Re-modelling the interaction design and structure of an online store.

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This master's thesis is carried out as part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

Preface

In this master thesis I want to challenge the normalized structure and interaction design of today's online stores. The goal for this project is to completely rebuild and remodel the user interaction design and the structure of the online store: bokhyller.no, and then research through user testing to see if this affects the overall usability and user experience of the online store in a positive way.

A large part of the work that has been conducted in this master's thesis happens on the live website of https://bokhyller.flywheelstaging.com and I hope that you would like to visit it and see the changes compared to the older version; https://bokhyller.no.

When delivering this thesis, a large chapter in my life will come to an end. I've spent 5 years studying Multimedia Technology at the University of Agder, and it has been an amazing journey from the beginning in 2016 until the end in 2021.

Throughout the years I have worked with a lot of talented students that I have befriended, and some of these friendships have also turned into work partnerships outside of the university. I would like to thank all the friends that I have made through the years at UiA for the amazing moments, and for being supportive when I have needed it.

While being a student, I have also had the pleasure of working for several professors at the university, as a student assistant, web developer and guest lecturer. This has given me a lot of experience that will be very beneficial for me after graduating. I would like to thank Morgan Konnestad, Haakon Sundbø, Arne Thomas A. Søndeled and Per Henrik Hogstad for the work you've given me and the work experiences I have had the opportunity to get.

I also would like to thank my supervisors Frank Reichert and Ghislain Maurice Norbert Isabwe for the support they've given me throughout the last six months. I have been struggling a lot with motivation this year, and if it wasn't for their constant dedication, interest and supervision I would not be able to complete this thesis in time.

Lastly I would like to thank my mom, my family and friends for the support and guidance that they have given me throughout the 8 years since I started studying.

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Abbreviations and definitions

Abbreviations

- B2B - meaning sales from "business to business"
- B2C - meaning sales from "business to consumer"
- C2C - meaning sales from "consumer to consumer"
- SUS - meaning System Usability Scale

Definitions

- Wordpress - A content management system made to build websites.
- Wordpress theme - A wordpress theme is a template that the website is based on. In this thesis the theme is empty and is built from the bottom.
- Beaver Builder - A plugin that helps building the website in blocks and modules.
- WooCommerce - A plugin that creates the e-commerce part of the website.
- Control Website - The old version of the online store
- Challenger Website - The new Re-modelled online store

Summary

The development of new technologies during the last couple of years have resulted in a massive growth within e-commerce, and it has for many people become a part of their daily life.

BBB system AS is a Norwegian company established in the 1950s, that specializes in creating bookshelves with their unique module system. Throughout the years BBB has become a familiar name in many households, and their bookshelf products are distributed through hundreds of different dealerships across Norway, Copenhagen, Bern and Flensburg.

In the year of 2015, BBB System AS launched their first-ever webstore, which they intended to use for marketing and sales of their bookshelf system. This webstore was renewed by Mediabooster in the year of 2017.

A brand new online store for bokhyller.no will be developed and designed, where the goal is to reduce the amount of errors in orders, to make the user experience better and shorten the road to checkout.

Chapter 1: Introduction

The development of new technologies the last couple of years have resulted in a massive growth within e-commerce, and it has for many people become a part of their daily life. E-commerce is short for electronic commerce, and it refers to the buying and selling of goods or services using the internet. With the massive growth of e-commerce, online marketplaces face endless competitions and many companies strive to create a successful and trustworthy online store.

1.1 Background

My employer Mediabooster.no received the summer of 2020 a web-project from a company called BBB System AS. The project description was to rebuild their online store located at bokhyller.no, and improve their overall usability.

After half a year with no substantial progress, it was decided that it would be beneficial for me, my employer and BBB system to change this project into my master's thesis.

BBB system AS is a Norwegian company established in the 1950s, that specializes in creating bookshelves with their unique module system. Throughout the years BBB has become a familiar name in many households, and their bookshelf products are distributed through hundreds of different dealerships across Norway, Copenhagen, Bern and Flensburg.

In the year of 2015, BBB System AS launched their first-ever webstore, which they intended to use for marketing and sales of their bookshelf system. This webstore was renewed by Mediabooster in the year of 2017 and is now being rebuilt through this thesis.

1.2 Problem statement

The current state of BBB system´s online store bokhyller.no has a big potential for an upgrade. The online store is built as a traditional e-commerce website, but has a confusing structure for customers given its purpose. The online store is meant to be selling modular systems for bookshelves, where the users can mix and match different types of modules to build their own unique bookshelf.

By using a traditional webstore approach, bokhyller.no makes it difficult for the users to understand where to find the products they are looking for.

All their products are sorted in categories, but there is no obvious way for a user to know what products fit together and there are numerous different pages to navigate. The products in the online store are displayed without any types of attributes such as height, width, depth, colors, etc. unless you click on the product which also creates a lot of extra steps for the users.

BBB has noticed a problem where the users of the store regularly make mistakes while ordering products. A typical mistake on bokhyller.no is a user buying modules that do not fit together, such as two bookshelf sections with different depth.

Having users making these mistakes and being confused about their orders can impact the online store in various negative ways, such as the online store losing its trustworthiness.

This can lead to potential buyers canceling their orders and going to competitors instead. Having faulty orders will also result in a lot of extra work for the employees at bokhyller.no having to call the buyers, fix and explain their orders.

It will be crucial to consider the list of existing problems described above while re-modelling the interaction design and structure of bokhyller.no.

1.3 Limitations, Requirements and Prerequisites

Due to the endless possibilities within web design and web development, it has been very important to create some specific limitations and prerequisites for this project. When deciding on the limitations it was necessary to consider what the clients wanted for functionality, their budget for the webstore, and the timespan of the thesis.

Through conversation with both the employer and their client, it was agreed upon that it was important to prioritize the quality within the functions of the website above the quantity. This meant that a well done structure and functionality was to be prioritized above experimental functionality such as 3D builders, AR / VR integrations and other futuristic integrations that would take a long time to produce.

As well as considering these limitations, it was also necessary to state certain requirements for the project.

- The newer version of the webstore is required to have the same functionality of the old webstore rebuilt to be more efficient and user friendly.
- The new webstore will have to be responsive on all devices.
- The new webstore has to be built using the webtools of which Mediabooster are providing, including: Wordpress, Beaver Builder, and WooCommerce.
- The webstore is required to follow the design manual delivered by the client.
- All products and their attributes in the old webstore will have to be copied over to the new webstore, this includes: Images, dimensions, categories, type of product, colors, names, descriptions and prices.

Being able to carry out a project of this size, have required prerequisites such as a structured work plan, active communication with the client and the employer, and a good workflow.

Chapter 2: Theory and State of the Art

This theory and state of the art chapter presents an overview of already existing theory and research on the most important topics of this thesis: E-commerce, user experience, interaction design, usability and context awareness. Chapter 2.1 will cover the basics of e-commerce, its advantages, challenges and its future. Chapter 2.2 will cover user experience design, its most basic theories and the research within the field. Chapter 2.3 will cover interaction design, what it is, and its five dimensions. The final subchapter 2.4 will cover and discuss the research questions and hypothesis for this thesis.

2.1 E-commerce

E-commerce stands for electronic commerce and on Wikipedia it is stated as; "the activity of electronically buying or selling of products on online services or over the internet." ("E-Commerce," 2021)

E-commerce is a commercial activity presented through electronic tools and it is based on electronic transmission of information through text, video and audio, whether it is on the internet, over the radio or through a kiosk-machine. The term itself involves many activities and can be applied in many areas such as marketing, investments, insurance, leasing, advertising, online shopping, sales of goods B2B, B2C or even C2C. (Išoraitė & Miniotienė, 2018)

The evolution of e-commerce is directly linked with the advancements of information technology such as the internet, mobile phones, personal computers and apps, and it has been in development since the 1990s.

When someone is looking for a product to buy, it is likely that they will be searching it up on the internet before they buy it. The information about products are always available through e-commerce websites with the coverage of mobile networks and wifi connections. This means that even if shops are closed due to opening hours or holidays, people would still be able to do their shopping and find information about products they are interested in 24/7.

E-commerce today is constantly evolving and it has a fast growing number of new companies and clientele involved. (Santos, Sabino, Morais, & Gonçalves, 2017)

2.1.2 Advantages

The growing popularity of e-commerce is not surprising. According to (Kiang & Chu, 2001) products and services such as software, music, news, consultancy services, issuance of online tickets and reservations, banking service, among others, which use the Internet as a distribution channel, there are a lot of advantages, which they present in table 2.1.2.1

Channel	Advantages
Communication	Better information on products
	More information on Pricing
	Service availability, 24 hours, 7 days per week
	Lower communication costs
	Interactivity and trustworthiness for on-demand information
	Stock updates in real time
	Online technical support
	Fast response for clients' requests
	Customized orders
	After-sales service
	No personal contact
Transaction	Virtual storefront viewable by all Internet users
	Lower transaction cost
	Human error reduction
	Purchase cycle time reduction
	Lower level of storage and other associated costs
	Possibility of customizing promos and sales for individual clients
	Price flexibility
	Relatively low initial investment and establishment cost
Distribution	Lower wait time for receiving digital products and services
	Lower cost for delivery of digital products and services
	Allows clients to follow-up orders
	Reduces the numbers of representatives

Table 2.1.2.1: (Santos et al., 2017) lists a detailed table of advantages of electronic commerce in a marketing approach, adapted and based on Kiang & Chu where they divide the process of e-commerce into three different channels; Communication, Transaction and Distribution.

The communication part of E-commerce where all information gets distributed between the two parts of trade, whether it's b2b, b2c or c2c. The transaction part is where the trade is happening, in the physical world it could be compared with the counter in a store. The distribution part happens after the trade and it is all actions between the payment and the acquisition of the goods or the services.

According to (Lefebvre & Lefebvre, 2002), e-commerce has become an imperative environment where the opportunities of and advantages are so great there is no going back.(Santos et al., 2017)

2.1.2 Challenges

Literature demonstrates that trust, usability, security and safety are some of the biggest challenges to e-commerce, and they are all related to each other. In e-commerce there is no personal buyer-seller relationship like there is in the physical world, where the buyer can read the seller's body language, discuss the product and actually see the physical product.

(Davis, 2002) During a transaction, a buyer has to supply the seller with a lot of sensitive information such as credit card information, banking information, localization and personal information. For a buyer it is crucial that the seller can be trusted to keep this information secure.

According to (Davis, 2002) the lack of trust in e-commerce is a major hurdle and there is required much more research on the topic, to understand how we can foster trust online. In his article "HCI Research Issues in Electronic Commerce" he provides thirteen guidelines that can integrate trust-building strategies into e-commerce websites. These guidelines are great contributions to the challenges, and one of the guidelines is to have a "Timely and Professional Website Design". The description of this guideline explains that a professionally designed and user-friendly website instills trust and confidence in consumers. Then it goes on to say that the website is expected to follow an orderly structure that is easy to understand and navigate, and be thoroughly tested from both a technical point of view and a usability standpoint.(Davis, 2002)

2.1.2 The future of e-commerce

As mentioned earlier, E-commerce is in constant development. In addition to overcoming the challenges identified as providing trust, greater security in purchases, usability and safety, it is predicted that the future evolution of e-commerce will run through new technologies such as augmented reality and virtual reality applications. (Santos et al., 2017) Being able to view 3D models of products in a virtual environment will open up new possibilities for businesses and it will give the consumers a much more trustworthy and realistic product display than what is available today. E-commerce is also expected to grow with the expansion of globalisation, using language translators and adaptive interfaces.

2.2 User experience (UX)

2.2.1 What is user experience?

The experience when you first discover a product in the store, the experience when you buy the product and you are transporting it home. Does it fit in the car? Is it difficult to assemble when you finally get it home?

This is how the inventor of the term "user experience", Don Norman explains what user experience is: "User experience is everything that touches upon your experience with the product, and it may not even be near that product. It may be when you tell somebody else about it."(NNgroup, 2016)

What we learn from this is that user experience is not only for websites and apps which many people would think. It is a widely used term of the whole experience a user has with the company, its services and its products.

In the article "The definition of User Experience (UX)" you learn that the first requirement for an exemplary user experience is to meet the exact needs of the customer, without fuss or bother. It then goes on to explain that "true user experience goes far beyond giving customers what they say they want, or providing checklist features. In order to achieve high-quality user experience in a company's offerings there must be a seamless merging of the services of multiple disciplines, including engineering, marketing, graphical and industrial design, and interface design."(Don Norman, n.d.)

User experience is vital to all sorts of products and services, and since this thesis is about the re-modelling of an online store, the user experience chapter will be narrowed down to user experience in regards to products, especially websites.

2.2.2 User experience in relation to websites

In the textbook "The elements of user experience, second edition" it is mentioned that user experience becomes much more important on the web than it is for other kinds of products. In the textbook it is argued that the reason is mainly because websites are complicated technology and that they are a self-service product. Meaning that users who visit a website have no instruction on how to use them, and they are dependent on prior knowledge or learning how to use the website on the go.(Garrett, 2011)

So what does it take to create a good user experience on the web? Usability.gov tells us that you should always have the users in mind. What do the users need? What do the users value and what are the users abilities and limitations? To ensure that the users find value in your product, Peter Morville has developed the UX honeycomb model which displays the seven aspects of user experience. Peter says that "in order for there to be a meaningful and valuable user experience, information must be; Useful, Usable, Desirable, Findable, Accessible, and Credible."("User Experience Basics," 2014)

Figure 2.2.2.1: Displays the user experience honeycomb model made by Peter Morville.

The seven aspects of user experience gives developers a great overview of what values a great user experience. In addition to shaping information through the seven aspects of user experience, there are some principles that are suggested by (Garrett, 2011) to follow if you are to build a website with great user experience.

(Garrett, 2011) presents a roadmap of five steps that are called the elements of user experience, and they are visualized as layers built on top of each other in figure 2.2.2.2.
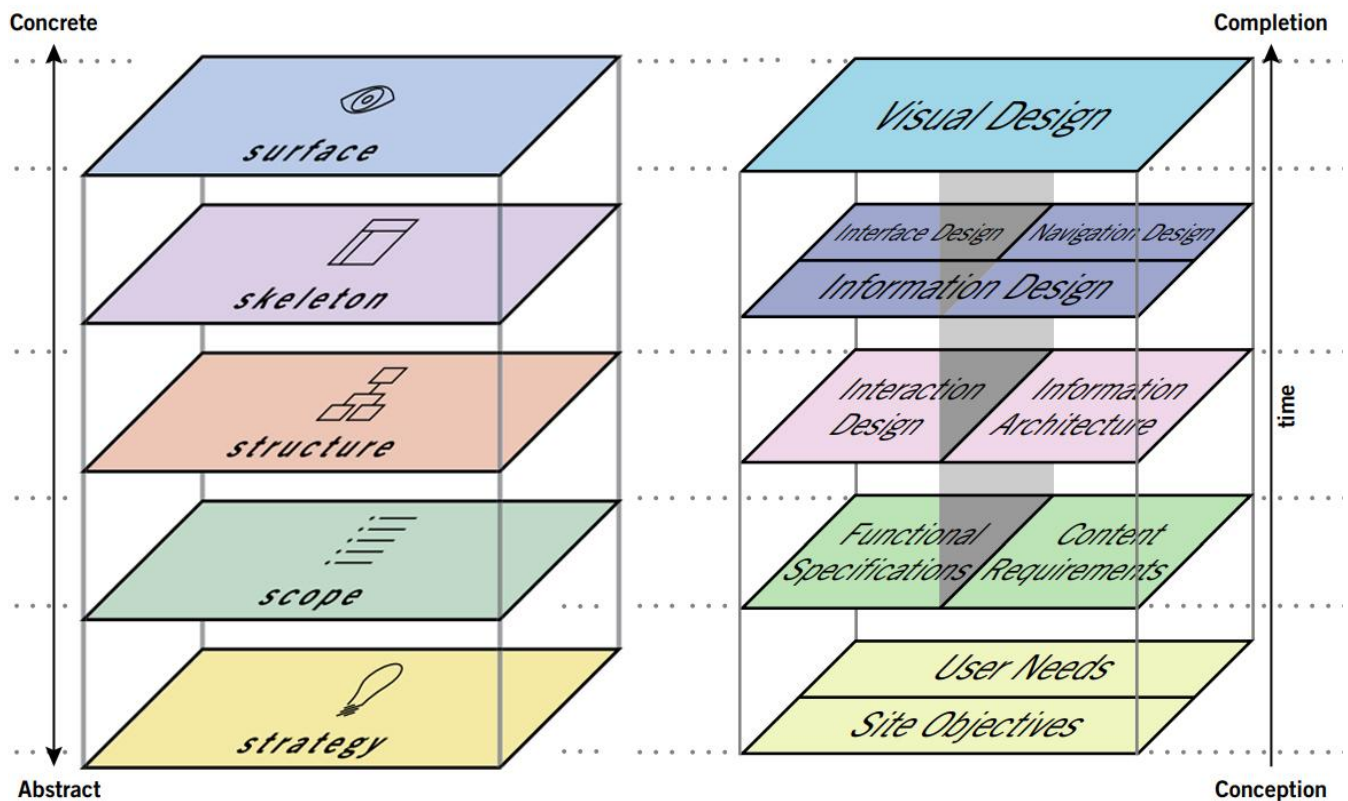
Figure 2.2.2.2: To the left, a visualization of the five elements to user experience displayed in layers on top of eachother; Strategy, Scope, Structure, Skeleton, and Surface. To the right, a visualization of the five elements with their web related terms in the appropriate layers.(Garrett, 2011)

The five presented elements are the strategy layer, the scope layer, the structure layer, the skeleton layer and the surface layer. Each of these layers are dependent on the layers placed below themselves, for instance; The scope plane is based upon and follows the logic of the strategy plane. All of the layers have their purpose and there are a lot of disciplines involved in the theory behind them.

Looking at the right illustration in figure 2.2.3.2, one can see the specified version that usability.gov and (Garrett, 2011) suggests for web applications and websites. This model shows us for instance, that for a web application or a website the strategy plane consists of user needs and site objectives. In user experience design for the web, there are numerous

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disciplines one can use to perform the actions and research on each of the five elements of user experience. An example for the strategy layer can be user research methods for user needs and a context of use analysis for site objectives.

Usability.gov mentions some other essential areas related to building user experience such as project management, user research, usability evaluation, information architecture, user interface design, interaction design, visual design, content strategy, accessibility and web analytics.("User Experience Basics," 2014) Many of these areas are central in this thesis, especially usability evaluation and interaction design which will be covered later in this chapter.

2.2.3 Research on user experience related to e-commerce

As mentioned in the previous chapter, e-commerce and the consumer's demand has grown massively the last couple of years with the evolution of technology. With larger demands from consumers, user experience has grown to become an essential competitive advantage for businesses online. Today businesses do not only compete about the quality of their products, it is now also about the whole user experience for their consumers. (Baru & Vemula, 2017)

There has been a whole lot of research on the areas of user experience. The first known example is from the 1950s when "Bell Labs" deducted user experience work on their design of the touchstone keypad.(Experience, n.d.-a)

Throughout the years, there have been a lot of discussions on how to perceive user experience, especially from IT, design and psychology perspectives. As observed by (Vliet and Mulder), the discussion on human experience has a long philosophical tradition, further explored by psychologists, neurologists and others in the last centuries(Hellweger, Wang, & Abrahamsson, n.d.) before it was made a term by Don Norman in 1993.

(Hellweger et al., n.d.) have made an interesting study where they research the contemporary understanding of UX in practice, and their empirical findings show that user experience is perceived as a multi-face phenomenon from multiple perspectives in practice.(Hellweger et al., n.d.)

This theory is backed up by (Asbjørn Følstad, Rolf Kenneth Rolfsen, 2006) in their study "Measuring the effect of user experience design changes in e-commerce web sites: a case on Customer Guidance". (Følstad et al., n.d.) states that UX may be understood as a broad concept containing usability among other things. Before listing up how three other researchers discuss UX in e-commerce.

- (Nielsen et al.) discuss e-commerce UX as web site usability and trust.
- (Garrett, 2011) considers UX to be associated with all possible user actions for a particular web site, relating UX to strategy, functional specifications, interaction design, information design and visual design.

- (Petre et al.) extends the concept of UX beyond the interaction with an e-commerce website to also include delivery of products, post-sales support, and consumption of products and services."

Different user experience practitioners perceive user experience in different ways, this explains why user experience is such a complex topic and difficult to define.

The current state of the art within the topic is complex and confusing. As of today (Følstad et al., n.d.) states that "the diversity of UX perspectives and definitions suggests that we are facing a concept that is used pragmatically by researchers and practitioners to explicate a variety of aspects of human-computer interaction that is not fully captured by traditional usability literature." (Følstad et al., n.d.)

2.3 Interaction design

2.3.1 What is interaction design?

As mentioned in the previous chapter, interaction design is an essential part of user experience design. One of the aims of user experience design is to shape the user's experience with the product, and a big part of this experience involves interaction between users and products.

The interaction design foundation defines interaction design as; "The design of interactive products and services in which a designer's focus goes beyond the item in development to include the way users will interact with it."("What Is Interaction Design?," n.d.)

This means that interaction design simply is the design of a user's interaction with a product, in the case of this thesis it will be about designing for the user's interaction with an online store. A typical interaction on a website would be the interaction with a button, or with features such as videos and graphics.

Further on, the Interaction Design Foundation mentions that the goal for interaction design is "to create products that enable the user to achieve their objective(s) in the best way possible".("What Is Interaction Design?," n.d.)

This definition and goal gives an impression of interaction design as a broad term, but luckily there are some useful theories behind interactive design that gives it a better structure.

2.3.2 The five dimensions of interaction design

In the article "What puts the Design in Interaction Design" written by Kevin Silver back in 2007, Kevin writes about the four dimensions to interaction design. These dimensions were first introduced by Gillian Crampton Smith in "the introduction to designing interactions" and in Kevins article he introduces a fifth dimension.("What Puts the Design in Interaction Design :: UXmatters," n.d.) These dimensions are the pillars to interaction design and represent the aspects an interaction designer considers when designing interactions:

- Words (1D) — which are interactions. These are typically words on a button, a link, short descriptive texts on a website.

- Visual representations (2D) — with which users interact. These are typically graphics, diagrams, typography, icons, symbols, etc.

- Physical objects or space (3D) — with which or within which users interact. This is typically a laptop, a phone, the keyboard, a mouse or a controller.

- Time (4D) — within which users interact. Typically content that changes over time such as animations, sounds or video.

- Behaviour (5D) — including action, or operation, and presentation, or reaction. This dimension is concerned with how the products can be used, behave, how they react to the users' inputs, and how feedback is provided.

This list is a citation from Kevin Silver's article ("What Puts the Design in Interaction Design :: UXmatters," n.d.) and ("What Is Interaction Design?," n.d.)

The first four dimensions (Words, Visual representation, Physical objects and Time) are enabling the interaction, and the last two dimensions (Time and Behaviour) define the interaction. An interaction in this case could be the press or clicking of a button.

For the creation of a successful product, interaction designers are utilizing all five dimensions to consider the interactions between a user and a product or service. If users are experiencing hindrances such as impractical features, bad aesthetics or if the responsiveness of the design fails to match the user's need in its context, the design will fail. ("What Is Interaction Design?," n.d.)

There is a lot of literature existing on interaction design. Some important literature for the topic are the "Designing Interactions" by Bill Moggridge who was said to have coined interaction design as a term together with Bill Verplank in the mid 1980s. Kevin Silver's "What puts the design in interaction design" and the websites of the Interaction Design Foundation who are publishing the most recent articles on the topic.

2.4 Research questions & hypothesis

This thesis is about re-modelling the structure and interaction design of an ecommerce website. The study involves exploring new possibilities of improving the user interaction design and the usability of an online store, which again leads to better user experience.

My hypothesis for this research is that: The re-modelling of an online store with the use of well thought out and innovative interaction design techniques will improve the usability and increase the overall user experience of the online store.

Based on this hypothesis, I've made up the following research questions:

RQ1: What new concepts can encourage inexperienced users to create a bookshelf successfully?

RQ2: How can context-awareness contribute to a better user experience in an online store?

RQ3: How can well thought out interaction design better assist the navigation for users of an online store?

RQ4: How can interaction design improve the usability within the user experience of a website?

Chapter 3: Human-centred design approach

3.1 Introduction to HCD (Human-centered Design)

The methodology applied in this thesis implements the Human-centred design process as per the international standard ISO 9241-210:2019, Ergonomics of human-system interaction - Part 210: Human-centered design process for interactive systems.

The human-centered design process has been followed strictly since the planning phase, and the process is particularly made for interactive systems, which fits very well with the type of research that is being conducted in this thesis.

The human-centered design process is made up of six phases where the goal is to design and develop a working solution that meets the requirements of the users. The six phases of HCD are the following:

1. **Planning the human-centered design process.**

2. **Understanding and specifying the context of use:** Identify the people who will use the product, what they will use it for, and under what conditions it will be used.

3. **Specifying the user requirements:** Identify any user goals or business requirements that must be met for the product to be successful.

4. **Producing design solutions:** Developing and designing the product.

5. **Evaluate the design:** Evaluate the product through usability testing and other evaluation methods with real users representing the target group of the project.

6. **Finished product, if evaluation proves that the product meets the requirements.**

When the product is ready for the fifth phase; evaluation, its next step is dependent on the results. The HCD process is iterative by nature: If the product does not meet the requirements of the users, it is sent back to the fourth phase; production, to be iterated before it gets evaluated again. Like this the production and evaluation stages are looped until the product meets the user requirements. The phases of HCD is visualized in figure 3.1.1
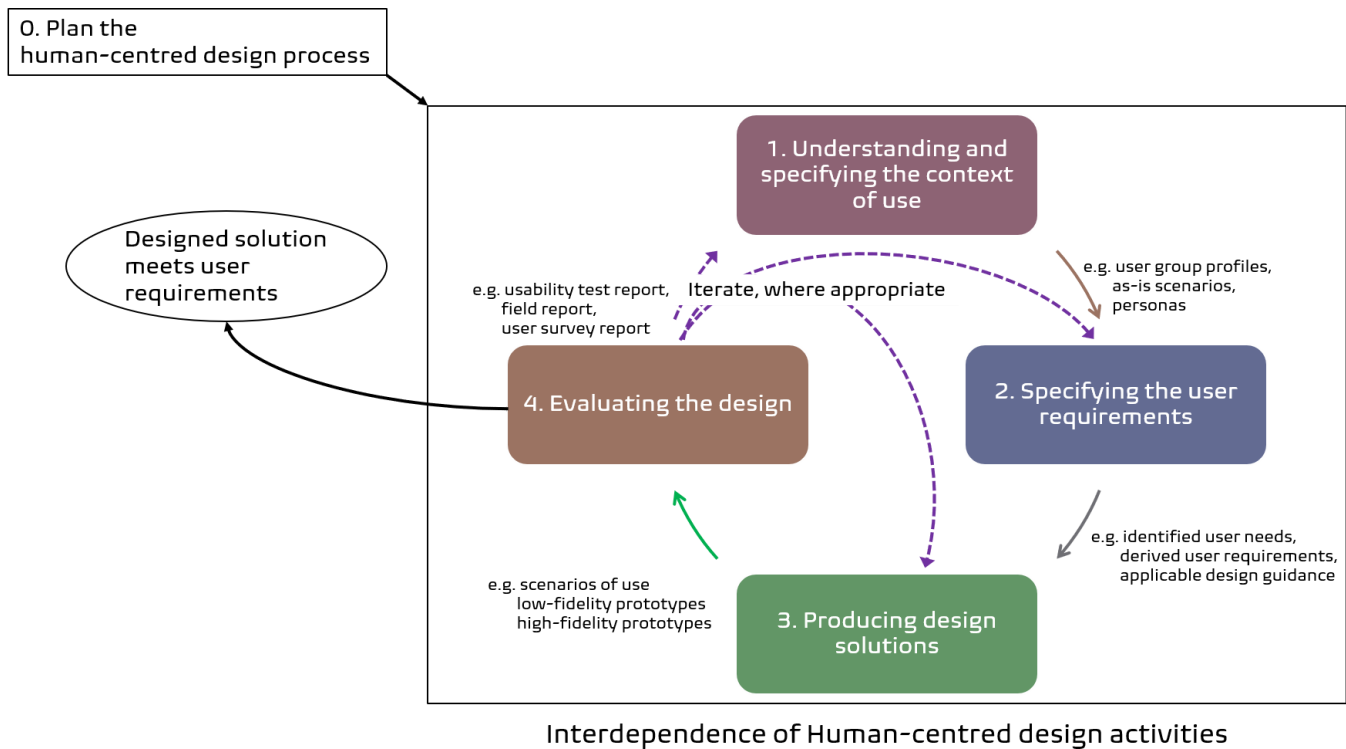
Figure 3.1.1: The interdependence of user centred design activities, adapted from NS-EN ISO 9241-210:2019, Ergonomics of human-system interaction - Part 210: Human-centered design process for interactive systems. Provided by (usabiliTEST, n.d.)

3.2 Understanding and specifying the context of use

To build the best possible product for BBB System, it is important to understand and specify the context of use. The context of use analysis was conducted at the very beginning of this thesis and its main goals are to ensure that all factors that can relate to the use of the system are identified before the production starts.

This context of use analysis involved the use of *People, Activities, Context, Technology (*PACT) framework, which presents the people who undertake activities in contexts using technologies. This type of analysis will give a brief overview on what stakeholders are involved, what they do, in what contexts and with what tools.

The information provided in this context of use analysis, has been collected through the project brief meeting with BBB System, an interview with a salesperson at BBB Systems, through observation and study of their previous website, and through google analytics data collection. The next subchapter will consist of this analysis:

3.2.1 People

This people chapter presents the stakeholders involved in this project, this includes users, employers, developers, suppliers, collaborators and competitors.

3.2.1.2 Stakeholders

There are a lot of stakeholders to bokhyller.no and they are identified in the following list:

Users
- Potential customers
- New Customers, with no experience of the BBB System
- Existing Customers, with knowledge of the BBB System, but no knowledge of the webstore.
- Existing Customers, with knowledge of the BBB System and the webstore.

BBB System employees
- Customer support
- Content managers
- Sales Team

The developers
- Web Master & Development team
- Marketing team

The suppliers
- Shops that are distributing the BBB System
- Factory that produces the BBB System

The collaborators
- Web System providers
    - Wordpress
    - Beaver Builder
    - WooCommerce
    - Flywheel Sites
- Analytical & Advertising systems
    - Google Marketing platform

The competitors
- Ikea.no
- bolia.com
- jysk.no
- mobelringen.no
- bohus.no
- skeidar.no

3.2.1.3 Stakeholder Groups

The users, which are potential customers, new customers, existing customers without any prior experience with the online store and existing customers with prior experience with the online store. The users are people who browse for, or intend to buy bookshelves and/or

bookshelf equipment. The typical user can be either male or female, the age can range between 18 and 90 years, and the demographics are mainly norwegian users.

The employees of BBB System which includes customer support, content managers, and the sales team. These are persons who range between 30 and 67 years of age, both female and males. Some might have experience with online stores and some may not.

The developers, which includes Mediabooster.no and their employers. The webmaster & development team and the marketing team. These stakeholders are the creators of the system and are very experienced with the online store. The developers are male, with an age range between 20 and 40, their demographic is norwegian.

The suppliers, which are the shops and stores distributing BBB System products, and the factory producing BBB System products. The age of these stakeholders can range between 20 and 67, they can be both male and female, and they can have a demographic from all over europe.

The collaborators, who are the companies providing us with analytical systems such as google marketing platform and web systems such as wordpress, beaver builder, woocommerce and Flywheel Sites.

The competitors, who are the organizations and companies that are selling the same types of services and products as BBB System. These companies are much larger companies with a much bigger customer base.

3.2.2 Activities

This activities chapter presents the expected goals and activities the stakeholders would perform. What are the user tasks, what activities are the stakeholders undertaking?

- **Users** wants to navigate the website based on different goals   .
  The different types of goals can be:
    - To find information about the product.
    - To find inspiration for their own bookshelves.
    - To find the company's contact information.
    - To buy a complete bookshelf, they build themselves.
    - To buy additional parts to an existing bookshelf

- **BBB System employees** would navigate the webstore:
    - To publish news and content.
    - To receive messages from Users using the Contact Form
    - To display the products for people in meetings and during a sale.

- **The developers** would navigate the webstore:
    - To perform development and design on the website
    - To gather marketing analytics

- **The suppliers** would navigate the webstore:

- To gather information about the product they are selling.
- To visualize the products for people during meetings or sales.

- **The collaborators** are the providers of the website's software and are organizational stakeholders that are required to keep the website up to date and running.

- **The competitors** want to create competition and potentially steal customers from the online store.

3.2.3 Context

This context chapter gives an overview of the context in which the stakeholders interact with the online store.

The activities listed in the previous subchapter will take place on the re-modelled version of the online store bokhyller.no. The website can be accessed from anywhere as long as the stakeholders have access to internet connection through either mobile network or wifi network. The different activities will take place in different types of scenarios based on the stakeholders and the technologies used to access the store.

3.2.4 Technologies

This technologies chapter presents what kind of technologies are being used to build the product, interact with it, and how information is being presented for the stakeholders

3.2.4.1 Input

The inputs from the users in the online store will come through the use of mouse, keyboard or fingertip interactions all depending on what type of output devices that are used.

3.2.4.2 Output

The online store will be available through the use of both mobile devices such as tablets or phones and personal computers such as laptops or desktops.

3.2.4.3 Communications

The form of communication between the online store and the users will be through the use of web-browsers such as google chrome, internet explorer, safari, opera, edge etc.

3.2.4.4 Content

The online store is built with Wordpress which is based on the programming languages: PHP, HTML, JavaScript and CSS. The content on the website will be visible through this websystem. Information will be provided to users through the website's textblocks, illustrations and videos.

3.3 System user requirements

The system user requirements are presented through the volere requirements specification template(Helen Sharp, Jennifer Preece, Yvonne Rogers, 2019). This template presents the requirements of a system in a structured manner and is intended for use as a basis for the requirements specifications in projects.

3.3.1 Project drivers

The purpose of the product, in this case the online store, is to efficiently advertise and sell bookshelf products by BBB System online. BBB System offers a unique product that is a fully modular bookshelf that users can build in several unique ways. In addition to this product, BBB System also offers accessories such as doors, shelves, drawers, and book supports. The motivation and goals for this project is to better the user experience and usability of the online store with the remodeling of the interaction design, increase the amount of conversions for BBB System, and reduce the amount of errors in orders.

3.3.2 Project constraints

There are a couple of constraints for this project that have to be considered. It is not possible to use other web tools than what exists on bokhyller.no today. This means that we are restricted to the use of Wordpress, Beaver Builder and WooCommerce as a foundation to build the new online store. The website is not going to involve advanced technologies such as AR or VR systems and 3D builders, this is due to costs and time restrictions.

3.3.3 Functional and Non-functional requirements

Functional requirements are requirements that are essential for the website to function as intended. An example is that an online store needs the functionality for ordering a product to be an online store. Non-functional requirements are requirements related to user experience, and not to the general structure of the online store.

In the case of bokhyller.no there are a lot of requirements that are needed in order for the store to function as intended. The most essential requirements have been listed in Appendix C, with the use of Volere requirement shells. Here are two examples on how these functional and non-functional requirement shells look like:

Requirement #4	Type: Functional requirement
Description: The online store is required to have the shopping cart page available to the users	
Rationale: To give users a way to edit their shopping cart.	
Source: Lars-Otto Bjerkeng	

Fit criterion:	
The shopping cart must be visible if a user has added an item to it.	
Customer Satisfaction: **5 extremely pleased**	**Customer Dissatisfaction:** **5 extremely displeased**
History: Defined 02.12.2021	

Requirement #10	**Type:** Non-functional requirement
Description: The online store is required to show all dealerships and suppliers of their products	
Rationale: To give users a way to find dealerships and suppliers that sell the products of BBB System.	
Source: Lars-Otto Bjerkeng	
Fit criterion: The stores must be pinned in a map, and the stores are required to be shown with name, address, phone number and email information.	
Customer Satisfaction: **3**	**Customer Dissatisfaction:** **1**
History: Defined 02.12.2021	

3.4 Design Solution of bokhyller.no

This chapter includes the whole process of work that has been performed to produce the re-modelled online store of bokhyller.no. The chapter is divided into several parts beginning with preparations and setups, then how the store functionality was added to the site, then the re-modelling of the interaction design, and in the end how visual design and information design was added. For the development of the online store it was important to always follow the elements of user experience design, beginning with the skeleton plane, working upwards towards the surface plane (referring to figure 2.2.2.2). The complete re-model of bokhyller.no can be found at https://bokhyller.flywheelstaging.com/, and the previous version can be found at https://bokhyller.no.

3.4.1 Preparations and setup

All websites are made up of the same basic elements, and they are all in need of a web host and a domain. Bokhyller.no was already hosted by Mediabooster.no, through a hosting service called Flywheel Sites. Flywheel Sites is a platform that allows companies to host a great number of websites, and they provide a system for developers to do back-end website management through their portal.

The first step of the preparations and setup was to backup the old website of bokhyller.no, so that all important files were safe, and that it would be possible to perform usability testing with the old website later in the project in case the re-modelled version was completed and got pushed out to live.

The next step was to export all the products from the previous store into a .csv file. This file is an export file that can be used to backup and save all the products and their attributes. This file will later be mentioned and imported to the new site in the next chapter; building the foundations of the online store.

3.4.2 Building the foundations of the online store

After all the data and information from the old store was backed up and saved, it was time to begin the process of setting up the foundation for the new website. The requirements chapter states that the website is required to use the systems that Mediabooster.no has provided; Wordpress, Beaver Builder and WooCommerce. Because of this, the automated wordpress installation feature of Flywheel Sites was used to create the foundation of the new website. After the install was completed, it was necessary to download and install the themes and plugins that bring the features to the website.

The "Beaver Builder" theme allows you to build the website in blocks containing different modules. This is very helpful for the efficiency and overall functionality of the website. Beaver builder includes pre-made modules that are completely changeable through php, css and javascript languages. The plugins required for the site was "Caldera forms" for contact forms, "Rankmath" for SEO, "Pods" for the use of custom post types, "FacetWP" for the sorting and filtration of products, "WooCommerce" for building the store, and "WooCommerce Klarna Checkout" for the payment system.

After adding all the plugins to the site, it was time to create the complete skeleton of the website, this included all the subpages and functionalities that were listed in the requirements specification. One wish from BBB System was for the new online store to include all functionality that already existed in the old store. This meant that it was necessary to create the following subpages:

- **A color guide page**, where users can find what colors and wood types that are available for the bookshelf modules. The final result for this subpage can be found at: http://bokhyller.flywheelstaging.com/fargekart/

- **An inspiration page**, including a picture gallery for users to see how others have built their bookshelves. The final result for this subpage can be found at: http://bokhyller.flywheelstaging.com/inspirasjon/

- **An about us page,** with information about the company including their history. The final result for this subpage can be found at: http://bokhyller.flywheelstaging.com/historien-om-bbbsystemet/

- **A dealerships page**, with a map and a list of all dealerships selling BBB System products. This was a complicated process, because the functionality was made so that BBB System are able to update the different dealerships through the control panel in wordpress. To enable this, it was necessary to create a custom post type for dealerships and connect it to a blog post display module that would list all the dealerships as if they were blog posts. The final result for this subpage can be found at: http://bokhyller.flywheelstaging.com/forhandlere

- **A contact Page,** with business information, contact information, customer support and a contact form. The final result for this subpage can be found at: http://bokhyller.flywheelstaging.com/kontakt/

In addition to creating these subpages, it was necessary to create a global header that included the logo and the navigation menu, and to create a global footer including a navigation menu, social media icons and business information.

With all the plugins installed and setup, it was time to add the store functionality.

3.4.3 Adding store functionality

The process of adding the functionality to the online store was both time consuming and a challenge. This was mainly due to the previous store having been built in a different approach. All the product data that was exported to a .csv file in chapter "3.3.1 Preparations and setup" needed a major update. All previous products were built in a way where it was one product, with the options of multiple colors and wood types. For the sorting and filtration of the new site to work, it was necessary to split the products. This meant that one product which had seven different colors and seven different wood types would turn into fourteen different products. These changes were implemented through the use of google spreadsheets, where it was possible to modify the .csv file.

When all products were split up and given their attributes it was time to import the .csv file to the new online store and fill it with the products. This was a success, and there were no significant problems with the products afterwards.

3.4.4 Re-modelling the interaction design

After identifying the problems of the previous website, three interaction design solutions have been developed that could improve the user experience of the re-modelled store. In

addition to the three, a solution was started, but it was not implemented due to time limits and lack of functionality.

The solution that was not implemented, was the idea to create a bookshelf builder. This would make it easier for users to create and order their unique bookshelves. After weeks of development, this showed to become a much harder task than first expected. Because of the time spent and because the functionality of the system did not fulfill the expectations of this feature, it was decided to scrap it.

The first solution to improve the interaction design was inspired by a feature often used by video games. In modern video games new users are often asked if they want to perform a tutorial when they enter the game for the first time, because games can have complex controls and gameplay. This can be compared to the complexity of the online store that is being re-built for BBB System, since building a bookshelf out of hundreds of different products is not easy.

The tutorial features in games are based on a theory called context awareness. Context awareness happens when a system, app or website decides an outcome or an action based on a user's context. In our case the context will be based on the user's previous experience with the online store, and here is how it is implemented.

When a user visits the online store, the user gets to choose between three buttons leading them to the store page. The three buttons represent three different experiences that the users might have with the system.

Figure 3.4.4.1: This is a screen print from the re-modelled online store showing the three buttons developed for users to choose their experience level.

The first button says "Recommended for new users, it is my first bookshelf". This button will lead the users to a shopping guide page where they will learn the very basics of the system and how they can build their own bookshelf in the store.

The second button says "Recommended for previous users, build a bookshelf". This button will lead the users straight to the store, and we assume that the users knows the basics of the system and how they can build their own bookshelf in the store.

The third button says "Recommended for previous users, buy accessories". This button will lead the users to the store page with accessories, and we assume that they know how to use the online store. (Illustrated in figure 3.4.4.1).

When using an interaction design like this, it is possible to provide the users with guidance based on their previous experience with the store. This will result in better user experience for all parts, since previous users will not need a guide and new users might need one.

The second solution, to improve the interaction design is to create an easier navigation for the users of the online store. One of the previously stated problems for bokhyller.no is that the navigation in the store is too complex, there is no way to filter products, and the categories are confusing. The solution to this problem has been to remodel the whole navigation, and information flow in the online store.

Every category has been carefully restructured and there have been added more categories and subcategories than before. These categories are now always displayed in a menu on the left side of the store, with an overall category title that indicates more precisely what products its categories involve. (See figure 3.4.4.2)
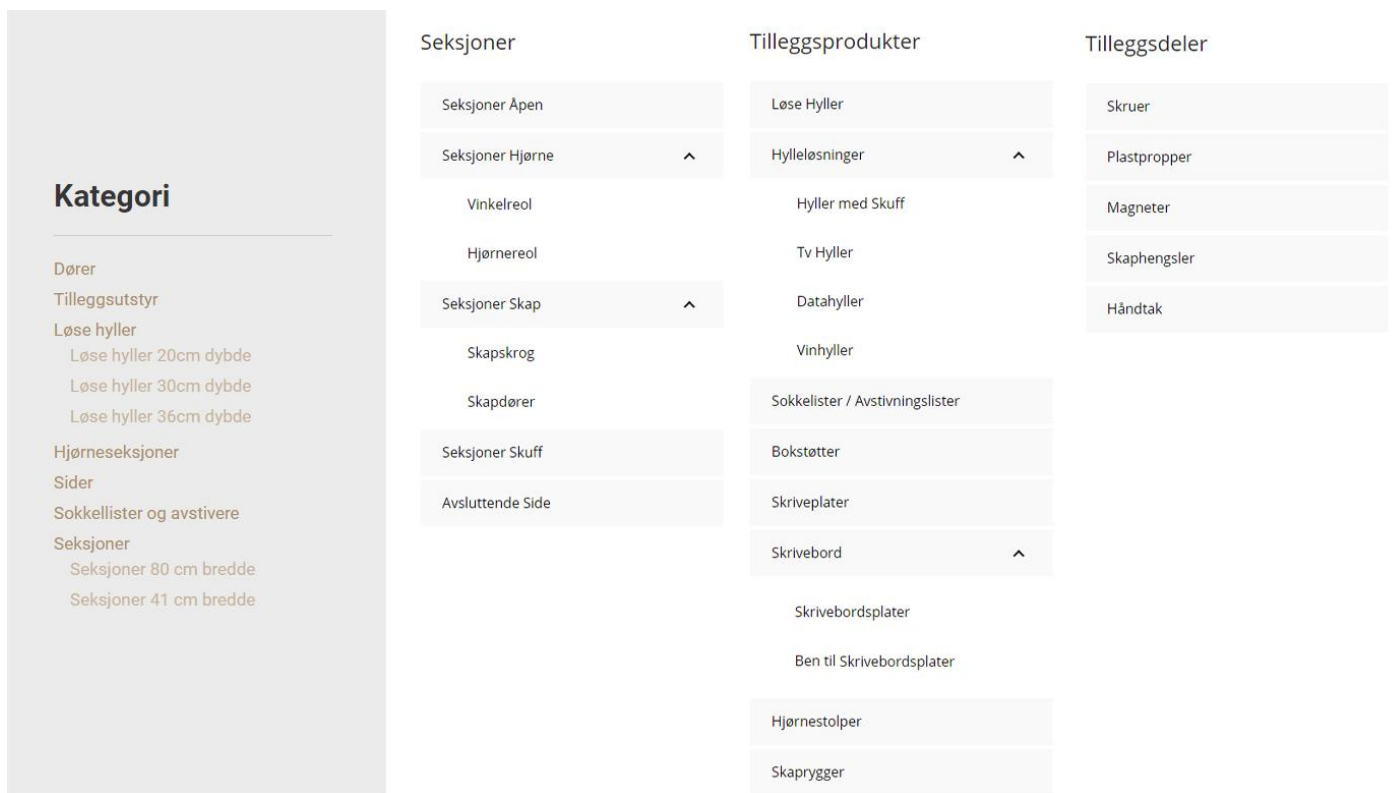
Figure 3.4.4.2: This figure illustrates the old categories on the left side and the new categories made on the right side. It is important to mention that the new categories are aligned underneath each other on the site, and are separated only to show the new structure.

There has been added a filtration feature that gives users the option to show and hide products in the store based on attributes they choose. This being wood type, colors, width, depth, and heights. This was done through the use of the plugin "FacetWP" and was made available when all the products were restructured earlier. (See figure 3.3.4.3)
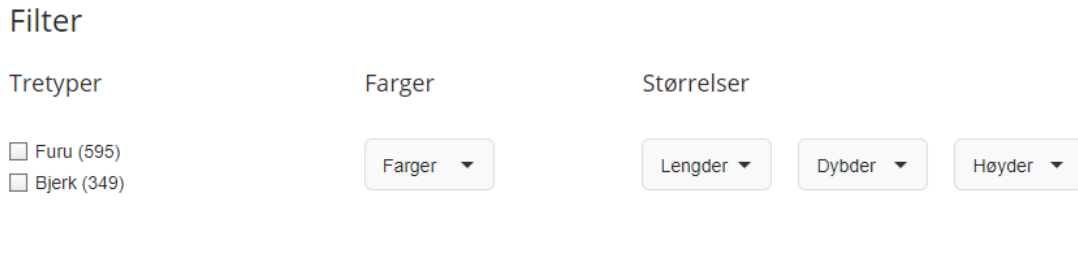
Figure 3.4.4.3: This figure illustrates the new filtration system that has been implemented in the improved interaction design. The old online store did not have any filtration at all.

There has been a complete redesign on how users navigate the products. Previously you would have to enter the single product page before adding the product to the shopping cart. This was necessary also because there were no attributes shown on the products in the overall shopping page. This is now fixed, by showing all attributes for each product on the overall shopping page, as well as an add to cart button. (See figure 3.4.4.4)
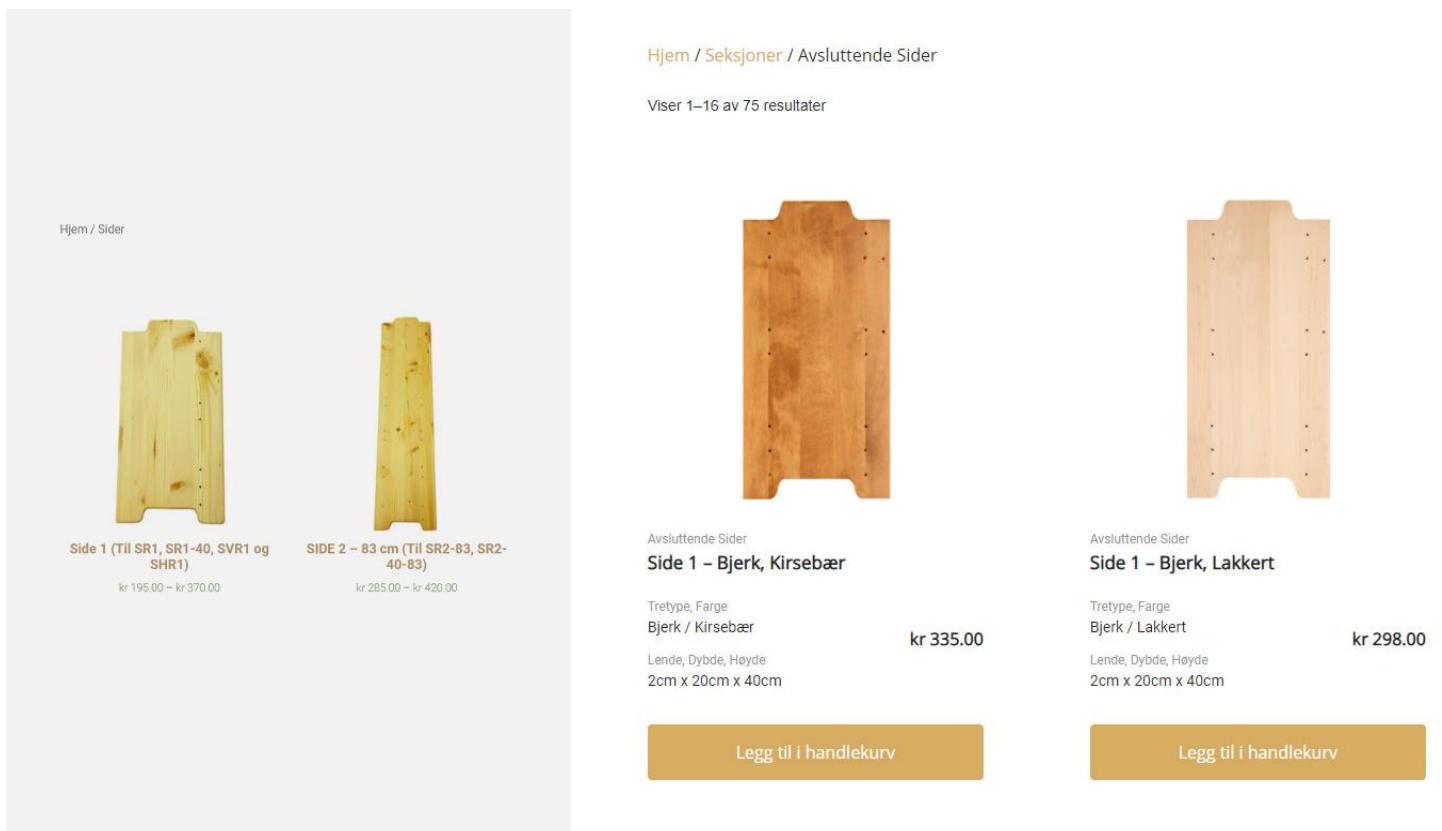
Figure 3.4.4.4: The figure on the right illustrates how the navigation of products are in the re-modelled online store in comparison to the old store on the left.

Previously the shopping cart button would only show on the page where you added a product to the cart, then it disappeared. This was very bad for the navigation of the site, because users wouldn't be able to find their shopping cart. The shopping cart is now available at all times when you have a product inside it, this was done by adding it to the menu through a plugin called "WooCommerce Menu Cart". (See figure 3.4.4.5)

Handleguide   Produkter ⌄   Fargekart   Inspirasjon   Historien om BBB   Forhandlere   Kontakt   🛒 kr 245.00

Figure 3.4.4.5: This figure illustrates how the shopping cart now is visible as long as you have products in the cart. The previous version of the store did not have this feature at all.

The third solution, to the improvement of the interaction design was to change the information flow of the website. Instead of having sections of long text and messy images, every page is now built one box at the time. A box consists now of one illustration, a short relevant text and a call to action button that leads you to a subsite or a different section with more detailed information about the topic. This solution makes the site easier to navigate, the information flow is much more consistent, understandable and easy to read. (See figure 3.4.4.6)

Tilpasning etter behov

BBB-Reolen er modulbasert, som betyr at den kan bygges direkte etter ditt behov. Den kan være så, høy, bred eller dyp du ønsker, du kan velge mellom 11 forskjellige farger og tretyper. I tillegg så finnes det flere titals tilleggsprodukter som bøkstøtter, skriverbord, vinhyller, skuffer og liknende. Hos BBB-Reoler er det kun fantasien som kan begrense oss!

Lær deg hvordan du bygger en bokhylle →

Figure 3.4.4.6: This figure illustrates how the information is now presented to users on the re-modelled online store.

3.4.5 Visual and Information Design

The visual and the information design are the two last layers to the elements of user experience. This is where all the finishing touches to the website are being designed and worked on. After implementing all the functionality on the website it was time to make a universal design for the website. One requirement from the requirements specification states that it is necessary to follow the design guide provided by BBB System.

3.5 User testing and Evaluation

To analyze the work that has been conducted in this thesis, it was necessary to gather data from volunteers through active user testing. The goal for the analysis is to research if the new version of the webstore has improved its usability, if it's easier to navigate and if users spend shorter time to find information and complete tasks such as buying a bookshelf. To do this, it would be necessary to perform user testing on both the old online store and the new online store, then compare the results.

3.5.1 Remote usability testing

It was planned to conduct the user testing for the webstore using the usability testing laboratory at the University of Agder in Grimstad. The usability testing lab at the university gives access to a professional test environment that you wouldn't find elsewhere. The lab is equipped with a lobby, a test room filled with camera and voice recording devices, and a control room that is used to gather information through these devices.

It was initially planned to do the user testing of bokhyller.no through this controlled environment, using both eye tracking and facial expression analysis technology.

Due to the rising numbers of Covid-19 cases in Norway this spring, most of the country was advised to keep distance, not travel and have as few physical contacts as possible. Given the situation with Covid it was necessary to cancel the planned user testing in the physical environments at the university and re-consider the test environment for the webstore.

The solution to the Covid-19 problem was to perform user testing through the use of remote usability testing("Remote Usability Tests: Moderated and Unmoderated", 2014). This meant that it would be possible to perform the same type of testing that was planned, but through digital platforms instead of physical.

3.5.2 A/B testing with System Usability Scale Questionnaire

To be able to gather the best data possible from the user test, it was decided to conduct an anonymous qualitative comparative usability test with the combination of A/B testing and the system usability scale (SUS) questionnaire("System usability scale (SUS)", 2013).

The A/B testing is conducted by creating a control website (old store) and a challenger website (new store), test these two, then measure and compare the results. The A/B testing performed included a pre-test questionnaire, an eye tracking and a behavioural analysis and two additional questionnaires using the system usability scale. The results of the A/B testing will provide data on how users interact with the two different online stores, what previous experience they have with online stores, and how the two sites score on the system usability scale.

The system usability scale is a measuring method that consists of a ten questions questionnaire with a five point likert scale response option, ranging from strongly agree to

strongly disagree. The results of the questionnaire will give us a score on the usability of the website, and if the score is above 68 it would be considered above average. For this test it will end up with one score for each website that can be compared to decide if the usability has been improved.

To get the most authentic data possible from the user testing it was necessary to split the test users into two different sample groups. One group would test the control website first then the challenger website, and the other group would test the challenger website then the control website. Neither the A/B testing nor the SUS testing requires a large sample size, so it was decided to recruit a sample of 10-20 candidates. The candidates were recruited through social media (see Appendix E) and all candidates that had shown interest were sent a detailed email with information about the user testing and the data collection(see Appendix F). Throughout the whole process it was very important to let the candidates know that they would have to use their webcam for eye tracking, that their data would be kept anonymous, and that they would be able to withdraw from the usertesting at any time.

Performing a user test like this requires a lot of coordination and to make it as efficient and user friendly as possible, a fully automated test environment was created. The user test environment was created using two types of online software, SurveyXact and iMotions online data collection.

The whole user test consists of 5 steps, and to allow the use of two sample groups in an automatic system it was necessary to create two versions of each questionnaire and user testing sites(See Table 3.5.2.1).

Sample group A	Sample group B
Pre-test questionnaire & information	Pre-test questionnaire & information
User testing of the **control** website including eye tracking and behavioural analysis	User testing of the **challenger** website including eye tracking and behavioural analysis
SUS Questionnaire	SUS Questionnaire
User testing of the **challenger** website including eye tracking and behavioural analysis	User testing of the **control** website including eye tracking and behavioural analysis
SUS Questionnaire & completion	SUS Questionnaire & completion

Table 3.5.2.1: This is an overview of the 5 steps that test users are going through in the user testing. Note that the control website is the "Old online store" and the challenger website is the "Re-modelled online store".

3.5.2.1 Pre-test questionnaire and introduction

When the candidates were ready to begin the user testing they were sent one out of two links taking them to either sample group A or sample group B. By clicking the link, users were

brought to the pre-test questionnaire at SurveyXact, where they found an introduction text about the user testing, some technical information, how the collected data is being processed, and a consent form (See Appendix G). During the whole process, users were given instructions on what to do provided by the information in the questionnaires. The pre test questionnaire involved demographics such as age and gender, as well as a few questions regarding previous experience with online stores.

3.5.3.2 User testing with eye tracking and behavioural analysis

When a user had completed the pre-test questionnaire, they would be automatically sent to the iMotions website, where the usertesting would be happening. When arriving at the user test website generated by iMotions, the users were introduced to the user tasks they would perform(see Appendix H).

The next step takes the users to an eye tracking calibration sequence that calibrates the program to track the eyes of the users in the best possible way. After the calibration the users are presented with the online store that is being tested, and which site depends on which sample group.

When the participants are performing the user testing, the iMotions software collects a screen recording and a video of the participants. These recordings can later be used for eye tracking and behavioural analysis.
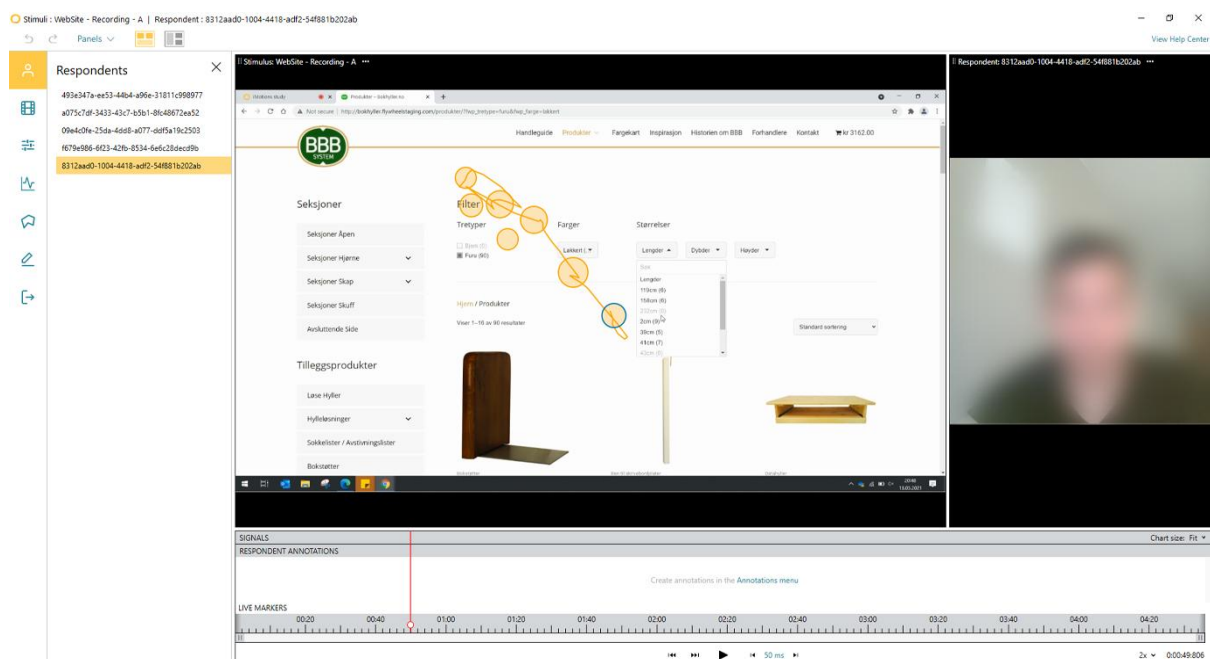

Figure 3.5.3.2.1: This figure is a print screen from a user test performed with eye tracking through imotions.com, in imotion's desktop program. In the figure you can also see how the eye tracking software adds marks to the screen recording where the test user is looking. The user has been blurred to keep his identity completely anonymous.

The whole setup of the eye tracking and behaviour analysis environment was created in the iMotion online data collection desktop program.This desktop program made it very easy to create a well organized and automatic test environment, and to gather data and analyze the testing later on.. The same program was later used to analyze the eye tracking data and screen recordings(see figure 3.5.3.2.1).

3.5.4.3 Post-test questionnaire with the system usability scale and completion

After exiting the website that the user testing had been performed on, test users are automatically sent to SurveyXact for a post-test questionnaire with the system usability scale questionnaire. Once this questionnaire is completed and the user presses next, the users are again automatically sent to the iMotions website where the second user testing is waiting. When this test is completed, the users are sent to a completion screen thanking them for their time.

Chapter 4: Results and discussions

4.1 Results: Sample Group A

The order of the websites in sample group A was first the control(Old) website, then the challenger(New) website. In this sample group there were four test users, two men and two women. Two of the test users were between the age of 18-24, one was between 25-34 and one was between 35-44.

4.1.1 Pre-test questionnaire results

The pre-test questionnaire results for sample group A(see Appendix I) show us that all the test users were relatively experienced with the use of online stores. Three test users said that they are shopping at least once a month using online stores, and one test user said once a week. For the amount of time the test users would spend on an online store, two test users answered 5-10 minutes, one answered 15-30 minutes and one answered 30-60 minutes. When asked what their price limit for buying products online was, one test user answered up to 5000, one answered up to 10000 and the two others answered with no limits.
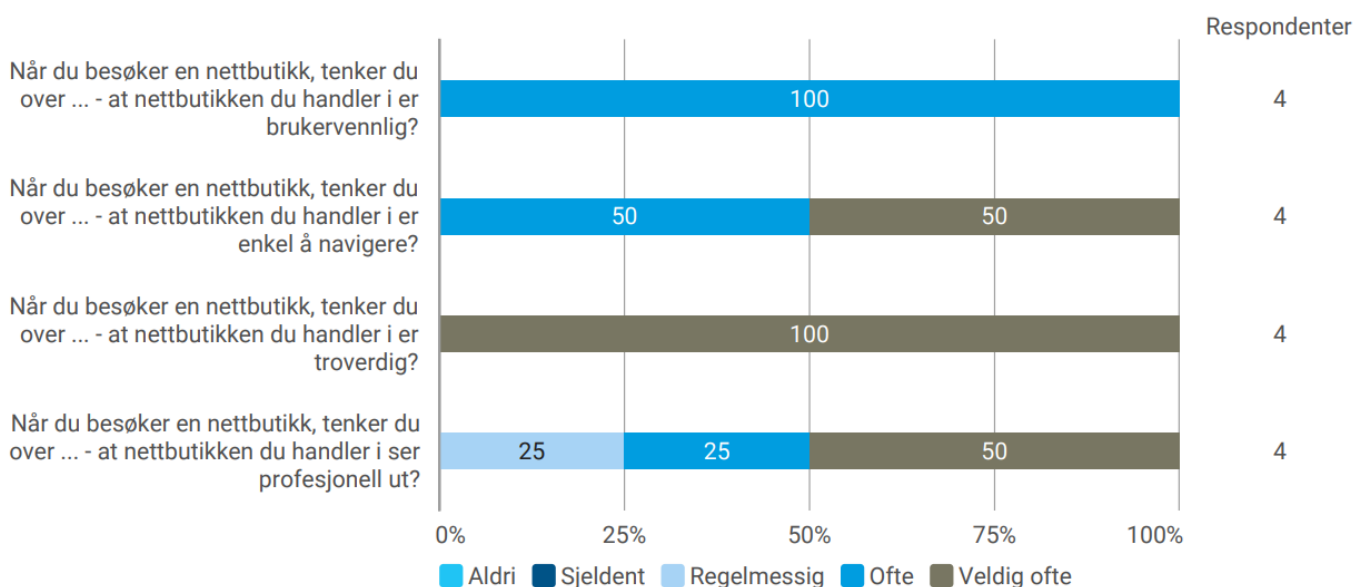
Figure 4.1.1.1: Results from the pre-test questionnaire in sample group A, about user experience awareness.

Some additional questions were asked to the participants regarding their user experience when they shop online(see figure 4.1.1.1).

4.1.2 System Usability Score

The system usability scale scores a website's usability based on the results of the questionnaire. The calculation of the system usability scale is quite complicated. Points (1-5) are given based on the user's answer on the likert scale. Strongly disagree gives 1 point, and strongly agree gives 5 points.

The questionnaire is built in a way that every odd number question is in a positive tone, and every even number questions are in a negative tone. All odd numbered questions need to be subtracted one point, and all even numbered questions need to start at five points and subtract the amount of points given by the answer.

By adding all points together you will create a score that is called the SUS Raw Score. After having produced the SUS Raw Score, you multiply it by 2.5 to create the final score. If this score is above 68, the website is proven to have good usability.

Here is an example of a spreadsheet formula to add points together:
((B2-1)+(5-C2)+(D2-1)+(5-E2)+(F2-1)+(5-G2)+(H2-1)+(5-I2)+(J2-1)+(5-K2))*2,5=score.

For the system usability scale conducted, these are the final scores for sample group A:

The average system usability **score of the control website was measured to be: 28,75.**

The average system usability **score of the challenger website was measured to be: 85.**

4.2 Results: Sample Group B

The order of the websites in sample group B was first the challenger(new) website, then the control(Old) website. In this sample group there were some problems for three out of the seven users who were performing the user testing. There were seven who completed the first questionnaire, but only 4 were able to complete the user testing. All of the test users were men, two of the test users were between 18 and 24 years, and the other two were between 25 and 34 years.

4.2.1 Pre-test questionnaire results

Unfortunately, because of the fallout of three test users undergoing the user testing, it was not possible to give completely accurate data about the respondents who ended up completing the testing in sample group B. Luckily, some of the collected data from the users who did not attend the full user testing can be used.

The pre-test questionnaire results for sample group B(see Appendix I) show us that most of the test users are experienced with online stores, there was one respondent that responded as inexperienced. Four test users said that they are shopping at least once a week using online stores, two test users said once a month and one test user said every second month. For the amount of time the test users would spend on an online store, one answered 5-10 minutes, four answered 15-30 minutes and two answered 30-60 minutes. When asked what their price limit for buying products online was, one candidate answered up to 10000, six test users answered with no limits.

Like sample group A, I asked sample group B some additional questions regarding their user experience awareness when shopping online(see figure 4.2.1.1).
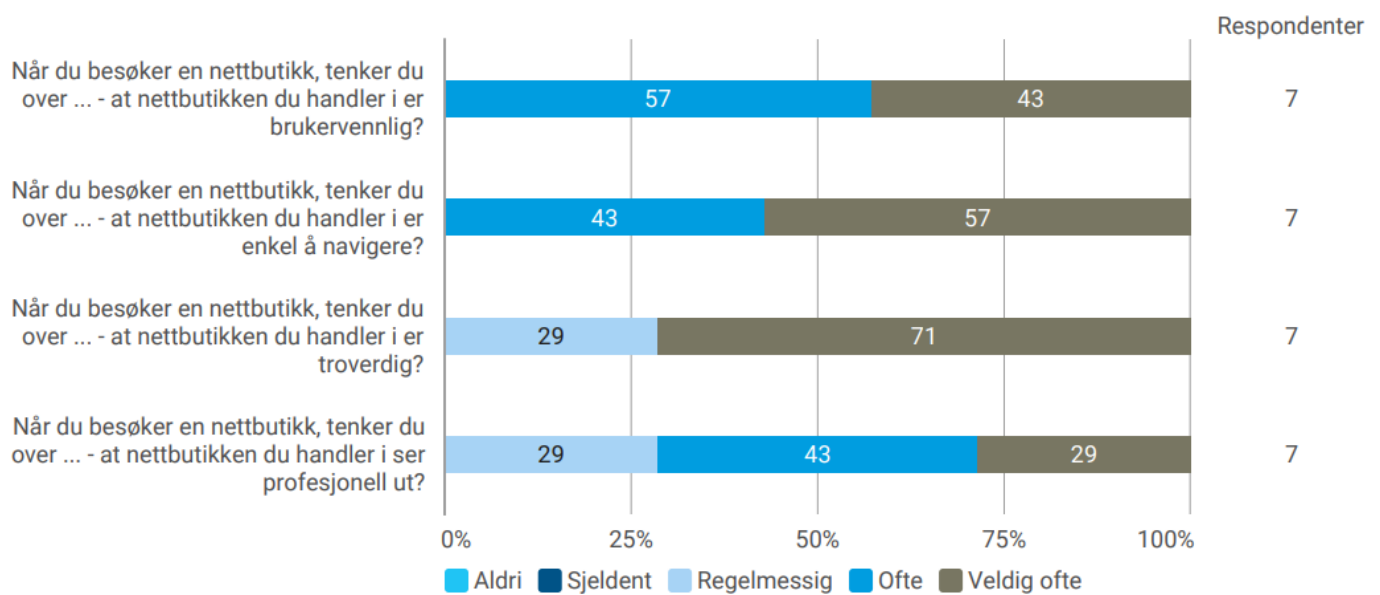
Figure 4.2.1.1: Results from the pre-test questionnaire in sample group B, about user experience awareness.

4.2.2 System Usability Score

These are the results from the system usability scale test of sample group B. The difference here is that the control website was shown after the challenger website. For a website to have good usability it is necessary to score above 68.

The average system usability **score of the control website was measured to be: 40.**

The average system usability **score of the challenger website was measured to be: 53,75.**

4.3 Eye tracking and behavioural analysis

The results from the eye tracking and behavioural observations were very promising. The eye tracking software worked as perfectly as intended and I was able to observe user behaviours

and collect data from 8 different test users. I used an Excel spreadsheet to assemble the data(see appendix I), and here are some statistics gathered from the observations and eye tracking.

Measurements	Control Website	Challenger website
Average time spent on given user tasks	07:35 minutes	09:46 minutes
Percentage of user tasks completed without mistakes	25%	50%
Percentage of users giving up before completing the user tasks	50%	0%
Percentage of users with mistakes in their orders	25%	25%
Percentage of users missing one product in their shopping cart	None	25%

Table 4.3.1: An overview of the results gathered from the eyetracking and behavioural analysis.

4.4 Discussion

In this discussion chapter I will be comparing the results from the two sample groups A and B, evaluate the authenticity of the test users, discuss the results of the system usability testing, and discuss the eyetracking and behavioural observations.

4.4.1 Evaluating the test users awareness about the user experience

In the two pre-test questionnaires I added a few questions to see if any of the test users had any previous experience with online shopping. After looking at the results it is clear that the users who have tested the system have got previous experience with browsing online stores. 82.8% of the test users claimed to be experienced with browsing websites, 45,5% of the test users have claimed to be shopping online at least once a week, and another 45,5% are shopping at least once a month. This is important to take into account, because experienced online shoppers will most likely have better knowledge and stronger opinions on how an online store should work which might result in a more authentic user testing.

I also asked the test users questions to see if they are aware of the quality of user experience of online stores while shopping online. If users tend to be aware of UX quality on websites then it can improve the authenticity of the testing even further. The questions asked were "When you visit an online store do you often think about:"

If the online store is user friendly?
72% of the 11 test users answered "Often" and the last 18% answered "Very often".

If the online store is easy to navigate?
54% of the 11 test users answered "Very often", while the other 46% answered "Often"

If the online store is trustworthy?
81,8% of the 11 test users answered "Very often" while the rest answered "Regularly"

If the online store is looking professional?
36,4% of the 11 test users answered "Very often", another 36,4% answered "Often" and the last 27.3% answered "Regularly"

These results tell us that the test users in this thesis do pay attention to various elements of user experience; user friendliness, interaction design, trustworthiness and visual design while interacting with online stores.

4.4.2 Usability evaluation

The system usability scale resulted in four different scores, one for each website in each sample group. The score indicates how good the usability of the website is, and if it is above 68 it is proven to be good. Both the control website and the challenger website were tested in the two sample groups A and B. Sample group A performed user testing on the control website before testing the challenger website and Sample group B did the opposite. The sample split was done so that the results would not depend on which store was shown first.

	Control website	Challenger website
Sample group A score:	28,75	85
Sample group B score:	40	53,74
Average score:	34,375	69,375

Table 4.3.2.1: Combined results of the usability test based on the system usability scale (SUS).

Having a look at the results, one could see a big difference to the scores given. The challenger website got a score of 85 when it was presented after the control website, and when it was presented before the control website it got a score of 53,75.

This is a large difference, and it can mean that the poor design of the control website made the test users biased to give the challenger website a much better score, because it felt much

easier to use. You can also look at it this way, when the challenger website was shown first in sample group B, it was easier to criticize it because the test users did not know the state of the control website.

This is a very interesting finding, and it shows why it was necessary to split the websites into two different sample groups. I would say that the result is much more authentic after adding the scores together to find the average score of each online store. The average score of the control website was 34,375 and the average score of the challenger website was 69,375. From these numbers we can see great results to the remodelling of the website. The measured usability of the website has increased by 101.8% and is now above the score of 68 which indicates that a website has good usability.

4.4.3 Eye tracking and behavioural observations

There were a lot of interesting observations to be made during the user testing of both the control website and the challenger website.

On the control website the average time spent on the user tasks were 07 minutes and 35 seconds, in comparison to the challenger website where the average time spent was 09 minutes and 46 seconds. You would think spending a shorter time is better, but 50% of the test users gave up during the control website testing. In addition it was observed that the users did nearly not spend any time reading the content of the online store. This is interesting because during the challenger website testing, every single test user spent time reading sections and learning about the products. Having every test user spend extra time reading content, makes the two minutes difference in time a very positive result. Overall the time per user task is reduced, and the test users spent the excess time learning about the products in the store. In addition to the reduced time spent on user tasks during the challenger testing, 50% of the test users completed all user tasks without any mistakes, and only 25% were missing one product in their shopping cart.

As well as these observations, it was noticed that the test users were actively using the new interaction design functionalities that was implemented on the challenger website:

- All test users were interacting with the product filter functionality
- All test users were using the shopping cart button.
- All test users were at least one time on the tutorial page.

The reduction of time spent and the use of the new functionalities shows that the remodelling of the structure and the user interaction design has definitely improved the usability of the online store.

4.5 Answers to the research questions

RQ1 and RQ2: What new concepts can encourage inexperienced users to create a bookshelf successfully, and how can context-awareness contribute to a better user experience in an online store?

Context awareness gives us the opportunity to design features that adapt to the users based on their desired context. This can for instance be done by letting users choose a path on a website based on their previous experience.

In this thesis I've used context awareness and interaction design to design a solution that gives inexperienced users an option to undergo a small tutorial on how to build a bookshelf and on how to use the online store in the best possible way.

All visitors to the online store are given three alternatives on arrival, where they can choose a path on the website based on their previous experience with the store. This functionality has been proven to be a popular feature through user testing and observations.

RQ3: How can well thought out interface design better assist the navigation for users of an online store?

This is how the inventor of the term "user experience", Don Norman explains what user experience is: "User experience is everything that touches upon your experience with the product, and it may not even be near that product. It may be when you tell somebody else about it."(NNgroup, 2016)

The results and findings from the user testing, have given us a clear indication that the navigation for the users have improved a lot in comparison to the control website. The time spent to complete tasks on the website went down a significant amount after adding interaction design functionalities such as the product filtration and shopping tutorial as well as the full re-structure of the product categories and attributes.

In addition, I've had some great feedback on the topic from some of the test users during the usertesting:

"Definitely prefer to have these category tabs for product selection, versus having to find the exact version in the store." - Test user, 2021

"Using the shopping guide was very helpful and will work very well for new users." - Test user, 2021

"Really liked that a guide was implemented on how to order bookshelves and accessories" - Test user, 2021

RQ4: How can interaction design improve the usability within the user experience of a website?

The project aimed "to create products that enable the user to achieve their objective(s) in the best way possible".("What Is Interaction Design?," n.d.)

The measured usability of the website has increased by 101.8% and is now above the score of 68 which indicates that a website has good usability. The re-modelled online store thereby doubled its usability score.

The time spent to buy a bookshelf has been reduced significantly, and the overall navigation of the online store improved.

With a brand new information design, it is now easier for the users to find the information they need about the products, and it has been shown through observations that users spend more time engaging with the text content on the website.

Chapter 5: Conclusion and future work

In this master thesis I have re-modelled the structure and the interaction design for the online store bokhyller.no. I have analyzed existing theories on the field of e-commerce, user experience, and interaction design. I have performed a full scale project following all the steps of the Human-centered design process, and I have conducted remote user testing with the use of A/B testing, the System Usability Scale (SUS) and eye tracking technologies including 8 test users that have helped me find answers to my research questions and hypothesis.

5.1 Main contributions

The results and findings of this thesis support the hypothesis: The re-modelling of an online store with the use of well thought out and innovative interaction design techniques improved the usability and increased the overall user experience of the online store.

The re-modelled online store doubled its usability score based on user testing and calculations using the System Usability Scale (SUS). The time spent to buy a bookshelf has been reduced significantly, and the overall navigation of the online store improved, with the implementation of the new interaction design functionality in the re-modelled online store.

With a brand new information design, it is now easier for the users to find the information they need about the products, and it has been shown through observations that users spend more time engaging with the text content on the website.

5.2 Limitations

This work was carried out during COVID-19 pandemic, which presented a big challenge to working closely with the website's stakeholders. For instance, access to test participants was very limited, and hence it was challenging to undertake user-based testing as one of the key human-centred design activities.

The publication of the final product was unfortunately put on hold for the time being, due to missing content and product updates that were required from BBB Systems, who will be planning to release the new online store once they have this sorted.

5.3 Future directions

There are a lot of possibilities for future research on the topics visited in this thesis. The old version of bokhyller.no has been collecting user data through google analytics and google tag manager for a long time, and all of this data is available and ready to use. Unfortunately it was not possible to publish the newest version of the website in time, to collect new and comparable data for the thesis.

In the year to come, there will be a lot of interesting, new data on the rebuilt online store. This data can be used for research on how the improvement of interaction design and usability can result in more conversions and sales for an e-commerce website. This data can also further prove that the changes made in this thesis have had a positive impact on the interaction design, the usability and the total user experience of bokhyller.no.

A futuristic vision on new possible features could allow customers, to use augmented reality or virtual reality to build bookshelves piece by piece directly in their living rooms, to use AI enabled chatbots for customer support, to use automated systems that can trace if a mistaken order has been made, and to use speech recognition and AI enabled chat bots to interactively create 3D animated bookshelves inspired by experiences from thousands of customers.

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Appendix A

Context of use analysis for Bokhyller.no

This context of use analysis will be conducted using PACT, which stands for people who undertake activities in contexts using technologies. This analysis will create a brief overview showing what people and businesses are involved in the project, what they do, what context and with what types of tools. The information provided in this context of use analysis, has been collected through the project brief meeting with BBB System, an interview with a salesperson at BBB Systems, through observation and study of their previous website, and through google analytics data collection.

1.0 People

The people chapter presents the stakeholders involved in this project, this includes users, employers, developers, suppliers, collaborators and competitors.

1.1 Stakeholders

There are a lot of stakeholders to bokhyller.no and they are identified in the following list:

Users
- Potential customers
- New Customers, with no experience of the BBB System
- Existing Customers, with knowledge of the BBB System, but no knowledge of the webstore.
- Existing Customers, with knowledge of the BBB System and the webstore.

BBB System employees
- Customer support
- Content managers
- Sales Team

The developers
- Web Master & Development team
- Marketing team

The suppliers
- Shops that are distributing the BBB System
- Factory that produces the BBB System

The collaborators

- Web System providers
    - Wordpress
    - Beaver Builder
    - WooCommerce
    - Flywheel Sites
- Analytical & Advertising systems
    - Google Marketing platform

The competitors
- Ikea.no
- bolia.com
- jysk.no
- mobelringen.no
- bohus.no
- skeidar.no

1.2 Stakeholder Groups

The users, which are potential customers, new customers, existing customers without any prior experience with the online store and existing customers with prior experience with the online store. The users are people who browse for, or intend to buy bookshelves and/or bookshelf equipment. The typical user can be either male or female, the age can range between 18 and 90 years, and the demographics are mainly norwegian users.

The employees of BBB System which includes customer support, content managers, and the sales team. These are persons who range between 30 and 67 years of age, both female and males. Some might have experience with online stores and some may not.

The developers, which includes Mediabooster.no and their employers. The webmaster & development team and the marketing team. These stakeholders are the creators of the system and are very experienced with the online store. The developers are male, with an age range between 20 and 40, their demography is norwegian.

The suppliers, which are the shops and stores distributing BBB System products, and the factory producing BBB System products. The age of these stakeholders can range between 20 and 67, they can be both male and female, and they can have a demography from all over europe.

The collaborators, who are the companies providing us with analytical systems such as google marketing platform and web systems such as wordpress, beaver builder, woocommerce and Flywheel Sites.

The competitors, who are the organizations and companies that are selling the same types of services and products as BBB System. These companies are much larger companies with a much bigger customer base.

2.0 Activities

What are the user tasks, what activities are the stakeholders undertaking?

- **Users** wants to navigate the website based on different goals .
  The different types of goals can be:
    - To find information about the product.
    - To find inspiration for their own bookshelves.
    - To find the company's contact information.
    - To buy a complete bookshelf, they build themselves.
    - To buy additional parts to an existing bookshelf

- **BBB System employees** would navigate the webstore:
    - To publish news and content.
    - To receive messages from Users using the Contact Form
    - To display the products for people in meetings and during a sale.

- **The developers** would navigate the webstore:
    - To perform development and design on the website
    - To gather marketing analytics

- **The suppliers** would navigate the webstore:
    - To gather information about the product they are selling.
    - To visualize the products for people during meetings or sales.

- **The collaborators** are the providers of the website's software and are organizational stakeholders that are required to keep the website up to date and running.

- **The competitors** want to create competition and potentially steal customers from the online store.

3.0 Context

These activities will take place on the rebuild of the online store bokhyller.no. The website can be accessed from anywhere as long as the stakeholders have access to internet connection through either mobile network or wifi network. The different activities will take place in different types of scenarios based on the stakeholders and the technologies used to access the store.

4.0 Technologies

4.1 Input

The inputs from the users in the online store will come through the use of mouse, keyboard or fingertip interactions all depending on what type of output devices that are used.

4.2 Output

The online store will be available through the use of both mobile devices such as tablets or phones and personal computers such as laptops or desktops.

4.3 Communications

The form of communication between the online store and the users will be through the use of web-browsers such as google chrome, internet explorer, safari, opera, edge etc.

4.4 Content

The online store is built with Wordpress which is based on the programming languages: PHP, HTML, JavaScript and CSS. The content on the website will be visible through this websystem. Information will be provided to users through the website's textblocks, illustrations and videos.

Appendix B

Interview with a salesperson at BBB System

How long have you been working for BBB and selling bookshelves?

Det er svært lenge da. Det går tilbake til 90-tallet.

Da har du vært igjennom en hel mengde salg da?

Ja, ja, har det. På godt og vondt.

Når en kunde kommer til deg og skal kjøpe en bokhylle. Hva spør de etter?

Det er veldig forskjellig. Vi har nokså ulike salg. I det at systemet har vært på salg siden 1953, så er det veldig mange grupperinger som har systemet fra før av. Enten fordi de har kjøpt det tidligere, eller fordi de har arvet det. Det er et ganske stort bruktsalg av dette. Om man går på finn er det masse gamle bbb-reoler der. Vi har solgt 2,5m enheter, ikke løse hyller men seksjoner. Løse pakker. Ekstremt mye som har vært solgt opp igjennom årene. Det er veldig mange som kjenner til det fra før av. Etter at folk har flyttet kan det være at de spør om en endring eller påbygging av allerede eksisterende system som de eier. For dette systemet er et skjøtesystem, med diverse skjøte reoler som du kan skjøte på i både høyder og bredder. Det er en del gamle kunder da som du skjønner, også er det den ene gruppen som starter fra bunnen av. I hovedsak skal folk ha bøker i det her, og da blir det å måle opp slik at de får fylt hyllene.

Er kundene usikre, eller bestemt på hva de skal ha?

Det blir ofte ganske lange samtaler da. Det er ganske vanlig å ha 30-45 min samtaler, for det blir fort en del penger og sånt da. Men det varierer veldig da. Noen vil ha det montert, men de aller fleste klarer å montere dette selv.

Hva er typiske ting kunden trenger hjelp med?

Det er jo systemets dimensjoner, at det er 3 forskjellige dybder. Dette er tøft å lese for de, og typisk hvor mange hyller man skal ha i høyden og.. Men det er ikke akkurat rocket science dette her. Det er no noen typiske gjengangere hvor folk spør hvilke dører passer til hvilke dybder og sånt.

Hvilke produkter er mest etterspurt?

Det er nok den pakken SR-2 pakken. (Skjøte reol 2 pakken). Eller ihvertfall den dybden med ulike høyder.

Hvilken informasjon om produktet er det du som selger mener er mest viktig å få frem når du selger?

Det er jo flere ting som er ganske relevante. Det ene er at det er veldig holdbart.Vi har ukentlig kunder med systemer som er over 40+ år gamle da. Det holder veldig lenge, og omsettes ofte brukt og sånt. Det er heltre, så veldig miljøvennlig (inn i tiden). De kan bygges i alle mulige varianter. Man kan tilpasse det ganske bra, i store grader skreddersydd uten å betale like mye som et plassbygd system. Et plassbygd system er fort en 10'000kr på en meter bredde og høyde. Vi føler at det vi leverer ikke blir så ille, selv om det blir ett par ti tusener så blir det sjeldent et sekssifret beløp. Så vi ligger relativt rimelig. Vi har jo Ikea, men de er vesentlig lite tilpasselig i forhold til oss. Vi ligger i et slags mellomsteg når det gjelder tilpasning og pris.

Har du fått tilbakemeldinger fra kunder om deres nåværende nettbutikk?

Ja, det er jo ofte slik at når det gjelder netthandler så er det ikke så mange tilbakemeldinger men heller at salget går opp eller ned ettersom du gjør endringer. Det er veldig få direkte konkrete tilbakemeldinger om at noe var fint eller håpløst. De misfornøyde kunder forsvinner bare til en konkurrenter. Alternativt da, når det er så få konkurrenter så gir de ofte bare opp også. Det som er en klar reaksjon på den gamle siden er at det er vanskelig, og ting er vanskelig å finne ut av. Dette er jeg ganske enig i. Så er spørsmålet om man kan lage dette slik at man kan kjøpe det uten at kunden tar en telefon eller direkte kontakt. Dette er jo mulig, siden vi får inn bestiller via den gamle nettbutikken, men samtidig er det jo en del som gjør feil da.

Så vi tar nesten alltid kontakt med kunder da, om vi ser det er en stor bestilling eller om vi ser det er noen potensielle feil. Dette kan være forskjellige fargekombinasjoner eller tretyper. Folk bestiller ting som ser veldig greit ut, men mangler sider f.eks. også tar vi kontakt med dem også er det galt da. Veldig mange produkter selges feil, og vi har pakker hvor det kun er én side da, så man må kjøpe ekstra osv. Så det er sånne ting. Så står det ikke så veldig klart på

nettet at ting kan tilpasses, dette må man også avtale over telefon. Det er jo skummelt for folk å bestille et femsifret beløp uten å ta en telefon.

Må man lære folk å komme seg dit?

Vi må vise at det ikke er så vanskelig og sånt.

Det koster mye penger, det er mange kombinasjoner. Folk vet ikke hvordan de skal gå frem for å komme seg til sitt mål da. Det er hvertfall veldig mange av våre forhandlere som har problemer med å hjelpe kunder fordi de ikke forstår systemet.

Hvordan ville du gått frem med å bygge en bokhylle, om du skulle bygd en selv?

Det er jo som sagt ikke rocket science. Det er jo en bredde og en høyde. Det kan være en del ulike høyder bortover veggen. Vi har begynt med en del hjemmebesøk, fordi det er folk som ikke får det til, å måle riktige høyder og bredder og sånt. Ofte kan det være kronglete med lister i tak og gulv. Det er jo også typer bøker da. Noen har store bøker og noen har små bøker. Oftere blir det litt dypere og høyere hyller nederst. Hvis det bare er bøker, så kan det være en del variasjon med antall hyller og sånt. Mange vil ha mer luft. Noen har veldig spesifikke mål, jeg må ha 27cm hyller f.eks. Ofte så vil det være sånn at om en skal fylle en vegg så går det ikke perfekt opp i de målene vi tilbyr. Så da blir det ofte kapping og tilpassing av hyller. Men alt i alt er jo dette ganske enkelt prinsipielt.

Hadde de hjulpet å ha en monteringsanvisning tilgjengelig på nettsiden?

Ja helt klart. Vi har jo snakket om det at vi skulle ha en liggende på produktene. Den er nødt til å vises, men er relativt dårlig da. Man burde kanskje hatt en monteringsvideo av en klassisk SR-reol da. Det ville hjulpet veldig. Skuffer er noe som vi ikke kan selge uten å ta montering over telefon, for bruksanvisningen er dårlig og produktets oppbygging er håpløs. Skuffer og skuffeseksjoner er helt forferdelig.

Appendix C

Functional requirements for the online store

Requirement #1	Type: Functional requirement
Description: The online store is required to have the following product filtering: Color, Wood type, Height, Width, Depth	
Rationale: To give users an easier way to find the products they are looking for.	

Source:	
Lars-Otto Bjerkeng	

Fit criterion:	
The filtration should hide products that do not fit the criterias of the filtration.	

Customer Satisfaction:	**Customer Dissatisfaction:**
5 extremely pleased	**5 extremely displeased**

History:	
Defined 02.12.2021	

Requirement #2	**Type:** Functional requirement

Description:	
The online store is required to have sorting for products.	

Rationale:	
To give users an easier way to find the products they are looking for.	

Source:	
Lars-Otto Bjerkeng	

Fit criterion:	
The sorting of products shall include price, popularity and name sorting.	

Customer Satisfaction:	**Customer Dissatisfaction:**
3 pleased	**5 extremely displeased**

History:	
Defined 02.12.2021	

Requirement #3	**Type:** Functional requirement

Description:	
The online store have to divide its products in to categories	

Rationale:	
To give users an easier way to find the products they are looking for.	

Source:	
Lars-Otto Bjerkeng	

Fit criterion:	

Products are to be categorized in a menu with meaningful categories and subcategories to sort products.	
Customer Satisfaction: **5 extremely pleased**	**Customer Dissatisfaction:** **5 extremely displeased**
History: Defined 02.12.2021	

Requirement #4	**Type:** Functional requirement
Description: The online store is required to have the shopping cart page available to the users	
Rationale: To give users a way to edit their shopping cart.	
Source: Lars-Otto Bjerkeng	
Fit criterion: The shopping cart must be visible if a user have added an item to it.	
Customer Satisfaction: **5 extremely pleased**	**Customer Dissatisfaction:** **5 extremely displeased**
History: Defined 02.12.2021	

Requirement #5	**Type:** Functional requirement
Description: The shopping cart page must allow users to remove items from their cart	
Rationale: To give users a way to undo their mistakes	
Source: Lars-Otto Bjerkeng	
Fit criterion: The remove item button shall give users a way to remove mistaken items from their	

shopping cart.	
Customer Satisfaction: **4**	**Customer Dissatisfaction:** **4**
History: Defined 02.12.2021	

Requirement #6	**Type:** Functional requirement
Description: The online store is required to have an add to cart button	
Rationale: To give users a way to add items to their shopping cart, this is essential for the online store to work.	
Source: Lars-Otto Bjerkeng	
Fit criterion: The add item button shall save the users choice of product to the shopping cart.	
Customer Satisfaction: **5 extremely pleased**	**Customer Dissatisfaction:** **5 extremely displeased**
History: Defined 02.12.2021	

Requirement #7	**Type:** Functional requirement
Description: Product attributes	
Rationale: To give users an indication on how the product looks, fits and measures.	
Source: Lars-Otto Bjerkeng	
Fit criterion:	

All products are required to have an image, measurements in depth, height and width, a color, a woodtype and a category it fits in.	
Customer Satisfaction: **5 extremely pleased**	**Customer Dissatisfaction:** **5 extremely displeased**
History: Defined 02.12.2021	

Requirement #8	**Type:** Functional requirement
Description: The online store is required to be responsive on all devices	
Rationale: To allow users to use whatever device they want while shopping.	
Source: Lars-Otto Bjerkeng	
Fit criterion: The website has to be functional on mobile phones, tablets and desktops.	
Customer Satisfaction: **5 extremely pleased**	**Customer Dissatisfaction:** **5 extremely displeased**
History: Defined 02.12.2021	

Appendix D

Non-functional requirements for the online store

Requirement #10	**Type:** Non-functional requirement
Description:	

The online store is required to show all dealerships and suppliers of their products
Rationale: To give users a way to find dealerships and suppliers that sell the products of BBB System.
Source: Lars-Otto Bjerkeng
Fit criterion: The stores must be pinned in a map, and the stores are required to be shown with name, address, phone number and email information.

Customer Satisfaction: 3	**Customer Dissatisfaction:** 1

History: Defined 02.12.2021	

Requirement #11	**Type:** Non-functional requirement
Description: The online store is required to provide their users with contact information for customer service.	
Rationale: To give users a way to contact BBB System if they have made mistakes in orders.	
Source: Lars-Otto Bjerkeng	
Fit criterion: A way to find customer support must be available and visible on all pages.	

Customer Satisfaction: 4	**Customer Dissatisfaction:** 1

History: Defined 02.12.2021	

Requirement #12	**Type:** Non-functional requirement
Description: The online store is required to provide their users with realistic projections of their products.	
Rationale: To give users a way to see how the products they buy look like.	

Source:
Lars-Otto Bjerkeng

Fit criterion:
All products are required to have images, there must be a way for users to see the different colors and wood types, and there must be a way for users to see finished products in normal environments.

Customer Satisfaction:	Customer Dissatisfaction:
2	2

History:
Defined 02.12.2021

Requirement #13	Type: Functional requirement

Description:
The online store is required to have a shopping guide for new users.

Rationale:
To give users an introduction to the product, how it works, how it assembles and how sections are combined.

Source:
Lars-Otto Bjerkeng

Fit criterion:
The users shall be introduced to measurements, product types and colors, what pieces fit together in what way, and an overview of accessories.

Customer Satisfaction:	Customer Dissatisfaction:
4	2

History:
Defined 02.12.2021

Appendix E

Social Media post for recruiting test users

Hei!

Jeg er på utkikk etter et par personer som kan hjelpe meg med brukertesting til min masteroppgave i multimedia and education technology neste uke. Undersøkelsen krever personer som er villige til å sette av 45 - 60 minutter for å teste to nettbutikker.

På grunn av dagens Korona situasjon, har jeg ikke mulighet til å gjennomføre tradisjonell brukertesting og innsamling av data. Derfor vil denne brukertestingen skje 100% remote over nettet. Siden undersøkelse skjer helt og holdent over nettet, så er det ingen begrensning på hvilket tidspunkt testingen må foregå og den kan tilpasses din timeplan.

Testingen kommer til å inneholde en pre-test spørreundersøkelse, tre oppgaver som skal løse på de to nettbutikkene, og en post-test spørreundersøkelse.

Er du interessert i å hjelpe meg med min oppgave, send meg en PM så kan jeg gi mer informasjon og avtale et tidspunkt.

Appendix F

Information email to test candidates

Hei, og tusen takk for at du har meldt deg som interessert til å bli med på min brukertesting.

Jeg skal utføre en brukertesting av en nettbutikk som består av to versjoner (A og B). Som testperson er det ønskelig at du gjennomfører tre oppgaver på hver nettbutikk. Disse oppgavene kan være å finne frem til informasjon på nettsiden, eller å kjøpe et produkt. (Disse blir mottatt underveis i testingen)

Undersøkelsen består av 4 deler.

- En pre-test spørreundersøkelse
- Oppgaver på nettbutikk A

- Oppgaver på nettbutikk B

- En post-test spørreundersøkelse

I brukertestingen ønsker jeg å bruke "Eye tracking" og "Facial Expressions" til å samle data om hvordan brukeren opplever og observerer de to nettbutikkene. Jeg vil da kunne se hvilke elementer som tiltrekker seg oppmerksomhet og hvordan brukeren navigerer seg på sidene.

Dette krever at du som brukertester har et webkamera tilgjengelig og er villig til å bruke dette under testingen sammen med screensharing.

Dataen som blir hentet opp av webkameraet blir sendt til meg igjennom en programvare som heter "iMotions online data collection". Dette programmet leser hvor øynene dine beveger seg og gir meg en oversikt over hvor du ser på de to nettbutikkene. Du blir bedt underveis om å skru på webkameraet og du får beskjed når webkameraet er slått av, og det vil kun være på når du løser oppgavene du er blitt gitt.

Jeg vet at dette kan være ubehagelig for enkelte, og derfor er jeg nødt til å informere om dette på forhånd. Om det ikke er ønskelig å bruke webkamera til "Eye tracking" så er dette helt okei, men da kan jeg dessverre ikke bruke deg i testingen.

Viktig informasjon om databehandling:

Alt av data som blir samlet inn i løpet av undersøkelsen er anonym data og vil ikke bli knyttet opp mot noen form for personlig informasjon (Dette gjelder både spørreundersøkelser og brukertesting). Alt av data som er samlet opp av webkameraet underveis vil bli slettet for godt så fort dataene er analysert og gjort om til tall. Den eneste som har tilgang til dataene er meg, og de vil kun bli brukt i denne masteroppgaven i anonymisert form.

Om du fortsatt er interessert i å hjelpe meg, kan vi nå avtale et tidspunkt i din kalender hvor vi setter av en time til brukertestingen.

Med vennlig hilsen,
Lars-Otto Bjerkeng

Appendix G

Pre test questionnaire information

Hei og velkommen til brukertesting av bokhyller.no!

Tusen takk for at du setter av din tid til å hjelpe meg med brukertestingen av min masteroppgave.

Litt informasjon om brukertestingen:

Denne brukertesten består av 4 steg. (est. tid 45 - 60 minutter)

1. (est. tid 5 min)
   Først skal du svare på en kort spørreundersøkelse om ditt erfaringsnivå ved bruk av nettlesere, nettsider og nettbutikker.
2. (est. tid 15 min)
   Etter spørreundersøkelsen blir du sendt til en nettside for brukertesting av nettbutikk A. Her vi du få 3 oppgaver du skal løse innen en viss tid.
3. (est. tid 15 min)
   Etter du har testet nettbutikk A skal du teste nettbutikk B. Her vil du også få 3 oppgaver du skal løse innen samme tids span.
4. (est. tid 10 min)
   En ny spørreundersøkelse, hvor du svarer på spørsmål om opplevelsen av de to nettbutikkene.

Teknisk informasjon:

Denne brukertestingen krever at du har et fungerende webkamera plugget inn i din pc. Dette vil bli brukt underveis til å tracke hvor øynene dine ser på en nettside.

Under brukertestingen av nettbutikkene i steg 2 og 3, vil ditt webkamera skrus på. Dette vil da ta opp data som forteller hvor øynene dine ser på nettsidene. Derfor er det veldig viktig at du under hele testingen er fokusert på de oppgavene du er gitt og at du sitter mest mulig i ro med hodet.

Du vil alltid bli fortalt underveis om ditt webkamera er i bruk eller ikke. For ordens skyld er det KUN under nettside testingen at kameraet er i bruk, og du kan være mye mer avslappet når du svarer på spørreundersøkelsene.

I løpet av brukertestingen med webkameraet, vil vi også være nødt til å spille inn det som skjer på skjermen din. Derfor vil jeg anbefale å legge ned alle faner og programmer som du ikke vil vise at du bruker på forhånd.

Databehandling:

Alt av data som blir samlet inn i spørreundersøkelsene er anonym og kan ikke knyttes opp mot testpersonene. Dataen vil bli samlet inn på en trygg nettserver hos SurveyXact og vil bli slettet så snart denne masteroppgaven blir levert og evaluert av sensor. Når det gjelder webkamera dataen som blir samlet opp i løpet av brukertestingen, vil denne bli sendt igjennom et dataprogram som heter "iMotions online data collection". Dette programmet

tar filmen fra webkameraet og gjør det om til dataanimasjoner som viser hvordan testerens øyne oppfatter nettsidene. Disse filmene er kun tilgjengelig for researcher og vil bli slettet så snart oppgaven er levert og evaluert av sensor.

Jeg er invitert til å delta i dette forskningsprosjektet som gjennomføres av Lars-Otto Bjerkeng. Min deltakelse er frivillig og dataene som er samlet inn er anonyme. Selv om jeg godtar å delta nå, kan jeg trekke meg når som helst uten konsekvenser av noe slag.

- Jeg godtar at under brukertesten vil mitt webkamera bli brukt til å filme mine øyebevegelser og mine handlinger på nettsidene vil bli tatt opp på film via screen share.

- Jeg forstår at deltagelsen involverer opptak av min øye-bevegelse og mine ansiktsuttrykk i løept av brukertestingen.

- Jeg forstår at all informasjon som blir samlet inn er konfidensiell anonym data.

- Jeg forstår at min data vil bli brukt anonymt i forskningsrapporten til dette prosjektet.

- Jeg forstår at signerte samtykkeerklæringer og filmopptak blir lagret på en dataserver, holdt anonymt, og vil bare bli sett av forskeren og eksamensstyret til eksamensstyret bekrefter resultatene av avhandlingen.

- Jeg forstår at jeg står fritt til å kontakte personene som er involvert i forskningen for å søke ytterligere avklaring og informasjon.

<u>Klikk neste for å godkjenne vilkårene og starte brukertestingen.</u>

Appendix H

User tasks for the user testing

Nettside A

Hei og velkommen til neste del av brukertestingen.

Du blir nå videresendt til nettside A og skal gjennomføre 3 oppgaver. Her er det viktig at du ikke glemmer hva du skal gjøre underveis, så skriv gjerne ned oppgavene, eller ta bilde av dem med din telefon.

Før du ser nettsiden kommer vi til å gjennomføre en kalibrering av ditt webkamera slik at de klarer å følge øynene dine.

Oppgavene som skal gjennomføres er som følgende

1. Finn informasjon om hvordan du kan lage / kjøpe din egen bokhylle.

2. Finn veien til selve nettbutikken fra forsiden

3. Bygg en bokhylle i din handlekurv med følgende spesifikasjoner:

   121cm   lengde
   20 cm   dybde
   186 cm   høyde

   Tretype: Furu
   Farger: Lakkert

   Du trenger også tilleggsprodukter:

   1x Avsluttende side i furu som er lakkert (På denne siden kalt for "Side")
   1x Løs hylle som passer en av seksjonene du har lagt til

   Når du er ferdig kan du krysse ut tabben og gå videre

Appendix I

Test results from sample group A

[Pre-test questionnaire results for sample group A](#)

[SUS Results: For the control website in sample group A](#)

[SUS Results: For the challenger website in sample group A](#)

Test results from sample group B

[Pre-test questionnaire results in sample group B](#)

Test results from the eye tracking and behavioural analysis

Appendix J

Press release for the thesis

Hei, mitt navn er Lars-Otto Bjerkeng, jeg er siste års masterstudent på studiet multimedieteknologi og e-læring ved Universitetet i Agder.

Jeg har det siste halve året jobbet med min masteroppgave hvor jeg legger frem fordelene ved brukervennlighet og interaksjonsdesign i nettbutikker.

I løpet av våren har jeg jobbet med å re-designe og utvikle nettsidene til bokhyller.no hvor jeg har implementert nyskapende funksjonalitet basert på interaksjonsdesign som skal forbedre brukervennligheten til nettbutikker.

I mine studier på feltet har jeg i disse Covid-19 tider hatt gleden av å jobbe med remote brukertesting hvor jeg har blant annet har brukt øye gjenkjennelses teknologi til å observere og forstå hvordan besøkende på nettsiden bruker løsningene jeg har produsert.

Resultatene og funnene i denne oppgaven har vist seg å være veldig positive. Re-designet av nettbutikken jeg har jobbet med har vist seg å ha økt brukervennligheten med 101% gjennom brukertesting og beregninger.

Med disse resultatene, ønsker jeg å fortsette videre arbeidet mitt med interaksjonsdesign og webutvikling, for å avdekke nye metoder og forbedre brukervennlighet for folket.

Forslag til mulig artikkel:

[Tittel] Brukervennlighet på agendaen UX/UI

[Ingress] Webutvikler og student Lars-Otto Bjerkeng ønsker å bidra til at landets mange nettbutikker blir mer brukervennlig.

[Innhold] Master studenten ved Universitetet i Agders Multimedieteknologi studie har brukt det siste halve året på å utvikle brukervennlig funksjonalitet og forbedringer til nettbutikker i sin masteroppgave. I oppgaven skriver Lars-Otto blant annet om teoriene bak UX design, interaksjonsdesign og netthandel.

I løpet av våren har han utviklet en helt ny versjon av nettsiden til bokhyller.no. Her ønsker han å vise frem hvordan interaksjonsdesign kan gjøre at en nettside kan skape en bedre opplevelse, blir enklere å bruke og blir enklere å navigere.

Resultatene etter implementasjonen av de nye funksjonalitetene på bokhyller.no har vist seg å redusere antall feil i ordre, forbedre brukervennligheten til nettsiden med 101%, og ved bruk av bedre informasjonsflyt får han de besøkende til å bruke mer tid på å lese innholdet på nettbutikken. Den nye brukervennligheten har også vist seg å redusere feil i ordre med hele 50%.

Disse resultatene har han funnet ved hjelp av remote brukertesting over internett hvor han har brukt skjermopptak og øye-bevegelsesgjenkjenning til å observere hvordan test brukerne navigerer seg rundt på nettbutikken.

Når vi spør Lars-Otto om veien videre etter studiene, forteller Lars-Otto at han ønsker å jobbe videre med webutvikling, og at han allerede har fått seg jobb innenfor feltet som venter på at han skal bli ferdig med graden.