure is developed by using multiple PHP files. All of the pages share a common header file where the appropriate style and script files are selected for the current page. The client sends a request for a page and the server responds by selecting correct files for the page.

2.3.2.2 Client

On the client side, we use the combination of HTML, CSS and JavaScript. Basically, HTML and CSS are used to define the structure and looks of the page. Functionality and handling data is done using JavaScript with the jQuery library. CSS is used without extra libraries for styling the UI and also in the responsive design with the help of JavaScript. All data, excluding the DOM, is transferred asynchronously using AJAX technology to make the page loading times shorter.

Chapter 3

Usability

This section gives a short overview of the usability of user interfaces, introduces couple of popular usability inspection methods and explains its importance in web services. The last section presents earlier studies about web applications usability.

3.1 Overview

Usability can be defined as an quality attribute which measures how easy user interfaces are to use. It consists of five components: learnability, efficiency, memorability, errors and satisfaction. Learnability measures the experience of the first time use: How easily the basic tasks designed for the user interface can be done? Efficiency is defined by how fast the tasks can be done after the users are familiar with the UI. Memorability measures how easy it is to continue the use of the UI after not using it for a while. The measurement of errors include the amount and severity of errors, and ability to recover from the errors. Finally, there's satisfaction which measures how comfortable the users are with the UI. [21]

Another quality attribute closely related to usability, is utility which refers to the functionality of the user interface. The utility of the system for the user can be measured by checking whether it has the features the user requires. The system is quite useless if it's too difficult to use or there's no functionality the user needs. With combining these two quality attributes in the design, the system becomes useful. [21]

Usability affects the amount of users of any system. For instance, if a web site looks very complicated and the main functionality is difficult to find, users tend to leave the site very quickly. That's why usability should always be an important part of the design process. Testing and improving usability can be done in the each stage of the process. [21]

3.2 Usability inspection methods

A usability inspection method is a method for having a user interface inspected by evaluators. The goal of these methods is to find usability problems from the user interface. On top of finding the problems, some of the methods address, for example, a severity for the usability problems. Also, some methods can be used in the very early stage of the design process. [16]

There's many different kind of methods for evaluating user interfaces. For instance, Jacob Nielsen classifies these evaluation methods in four groups: automatic, empirical, formal and informal methods. The automatic evaluation is basically an analysis made by a computer program. Empirical methods include user testing which is probably easiest and most common method. Formal methods use some model to evaluate user interface. Informal methods follow some basic rules and their success depends on evaluators knowledge and experience. [18]

In addition to the basic user testing, the most popular usability inspection methods are heuristic evaluation and the cognitive walkthrough [8]. These methods will be presented in the next sections.

3.3 The cognitive walkthrough

The cognitive walkthrough is one of the most common methods in usability inspection. It focuses on first-time user's actions in certain areas of the user interface instead of looking through the whole user interface by following agreed usability rules like in heuristic evaluation. CW is designed to evaluate only the learnability and understandability of the user interface and it's therefore suggested to be used in the usability inspections which include also other methods [34]. In essence, the goal is to find usability problems by going through regular user's every-day tasks step by step using the user interface. [24]

3.3.1 Process

The walkthrough process starts with defining the regular users of the system. The definition of the regular user includes user's experience and knowledge of the tasks and similar systems. After knowing the users, the next thing is to figure out the tasks what regular users would do using the user interface.

These basic tasks should be arranged from simple to complex for gaining experience with the method in the beginning for the more complex tasks [33]. The end results of the basic tasks are used as base data to create goals and, task and UI descriptions. UI description is a presentation of the current user interface at some level [34]. It may be for example already implemented version of the UI or just a paper prototype [34]. A task description includes background information, a desired end result and actions to get there. The next step is to find the correct path to reach the goal by using the user interface and create an action sequence containing all actions from the start to the goal. The action sequence should be made by keeping the defined user's knowledge and skills in mind during each action [34]. Each action or step is analyzed by asking the following questions[8, 34]: [24]

1. Will the user be trying to reach the correct goal?
2. Will the user find the required action among the currently available actions?
3. Will the user associate the correct action with the goal?
4. Will the user notice the feedback after the correct action has been performed?

The idea is to answer these questions with a credible story explaining why the defined user would choose the selected action. After each question has been answered in detail in every step, all negative answers are gathered and analyzed by trying to explain why the user failed. These issues are then identified as usability problems with selected priority. Also, the explanations for failed actions are useful information in developing fixes for found problems. [8, 34]

3.3.2 Strengths and weaknesses

According to Wharton et al. [34], the cognitive walkthrough has two main limitations which usually occurs when walkthrough is done using individual evaluators. These are the relative low amount of problems found and the repetitiveness in process when filling out different kind of forms [33]. The low amount of problems can be explained with the limited range of problems because of the individual evaluator. These limitations have been tried to mitigate by using a new cognitive walkthrough. It uses small groups of evaluators instead of individuals to expand the range of found problems and the forms are tested by the whole group. Another weakness of the cognitive walkthrough is that there are no guidelines about how to determine available actions. This occurs in process' step two where the user should be able to determine currently available actions [33]. [8]

On the positive side, the cognitive walkthrough is usable also by novices. Even though evaluators with experience on the method are obviously the better choice, method is learnable by beginners. The downside is that the beginners may have problems with choosing and describing tasks [12] which affects the evaluation's effectiveness. Also, using method in the early phase may cause troubles to inexperienced evaluators [12]. But yet again, the cognitive walkthrough is among the most used evaluation methods and there's many researches about it so there's lot of information for the novice users. Finally, the method can be used in every phase of the development. [8]

3.4 Heuristic evaluation

Another very popular usability inspection method is heuristic evaluation which was introduced by Jakob Nielsen and Rolf Molich in the 1990. It's used in iterative design processes since it's relatively fast and effective inspection method [14]. Heuristic evaluation basically means looking through the interface and finding positive and negative things from the user interface using a certain set of guidelines [22]. There are many sets of guidelines with various amount of rules which can be used in the evaluation process [22] for instance 1000 rule collection[27] by Smith and Mosier or Nielsen's 10 heuristics[17, 25] listed below:

1. Aesthetic and minimalist design
2. Match between system and the real world
3. Recognition rather than recall
4. Consistency and standards
5. Visibility of system status
6. User control and freedom
7. Flexibility and efficiency of use
8. Help users recognize, diagnose, and recover from errors
9. Error prevention
10. Help and documentation

3.4.1 Process

Heuristic evaluation starts with planning the evaluation process by thinking three things: the test, evaluators and heuristics. Testing a user interface can be done by developing tasks, creating goals or generally going through the UI. The difference between tasks and goals is that tasks are given to the evaluators and in the goal case evaluators create tasks themselves using the goals. The way how the tests are done, depends on the evaluators conducting the evaluation and the user interface. If the evaluators are experienced, giving them the goals could be the best choice so they can develop tasks themselves. On the other hand, the evaluators can just go through the whole UI or a part of it themselves if they are familiar with the domain and don't need assistance in using the system. [4, 14]

The next step is to choose evaluators, how experienced and how many persons are used in the process [4]. There is no a required number of evaluators needed to the evaluation process but 3-5 evaluators is the recommended amount [22]. Also, the experience of the evaluators affect significantly the process' effectiveness [4]. In addition to that, single evaluator finds only 35% of the usability problems and different evaluators usually come up with different problems. Using too many evaluators isn't effective either because when more evaluators are used, the costs of the inspection tends to rise and total amount of found problems doesn't increase so remarkable after 5 evaluators. [14]

The third thing before the actual evaluation is to choose the heuristic set used in the process for instance Nielsen's 10 heuristics. Also the set selection depends on the user interface and the evaluators' experience. [4, 14]

The evaluation can be performed either in a group or individually using either set goals or tasks and selected guidelines. In the group evaluation, evaluators work as a team inspecting the UI in same session and record all problems they found, even they don't all recognize the problem. Group evaluation requires more planning and organizing but saves time since the inspection process needs to be arranged only once. [4]

Another way of performing evaluation process is conducting inspection individually where an evaluator or several evaluators inpect the user interface alone and record found issues. Usually, this kind of inspection takes one or two hours since evaluator needs to go through the UI several times. Evaluators first go through the whole UI to get familiar with the system and then either inspect each screen of the UI comparing it to the selected heuristics or go through the UI using each of the heuristics at a time. The main difference between the group inspection and the individual inspection is the individual inspection not allowing the communication between evaluators before all evaluations are conducted to avoid biased results. [14]

The final step of heuristic evaluation is analyzing the gathered information including issues and feedback from the evaluators. Evaluators should explain these issues as in detail as they can and also why the found issue is a problem. All usability issues should then be handled by removing duplicate issues and combining appropriate insights. Then, this analyzed data can be used to create improvements for the user interface. [4, 14]

3.4.2 Strengths and weaknesses

Maybe the main strength, and weakness at the same time, is the amount of evaluators affecting the number and severity of found problems. Heuristic evaluation works best with five evaluators finding 55-90% of the usability problems. On the other hand with one evaluator percentage of found problems drops to 20-51% [22]. Also, according to Nielsen, evaluators should be experts [22] which means that the heuristic evaluation isn't efficient when conducted by beginners and process can be expensive since there should be several experts [8, 10].

Another positive thing about HE is that it's quite easy to use and is also relatively fast method to find even low priority problems [9]. On the negative side, it may produce false positive problems and focus on too specific problems [9].

3.5 User testing

One of the easiest, but also probably the most time consuming usability inspection methods, is user testing. It's also very popular method because evaluators get feedback from the real users. Testing with real users takes time and resources but at least evaluators usually get a lot of data for analysis. Similarly to the cognitive walkthrough, it doesn't focus on the heuristics but the users' experience on the system.

The idea is that an evaluator watches test users using the user interface. This way, it's easy to see the issues causing troubles to the users. Also, evaluator can evaluate the overall usability of the site by checking how many tasks users were able to accomplish. [7]

3.5.1 Users

One of the most important things in user testing is getting good users for the user interface to be tested. Test users should preferably have some interest on the system and its features so that they feel comfortable in the test situations. According to Jakob Nielsen the amount of test users depends on the system to be tested and the number of user groups intended to use the system. He suggest that in the usual case, meaning only one user group, 5 test users is enough for two main reasons: An evaluator continuously learns less with increasing number of test users and a lower number of test users gives an evaluator a chance to save on the budget and resources. When there's more than one user group, there should be 3-4 users from each group. In addition to some new insights the next user often gives same results than the previous one, so the amount of new issues per user decreases when number of users increases. Dropping the amount of test users also gives evaluator a chance to test system iteratively in small increments rather than arranging one large test. After fixing the usability issues to the software found from the first test with less users, another test can be arranged to test improvements with rest of the users. [19]

3.5.2 Tasks

Following test users playing with user interface may not produce so much data because they don't know what to do. In order to get the desired part of the system or the whole system properly tested you need to have activities or tasks for users. This way, testing is more systematic and the right parts of the system get tested. Also, these tasks should be realistic and make sense so that users don't get confused and are able to complete tasks.

Creating tasks starts with thinking about the main goals users should be able to achieve using the site, meaning what are the main activities the site is used for? Next step is to figure out scenarios for tasks leading to these goals. Scenarios should be well-thought, realistic and motivate the user to use the interface. Also, selected participants should have some experience of the selected features for the test or at least be interested of the site, so that doing the task feels as normal as possible. Finally, if the participants are already trying to reach some goal set for the site before the test, they can define tasks themselves by just using the site.

After coming up with the scenarios, the tasks descriptions should be finalized. The main thing of the task description is to get the user complete the task without any help. Some important things might not get tested if the description tells users for instance to click correct buttons to get the task done. Would the user have pressed the correct button at first if there were no clue? Therefore, the assignment shouldn't include any clues or describe how user should complete the task, but it should be too generic either. For example, using the assignment "Buy a product" when testing a web shop might be too vague if some particular feature in the shopping process is tested. Also, user shouldn't just talk about completing the task but actually do the task, so there shouldn't be any questions in the assignment. This way, a facilitator gets more accurate data from the test, as they see all actions and how participant feel about using the UI. [7]

3.5.3 Test sessions

After defining the user group or user groups, creating assignments and choosing participants, the next step is to set up the test environment. This means finding place for tests, choosing the facilitator who conducts the test and the observers who observe the user and user's actions and getting the equipment needed to conduct these tests [20]. Although user testing can be arranged almost everywhere [20, 32], for instance in cafeteria or even in airport lounges, it's still important to keep distractions in the minimum [20] so that users could feel comfortable during the test [31]. The required equipment depend on the system to be tested but usually in addition to some kind of prototype of the system (or ready system), a recording device or something to make notes with, are required [32].

When equipment and personnel are ready, next thing is to conduct the user tests. In the test session, a facilitator conducts the test by explaining the test to the user and discusses with the user during or after the assignment about user's actions depending on which moderator technique is used. The user either explains the performed actions during *(Concurrent Think Aloud)*, or after *(Retrospective Think Aloud)* the assignment or facilitator asks questions about the actions or things user say during *(Concurrent Probing)* or after the assignment *(Retrospective Probing)*. Also, the facilitators take care of the recording devices etc. The observers watch the user working while making notes of user's actions and observations. [31]

Then notes and observations from every recording device used in the test session, are analyzed by finding usability problems and listing them. It's also possible to make different kind of calculations considering task completion times and success rates. In addition to the problems, it's also useful to give them descriptions. This will help for example setting the severity rating for the problem. [30]

3.5.4 Strengths and weaknesses

Conducting user testing is kind of pricey, but on the other hand it's easy to perform and it most likely produces lots of useful data. Another benefit of user testing is finding out if users are even able to complete the designed tasks and how long it takes [32]. Also, it's one way of getting feedback of the user satisfaction [32].

As one remarkable disadvantage, it consumes much time and resources in contrast, for example, to heuristic evaluation [11]. Planning the test, getting participants and conducting the test take a period of time depending on the magnitude of the usability test. Also, there's different kind of costs which include for instance recruiting participants, equipment and room costs. [32]

3.6 The evaluation of usability problems

After figuring out and analyzing the usability issues using any of the previous methods, the gathered problems can be evaluated by adding them severity ratings. This is usually done for helping the prioritizing of the fixes for the UI. According to Nielsen, a severity rating is added for the problem by using three factors: [15]

- The frequency: How often the problem occurs?
- The impact: How easy the problem is to overcome?
- The persistence: How easily the problem can be avoided?

A severity of the problem can be rated for instance by numbers (0-4) [15] or by words (minor, serious and critical) [30]. The selected rating scale should be defined by describing each of the levels e.g. the 0-4 scale suggested by Nielsen described below. [15]

- 0: Not a problem
- 1: Cosmetic, fixed only if there's nothing else to do
- 2: Minor, fixed with low priority
- 3: Major, important to fix
- 4: Catastrophic, must be fixed

3.7 Usability studies in web applications

In addition to the presented methods in this chapter heuristic evaluation, the cognitive walkthrough and user testing, there's extensions of these methods and combination of different methods. For example, heuristic evaluation[4] and an extension of the cognitive walkthrough[2] are used to evaluate web applications. Also, usability inspection methods can be used alone but it's often more efficient to use more than one method to evaluate usability and it's a common way of performing usability inspections [8].

When using just a single method for evaluating usability, one good example is heuristic evaluation which is quite popular in evaluating web application since requirements for resources are low. [4]

One example of extension of a method is the Cognitive Walkthrough for the Web (CWW) which uses the cognitive walkthrough as a basis for a new method. It's designed purely for evaluating usability of websites by performing user's tasks. In addition to the basic cognitive walkthrough, it focuses especially on measuring how well users are able to navigate and search information using the site. This is done by simulating user's navigation in each action with the actual action, e.g., selecting a link includes going to a certain part of the page and then selecting a link from the selected part of the page. [2]

In addition to be used alone, heuristic evaluation is often used with user testing or the cognitive walkthrough for gathering problems using a different point of view. This way evaluators get better coverage of problems because the data is based on both design principles and user's actions. [8]

Chapter 4

Methodology

This chapter presents the usability inspection process consisting of the cognitive walkthrough, heuristic evaluation and user testing. These methods were chosen because the cognitive walkthrough and heuristic evaluation are the most used evaluation methods and user testing gives important data from the real users.

The process includes three evaluation methods for getting a better coverage on the usability problems. Also, by using multiple methods, it's easier to recognize possible false positives from the found problems. Furthermore, this enables the comparison of used methods. Is there difference in results? Which method finds the most relevant usability problems?

4.1 The cognitive walkthrough

The cognitive walkthrough is used to develop and test created assignments for test users. The user group for CW is flower shopkeepers who have basic computer skills and some experience on web shops. The assignments will be based on flower shopkeeper's basic tasks and after creating them, each action in assignments is analyzed by using the CW questions.

4.2 Assignments

Assignments in test sessions will be basic every-day tasks for shopkeeper like managing products and orders. In addition to default tasks, there will be some tasks considering our custom features, for instance using image gallery. In addition to testing the assignments in the previous section, the assignments will also be tested using a test user who has some experience on the system.

4.3 Interview

Interview questions are mostly about usability of shop platform but also about the assignments. For example, did the assignments cover whole user interface even though it's still in development phase.

4.4 Test sessions

Test sessions are arranged in flower shops or offices if available. The requirements for arranging a session will be a researcher, a test user, researcher's laptop equipped with a screen capture software and a voice recorder.

Test users are flower shop keepers and their computer skills will vary: there will be users with experience on other shop platforms and also some without experience. In addition to inexperienced shop keepers, the goal is to get also experienced shop keepers to find usability issues and get comparisons to other shop platforms. Nielsen suggests 3-4 users per user group, but because of the magnitude of the assignments there will be 5 users from both groups.

A voice recorder is used to get notes from the test user during the assignments part if allowed, and to record the answers to the interview. Also, a screen capture software is used to record session to see user's actions and find problems in the user interface. The test user receives a paper containing assignments and tries to accomplish task using the laptop in the time period of 5-10 minutes, depending on the assignment. After the assignment part comes short interview part lasting about 15 minutes. Finally, test users can give feedback about the test session and arrangements.

4.5 Heuristic evaluation

Heuristic evaluation will be done after CW and test sessions to find usability problems using a different point of view. The assignments created using CW will be used with this method also. This way usability problems found by using other methods can be compared to results form this method and there will probably come up some new ones during the evaluation. The rule set used in the evaluation process is Nielsen's 10 heuristics.

4.6 Organizing data

First of all the recordings must be transcribed to computer before doing any organizing. The transcribing process includes making notes of the sessions by using recordings and screen capture videos. Then, data is organized assignment-wise and each question is separated from the interview part. Also, findings from the other methods will be organized in the same way.

4.7 Data analysis

In the data analysis section, the gathered data is analyzed by recognizing and listing possible usability problems from the assignments and the interview parts. This is done by gathering all incorrect and unnecessary actions, and mistakes from the data and finding out why test users did those things. These reasons leading to unwanted actions are then eventually recognized as usability problems. After issues are gathered from each method's data, the similar kind of issues will be combined and identified as problems.

Then, these problems are graded according their severity. The grading parameters include how often the problem occurs, how easy the problem is to overcome and how easily the problem can be avoided by a basic user. The scale suggested by Nielsen is used in rating severities to the problems.

4.8 Comparisons

In addition to finding usability problems from the UI, one of this research's goals is to find out which method was most effective and what kind of problems each method found out. The comparison between methods is conducted by looking at amount and severity of the problems found and also how the found problems affect to the usability.

Chapter 5

Usability inspection

Previous chapter went through the usability inspection plan and this chapter describes how the things actually went. The process is presented by going through the usage of each method in detail.

5.1 The cognitive walkthrough

5.1.1 User group

The process started with figuring out the user group for the system. In this case, it's the flower shopkeepers with some experience in administering a web shop, so they have basic computer skills. I considered the shopkeepers without experience but using experienced users serves better this study.

5.1.2 Assignments

The next step in the process was creating assignments with background stories and action sequences. The assignments were designed keeping upcoming test sessions in mind. This also gave a chance to compare the cognitive walkthrough, heuristic evaluation and testing with real users. The basic tasks of the flower shopkeeper were quite easy to find out but turning them to rational test tasks was challenging. It was difficult to find the balance between even workloads and difficulty of the assignment. Also, trying to cover all the important features of the user interface brought another challenge to the process. Finally, some tasks were fine at first but creating the action sequence revealed the real magnitude of the tasks.

Since the user interface was still under development and only the features for setting up a new shop were implemented, the assignments focused on shop initialization. At first, I was designing six assignments but ended up with five since the workload of one task was unbalanced compared to the others and the task wasn't actually relevant. The task was about the handling orders feature which was a very simple feature at the moment so there wasn't much to test. Therefore, in the end there were five assignments which focused on covering the whole shop initialization process:

1. **Enter company and office details to the shop.** The purpose of this assignment was to test forms and error handling. The data to be entered to the system was given in assignment and the goal was to see if forms were easy enough to fill, were the errors noticeable, were the instructions sufficient and were there unclear terms or text fields.

2. **Edit the shop's front page.** This assignment was created to ensure the usability of the front page customization by testing all functionalities of the page. Editable texts, product order, theme color and banner image selection on front page should be noticeable and easy to edit. Also, like in the first assignment, one of the main things is guidance as well. Is it clear and sufficient enough.

3. **Add a product image to the shop.** This task was designed to test usability of the shops gallery. The main features to test are adding product images to the gallery and checking initially existing and added images. Also, there's roughly detailed instructions for adding images which must be tested.

4. **Add products to the shop.** The goal of this task was to find out problems in "Add product"-page. This feature includes filling in product name, description and price options, and selecting image and category for the product. The idea is to see if adding images intuitive is enough and is there some problems with product detail form.

5. **Edit products in shop.** In addition to the list of shops products, almost similar kind of form is tested in this assignment compared to add product form. The only significant difference is a possibility to remove existing product. The goal is to find out if users figure out how to open the product edit form and do they notice other functionalities in the product list.

While creating the assignments some unknown bugs were found from the system. Also, the action sequence phase revealed couple major bugs from the user interface. Even though these bugs aren't purely usability-related, the study is already paying off.

5.1.3 The walkthrough

After the action sequences were done, it was time for the evaluation process. On each action, I went through the CW's four questions and tried to answer them as well as I could. In addition to positive or negative answer, there was reasoning in each answer why user would behave the chosen way. Usually coming up with the assumptions on user's actions was quite straight-forward but there were also some actions which were more difficult to analyze. For example, even though some links are visible, does the user really notice them?

In addition to the reasonable assumptions, it was challenging to do the assignments as someone else. Using the user interface as a new user was difficult especially because I was, of course, familiar with the UI since I was developing it. So, I knew the features very well, which made creating assumptions on a new user's actions and behaviour more difficult. Also, taking the role of a user with different skillset and knowledge wasn't too easy.

As mentioned in the usability section, one of the main limitation of the walkthrough is relatively low amount of found issues which occurs especially when the process is conducted individually. The conducted evaluation probably suffered from this limitation a little bit, since the amount of found issues remained low. Furthermore, the simplicity of the user interface had probably an effect on the issue count.

5.1.4 Issues

The issues were gathered from negative answers by going through the action sequences. The negative answers' reasonings were used as base data in figuring out the usability issues. Although there were some challenges in the walkthrough, some usability issues were found. Found issues are listed in the table A.1 with descriptions included. As can be seen from the table the amount of issues was quite low and most of the issues seems to be quite minor.

In each of the assignments I ran into at least one usability issue. In essence, there was mostly problems with things being hidden or too unnoticeable from the user and insufficient feedback. Most of the things being hidden from user problems related to hovering elements, meaning buttons appear only if user tries to move cursor on the elements, e.g., images. Also, some elements were barely noticeable or simply too small to notice, even though they were mentioned in the instructions, for instance input elements without borders. Another main issue was insufficient feedback from the system which concerned especially saving forms. The feedback is visible for very short time and might remain unnoticed since user doesn't necessary look the button before it's too late.

5.2 Test sessions

After developing the assignments using the cognitive walkthrough, it was time to conduct the evaluation of the user interface with real users.

5.2.1 Arrangements

The test sessions for user testing were arranged in different locations trying to keep the arrangements as similar to one another as possible. Since the sessions were arranged in May which is a very busy time for the flower shopkeepers, and in various locations in Finland, it was very difficult to quarantee the same circumtances for every session. Most of the sessions were arranged in Oulu which had the best test arrangements. However, the tests were conducted by using the same equipment kit and in similar kind of situation between each other so the location shouldn't have effect on the results.

5.2.2 Tools

The equipment used in the usability test were: authors laptop with the video capture software called Open broadcaster software, an external mouse, a mobile phone (used as voice recorder) and the assignment and interview papers. In addition to these, the setup for the sessions in Oulu included also external display and keyboard.

5.2.3 Users

Originally, the idea was to get 10 shopkeepers to test the system. There should've been five shopkeepers with experience on web shop platforms and another five shopkeepers without experience. Because of the bad timing on the tests, there was only three experienced shopkeepers and seven without experience. Some of the shopkeepers couldn't make it to the test sessions after all, so they were replaced with other ones.

5.2.4 Assignments

As mentioned before, the assignments used in the cognitive walkthrough are also used in the test sessions with real users. After being created by using

CW, the assignment were tested by using a developer as test user. This way I could ensure that assignments were reasonable and the order simulated creating new shop at least in some level. Few faults were found during the assignment test session, so improvements were made. Some refinements were made to assignments instructions and couple of assignments got more input data, but the goals and the initial situation remained the same. So, no major changes were made to the assignments.

After finalizing the assignments, the actual test sessions were conducted. There were still some problems with the assignments: some assignments were unclear to unexperienced computer users, although some users admitted that they didn't properly read the whole assignment before starting the task. On the other hand, some users had no problems at all and thought the assignments were very easy to understand. Even though there were some repetitiveness added after the CW, e.g., filling two quite similar information forms and adding three products using the same form, the assignments didn't take too much time. Actually, this helped to raise more usability issues in some cases and brought some suggestions from users to improve usability. Also, the test sessions were well arranged according to the feedback: the setup was organized properly and assignments corresponded well to tasks to be performed in the initialization of new shop.

Although there was some sloppiness in doing the assignments, the tests went quite well after all. Most of the times the assignments were fully accomplished quite effortlessly and fast. Some users had problems doing every required part in the assignment but most of the cases it was because they didn't focus well enough.

5.2.5 Questions

The interview questions were about users experience on using and administering web shops, user interface advantages and disadvantages, assignments and the test session itself. The experience part was important because it gave possibility to compare this UI to other ones and it revealed the strengths and some shortcomings of the UI. The questions considering the assignments were asked to clarify which were the main problems in the assignments and why. For instance sometimes there were clear problems during the assignment but I wasn't sure what was the reason: the assignment itself or some functionality in the user interface. Finally, there were questions about the test sessions to find out if there were some distractive factors in the arrangements.

5.2.6 Issues

Since there was much data in various forms, I had to transform it to one form and organize it in some way. The recordings from the sessions produced almost 7 hours of both audio and video data which had to get to text form and there was also some notes. Averaging over 41 minutes per test session, there was a lot data to go through. I ended up loosely transcribing these recordings in to notes, which included all the significant actions and thoughts from the tests. After making notes, I started to gather usability issues by going through these notes. In addition to the issues, the suggested solutions for the issues and other improvements were written down for later use. The list of issues was going to be relatively long, so issues were organized assignment-wise. Furthermore, assignments considered different parts of the UI so classifying issues made sense anyway. The classified issues can be found from the table A.2.

A lot of usability issues came up in tests, mainly from the assignments but some good details and questions were raised up also during the interviews. A few of the issues were almost expected since while there was guidance about some features, we were quite sure that users may not read them. One major issue was the automatic saving in the customizing front page. There's a description of the automatic saving in the bar below the navigation bar but users tend not to read it. On the other hand, the few users who noticed the text still wanted an actual save button.

There was also some issues which were very surprising, for example, the validation of input fields. Most of the users didn't notice errors in input fields. The fields with invalid values were marked clearly with red borders but still users seemed to ignore them. The exception was the add product form where the input fields considering the price versions were significantly smaller than in other forms. As expected, it did produce most of the validation errors.

In the end, every feature seemed to have some issues considering usability.

5.3 Heuristic evaluation

Finally, the user interface was inspected for usability issues by using heuristic evaluation. Instead of focusing on the user's actions, I went through the UI using selected usability rules.

5.3.1 Arrangements

The heuristic evaluation process started with defining the parts of the user interface which will be evaluated. This was done by quickly going through the assignments used in the cognitive walkthrough and checking which parts of the UI were used. Not following the Nielsen's recommendations of the amount of evaluators, there was only one evaluator inspecting the user interface, the author, which may have been affecting the amount of found issues. According to the plan, I was using the 10 heuristics by Nielsen because it's probably the most used one.

5.3.2 Inspection

The assignments covered almost fully the current version of the UI. Every page, except the page including the list of orders, was inspected. I started going through the whole area in order of the assignments one rule at a time.

Most of the time inspection went very well without problems, but sometimes it was hard to decide whether there was an issue. For instance, should the image upload form be always visible in image gallery, even though it takes notable amount of space from the actual image section. Also, there came up some minor issues which could be false positives, depending very much on user's background and knowledge. Some terms might have been little weird for me but could be clear for the main users of the UI. The similar issue was with some icons, most of them were clear to me during the inspection but some users might not associate them as I do.

Some heuristics felt much more suitable for a web site than the others. For example, finding short cuts seemed to belong more to the desktop applications than web site. Still, the visibility of system status and documentation seemed important also in web sites.

In the end, the heuristic evaluation was quite fast since the assignments were already designed and went through in the earlier phases of the study and therefore the parts of the UI for the evaluation were already selected. Basically, the only thing left was to go through the UI using each of the heuristics.

5.3.3 Issues

The issues which are shown in A.3, were once again listed according to the assignments, or in this case, pages. Many of the issues were cosmetic or minor in some other way but usually still significant. For instance, it might confuse users if all of the save buttons don't resemble each other. They might think that the different button is maybe disabled.

There was lot of issues considering errors and instructions. Most of the times, instead of a proper error message, there was just some kind of sign of an error. Also, the amount of instructions vary quite much, which wasn't entirely wrong. Some things seemed to be so obvious anyway, that they didn't need any guidance.

Chapter 6

Results & Analysis

The usability inspection process produced a lot of useful data, which is analyzed in this chapter.

6.1 Identifying the problems

In total, the usability inspection process produced 123 usability issues, which needed organizing. Before organizing, each issue were labeled with the information of which method and test or heuristic was used. Then, the process started by gathering all issues from each assignment separately to see how many issues were found from each part of the UI. This way it's easy to compare the findings from each method in each page.

After organizing the issues, the analysis started by going through the issue lists one assignment at a time. The idea was to figure out the reasons for each of the issues. First, I had to get rid of the duplicates, which was done by grouping similar issues to each other and naming the group according to the usability problem the selected issues were related to. Then, I identified the problems for rest of the issues. In case of some issues, there were some challenges in recognizing the problem. This might have been caused by using the retrospective probing, since some users had difficulties to explain the actions leading to the certain issue when asked afterwards. Finally, the issues' labels were combined to the group's label. In the end, there were some issues relating to the same problems, but also many problems related to a single issue were found.

For example, the problems found in the office page are shown in Figure 6.1. The numbers refer to the problems in the list. However, the figure doesn't include the problem about sending form multiple times before feedback (4.), because it's difficult to mark to the image. The problems in the

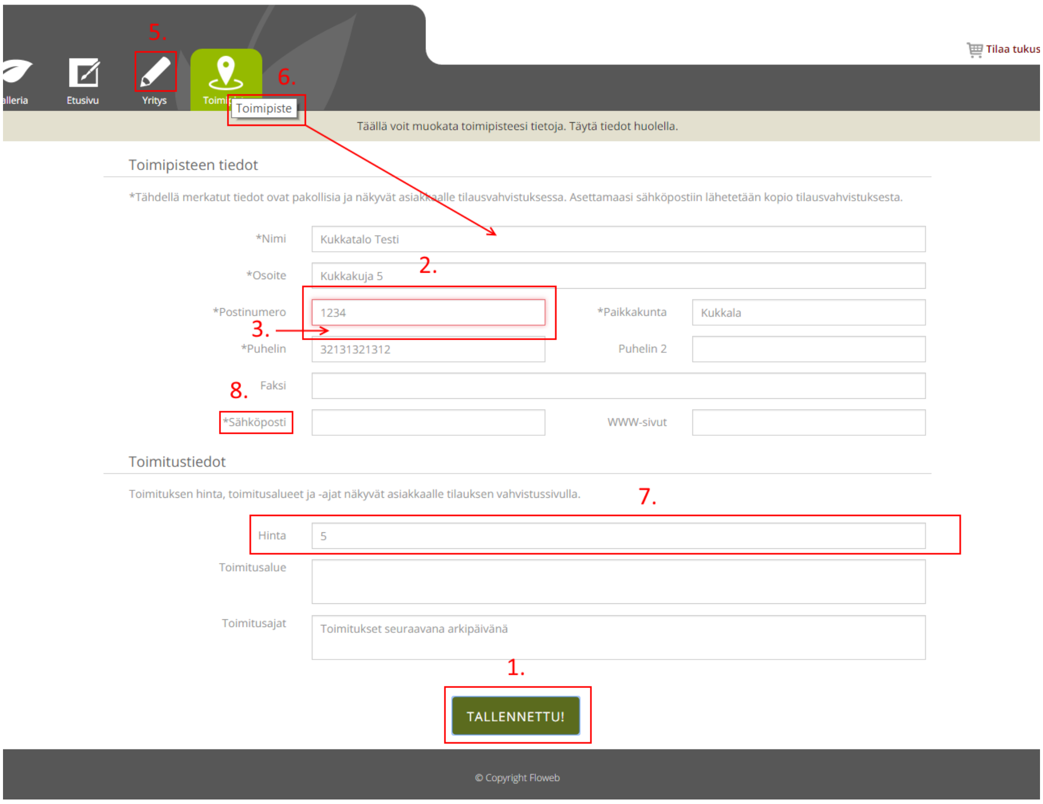

Figure 6.1: The usability problems in the office page.

office page were identified as usual by checking the issues and the UI. For instance the problem with the feedback from saving form (1.) was recognized by all methods by mentioning that feedback may not be noticed and also, that the reason was the rapidly changing text in the ”save” button.

6.2 Usability problems

When the total amount of 77 usability problems causing the issues were identified, they were listed according to the appropriate page, shown in Listing B.1. The usability issues caused by the current problem are listed under the problem. The list of usability problems include also the bugs in the system since they affect the usability of the UI, e.g., the problem which is about editing products details removes the image from product is caused by a last minute fix in the system which caused a new bug. Furthermore, the list includes duplicates of the usability problem if it's affecting another page excluding the office and company forms since they are so similar to each other. These are counted as different problems since each appearance of the problem must be fixed separately.

The actual analysis of the usability problems started by listing them to Microsoft Excel. The problems were arranged to the table according to the part of the user interface they appeared and then marked which of the methods recognized them. Also, if the problems were detected by either user testing or heuristic evaluation, the details of which users or heuristics did the finding were noted. After entering the problems and the methods which found them, different kind of counters were added to the table. Each part of the UI were handled by counting how many hits the cognitive walkthrough and each of the user tests and heuristics got of the detected problems. This was done for the easier comparison of these methods. Furthermore, the total hits for the problems were also counted for the evaluation purposes.

6.3 The evaluation of found problems

Then, the found usability problems were evaluated by grading them by their severity. The evaluation parameters were the frequency, the impact and the persistence of the problem. The frequency was deduced by counting how many recognitions the problem had. The impact was evaluated thinking how much the problem affects usability or how easily test users did overcome the problem. The persistence was mainly decided by thinking how did the test users handle the situation after running into the problem.

The finalized table of the usability problems is shown in Table B.2. The usability problems are arranged to the table first by the area of the user interface they appear in and then according to their severity. In addition to the information about which of the usability inspection methods recognized the problem, there's also information about problem's severity.

Since there were 5 level system, it was difficult to decide severity levels for some usability problems. In the end, the difference between minor and major is quite small so especially problems with estimated level of either of those were challenging to assign. For example, the severity level for problems about unclear instructions for image upload was quite difficult to evaluate because some users didn't even read them and just tried the upload functionality. Therefore, it was difficult to know if the instructions were really unclear or even needed.

The least error-prone part of the site seems to be the company and office forms, which includes only the basic forms. The other pages are more complex and have more problems. None of these pages is clearly more problematic than the other, although the problem amount and the severities varies quite much. If one page should be picked, it would be the page for customizing the front page. Even though the problem amount isn't among the highest, most of its problems were classified as minor or higher and the page's automatic saving caused very much troubles and confusion among the test users.

6.4 Reasons for the problems

In addition to the evaluation of the problems' severities, it's important to think what caused the problems. There is clearly no single reason for the usability problems but by going through the issues, there seemed to be some factors which affect more than the others. As can be seen in from Table 6.1, many of the problems seems to be related to something being not clear (31,2%) or noticed (14,3%), or instructions (18,1%) in the UI. In the table, the problem can be related to being not clear and instructions at the same time, e.g., if instructions are unclear. Also, the reasons have been concluded from the issues related to the problem.

The test situation always affects at least a little bit. Some of the test users were clearly nervous during the assignments, which may explain some of the unnoticed things and instructions, but not all. Also, in many places the instructions are missing when needed. Although there were some cosmetic recognitions by the heuristic evaluation in problems related to instructions, user testing revealed that there were also more severe ones. However, is an instruction text really unclear or unnoticeable if some of the test users don't notice it? Do these problems occur the second time?

Reason	A1	A2	A3	A4	A5	All
Not clear	12,5%	25,0%	31,3%	60,0%	11,8%	31,2%
Instructions	25,0%	25,0%	18,8%	15,0%	11,8%	18,1%
Not noticed	25,0%	18,8%	6,3%	10,0%	17,6%	14,3%
Feedback	12,5%	6,3%	6,3%	15,0%	11,8%	10,4%
Errors	25,0%	6,3%	0%	5,0%	5,9%	6,5%
Problems in total	8	16	16	20	17	77

Table 6.1: Reasons for the problems

It's difficult to know beforehand what users think and look at in different pages. Especially the needed amount of guidance and the required precision of the instructions are challenging to evaluate for the users with varying knowledge and experience of the similar systems. The lack of either one of these may easily lead to things being not clear or noticed, which can be seen in the reasons for the problems of the fourth assignment. The page for adding products doesn't include proper instructions for, e.g., adding product image, there's only a text about product image can be added instead. Still, the significant figure is the "Not clear" problems: 60%. The page seems to have quite many unclear icons, errors, etc. Most of the problems didn't repeat in the next assignment with similar kind of features, so apparently those are relatively easy to overcome but may still be distracting. Furthermore, almost a third of all problems are related to things being unclear which suggests that there should be more accurate instructions and more testing with real users is needed to reveal the unclear things.

6.5 Solutions for the problems

In addition to the finding usability problems part, the essential part of the usability study is coming up with the solution suggestions for these problems. The suggestions were created by using the problem and the usage of UI as a base data.

The suggested solutions for the found problems are listed in Listing B.3. The number of the solution corresponds to the number of the usability problem. The same solution is mentioned multiple times if it solves multiple problems, however there's no solutions for the problems which have the severity level "none", therefore there's 69 solutions.

Excluding a couple of the problems, the process was quite straight-forward. Thinking of the problem and looking at the UI usually revealed the missing elements or elements to be fixed without difficulties. Most of the solutions are very basic including highlighting an element, text changes and adding more information of an element. Some of the solutions were more difficult to figure out than the others, including changing of icons for some features for making them more describing, e.g., at first, some users didn't associate the "eye" icon with the product's visibility. How exactly should the "eye" icon be changed or is adding an instruction text enough? The challenge was that since the icon was so clear to me, it was difficult to figure out how to improve the icon. There are also quite obvious solutions, for instance adding the save button instead of automatic saving.

6.6 The comparison of methods

The comparison of the usability inspection methods is based mainly on the data about the detected problems but also on the experiences during the study. The count and the severity of the problems are the main factors in the comparison. The experiences have an effect too since they may explain, e.g., the low problem count.

First, there's the comparison of how many problems each method found. The table 6.2 includes the figures how many of the problems each method found using the assignments. The percentages are the shares of the found problems in the particular assignment by using the methods. After the "Method" column, in the first five columns "A" stands for assignment and the final column includes the method's share of all found problems.

Method	A1	A2	A3	A4	A5	All
CW	12,5%	18,8%	12,5%	5,0%	5,9%	10,4%
UT	37,5%	56,3%	56,3%	75,0%	41,2%	55,8%
HE	75,0%	62,5%	56,3%	60,0%	64,7%	62,3%
Problems in total	8	16	16	20	17	77

Table 6.2: The comparison of methods by found problems

As can be seen from the table, heuristic evaluation was the most effective in recognizing problems finding 62,3% of the problems, although user testing wasn't far away with its 55,8%. The cognitive walkthrough was left behind with the share of 10,4% which is understandable because of its disadvantage of being used only by one evaluator.

Secondly, the problems have different severity levels which must be taken into account in the comparison. Even though a method recognizes a lot of problems, it doesn't guarantee that the method is effective. That's why the focus is next on how severe problems each method found. The table 6.3 contains the severity levels of the problems found by using methods.

Method	Catastrophic	Major	Minor	Cosmetic	None	all
CW	0	2	3	3	0	8
UT	2	18	10	10	3	43
HE	1	11	9	22	5	48

Table 6.3: The severity levels of the found problems

The statistics about problem's severities shows that user testing recognizes the more severe problems than heuristic evaluation or the cognitive walkthrough. The most of the problems found by user testing were minor or more severe, while the majority of heuristic evaluation's problems are minor or less severe problems.

The comparisons suggest that user testing was the most effective method of finding usability problems according to the problems found in this research, shown in the Table 6.4. Although heuristic evaluation found the highest amount of problems, 75% of the found problems have minor or lower severity level. User testing found almost the same amount as heuristic evaluation but 46,6% of the problems are either major or catastrophic. The cognitive walkthrough found clearly less problems but it's better be used along with other methods anyway.

Method	Catastrophic	Major	Minor	Cosmetic	None	Total amount
CW	-	25,0%	37,5%	37,5%	-	8
UT	4,7%	41,9%	23,6%	23,6%	7,0%	43
HE	2,1%	22,9%	18,8%	45,8%	10,4%	48

Table 6.4: The problems found by each method including the percentages of severity levels

In addition to the numbers, the experience of using the methods was one factor in the comparison. Although the user testing had easily the largest workload, it felt easy and efficient method to use. Also, it was easy to recognize the problems using the gathered issues because there was so much data available. Heuristic evaluation was much lighter method but I had some difficulties in finding severe problems. On the other hand, the problems considering the style and outlook of the user interface were easy to find. The cognitive walkthrough seemed to be quite challenging to use. As a developer, it was difficult to try thinking things from the user's point of view which can be seen from the relatively low amount of problems. Also, CW measures only the learnability which might affect the low amount.

So, all of these methods identified significant problems, heuristic evaluation focusing more on the texts and looks of the elements and the cognitive walkthrough finding problems using expected actions of the first time user. User testing, on the other hand, identifies all kinds of problems by using real user experiences of the system. In addition to the found problems, user testing produced also feedback including several improvement ideas from the test users.

6.7 Feedback from users

The feedback from user testing consists of different kind of improvement ideas and other comments considering the UI which are shown in Listing A.4. Most of these ideas rose during the interview but the assignments produced few development ideas also, e.g., instead of one category, could the product belong to multiple categories. Some users even started thinking about new features for the shop, for instance the side products which would be sold along with the main products.

The comments included general thoughts of the UI and the test. Most of the users thought that the UI was very easy to use and even with the unfinished and some missing features, it was already almost good enough for the very basic use. Some features worked already better than in other platforms, mainly because of their simplicity.

Most of the feedback is positive but there is some negative comments too. Some mentioned that tasks were easy basic tasks for a shopkeeper but a couple of the users complained about the assignments weren't clear enough.

Chapter 7

Conclusions

The purpose of the study was to find out what kind of usability problems our current implementation of the custom e-commerce platform had. Other goals were to find solutions to these problems and compare the methods used in the inspection process. Finally, we wanted to know if there's something missing from our platform.

7.1 Findings

Since there were at least some usability problems in every page of the user interface, the usability inspection was concluded to be probably more useful to do in the earlier phase of the development process and repeat periodically in the different phases of the process. This could save much work in fixing things especially if the first inspection was made, e.g., using a paper prototype.

In the company's point of view, the usability study was an insightful experience. In addition to the found usability problems and solutions there were also other benefits. The amount of problems was greater than expected which raised the question of emphasizing the importance of usability inspection in the software development process. Furthermore, it seemed to be useful to include users as part of the development process since user testing produced many usability issues and much positive feedback including many improvement ideas. Finally, the feedback of the admin panel was mainly positive and most of the users thought that it's simple and easy to use, which was one of the company's goals.

7.2 The research questions

This section presents answers to the research questions defined in the introduction chapter.

7.2.1 What kind of usability problems were found from the user interface and why?

The total amount of 77 problems includes various types of usability problems. The significant amount of the problems are related to unclear or unnoticed things. These are probably partially caused by the lack of instructions since almost one fifth of the problems are related to instructions. However, almost one third of the problems are related to the unclear things which suggests we need more accurate instructions and clearer icons for the site. In top of that, many of these problems are quite severe. Although there are some less severe problems identified by the heuristic evaluation and the cognitive walkthrough, most of these problems are also recognized by user testing which affects quite strongly especially when considering the unclear things. The real users seem to notice, realize and see things in a different way than a developer of the user interface, so unclear things are very difficult to recognize before testing. Therefore, the lack of testing the user interface with real users seems to be the reason to the unclear icons, the inaccurate instructions and other unclear things.

7.2.2 Which of the usability inspection methods would be used next time?

When thinking of which method to use, it's important to think how much time and resources are available for testing purposes. If there's enough resources and time, the selection is user testing because on top of identifying most of the relevant problems with quite good explanations, test users give valuable feedback of the UI including different kind of improvement ideas which can be used in the development process. On the other hand, if the resources are tight and a couple of false positives doesn't matter, heuristic evaluation is the way to go. Although it's not as effective as user testing when used alone, it's very fast and produces rather good results excluding some of the problems related to user's actions. Heuristic evaluation could also be used along with the cognitive walkthrough to find also action-related problems.

7.3 Observations

In the test sessions, it seemed to be very important to tell and stress the fact that there's no hurry in test situations, because some users did the assignments too quickly, which caused some parts of the assignment being left undone. Furthermore, the test environment should be silent with no distractions and as comfortable to the users as possible. In the different kind of test locations, the silence seemed to have an effect on users performance.

There were some problems with the cognitive walkthrough which affected the found issues. It was difficult to do the assignment as the regular user since I knew so much about the user interface. The problem probably was that I assumed that the user reads at least most of the instructions and sees the UI almost like I do. The tests with real users proved the fact that users tend not read the instructions as much as I expected which might have been the main reason for the low amount of found issues.

The heuristic evaluation seemed to identify more minor usability problems than the other methods, which has been also noticed in previous research [11, 13]. Similar to the Nielsen's findings[13], some of the found problems weren't identified by user testing or the cognitive walkthrough, which led to a question: Does the problem even exist? However, the heuristic evaluation did still find more problems than the other methods, including some major problems. In opposite to the results of this study, the comparison in the research by Jeffries et al. [11] suggests choosing heuristic evaluation over user testing as the best evaluation method. The significant difference is that they used four evaluators instead of one. Both researches do stress the fact, that using multiple experienced evaluators in the heuristic evaluation process has a remarkable effect to the results. Still, they also mentioned the significant amount of low-priority problems as one limitation of heuristic evaluation.

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Appendix A

Usability issues and feedback

Listing A.1: Usability issues found with the cognitive walkthrough

Assignment 1

1. User might not notice the “saved” text in the button when save button is clicked because it’s not usual way of showing feedback and the change is quite fast.

Assignment 2

2. There are basically two links referencing to the front page. The correct one “Front page” link is in main navigation bar but there’s also “Show shop” in the smaller navigation bar in the right side.
3. Front page’s dark grey top bar may be too small to notice at least in the first time even though there are instructions.
4. Input fields in the page, especially in grey top bar, are barely noticeable because there’s no borders.

Assignment 3

5. There’s no indication of which images are new (just uploaded).
6. Opening the image and removing the image are both in hidden layer on top of the image which can be seen by hovering the image. Users might not realize that in the first time.

Assignment 4

7. Adding image to the product feature is hidden from the user and can be seen only by hovering the default product image.

Assignment 5

8. Changing image to the product feature is hidden from the user and can be seen only by hovering the default product image.

Listing A.2: Usability issues found with user testing

Assignment 1

9. Error in postal code isn't noticeable enough (T3)
10. Postal code is missing first zero (bug) (T9)
11. Error in company code isn't noticeable enough (T8)
12. "Saved" text in the button may not be noticed (T7, T8)
13. Save button stays active after saving - shouldn't stay? (T8)

Assignment 2

14. Clicking text field doesn't select whole text (PT, T1, T2)
15. Clicking text field doesn't remove whole text (T4)
16. Example products in editing front page are confusing (PT, T2, T3, T7, T9)
17. Save button missing from the page, guidance isn't clear enough (PT, T1, T2, T4, T5, T6, T8, T9, T10)
18. Contact information bar is too small, now barely noticeable (T1, T2, T8, T9, T10)
19. Clicking the link in the contact information bar leads to admin panel's front page (T2, T3, T9)
20. Text fields' guidance texts disappear when user starts to type (T1,T6, T10)
21. Separate input fields for contact information needed (T1, T10)
22. Text fields' old text doesn't disappear when typing to field (T3, T4)
23. Editing shop name field is illogical - first select elements and then text fields (T8)
24. "Front page" link isn't found (T10)

Assignment 3

25. Buttons appear too slowly on top of the image in gallery (PT, T2)
26. Uploaded image disappears after uploading, where is it? Is the image uploaded? (T1, T5, T6)
27. Unclear icon for opening image in popup (T2)
28. Troubles with opening image popup (T3)
29. "Gallery" icon not clear (T5, T10)
30. "Add product" page is opened instead of "Gallery" page (T3, T4, T5, T6, T9, T10)
31. Instructions on the page are not clear enough (T3)
32. "Upload product image" button is not clear enough (text is grey so button is disabled?) (T4)
33. Windows image preview distracts completing the task, failed (T4)
34. Image description couldn't be changed after uploading image (T7)
35. Image preview didn't work for just added image on "Own images" tab (bug) (T10)
36. Initial gallery images are confusing (T10)
37. The "Gallery" button and its text are not clear (T10)

Assignment 4

38. Traversing form with tab button surpasses version amount selection (PT)
39. Double clicking images in product image selection popup removes the selection (PT, T3, T8)
40. Image selection could be clearer when cursor is on selected image (T3)
41. Product image selection isn't easy to spot (T1)
42. The "Hide/Show product" button is unclear (T1, T2, T7)
43. Decimals in example prices are confusing, should there be an autofill function? (T2, T8)
44. Price fields accept all characters (also invalid ones), especially euro sign confuses (T2, T4, T5, T6, T7, T10)
45. Invalid input cells in prices are not clear enough, red borders are too thin (T4, T5, T6, T10)
46. Empty input cells should be shown more clearly when trying to save (T5)
47. Unclear term "Myyntirajoitin" (T2)
48. Unclear term "Versiomäärä" (T6)
49. How to use price versions? (T6)

50. It’s not clear that new product has really been saved (T3)
51. The selection of price version amount is unclear at first (T4, T5?, T6, T9, T10)
52. Why the save button doesn’t work? More guidance needed about errors? (T4)
53. Input cells’ placeholder texts are confusing (T7)
54. Validation doesn’t work if amount of price versions is changed (T7)
55. Copying product info isn’t clear, there’s no clear sign of new product (T8)

Assignment 5

56. Editing prices doesn’t work by clicking product’s price from the product list (PT)
57. Editing product’s information drops products image (ALL, Major bug)
58. Had troubles finding the “Show shop” link (PT, T2, T5, T7, T9, T10)
59. More guidance texts for icons (T2)
60. List of example products could confuse users in own products page (T3)
61. Double clicking product image to edit products, perhaps not so experienced with web page interfaces? (T3)
62. Troubles with hiding the product from product edit popup, clear in the product list though but changing product visibility in list view doesn’t affect edit popup (T4)
63. “Hide product” feature wasn’t found (T5, T10)

Listing A.3: Usability issues found with heuristic evaluation

Assignment 1

64. The icon for company page could be misleading (H2)
65. The delivery price doesn't have unit (H3)
66. Some of the input fields have title texts as instructions, other have nothing (H4)
67. Feedback of saving varies between pages, this has text in button changes (H4)
68. Saving form feedback is barely noticeable (H5)
69. Clicking an input field’s label doesn’t move focus to the field (H7)
70. Same red borders for empty field and invalid input in field (H8)
71. Some input fields with an invalid value have instructions other doesn't (H8)
72. Some fields doesn't have an instruction text (H10)

Assignment 2

73. Save button is missing (H1)
74. Logo in the grey top bar is unnecessary (H1)
75. Example products shouldn't be "active", cursor changes without functionality (H1)
76. Input fields have no borders (H1)
77. This page has autosave, others have save button (H4)
78. Input fields have instructions as values, other pages’ fields don’t (H4)
79. input fields have no borders (H4)
80. No feedback of saving (H4)
81. No feedback of saving changes (H5)
82. The changes are saved automatically, there's no way to cancel changes (H6)
83. There's no warnings or errors if not mandatory but highly recommended fields are left empty e.g. Shop name (H8)
84. There's no proper instructions of the fields (H10)
85. No info about the example front page or the example products (H10)

Assignment 3

86. The button for opening the upload form is too small and inconspicuous (H1)
87. The save button and the button for opening the upload form look like disabled (H1)
88. Image popup's header is the file name which is quite irrelevant (H1)
89. The button for opening the upload form is misleading when the form is visible (H1)
90. The icon for gallery isn't appropriate "leaf" (H2)
91. The terms "eKukkakuvat" and "Asemoi" are a little weird at first (H2)
92. Gallery's buttons have different style than others (H4)
93. Confirmation of removal and popup differ from other pages' (H4)
94. Insufficient feedback of adding image (H5)
95. Label has no "for" attributes, clicking doesn’t activate the input field (H7)
96. Confirmation popup doesn't tell image is being removed, it's still noticeable though since Image is active during the confirmation (H9)
97. Icons on the layer on the thumbnails doesn't have title texts (H10)

Assignment 4

98. The button for setting product image is hidden until cursor is over the image (H1)
99. The form is very tight, there's no room (H1)
100. The icons for “versiokuvaus” and “Gallery” button are pretty weird (H2)
101. The terms "versiomäärä" and "myyntirajoitin" are a little weird at first (H2)
102. Input fields have instructions as placeholders (H4)

103. Feedback of saving is the sliding text with background (H4)
104. No feedback from copying product (H5)
105. No shortcut to selection of version amount (H7)
106. Label has no "for" attribute (H7)
107. The error in cells of the price version table is shown with red borders without an explanation: there might be wrong characters, too large number in price field and so on… (H8)
108. Same error for invalid values and empty fields (H8)
109. There's no guidance about adding image to the product (H10)
110. Icons have no title texts (H10)

Assignment 5

111. The button for setting product image is hidden until cursor is over the image (H1)
112. The input fields have no border (H1)
113. The edit popup has no header e.g. "Editing product" (H1)
114. Removing product requires pressing delete button two times (H1)
115. The term "myyntirajoitin" is a little weird at first (H2)
116. Feedback of saving is the sliding text with background (H4)
117. Input fields have no borders (H4)
118. No proper feedback of removing product (H5)
119. No shortcut to selection of version amount (H7)
120. The error in cells of the price version table is shown with red borders without an explanation: there might be wrong characters, too large number in price field and so on… (H8)
121. Same error for invalid values and empty fields (H8)
122. There's no guidance about adding image to the product (H10)
123. Icons have no title texts (H10)

Listing A.4: Feedback from users

Improvement ideas:

A. Could product belong to multiple categories? (T8, T9)
B. Decimal numbers in product prices could appear automatically when editing (T8)
C. Change gallery link text to “Images” (T3)
D. Is 3 price versions really enough for the products? (T6)
E. Should delivery info be included in office information? (T8)
F. “Buy also this” products would be good (T8)
G. Separate input fields for contact information (to customize front page)? (T1, T10)
H. Possibility to upload banner images and categories (T8)
I. Office and company info could be in the same page? (T9, T10)
    a. Perhaps if only one office then office = company

Comments:

J. The assignments were easy basic tasks for a shopkeeper (T1, T2, T3, T4)
K. Some of the assignments were unclear(T4, T6, T10)
L. Simple, easy-to-use UI (PT, T2, T3, T4, T5, T6, T7, T8, T9, T10)
    a. Much better than PrestaShop (PT, T9)
M. An easy quick edit feature for products (T3, T4, T7)
    a. Better than PrestaShop’s (T9)
N. The crop image feature is good (T10)

Appendix B

Usability problems

Listing B.1: Usability problems

Assignment 1 (Company & Office forms):

1. **The feedback text from saving form is almost unnoticeable (CW, H4, H5, T7, T8)**
    a. 1. User might not notice the “saved” text in the button when save button is clicked because it’s not usual way of showing feedback and the change is quite fast. (CW)
    b. 67. Feedback of saving varies between pages, this has text in button changes (H4)
    c. 68. Saving form feedback is barely noticeable (H5)
    d. 12. “Saved” text in the button may not be noticed (T7, T8)
2. **The errors in input fields aren’t noticed (T3, T8, T9)**
    a. 9. Error in postal code isn’t noticeable enough (T3)
    b. 10. Postal code is missing first zero (bug), remain unnoticed (T9)
    c. 11. Error in company code isn’t noticeable enough (T8)
3. **Missing error messages for invalid values (H8)**
    a. 70. Same red borders for empty field and invalid input in field (H8)
    b. 71. Some input fields with an invalid value have an error message other doesn't (H8)
4. **Form can be sent multiple times before feedback (T8)**
    a. 13. Save button stays active after saving - shouldn’t stay? (T8)
5. **The icon for company page could be misleading (H2)**
    a. 64. The icon for company page could be misleading (H2)
6. **All input fields don’t have instructions (H4, H10)**
    a. 66. Some of the input fields have title texts as instructions, other have nothing (H4)
    b. 72. Some fields doesn't have an instruction text (H10)
7. **Delivery price field doesn’t have proper unit (H3)**
    a. 65. The delivery price doesn't have unit (H3)
8. **Clicking an input field’s label doesn’t move focus to the field (H7)**
    a. 69. Clicking an input field’s label doesn’t move focus to the field (H7)

Assignment 2 (Customize front page):

9. **Save button missing from the page, guidance about automatic saving isn’t clear enough (PT, T1, T2, T4, T5, T6, T8, T9, T10, H1, H4)**
    a. 17. Save button missing from the page, guidance isn’t clear enough (PT, T1, T2, T4, T5, T6, T8, T9, T10)
    b. 73. Save button is missing (H1)
    c. 77. This page has autosave others have save button (H4)
10. **Contact information bar is too small, now barely noticeable (CW, T1, T2, T8, T9, T10)**
    a. 3. Front page’s dark grey top bar may be too small to notice at least in the first time even though there are instructions. (CW)
    b. 18. Contact information bar is too small, now barely noticeable (T1, T2, T8, T9, T10)
11. **Example products in customizing front page are confusing (PT, T2, T3, T7, T9)**
    a. 16. Example products in editing front page are confusing (PT, T2, T3, T7, T9)
12. **Clicking the useless link in the contact information bar leads to the admin panel’s front page (T2, T3, T9, H1)**
    a. 19. Clicking the link in the contact information bar leads to admin panel’s front page (T2, T3, T9)
    b. 74. Logo in the grey top bar is unnecessary (H1)

13. **Disappearing guidance in the input fields (T1, T6, T10, H4)**
    a. 20. Text fields' guidance texts disappear when user starts to type (T1,T6, T10)
    b. 21. Separate input fields for contact information needed (T1, T10)
    c. 78. Input fields have instructions as values, other pages' fields don't (H4)
14. **The input fields without borders are unnoticeable (CW, H1, H4)**
    a. 76. Input fields have no borders (H1)
    b. 79. Input fields have no borders but in other pages they do (H4)
    c. 4. Input fields in the page, especially in grey top bar, are barely noticeable because there's no borders. (CW)
15. **Old data doesn't get selected or removed when clicking fields (PT, T1, T2, T4)**
    a. 14. Clicking text field doesn't select whole text (PT, T1, T2)
    b. 15. Clicking text field doesn't remove whole text (T4)
16. **Old data doesn't get removed when editing fields (T3, T4)**
    a. 22. Text fields' old text doesn't disappear when typing to field (T3, T4)
17. **No feedback of saving changes (H4, H5)**
    a. 80. No feedback of saving changes (H4)
    b. 81. No feedback of saving changes (H5)
18. **The correct front page link isn't found (T10)**
    a. 24. "Front page" link isn't found (T10)
    b. 2. There are basically two links referencing to the front page. The correct one "Front page" link is in main navigation bar but there's also "Show shop" in the smaller navigation bar in the right side. (CW)
19. **Undoing changes is impossible (H6)**
    a. 82. The changes are saved automatically, there's no way to cancel changes (H6)
20. **Example products shouldn't be "active", cursor changes without functionality (H1)**
    a. 75. Example products shouldn't be "active", cursor changes without functionality (H1)
21. **There are no warnings or errors if not mandatory but highly recommended fields are left empty e.g. Shop name (H8)**
    a. 83. There's no warnings or errors if not mandatory but highly recommended fields are left empty e.g. Shop name (H8)
22. **There are no proper instructions of the input fields (H10)**
    a. 84. There's no proper instructions of the fields (H10)
23. **No proper instructions about the example front page (H10)**
    a. 85. No info about the example front page or the example products (H10)
24. **Editing shop name field is illogical - first filling the normal form then editing the preview (T8)**
    a. 23. Editing shop name field is illogical - first select elements and then text fields (T8)

Assignment 3 (Gallery):

25. **The "Gallery" link in the navigation bar is not clear (T3, T4, T5, T6, T9, T10, H2)**
    a. 30. "Add product" page is opened instead of "Gallery" page (T3, T4, T5, T6, T9, T10)
    b. 29. "Gallery" icon not clear (T5, T10)
    c. 90. The icon for gallery isn't appropriate "leaf" (H2)
    d. 37. Gallery button and name are not clear (T10)
26. **Insufficient feedback of uploading image (T1, T5, T6, H5)**
    a. 26. Uploaded image disappears after uploading, where is it? Is the image uploaded? (T1, T5, T6)
    b. 94. Insufficient feedback of adding image (H5)
27. **There's no indication of which images are new (recently uploaded) (CW)**
    a. 5. There's no indication of which images are new (just uploaded) (CW)

28. **The buttons for previewing and removing images are difficult to find (CW, PT, T2)**
    a. 6. Opening the image and removing the image are both in hidden layer on top of the image which can be seen by hovering the image. Users might not realize that in the first time. (CW)
    b. 25. Buttons appear too slowly on top of the thumbnail in the gallery (PT, T2)
29. **The icons for the image functionalities doesn't have any instructions (H10)**
    a. 97. Icons on the layer on the thumbnails doesn't have title texts (H10)
30. **The icon for previewing image is unclear (T2, T3)**
    a. 27. Unclear icon for opening image in popup (T2)
    b. 28. Troubles with opening image popup (T3)
31. **The buttons used for uploading image look like disabled (T4, H1, H4)**
    a. 86. The button for opening the upload form is too small and inconspicuous (H1)
    b. 32. "Upload product image" button is not clear enough (text is grey so button is disabled?) (T4)
    c. 87. The save button and the button for opening the upload form look like disabled (H1)
    d. 92. Gallery's buttons have different style than others (H4)
32. **The button for opening the upload form is misleading when the form is visible (H1)**
    a. 89. The button for opening the upload form is misleading when the form is visible (H1)
33. **The image preview popup's header is irrelevant (H1)**
    a. 88. image popup's header is the file name which is quite irrelevant (H1)
34. **Weird terms "eKukkaKuvat" and "Asemoi" (H2)**
    a. 91. The terms "eKukkakuvat" and "Asemoi" are a little weird at first (H2)
35. **The confirmation of removal doesn't clearly indicate the selected image (H4, H9)**
    a. 93. Confirmation of removal and popup differ from other pages' (H4)
    b. 96. Confirmation popup doesn't tell which image is being removed, it's still kind of noticeable though since image is active during the confirmation (H9)
36. **There's no information about the existing "eKukka" images (T10)**
    a. 36. Initial gallery images are confusing (T10)
37. **Unclear instructions for uploading images (T3, T4)**
    a. 31. Instructions on the page are not clear enough (T3)
    b. 33. Windows image preview distracts completing the task, failed (T4)
38. **The description can't be changed after uploading (T7)**
    a. 34. Image description couldn't be changed after uploading image (T7)
39. **Clicking an input field's label doesn't move focus to the field (H7)**
    a. 95. Label has no "for" attributes, clicking doesn't activate the input field (H7)
40. **Image preview doesn't work from own images tab (T10)**
    a. 35. Image preview didn't work for just added image on "Own images" tab (bug) (T10)

Assignment 4 (Add product):

41. **The button for selecting product image is difficult to notice (CW, T1, H1)**
    a. 7. Adding image to the product feature is hidden from the user and can be seen only by hovering the default product image. (CW)
    b. 41. Product image selection isn't easy to spot (T1)
    c. 98. The button for setting product image is hidden until cursor is over the image (H1)
42. **The selected image doesn't show up clear enough when hovering image (T3)**
    a. 40. Image selection could be clearer when cursor is on selected image (T3)
43. **The selection of image disappears when clicking image again (PT, T3, T8)**
    a. 39. Double clicking images in product image selection popup removes the selection (PT, T3, T8)
44. **The input fields accept also invalid characters (T2, T4, T5, T6, T7, T10)**

   a. 44. Price fields accept all characters (also invalid ones), especially euro sign confuses (T2, T4, T5, T6, T7, T10)

45. **The input fields with invalid values are difficult to notice (T4, T5, T6, T10)**
    a. 45. Invalid input cells in prices are not clear enough, red borders are too thin (T4, T5, T6, T10)
    b. 46. Empty input cells should be shown more clearly when trying to save (T5)
46. **The validation of price fields doesn't work if the amount of price versions is changed (T7)**
    a. 54. Validation doesn't work if amount of price versions is changed (T7)
47. **Unclear terms "Versiomäärä" and "myyntirajoitin" (T2, T6, H2)**
    a. 101. The terms "versiomäärä" and "myyntirajoitin" are a little weird at first (H2)
    b. 47. Unclear term "Myyntirajoitin" (T2)
    c. 48. Unclear term "Versiomäärä" (T6)
48. **Insufficient feedback of saving product (T3)**
    a. 50. It's not clear that new product has really been saved (T3)
49. **Insufficient feedback of copying product (T8, H5)**
    a. 104. No feedback from copying product (H5)
    b. 55. Copying product info isn't clear, there's no clear sign of new product (T8)
50. **No error messages when trying to save (T4, H8)**
    a. 107. The error in cells of the price version table is shown with red borders without an explanation: there might be wrong characters, too large number in price field and so on… (H8)
    b. 108. Same error for invalid values and empty fields (H8)
    c. 52. Why the save button doesn't work? More guidance needed about errors? (T4)
51. **No instructions for adding image for the product (H10)**
    a. 109. There's no guidance about adding image to the product (H10)
52. **The selection of price versions is unclear (T4, T5, T6, T9, T10)**
    a. 51. The selection of price version amount is unclear at first (T4, T5, T6, T9, T10)
    b. 49. How to use price versions? (T6)
53. **Traversing the form by using tab key surpasses the selection of version amount (PT, H7)**
    a. 38. Traversing form with tab button surpasses version amount selection (PT)
    b. 105. No shortcut to selection of version amount (H7)
54. **Unclear icons for "Versiokuvaus" and the "Gallery" button (H2)**
    a. 100. The icons for "versiokuvaus" and "Gallery" button are pretty weird (H2)
55. **Disappearing instructions in input fields (T7, H4)**
    a. 102. Input fields have instructions as placeholders (H4)
    b. 53. Input cells' placeholder texts are confusing (T7)
56. **Decimal numbers of the instructions are confusing (T2, T8)**
    a. 43. Decimals in example prices are confusing, should there be an autofill function? (T2, T8)
57. **Different kind of feedback of saving (H4)**
    a. 103. Feedback of saving is the sliding text with background (H4)
58. **The icon for setting products visibility is missing description (e.g. title text) (T1, T2, T7, H10)**
    a. 110. Icons have no title texts (H10)
    b. 42. The "Hide/Show product" button is unclear (T1, T2, T7)
59. **Clicking an input field's label doesn't move focus to the field (H7)**
    a. 106. Label has no "for" attribute (H7)
60. **The form is too small (H1)**
    a. 99. The form is very tight, there's no room (H1)

Assignment 5 (Product list):

61. **The button for selecting product image is difficult to notice (CW, H1)**
    a. 8. Changing image to the product feature is hidden from the user and can be seen only by hovering the default product image. (CW)
    b. 111. The button for setting product image is hidden until cursor is over the image (H1)
62. **The “Show shop” link is difficult to find (PT, T2, T5, T7, T9, T10)**
    a. 58. Had troubles finding the “Show shop” link (PT, T2, T5, T7, T9, T10)
63. **The “Hide product” feature is difficult to notice from the edit product popup (T4, T5, T10)**
    a. 63. “Hide product” feature wasn’t found from the popup (T5, T10)
    b. 62. Troubles with hiding the product from product edit popup, clear in the product list though but changing product visibility in list view doesn’t affect edit popup (T4)
64. **Insufficient feedback of removing product (H5)**
    a. 118. No proper feedback of removing product (H5)
65. **The icons are missing descriptions (e.g. title text) (T2, H10)**
    a. 123. Icons have no title texts (H10)
    b. 59. More guidance texts for icons (T2)
66. **The product name and description fields have no borders (H1, H4)**
    a. 112. The input fields have no border (H1)
    b. 117. Input fields have no borders (H4)
67. **Edit popup has no header (H1)**
    a. 113. The edit popup has no header e.g. "Editing product" (H1)
68. **Removing product requires pressing “remove” button two times (H1)**
    a. 114. Removing product requires pressing delete button two times (H1)
69. **An unclear term “myyntirajoitin” (H2)**
    a. 115. The term "myyntirajoitin" is a little weird at first (H2)
70. **Traversing the form by using tab key surpasses the selection of version amount (H7)**
    a. 119. No shortcut to selection of version amount (H7)
71. **Different kind of feedback of saving (H4)**
    a. 116. Feedback of saving is the sliding text with background (H4)
72. **No error messages when trying to save (H8)**
    a. 120. The error in cells of the price version table is shown with red borders without an explanation: there might be wrong characters, too large number in price field and so on… (H8)
    b. 121. Same error for invalid values and empty fields (H8)
73. **No instructions for adding image for the product (H10)**
    a. 122. There's no guidance about adding image to the product (H10)
74. **Unlike product’s visibility, prices can’t be edited from the product list (PT)**
    a. 56. Editing prices doesn’t work by clicking product’s price from the product list (PT)
75. **The example products in the product list are confusing (T3)**
    a. 60. List of example products could confuse users in own products page (T3)
76. **Double clicking product image to open the edit popup immediately closes it (T3)**
    a. 61. Double clicking product image to edit products, perhaps not so experienced with web page interfaces? (T3)
77. **Saving product changes removes image from product (PT, T1, T2, T3, T4, T5, T6, T7, T8, T9, T10)**
    a. 57. Editing product’s information drops products image (ALL, Major bug)

	Pilot	User testing T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total	Heuristic evaluation H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Total	CW Total	SUM	Severity Level
Assignment 1 (The Company & Office pages)	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**3**	**1**	**0**	**6**	**0**	**1**	**1**	**2**	**1**	**0**	**1**	**1**	**0**	**1**	**8**	**1**	**15**	
1. The feedback text from saving form is almost unnoticeable								x	x							x	x							x	**5**	major
2. The errors in input fields aren't noticed				x					x	x															**3**	major
3. Missing error messages for invalid values																				x					**1**	minor
4. Form can be sent multiple times before feedback									x																**1**	minor
7. Delivery price field doesn't have proper unit															x										**1**	minor
5. The icon for company page could be misleading														x											**1**	cosmetic
6. All input fields don't have instructions																x						x			**2**	cosmetic
8. Clicking an input field's label doesn't move focus to the field																			x						**1**	cosmetic
Assignment 2 (Customize front page)	**3**	**4**	**5**	**3**	**3**	**1**	**2**	**1**	**3**	**4**	**4**	**30**	**4**	**0**	**0**	**4**	**1**	**1**	**0**	**1**	**0**	**2**	**13**	**3**	**46**	
9. Save button missing from the page, guidance about automatic saving isn't clear enough	x	x	x		x	x	x		x	x	x		x			x									**11**	catastrophic
10. Contact information bar is too small, now barely noticeable		x	x						x	x	x													x	**6**	major
11. Example products in customizing front page are confusing	x		x	x				x		x															**5**	major
12. Clicking the useless link in the contact information bar leads to admin panel's front page			x	x						x			x												**4**	major
13. Disappearing guidance in the input fields		x					x				x					x									**4**	major
17. No feedback of saving changes																x	x								**2**	major
14. The input fields without borders are unnoticeable													x			x								x	**3**	minor
15. Old data doesn't get selected or removed when clicking fields	x	x	x		x																				**4**	minor
19. Undoing changes is impossible																		x							**1**	minor
20. Example products shouldn't be "active"													x												**1**	minor
21. No validation of the important input fields e. g. Shop name																				x					**1**	minor
18. The correct front page link isn't found											x													x	**2**	cosmetic
22. No proper instructions of the input fields																						x			**1**	cosmetic
23. No proper instructions about the front page preview																						x			**1**	cosmetic
24. The page is illogical - first filling the normal form then editing the preview									x																**1**	cosmetic
16. Old data doesn't get removed when editing fields				x	x																				**2**	none
Assignment 3 (Gallery)	**1**	**1**	**2**	**3**	**3**	**2**	**2**	**1**	**0**	**1**	**3**	**18**	**3**	**2**	**0**	**2**	**1**	**0**	**1**	**0**	**1**	**1**	**11**	**2**	**31**	
25. The "Gallery" link in the navigation bar is not clear				x	x	x	x			x	x			x											**7**	major
26. Insufficient feedback of uploading image		x				x	x										x								**4**	major
31. The buttons used for uploading image look like disabled					x								x			x									**3**	major
40. Image preview doesn't work from own images tab											x														**1**	major
27. There's no indication of which images are new (recently uploaded).																								x	**1**	minor
28. The buttons for previewing and removing images are difficult to find	x		x																					x	**3**	minor
30. The icon for previewing image is unclear			x	x																					**2**	minor
35. The confirmation of removal doesn't clearly indicate the selected image																x					x				**2**	minor
37. Unclear instructions for uploading images				x	x																				**2**	minor
38. The description can't be changed after uploading								x																	**1**	minor
29. The icons for the image functionalities doesn't have any instructions																						x			**1**	cosmetic
32. The button for opening the upload form is misleading when the form is visible													x												**1**	cosmetic
36. There's no information about the existing "eKukka" images											x														**1**	cosmetic
39. Clicking an input field's label doesn't move focus to the field																			x						**1**	cosmetic
33. The image preview popup's header is irrelevant													x												**1**	none
34. Weird terms "eKukkaKuvat" and "Asemoi"														x											**1**	none

		User testing											Heuristic evaluation											CW		
	Pilot	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Total	Total	SUM	Severity
Assignment 4 (Add product)	**2**	**2**	**4**	**3**	**4**	**3**	**4**	**4**	**3**	**1**	**3**	**31**	**2**	**2**	**0**	**2**	**1**	**0**	**2**	**1**	**0**	**2**	**12**	**1**	**89**	
43. The selection of image disappears when clicking image again	x			x					x																**3**	major
44. The input fields accept also invalid characters			x		x	x	x	x			x														**6**	major
45. The input fields with invalid values are difficult to notice					x	x	x				x														**4**	major
46. The validation of price fields doesn’t work if the amount of price versions is changed								x																	**1**	major
50. No error messages when trying to save					x															x					**2**	major
58. The icon for setting products visibility is missing description (e.g. title text)		x	x					x														x			**4**	major
49. Insufficient feedback of copying product									x								x								**2**	minor
41. The button for selecting product image is difficult to notice		x											x											x	**3**	cosmetic
42. The selected image doesn’t show up clear enough when hovering image				x																					**1**	cosmetic
47. Unclear terms “Versiomäärä” and “myyntirajoitin”			x				x							x											**3**	cosmetic
51. No instructions for adding image for the product																						x			**1**	cosmetic
52. The selection of price versions is unclear					x	x	x			x	x														**5**	cosmetic
53. Traversing the form by using tab key surpasses the selection of version amount	x																		x						**2**	cosmetic
54. Unclear icons for “Versiokuvaus” and the “Gallery” button														x											**1**	cosmetic
55. Disappearing instructions in input fields								x								x									**2**	cosmetic
56. Decimal numbers of the instructions are confusing			x						x																**2**	cosmetic
59. Clicking an input field’s label doesn’t move focus to the field																			x						**1**	cosmetic
48. Insufficient feedback of saving product				x																					**1**	none
57. Different kind of feedback of saving																x									**1**	none
60. The form is too tight													x												**1**	none
Assignment 5 (Product list)	**3**	**1**	**3**	**3**	**2**	**3**	**1**	**2**	**1**	**2**	**3**	**21**	**4**	**1**	**0**	**2**	**1**	**0**	**1**	**1**	**0**	**2**	**12**	**1**	**70**	
77. Saving product changes removes image from product	x	x	x	x	x	x	x	x	x	x	x														**11**	catastrophic
63. The “Hide product” feature is difficult to notice from the edit product popup					x	x					x														**3**	major
65. The icons are missing descriptions (e.g. title text)			x																			x			**2**	major
72. No error messages when trying to save																				x					**1**	major
62. The “Show shop” link is difficult to find	x		x			x		x		x	x														**6**	minor
68. Removing product requires pressing “remove” button two times													x												**1**	minor
74. Unlike product’s visibility, prices can’t be edited from the product list	x																								**1**	minor
75. The example products in the product list are confusing				x																					**1**	minor
61. The button for selecting product image is difficult to notice													x											x	**2**	cosmetic
64. Insufficient feedback of removing product																	x								**1**	cosmetic
66. The product name and description fields have no borders													x			x									**2**	cosmetic
67. Edit popup has no header													x												**1**	cosmetic
69. An unclear term “myyntirajoitin”														x											**1**	cosmetic
70. Traversing the form by using tab key surpasses the selection of version amount																			x						**1**	cosmetic
73. No instructions for adding image for the product																						x			**1**	cosmetic
71. Different kind of feedback of saving																x									**1**	none
76. Double clicking product image to open the edit popup immediately closes it				x																					**1**	none

Table B.2: Usability problems ordered according to severity

Listing B.3: Solutions to the usability problems

Assignment 1 (Company & Office forms):

1. Replace current button text change with an automatically out-fading popup with “Saved” text.
2. In addition to the red borders of the input field, change field’s background color to light red.
3. If the value is invalid, add instruction text during the validation how to fix it.
4. Disable the “save” button after clicking and enable it after feedback.
5. Change the icon for the company page to more describing one.
6. Add title texts for all input fields including instructions or an example about required value.
7. Add the currency symbol after the field.
8. Add “for” attributes for all labels for moving focus.

Assignment 2 (Customize front page):

9. Add the save button to the right side under the beige bar with instructions
10. Add dashed borders to all editable input fields, also in the contact information bar
11. Remove example products or is the example of product order really needed?
12. Remove the link from the contact bar at least in the preview, it’s obsolete
13. Move instructions to the placeholder attribute or to title text
14. Add dashed borders to all editable input fields, also in the contact information bar
15. Change the click handler to select all text from input fields
16. Change the click handler to select all text from input fields
17. Add an automatically out-fading popup with “Saved” text.
18. Change the icon for the customize front page
19. Add the save button to the right side under the beige bar with instructions
20. Remove example products or is the example of product order really needed?
21. Add validation for the input fields, at least the shop name and contact information fields shouldn’t be empty
22. Add information that the page includes the preview of the front page and also describe better where the fields are.
23. Add information that the page includes the preview of the front page and also describe better where the fields are.
24. Add some space after instructions

Assignment 3 (Gallery):

25. Change the gallery link icon to an image or something like that and its text to “Images”. Also change the add product link icon to more product-like.
26. Add an animation to move image to the list or automatically out-fading popup with “Image added” text.
27. Add small “new” icon to the upper left corner of the thumbnail
28. Add information to the beige bar about the invisible layer on top the thumbnails
29. Add title texts for the icons
30. Add title texts for the icons
31. Change the button style to same as in other pages.
32. Change the button text when the form is visible
33. -
34. -
35. Highlight the selected image more clearly.
36. Explain the “eKukkaKuvat” for example in beige bar.
37. Improve the instructions for upload.

38. Add a possibility to edit image description for example in popup. Add dashed borders to the description and the click handler to make it editable.
39. Add “for” attributes for the labels
40. Fix the image preview in the own images tab

Assignment 4 (Add product):

41. Add more detailed instructions of the invisible layer to the beige bar.
42. Highlight the borders for selected image and remove the hover effect from it
43. Remove click handler from selected image
44. Remove the possible invalid characters from the input when focus is moved away and highlight it if needed.
45. In addition to the borders, highlight input fields’ background
46. Update the validation when the version amount is changed
47. Add title texts for unclear terms
48. -
49. Add “Copy of” text in front of the copied product’s name
50. Add an error message next to the field with an invalid value
51. Add more detailed instructions of the invisible layer to the beige bar
52. Add a title text for the price versions buttons and the label also
53. Add click handler for the category selection to jump next to the version selection
54. Add a title text for the version description and change the icon for gallery button
55. Add instructions to title texts for input fields
56. Add automatic adding of decimal numbers to the entered values
57. -
58. Add title texts for icons
59. Add “for” attributes for the labels
60. -

Assignment 5 (Product list):

61. Add more detailed instructions of the invisible layer to the beige bar.
62. Enlarge the icons in the right
63. Change the icon for “Hide product” feature
64. Add an automatically out-fading popup with “Product X removed” text
65. Add title texts for icons
66. Add dashed borders for the product name and description fields when inactive
67. Add a title for edit popup e.g. “Editing product x”
68. Open the popup with the remove product confirmation visible when the remove product is pressed from the product list
69. Change “myyntirajoitin” to “varastosaldo”
70. Add a click handler for the category selection to jump next to the version selection
71. -
72. Add an error message next to the field with an invalid value
73. Add more detailed instructions of the invisible layer to the beige bar.
74. Either open popup and activate the correct input field when clicked in the price or implement editing prices to the list
75. Add more information about the initial products in the shop in the beige bar
76. -
77. Fix saving product details