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**Website redesign: The role of the user experience design process in the  
improvement of local e-commerce website design.**

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## **Abstract**

The importance of having a good e-commerce or information website has become of paramount importance in the present era of huge data release, the influx of technological devices and the ever-growing number of online businesses. Providing a good user experience is important to stand out in the competition. This master's thesis outlines a special design approach to increase the website's effectiveness and improve user satisfaction of Getränke Hax, a Deloma UG webshop.

The user experience design process has been recognized as a critical component of website success and it has been used as an input in a website redesign. Customer satisfaction can be achieved by a process that starts with user research, then moves on to designing a prototype based on users' feedback, testing the prototype, and finally implementing it in the final design. The approach began with a systematic comparison of two Getränke Hax websites, as well as performing user tests to identify current issues. Then, multiple UX design methodologies were applied to develop a more comprehensive high-fidelity prototype for the new edition of the website.

The study resulted in an updated website for the web and an entirely new design for the mobile version that met the company's UX and business objectives, enhancing customer satisfaction and attracting new customers. The selected strategies were effective in identifying customer issues with local e-commerce shops and enhancing user satisfaction over a longer period.

**Keywords:** *UI Design, UX design, Usability, User Testing, Prototyping, E-commerce, Web Design.*

## **Confidentiality Clause**

This study comprises several confidential data and information which are provided by the company “Deloma UG”. Those data and relative information may not be disclosed, published, or exhibited to others in any circumstances, including in the form of extracts, before or without the explicit permission of Deloma UG and the thesis. This research and the results are concluded to be available to the members of the Examination Board of Hochschule Rhein-Waal solely for assessment.

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## List of Abbreviations

EC	Electronic Commerce
UX	User Experience
UI	User Interface
HCD	Human-Centered Design
UCD	User-Centered Design
HCI	Human-Computer Interaction
EDI	Electronic Data Interchange
ID	Interface Design
IA	Information Architecture
ISO	International Organization for Standardization
MC	Mobile Commerce
PQ	Pragmatic Quality
PQ-I	Pragmatic Quality Identity
HQ	Hedonic Quality Stimulation
ATT	Attractiveness

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# 1. Introduction

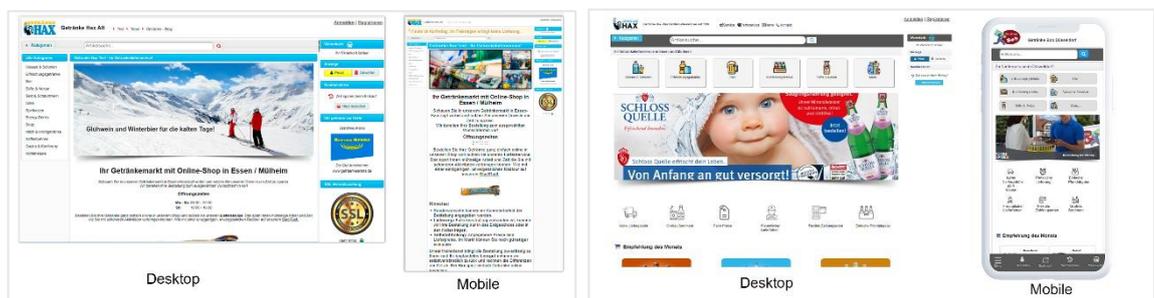
The emergence of the internet has significantly evolved people's behavior of buying and selling goods and services (Bakos, 2001). The rapid expansion of web technologies has enabled electronic commerce (EC) businesses to deliver easy shopping environments with more information to assist customers in making better decisions. Many sectors of business such as private and government sectors and social life are being reshaped by electronic commerce. Chaffey (2009), defines e-commerce as "all internet-based operations between the organization and third parties." With the ever-growing e-commerce sector, many traditional businesses have embraced the EC business model to sell their products and reach new clients from all over the world, which would be impossible with only a physical store. More and more small and medium enterprises (SMEs) have started to supplement their physical shops with electronic offerings to survive in this competitive market or to cushion the impact of the Corona pandemic (Andrienko, 2020).

More than six billion people - 75% of the world's population will have access to online by 2022, suggesting that understanding and aligning business models to changing customers' demands is more important than ever (Morgan, 2019). Marketers must constantly refine their company strategies and approaches according to customer needs and the nature of the markets (Ungerma, 2018). Online shopping environments are evolving in parallel with the evolution of digital platforms (e.g., Shopify, BigCommerce Magento etc.), they can also provide customers more choices during the purchasing process, as well as improved services and products (Pappas, 2018). It is essential to understand why buyers choose to buy at an online marketplace and to follow their purchasing motivations. It's also important to know how their behavior alters depending on their intention for current online shopping (Momani, 2017). This research paper focuses on the customer needs and behavior while buying products based on a survey to redesign a website prototype of a shop named Getränke Hax, an online platform for selling products of Deloma UG.

Deloma UG is a company located in Krefeld Germany helping local shops, providing websites and other services (for instance: consultancy, advertisement, logistics, content etc.) that do not have a website. Deloma has a particular website template that is slightly customized for each store. Getränke Hax is one of the many stores of Deloma UG. Currently, user experience does not play a central role in the design cycle at Deloma,

resulting in not user-friendly website design as well as problems in website usage. For example, customers add products to the cart but many of them leave without buying. Even though some customers buy products, they do not stay as long-time customers. The problem was recognized while speaking to the shop owner. The users described that they had been facing problems during registration as well as when checking out orders. In addition to that, it was hard to use the Deloma company's shop (Getränke Hax) website on mobile devices since Deloma did not offer any website for mobile platforms.

Deloma intended to conduct preliminary research to determine if resolving the existing issues would increase the number of visitors to their website, which is outdated and lagging the competition. To find out the present usability issue on the Getränke Hax website, a user study was designed. Users were asked a few simple questions about their experience while using this website to collect their feedback (e.g., their problems while looking for specific products, order placing problems, payment procedures, etc.). As an experimental project and in response to user input, certain elements were changed (for instance, the category is now highlighted, the homepage is simplified, and product pages are grouped and easier to register for) and made the mobile browser compatible without modifying the backend. Figures 1 and 2 display both the before and after states.



**Figure 2: Before Modifying the website.** The first version of the website used for the evaluation tests - website for desktop and mobile.

**Figure 1: After Modifying the website.** Modified version used for the evaluation tests with user's feedback - website for desktop and mobile.

After reviewing the customer request logs between June and November it was concluded that sales climbed from 1300 to 1700 orders, an increase of around 4% considering the growth of new customers. After observing the effects of user testing and an enhanced user interface, Deloma decided to improve the user experience of its existing website on a large scale. In addition, the company intended to create a mobile version, as users indicated that a mobile platform would make it easier for them to place orders after utilizing the mobile-optimized version.

## **1.1 Thesis Outline**

This thesis is structured as follows:

### **Chapter 1: Introduction**

This chapter introduces the basic concept of the topic and describes some problems Getränke Hax, a shop of Deloma UG is facing. The aims and objectives are also outlined in this chapter.

### **Chapter 2: Theoretical Background**

In this chapter the theoretical background will be described which is necessary to understand the topic. The principles of user experience design for web and mobile platforms are introduced. Usability ideas, human cognition theories and graphical design features are explored to familiarize the reader with the vocabulary and aspects for the practical phase of the thesis.

### **Chapter 3: UX Design Process Overview**

The user experience design process will be presented in this chapter to provide readers with an understanding of how it will be used to redesign the website prototype.

### **Chapter 4: Hypothesis**

Hypotheses are formulated based on a theoretical basis and will be explained in Chapter 4 where research questions will also be given.

### **Chapter 5: Methods and Materials**

Then Chapter 5 describes the investigations that were conducted to test the hypotheses. A/B testing and AttrakDiff questionnaire is used to testify Getränke Hax website. Results will also be discussed in this segment.

### **Chapter 6: Limitations**

Some research and technical limitations experienced during the overall process will be discussed in this section.

### **Chapter 7: Conclusion and Future Works**

The final chapter summarizes the overall process of obtaining the primary goal and offers suggestions for future research.

## 2. Theoretical Background

The theory that supports the research questions will be discussed in the following chapter. First, the essential fundamentals and terminology needed to comprehend the significant parts of this master's thesis are explained, followed by the relevance in user interface design (Section 2.1) and usability (Section 2.2). The user experience will be detailed in Section 2.3. The contrast between usability and UX will next be discussed in Section 2.4, followed by interactive design and mobile literature in Sections 2.5 and 2.6. In Section 2.7, the impact of human psychology on UX will be discussed. In chapter 2.8, we will consider a detailed summary to present the chapter's general notion.

E-business is a modern style of business organization that involves the extensive use of information technology and the internet to accomplish all an organization's essential business operations (Kovacevic, 2010). E-business has a lot of benefits: where it is used, people are better educated and the firm strives for technological advancement, which considerably helps future development and therefore leads to a better market position. The advantage of employing e-business, which is based on internet technology, is that it provides improved market efficiency by providing insight into items and their features, such as pricing, availability, payment terms etc., while also simplifying business across local and global marketplaces. Business to business (B2B), business to customer (B2C), customer to customer (C2C), and other types of e-business exist (Ana, 2017, P. 687).

The webshop is a subset of e-business that only refers to conducting trade activities over the Internet, whereas e-business refers to a broader concept of intensive commercial activity conducted electronically. A webshop allows customers to purchase products from a merchant in real-time through the Internet (Ana, 2017, P. 688).

In recent years, the number of web retailers has increased dramatically. Webshops, unlike traditional stores, are not geographically constrained and can draw clients from all over the world, allowing businesses to establish a global presence. Webshops offer numerous benefits to both businesses and customers, including access to a new, limitless market, fewer operating expenses, and the ability to buy at any time. Customers get easier and faster access to product information because they do not have to go shopping and look for a certain item and its information, and there are no restrictions on the number of things that can fit into a physical outlet. Customers may obtain all available product details on

the online store and if they have any further questions, contact between the customer and the seller is faster and easier (Ana, 2017).

Poor website design continues to be a key obstacle to e-commerce deployment, despite the growing trend toward online shopping. According to recent research of 10,000 online shoppers, poor site organization was attributed by 30% of users for leaving an e-commerce website (Sivaji, 2011). On e-commerce sites, user success rates are barely 56%, with most sites following only a third of recognized usability criteria. As a result, improving website usability is important because it can dramatically boost income, loyalty, and survival (Nielsen, 2001).

Moreover, websites are quickly becoming the medium of choice for the average consumer seeking information, social networking, education, pleasure, and shopping (Thorlacius, 2007). Due to the significant increase in the number of devices each person owns, the number of interfaces they use regularly has also grown (Zender, 2008). The development of technology devices such as tablets and smartphones with a variety of interface sizes has resulted in a variety of web page requirements. Now, the website must adjust to various screen sizes without being unpleasant, unsightly, or difficult to navigate (Budiu, 2013). Information is being produced in ever-increasing quantities, and the human brain's limited capacity appears to have become the greatest barrier through which it must be delivered. This massive generation and compression of data have also increased the significance of the interface design process, and usability, UX, and user-centered design are among the concepts and studies that have evolved as a result (Bias, 2015).

UX is concerned with the interactions that a person has with goods and services (Roto, 2011). UX also refers to an important part of many disciplines and fields of study. Multiple fields have grown and evolved over the last 80 years, each contributing significantly to the UX of technology and goods. Human factors and ergonomics (HF&E), human-computer interface (HCI), and usability are three significant contributors. Along with these foundational disciplines, related design processes and disciplines formed. UCD (a process scheme consisting of different phases to design user-friendly products), interface design (ID), and information architecture (IA) are all major factors.

A customer's interaction with a product or service is referred to as user experience (UX). Every factor that influences this experience, including how it makes the user feel and how easy it is for the user to complete their desired objectives, is considered by UX design. This might be anything from the feel of tangible goods in one's hands to how simple the

internet checkout procedure is (Stevens, 2022). User experience (UX) studies have become more crucial in conveying the right information to the right audience and offering the finest experience for the user to understand that message. UX, as a set of tactics, enables us in recognizing the user's demands and behaviors, and then use that knowledge to the creation of helpful, functional, and aesthetically attractive products and data. These approaches could support the transmission of the correct intended message, helping any website to meet the goal for which it was developed. Processes that improve the user's experience can lead to a massive rise in existing customers and brand advertising while also increasing user quality and performance. Alternatively, a non-effective, worse website designed without such methods and ideas will have the potential to damage any firm. As a result, it's a basic reality that if people don't get the information, they won't respond in the way that is expected from them. This has established an industry dedicated to providing the greatest possible user experience for clients, resulting in higher levels of user satisfaction.

Not only does user experience have a significant impact on brand reputation and value, but it may also have a positive effect on sales, especially on e-commerce sites. According to a study conducted by Schiller (2011), providing a top-class customer experience has resulted in a 400% boost in sales rate. Today, a huge effort is invested into designing effective websites since studies show that only effective websites can result in greater customer happiness, which is essential in the competitive world. That is why every company is battling and focusing on producing the finest user experiences possible, which can lead to increased website user happiness (LeAnn, 2012).

## **2.1 User Interface (UI)**

A user interface is a component of a website that is meant to deliver the visitor everything they need to locate information quickly on the site. It is the foundation for human-computer interaction. It might be graphical, text-based, or a mix of the two (Dan, 2019).

The user interface (UI) is the environment through which humans and computers interact. Therefore, an adequate user interface (UI) is a crucial component of the user experience (UX), and it is divided into two parts: The aesthetic of a product is communicated through visual design, and interaction design is the grouping of components functionally and logically. The purpose of user interface design is to build a user platform that enables interaction with a product simple, efficient, and enjoyable for users (Dan, 2019).

In e-commerce, the website serves as the company's customer experience, and its functionality is important to the venture's success (Turban, 2000). The web is the key e-commerce platform, and it has some benefits. First, a website increases a company's image and facilitates interactions with other companies, enhancing business process efficiency and lowering costs (Alper, 1999). Second, customers interact with sellers online through the sellers' site; hence, a well-designed webpage can predict a user's inclination to browse on a webpage, return to it, and make an online purchase. A poorly designed website, on the other hand, might result in financial losses and a terrible effect on the company's reputation. (Zona, 2000)

## 2.2 Usability

Usability refers to the degree of user-friendliness or serviceability of digital products such as websites, online stores, and applications during use (Marucci, 2019). Any modification in the product or system's attributes, the user's task or the surroundings might affect usability. A product is not usable or useless in and of itself; it contains features that define its usefulness for a specific person, activity, and environment (Nigel, 1991).

Five quality components (Figure 3) describe usability (Nielsen, 2012):



Figure 3: Usability Components (Nielsen, 2012).

- Learnability: When consumers see the design for the first time, how simple is it for them to execute fundamental tasks?
- Efficiency: How quickly can users complete tasks after understanding the design?
- Memorability: How swiftly are users able to regain proficiency with the design after a period of inactivity?
- Errors: How many mistakes do participants make, how significant are these mistakes, and how quickly can they recover?
- Satisfaction: How satisfying is it to engage with the design?

There are numerous additional significant quality characteristics. One of the most important is utility. In design, utility is treated as a separate element. It is regarded as a crucial component of web design that has an impact on the user experience. According to Hartson (2012), the effectiveness, value, or attractiveness of a website's content to a user is referred to as its utility. The same website may not be fascinating to two distinct people all the time. Based on the differences in the website visitors themselves, a unique design will result in diverse visitor experiences. As a result, it's essential to design for a specific target group based on thorough research. Usability and utility are both critical factors in determining whether something is useful.

### **2.2.1 Usability + Utility = Usefulness**

The overall acceptability of a computer system, as stated by Nielsen (1993), is a combination of its social and practical value. Some traditional factors, such as cost, support, and reliability, are included in practical acceptability. The usefulness of something can be broken down into two categories: usability and utility.

Usability is one aspect of a computer system's overall usefulness, and any sort of software should meet the basic usability requirements. The examination of usability is a critical element of the total evaluation of web-based learning environments. A web-based application's UI must be simple and easy to use so that the visitor may focus on the data content and learning rather than the design. When technology is usable, it is simple to use, memorize, and has few faults, as well as being aesthetically attractive (Nielsen, 1993).

One of the techniques for achieving utility in an excellent UI is simplicity. Wong (2016) described Simplicity in Design as diving deep into the thought of the customers and using that thinking to create a product that eliminates insignificant aspects and bridge the gap

between the users and the system to reach those goals using the platform. He (Wong, 2016) outlines four methods for achieving design simplicity.

- **Maintain Clarity:** comprehend and create for the primary objectives of your users
- **Make use of automation:** Create a system that requires the least amount of conscious and cognitive effort.
- **Limit options:** Create a powerful "information fragrance."
- **Reduce the "gulf of execution":** convince your users of the benefits of using your goods

Survey questions about user satisfaction are typically used to find out how people feel or to collect their feedback. For this reason, customer satisfaction is a result of how users perceive usability and utility.

## **2.2.2 Importance of Usability in E-commerce**

Several things influence the usability of an e-commerce website. The focus on continuous improvement is critical for the establishment of a system. Technical functionality is essential for every e-commerce website, but it is not the only concern. E-commerce systems are part of human interactions and cultural systems, allowing us to transmit, alter, and analyze data via worldwide networks. As a result, when creating the network and website, the social dimension must be considered as well (Safavi, 2009).

When it comes to online shopping, today's customers have high expectations. People leave websites that are difficult to navigate if the homepage does not indicate what a company offers and what consumers can do on the site if they become lost if the information is difficult to comprehend or does not answer their essential questions (Nielsen, 2012). For this reason, e-commerce retailers must improve their functionalities to meet consumer expectations. Updating the usability of the store and eliminating faults should be a continuous effort. Here are a few of the main advantages it can provide (Cooper, 2018):

### **2.2.2.1 An improved omnichannel customer experience**

Users have evolved to demand greater integration of their digital and physical purchasing experiences as their needs have changed. Any business may satisfy customers' omnichannel expectations by improving usability across platforms. Customers like having the products or services available when and when they need them. The process is made even easier with a simple and functioning website.

#### **2.2.2.2 Reduce browsing time**

Website visitors' browsing experience should be as simple and entertaining as feasible. An improved e-commerce UX minimizes loading times and allows customers to easily find the products they want. Consumers are most likely to purchase between three and four minutes after loading the site, according to a recent poll. When it reaches seven minutes, the chances of finishing the checkout process drop dramatically. As a result, increasing visitor durations due to usability concerns have a major impact on prospective revenue (Cooper, 2018).

#### **2.2.2.3 Establish credibility**

Consumer trust and brand credibility are enhanced when an online store provides a consistent experience with each visit and transaction. In contrast, if the website is hard to access or has a cluttered user interface (UI), it will harm the brand's reputation with customers. This means fewer repeat purchases and a larger chance of leaving carts.

A QA test (quality assurance testing) will allow us to find out site flaws and ensure that the customers have the best e-commerce experience possible. Automated and manual tests will show how to improve the usability of the store from the customer's standpoint.

#### **2.2.2.4 Enhanced brand engagement**

Consumers are more inclined to return for repeat purchases if they have a pleasant shopping experience. A clean and distinctive web design, in addition to easy navigation, can ensure that your brand is remembered and set it apart from the competitors.

Brand awareness will be established through consistency in the visitor experience. Furthermore, visually, and textually appealing components will attract readers to explore the site and interact with the content (Cooper, 2018).

### **2.3 User experience (UX) design**

The user experience of websites, apps, and software consists of the perceptions and reactions of users to the usability, information architecture, interaction design, and visual design - before, during, and after use. Establishing a good user experience is necessarily more complex than merely creating good usability due to the various components involved. Usability merely describes the degree of user-friendliness during use. (Marucci, 2019). According to Norman (2017), Users' requirements and desires should guide design decisions. User experience design focuses on making the product easy to use by performing user research, producing wireframes and prototypes, and conducting usability

tests. Preston (2003) described UX as a set of methods established and built to recognize the expectations and behaviors of consumers of products/websites, and then to apply these strategies to the creation of an aesthetically beautiful, functional, and effective website design.

The user experience (UX) focuses on how the entire design makes the user feel. It is required to develop not only appealing but also the quality and well-functioning designs. Designers must understand customers' objectives, needs, emotions, behaviors, and intentions to achieve favorable user feelings while using a website. The user experience is determined by more than just usability when it comes to website design. It is also influenced by the additional design elements that UX design encompasses. User Experience is affected by seven factors: Usefulness, Usability, Findability, Credibility, Desirability, Accessibility, and Valuable (Morville, 2004).

Figure 4 illustrates seven factors that UX pioneer Peter Morville (2004) identifies as important.



Figure 4: 7 factors that describe user experience (Morville, 2004).

### **2.3.1 Useful**

It is not logical to put a product to market if no one finds it valuable. If it lacks purpose, it is challenging to compete for attention in a market saturated with useful and purposeful products. Notably, "useful" is subjective, and things might be regarded as "useful" if they provide non-practical benefits such as amusement or aesthetic appeal.

Consequently, a computer game or sculpture may be judged valuable even if it does not enable the user to achieve a goal that others find significant.

### **2.3.2 Usable**

Usability refers to a product's capacity to assist users in achieving their objectives effectively and efficiently. Despite the continuous relevance of usability, the interface-centered approaches and perspectives of human-computer interaction do not cover all elements of web design. In short, usability is required but insufficient.

### **2.3.3 Findable**

Findable refers to the notion that the product must be simple to locate, and in the case of digital and information products, their content must also be simple to locate. If customers cannot locate a product, they will not purchase it, and this holds for all potential customers.

For instance, if the products on an e-commerce website are not ordered into product categories such as vegetables, water, beer, juice, etc., then visitors would likely find browsing this website to be quite annoying. Findability is therefore a crucial component of the user experience.

### **2.3.4 Credible**

Credibility refers to the user's ability to have faith in the offered product. Not only that it performs its intended function, but also that it will last a fair amount of time and the accompanying information is accurate and appropriate.

If a user believes that the product's developer is a liar and a clown with ill intentions, it is very impossible to provide them with a positive experience; they will go elsewhere.

### **2.3.5 Desirable**

Design communicates desirability via branding, image, identity, aesthetics, and emotional design. The more attractive a thing is, the more likely it is that its owner will speak about it and inspire desire in other consumers.

For example, Skoda and Porsche produce automobiles. Both are useful, useable, findable, accessible, credible, and valuable, yet Porsche is far more desirable than Skoda. This is not to imply that Skoda is unpleasant, as they have sold many vehicles under that name, but if offered a choice between a new Porsche and a Skoda for free, most individuals would choose the Porsche.

### **2.3.6 Accessible**

Unfortunately, accessibility is frequently overlooked while designing user experiences. Accessibility refers to the provision of an experience that can be accessed by individuals with a wide range of abilities, including those with disabilities such as hearing loss, impaired vision, mobility impairment, or learning disability.

Companies frequently view accessibility design as a waste of money due to the misconception that persons with disabilities represent a small portion of the population. According to census data, at least 19% of people in the United States have a disability, and this percentage is likely greater in less developed countries.

### **2.3.7 Valuable**

The product must also provide value. It must provide value to both the business that created it and the user who purchases or employs it. Without value, a product's initial success may be eroded over time.

Designers should keep in mind that price is one of the most influential factors in consumer purchasing decisions. A \$100 product that addresses a \$10,000 problem has a greater likelihood of success than a \$10,000 product that solves a \$100 problem.

A product's success depends on more than just its utility and usability. Products that are useable, useful, discoverable, accessible, credible, valuable, and desirable have a greater likelihood of market success.

## 2.4 Difference between Usability and User Experience

The scope of user experience and how it should be characterized (Law, 2009) have been the subject of much recent discussion. In ISO FDIS 9241-210, UX is defined as:

“A person's perceptions and responses that result from the use and/or anticipated use of a product, system, or service”.

In contrast, the new definition of usability was published in ISO FDIS 9241-210.

“Extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”

Both definitions recommend that usability or UX can be evaluated during or after the usage of a product, system, or service.

The terms "user experience" and "usability" are often used simultaneously. Mifsud (2011), on the other hand, believes that these two fields are separated. The difference between Usability and UX will be discussed below based on his publication.

Firstly, the aim of the two terms is distinct. In terms of a website, the goal of usability is to create a website simple to use so that users can accomplish their goal using the website whereas user experience makes consumers enjoy using a website by understanding their behaviors.

Secondly, these are two different processes. UX design is the process of developing products that provide customers with useful and interesting experiences. It involves the entire process of product integration including branding, design, usability, and function. whereas Usability is a part of the UX process.

Thirdly, both can be defined by asking different questions. Usability can be thought of as the question “Can the user accomplish their goal?” UX, on the other hand, can be expressed as “Did the user have as delightful an experience as possible?”.

Next, Employees who contribute to the user interface design of a website are involved in usability whilst Employees from several areas, such as engineering, marketing, graphical, industrial, and interface design must work together to provide a positive user experience.

Finally, usability and UX both have a different effect on the user interface. A useful user interface is intuitive, straightforward, or very easy to learn. When the focus is on the user

experience, this isn't mean that the user interface isn't usable. UX professionals, on the other hand, frequently send their designs to usability experts for approval.

## **2.5 Interaction Design**

The interaction between a person and a product is the focus of interaction design (Hackos, 1998). It investigates navigating elements from a stylistic and functional perspective. User interaction design links the user interface and the user experience. A perfect example of interaction design could be, when a user hovers over a button, the color of the button gets changed. Creating interactive products to assist individuals in their daily and professional lives is described as interaction design by Jenny (2002).

Product attributes, tasks, user characteristics, and other contextual variables can be used to characterize the interaction between users and products, and users prefer to generate an instant impression of a website. A significant component that can help influence the user's relationship with the site is the evaluation of attitude development throughout online contact. As a result, the desired behavior is achieved, and users are less likely to migrate to a competing or similar website (Zhenhui, 2016).

It's difficult to distinguish the difference between the frontend and the behavioral or interaction layer since design interaction is about behavioral aesthetics. The aesthetics of an iPhone can be evaluated to comprehend this argument. The aesthetics are noticeable not only in its external look but also in its touchable interface and in the kind or type of experience it provides to its consumers. It is strongly reliant on the engagement and behaviors of consumers. Rising to a behavioral level of aesthetics, in which people experience beauty through their behaviors or interactions, to be precise (Zhenhui, 2016).

To sum up, the way the system responds to interactions and how it animates items is called interaction design.

### **2.5.1 Visual Design**

Visual design is concerned with the aesthetics and visual expression of a website. It includes a set of fundamental aspects such as color theory, typography, hierarchy, object positioning, and other components (Cyr, 2008). Putting them all together in the appropriate order helps to build a great design. As the visual design is the first item a person interacts with, the visual design must attract their attention. To hold the user focused and produce a good initial experience, the visual design must balance

sentimentalism, attractiveness, and harmony of the entire graphical style. According to experts, a well-designed visual design enhances the consumer experience and contributes to the establishment of trust and desire for the product (Karimov, 2011). Visual design, as reported by Wang (2005), can be split into two distinct: 'graphic design' and 'structure design'.

### **2.5.2 Graphic Design**

Graphic design relates to the "look and feels" of a website, or the features that frequently influence a customer's first experience (Montoya, 2003). The use and scale of pictures, the use of motion, the word count per line and the size of letters, icons, and the presentation of color are all graphic design aspects (Kang, 2002). A study conducted by Rosen (2004) found that great designed graphics, such as font size, how information has shown, and how attractive the interface is to the customers in general, can enhance users' online purchasing experiences and have a positive impact on their buying habit. Poor visual design, on the other hand, can cause frustration and unpleasant feelings, making it difficult for customers to keep exploring or making purchases on the site (Montoya, 2003). According to the idea of cue signaling, it can be assumed that using appealing and relevant visuals to attract online buyers further into the website may help to establish initial credibility.

### **2.5.3 Structure Design**

Structural design is an essential component of visual design, which refers to the general organization and presentation of shown information online (Wang, 2005). Structure design also known as site architecture is described as "the arranging of the several pages into a logical whole" by Demangeot (2010). It is associated with technological factors such as navigation, data structure, page loading time, link reliability, search tools, site maps, and site availability (Ahn, 2007).

According to Nielsen (1999), A website's architecture and navigation assistance are essential for users to understand their current position, the page they've been on now, as well as which page they can switch to. Visitors can shift to some other e-retailer if a website is challenging to use. On the other hand, users are less price-conscious and may buy more luxury items if a website is simple to navigate (Lynch, 2000). A decent site architecture, based on the findings of a cross-cultural investigation conducted by Cyr (2008), influences the level of faith people have in the webpage.

## 2.6 Literature for Mobile Commerce (MC)

Mobile commerce (MC) has emerged as a new business phenomenon because of the increasing usage of mobile devices and the development of mobile platforms (Xiabing, 2019). Mobile commerce refers to “any transaction, involving the transfer of ownership or rights to use goods and services, which is initiated and/or completed by using mobile access to computer-mediated networks with the help of an electronic device” (Rajnish, 2007). According to research conducted by Chong (2011), compared to what e-commerce did as a business strategy in the early 2000s, MC has more capability to influence business organizations and communities. In various regions, the number of mobile customers is believed to be bigger than the number of internet users (Mingdun, 2009).

The research followed by Enge (2021) describes that 68.1% of all website visitors globally came from mobile devices in 2020, up from 63.3% in 2019. Recognizing the importance of MC, numerous businesses are viewing it as a potential growth channel and have spent heavily on the design of mobile-friendly MC websites (Patel, 2011).

The widespread availability of mobile devices motivates users to make random purchases, resulting in increased revenues for the retailer (Hannah, 2018). In 2021, retail MC sales will reach \$359.32 billion, up 15.2% from 2020. Retail MC sales are expected to more than double to \$728.28 billion by 2025, accounting for 44.2% of total retail e-commerce sales in the United States (Meola, 2022), and worldwide retail MC turnover was rise to 693 billion US dollars in 2019 (Department, 2016). In addition to that, from 2015 to 2017, China's online shopping sales grew at a rate of more than 30%, and from 2017 to 2020, they surged at a rate of over 20% (Daiqing, 2020). In latest years, advancements in digital transaction systems and transportation, as well as rising smartphone and internet usage, have pushed the global m-commerce boom. Using user-friendly features and universal compatibility, mobile shopping platforms have enabled online shops to create a personalized buying experience (Balakrishnan, 2020).

Shneiderman (1986) Presented "Golden Rules of Interface Design" as a foundation for developing and proposing their unique mobile interface design principles. He presented 8 major rules for mobile UI design, four of which were suggested by Shneiderman, including allowing regular users to use shortcuts, providing constructive feedback, designing interactions to generate a conclusion, and supporting an effective team. Stability, reversal of activities, error handling, and simplistic error management are the other four recommendations, as are reducing bad memory capacity. All these rules are

focused on desktop interface design, but they have been adapted to meet the characteristics and limitations of mobile devices (Tarasewich, 2004). As indicated in Table 1, Chan (2002) offers eight design criteria for m-commerce platforms.

<b>Design</b>	<b>Details</b>
Scrolling, mainly horizontal scrolling, should be avoided.	To avoid scrolling, keep the page length to a minimum and arrange it to fit the screen width.
Make use of a flat hierarchy.	Because each step on a phone or tablet takes longer, a flat hierarchical structure with fewer stages is desirable.
Create a navigation system that is similar to standard Web browsers.	Handsets and the browsers that run on them must use similar metaphors and have a layout that is like traditional Web browsers.
Create a "Back" button that performs the same function as a conventional browser.	It is preferable to have a "Back" function in wireless applications that are identical to the one found in a standard browser.
Create a history list that tracks the order in which hyperlinks were clicked.	Recently visited Web pages should be stored in the history list.
On each screen, show the connection speed and status of the download.	Users can measure the speed of data transfer by looking at the download status.
Users should not be required to recall items.	After evaluating the codes, give suitable navigation to return visitors to the data entering the page, or present a reference screen without leaving the data input screen.
To boost searchability, narrow the search range.	Sophisticated query tools and established search tools enhance search accuracy.

Table 1: The Recommended Design (Chan, 2002).

Chan (2002) suggested that the key challenge with the wireless platform (MC) is that they must be available utilizing a variety of platforms with varied operating systems and functions. To address the problem, the recommended design should consider certain factors, such as displaying content in shorter lengths to avoid excessive scrolling and creating a navigation mechanism that is comparable to the browser.

Cyr, Headb, and Ivanovc (2006) found that MC design aesthetics enhance performance expectancy, the comfort of use, and satisfaction. All these criteria have a major effect on m-loyalty, which refers to a user's inclination to return to an MC platform. Aesthetics refers to how our brain reacts to anything that appears to be excellent or unpleasant at first glance. Color, form, font styles, audio, and animation are all used to represent interface design in terms of m-commerce. All these factors will have an impact on the visual experience of MC that will attract more customers. (Cyr, 2006).

According to Tobing et al. (2016), MC has three primary features: a product catalogue, a shopping basket, and a payment system. The product design catalogue must contain product detail, name, picture, price and discount, product category and search tools. For the time being, the shopping basket will appear once the consumer has chosen a product or between the steps of adding, editing, deleting, and checking the final cost of the purchased item. The final procedure, the transaction feature, should be able to take user data, track orders, and present a payment gateway.

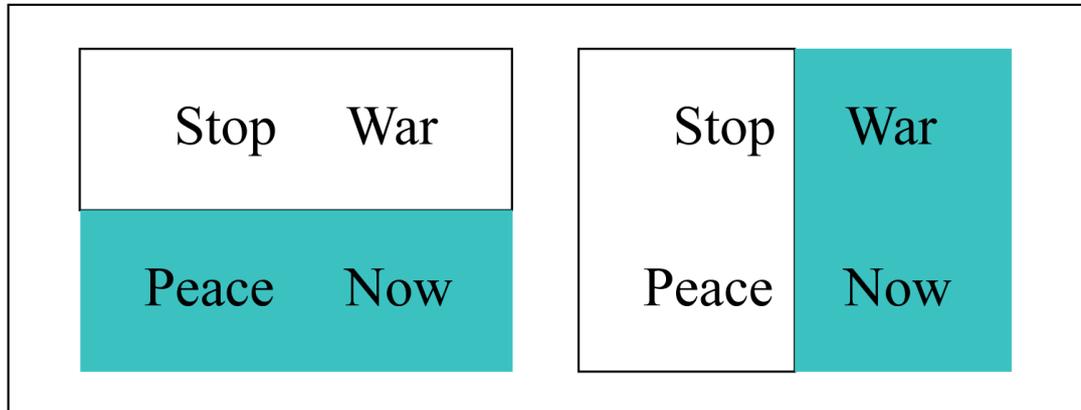
## **2.7 Human factors in UX**

One of the most important aspects of user experience design is human psychology. A website can be built for a variety of purposes and the target audience expects a well-structured design for a web product. The understanding of human psychology allows us to discover how people decide, think, and act, as well as how to inspire people to acknowledge a website's ideals and goals (Claypoole, 2021).

Factors affecting humans Psychology is concerned with the relationship between a human and a system (A desk, a spaceship, or even a staff member of humans and robots could be considered a system). The discipline of Human Factors is also recognized as Ergonomics; in North American societies, this scientific subject is referred to as "Human Factors," whereas European societies know it as "Ergonomics." Doesn't matter what it is called but it's all about enhancing and knowing people's relationships with the items they utilize (Claypoole, 2021). The entire chapter is based on a book written by Weinschenk (2011) about 100 things every designer needs to know about people. Some important human behaviors are discussed which are related to this paper.

### **2.7.1 The way people see**

People's brains develop stereotypes to quickly assimilate information from their surroundings. Various forms and colors have an impact on how people perceive and think about what they see. Figure 4 demonstrates how colors can be used to divert attention from one type of data to another.



**Figure 5: The impact of colors and shapes on people's vision** (Weinschenk, 2011). The meaning of the same text altered when the color was used in a different way. The color pattern is shifted from horizontal to vertical.

Central and peripheral vision are the two forms of vision that people have. The details are recognized using central vision. The peripheral vision encompasses other observable areas that humans can see even if they are not looking at them explicitly. When there are no flashing objects on the periphery of the monitor, users will concentrate on the center.

People scan the screen depending on past experiences or expectations. Because of their experience, they always start screening from the left. It will be a problem for them if the screen allows them to read from right to left. People also don't start reading from the top-left corner because they've grown accustomed to the idea that there are things in the top-left corner that aren't relevant to them, such as a logo, blank space, or navigation bar. As a result, people tend to focus on the screen's center rather than its borders.

### 2.7.2 The way people read

It was once thought that capital letters were more difficult to recognize. Nevertheless, according to the current study, when we read, we identify and predict letters, and then identify the word based on the letters.

As people concentrate, their eyes remain stationary, then shift by quick jumps (saccades<sup>1</sup>). They can't see anything for 250 milliseconds during saccades. During saccades, human eyes are mostly ahead, but they take a glance backwards approximately 10-15% to reread.

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<sup>1</sup>A saccade is a fast, conjugated eye movement that transfers the focus from one portion of the visual field to another (A. Nicole Somani, 2022).

A saccade is 7-9 letters long, whereas the human eyesight scans 15 letters forward (Weinschenk, 2011, P. 30).

There is a distinction between reading and understanding. For instance, people might be able to read the abstract of a scientific article and recognize the individual terms, but they may not be familiar enough with the subject area to comprehend the content.

Using a headline to convey context to consumers is preferable. It's better to employ patterns so that consumers can detect different fonts if they don't comprehend the context. It is preferable to select a simple and understandable typeface, as otherwise, the website's users may neglect it. People will think that if they face a problem reading a piece of a text, they will feel the same reading rest of it. Designers should ensure that there are sufficient contrasts between the foreground and background to allow readers to read easily. The length of the line should be kept to a minimum.

### **2.7.3 The way people remember**

Many hypotheses exist concerning how short-term or working memory works, according to psychologists. Only a few people can retain this memory before forgetting it. Its data can be readily tampered with. For example, If X is trying to recall Y's phone number or address while Z is conversing with X, X will become irritated. If he doesn't focus, he'll forget the phone number and address because the information from his working memory is easily lost. This is because working memory is linked to one's ability to concentrate. As a result, if someone wants to keep data in working memory, he or she must focus on it.

In usability, psychology, or memory research, the phrase “the magical number seven, plus or minus two” is very popular. This implies that an individual can remember between five and nine chunks (plus or minus two) (Miller, 1956). A designer should not add more menus or tabs to a screen because a human can only comprehend seven plus or minus two items of information at a time.

People have discovered an interesting way of remembering data as they can only keep three or four items in short-term memory if their information is not disrupted. This method is known as 'chunking,' which implies dividing data into groups. For example, This German phone number looks like this-

174-624-6736

Instead of remembering ten separate characters, a phone number is divided into three chunks, each of which contains four or fewer digits. Designers should not be required to

always use the number seven, plus or minus two chunks, and the size of each chunk is not always the same; chunks might be tiny or large.

#### **2.7.4 The way people think**

There are 23 billion neurons in the brain. That's a lot of brain processing power. In a single second, a human can process around 40 billion pieces of information subconsciously, but only 40 of them are processed in the conscious brain. One common blunder made by designers is to put a lot of information into a little space. As designers design for people, they must first understand how they think.

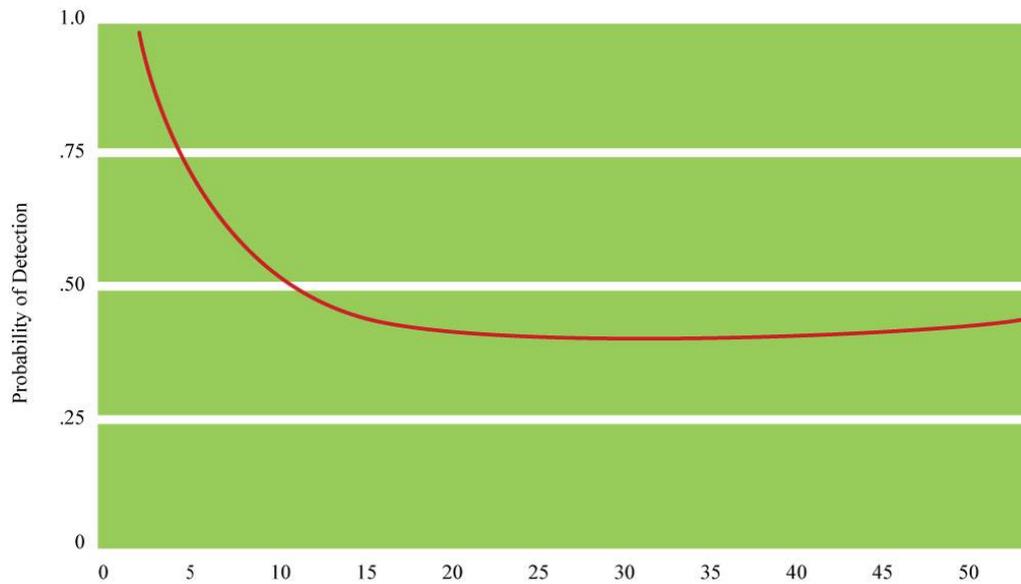
Some mental processes need a significant amount of effort. In human factors language, loads refer to mental processes like thinking and remembering things, as well as physical tasks like staring at a screen and hitting buttons, or mouse motions and typing. There are three types of loads, according to the theory: cognitive, visual, and motor. Among these three 'cognitive' loads requires more effort because when someone is told to look at a monitor (visual) and find something (cognitive), it uses more mental resources than asking someone to click a button or move the mouse (motor). Because when people try to remember anything or are busy with mental calculation (cognitive) it takes more mental resources. In website usability, if the designer must add some clicks where the users don't need to think, that's worth, it because adding a click is better than making the customer think. So, it's preferable to reduce cognitive or mental load, if possible, by increasing visual or motor load.

When information is given in the form of a story, it is more easily understood. Users' interest is captured and held when stories are offered on a website.

#### **2.7.5 The way people pay attention**

In many circumstances, people are easily distracted. Their focus is frequently drawn away from what they are concentrating on. They may, however, focus on one subject while filtering out all other information. This is what is referred to as selective attention. How tough it is to get their attention is determined by their level of involvement. For example, if someone wants to buy a present from a website but isn't sure what to order, a colorful image, video, or animation will easily capture that person's attention. If someone, on the other hand, concentrates on filling up an online form with his personal information will be tough to get his attention. So, designers should pay attention during designing a

website to the habit of people that they filter information. Considering that they should use color size, animation, video, and sound to grab users' attention.



**Figure 6: Attention starts to wane after 10 minutes.** During 0 to 5 minutes, the attention seems to be at its peak. From 5 to 10 minutes the attention drops down to less than 0.5%. After 10 minutes the attention remains to stay at a stationary phase.

People always love to develop a mental model about how often some incident can happen to have previous experience. Research conducted by Andrew et al. (1997) found that, if individuals expect something to happen at a certain regularity, they are more likely to miss it if it occurs more or less frequently than expected. They have a conceptual framework of how frequently something will happen and have placed their concentration on it.

### 2.7.6 The way people decide

While thinking about buying something (TV for example) in a conscious mind people care about the size, brand, how will it look in the room, buying from a reliable source, good review, and whether it's a good time to buy and so on. But research shows that people mostly buy something unconsciously taking decisions. These are some factors people consider while buying products unconsciously (Weinschenk, 2011).

- They love to follow other people while buying products: people like to check ratings and reviews.
- People want to own the latest thing, modern technology.
- They are competitive with other people including relatives in terms of buying products.

- They feel insecure. For instance, if they don't buy it soon, someone else might buy it.

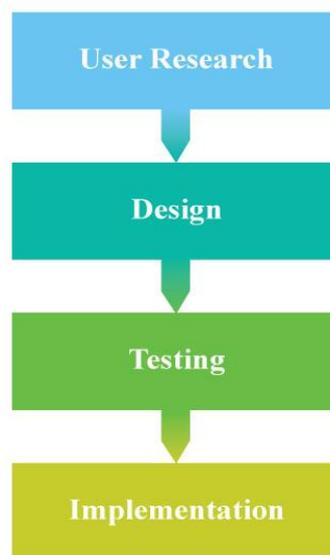
Taking decisions is a skill which is developed over time. When humans are confronted with a large amount of data, their brains are unable to comprehend it all. Most mental processes take place in the subconscious mind. Most decisions are chosen unconsciously as well, but that doesn't mean they're wrong, irrational, or terrible. People desire a logical and sensible reason for their choices. Because an unconscious reaction is faster than a conscious one, they are frequently unable to describe their behaviors or opinions.

## **2.8 Summary**

The second chapter is broken into several sections. The user interface is detailed in full in Section 2.1. In this stage, the significance of UI in e-commerce is also described. Usability and its importance in e-commerce are covered in Section 2.2. In Section 2.3, UX and its critical components are described. The interaction design and distinction between usability and UX are discussed in Sections 2.4 and 2.5. In Section 2.6, the literature necessary to comprehend the significance of a website's mobile version is covered, whereas human aspects as a component of UX are discussed in Section 2.7. The usability subsection also discusses the usability of e-commerce websites. Seven elements affecting UX design are examined alongside UX design. The visual design includes graphic design and structure design, which will initially attract customers. Mobile literature that supports mobile e-commerce and describes its significance is explored. Several human variables or behaviors, like how individuals perceive, how they read, how they remember things, how they pay attention, and how they decide when purchasing online, are also explored in this area. Therefore, this whole chapter focuses on the impact of Usability, UX, Interaction Design, Graphic Design, Structure Design, and Human Psychology on a website.

### 3. UX Design Process Overview

There are several steps to the user experience design process. In this chapter, four vital phases will be described which are most important to design a website for desktop or mobile platforms. This entire chapter will be discussed based on a blog written by Allabarton (2022). UX design is a repetitive process, according to her. There is a phrase familiar to most UX designers is “design is never finished” because new insights will continually emerge during the UX design process, which may result in revising previous design decisions. Figure 7 demonstrates the UX design process.



**Figure 7: UX design process for web redesign.** For web redesign, the UX design process is established. The most crucial steps are illustrated graphically.

The first phase in the UX design process is user research, which gives an idea about users, their behaviors, aims, motivations, and desire.

There are different processes of user research available. For instance, users’ interviews, online surveys, persona, user testing etc.

Wireframes and prototypes are the following steps in the UX design process. This provides a concrete object to test on genuine and future customers, which is important in ensuring that the designs are usable.

User testing is a vital aspect of the whole UX design process. It's been put to the test since it helps to enhance the original product or website design and see how well the changes made during the 'design' phase hold up under evaluation.

The last phase of this process is implementation. This is where the UX designer must play the main role. In this step, UX designers will implement all the knowledge they achieved in the previous phases.

### **3.1 User Research**

User research is the starting point to design an UX. It reflects not only how users behave, their motivation for using the product or website, and the goals they want to achieve by using the website, but also how users use the navigation system, where they encounter problems while using the product or website, and their feelings while interacting with the product. Conducting research with actual users is crucial to the effectiveness of the design because what designers know is instinctive and may not work for the users.

A book named “Researching UX: user research” written by Lang (2017) suggested that it’s better to think about the endpoint of the project while making decisions. Every project has an end objective, whether it's to generate new ideas, increase empathy for consumers, better comprehend a situation, or influence decision-making. Though it will be tough throughout the process, the sight of the end goal shouldn’t be loosened. Because it will influence the decision at every point.

He also stated that it’s not about providing documentation when it comes to great research; it's about generating design solutions through user engagements. To obtain the most effective research, UX designers should live with the users who will use the goods to collect their real-life experiences so that UX designers may make appropriate product development decisions. Reading research papers does not always result in smart and simple decisions because there is no personal experience associated with the suggestion.

User research is an essential part of the UX design process, because building a product or service based on assumptions or personal experience may fail to meet the needs of the users. Furthermore, UX designers may think the established system is simple to traverse since they are already familiar with it, but consumers may not feel the same way because they are unfamiliar with the system. So, the best way to develop a product is to know the people and their behavior, and who is going to use it. Thinking from the user's perspective is essential for understanding how users feel while interacting with the product and whether it meets the need for which it was created (Allabarton, 2022).

It's critical to distinguish between listening to users and observing them. Both strategies have a role in research, and both will give useful information. Depending on the research topic that needs to be solved, user research can be done in a variety of ways. For example, user interviews, surveys, persona, and user testing. For this study, user research will be conducted through online user testing, which will be described in a separate section.

### 3.2 Design

Wireframes and prototypes are created at this level of the UX design process. This provides a concrete object to evaluate real and future users, which is important in ensuring that the designs are usable. In the design phase, looks and usability both are important. Steve Jobs, the co-founder of Apple once said,

“Design is not just what it looks like and feels like. Design is how it works.”

Although a product's aesthetics play an important role in its attraction, if it doesn't operate effectively, the user will be unconcerned about how it looks. Creating a great user experience includes precisely arranging a customer journey for the users and guiding them through an understandable approach to locate what they're aiming for. Users would naturally follow a specific procedure when executing an activity depending on their prior experiences with similar products. So, the UX designer should concentrate on how well the goods can meet the customer's current habits.

Wireframing and prototyping are two processes that are covered by design.

- **Wireframing:** In UX design, wireframing is a representation or schematic of a webpage, software, or application page. Wireframe consists of the amount of space allocated on the page, distribution of pictures and information, the way contents get prioritized, and available functionalities on the page (Figure 8). A wireframe does not normally contain color, picture, and styling because it aims to give the designer a proper idea of the blueprint of the actual design. It helps the visual designer to be focused and avoid making mistakes. The wireframe can be simple like a pencil sketch on a paper and later it can be digitalized to create a prototype to add more detailed specifications.



**Figure 8: Collaborative wireframing UX design whiteboard** (Allabarton, 2022) The wireframing technique is portrayed graphically as a process of designing in a whiteboard by a UX designer.

- **Prototyping:** Before any development begins, a prototype is a rough form of the website or product that gives almost the actual scenario of a product or website and its user interface. This enables UX designers to test functionality and usability before investing time and resources toward complete production. Using the prototype, designers understand all the features and how the overall design works together as well as fix unwanted features and errors. This process helps the UX team to save cost, effort, and time. It is necessary to use a specialist prototyping tool while generating a digital prototype. Adobe XD, InVision, and Proto.io are some of the most recognized prototyping platforms.

After the prototype has been constructed based on the results of the user research, it is time to test it with real users to receive their input.

### 3.3 User Testing

Testing, like User Research, is an important aspect of the UX design process which enables UX designers to update the original product or website and check whether the modification was made during the ‘Design’ phase is perfect or not. It’s a wonderful technique to find and fix any faults or user issues that unnoticed during the ‘Design’ phase before moving on to the implementation stage.

Testing is an underestimated art. Many start-up organizations are hesitant to speak with genuine customers because of concerns about cost and time. Testing should not be overlooked, as even simple user testing can ruin a product or business concept. The time and money spent in this stage by the company will be saved a huge amount of both in the

future. According to the experts, testing with five genuine users can solve 85% of usability issues. With very little effort, testing can produce outstanding results.

Testing a product does not have to be difficult. It might be as simple as a paper prototype or a whiteboard drawing that can be used to demonstrate the product to the potential users. If the desired result is not attained right away, the testing might be repeated. Early testing has a significant impact on producing the product with the earliest adjustments, which helps in the product's quality maintenance. There are two popular testing methods: remote user testing and A/B testing. Remote user testing is a method of conducting a test over the internet when it is not possible to contact the user personally due to cost or the user's schedule. A/B testing, on the other hand, is more likely to be used to compare two versions of an existing website or application and identify faults by the users.

A chapter in the study on a section will explore two methods for engaging consumers in design: A/B testing and the AttrakDiff approach, both of which were used in this study. This will help in the identification of website usability issues that need to be redesigned.

### **3.4 Implementation**

Implementation is the last step of the UX design process where UX designers forward the concept that they learned during the testing phase. Developers' responsibility is to turn the concept of UX designers into fully functional products. Designers must interact with developers and, if possible, collaborate so that all design aspects are implemented correctly. Because the developers will turn the design ideas into a real or working website, the interaction between the UX designer and the developer is significant to the project's success or failure.

Here are some important points UX designers should keep in mind while working with the developers.

- **Honesty:** The end aim of the product should be expressed openly by the UX designer to the programmers.
- **Transparency:** Developers should also be open about the steps they take to get to the outcome they target. They must clarify why something will not function, not just that it will not work.
- **Involvement:** UX designers must collaborate with the programmers from the beginning of the work, not only when they are needed. They'll have a lot better understanding of what may or may not function quickly in this manner.

- **Work together as a team:** To avoid misunderstandings or conflicts during the project, designers and programmers should work in the same team and sit side by side if possible.
- **Be realistic:** While transferring the final design for implementation, it's good to talk to the programmers about what is feasible in terms of timeframe so that everyone can be on the same level about their objectives.
- **Be precise:** Designers and programmers should communicate clearly about their goals and requirements. Designers should be able to explain to programmers how the website or software should function.

### 3.5 Summary

In this chapter, the user experience design process is illustrated. Even though the UX design process is iterative, some procedures, including research, design, testing, and implementation, are discussed in length in this article. To create a powerful user experience in a company's website or products, it is necessary to integrate the services of numerous specialities, such as website development, marketing, graphics and interaction design, as well as the whole spectrum of user experience design disciplines. Even though the user interface is unquestionably a crucial part of the design, it is vital to distinguish the UX from the UI. In the UX design process, it is crucial to begin a project with user research and to detect UX issues early so that they do not pose a significant threat to the final product. It's ideal to work with designers and developers as a team, if possible, in the same place, to get the best results for the complete design project and save time. These are the most important takeaways from this chapter. This chapter will help comprehension of the procedure followed in this thesis.

## 4. Hypothesis

The research predicts, based on the above-mentioned facts and understanding, that the UX design process is a potential knowledge source. People who employ this methodology can accurately identify usability issues on an existing website and redesign it based on genuine, targeted user feedback. As a result, the following is the research hypothesis:

‘As the UX has a significant impact on the purchase intention of Getränke Hax's users, a systematic UX design process can be used to enhance the website's design maturity as well as users' satisfaction.’

### 4.1 Aim and objectives

This master thesis aims to analyze the existing problems of an existing website by A/B test surveys, asking some online questions from the users. Through the A/B test, two versions (Version A and Version B) of the Getränke Hax website were examined and find out the problems users are facing. In addition to that, to investigate the attractiveness of the website, AttrakDiff questionnaires were used. After carefully analyzing the data collected from the users, solutions were made. Based on the solution, an optimized website was created. This prototype was retested, and user input was gathered. After incorporating all this feedback, a final prototype was presented to the company. The primary objective of the research is to enhance the website's usability. To accomplish this, the following steps were taken:

- Test the usability of Getränke Hax's two website versions (A and B) using an online A/B test in combination with some tasks and questions.
- Use the AttrakDiff questionnaire to evaluate the attractiveness of Website Versions A and B.
- Redesign a website optimized for web and mobile platforms in response to customer feedback.
- Retest the optimized design and gather user input.
- Design a final prototype after resolving user concerns.

To explain the above-mentioned research hypothesis, this study focused on investigating and answering the following Research Questions:

1. How UX design approach can improve the sales of Getränke Hax, a shop of Deloma?
  - a) What are the expectations of the Users on Getränke Hax's website?
  - b) What is a good UX mix of methods to find the target users' requirements for Getränke Hax's website?
  - c) According to user feedback and design principles, what would be the best website design?
  - d) Does the same hold true for both the website and the mobile version?

## **5. Methods and Materials**

This chapter discusses the research approach and techniques for this master's thesis. The Mixed Methods Research strategy, as well as qualitative and quantitative data collection and analysis methodologies, are detailed here. This chapter will also explain the UX design process in the construction of the website of Getränke Hax, including suitable methods for data collection and subsequent data analysis. The chapter closes with a description of how the insights from the analysis parts are applied in the design phase where wireframes and high-fidelity prototypes were created.

### **5.1 Mixed-Method Research**

There are two types of scientific research - qualitative and quantitative research. Qualitative research is a type of study that relies on examining and comprehending the qualitative characteristics of a study area, including its value and importance. Quantitative research, on the other hand, is a method of investigation that tries to discover and explain the relationships and contrasts between statistical and tangible variables (Hanna, 2007). The qualitative method includes observing people and their interactions, engaging in activities, conducting interviews with relevant individuals, compiling life histories, creating case studies, and/or examining existing materials. Quantitative research refers to the survey questionnaire, telephone interview or in-mail surveys. These methods aim to provide measurements (numerical values) which are fair, reliable, and widely applicable (Steckler, 1992).

In the subject of industrial design, most studies conducted rarely use a single research method alone due to its multifaceted nature. To begin with, anything is made when it is designed. This does not have to be a physical product or artefact in the traditional sense; designs for ideas, services, or UI, for example, are equally tangible products of the industrial designer's design method. Second, all the designs, at least to remain effective and achieve their goals, must include both physical and conceptual features, such as beliefs and connections. Because of the multidimensional character of the design concept, such as user interfaces, these can be investigated in a variety of ways and using a variety of approaches. And the flexibility of the study materials provided emphasizes the researcher's position and inspiration even more. Although it is advantageous in some circumstances to concentrate entirely on the quantitative or qualitative parts of the

investigation, this does not cope-up with the nature of this study. To understand users more and collect data from them based on the research topic, the research strategy should be a mixed approach which was decided at the beginning of this study.

By using mixed methods research, a broader awareness of research challenges can be obtained along with a measurement of the difficulty of the mechanisms employed. Creswell (2007) described in his book, that a greater picture can be achieved by gathering and combining data collected using quantitative and qualitative approaches. He also pointed out that mixed-method research requires more work, financial resources as well as time investment. Furthermore, mixed methods research needs the development of a broader set of skills covering both quantitative and qualitative areas. Figure 9 states the overall research design which was used in this thesis.

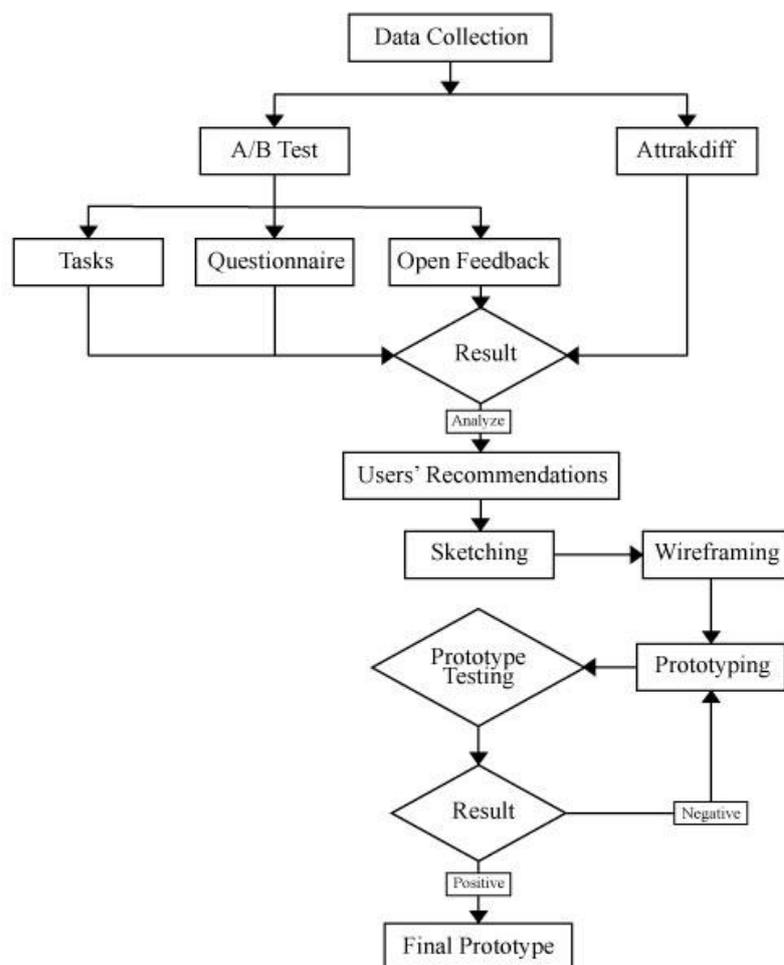


Figure 9: Overall Research Design Plan

## **5.2 Data Collecting Methods**

Due to the mixed methods research strategy utilized for this thesis, the types of study data and techniques for gathering them were diverse. In this part, the methods for collecting data are explored. The data collecting methods consist of two sections: A/B Test will cover in part 1 which includes the procedure for conducting the A/B test which includes the task and questionnaire. The main objective of the A/B test was also addressed in this part. Part 2 describes the procedure for comparing the attractiveness of two versions of Getränke Hax website using the AttrakDiff questionnaire

### **5.2.1 A/B Test**

A/B testing allows UX experts to make dynamic, data-driven decisions for products and services. A/B test is a shorthand term for a straightforward scientific experiment, where users are given two or more versions of products or services randomly to testify. According to Kohavi (2007), the best-performing version can be discovered using the A/B testing strategy. It is an effective way of evaluating UX issues in the form of several UX research approaches.

This method is frequently applied because, in the case of complex products, such as websites, it can be applied to judge between the better of two alternative designs. A/B testing data also gives a concrete indication of user behavior, which supports the idea of "perpetual beta." To achieve perpetual beta, goods or services must be examined frequently, with customer feedback looping through an iterative sequence that constantly attempts to enhance the user experience of that product or service (Young, 2014). A/B testing and other forms of user-centered study integrate nicely with the perpetual beta strategy, where a practice of consumer review assists in the development of goods and services that fulfil present customers' requirements.

A/B testing, like other common UX research methods like usability testing and heuristics evaluation, strives to provide insight into human preference. The key benefit of A/B testing and identifying features is its potential to offer measurable customer suggestions for existing UX issues (Young, 2014). Usability testing, on the other hand, aims to uncover prior undiscovered UX issues. When a clear design question can be stated alongside statistically measurable findings, A/B testing is the most effective process. Thus, A/B testing can be used as part of a larger UX research program to collect user data

and create a user experience that suits their needs. This thesis shows how A/B testing can be used to solve an e-commerce web design challenge.

This strategy has been proven to work in a variety of testing situations. Many people apply this method to determine if an alteration on a website is useful or harmful (White, 2012). A user survey or interview should be conducted through questionnaires to test the usability of a website. Sometimes tasks can be provided to the users or can be done with different methods. In this study, participants were given tasks to complete as part of an A/B test process, and questionnaires were provided immediately after they completed the tasks to assess their experiences. The same steps were followed, and the same questions were asked for both Version A and Version B.

According to Starikova (2018), A/B testing is intended to engage consumers with a product and boost the project's growth. In terms of e-commerce, testing with two distinct user groups resulted in the version that is the most useful to the customers and the designers. There is frequent communication between the designer and the users. While the designer is focused on producing a stylish look, the business owner is more concerned about achieving certain business goals. Figure 10 shows three major A/B testing benefits.

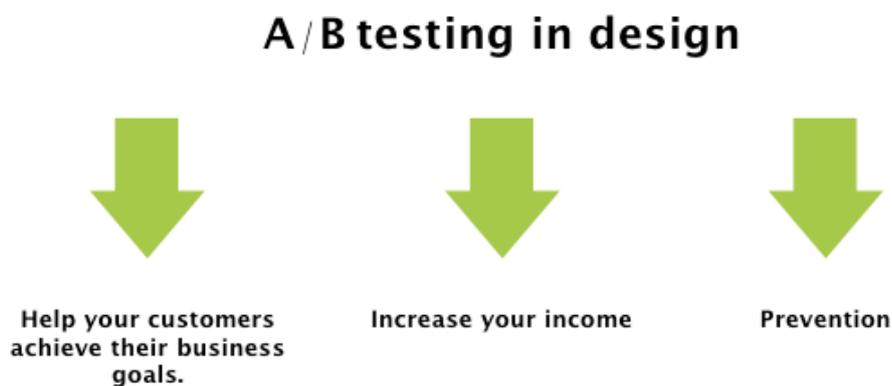


Figure 10: The main aim of A/B testing. Three key goals of A/B test were recognized, which were directed with green arrows and presented in a visual format (Starikova, 2018).

The following 3 goals of A/B testing are discussed briefly by Starikova (2018).

- **Helping customers to achieve business goals:**

Consumers enjoy several tools and procedures as a milestone toward greater accountability which helps to make more profits. Analytics, such as hypothesis testing and site tracking, is self-evidently the best way for the designer and users to emphasize the brand values of an e-commerce store.

- **Increasing income:**

It's worth mentioning that the company's last revenue is assumed to become the finishing line of business. As a result of real user testing, personalized support improves the webpage's performance and increases the number of target buyers.

- **Prevention:**

Collaboration between the designer and the customer often does not result in fruitful results. When making ideas in the ideation phase, the users overlook the overall design and expresses a biased viewpoint depending on their own experience. A/B testing establishes proof for many UI options and establishes the best one.

In terms of the website, A/B testing enables the resolution of controversy by dividing users into two groups (1 and 2) for two versions of the same component or website and observing which one meets the benchmarks more successfully.

#### **5.2.1.1 Tasks**

Users are assigned a set of tasks to complete over a period which includes providing information about their judgements, relationships with items, favored websites etc. Users are asked to submit images or short descriptive text as answers for these assignments. It was traditionally done using pens and notebooks but, nowadays, newer technology allows for more innovative alternatives such as creating the logbook on an electronic device and sending it over email enabling designers to investigate customer behavior in real-world scenarios as well as allowing them to fully appreciate user abilities and pleasure. Secondly, the diary research method which records qualitative data of user activities, behaviors, and experience over a while shows extrinsic aspects that affect customer experience that is tough to comprehend in a confined testing environment. Lastly, because a diary study typically takes longer to perform, it encourages participants to carefully consider their experiences and find alternative ways to express real emotions.

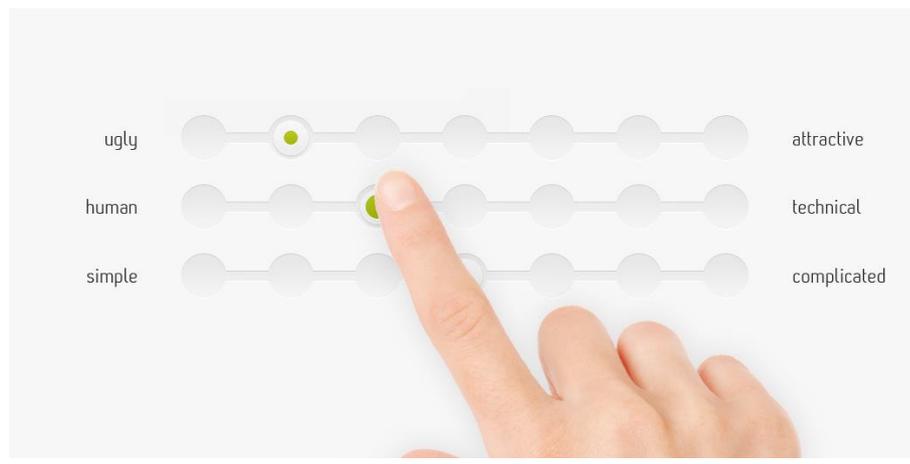
#### **5.2.1.2 Questionnaire**

A questionnaire is an effective way to gather huge amounts of data quickly (Martin, 2012). An online questionnaire is one kind of questionnaire which has made it easy to get data from a big community. Additionally, the existence of various online analytic tools such as Excel, Survey Monkey, Trifacta etc. makes evaluating the results simpler and anyone without prior familiarity with statistics or scientific study can conduct it. Another benefit

is that, because questionnaires are normally anonymous, individuals can complete them without feeling rushed which may allow them to express their actual feelings.

### 5.2.2 AttrakDiff Questionnaire

AttrakDiff<sup>2</sup> is a questionnaire that determines how appealing a website or product is in terms of usability and attractiveness (Hassenzahl, 2004). AttrakDiff is made up of 32 bipolar components with a 7-point scale that represents opposite activities (e.g., ugly - attractive) (Figure 11). The following UX dimensions are measured by the 32 items:



**Figure 11: Question example of AttrakDiff method** (Koller, 2003). With Seven-point scale used in the user studies for gathering interval data. Users choose a scale between ugly and attractive for example. The first one represents that the test result is ugly as ugly is the near.

Attractiveness, Hedonic Quality-Identity, Hedonic Quality-Stimulation, and Pragmatic Quality (Koller, 2003).

The pragmatic quality describes traditional usability aspects, i.e., efficiency, effectiveness and learnability whereas hedonic quality describes aspects that are not directly related to the tasks the user wants to accomplish with the software such as originality and beauty.

In this study, two versions of the Getränke Hax website's attractiveness and usability will be tested using the AttrakDiff questionnaire. Comparing these two results the best one will be chosen and redesigned as an optimized prototype as a final design proposal.

### 5.3 Research Design

The procedure for this research is given in this section. Planning, user testing, tasks, questionnaire, evaluation, brainstorming and low-fidelity prototyping, pilot testing, and final optimized design are among the steps in the design process. First, Getränke Hax's

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<sup>2</sup> Available: <http://attrakdiff.de/>

two versions of website design were tested for understanding the problem experienced by the two groups of users. The user testing consists of some tasks performed by the users. Then to know more about the experiences of the users some questions were asked them. Prototypes were created based on the user data collected from the A/B test as discussed in Section 5.2.1, followed up with a website attractiveness test and an analysis for iteration and the results. Current problems will be identified based on the results of the Version A<sup>3</sup> and B<sup>4</sup> tests, and with solutions, an optimized prototype will be generated.

### 5.3.1 Participants

Altogether 63 (Web 44, Prototype 19) people took part, 34 male and 29 female with ages ranging from 18 to 45+, in the first step of Getränke Hax's usability testing. They all live in the German cities of Duisburg, Essen, and Mülheim, where Getränke Hax provides its services. As mentioned in Section 5.2.1, the A/B test involved two sets of participants (A and B), each with roughly 22 individuals. It should be noted that the participants who took part in A/B testing were excluded when the prototype was designed and tested as described in Section 5.6.1.4. Approximately 52% of those in group A were young people aged 26-35, whereas 78% of those in group B were of the same age (Table 2).

Age Group	No. of Participants		
	Overall	Group A	Group B
16-25	11	7	4
26-35	27	12	15
36-45	4	4	0
45+	0	0	0

Table 2: Age group of both groups' participants

People who buy frequently online were selected for this study because it will be easier to extract real information from them. Among the participants, 52.17% of group A shop online once a week whereas 42.11% of group B shop in the same timeframe (Table 3).

<sup>3</sup> Available here: <https://www.getraenke-hax.de/>

<sup>4</sup> Available here: <https://www.deloma-shop-demo.de/>

Shopping Frequency	No. of Participants		
	Overall	Group A	Group B
Once a week	20	12	8
Twice a week	13	8	5
Once a month	9	3	6
Almost everyday	0	0	0

Table 3: Online Shopping Frequency of the Participants

In terms of education, 70% of group A members are university postgraduates, while the remaining 30% are college graduates. Group B had 55% of participants with a post-graduate degree and the rest were college graduates. All the participants from both groups A and B have excellent knowledge about online shopping using computers or mobile.

Participants were also asked about the device or devices they use to order products to know. Everyone from both groups prefers to order through their mobile phone as well as 60.87% of participants from group A and 57.89% of participants from group B also use a laptop to place an order (Table 4).

Preferred Devices	No of Participants		
	Overall %	Group A	Group B
Laptop	59.38%	14	11
Mobile	100%	23	19
Tablet	16.59%	4	3
Other	4.35%	1	0

Table 4: Preferred Devices to Place Order by the Participants

A new group of 19 participants also tested the finalized website prototype for both the web and mobile platforms (Around 75% male and 25% female). 70% of the participants were university postgraduates with more than two years of product experience. The remaining individuals have less than a year of experience with this website.

### 5.3.2 Procedure

For both the A and B Versions of this study, the A/B test technique consists of two steps: tasks and questionnaires (Section 5.2.1), and AttractDiff questions (discussed in Section 5.2.3). Participants were split into two groups (Group A & B) to test two different versions of the Getränke Hax website (Version A & B). Survey Monkey created two questionnaires that were mailed to each group's participants. This survey was done entirely online. Figure 12 shows Version A, which was tested by the group A participants.



Figure 12: Homepage of Getränke Hax Website Version A.

Figure 13 illustrates Version B which was tested by Group B.

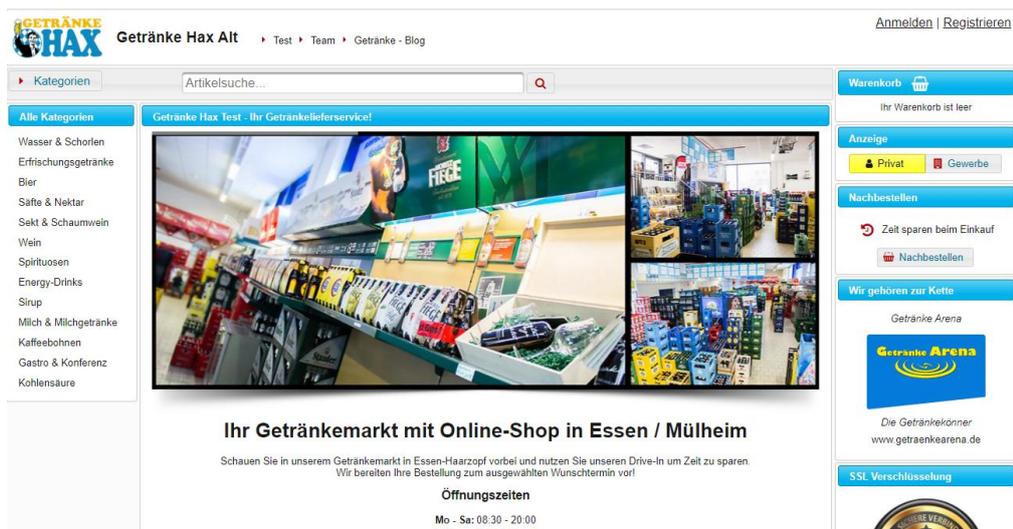


Figure 13: Homepage of Getränke Hax Website Version B.

Among all the attendees, some were connected via video call on social media. During the virtual test, they were greeted and thanked for participating in the procedure. Users who

participated via video call received the test procedure (Provided in Appendix) verbally, while the rest of the attendees received it via email. Because some of them were new to the website, they were given some time to get used to it. Then, they began completing tasks one by one using the mailed link of the task. Through video calls and screen sharing, a few of those who agreed were monitored for the duration of the test. Average completion time, amount of page visits, and rate of success were observed and recorded as performance parameters. Those who refused to accept video calls were asked to record their screens which were later used in the analysis phase of the results. Regrettably, not everyone had a screen recorder with them. Participants in this program were able to capture and send back recordings of their screens. The participants were thanked after the test. There was no time restriction in place. The exercises, questions, and attractiveness testing took an average of 10 minutes to complete.

### **5.3.3 Material**

This study utilizes Survey Monkey, a prominent data collection platform. Survey monkey assists researchers in gathering information from users and analyzing it. It also allows users to create a link and send it to the target customer via email. The data collection questionnaire has four tasks and sixteen questions (Provided in Appendix), nine of which were used to collect personal information and the rest seven to test website usability.

The following were the assigned Tasks:

1. Please register yourself on the website.
2. Log in here.
3. Can you add a Coca-Cola 0.5 l to the cart?
4. Would you please check out your products and pay the bill?

After completing these four tasks, respondents were asked seven questions regarding their experience. Following this, open feedback (Provided in Appendix) was requested from the users regarding their overall website looks.

The first two tasks are about registering and logging in, the third task is about browsing, and the last task is about checking out.

32 bipolar components were utilized to evaluate the attractiveness of both Versions (A and B) of the Getränke Hax website for the AttrakDiff questionnaire (Chapter 4.4.2).

## 5.4 Results

This section will present the study's findings. This component of the results is split into two sections: the A/B test and AttrakDiff. Because user tests were conducted using the Survey Monkey and AttrakDiff questionnaire, the results were also analyzed by them.

### 5.4.1 A/B test

As A/B testing includes two components: tasks and questionnaires, the results are presented in two parts. During the first section of the test, the duration of task completion, the number of page views, and the task completion success rate for each task and participant were recorded. Table 5 shows the A/B test results for both versions of the Getränke Hax website. All four activities were completed by more than 95% of the participants in both versions. The time it took to complete some tasks, on the other hand, varied substantially. For example, the average task completion time for Version B was more than 12% longer than Version A for Task 1 (Available in Section 5.3.3).

Websites	Tasks No.	Success (%)	Fail (%)	Avg. Time is taken (sec)	page viewed avg. no.	No. of avg clicks
Version A	1	95	5	1.25	3	15
	2	95	5	0.35	3	4
	3	100	0	0.30	3	3
	4	95	5	1.15	7	9
Version B	1	100	0	1.40	4	16
	2	100	0	0.36	3	5
	3	100	0	0.34	3	4
	4	100	0	1.36	8	10

Table 5: Users' tasks and overall performance result

In the A/B test, task1 took substantially longer to complete in Version B (avg. 0.15 seconds longer) than in Version A. It also needed more clicks. Task 2 took the same amount of time to complete because both versions have the same design for the 'Login' page. When it came to task 3, Version B took somewhat longer than Version A to look for products. In Version A, performing task 4 (putting an order) required less time than in Version B. All these tasks are available in Section 5.3.3.

Most participants had previously used the site to place orders and because of the familiarity, the time they took to accomplish a task was much shorter than those who

never used the website. Participants with previous experience were also more economic with the number of clicks needed to accomplish tasks.

Because young individuals have prior browsing experience and people with experience of using similar types of websites influenced task completion time, two variables - age group (shown in Table 2) and online shopping frequency (shown in Table 3), had a substantial impact on this outcome. On the other hand, gender, the types of things they buy and their professions had no effect on the task completion time. Overall, Table 5 shows that Version A has a considerable favorable influence on time spent and clicked during task completion when compared to Version B.

After both Version A and B participants completed the exercise, seven questions were asked about their experience while performing the task. These questions were posed to identify specific issues with website design, such as navigation, product category, aesthetics, product information, and trust. Figures 14 to 17 show client satisfaction levels with the A and B Versions of the website.

Some notable user feedback is supplied and exhibited in Version A and B comparison:

Q1. Overall, how well does our website meet your needs?

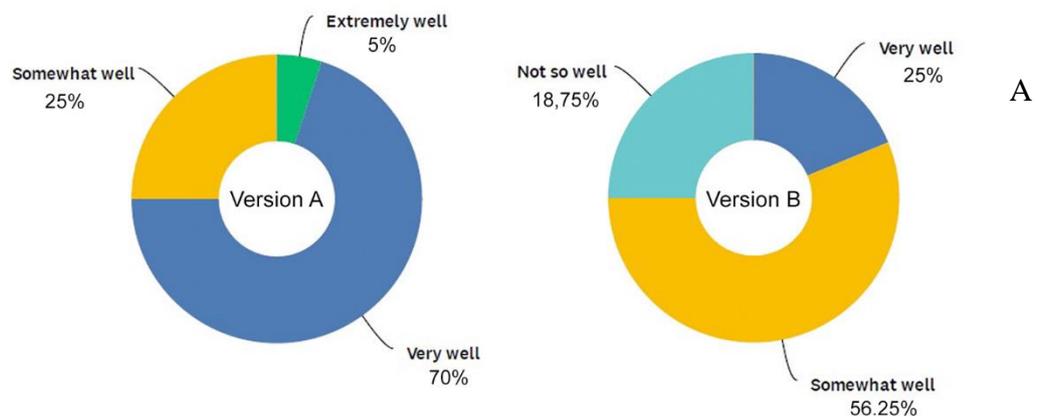


Figure 14: Comparison of Users Need Fulfilment in both versions

comparison between Version A and B reveals in Figure 14 that Version A satisfied the users' overall needs slightly better. 70% of test participants said Version A satisfied their demands "very well," whereas 56.25% said Version B satisfied their needs "somewhat

well." Only 5% of participants thought Version A suited their needs exceptionally well whereas no one from Version B said the same.

Q2. How easy was it to find out the product COCA-COLA on our website?

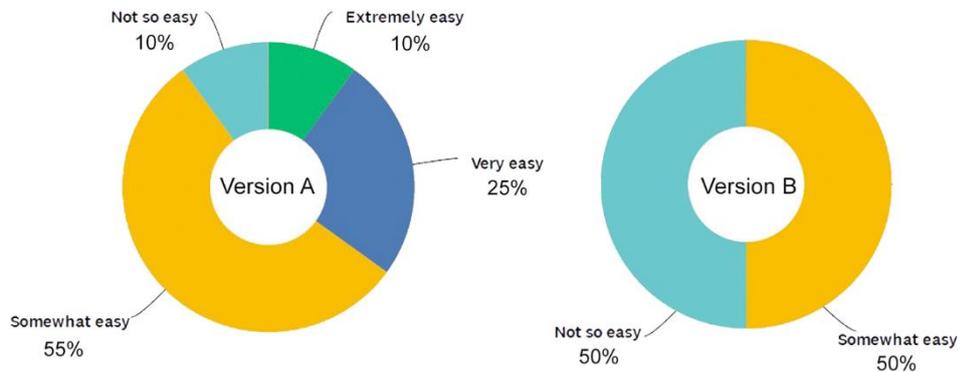


Figure 15: Comparison of Finding Particular Product in both versions

Figure 15 illustrates that customers had a better experience with Version A when it came to finding desired products than with Version B. Even though most users considered it somewhat easy to identify goods in both versions, some users found Version A to be very easy and extremely easy.

Q3. Did it take you more or less time than you expected to find out the product CATAGORIES on the website?

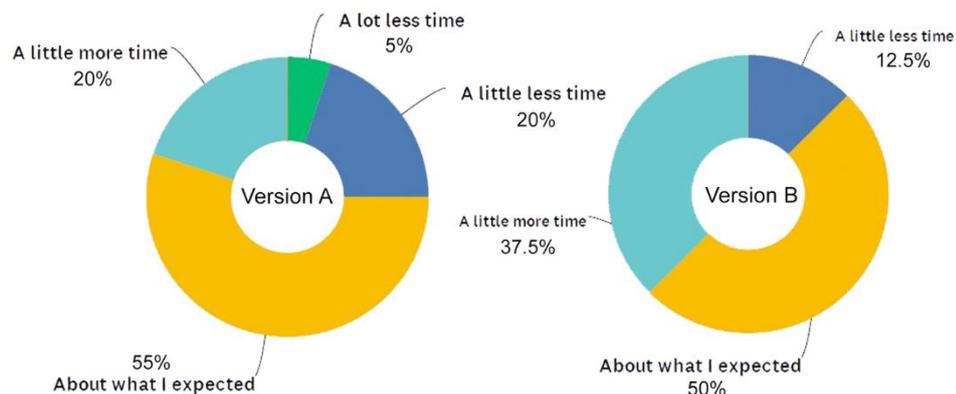


Figure 16: Comparison of Finding Product Category in both Versions

Figure 16 indicates that customers' expectations for discovering product categories on the home page are generally met in both versions. Between the two versions, Version A took significantly less time to locate the category. Furthermore, 20% of Version A participants took a bit longer to figure out the category, but 37.5% of Version B users took the same

amount of time. In Version A, 20% of participants took somewhat less time, whereas 12.5% of participants took the same amount of time.

Q4. How visually appealing our website design is?

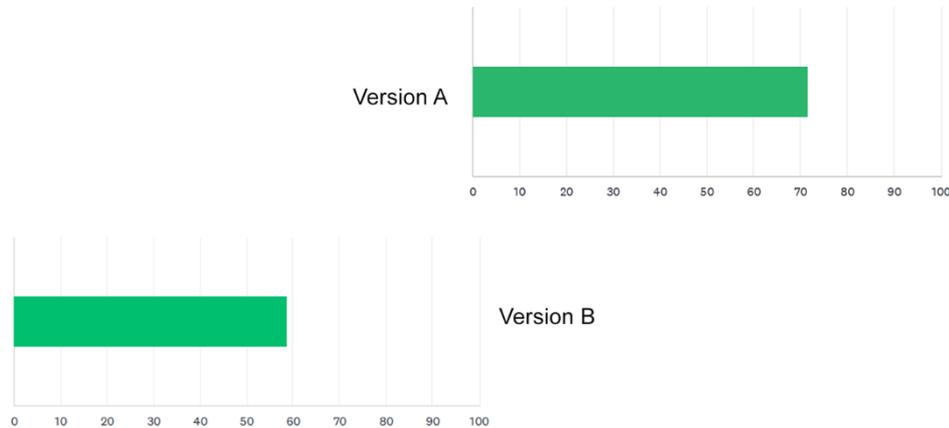


Figure 17: Comparison of website aesthetics of both versions shown in %.

This question was posed to the participants to determine the aesthetic appeal of both versions. Version A received more than 70% of the total attractiveness scores, whereas Version B received less than 60% (Figure 17).

Most participants in both versions found it simple to comprehend product information. Some individuals, on the other hand, found it neither simple nor challenging. In terms of product information trust, 5% of users have a high level of trust, but no one has a high level of trust in Version B. In both versions, more than half of the participants regarded it to be trustworthy at a moderate level. 20% of those polled stated they have some faith in the product information. Due to website flaws and UI design, the majority of participants find it less trustworthy. Based on these considerations, individuals are more likely to recommend Version A (72%) than Version B (approximately 60%) to their friends and other persons.

#### 5.4.2 AttrakDiff Questionnaire

The AttrakDiff results were quantitative and displayed using a scale (-1-2-3 0 1 2 3) with negative meanings closer to -1 and positive meanings closer to 3 and 0 correspondence to neutral. This test was conducted to find out the better version of the Getränke Hax website comparing Version A and B. This evaluation took place after some tasks were performed by the users. For each of the three measurements, Figure 15 shows the mean values of the four AttrakDiff dimensions for both A & B Versions.

In all aspects, the experience was slightly better in Version A compared to Version B. The pragmatic quality and attractiveness dimensions have a little better experience than the other dimensions.

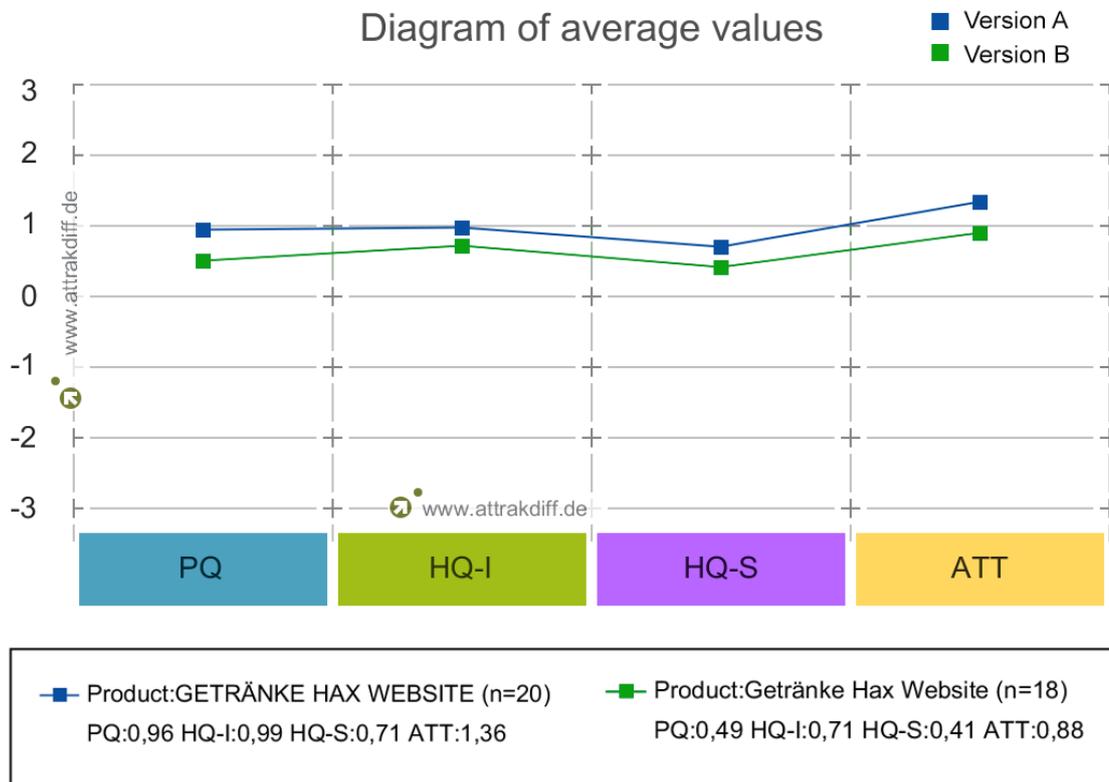


Figure 18: Diagram of average value for version A&B

The first AttrakDiff dimension in Figure 15 is Pragmatic Quality, which contains the mean values of the 7-word pairs. The pragmatic quality describes traditional usability aspects, i.e., efficiency, effectiveness and learnability. It is the task-oriented nature of an experience. The second AttrakDiff dimension is hedonic quality, which contains the mean values of another 7-word pair. It describes quality aspects, which are not directly related to the tasks the user wants to accomplish with the software, for example, originality and beauty. Both are subjective characteristics of a user interface. Therefore, consumers' evaluations of these elements may vary. The approach implies that pragmatic quality and hedonic quality are two distinct aspects of an interactive product's quality. The model was improved by Hassenzahl (2003) separating hedonic quality into identity (HQ-I) and stimulation (HQ-S) components. Identity emphasizes the human need be viewed in a particular manner by others. 'Humans express their personalities through their products' whereas stimulation focuses on the human urge for personal development, that is, the need to improve personal abilities and knowledge.

Figure 16 shows the mean values for all the word pairs of Version A (Marked in Blue) & B (Marked in Green). The AttrakDiff result shows that in most cases the user experience was slightly better while using Version A.

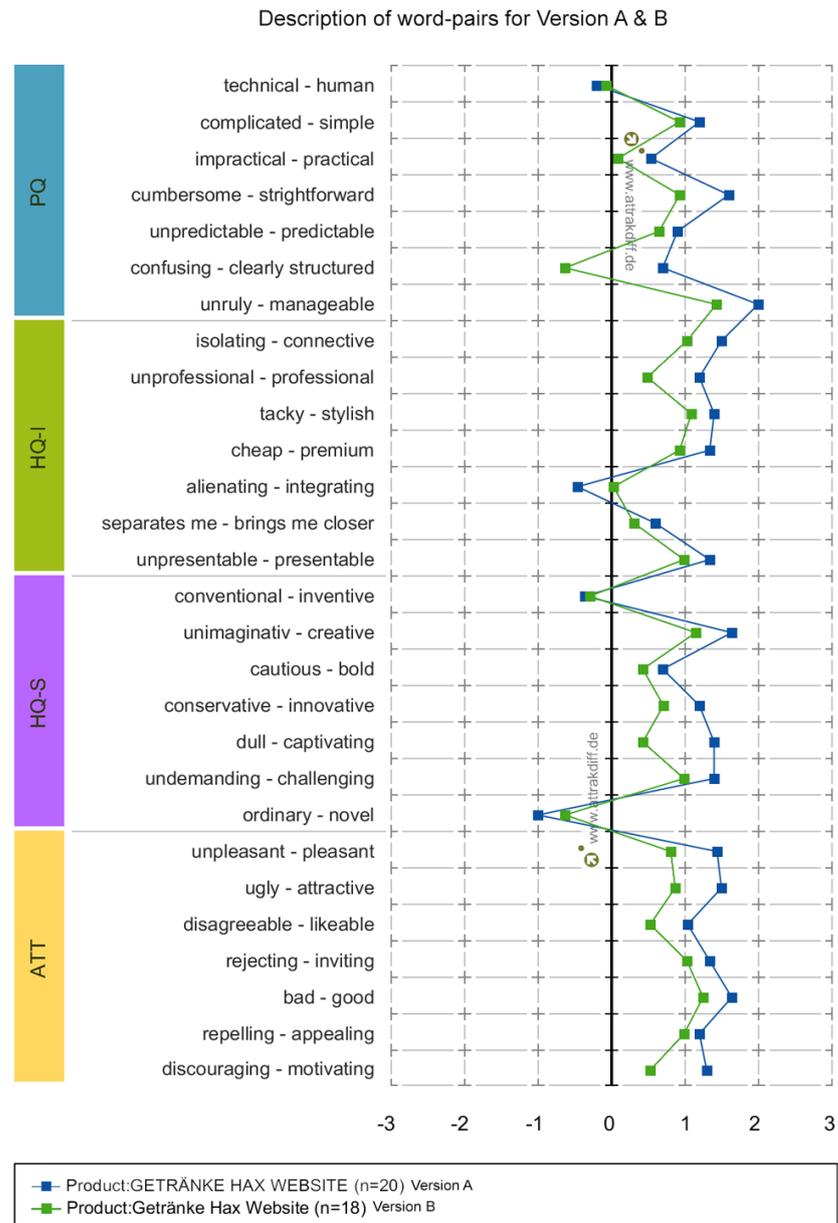


Figure 19: Word pares comparison between Version A & B

then Version B. But in a few dimensions, Version B provided a moderately better experience to the customers compared to Version A. Most of both versions' word pares were positive as 2 whereas some were 1. Only five-word pares from all dimensions except attractiveness were negative in both versions which were mostly 0 to -1. Not a single pair reached the top (3) or the bottom (-3).

This result provides a positive impression of the website, suggesting that it is a manageable tool; but, to offer users a lasting positive experience, some areas must be enhanced.

## 5.5 Key Learnings

This section summarizes the feedback given by the users from the events (I) performed tasks by the users, (II) questionnaire results, (III) open feedback received from the participants and (IV) the AttrakDiff questionnaire. Table 6 shows the suggestions received from the users while taking their overall opinion from open feedback.

<b>Page Type</b>	<b>User's Feedback/Suggestions</b>
Home Page	As search button plays an important role to find out products should be highlighted. Categories should be taken out and put simply so that users can instantly notice them. More text on the home page makes users confusing, so more icons should be used rather than text.
Product Page	On the product page, products should be aligned in a manner so that the users can switch between product categories without going to a new page. The product category has been placed left and is visible.
Login Page	Log in page structure should be a bit larger so that users can notice it.
Register Page	The register page should be updated and user-friendly for data entry. It is now difficult to trust the website due to its flaws and design. User confidence is very important.
Cart	The shopping cart should be notified correctly when a product is added and removed if added by mistake. Order status should be also there to track the update of the product delivery process.
Checkout	The flow size should be kept as minimal as reasonable. A lengthy process may cause a user to skip it.

Table 6: Feedback given by the users to redesign the web.

In addition to that, for a successful online sale, a professional site is essential. A modern and professional-looking website will never be complete without user testimonials and suggestions from well-known groups or individuals that have used the service for sale.

The most important aspect of communication is determining who the intended customer is to use proper language.

## **5.6 Result Implementation**

As stated previously in this paper, the goal of this study is to compare Version A and Version B of the Getränke Hax website to discover any usability-related concerns. Users' input was collected utilizing some of the strategies discussed in Section 5.2 to achieve this goal. Some issues were discovered, which were also detailed in Section 5.4. Section 5.5 discussed evaluating user feedback and making decisions throughout the process based on user comments or feedbacks. This section will implement the user suggestions from earlier sections and create an appropriate design prototype based on Version A, as it's slightly better than Version B, for the company's web and mobile platforms.

### **5.6.1 Design**

The first optimized prototype for both mobile and online versions is presented in this design section. Version A was used to carry out the design process. Because of the company's recommendation, the existing color and typefaces were not modified during the web platform design, and various functionalities were also not changed. The mobile version, on the other hand, is an entirely new wing for Getränke Hax. During an online poll, it was determined that people prefer to place orders on their mobile phones (Shown in Table 4) rather than on their computers.

#### **5.6.1.1 Sketching**

The paper sketches are the first step in the concept generation process. Following the analysis of user feedback, some brainstorming was done on a paper draft, which is a quick and easy way to adjust as needed. Other competing websites were investigated based on comments to evaluate how they supply products to their customers. It was helpful to understand their approach. After that, sketching began, and it was modified a few times until the final product was achieved (shown in Figure20).

The home page of Getränke Hax's website blueprint for web and mobile is shown in Figure 20. Considering all the feedback from the users (Available in Section 5.5), this sketching was done. The product categories are now prominently shown in both the online and mobile versions and will also appear on the left side of the product page in a larger format. The categories and certain buttons such as reorder, login etc. on the home page

were moved in the web version. Slider categories are used in the mobile version, whereas static categories with drop-downs are used in the web version, as seen in Figure 20. Menus that are in the upper section of the web version are in the lower section of the mobile

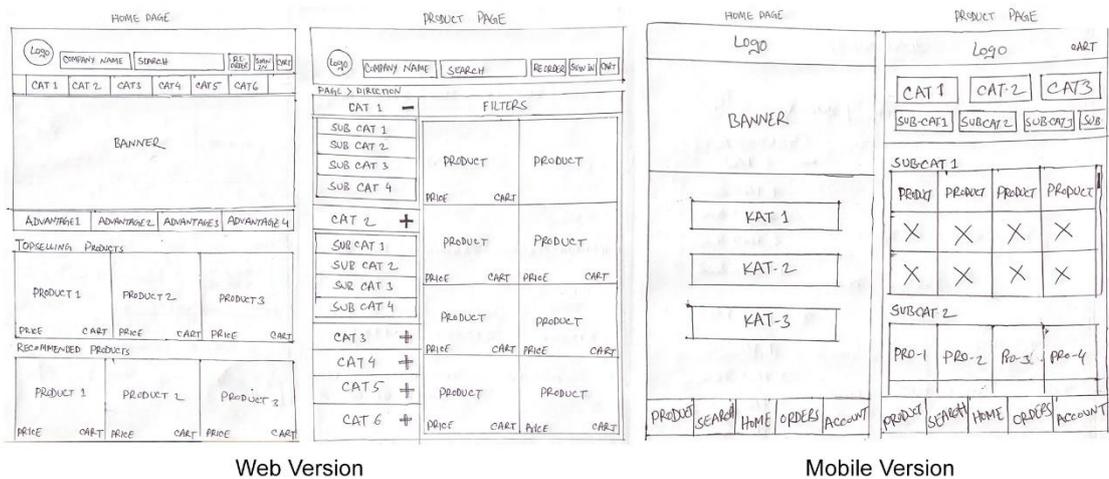


Figure 20: Sketching of web and mobile Version

version. While working on the mobile version, the rule of thumb for mobile reachability was examined to improve the user experience (Kirhenstein, 2015). People use their phones in three basic ways, according to Kirhenstein: one-handed, two-handed, and cradled. The statistic shows that 49% of people use their phone with one hand, 36% with curdled, and 15% with both hands. This is a natural occurrence, and designers should strive to give the greatest possible user experience without causing them discomfort.



Figure 21: Mobile Reachability in rule of thumb (Kirhenstein, 2015).

People just use their thumbs to control smartphones. Because of physical limits, the human thumb cannot reach the middle or top of the screen (shown in Figure 21). As a result, while creating something, designers should take this in mind and avoid placing any

important buttons in the top left or top right corners (Kirhenstein, 2015). Therefore, when designing the mobile version, the important buttons were positioned at the bottom.

### 5.6.1.2 Wireframing

The sketched mock-up was transferred to digital representation during the wireframing stage using Adobe XD<sup>5</sup>, software for designing graphical user interfaces for web apps and mobile apps. It was selected since it is appropriate for this project. Wireframing was used to rebuild several of the primary pages (shown in Figure 22) of the web version where users were having issues.



Figure 22: Wireframing of Web and Mobile Version

Figure 19 illustrates the home and product pages for both web and mobile versions. Wireframes are a crucial aspect of the redesign process since they allow designers to experiment with website structures while also focusing on individual elements.

### 5.6.1.3 Prototyping

Prototyping is the next step after creating a wireframe. This section displays the high-fidelity prototypes generated because of the research for both web and mobile platforms. This is the updated version; nevertheless, after the design is complete, a pilot test with users will be conducted to check if they are satisfied with the enhanced prototypes when placing orders. Any user feedback received throughout the test was implemented, and the final design was presented to the company.

**Web platform:** Usability testing was important in gaining an understanding of user demands and behavior while interacting with the website. Understanding the business purpose was also essential during the design process. Because it expresses the brand personality, having a good, interactive, and welcoming UI are vital. During the

<sup>5</sup> Available: <https://www.adobe.com/products/xd.html>

implementation, the users' feedback, as mentioned in Section 5.5, was followed. Figure 20 illustrates a high-fidelity prototype of the Getränke Hax home and product page.

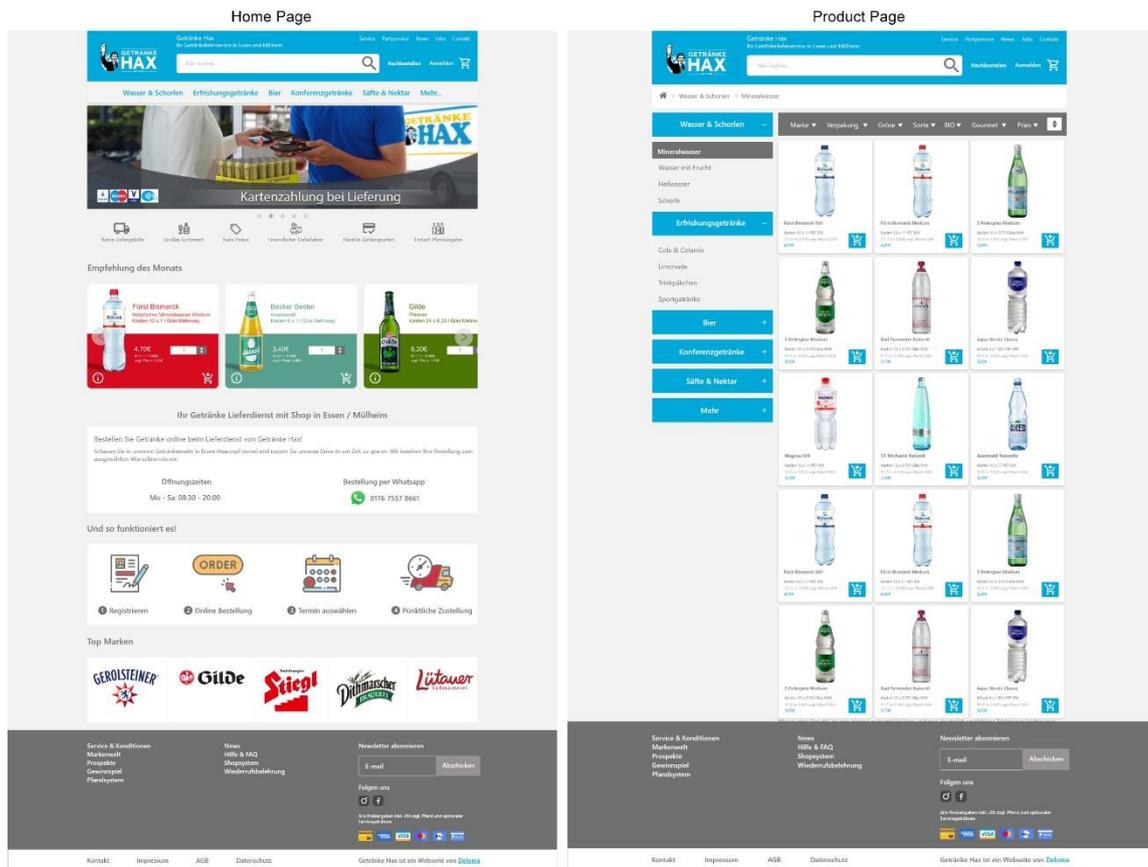


Figure 23: Updated Home and product page of Getränke Hax

It shows that the icons are now the same style, the search function is more prominent on the home and product pages, categories are in the front, products are more highlighted, and texts are less prominent on the home page. More goods are now displayed simply on the product page, and side categories are larger, with new categories added as subcategories. These changes are implemented in Version A (Available in Figure 12).

The updated interactive prototype for the web is available here: <https://urlzs.com/gzV5w>

**Mobile platform:** The mobile platform is critical because 100% of the people who participated in user testing prefer to place orders via mobile. This is because they can simply place orders no matter where they are or what they are doing. They can even place an order with just one hand. This mobile version was created to provide users with a better website experience. The basic idea is that while users get more satisfied with the website, they would place more orders. Figure 24 exhibits several of the Getränke Hax website's mobile pages. This design was done considering users' feedback and research about the competitors such as Amazon, Flashenpost etc. mobile-optimized websites and based on

web prototype functionality. People are used to using this kind of website in every online shop.

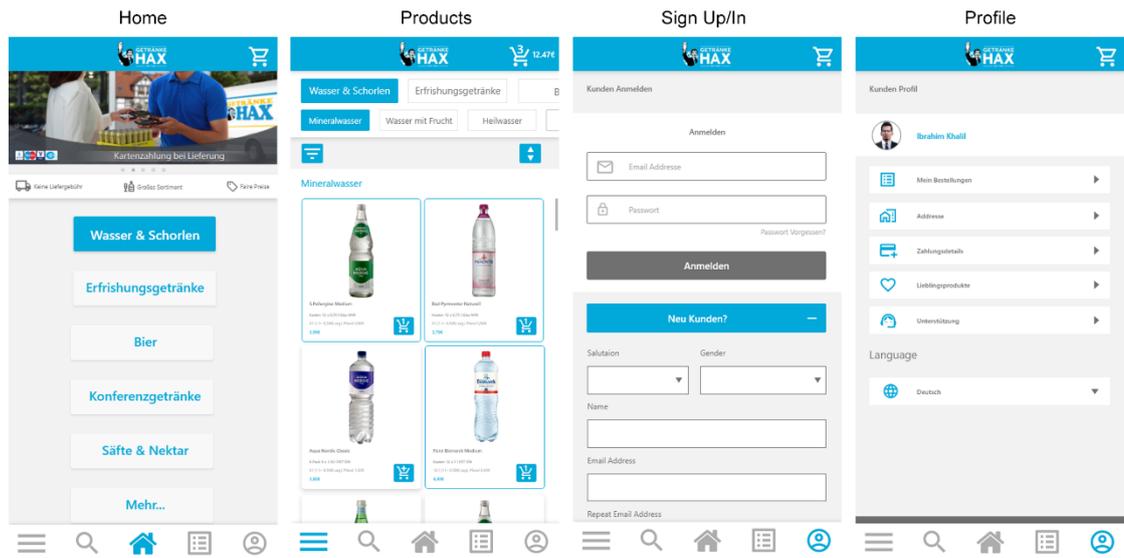


Figure 24: Some Pages of Mobile Platform of Getränke Hax Website

The navigation menus are now near the bottom of every page, as shown in Figure 24, so that users may simply navigate them with their thumbs. They will be able to control most of the crucial sections with just one hand. Users are already habituated to using these types of websites; therefore, the symbols and style were created with that in mind. The prior shopping experience will provide them with ideas and directions on how to proceed.

The new interactive mobile prototype is available here: <https://urlzs.com/2tkho>

#### 5.6.1.4 Prototype Testing

After building the prototype for the web and mobile platforms, it was tested again by users to see how they felt when using it, where they encountered problems, and if they had any suggestions. As stated in Section 5.3.1, this experiment involved 19 people (11 male and 8 female). Survey Monkey and the AttrakDiff questionnaire were also utilized for this. Most of the participants were in their twenties and thirties (age group between 16 and 35). More than 45% of participants buy products online every week, while more than 30% order once a month. Most attendees used the internet site to order drinks (100%), food (26.32%), and clothing (89.47%). To order products, they all choose laptops and smartphones, with a tiny percentage preferring tablets. Because both the mobile and web versions were examined during this process, around 70% of participants provided feedback on the web platform, while 30% provided feedback on the mobile platform. Users were emailed two links, one for web and one for mobile. Users selected one to

provide feedback based on the device they were using at that time. After completing several activities, 47% of consumers said it was easy to operate, and over 55% thought ordering products were extremely simple.

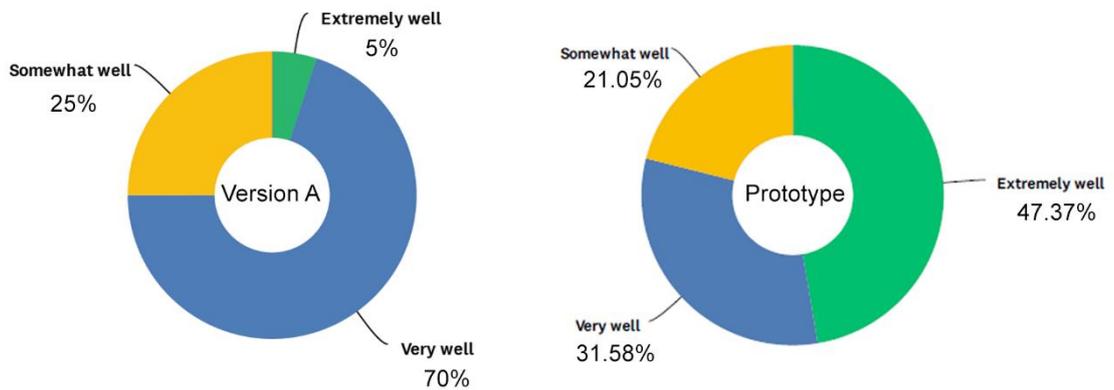


Figure 26: Comparison of user's overall feedback about website operation

When compared to typical website usage, over 45% of users thought this prototype took a little less time, while 31% thought it took the time they expected. Figure 26 illustrates that the prototype exceeds Version A in terms of user satisfaction. Because just 5% of people report feeling good when using Version, A, however over 45% report feeling the same when using the improved Prototype.

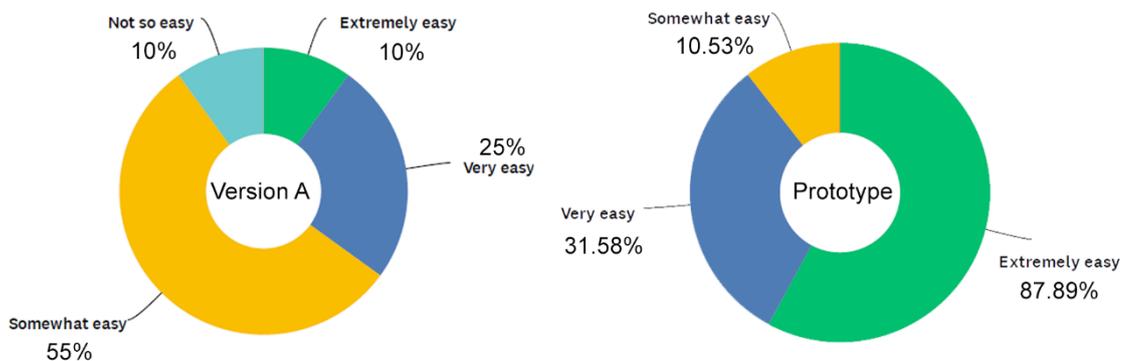


Figure 25: Comparison of how easy to find desired product.

As shown in Figure 25, more consumers considered it incredibly easy to find desired products in the Prototype compared to Version A. For 25% of Version A users, finding products was extremely easy, whereas for more than 30% of Prototype users, finding products were very easy.

The new streamlined prototype is 19% more visually appealing than Version A, and interpreting product information is as simple as before. Users are likely to suggest this website to 85% of their friends or colleagues, a 15% increase over the present website.

These data were received from the users using the same questions (Available in Appendix) used to testify Version A & B. Users were quite enthusiastic about the new design, particularly the mobile platform, and it took a lot less time to make an order compared to the current website.

Users were asked if they had any comments on the website after taking the test to get their feedback. They made several minor suggestions, such as adding category icons, using tiny animations, and updating the website with a drop-down menu. They also complained about various buttons on every page in both the web and mobile versions not working (e.g., search option, drop-down menu). The website was adjusted in response to the users' feedback. Because of the constraints (Chapter 6) of the application Adobe XD used to design the prototype, all these feedbacks were overlooked when updating the final design.

## 5.6.2 Final Design

This section presents the final high-fidelity prototype after implementing the prototyping testing feedback which was proposed to the company for further development. People had difficulty locating the product categories because they were narrow and lacked icons. As a result, new icon sets for product categories have been designed. Figure 27 depicts the web version's home page and product page.

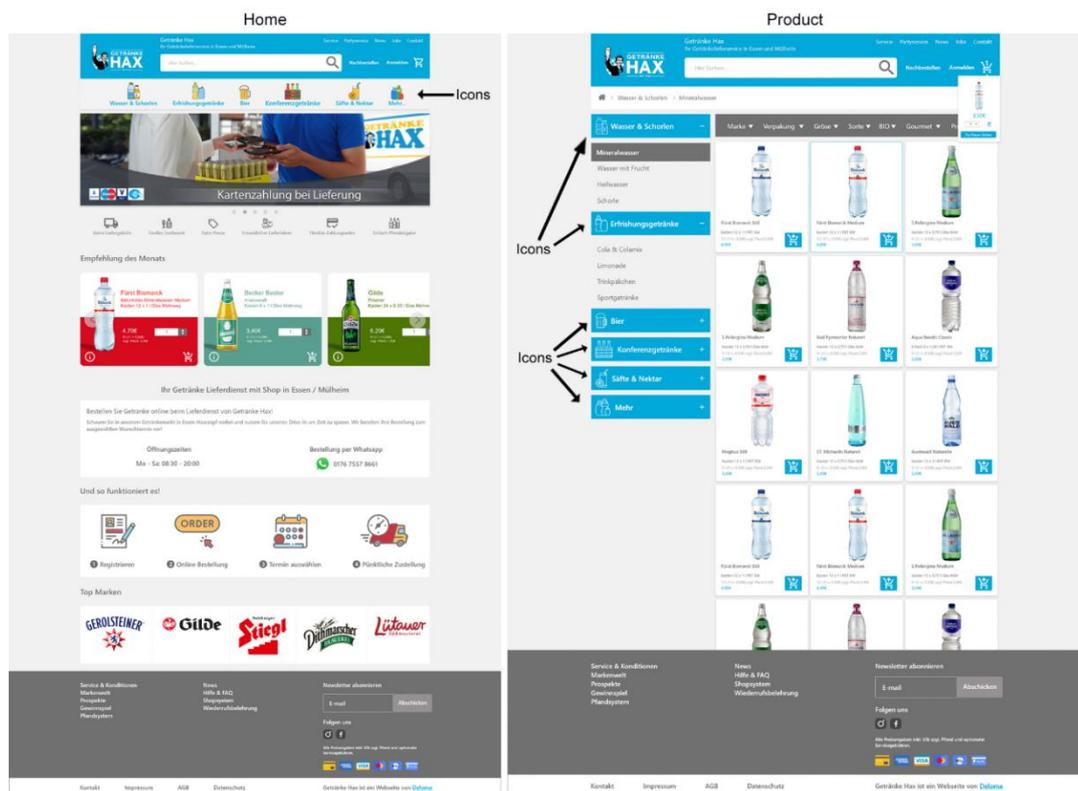


Figure 27: Home and Product page.

The new icons were placed in a different color on the home page in this final web version. Users will now be able to quickly locate product categories. On the product page, white icons were also used. While adding products to the cart, a short pop-up animation with the number of products added was also designed. It was introduced so that users would be aware of the new products right away. As discussed in Section 2.7.4, people can perceive a small amount of information at a time, more icons were used instead of texts. Products were organized straightforwardly so that users could easily add or delete items from their carts. Users may now add products to their cart and check out with fewer clicks and less stress with this updated version.

Unlike the current website, users can quickly register or log in with their credential data from the same page without having to switch between separate pages in the prototype. Existing users will be able to log in, but new customers would have to register to place an order. Both pages are illustrated in Figure 28.

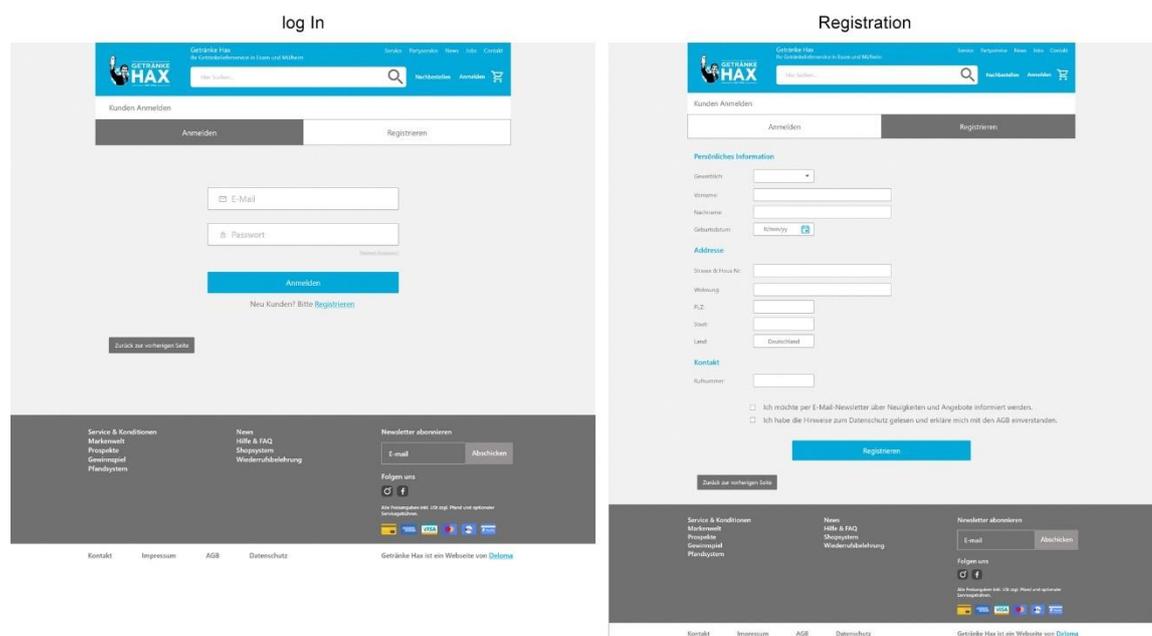


Figure 28: Log in and Registration page.

Users can add or change their photos, personal information, and payment information after registering. They will also have access to the 'Order Summary', which will provide information on the current order status as well as previous orders. Users will be able to repurchase items from previous order lists. Figure 29 illustrates Profile and Order Summary Page.

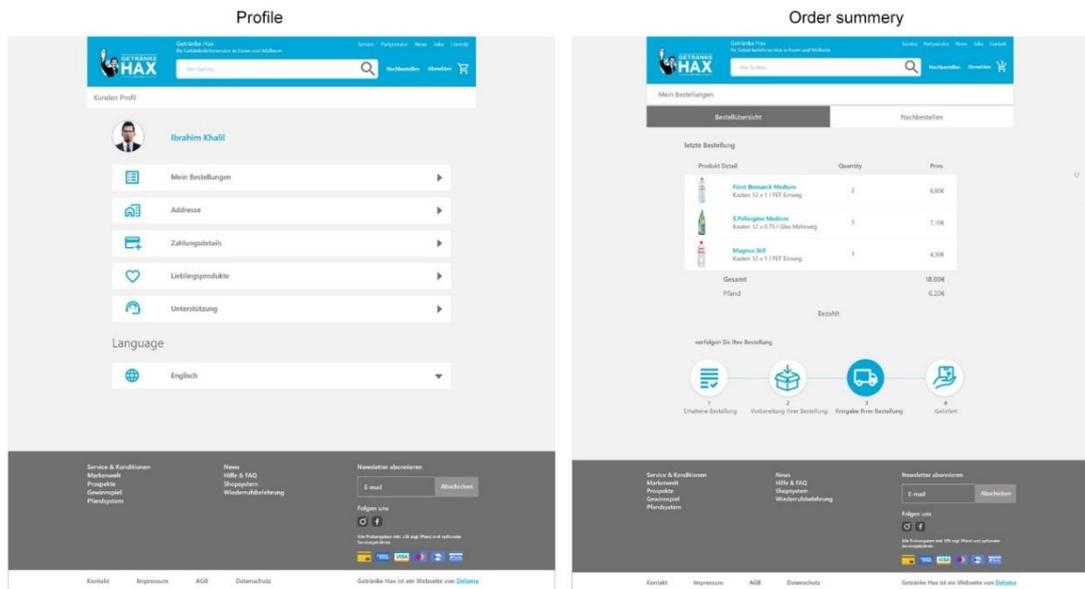


Figure 29: Profile and Order Summary page

During the design phase, more pages such as a cart, reorder, and order history was improved. The final prototype for the web is available here- <https://urlzs.com/JWwfl>

Because the mobile version was based on the web version, the same adjustments, such as icons and animations, were designed for mobile. Filter and Sort menus were added to users' feedback on the product page. Figure 30 shows some pages designed for mobile.

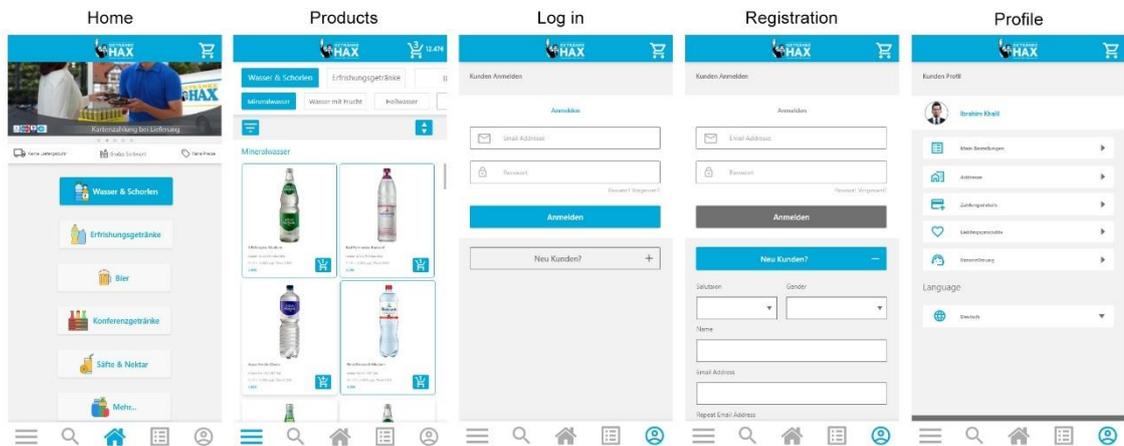


Figure 30: Mobile platform webpage design

Figure 30 demonstrates that the entire prototype was designed to be like modern e-commerce platforms now available in the marketplace so that customers may quickly embrace it. Product categories are highlighted on the home page, and the navigation bar is at the bottom so that consumers can switch between them with their thumbs. Products are also aligned so that customers can quickly add them to their carts, and once they do, a pop-up with a brief animation showing the number of products added to the cart will

appear. The login and registration pages have been combined into one. Users can change personal information such as their address, brand details, favorite products, and so on by creating a user profile.

More Getränke Hax mobile web pages, such as a product summary, order status, and reorder page, are available. The final prototype, which includes all mobile-friendly pages, can be found under this link- <https://urlzs.com/urScH>

## **5.7 Discussion**

The design process used to improve the UX of the Getränke Hax website was the subject of this research study. User research, design, testing, and implementation were chosen as part of the UX design process. The usability of the current Versions (A & B) of websites was measured using A/B testing, including tasks, questionnaires, and open feedback, as well as the AttrakDiff. In the previous chapters, the study and test results were addressed in detail, with each user's study examined separately. This section briefly analyzes these experiments and their conclusions to gain a better understanding of the customer experience with aesthetic, meaningful UI design, investigate the methodology used in this master's thesis, and make a prediction about future research choices on the topic.

The primary purpose of this study was to improve user satisfaction to increase sales on the Getränke Hax website. Because when customers become more satisfied, they will be more driven to place additional orders (Schiller, 2011). Some research questions were set in Chapter 4 to learn more about the users' criteria and to see if they were satisfied. These questions were addressed in this paper's studies and findings.

Section 5.5 addressed the first question, which concerned the user's feedback about Getränke Hax's website. This section highlights the most important lessons learned from users during user testing. From the Getränke Hax website, users have given feedback about what they want. While comparing the Versions (A & B) of the Getränke Hax website, these suggestions were collected from the user test results. Individual encounters what they desire in terms of aesthetics: a modern website that is easy to navigate, fascinating and fun to use. Users also desired a professional website with suitable terminology.

The second question concerned the most effective UX hybrid strategy for determining user requirements for the Getränke Hax website. There are numerous approaches for determining what problems people encounter while using a product. A/B testing, which

includes tasks, questionnaires, and open questions, as well as the AttrakDiff questionnaire, were utilized in this study to determine user desires. It is debatable whether this is the best UX mixed method for determining users' problems in all contexts, but according to this study, users claim that the optimized interface design is 19% more appealing than the previous version, and they are now 85% more likely to recommend this website to their friends or colleagues, a 15% increase over the previous design. This mixed methods research was ideal for extracting the user's problem and implementing the solution with a positive outcome in this setting.

The third question addressed the optimal Getränke Hax website design based on user feedback and design principles. Two current websites and a newly optimized prototype were tested in this study. The first two websites were assessed to determine the existing issues, then the third was designed. Version A has a significantly higher customer satisfaction level than Version B, according to the results of the A/B test and AttrakDiff. When comparing Versions, A, B, and the prototype, the prototype has the most beneficial influence on user satisfaction, as mentioned in Section 5.6.1.4. This section demonstrates that, when compared to prior versions, the prototype makes it easier for the users to place an order. In the prototype, finding products was also easy. Optimized prototypes are more appealing to users and are more likely to be recommended to others in terms of UI design.

The final inquiry was whether all the procedures used to improve the UX of Getränke Hax for the web are also applicable to the mobile version. In Section 5.2.4, some literature on the importance of mobile commerce was reviewed and debated to answer this question. This section explained how the mobile platform has a similar or even greater role in increasing sales than the web. People are increasingly using mobile to place orders since it is simple to use and allows them to order things from anywhere at any time. This part also covers certain design criteria proposed by Chan et al. (2002). Since mobile platforms are built on websites, the same UX design process can be utilized to develop them; yet, this study revealed that certain design elements are different.

According to the findings of this study, using the systematic UX design process, it is possible to identify problems with one or more website versions and improve user satisfaction, resulting in increased sales. However, maintaining the same level of quality over time is difficult. The UX design process is never-ending, and it must be updated as time passes. If this strategy is utilized in a similar circumstance, it should be carefully reviewed considering the limitations (Chapter 6) of this project.

## 6. Limitations

The proposed approach is approved to be valid to optimize such kinds of websites. Many optimization criteria could be found which lead to improved usability and more positive user feedback. However, several limitations of the chosen research approach were found as well. To begin with, the duration of the user research was insufficient to obtain accurate conclusions on how user experience is generated when user interfaces are integrated into everyday situations. Therefore, longer-term research should be conducted to minimize the chance of unexpected study results.

Secondly, the difficulties of this project were related to implementing the whole UX design process alone. When working on a large project like this, it is preferable to work as a team. The fundamental advantage of working in a group is the collective mind, which allows people with varied perspectives and visions to come up with good answers.

Third, because the entire study procedure took place during Corona lockdown, the number of interviewees was limited, and face-to-face interviews were not possible. Face to face interviews is preferable to online interviews for a better understanding of users by studying their expressions, problems, and successes while completing tasks, and so on. As a result, the findings cannot be considered indicative of the entire organization. At the same time, the outcomes in this thesis are greatly dependent on the research interpretation, location, and culture; so, their reproducibility is in doubt.

Finally, the prototype tool Adobe XD and the data gathering platform AttrakDiff, both of which were employed in this project, have some flaws. Dropdown menus and various small animations and transitions, for example, hover over, maximizing categories on the web, and sliding categories on mobile, are not possible to create with Adobe XD, and the AttrakDiff platform does not allow mobile users to test any prototype. As a result, no feedback from mobile users as possible, and the final mobile version could not be evaluated by people with mobile phones.

## 7. Conclusion and Future Work

Because UX Design is a part of a rapidly evolving technology environment, it requires successful implementation, adaptability, and ongoing improvements to keep up with ever-changing design trends. While many current customers appreciate online shopping as a handy and time-saving approach, businesses must establish an online platform that fits their needs and provides a smooth and enjoyable experience to attract new customers. It also assists firms in increasing sales and gaining a strategic advantage over competitors in the same industry.

Getränke Hax is a retail e-commerce platform with two main functions: providing a smooth and enjoyable browsing experience for target customers and reducing the time spent by users while purchasing things. However, the extensive user research undertaken in this study revealed consumers' present problems and suggested solutions, resulting in increased customer satisfaction.

Throughout the research, several methodologies and strategies were used. To discover the present problem faced by the users, A/B testing approaches such as tasks, questionnaires, and discussions were used. AttrakDiff was used to assess the aesthetic of the website. After analyzing the user feedback, a prototype was designed. The design was retested by the users, modified once more based on their comments, and then presented as the final version. The final design produced a positive effect in terms of increasing client satisfaction, which will contribute to increasing sales.

In several areas, more research can be done. In the future, a user study addressing the evolution of user experience through time and continual exposure to UIs should be done. Furthermore, after constructing the website, various functions of the web and mobile user interfaces, such as adding products to the basket and placing an order via mobile, as well as checking order summary and status, can be tested face to face with users. If there is any substantial input provided by users that may be improved.

Although the study's limitations were acknowledged, it might be claimed that the master's thesis's outcome was effective, and the intended target goal was met.

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## **Appendix**

### **Plan for the Online Testing (Video Call and Screen Sharing)**

#### Welcome and Briefing

- i. Welcoming participants
- ii. Overview of procedure:
  - o Getting to know the website and try it out
  - o Link sharing of a questionnaire containing-
    1. Tasks
    2. Questionnaire
    3. AttrakDiff questionnaire
  - o Open feedback about the whole experience

#### Learning Phase

- i. Observe the reaction of the participants
- ii. Frustration or fun! How much fun? Are they frustrated at some point in time? How much time taken? How many pages were visited?
- iii. Are there usability problems?

#### Evaluation Phase

- i. Demographic Data

### **User testing invitation letter sent by mail**

This letter was sent to each user with a link to Version A, Version B, or the Prototype.

Hello everyone!

I am Ibrahim Khalil, Content Manager & Designer of Deloma UG. I'll be assessing the usability of our e-commerce shop website Getränke Hax, one of many Deloma UG's existing websites, over the next few days to assess its negative and good feel to users to improve the user experience.

There will be a few tasks and a questionnaire in this evaluation. I'd like to invite you to contribute to the development of our shop website and the enhancement of the tool's user experience by filling out a survey.

Here is the link: <https://www.surveymonkey.de/r/GLK3VJT>

Please provide some of your time to help us improve the user experience.

Thanks a lot!

Ibrahim Khalil

Content Manager and Designer, Deloma UG.

### **A/B test questionnaire (for Version A, B and Prototype)**

These questionnaires were presented using Survey Monkey (Available <https://www.surveymonkey.com/>)

Version A: <https://www.surveymonkey.de/r/GLK3VJT>

Version B: <https://www.surveymonkey.de/r/G9LKQ2C>

Prototype: <https://www.surveymonkey.de/r/C5P5ZDH>

### **Personal Information (Section 5.3.1):**

- Your name please?

\_\_\_\_\_

- How old are you?
  - 16-25
  - 26-35
  - 36-45
  - 45+
- What is your Occupation?
  - Student
  - Engineer
  - Consultant
  - Other \_\_\_\_\_

- How often do you shop online on average?

- Once a week
- Twice a week
- Almost everyday
- Twice a month
- What types of products do you buy online?
  - Food
  - Drinks
  - Cloths
  - Others\_\_\_\_\_
- Do you feel relaxed purchasing things online using your laptop or computer?
  - Yes
  - No
- Which device(s) do you usually use for online shopping?
  - Laptop
  - Mobile
  - Tablet
- How familiar are you with browsing, shopping, and other online retail activities?
  - Less familiar
  - Familiar
  - Highly familiar
- Have you ever purchased beverages from an online store?
  - Yes
  - No
- Have you ever used Getränke Hax to buy a product?
  - Yes
  - No

**Tasks (Section 5.3.3):**

- Can you please register yourself on the website?
- Would you mind logging in?
- Can you add a coca-cola 0.5 l to the cart from this website?
- Would you please check out your products and pay the bill?

### Questionnaire (Section 5.3.3):

Inspired by: <https://www.hotjar.com/usability-testing/questions/>

1. Overall, how well does our website meet your needs?

- Extremely well
- Very well
- Somewhat well
- Not so well
- Not at all well.

2. How easy was it to find out the product COCA-COLA on our website?

- Extremely easy
- Very easy
- Somewhat easy
- Not so easy
- Not at all easy

3. Did it take you more or less time than you expected to find out the CATAGORIES on our website?

- A lot less time
- A little less time
- About what I expected
- A little more time
- A lot more time

4. How visually appealing is our website design?

- Extremely appealing
- Very appealing
- Somewhat appealing
- Not so appealing
- Not at all appealing

5. How easy is it to understand the information on our website?

- Extremely easy
- Very easy

- Somewhat easy
- Not so easy
- Not at all easy

6. How much do you trust the information on our website?

- A great deal
- A lot
- A moderate amount
- A little
- Not at all

7. How likely is it that you would recommend our website to a friend or colleague?



### **Open feedback (Section 5.5):**

These were some open feedbacks got from the users.

1. Introduce a mobile-optimized version.
2. Highlight search option
3. Use icons and try to use less text if possible.
4. Highlight product category
5. Products should be presented simply.
6. The login page should be simple and merge with Registration.
7. It's better to allow users to track the order.
8. Add small pop-up animation while adding products to the cart.
9. Make the checkout process easy.

## AttrakDiff Questionnaire (Section 5.4.2):

Available in: <http://attrakdiff.de/>

Version A: <https://esurvey.uid.com/survey/#888598ec-df48-469f-9d84-7356c94f1a45>

Version B: <https://esurvey.uid.com/survey/#5f2b0f23-590c-4395-92a4-ca11ff8b9ab8>

Prototype: <https://esurvey.uid.com/survey/#271baa0e-dae3-449f-a8c5-1211ff4b3cea>

Please make your evaluation now.

For product evaluation purposes, please complete the following questionnaire. The questionnaire consists of opposing pairs of characteristics that may apply to the product. The circle shows the levels of progression between the opposing characteristics. You can indicate your agreement with the characteristics by selecting the circle that best reflects your opinion.

Example,

attractive	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	unattractive
------------	-----------------------	-----------------------	----------------------------------	-----------------------	-----------------------	-----------------------	-----------------------	--------------

This response would mean that you rate the application as more attractive than unattractive.

Please decide spontaneously. Don't overthink your decision to ensure that you portray your original opinion. You may not always be certain of your agreement with a certain attribute, or you may discover that the attribute does not fully conform with the product. Nonetheless, please mark each line with a circle.

Your opinion is what matters. Please note that there is no correct or incorrect response!

## Annex

COMPANY PROFILE	
Name	Deloma UG
Logo	
Address	Kleinewefersstr 1
Postal Code	47803
City	Krefeld
Country	Germany
Telephone	+4921514121928
Email	support.shop@deloma.de
Website	<a href="https://www.deloma.de/">https://www.deloma.de/</a>
Year established	2011
In-house working language(s)	German, English
Type of Business	Deloma UG assists local small businesses by providing an e-commerce platform for them to sell their products to the community, as well as additional services such as consulting, advertising, logistics, and content creation.

## Declaration of Authenticity

I, Ibrahim Khalil, hereby certify that the work presented above was created solely by my efforts, without the assistance mentioned. Any additional sources of information or efforts by others are acknowledged and listed in the reference section. The identification of external sources for the statement and scope of the work is cited; lines or portions of phrases directly quoted are indicated by quotation marks. This work has not been previously published or submitted for review in the same or comparable form. I will maintain a copy of this assignment until the Board of Examiners announces the results, at which point I will provide it upon request.

Kamp-Lintfort, 03.06.2022

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Place and Date

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Signature: Ibrahim Khalil