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Universal Design

A Usability and Universal Design Investigation into the Use of Persistent Headers in Web Pages

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OSLOMET

0.1 Preface

I would like to say thank you to my supervisor Pietro Murano and OsloMet for the opportunity to write this thesis. Pietro has been a great supervisor providing me with useful guidance and great communication throughout the process of writing the master thesis. To investigate the use of persistent header has been very interesting and I have learned a lot during this process. Navigation is a vital part of many websites and universal design principles are important to consider.

Oslo, May 2022.

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0.2 Abstract

This thesis investigates users' preferences and performance of persistent headers on websites. Persistent headers and non-persistent headers are compared through a questionnaire and experiment. Two websites are setup identically with the only difference being the header. One website has a persistent header, and the other one has a non-persistent header. All 24 participants are testing both websites through tasks. Time and wrong clicks are measured in this within-users experiment. Results from the experiment and questionnaire are analyzed to measure users' preferences and performance of the two header types.

Results show persistent headers performed better and was preferred by the participants. The experiment was performed on a laptop with a 13-inch screen. Future work could investigate smaller devices like smartphones to see if it the results are different. Using websites on smartphones is popular, and today many websites use partially persistent headers on smartphones and smaller screens in general. (Laubheimer, 2021) Different devices, screen sizes, and partially persistent headers was not part of the scope of this thesis and is something that could be further investigated in future work.

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1. Introduction

My project is to investigate users' preferences and performance when it comes to the use of persistent headers on webpages. I will use an online newspaper website to do my experiment where the participants test one website with a persistent header and one without. Today different websites use different types of headers, and there is no standardized way of navigation that every website is using. (Murano & Sander, 2016) Both persistent and non-persistent headers are used today, and there is not much research done on this specifically. On the other hand, there is a lot of research done on navigation in general, and this paper aims to enlarge the website navigation research field. A potential problem when it comes to headers is that users have different preferences. Context and type of website may also impact their preferred choice of header. This paper aims to address these potential problems by doing an experiment with within-users design. The experiment uses a website that is setup much like most online newspapers are today. By doing so the users are using a common and known environment when doing the experiment.

Headers are used on most modern webpages. The goal of headers is to give the users a nice experience using the webpage. Navigation of a webpage is usually done in some way using the header. Headers also usually present important information like company logo/name, navigation, and a search bar. The header is used to give the user a pleasant user experience. There are different types of headers both when it comes to appearance, interaction, and visibility when users are navigating the website. A header is normally placed at the top of a webpage and if it is persistent, it will stay there even though the user scrolls or navigate around the webpage. An example of a webpage that uses a persistent header is Apple (https://www.apple.com). As you can see from the screenshot below in figure 1, they have a

dark grey header at the top of their webpage with different interactive icons and text. The grey header will stay in place also when scrolling further down on the website.
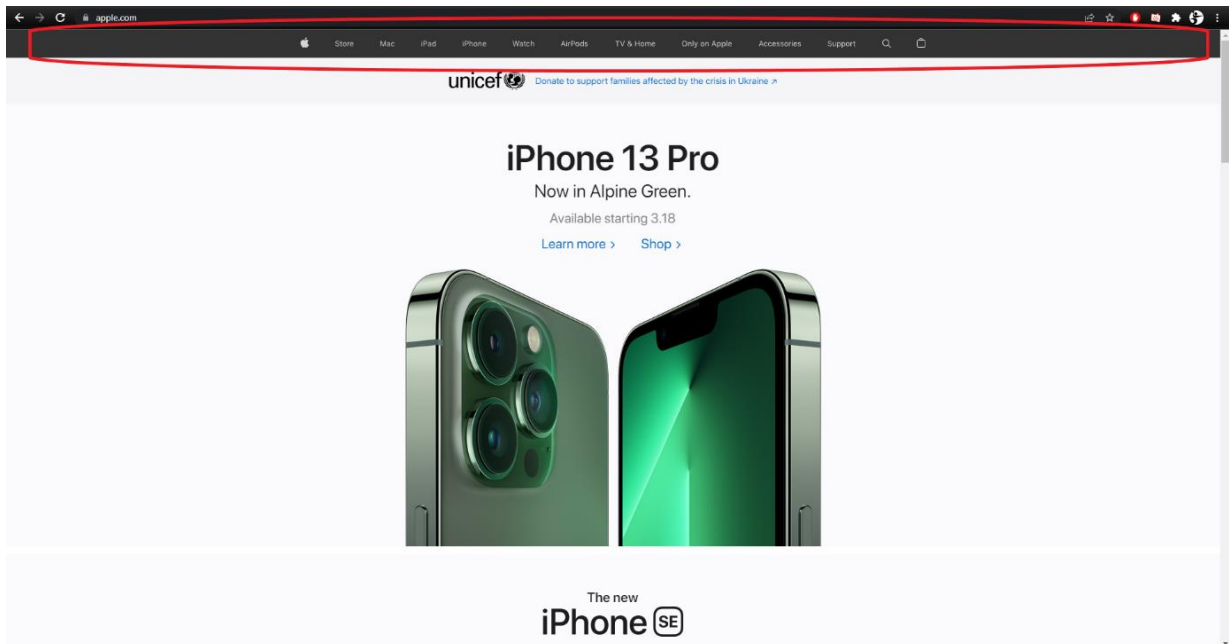

Figure 1: Screenshot of Apple homepage (https://www.apple.com)

1.1 Goal and Structure of Research

The goal for this research project is to investigate users' preferences and performance when it comes to persistent headers. My focus will be if users prefer persistent or non-persistent headers on webpages. Many factors may be relevant regarding whether a persistent header is wanted, and I will try to consider different factors through a well set up experiment and questionnaire. These factors and different preferences depending on the context will also be discussed in my discussion chapter. Usability and universal design are important factors to have the best user experience, and persistent headers is part of the navigation of most websites, and usually one of the most vital navigation elements. I am investigating whether the header should be persistent or not, but to create a good header there are also lots of other factors to consider. These factors can be size, font, and color contrasts. These are factors that should be in place for an accessible website and good universal design. In chapter 1.2 and 1.3 I will go more into detail and give an explanation regarding universal design principles and headers.

There is no superior navigation method and menu type that all websites use today. Different webpages and applications create their own navigation with different styles and methods. Context and content of the webpages impact what type of navigation is needed and most usable. (Melguizo, 2011) Research shows no superior menu type or way of navigation. (Sander & Murano, 2016) One type of navigation most online newspapers and other webpages uses, is a header. Headers can be both persistent, partially persistent, and non-persistent. Although a lot of research on navigation and different menu types are done, there is little research is done on type of headers specifically.

My main research question is whether users prefer a persistent or non-persistent header when using websites. My goal is to investigate the performance and preferences regarding persistent vs. non-persistent headers. The website I will be using for my testing is a newspaper website. The results will be based on the preferences and performance regarding tasks participants receive and this type of website. The results can be generalized to some extent, but type of website and content can potentially influence results. I have tried to set up the tasks and website in a way where the results can be generalized beyond only newspaper website.

To measure the performance, I will use time used and wrong clicks as measurements, and to measure preference I will use the participants opinions based on a questionnaire. My hypothesis is that the header that has the best performance also is going to be the one that is preferred by the users. Personally, I will almost always prefer the type of navigation that is most efficient, but that may not be true for all users. Especially if the performance is very close between the headers, factors like esthetics, or other factors may affect the decision. In my research I will look at pros, cons, and other important aspects of headers. I will also discuss headers in different contexts, which could influence what type of header is preferred.

My research is an empirical experiment with a within-users design, that can be divided into three parts. The first part is to collect data about the participants, their experience, and give them information about the experiment. The second part is the experiment itself. The participants get a set of tasks to perform on two different webpages. One of the webpages

has a persistent header and the other one does not. I will measure time used, total clicks and other relevant data. Half the participants will get the website with a persistent header first and the other half will have the website without the persistent header first. All participants will test both websites. The tasks are the same for all participants. After the users have finished the tasks, they will answer a questionnaire about their experience. The data will carefully be examined and evaluated. To analyze and conclude on what type of header is preferred, both the results of the experiment and the users' opinions gathered in the questionnaire are important. I will only evaluate a website with one type of content and on the same device (laptop). In a different context the results may be different.

1.2 Structure of report

This report has six main chapters. The first chapter is the introduction and background chapter. Here I aim to give a brief introduction about the research I am doing and background information about persistent headers and universal design as it is important to understand these terms and their importance in the context of my project.

The second chapter is where I dive deeper into existing research on the topic. Although there is not much research done specifically on persistent headers, there are a lot of articles available on website navigation. The aim of the chapter is to put the literature I review into context of my research and explain why I am doing the research I am doing.

The third chapter is methodology. Here I describe how my experiment is setup and how I collect my data. The method of my experiment is well documented here, and I aim to explain why I chose the methods I did.

The fourth chapter is results, and this is where I present my findings from the experiment. It contains a practical presentation of the data I obtained in my experiment. This part will contain both visual and written representation of my results.

In the next chapter called "Discussion" I discuss my results and try put them into context. I will analyze my results critically and compare my results with other literature and my research questions and hypothesis.

In the last chapter, Conclusion, I will wrap up my project, summarize my findings and try to look forward regarding potential future work and how the reader should interpret my project.

1.3 Background

In this part of my report, you will find a thorough go-through of important background information regarding important terms and aspects about persistent headers, universal design, and accessibility. When designing complex websites with navigation it is important to always consider what is best for the users. User-centered design and usability should always be top priorities.

1.3.1 Persistent Headers

A persistent header, also called sticky header, is a common pattern to make the header of a webpage stay in place when the user scrolls down or navigates the webpage. The main content of a header usually consists of a logo (and/or brand identifier), text/headlines, navigation elements, and a search bar/icon. These elements are very useful for the user when browsing the webpage. These elements should be easily accessible. Navigation should be easy to understand, and it should not be hard to figure out where to click.

Research shows that when using a (never before used) webpage users are scanning the webpage instead of reading it word by word. Users are drawn towards headlines, captions, and other graphical elements. (Nielsen, 2000) Although this research mainly focuses on the main content of a webpage and how users read it, it also applies to the header, and other content presented on the webpage. Users are scanning the webpage at first glance, and it is therefore important to make the header stand out with a good color contrast to not confuse the user, and make it clear what the purpose of it is and what the different elements do. (Tubik, 2017) How people are scanning a website can vary depending on different factors like their task, page layout, and assumptions from previous experiences. (Pernice, 2019) Although it may vary, eye tracking research has identified commonly used scanning patterns like F-pattern, Z-pattern, and Commitment pattern. (Bradley, 2011) No matter what pattern is used, or what type of content/intention of the user is present, it is important to make a

header visible and stand out from the main content of the webpage. By doing so, users will have a better experience using the website as it is easier to navigate and distinguish between different types of content.

There are three main types of headers. Persistent, partially persistent, and non-persistent header. With a persistent header the header stays on the webpage even though the user scrolls down, and with a non-persistent header it disappears when the user scrolls down. A partially persistent header will disappear when the users scroll down but reappear as soon as the user scrolls up again. The user will not have to scroll all the way to the top for the header to reappear, like a non-persistent would. A good principle for headers and website design in general is to keep motion minimal, natural, and responsive. (Laubheimer, 2021) Animations is often distracting and disruptive. A partially persistent header is an animation and animations should be used to a minimum to not distract the user any more than necessary. Partially persistent headers can still be usable in some cases, especially when size and space is minimal. It is typically used on mobile devices and other devices with small screens. (Laubheimer, 2021)

The size of the header itself is also important. Large headers will only create frustration for the user, as the main content of the webpage should take up a larger portion the page, and it will make the user scroll more than necessary. The size of the header is even more important on mobile devices, as the screens is smaller. On touchscreen devices tap targets should be at least 1 cm x 1 cm and text around 16pt. You should ensure this is the case when creating webpages and do not waste unnecessary vertical space. On desktops there is more space to work with, but the header should still not consist of excessive empty space, simply to make the logo bigger. Make the text size readable and create the vertical height of the header off that. (Laubheimer, 2021)

Another important aspect of the header is the coloring. Contrast with the content is important to not confuse the user. The header is a different part of the webpage, and it should be easy to understand and not confuse it with the main content on the webpage. It is also important to have a visual contrast with the background color of the webpage for it to be readable, noticeable, and clearly differentiated from the content that it is hovering over.

Color contrast and font sizes are important universal design aspects to consider when creating a good user experience. Universal design principles and guidelines are important to follow and is regulated in many countries today. World Wide Web Consortium (W3C) has created universal design principles and guidelines called WCAG. WCAG is one of the most used ones, and regulations in most of the western world is referring to it. (W3C, 2018) I will discuss more on universal design in 1.4. A good choice of color contrast can be seen in figure 1 earlier in this chapter where Apple is using a dark grey background color for their header, and a light color as background color for the main webpage. A bad example can be seen in figure 2 below, where the background color is the same for both the header and the main webpage. It is hard to distinguish the header and the main content. The only way to do so is by a thin grey line. It is not intuitive that it is a header before you start scrolling and it can create confusion. This is not a good header.
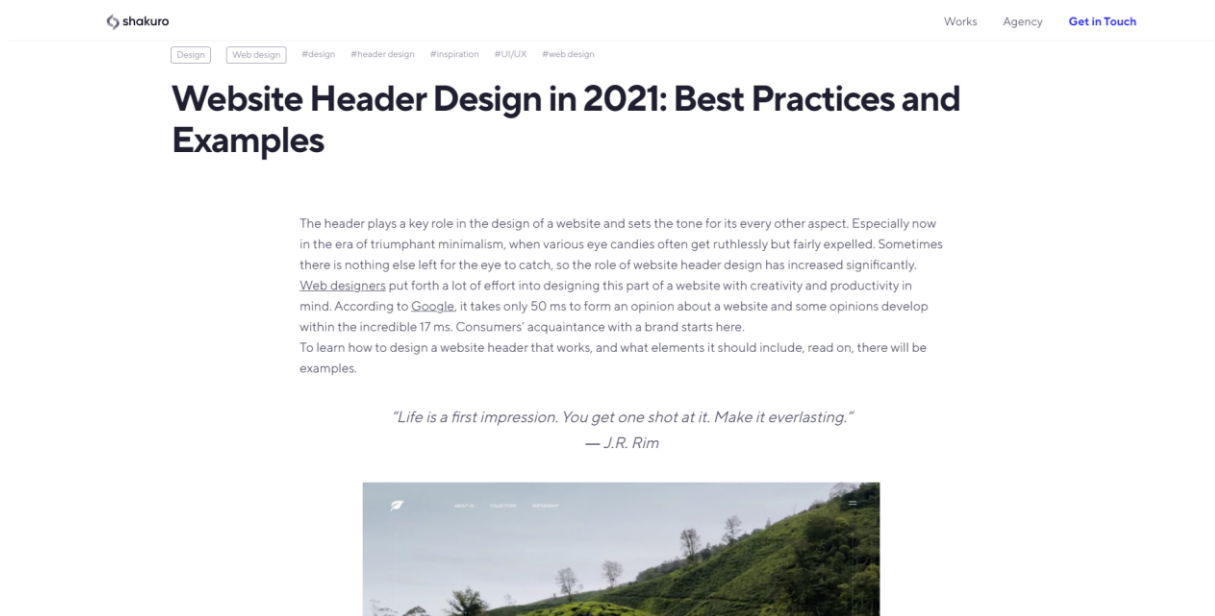
Figure 2: Article from Shakuro webpage. (https://shakuro.com/blog/website-header-design-in-2020-best-practices-and-examples)

Another thing to consider is if a persistent header is needed at all. By having a persistent header, you are losing some space all over your webpage on all the different pages. The main thing to consider is its functionality and usability. If you have a large website with many different pages and lots of navigation possibilities, a header is most likely useful. If the webpage is smaller, with fewer different pages and less complex navigation elements,

and/or longer articles/text to read, it is maybe worth considering not having a header at all, or at least a partially persistent, since it will most likely not be usable, and only be a frustrating part of the page for the users.

1.3.2 Universal Design and Accessibility

"Universal design is design that is usable by all people to the greatest extent possible." (The Universal Design Project, 2022) Some people tend to believe that the only purpose of universal design is to create solutions that people with impairments can use. Although that is one of the reasons for universal design principles and guidelines, universal design is beneficial for everyone. Simplifying and making webpages follow the same guidelines and norms creates a better user experience for everyone.

Most countries in the western world have regulations in place to make businesses follow universal design principles. In the European Union there is a Web Accessibility Directive (WAD) that is describing how public webpages and applications should be universally designed. You will get fined if you do not follow these regulations. You can read more on what WAD is and how it is implemented in Norway (and other European countries) here. (Uutilsynet, 2022) The guidelines used in WAD is called Web Content Accessibility Guidelines 2.1 (WCAG). (W3C, 2018) These guidelines are divided into three levels. The first level is called principles. These are perceivable, operable, understandable, and robust. The next level is guidelines, and the third level is success criteria. Principles and guidelines are general guidelines on how webpages and applications should behave/look, and what is important to consider creating good usability and user experience. Success criteria are very specific criteria. The success criteria are usually the ones that are measured through legislations. These guidelines try to cover everything regarding universal design and is edited from time to time to keep up with new demands. Examples are alternative text, font size, navigation, error handling, and compatibility with assistive technology. You can read more on what these guidelines are and their purpose from this source. (W3C, 2018)

Although HTML and CSS has been the basis of how to create websites for a long time, there is new methods and technology that has become more popular the last years that have impacted how many developers create websites. These new technologies have opened for

many opportunities. These opportunities include easier ways to implement universal design aspects, as well as more fancy interaction and visualization options and elements on websites. With more user interaction, different input modalities (touch screens, mouse, and keyboard etc.), dynamically changing webpages, and visualizations it is easy to forget universal design principles and guidelines. Some developers seem to jump these trends without considering universal design aspects at the same time. Because of these new trends, different devices, and this urge many seem to have jumping new trends and fancy looking webpages it is important to follow universal design guidelines such as WCAG. The last years many countries have implemented regulations to create a better user experience for all users through laws and regulations like the WAD directive from EU making companies follow Universal Design principles explained in the WCAG. (W3C, 2018)

Another set of universal design principles that are important is "The 7 principles of universal design" developed in 1997 by a group of people at North Carolina State University led by Ronald Mace. (National Disability Authority, 2020) These are seven principles that are useful to understand and consider when creating webpages and applications, to ensure a good user experience. Flexibility, simple and intuitive, tolerance for error, and perceptible information are some of the topics these principles include. These are principles that makes the experience of using the web more pleasant and easy for every user, no matter experience, cultural, or other differences.

The first principle is called "Equitable Use" and emphasizes that design should be usable for all users and their diverse abilities. Design should be identical whenever possible and equivalent when not. By doing so segregation and stigmatization of any users is avoided. The design will also be more appealing to all users. (National Disability Authority, 2020)
The second principle is called "Flexibility in Use". Flexible design should be created to accommodate a range of individual preferences and abilities. An example is to ensure usable design for both left- and right-handed people. Providing choice of different methods of use is important to ensure flexibility. (National Disability Authority, 2020)

"Simple and Intuitive Use" is the third principle. Design should be easy to understand regardless of users´ experience, language skills, or abilities. Creating understandable design

requires removing unnecessary complexity, understanding users' expectations, effective prompting, and feedback. Simple and intuitive use also involves having "perceptible information", which is what the fourth principle is called. Information needs to be communicated effectively, regardless of users' abilities, experience, or ambient conditions. To do so you should use different modes of presentation of essential information (verbal, tactile) and provide contrast between essential information and other content/parts of the design. (National Disability Authority, 2020)

Principle five is called "Tolerance for Error" and emphasizes the importance of minimizing consequences of unintended or accidental actions. Providing fail safe features is important to minimize this risk. (National Disability Authority, 2020)

"Low physical effort" is the sixth principle. Design should be used comfortably and efficiently with minimum fatigue. Users should be able to maintain a neutral body position, and repetitive actions should be minimized to the greatest extend. (National Disability Authority, 2020)

The final principle is called "Size and Space for Approach and Use". It emphasizes the size and space should be carefully thought of for all users regardless of their abilities. Providing a clear line of sight to elements for any seated or standing user (regardless of heigh) is important. To read more in depth about all principles I recommend looking at their webpage. (National Disability Authority, 2020)

2. Literature Review

My goal for the study is to investigate the use of persistent headers on webpages. The use of headers is part of the navigation and design of a webpage. There has been done a lot of research in the field of navigation, universal design, and accessibility focusing on usability and user experience. However, there is not a lot of research done specifically on headers comparing persistent and non-persistent headers. Most of the papers that involve headers are investigating bigger parts of the general navigation of bigger webpages.

Jakob Nielsen has done a lot of research regarding user experience of webpages. One of the more relevant studies he has done is an Eye-tracking study. (Nielsen, 2000) Here he investigates how users read on the web and compares his results to previous studies within the field. His main findings are that text attracts users, that you should keep headlines simple and direct, and that users use shallow reading combined with selected depth. Only 22% of users´ first three eye-fixations were on graphics and 78% were on text. Therefor text design and wording should be carefully considered as text is what users first are looking at when browsing web pages. The most common user behavior is to hunt for information and ignoring the details, therefore presenting the webpage in a readable way with good use of headers (both style and content) is very important to create the best user experience. (Nielsen, 2000)

Sharma and Murano have written a research paper on different scrolling types in web interfaces. This is one of many papers written regarding usability and user experience using webpages and interfaces. The paper is evaluating normal scrolling (with pagination), infinite scrolling, infinite scrolling with a "load more" button, and infinite scrolling with pagination. The results showed that there was not a significant difference between the methods when it comes to speed and errors, but the paper emphasizes that accessibility is an important factor to consider, and that design that creates unnecessary steps and clicks for the users should be avoided. (Sharma & Murano, 2020)

Pittsley and Memmott has written another research paper regarding navigation. They tried to look at how to improve the navigation of complex research websites, so that the users

find their way without intermediation or instruction. Complicated websites with lots of navigation can be hard to use for users. In the study two types of navigation improvements were applied to different sets. Usage patterns from before and after were analyzed and both sets of changes showed an increase in use of secondary guide pages (which is what the users did not use much because of navigation difficulties beforehand). They also had a comparison group with no navigation changes that showed no significant change in usage patterns. Their findings suggest the navigation changes helped users access more of the pages and improved the user experience. They conclude that it is an ongoing challenge to design the navigation of complex sites and that thoughtful design with user centric design can improve navigation. (Pittsley & Memmott, 2012)

Another relevant paper is written by Murano & Sander. The review paper is about menus on webpages and applications regarding their positioning. The paper is giving an overview of existing research, their findings, and then concludes with some suggestions for future research on menus and how their positioning on the screen could be improved. The results of the review paper shows that there is no totally clear picture to suggest which menu type or position on the screen is optimal regarding performance, nor user preference. The paper does however say that the strongest suggestion of better performance comes from menus which are simple and intuitive and well structured. In some of the studies reviewed, the evidence suggests a top horizontal menu is the best performer. (Murano & Sander, 2016) This paper is very relevant for my research as it is a review paper about menus and their positioning, which is within the same topic I am investigating. When investigating the use of persistent headers, I will follow the findings from this paper by having the menu within the header that is placed horizontally at the top of the webpage. My menu is as simple and intuitive as possible to not confuse the user creating better user experience.

Another study on navigation was done in 2011 by Melguizo. She was looking into how users seek information online, and how the influence of menu type, navigation path complexity, and spatial ability matters. Two aspects were included in the study: Navigation path relevance and information gathering tasks. The results show that when measuring aspects directly related to navigation performance such as time and lostness, path complexity plays an important role. They also found that during navigation expandable menus are more

useful than sequential menus, especially for people with low spatial skills, and when the semantic similarity between the information goal and the navigation path is high. The results also show that participants with high skills perform well in all conditions. (Melguizo, 2011)

Leuthold et al. has done relevant research regarding menu types. Their research is a statistical experiment which tests different menu types that have a left vertical position (simple menu, extended menu, and dynamic menu). They measure eye fixations, time to do first click, wrong clicks, navigation strategy and participants preferences. The results show that the users were fastest with the simple menu but used fewer eye fixations with the extended menu for both simple and complex tasks. The extended menu was the preferred choice by the participants, as it was viewed more helpful and easier than the simple and dynamic menu. (Leuthold et al., 2011)

What I found during my literature review is that there is a lot of research done on navigation elements and different menu types, but little done on different types of headers or visual design and appearance specifically. The research field shows no superior way of doing navigation, and often the results show little differences when it comes to performance and user preferences. The results that do show significant differences are depended on the context of the websites/tasks. Type of navigation is depended on the complexity of the website and tasks. (Murano & Sander 2016) However, important universal design guidelines like simple and intuitive, general accessibility, and readability is important to create a good user experience. My research aims to add to the field of navigation research that has already been done.

From the research I found within the navigation field most of it is done regarding what menu elements should appear, what they should say, and the complexity of the navigation elements. Less research is done purely on the looks and appearance of a chosen navigation/menu type, like a header. Consequently, I will try to fill the research gap within header appearance.

To create a good header there are multiple things to consider. Laubheimer has written a good article mentioning different aspects to consider. (Laubheimer, 2021) The first one is to

maximize the content-to-chrome ratio by keeping the header small. Persistent headers take up space, and therefore it is important to keep them small compared to the rest of the webpage. Especially on smaller screens headers taking up much of the screen is annoying. The header should be small, but still provide appropriately readable text and tappable target sizes for all devices. The second aspect discussed is contrast with content. There should be a clear contrast from the header to the website content. It is important to not confuse the user and clearly show the difference of these elements. Another aspect that is important to consider is the motion. It should be kept to a minimum, natural, and responsive, as animations is often distracting, disrupting, and annoying for users. The last aspect discussed in Laubheimer article is whether a persistent-, partially-, or non-persistent header should be chosen. The context decides what type of header is appropriate. A header could contain elements like the main navigation, utility navigation, login button, search bar, and logo. If the content of the header is likely to be needed often during the session, while scrolling down on the webpage there is a bigger reason to use a persistent header. Screen size is also an important factor to consider when deciding on the header design. Today partially persistent header is a popular choice of header on mobile devices. (Laubheimer, 2021)

3. Methodology

Experiments help understand human-computer interaction and describe the value of user interfaces. To conduct good experiments one of the most important things is to find an interesting and significant research question. (Hornbæk, 2011) My research question is whether users prefer a persistent or non-persistent header on websites. I will investigate performance (time and wrong clicks) and preferences (questionnaire). Headers are used in various context, both when it comes to their content, and the environment/device they are used on. To narrow down my research I have focused on a newspaper website tested on a laptop with a 13-inch screen size.

My main research method is quantitative. Quantitative research is often used to test theories and assumptions, which my research question is. The results can normally be expressed in numbers and graphs, as opposed to qualitative research where the research is expressed in words. Qualitative research is designed to gather in-depth insights through words collected by methods like interviews with open-ended questions, observations and literature reviews that explore theories and concepts. (Streefkerk, 2022) In my research I use numbers and scales for most of my survey questions, and measure time and wrong clicks from the experiment. I have a question in my survey which opens for written response from my participants, but I would still say my research is mostly a quantitative research project. My core data collection methods are surveys and records from the website testing tasks. The survey aims to establish the users´ experience and their preference when it comes to the use of persistent headers. The tasks aim to measure the performance by wrong clicks and time used.

3.1 Experiment design

In this part I will go into detail on how my experiment is designed. My experiment consists of both website-testing and questionnaire. My participants first answered some questions regarding their experience, followed by the website testing. After the testing is finished, they answer more questions regarding their experience, the performance of the two websites, and their preferences.

All participants test two different websites, where the only difference of the websites is whether the header is persistent or not. Half the participants are testing the persistent header first, and the other half tests the non-persistent header first. The task consist of ten articles participants must find on the webpage (five for each website/header type).

I will go more into detail in the coming parts under 3.1 named "Website", "Questionnaire", Participants", "Environment", and "Procedure, Tasks, and Measurements".

3.1.1 Website

To design my experiment, I chose to create a newspaper website as my testing environment. A newspaper website is something many users are familiar with and a typical website that uses headers. Some headers of big news corporations can contain elements like main navigation, logo, and search bar. For my experiment I choose to focus mostly on the navigation with my header containing the main navigation of my webpage. I have 5 main buttons/links to different sites in my header. These are called "Home", "Sport", "Celebrity", "Finance", and "Foreign". The "home" button takes you to the homepage which is filled with news articles. Remaining header elements takes you to sites with news articles within their area.
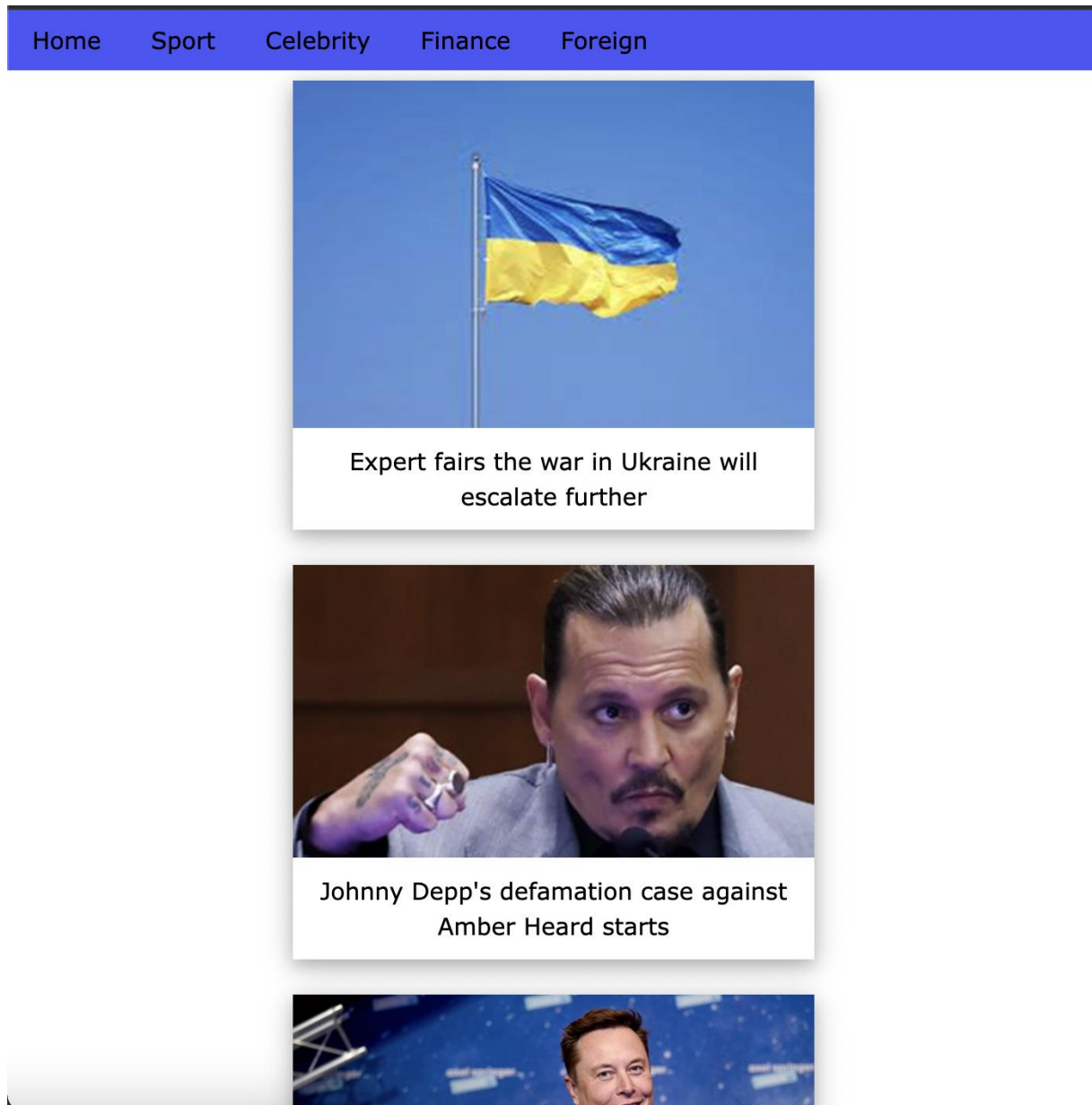
Figure 3: Screenshot from frontpage of the experiment website (Wang, 2022. Sæter, 2021)

To create a good header, it is important to make it small, but as well readable and links clickable. Another important aspect is the color contrast of the header and the main content. (Laubheimer, 2021)

For my experiment I am comparing persistent and non-persistent headers. I have created two identical websites, with the only difference being the header, and whether it is persistent or not. Other than that, the webpages are identical.

Figure 4: Screenshot from the persistent header webpage (Stavanger Aftenblad, 2022. Mao, 2022)

Figure 5: Screenshot from the non-persistent header webpage (Stavanger Aftenblad, 2022. Mao, 2022)

Above you see an example where I have scrolled down on the "Foreign" news site. On the non-persistent header website in Figure 5 the header has disappeared, and the user would have to scroll all the way back to the top to find it again. My website is a simplified news website setup as my testing environment. Today some of the biggest media corporations have more complex websites, with navigation options to other parts of their services like TV or streaming services for example. Most websites are also filled with advertisements

typically vertically on both sides of the main content (the parts that are white on my website).

3.1.2 Questionnaire

As well as doing the website experiment, all participants answered a questionnaire. One part of the questionnaire was answered before the experiment, and the biggest part was answered after the experiment was done.

The goal of the first part of my questionnaire (that is answered before the experiment) is to gather information regarding the participants experience and diversity. They answered one question regarding their experience when it comes to participating in online research, and one question regarding their experience reading newspapers online. The scale used for these questions is 1-7 where 1 is not experienced at all and 7 is very experienced. The last question they answered before doing the experiment was their age, with alternatives for different age intervals as seen in the figure below. The reason I chose age intervals is to not have any identifiable or private data that the users might not want to share. To avoid any ethical issues when using minors, I choose to not include anyone under the age of 18. As you can see later in my results chapter there is only one participant in age group 1-19, and the participant was 18 years old.

Figure 6: Screenshot from the questionnaire

These are all factors that may influence the results, as people that are more experienced will probably finish the tasks quicker with less errors. I also asked these questions as I wanted to showcase how diverse my group of participants are. I selected participants at random not wanting a specific group of people to be preferred or excluded. These

questions are asked to showcase what group of participants I am using for my experiment, as it will influence the results, and are useful information when you are interpreting the results.

After the experiment was conducted, the rest of the questions were asked. I asked four questions regarding how the user experienced the website and header. These questions were answered two times, one for each website (persistent and non-persistent header).

Persistent Header Questions

Did you feel the header used appropriate space compared to the rest of the content on the webpage? (On a scale from 1-7 where 1 is not appropriate and 7 is very appropriate.)

1	2	3	4	5	6	7
○	○	○	○	○	○	○

Did the usage of space and clutterness of the webpage feel pleasant? (On a scale from 1-7 where 1 is not pleasant at all and 7 is very pleasant.)

1	2	3	4	5	6	7
○	○	○	○	○	○	○

Did the motion and responsiveness feel pleasant? (On a scale from 1-7 where 1 is not pleasant at all and 7 is very pleasant.)

1	2	3	4	5	6	7
○	○	○	○	○	○	○

How easy was it to find the desired navigation elements? (On a scale from 1-7 where 1 is very difficult and 7 is very easy.)

1	2	3	4	5	6	7
○	○	○	○	○	○	○

Tilbake   Neste   Tøm skjemaet

Figure 7: Questionnaire questions

The questions were asked to measure how good the participants liked different elements of the header and website, but most importantly to compare the results of the two different websites/header types. The space usage of a header is an important aspect and should be carefully considered. (Laubheimer, 2021) I wanted to ask this question to investigate whether the users preferred the size or not. If the size is too big it would probably have made more users prefer a non-persistent header, as they would want to use the whole screen when scrolling to look for articles. I would also like to find out whether the answers regarding the space usage differ from the persistent and non-persistent header.

Keeping motion minimal, natural, and responsive is important because animations is often disruptive and distracting. (Laubheimer, 2021) I wanted to ask a question regarding this to see what the participants felt regarding the motion and responsiveness, and if the results differ from the type of header.

Simple and intuitive is an important aspect of navigation and a universal design principle. I wanted to ask a question regarding this to see how easy the users felt the navigation was, and if the results differ comparing the header type.

After these questions was answered one time for each website, there was one more part of my questionnaire left with general questions regarding the users' preferences when it comes to persistent headers. This part consists of three questions as you can see in the figure below.

Figure 8: Questionnaire questions

The goal of my research is to measure both the performance and preferences when it comes to the use of persistent headers. These questions answered after the experiment was finished is one way of measuring their preferences. I am asking the questions in a neutral way to not influence the user's decision when it comes to their preferences. Their reasoning for choosing header is important to interpret, and therefore I am collecting it as well.

3.1.3 Participants

When finding my participants, I purposely tried to get a random sample of people, so that I can generalize my results in a bigger degree, than if I looked only for one specific type of

participants. Age, background, and experience are factors that are different for my participants, which can be seen through my results, as I also asked questions about it in my questionnaire. I did not include any participants below the age of 18 years old to avoid using minors and ethical issues that could arise.

My research includes 24 participants with various experience and age. To find potential participants I asked various people, for example people at work, campus, and on the street. My project was carried out without processing personal data. That means I did not have to apply or register my project to the Norwegian Center for Research Data. (NSD, 2022) A project is seen as anonymous if it is not possible to identify individuals at any point of my data collection. I did not have any sound clips of my users, nor did the participants answer my questionnaire remotely, which usually means their IP address or email gets stored. My questions are not asked in a way where I ask about any identifiable data. Their age is answered with age groups of ten years and is not identifiable.

3.1.4 Environment

When performing the experiment and conducting the questionnaire there was only me present in the room with the participant. I used a room with a desk and a comfortable chair to make participants feel pleasant when performing the research, and to cancel out environmental noise. The experiment was done using my laptop, which is a MacBook Air with a 13 inches retina screen. The participants got the choice of using the touchpad or a separate mouse. Most of the participants did the experiment at the same place as I was using my mac, but some did it remotely. Participants doing it remotely used Zoom or Teams, so I could share my screen and they performed the experiment on my computer. The reason I chose this method was to give remote participants the same environment as participants doing it in person on my computer. Another reason was so that the participants would answer the questionnaire on my computer, and that way do not store their IP/email.

I was present during the experiment and questionnaire in case the participants had any questions regarding difficult terms, or other difficulties doing the experiment or answering the questionnaire.

3.1.5 Procedure, Tasks, and Measurements

My experiment consists of five elements. These are:

- Information sheet

- Consent form

- Pre-experiment questionnaire

- Experiment

- Post-experiment questionnaire

The information sheet and consent form are there to inform the participants about how the experiment is done, their right to withdraw at any point, and how there is no personal data stored (a blank copy is part of my appendices). The questionnaire has been described in 3.1.2, website appearance is described in 3.1.1, and I will focus the following part on what tasks have been done, and how I do the data collection of the experiment.

I am using within-users design for my research. All participants are testing two different websites. One with a persistent header, and one with a non-persistent header. Half the participants are testing the persistent header first, and the other half tests the other one first. There are ten tasks in total. The first five tasks are performed on the first website, and the last five tasks on the second website. These tasks are to find and click on an article. To find the article they browse the website and click on it once they find it. There is no content inside the articles, and once they click the correct one, they will receive the next task/article to find. Tasks/article names are told to the participants by me who is also confirming they pressed the right article for each task. Once all five articles for one webpage/header type are found there is a short break, before the next website is tested with five new articles to find. To make sure the results are showing the difference between persistent, and non-persistent header, half the participants are starting with a different header the first time. By doing so I minimize the risk that the users get more familiar with the website during the testing and therefore answers quicker towards the end/second header tested. I also minimize the risk of specific tasks/articles being harder to find than others affecting the results. Each task is approximately equivalent to each other regarding difficulty. The scrolling distance and number of clicks needed to find each task is close to equal for each task.

Task
Find the article named "Elon Musk buys Twitter"
Find the article named "Manchester City beat Real Madrid in epic battle"
Find the article named "Expert fairs the war in Ukraine will escalate further"
Find the article named "Tiger King star Joe Exotic reveals new girlfriend from prison"
Find the article named "Bodø/Glimt heroic effort in European competition"
Find the article named "Fast & Furious" director backs out after filming begins"
Find the article named "Johnny Depp's defamation case against Amber Heard starts"
Find the article named "Myanmar military court jails Suu Kyi for corruption"
Find the article named "Russia expels 3 Norwegian diplomats"
Find the article named "Russian athletes suspended"

Figure 9: Tasks

The data I collect during the website testing is time used and wrong clicks. I measure the time from both the websites/headers separately and compare them. I count wrong clicks as clicks on the wrong article, wrong header element that is not leading to the correct article asked for in the current task, or other clicks that is not either on the article they are looking for or the correct navigation element.

4. Results

The data collected was analyzed using SPSS. SPSS is a powerful software for analyzing statistical data provided by IBM. (IBM, 2022) SPSS was used to analyze the data comparing the results from the persistent and non-persistent header websites. I have done 6 separate tests for time used, wrong clicks, and for four of the questions from the questionnaire. The questions analyzed were answered using a Likert-type scale from 1-7 where 7 is the most positive answer.

The first thing I had to do for all my parameters was to check whether my data is parametric or not. The two most used tests to check for normality and parametric data is "Kolmogorv-Smirnov" and "Shapiro-Wilk". Shapiro-Wilk is preferred if N < 50. I have N = 24 for all my tests, consequently I will refer to the Shapiro-Wilk test when testing my data for normality. (Mayers, 2013, p. 49) If the data is parametric, I will continue analyze it using a within-users t test, also called "Paired sampled T-test". If the data is not parametric, I will use a Wilcoxon signed-rank test, which is the equivalent to within-users t-test for non-parametric data. (Mayers, 2013, p. 473)

4.1 Time

The dependent measure is number of seconds used to answer all five tasks. The independent variable is what website the tasks was done on, for which there are two conditions (Persistent or non-persistent).

To check if my data is parametric or not, I ran a Shapiro-Wilk test of Normality. The results indicated that the data is parametric because $p > .05$ for both websites. Time used for the persistent header ($p = .782$) and non-persistent header ($p = .953$).

Tests of Normality

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Time in seconds for persistent website	.136	24	.200[*]	.975	24	.782
Time in seconds for non–persistent website	.123	24	.200[*]	.984	24	.953

Figure 10: Results of normality test

Total task time is significantly different with the persistent header webpage being the fastest with a mean M = 46,88 seconds and standard deviation SD = 6, whereas the non-persistent header has M = 49,96 seconds and SD = 7,1. The results from the within-users t-test is $t(23)$ = - 4,063, p < .001. The p value is less than .05 which means there is a statistically significant difference between the two websites with the persistent website being the fastest one.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Time in seconds for persistent website	46.88	24	6.031	1.231
	Time in seconds for non–persistent website	49.96	24	7.105	1.450

Figure 11: Statistics regarding time used

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2–tailed)
Pair 1	Time in seconds for persistent website – Time in seconds for non–persistent website	−3.083	3.717	.759	−4.653	−1.514	−4.063	23	.000

Figure 12: Results of within-users t-test

4.2 Wrong clicks

As mentioned earlier in chapter 3.1.5, wrong clicks are measured as clicks that is not clicks on the correct article or correct navigation element for current task.

The results of wrong clicks show no significant difference between the persistent and non-persistent header webpages. Both webpages had the same mean of 0,29 and standard deviation of .550. The experiment has N=24 and an equal amount (7) of wrong clicks for both websites. Results can be seen in the table below. Because the mean and standard deviation is equal for both websites there is not necessary to run a Shapiro Wilk test or within-users t-test as we can already conclude there is no significant difference.

	0 wrong clicks	1 wrong click	2 wrong clicks
Persistent webpage	18	5	1
Non-persistent webpage	18	5	1

Figure 13: Relation between participants and wrong clicks

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Wrong clicks persistent header	.29	24	.550	.112
	Wrong clicks non–persistent header	.29	24	.550	.112

Figure 14: Statistics regarding wrong clicks

4.3 Question One

The first question from the questionnaire I will evaluate the results of is "Did you feel the header used appropriate space compared to the rest of the content on the webpage? (On a scale from 1-7 where 1 is not appropriate and 7 is very appropriate.)" The question was asked once for the persistent header website and once for the non-persistent header website. The data is ordinal, which is numerical data that can be ordered by rank. (Mayers, 2013, p. 463) Answers were given using a Likert-type scale of 1-7.

The data is not parametric as the result from my Shapiro-Wilk test of normality is p < .001 for both websites.

Tests of Normality

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Answer question 1 persistent header	.310	24	.000	.761	24	.000
Answer question 1 non-persistent header	.292	24	.000	.742	24	.000

Figure 15: Results of normality testing

Because the data is not parametrical, I will not do a within-users t-test, as it requires data to be parametrical. I will rather do a Wilcoxon signed-rank test which tests differences in scores of a non-parametric dependent variable across two conditions of a single independent variable. It is the non-parametric equivalent of a within-users t-test. (Mayers, 2013, p. 473)

Wilcoxon signed-rank test shows a significant difference (p < .05) where the persistent header (m=6,38) webpage has the highest score compared to the non-persistent webpage (m=6). As you can see in the figure below z = -2.264, p = .024. Highest score in this context means more "appropriate" because that is what was used as the 1-7 scale for this question.

Test Statistics[a]

	Answer question 1 non-persistent header – Answer question 1 persistent header
Z	–2.264[b]
Asymp. Sig. (2–tailed)	.024

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Figure 16: Results of Wilcoxon signed ranks test

4.4 Question Two

The second question is "Did the usage of space and clutterness of the webpage feel pleasant?" and was answered using a Likert-type scale of 1-7 where 1 is not pleasant and 7 is very pleasant. The results of my tests for normality shows the data is not parametric. Answers regarding persistent header are m = 6.04, standard deviation = .751, and Shapiro-Wilk test is p = .001. Non-persistent header results show m = 5.67, standard deviation = 1.204, and Shaprio-Wilk test is p < .001.

Tests of Normality

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Answer question 2 persistent header	.230	24	.002	.814	24	.001
Answer question 2 non–persistent header	.359	24	.000	.755	24	.000

Figure 17: Results of normality testing

Because the data is not parametric, I am performing a Wilcoxon signed-rank test instead of a within-users t-test, as it is the equivalent test for non-parametric data. (Mayers, 2013, p. 463) The results of the Wilcoxon test show there is a significant difference ($p < .05$) and the score of the persistent webpage is highest. $z = -2.264$, $p = .024$

Test Statistics[a]

	Answer question 2 non-persistent header – Answer question 2 persistent header
Z	-2.264[b]
Asymp. Sig. (2-tailed)	.024

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Figure 18: Results of Wilcoxon signed ranks test

4.5 Question Three

The third question is "Did the motion and responsiveness feel pleasant?" and was answered using a Likert-type scale of 1-7. The results of my tests for normality show the data is not parametric. Answers regarding persistent header is $m = 6.25$, standard deviation = .737, and Shapiro-Wilk test is $p < .001$. For the non-persistent header, the results show $m = 5.25$, standard deviation = 1.294, and Shaprio-Wilk test is $p = .030$.

Tests of Normality

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Answer question 3 persisten header	.262	24	.000	.792	24	.000
Answer question 3 non persistent header	.160	24	.115	.907	24	.030

Figure 19: Results of normality testing

Because the data is not parametric, I am performing a Wilcoxon signed-rank test instead of a within-users t-test, as it is the equivalent test for non-parametric data. (Mayers, 2013, p. 463) The results of the Wilcoxon test show there is a significant difference (p < .05) and the score of the persistent webpage is highest. z = -4.062, p < .001

Test Statistics[a]

	Answer question 3 non persistent header – Answer question 3 persisten header
Z	–4.062[b]
Asymp. Sig. (2–tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Figure 20: Results of Wilcoxon signed ranks test

4.6 Question Four

The fourth question is "How easy was it to find the desired navigation elements?" and is answered using a Likert-type scale of 1-7. The results of my tests for normality show the answers regarding persistent header is m = 6.04, standard deviation = .806, and Shapiro-Wilk

test is p < .001. For the non-persistent header, the results show m = 4.63, standard deviation = 1.345, and Shaprio-Wilk test is p = .185. Shapiro-Wilk test indicates that the data for the persistent header is not parametric (p < .001), but for non-persistent header data is parametric (p = .185)

Tests of Normality

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Answer question 4 persistent header	.216	24	.005	.806	24	.000
Answer question 4 non persistent header	.179	24	.046	.942	24	.185

Figure 21: Results of normality testing

Because not all the data is parametric, I am performing a Wilcoxon signed-rank test instead of a within-users t-test, as it is the equivalent test for non-parametric data. (Mayers, 2013, p. 463) The results of the Wilcoxon test show there is a significant difference (p < .05) and the score of the persistent webpage is highest. z = -4.215, p < .001

Test Statistics[a]

	Answer question 4 non persistent header – Answer question 4 persistent header
Z	−4.215[b]
Asymp. Sig. (2–tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Figure 22: Results of Wilcoxon signed ranks test

4.7 Final Questionnaire Questions

After the website testing and the four questions were answered for both the websites there is one final part of the questionnaire left containing 3 questions. The first question of this part was "What website did you prefer?" with the options "persistent header website", non-persistent header website", and "no preference/equal". The results showed that 75% of the participants preferred the persistent header, 8,3% preferred the non-persistent header, and 16,7% preferred them equally or had no preference.
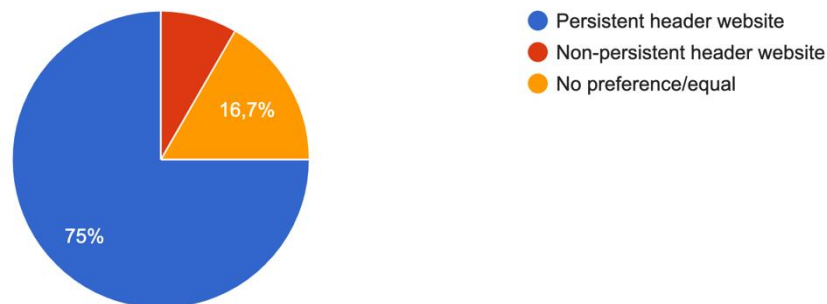

Figure 23: Results of prefered header question from questionnaire

The final two questions were optional and asked the participants "Why did you prefer the desired website?" and "Any other comments you would like to add regarding the websites, headers, experiment, or experience in general?". The participants could write whatever they felt like in a text input field to these questions. I have generalized/rephrased the answers and categorized them to show the results in the table below. A total of 18 participants gave a reasoning for why they chose their preferred website.

Answer	Number of answers	Preferred website
Easier navigation	11	Persistent
Less scrolling	4	Persistent
Preferred both websites equal/good	2	No preference/equal
Like to focus on main content when I scroll	1	Non-persistent

Figure 24: Questionnaire results of reasoning regarding preferred header

4.8 Pre-Experiment Questionnaire Questions

There were three questions answered in the questionnaire before doing the website testing. These are "How old are you?", "How experienced are you when it comes to participating in online research?", and "How experienced are you when it comes to reading newspapers online?". The results of the age question can be seen in the figure below and indicates a varying age with people in all age categories, and 20-29 being the most common age category with 41,7% of participants. 4,2% of the participants is 0-19 years old, 12,5% is 30-39 years old, 20,8% is 40-49 years old, 16,7% is 50-59 years old, and 4,2% is 60 years old or more.
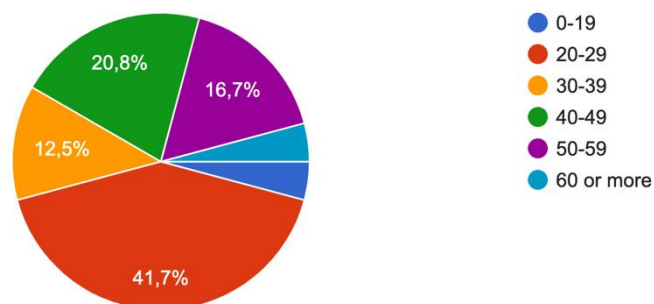

Figure 25: Results of questionnaire question regarding age

Participant experience regarding online research was answered using a Likert-type scale of 1-7 with varying results and all categories represented. The mean is 4,33. All the answers is showed in the figure below.

How experienced are you when it comes to participating in online research? (On a scale from 1-7 where 1 is not experienced at all and 7 is very experienced.)
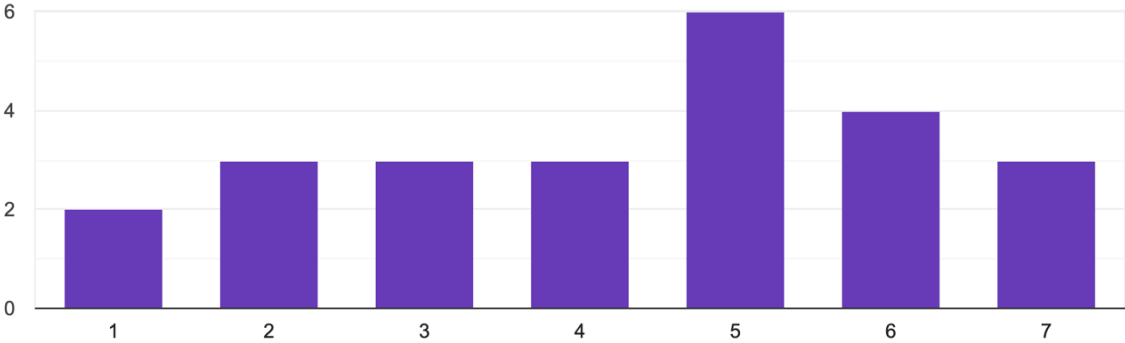24 svar

Figure 26: Results of participants experience regarding research participation

Participant experience regarding reading online newspaper was also answered using a Likert-type scale of 1-7. The mean is 5,66 which is slightly higher than the experience regarding online research. All the results of the question can be seen in the figure below.

How experienced are you when it comes to reading newspapers online? (On a scale from 1-7 where 1 is not experienced at all and 7 is very experienced.)
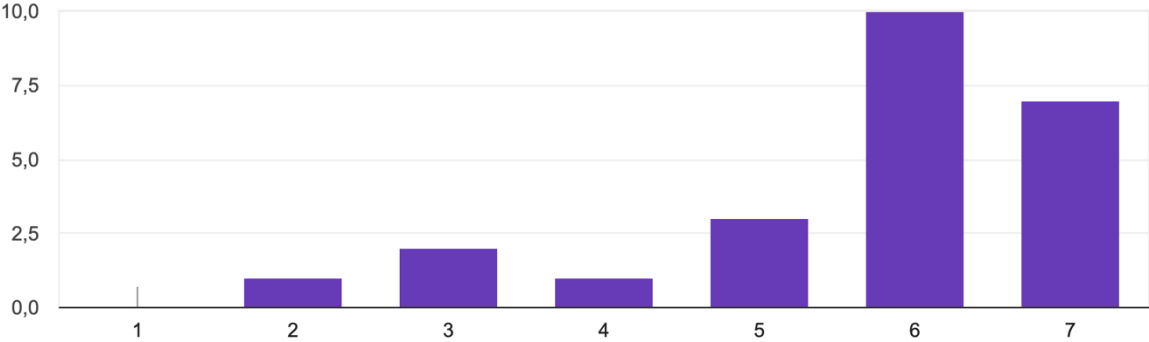24 svar

Figure 27: Results of participants experience regarding online newspapers

5. Discussion

This chapter aims to analyze and discuss my results. Significance and value of the results will be discussed thoroughly. Most of the results show a significant difference between the websites, but some does not. Value of results and how to interpret significant differences of my research will be reviewed. The results will be put into context of previous research described in chapter 2 (Literature review). I will discuss how the results narrate with previous research, potential differences, and their relation. Environmental differences can potentially influence results, and these factors are important to consider. Different types of websites and tasks may influence users' preferences regarding persistent versus non-persistent headers. The website and tasks are set up in a way to minimize this risk, and results can be generalized to a longer extent. User diversity and experience level are other factors that are important to consider. Device type and screen size is factors that play an important role regarding users' preferences. (Laubheimer, 2021)

I will also link universal design principles to the performance and preference of the website/header and discuss to what extend the different headers are applying relevant universal design principles. (National Disability Authority, 2020) Limitations and potential weaknesses of my research will also be discussed further in this chapter.

5.1 Interpretation of results

One variable tested was time used. A significant difference was shown with the persistent header website being fastest. With many articles to find involving a decent amount of scrolling, the results show participants found articles faster using a persistent header. For the non-persistent header webpage, the users had to scroll all the way to the top each time they had to look for a different navigation element. It took extra time to do so with ten different articles to find in total. 15 participants answered that less scrolling or easier navigation was the main reason they preferred the persistent header webpage. Another advantage that may influence the time used is the fact that the header is always visible, which makes the users have a clearer picture as to what are the different navigation elements, and their position. When the users used the non-persistent webpage and finally

scrolled all the way up to see the header again, they then had to use some time to look at what the different navigation elements were named and their position.

Number of wrong clicks showed no significant difference. Total number of wrong clicks was equal for both websites. Seven total wrong clicks among 24 participants are very low number and is impressive. The reason for all wrong clicks was pressing the wrong navigation element. Some participants did not immediately understand under what category a news article belong, and therefore "guessed" the wrong subheading. No users missed clickable areas of articles/navigation elements or did not understand layout of the webpage. Type of header was never a reason for a wrong click, and the results did not show any significant difference.

Low number of wrong clicks can be caused by several reasons. One is that the tasks were clear and easy to understand, and the website itself was easy and intuitive to use. Participants found the layout and navigation understandable. Results of the four questions asked for both persistent and non-persistent header validates this hypothesis. These questions were asked with the intention to substantiate vital header-characteristics that is important to create best possible user experience. These characteristics is space usage, main content to header ratio, contrast, and motion. (Laubheimer, 2021) These four questions were answered with a Likert-type scale of 1-7 and most of the mean results is around 6, with the lowest mean being question four regarding non-persistent header with M = 4,6. The positive results indicates participants were happy with how the header was when it comes to looks and performance. The header is simple and intuitive with easy-to-understand navigation and clear contrast to main content. All results of these four questions showed a significant difference with the persistent header website scoring best. It reflects users' general preference of the persistent header.

Trend of results showing persistent header performing best regarding time used and questions from the questionnaire continues in the final part of my questionnaire, where I ask "What website do you prefer?". 75 percent preferred the persistent header webpage. When answering what type of header participants preferred, usability and performance were the most important factors, which they mentioned in the next question where they gave their

reasoning. Time used plays and important role because most users prefer the website that performs best and is most easy to use. This can be said for most aspects of websites and applications, not only header type. User centered design is important to create best possible solutions with good usability. All users are not always agreeing, but we see a clear trend in my project, although a couple participants liked both websites equally, and one participant preferred the non-persistent header because the user wanted the whole screen size to prioritize the main content when scrolling and looking/reading for specific articles. To satisfy all users, webpages could have an option in the form of a button they could press to toggle between type of header. By doing so the minority of users that prefer a different header can have their preferred header as well.

These results could potentially be different in another environment. Complexity of navigation and use patterns differ depending on what type of website/application is used. Another important factor that may influence user preferences is the device, equipment, and screen size. On smaller screens screen, there is less space, and therefor hiding the header more often may be beneficial. Partially persistent headers are often used on mobile devices to hide them when users are scrolling but reappear as soon as users scroll upwards. This is a measure to use all the screen when users are scrolling through content, but at the same time have the header reappear easily to access all its elements (like navigation etc.).

The first questionnaire questions asked were regarding age and experience. These results show that my group of participants are diverse to some degree. Age is varying and they have different experience. Although these factors are different the experiment could still have a more diverse group with for example participants from different countries and more diverse backgrounds. Most of the participants have been contacted in person in Oslo, which limits their diversity to some degree. Results shows all age groups are represented, as well as all the 1-7 scale options represented regarding my question of previous experience of participation in online research. When it comes to experience regarding reading online newspapers the scores are better than scores of research experience. The mean of reading online newspapers is 5,66 versus 4,33 for research experience. 5,66 is a high average of newspaper experience, which means my participants in general are very familiar with reading online newspapers. Input from users with different experience is important because

webpages/online newspapers should be usable for all users, no matter their experience. This can be said for any given website.

There is little research done comparing persistent and non-persistent headers, but there is a lot of research done on navigation in general. To create a good header with navigation it is important with simple and intuitive names of navigation elements. Path complexity will negatively affect the results (time, wrong clicks, and user satisfaction). (Melguizo, 2011) For websites with less complex navigation, like my website for this experiment, some research suggests horizontal menus with top position is preferred. (Murano & Sander, 2016) Simplifying navigation elements and paths is important, as well as showing all information if possible. Simplified/extendable menus not showing all information is not a good thing, and users prefer clear menus showing all information right away, which is what I created for my website. (Leuthold et al., 2011)

5.2 Universal Design

Universal design principles are important to consider. When they are followed it often means the usability is good. The seven principles of universal design cover various aspects of universal design and some are more relevant than others in regards to headers. (National Disability Authority, 2020)

The first two principles, "Equitable Use" and "Flexibility in Use" are about making the design useful and usable for users with diverse abilities. Users have different abilities and preferences, and to accommodate everyone it is important to make the content identical whenever possible; equivalent when not. Providing users with choice of method in use is important to improve flexibility. As my results show all users are not agreeing on preferred header and providing a choice could be an effective way of providing all users with their preferred header. A button/option could be implemented to toggle whether the header is persistent or not. (National Disability Authority, 2020)

Another principle is "Simple and Intuitive". (National Disability Authority, 2020) It is important to keep the design understandable regardless of users experience and abilities. I would argue that a persistent header is more intuitive and easier to use because it is always

visible. Having a non-persistent header can be confusing as vital elements of the webpage is hidden when users scroll. On mobile devices and small screens persistent headers could potentially not be as simple in use because they would potentially take up a bigger portion of the total screen size, resulting in the main content being harder to use. In context of my experiment, websites on laptops with 13-inch screens (or bigger) persistent headers is more intuitive and simpler to use. It creates better usability and user experience, which my results indicates as it shows users prefer persistent header instead of a non-persistent header.

Using a non-persistent header results in users having to scroll all the way back to the top of the webpage to find navigation elements. It creates unnecessary time usage and physical effort, which is not desirable. Keeping physical effort to a minimum by minimizing repetitive actions is important and part of universal design principle six "Low Physical Effort". (National Disability Authority, 2020)

5.3 Environment

Environmental differences will influence the results. I have tried to setup my experiment in a way where my results are valid and not influenced by other factors. One factor is users' diversity and experience. I have tried to have my participants being as diverse as possible. By doing so the results can be generalized in a bigger degree. Most of my participants performed the experiment in person, and therefore the geographical differences are not that high. However, my results show their experience and age are varying and implying my group of participants is diverse. While performing the experiment, disturbance and device type can influence the user's concentration and results. I minimized the risk of these factors influencing the results by having participants doing the experiment in a closed room from the same computer. Half the participants tested the persistent header webpage first, and the other half tested the non-persistent header webpage first. By having the within-users design I minimized the risk of other factors influencing the results (users getting familiar with the website/tasks before second test, different users performing differently).

Experiment testing was performed on my laptop with a 13-inch screen. The setup was equal for all participants except a small minority which performed the experiment remotely using their own equipment. I made sure everyone who performed the experiment remotely used a

laptop with an approximately equal size screen and using a screen sharing program to create as equal environment as possible. I chose to have some participants do the experience remotely to increase my number of participants. I believe it helped me get more reliable results with more participants, as the risk of environmental differences influencing the results of participants doing the experiment remotely is low.

Different screen size and device type could potentially have influenced the results. With a fairly big screen size the space usage of having a persistent header present all the time is not as problematic as it potentially could be on smaller screens like smartphones. On smartphones persistent headers is not commonly used, as total screen space is less. Partially persistent header is commonly used on smartphones. (Laubheimer, 2021)

Type of website can potentially change user preferences and performance of headers. How complex and often navigation is needed can change user preferences. If a website requires less navigation and is more focused purely on scrolling and reading content a persistent header is less popular, than a website which requires frequent navigation. Headers do not always only contain navigation, and search bar and company logo is popular header elements. If these elements are important a persistent header is more likely to be preferred. For my research I tested a newspaper website with tasks of finding specific articles. In a different context with different website type or different tasks, the results may have been different, and is something that could be further explored in future research.

5.4 Generalize

My findings indicate persistent header is better than non-persistent header both when it comes to performance and user preference on a newspaper website on laptops. Other environmental differences are minimal, and the results can be trusted and generalized in this context. Different device type and/or screen size can influence results and should be further investigated. Tasks and website type was setup in a way to generalize my findings and are representable for most webpages. On webpages with a header containing important content a persistent header should be used.

Participants are diverse when it comes to experience and age, but an even more diverse group of people can be further investigated. People with impairments would be valuable to have as participants.

5.5 Limitations

There are three main header types. These are persistent, non-persistent, and partially persistent. I have investigated persistent and non-persistent headers, but an interesting aspect to investigate further is how my findings would be with an experiment of all three headers instead of the two I have done. Even though partially persistent header has not been investigated in my research, it does not influence my results of a persistent header being preferred over a non-persistent header.

Another limitation of my research is that the headers are tested on a laptop (13-inch screen). With bigger screens, there is more space and the header should be persistent, but it would be interesting to investigate further how my results would be on smaller screens like smartphones. Non-persistent and partially persistent headers are more common on smaller screens today. (Laubheimer, 2021)

6. Conclusion

This master thesis has been written with the intent of being a usability and universal design investigation into the use of persistent headers in web pages. I have compared persistent and non-persistent headers to investigate what header users prefer and what header performs best measuring time used and wrong clicks. Users prefer persistent headers instead of non-persistent headers. My results show persistent headers perform better, with users using significantly shorter time finishing the tasks using the persistent header webpage. Wrong clicks showed no significant difference, and the wrong clicks that occurred in the experiment had no correlation with type of header. Persistent header performed better because users do not have to scroll all the way to the top of the webpage to find navigation elements, which are located inside the header. Persistent header is participants preferred choice of header with 75% preferring it. Universal design principles are important to consider when creating headers, navigation, and website in general. A persistent header is following universal design principles to a greater extent than a non-persistent header. It is simple and more intuitive to use as the header is visible at all times, and it requires less physical effort, with fewer repetitive actions (scrolling).

6.1 Future Work

Results indicate persistent headers should be used instead of non-persistent headers on screen sizes of 13 inches and above. Smaller screen size is an interesting area that should be further investigated. Websites and applications are very popular on smartphones, which is a device type with smaller screens that should be used in further work.

Partially persistent header is something that also should be further investigated. I have not investigated it but compared persistent and non-persistent headers instead. With more time it would certainly be something I would have included in my research, but while narrowing down my research it was something I chose to exclude from my investigation.

When investigating usability and universal design it is important with diversity within the group of participants. In future work I would recommend including participants with impairments, which I was not able to recruit/include in my research.

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8. Appendices

8.1 Information sheet

Information sheet handed to users to inform them about how my research is conducted.

8.2 Consent form

Blank copy of consent form handed to participants. Each participant handed me a signed copy and kept one for themselves.

8.3 Questionnaire

Full blank questionnaire. Questionnaire was created using Google Forms and answered online from my computer before and after the experiment to ensure to personal data was collected.

8.4 Results of questionnaire

Results from all questions and participants for all parts and questions of my questionnaire.

8.5 Dataset of results

Results of time, wrong clicks, and 4 of the questionnaire questions used in SPSS to analyze the results.

8.6 Poster

A1 digital poster of my master thesis.