UNIVERSITY OF AGDER

Development, Usability Engineering and Testing of the Video on Demand Service Filmrommet.no

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ABSTRACT

This thesis describes the design outcomes and user evaluation of the redesigned Filmrommet-service, from a human-centred point of view. Research into several interdisciplinary fields, including interaction design, design principles, usability testing and usage of movies in schools have been assessed in order to design an interface that is easy to use, engages the user and presents meaningful content. Prior to starting designing the new interface, a questionnaire survey comprised of feedback from 116 Filmrommet users was conducted. The qualitative and quantitative data from the survey covering user characteristics, user behaviour, user satisfaction and user needs, was then analysed and put to use in subsequent design activities. Human-centred design activities are described and presented as well as a usability study conducted on 6 teachers and librarians. Digital prototyping and testing was done through the use of Adobe XD and InVision, and a design solution is presented based on the feedback acquired from testing. The concluding redesign of Filmrommet gives suggestions for further development. Findings emphasise the importance of implementing a well-functioning search feature

ACKNOWLEDGMENTS

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CHAPTER I: Introduction

Since the dawn of formal education, teachers have used several tools for delivering their learning content. In the beginning there were only analogue forms of expression, such as speech, written text, paintings and drama plays. In the 15th century the Gutenberg Revolution took place, and printing books has ever since been the de facto medium of delivering and distributing learning content.

Mankind have always used different forms of expression in their communication. The invention of the motion picture camera led to the production of the first movies. This paved the way for a large movie industry. Educational films have been used in education as an alternative to other teaching methods. Films can be powerful and engaging educational tools. Usage of movies can motivate, provide variation and give new aspects to education.

Then the Digital Revolution occurred, and later the Internet came. It provided new ways of distributing content. Text, images and video could now be sent digitally and distributed instantaneously. Incorporating video in teaching and learning is now common practice. As learning shifts to the online arena, digital video will play a bigger role in delivering course content to the 21st century student.

The evolution of online technologies holds promise for providing users with the convenience of easier access to media, but it does not necessarily imply that video will become a better tool for delivering learning content. By itself, video is just a medium consisting of sound and image, just as a book is a medium consisting of written words. Usage of videos and books for schools are just one component of the complexity of a classroom activity system(Karppinen 2005). Simply presenting information through video to the students will not automatically lead to in-depth learning. The teacher should assess video with the characteristics of a meaningful and good learning process. The tool's value lies in the way it is put to use.

Filmrommet

Norgesfilm AS is one of the leading Nordic firms in the area of Digital Asset Management-, Video on demand- and Streaming-services. Their video streaming service Filmarkivet

(www.filmarkivet.no), claims to be the world's first national digital film archive. Launched in 2004, after having completed a pilot project in collaboration with The Norwegian Film Institute(NFI), Filmarkivet.no has since its inception been geared towards the commercial private consumer market, providing on demand content with emphasis on the Norwegian film heritage. A subscription and pay per view-licence grants access to a library of feature movies, short films, documentaries and older commercials. Filmrommet (www.filmrommet.no), the sibling service of Filmarkivet and which was launched in 2008, is Norgesfilm's video on demand service for schools, libraries and other similar public institutions. Filmrommet is based on a subscription only only, and provides institutional movie-viewing licences.

Norgesfilm's service Filmrommet is unique because it is targeted towards education, providing the user access to relevant movies categorized by school subjects and stages of education. Some of the movies are also presented with educational learning resources such as articles and tasks. The viewing of movies is restricted to subscribers only. Subscribers are schools, libraries and other institutions where access is given to the teachers, librarians or other institutional workers. The service provides institutional viewing rights for its content, enabling teachers the right for screening films to the class.

Background and Problem statement

Delivering movies through an on demand service holds great potential, as seen with disruptive innovations like YouTube and Netflix. A VOD service delivers convenience for the teacher, but few are tailor-made for providing educational resources and there is also a rather complicated rights related to screening in a classroom. A relationship with Norgesfilm had been established back in the 1. semester of 2015, but due to lack of fitting project-courses, further collaboration was put on hold. The design for this master's project was started in the 2. semester of 2015 when Norgesfilm reached out once again and wanted to discuss future possible projects. Norgesfilm had stated that the design of the current Filmrommet service lacks several characteristics of what makes an effective user interface. Without ease of use and engaging and meaningful content, the service will not be able to fulfil the needs of the user. Also, the learning resources which Norgesfilm develops for the Filmrommet service needs to be easier for users to access. These were the initial requests from Norgesfilm. This gave incentives to launch a project were human-centred design activities could be used and a new design solution for Filmrommet based on Interaction Design principles could be

developed. This thesis will in the coming chapters explain how an approach to the redesign and development of the service Filmrommet was set up.

Objective

The focus for this thesis was on the user experience and usability factors of the user interface of the Video on Demand service Filmrommet. The service should be easy to use, engaging and present meaningful content. This user interface will be designed both with interaction design and pedagogical principles in mind. The interface will be verified through usability testing of the produced prototype, the results from testing will be analysed and suggestions for further development will be presented. The main goals are to improve the way movies and learning content is provided to the user. It should be easier to find relevant content for educational usage as well as accessing the content on modern devices. Therefore, the technical design of the service needs to be compatible and play nice with today's standards and conventions. The research questions are as follows:

- How to design an interface for Filmrommet based on Interaction Design-principles that is easy to use, engages the user and presents meaningful content.

Hypothesis

A well designed VOD with integration of meaningful learning-resources will improve the teacher's involvement and effectiveness, and thus possesses a greater value for learning.

Scope of thesis

- The implementation of a new design into the existing service Filmrommet are out of scope of this thesis.
- The economical incentives for improving the usability of the service Filmrommet is that the service will draw more user and generate more revenue.
- The economy of Filmrommet will be out of scope for this Master Thesis.
- Because of the timespan of the research, no economical data in relations to the design can be evaluated.
- Because of the the limited scope and timespan of this research, only a limited context of

use for the product will be tested.
- The research assumes that most of the teachers are using a regular PC Laptop and are sitting at their office when accessing Filmrommet.
- Because of the time available, only a small number of test users will be involved in the usability testing of the design.

Interaction Design and Human-Computer Interaction (HCI)

In order to design systems that support users, one need to understand what users need and how users interact with the system interface. Understanding human needs is key to producing a good interactive system. Therefore, it has to be acknowledged that many disciplines need to be involved when planning and creating a successful interface.

The textbook on Interaction Design: *Interaction Design: Beyond Human Computer Interaction* describes Interaction Design this way: "designing interactive products to support people in their everyday and working lives." (Rogers, Sharp et al. 2011).

In order to come up with a proper redesign of the Filmrommet service, research into and understanding of the context of use, prototyping of possible solutions and validation of the proposed design are some of the activities that will be needed in the development.

The production of the interface and the evaluation of the user experience and the user effectiveness will be done through researching and devising literature in the field of usability engineering. Research and literature by the Nielsen Group, and especially the book «Usability Engineering»(Nielsen 1994), will be emphasised.

Areas that can be enhanced and extended by designing the Filmrommet service will be examined. Knowledge on the interdisciplinary fields of interaction design will be incorporated and combined with the different aspects of Human-Computer Interaction.

Thesis overview

This thesis is divided into four chapters. The first chapter introduces the subject and gives a brief background to the project. It also sets the objectives and defines the scope of the thesis.

Chapter two describes the background behind video on demand and interaction design. It then establishes the basic principles about design and user experience, as well as looking into usability goals and user experience goals. Usability heuristics and surveying and testing of similar services is covered. It then takes the state of the art in the field of video on demand and introduces two relative services. Finally, litterature related to the usage of movies in schools is assesed.

The third chapter covers the data gathering and user research methods related to producing the design.

Chapter four describes the results of doing user research activites. The prototype implementation is covered in detail as well as covering the survey and usability evaluations and the practicalities of the user-tests. Finally, the appendices related to the activites and a conclusion is presents based on the findings of this thesis work.

CHAPTER II: Background

The subject for this master's thesis merits study because the intersection between technology and pedagogy have the potential to enable new and more innovative and convenient arenas for delivering learning content. This thesis will give an overview into several academic fields, concentrating on subjects that can add to the development of an effective process of making a design solution for the redesign of Filmrommet.

Technical background

According to the multinational professional services network PricewaterhouseCoopers (PWC), the majority of movie distribution is expected to shift from physical(DVDs) to streaming(VODs) services by 2018:

"Global electronic home video revenue will exceed physical home video revenue in 2018. Globally, the total combined revenue from over-the-top (OTT)/streaming services and broadcasters' video on demand (VOD) services will grow at a CAGR[1] of 19.9% to overtake physical home video revenue (the sale and rental of DVDs and Blu-ray discs) in 2018." (PWC, Global entertainment and media outlook 2015-2019 – Filmed entertainment. 2015)[2]

A video on demand service, abbreviated VOD, is a system that allows users to access video-content when they choose to, either as video-stream, enabling real-time viewing, or through downloading the content, giving the users access to watch the content without an internet connection.
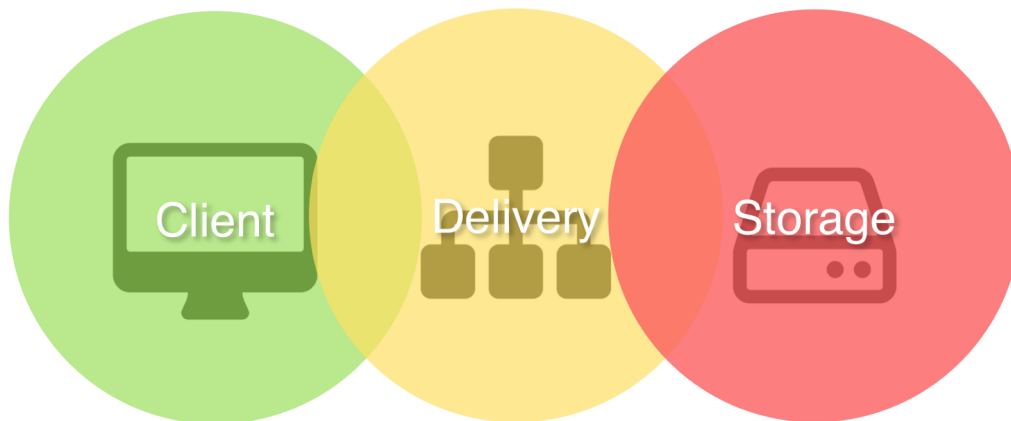
Figure 1. Overview of a streaming video service

Figure 1 illustrates an overview of a streaming service. Here the client is the device and interface used by the end-user for watching movies. Delivery of content is achieved through IP(Internet Protocol). The delivery can be optimized for the individual user and device, both in regards to bandwidth and personalization. A server or CDN(Content delivery network) stores associated media.

Recent advances in technology, combined with innovate business solutions, have paved the way for disruptive services like YouTube[3] and Netflix[4]. These services have made a strikingly impact on the market, forcing traditional broadcasting- and movie companies to rethink their strategies.

Theory of Interaction Design

The practice of designing interactive digital products is called Interaction Design. Interaction design focuses on providing engaging interfaces and ways to support, extend and enhance the way people do work. An understanding of how users and technology communicate with each other is fundamental to this field.
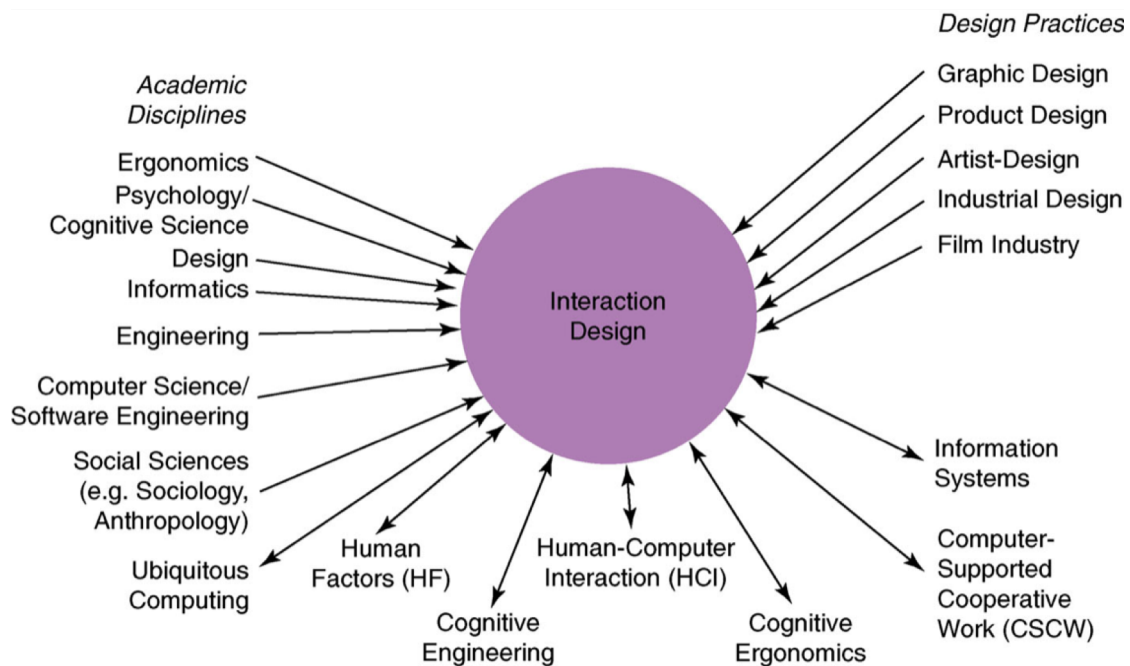
Figure 2.   Interdisciplinary overlapping fields of Interaction Design.

Many academic principles, design practices and interdisciplinary fields have to be taken into account when working with Interaction Design as can be illustrated by figure 2[5].

An integral part of interaction design is to understand what goes on in the human mind when using digital interfaces. Insight into the human cognition and behaviour is central when developing products. Mental models are described by Jakob Nielsen as "What the user believes about the system at hand"[6]. Mental models impact how humans use a system and drives the user's prediction and planning of actions. To develop a product, designers conceptualize interaction by making conceptual models of how humans use the product. Ideally this would be a conceptual model that matches the mental model of the users. A mismatch between the designer's conceptual model and the user's mental model is a common predicament for a badly designed system.

Usability and User Experience Goals

In order for a system to be effective and to enable users to be more productive, goals regarding optimizing interactions people have with the product must be clearly defined. In the discipline of Interaction Design such goals are called Usability and User Experience goals.

Usability is defined in ISO 9241-11:1998 as:

"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use"(DIS 2009).

In relevance for the Thesis, usability can be divided into two categories; physical usability and usability of the software. The physical usability relates to the physical device being interacted with by the user, its design and ergonomics. Physical usability will not have a primary focus in the Thesis because hardware-design will be out of scope given the timeframe, the resources and the relevance. Usability goals generally ensures that a product is easy to learn, effective to use and is enjoyable for its users. Usability goals for Filmrommet will be:

- effective to use
- easy to learn
- have good utility
- efficient to use

While usability assess the usefulness or productivity of a system from the system's perspective, user experience assesses how the users feel when interacting with the system. Usability can have objective criteria, while User Experience is subjective in its nature. When designing an interactive product, understanding of how users experience the system is key.

User Experience goals concern with the users feeling when interacting with a system. Such goals for the new design of Filmrommet can be that the interaction with system feels:

- helpful
- motivating
- aesthetically pleasing
- supportive of learning

Design concepts and principles

"Design is really an act of communication, which means having a deep understanding of the person with whom the designer is communicating." (Norman 2002)

Several principles and concepts regarding designing interactive systems have been suggested to guide designers making the right design-choices. These are based on a mix of theory-based knowledge, experience and common practice and can be thought of as the do's and don'ts of Interaction Design. Such principles are critical for understanding why some designs are more usable and learnable than others. In his book, *The Design of Everyday Things* (Norman 2002), Don Norman establishes 6 principles of design:

Visibility

Shortcuts are great for an expert user, but when operations are hidden or hard to find, new users will not easily be able to use certain functions.

The principle of Visibility suggests that the usability and learnability of a system can be improved when the controls for operations are clearly visible and easily accessible. This implies that commands and options are placed where the user is expected to find them, indicating what they do and how they work. A comprehensible relation between the placement of an option and what it does, makes it easier for a user to utilise a product. Likewise, when an option is hard to find, the probability of the user discovering a certain functionality is limited. This does not necessarily imply that a complex interface needs hundreds of options clearly visible to the user at all times. Compromises can be achieved in several ways. Examples being drop down menus and presenting commands and controls in relevance to the context of use.

Feedback

Correct feedback is essential to everyday life. It tells us if the things we are doing are right or wrong. It provides comfort and a sense of security. It helps us decide if an action has been valuable. Imagine driving down a city lane. Suddenly, the traffic lights turn red and the driver stops. A few seconds later, and cars are crossing the intersecting lane in high speed. The feedback from the traffic light gave the driver indication that she should stop the car. Imagine if there hadn't been any feedback.

The principle of Feedback is about giving the user a confirmation what action has been done and what has been put into effect. An action should send back information whether the action is performed successful or unsuccessful. Feedback can come in many forms. In the case of traffic lights, there are visual feedback given to the driver, informing whether she has to stop, or is allowed to drive. When a button is clicked on a website, indication should be provided so that the user has evidence that the operation was activated successfully. This can be done through giving the interaction animation, giving the appearance of a button being depressed and released. Likewise, feedback can also be given through sound; playing a "click"-sound when the user presses the button may be appropriate to help inform that the button has been pressed. When the operation is activated, the system should then give feedback on what the effect is. For example; when pressing a play-button on a movie-player, the user expects the movie to start playing. Giving wrong feedback, the user may feel confused or irritated.

Constraints

Without constraints, interactions may lead to systems failing. Computers, by themselves, aren't smart enough to understand what to do and not do. It is the people that are developing and designing applications that have to make sure invalid commands are being entered and that errors are prevented.

The principle of Constraints suggest that interfaces must be designed with restrictions in order to prevent invalid data being entered and invalid actions being performed. An example of this will be a subscription-based VOD were non-subscribers are restricted from playing movies. If a play-button, enabling a movie to be played, were accessible the non-subscriber, this would lead to an invalid action.

Mapping

Effective interface-controls should match real world objects. Therefore, logic and conventions has to be taken into account when designing interactive systems.

The principle of Mapping suggests that there should be a clear and explicit relationship between a control and its effect. When pressing a button on a website, the action should trigger a related effect. The design should help inform the user what will happen if an interaction is performed.

Consistency

Things that look similar should operate similar. Only when a product is consistent can users apply knowledge patterns.

The principle of Consistency suggests that interactive design should help user recognize similar operations and be able to apply patterns. Design through consistency can help users memorize how a product works and make them able to utilize that product. Contrarily, an inconsistent product will cause confusion for the user, making them lose confidence in the product.

Affordance

A door handle affords you to pull the handle, in order for the door to open. A chair affords sitting down on it. The handle of a cup provides obvious affordance for holding. An open terrain affords walking. These are all affordances, or possibilities of action. The term affordance was introduced by James J. Gibson in his article "The Theory of Affordances".(Gibson)

The principle of Affordance suggest that an object or control gives clues through its attributes as to how the object or control can be used or operated. Physical affordance is provided by the objects attributes; its shape, dimensions, weight, and more. When applying the concept of affordance to graphical user interfaces, sensory feedback through for example visual cues can be used. An example of this is a button on a website. The button, which is displayed on a two dimensional screen, is simulated to look like it is a three-dimensional object and raised off the screen through the use of shadows. When it is clicked, its shape is changed, simulating a force being active on the object. This tells the user that the state of the object is changed, leading to an action being performed on the system. Designers can use design conventions and frameworks for providing affordance cues. One example of this is Bootstrap[7], which is a front-end website framework, providing design templates for web-interfaces, as well as other typography, layout, forms, and more. Another example is by developing a software application and using the standard guidelines provided by the operating system. One example of this is Apple's iOS Human Interface Guidelines[8] that provides guidelines for developers and promotes consistent use of design patterns.

Usability evalutaion and Heuristics

When design principles are put into practice, evaluation of the products usability is done through examining the interface and evaluating it compared to usability principles. These evaluation criteria can act as guidelines or heuristics[9]. Several guidelines and evaluation-methods have been developed. Each taking different approaches, most notably: Gerhardt-Powals' cognitive engineering principles (Gerhardt-Powals 1996) and Weinschenk and Barker classification of heuristics (Weinschenk and Barker 2000). But probably the most-used heuristics for evaluating user interface design are Jakob Nielsen 10 general principles for interaction design (Nielsen 1994). These rules of thumb-principles promote:

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from errors
- Help and documentation

These heuristics form the guidelines for many usability evaluation-methods. A more comprehensive list can be found over at the nngroup.com-website[10].

HCI testing and analysis of eTeaching- and VOD-services

Prior to the development of evaluation procedures for the Filmrommet design process, user surveys and usability tests conducted on similar services were examined. An overview of some of those studies are given here:

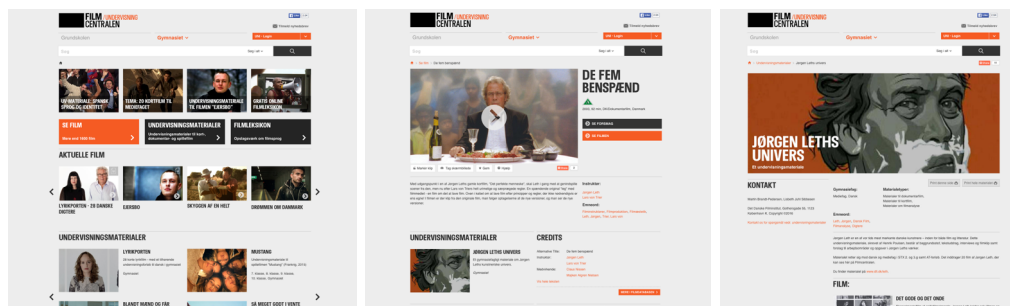**"Webstatus Filmcentralen 2014 – Grundskole og gymnasiet"**

Figure 3.   Filmcentralen.dk

Filmcentralen.dk[11] is a Danish VOD/streaming service by the Danish Film Institute that opened in 2014. Its catalogue consists of documentaries and short films. The service is split up in two sections: *Filmcentralen / For Alle* is a public service free to access and view by all citizens of Danmark. *Filmcentralen / Undervisning* is a service free to access, but movie viewing is restricted via Uni-login[12], limited to Danish students and teachers in *Grundskole* and *Gymnasiet*.[13] The *Filmcentralen / Undervisning* service includes learning resources, making it similar to Filmrommet. Figure 3 presents some of the different content-pages from Filmcentralen. From left to right: The frontpage of *Filmcentralen / Undervisning*, the player-page for watching movies and a learning resource-page.

In 2014, the company Userneeds[14] was commissioned to run a *Webstatus*[15] user survey on *Filmcentralen / Undervisning*. The report from this survey has been disclosed for this Masters. The survey focuses on three areas: *User demographics*, *Ease of use* and *User experience*. A total of 3528 respondents contributed, consisting mainly of students and teachers. The survey consisted of both qualitative and quantitative questions regarding users preferences, needs and satisfaction. Results show that close to two thirds of *Filmcentralen / Undervisning* users are teachers. Results show that half of the respondents are searching Filmcentralen.dk for both the movie to view and its accompanying learning resources. A third of the respondents use Filmcentralen.dk only for movie viewing while the major portion of the remaining participants say they only use Filmcentralen.dk for accessing learning resources. The service scores generally well on both user experience satisfaction and ease of use, giving the aggregated evaluation-index of 72,7%(for *Grundskole participants*) and 75,6%(for *Gymnasiet participants*). The most prominent drawback of the site is its relevance

in the context to content. When asked "Filmcentralen.dk have the content I need"("hjemmesiden har det indhold, jeg har brug for"), a third of the respondants say they disagree.

"Brukerundersøkelse for NDLA 2015"

Figure 4.   NDLA.no

Nasjonal Digital Læringsarena(NDLA) is a Norwegian inter-county cooperation, offering freely available open educational resources for secondary education (Videregående skole)[16]. The service started out in 2007 and has since gained a portfolio of courses. At the start of the school year 2015, NDLA had available educational resources targeting close to 50 curriculaes for secondary education. Website-statistics dated back to the winter of 2016, show that NDLA.no had 300.000 user sessions per week. Figure 4 presents some of the different content-pages from NDLA. From left to right: The frontpage of *NDLA.no*, a course-page and a learning resource-page.

In 2015, the research company Ipsos MMI[17] conducted qualitative research by means of in-depth interviewing 10 teachers and 17 students at 5 schools. The goal of the research was to get insight into the user experience. The report from this study is publically available at the NDLA.no website[18]. Results show that, even though students and teachers have great confidence in the educational content that NDLA have in their portfolio, they are finding the structure and navigation of the site disorganized. Proposed suggestions for providing easier navigation and better overview of the structure points to giving the site a more effective visual design.
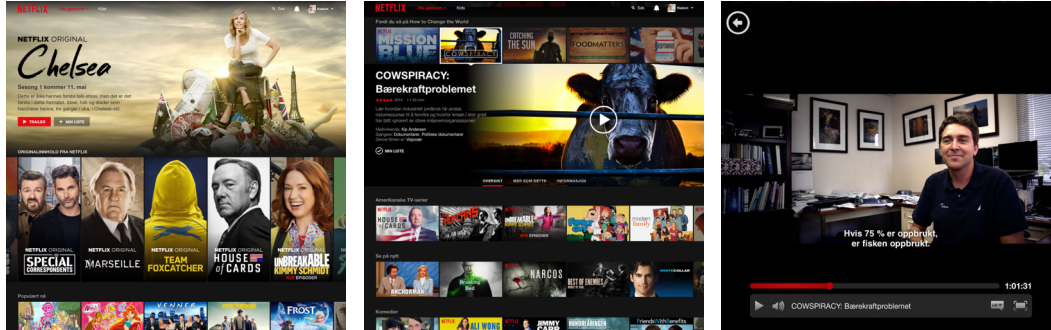
State of the art

Netflix

Figure 5.   Netflix.com

Netflix is one of the worlds largest providers of streaming movies and TV shows. The service is available through the use of a web-browser, as well as through the Netflix-app supported on several devices, such as smart TV, game consols, streaming players, phones and tablets. Figure 5 presents some of the different content-pages from the desktop browser version of Netflix. From left to right: The personalized starting page of Netflix.com, a movie-listing page with a movie expanded showing details about the movie and the movie-player. As of April 2016, Netflix reported that the service had over 81 million subscriber in over 190 countries[19]. The user interface of Netflix have changed many times over the recent years, and different interfaces exists on different devices. Looking at the most recent desktop web version of Netflix.com[20](May 2016), the first thing one will find is that this service has a pay-wall. In order to access the movie-catalouge, the user has to have a subscription. When the user has made an account, he is prompted by the service to give feedback on his personal preferences. When the user enters Netflix, the service displays a suggestion of movies for easy access, as well as listings of featured content, popular content, recently added content, and more.

The user can browse through movies and TV shows based on categories, genres, and more. The user can search for content based on movie/show titles, people involved, as well as doing full-text search. The user can queue movies/shows with the use of the "My List" feature[21]. The main interface consists of a modular content tile layout. Here the tiles are representing movies/shows. Interactive features, such as hoovering with the mouse cursor, populate the tile

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with a image slideshow(also called a live tile[22]) as well as content title, details, play-button and expand button. The expand button, also activated when clicking the rest of the tile except the play-button area, expands more details about the content in the space below. When the user starts playing a movie/show, the video and its control displays in browser fullscreen, leaving all other content unavailble for the user.

Netflix can only be used for private viewing, making it restricted in regards to educational usage[23].

NRK Skole
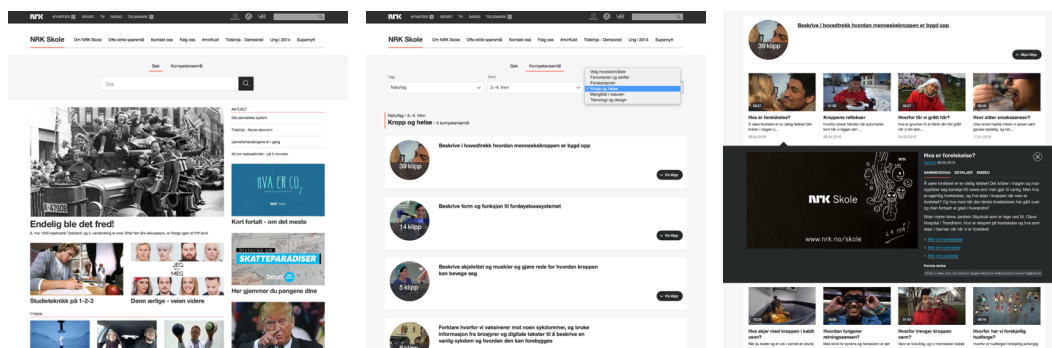
    Figure 6.   NRK Skole

NRK Skole is a free and open digital media-clip archive with thousands of clips that are handpicked and adapted for use in education[24]. The Norwegian Broadcasting Corporation(NRK) developed their service in collaboration with *Kunnskapsdepartementet*, *Kultur- og kirkedepartementet* and *Utdanningsdirektoratet*, and released www.nrk.no/skole back in 2010. The video and audio archive consists of a wide selection of clips from the NRK radio and broadcast-archive. The video-clips are full-text searchable and sortable by their associated courses, topics, stages of education and competence goals (Kompetansemål). NRK Skole uses the curriculum developed by the Norwegian School System (*Utdanningsdirektoratet)*. NRK Skole launched a redesigned website in april 2016. The new website simplifies the layout, putting focus on search and the ability to browse clips based on their corresponding competence goals. Figure 6 presents some of the different content-pages from NRK Skole. From left to right: The front-page, the search page, presenting video-clips based on competence goals and the movie-player. For the first time, NRK Skole is now

"mobile friendly" through the use of responsive design. As of May 2016, the redesign and the features of NRK Skole is not fully developed, missing clips organized to certain courses and some more advanced navigational and search features. One interesting aspect of the new NRK Skole-site is the way it's web resources are structured. While traditional web pages are often organized with several different sub-pages, the redesigned NRK Skole website relay heavily on the use of querying. When navigating the site, the URL-path stays the same as for the front page of NRK Skole. The query string in the URL consists of attribute-value pairs, providing the search result. This is used throughout NRK Skole, making it very dynamic. One example of this is when clicking on the front-page link "Lønnsforhandlingene er i gang", located in the current-section. The resulting page is the query-page:

http://www.nrk.no/skole/?page=search&q=fagforening

Usage of movies in schools

Efficient use of movies in education requires that the teacher is able to apply knowledge about the usage of movies as an educational resource and its didactical perspectives on how movies can promote learning.

Maria Deldén(Deldén 2014) did research on two Swedish upper secondary schools, consisting of interviewing 12 students and their teachers. The study was concerned with how pupils experience film as well as the importance of feature films for the students understanding and interpretation of history. She found that movies can be used as an educational tool for igniting students cognitive and emotional processes, both being decisive instruments for perception. Movies are perceived as trustworthy by the students based on the authenticity of the narrative and the overlap of student's previous historical knowledge.

The learning outcome provided by the use of films in education will largely depend on the context it is used in. Trond Heum, teacher and text-book author, shares his views on the use of movies in the history-course, which is also available at fagsnakk.no[25]. Through a pedagogical perspective, movies can be used for evoking curiosity about a certain subject. Regarding education, the use of movies can be used in context to learning goals in the curriculum (HEUM).

Robert A. Rosenstone, an American pioneer in the field of the usage of movies in history education, argues that film-portrayals must not be conceived as pure factual recounting of an historic event(Rosenstone 2014). Movie makers are, in his view, artists, and movies need therefore to be perceived as an art form.

CHAPTER III: Methodology

Introduction

There are many ways in which a product can be developed. The method best used in a given development is dependent on the product one wishes to design as well as the resources one has at hand. The most relevant methods are here presented and the preferred approach is outlined.

Agile[26], Lean[27] and Design thinking[28] development are popular teamwork principles and methods for designing and developing software and other products to market. They share certain similarities, most notably being the iterative approach to design.

Figure 7.   A Design Sprint

Google Ventures have developed a process for product design based on the design thinking structure from IDEO[29] and Stanford's d.school[30]. The process is structured on the basis of agile development, suited for rapidly getting a product out on the marked, ideal for start-ups. This approach is called a Design Sprint[31]. Several versions of this process exist. The version[32] presented in the figure 7[33], can be split up to to 5 stages:

Stage 1. Understand: Dig into the design problem trough advance preparation; setting goals, do research, understand user needs as well as doing competitive reviews and setting business goals.

Stage 2. Diverge: Encourages to rapidly generate as many solutions as possible before committing to a preferred option.

Stage 3. Decide: Review and choose the best ideas. Hammer out the user story.

Stage 4. Prototype: Build something without investing a ton of time, money or resources. By doing this, feedback from users regarding aspects of the design can be collected at an earlier stage, leaving room for iteration.

Stage 5. Validate: Get real feedback from users. Only by doing this can the question "Is the design any good?" be answered.

Another general simplification of the creation of an interactive system can be described through these stages: planning - design - production - completion. ISO 9241-210:2010(DIS 2009) states that four key human-centred design activities shall take place when planning, designing and producing an interactive system. These are:

- Understanding and specifying the context of use
- Specifying the user requirements
- Producing design solutions that meet user requirements
- Evaluating the design against requirements

(DIS 2009)

These activities are interdependent, iterative and do not imply a strict linear process. The Human Centred Design Lifecycle Process is presented in figure 8.
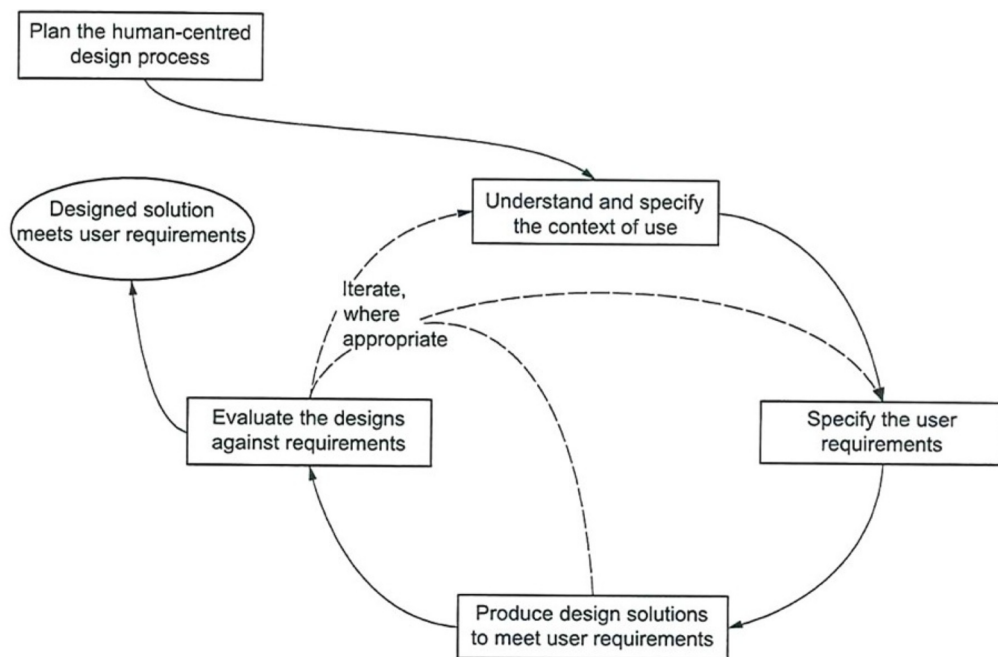
Figure 8. Human Centred Design Lifecycle Process

For the redesign-process of Filmrommet, Human-centred design principles and activities provided by ISO 9241-210:2010 are chosen as the main method. Iterative prototypes of the Filmrommet interface will be evaluated against obtained user requirements. In order to understand the requirements, knowledge of user behaviour, user needs and user preferences is taken into account.

For acquiring quantitative and qualitative evaluative data about the user experience, usability testing of users will be conducted.

Prototyping will include development and design of:

- Interactive elements
- Design elements
- Categorization of movies based on subjects, curriculum and availability and quality of learning resource
- UI/UX-elements for improved usability.

By introducing the user to the system in terms of the development, the concepts of user-centred approaches to interaction design taken from the text book on Interaction Design *Interaction Design: Beyond Human Computer Interaction(Rogers, Sharp et al. 2011)* can be included when developing :

1. Users' tasks and goals are the driving force behind the development.

2. Users' behaviour and context of use are studied and the system is designed to support them.

3. Users' characteristics are captured and designed for.

4. Users are consulted throughout development from earliest phases to the latest and their input is seriously taken into account.

5. All design decisions are taken within the context of the users, their work, and their environment.

Data gathering and user research methods

Data gathering techniques is an important part of the process of developing and evaluating design. Different techniques have different strength and weaknesses. The textbook on Interaction Design *Interaction Design: Beyond Human Computer Interaction* has great information for using data gathering techniques. A comprehensive list of data gathering techniques appropriate for establishing product requirements, can be seen in table 7.1(Rogers, Sharp et al. 2011). According to the textbook, the essential data-gathering techniques are: questionnaires, interviews, focus groups and workshops, naturalistic observation, and studying documentation. These techniques are flexible and can be extended and combined in order to establish requirements.

The Nielsen Norman group and the work of Jakob Nielsen give great resources for choosing research methods when doing evaluation. An illustrative chart, showing 20 popular methods for doing user research can be seen in figure 9[34]. Here, the methods are illustrated on a 3-dimensional framework, giving clues to when and where to use them, as well as what types of questions they can answer. The three dimensions are: Attitudinal vs. Behavioural, Qualitative vs. Quantitative and Context of Use.

A LANDSCAPE OF USER RESEARCH METHODS

BEHAVIORAL

● / ■ Eyetracking
● Clickstream Analysis
● A/B Testing

■ Usability Benchmarking (in lab)

■ Usability Lab Studies
■ Moderated Remote Usability Studies

■ Unmoderated Remote Panel Studies
■ Unmoderated UX Studies

● Ethnographic Field Studies
● True Intent Studies

◆ ←— Concept Testing —→
● Diary/Camera Studies

◆ Participatory Design
● Customer Feedback

▲ Focus Groups
◆ ←— Desirability Studies —→
● Intercept Surveys

ATTITUDINAL
▲ Interviews
▲ ←— Card Sorting —→
▲ Email Surveys

QUALITATIVE (DIRECT)
QUANTITATIVE (INDIRECT)

KEY FOR CONTEXT OF PRODUCT USE DURING DATA COLLECTION
● Natural use of product
▲ De-contextualized / not using product

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■ Scripted (often lab-based) use of product
◆ Combination / hybrid

Figure 9. User Research Methods

Activities

Once the decision was made on using human-centred development, research based on the human-centred design activities were undertaken. In this chapter, an overview of these activities will be shown, and detail about each data gathering technique is presented. In the next chapter, results retrieved doing those tasks is presented as well as discussion and a conclusion.

When understanding and specifying the context of use of Filmrommet, being able to understand who the users are, what their characteristics are, their goals and tasks, and their environment when using the system, is crucial. The research started out with finding out what Norgesfilm knew about their users. What was their view on who their stakeholders were? Who were the main users of Filmrommet? What did Norgesfilm know about the Filmrommet-user needs, and how well was the existing Filmrommet-service able to fit those user needs? For representing the key users, Personas was created based on qualitative data gathered

through information from the Norgesfilm-staff. These Personas was later updated to reflect the qualitative data gathered along in the process. In order to get empirical qualitative and quantitative data about the Filmrommet-user, a web-survey consisting of 116 participants was run. Analytic-tools relevant to the Filmrommet-service was accessed. Scenarios were made, corresponding the representation of users derived from the Personas.

For specifying the user requirements, all of the relevant data retrieved from the data-gathering techniques was assessed. A set of documents, consisting of both product requirements as well as a site-map for the redesigned Filmrommet, was initiated.

For producing design solutions that met user requirements, utilization of digital prototyping as well as doing an overhaul of Filmrommet's visual profile was implemented.

For evaluating the design against requirements, usability testing and interviewing of six teachers and librarians was conducted. The think-aloud and observation techniques was chosen for gathering qualitative data from the user testing.

Surveying

Surveying can be used for gathering empirical data regarding who the users are, and what the users like and do not like about a product. This can be done by asking questions, either by interviews or questionnaires. Questions covering demographics, user behaviour, user preference, user satisfaction and user needs can then be collected, summarized and analysed. Online questionnaires can be used as an effective and inexpensive method for gathering a large amount of feedback from participants.

Personas

Personas are fictional representations of the intended users. The Persona is based on qualitative and quantitative research gathered trough real user-feedback. The benefit of developing Personas is to help focus design decisions by adding a layer of real world considerations. Each Persona present attributes of an intended user. These attributes can be; a fictional name, relevant background information, age, goals and concerns, as well as adding a set of quotes.

Scenarios

Scenarios depict the story and context of a typical use case. They describe what motivation the user has for visiting the site, how the user accesses the site, what the user goals are and how the user browses the site. Scenarios help keep design grounded in reality, giving focus to how real people are using the product in real situations. This helps identifying the features and functionality required.

Requirements Specification

In order to understand what to produce, and to be able to produce it efficiently, the need for specifying the product requirements is a key activity when developing and evaluating design. Requirements are gathered and iterated based on data gathered and feedback from stakeholders. The textbook on Interaction Design, *Interaction Design: Beyond Human Computer Interaction* terms this activity *Requirements Engineering*. This term is used because it recognizes that the process is an "iterative process of evolution and negotiation, and one that needs to be carefully managed and controlled." (Rogers, Sharp et al. 2011)

Requirements can be split up to two main sections; Functional requirements – for describing what the system should do, and non-functional requirements – for describing what constraints there are to the system. There are also environmental requirements describing the context of use, which can be split up in four aspects: physical environment, social environment, organizational environment and technical environment.

Prototyping

Prototyping is the activity of creating a product prototype, representing an incomplete version that is used for evaluating a design proposal. A prototype can be developed at various fidelities, examples being hand drawn paper prototypes (low fidelity) and realistic computer prototypes (high fidelity). Prototypes are helpful for visualising alternate design solutions, and for provoking innovation and improvement. Prototyping can be used as a way of thinking through making.

Usability Testing

Usability testing is a research method for evaluating a product design against its requirements. This is typically done by letting users test a product while observing their actions. Usability testing gives direct input on how real users use the system. Tasks are given to the user, and their actions are recorded. Usability testing focuses on measuring the system's capacity to meet its intended purpose. Several techniques can be used and combined during Usability testing, examples being:

- Getting participants to "Think aloud, verbalizing their thoughts as they move through the user interface".
- Recording video and audio for analysing interactions.
- Measuring how much time a participant uses in order to do a certain task.
- Measuring the amount of errors a participant does related to doing a task.

CHAPTER IV: Results, discussion and conclusion

Surveying

Early in the process, after researching what information the Norgesfilm-staff had about its users, the need for doing a survey questionnaire was significant. The aim of the survey was to gather data about who the users were, how they used the existing service, the user satisfaction, and the user needs. The survey was planned and run in collaboration with the Norgesfilm-staff. The framework, question-types and the phrasing of the questions related to the survey, was created based on insight derived from literature(Nielsen 1994) (Rogers, Sharp et al. 2011), and web-articles[35] [36] covering the topic.

Google Forms[37] was chosen for running the survey. Google Forms is a free tool for collecting information from users through questionnaires. Norgesfilm is using Google Apps for Work[38], therefore this lead to ease of use and enabled several features including real-time scripting collaboration. Data from the user responses is presented visually through graphs and charts on the Google Forms results page, as well as collected to a spreadsheet. The data collected in the spreadsheet was then analysed and summarized into a report and a presentation.

The survey comprised of a total of 33 questions listed in *Appendix 1* covering user demographics, user behaviour, user preference, user satisfaction and user needs. Different question-types were used as can be seen in *Appendix 1*. The survey ran from the 2nd to the 14th of February 2016 and was sent out via the Filmrommet news-letter as well as being presented to the logged in user of the service during this time. Feedback from 116 respondents, consisting of mainly teachers and librarians, was collected. Both Google Forms and Microsoft Excel were used for collecting, summarizing and analysing the data collected during the survey. Results have been summarized and made into a presentation attached as *Appendix 3*. A report of the survey has been compiled and is attached as *Appendix 4*.
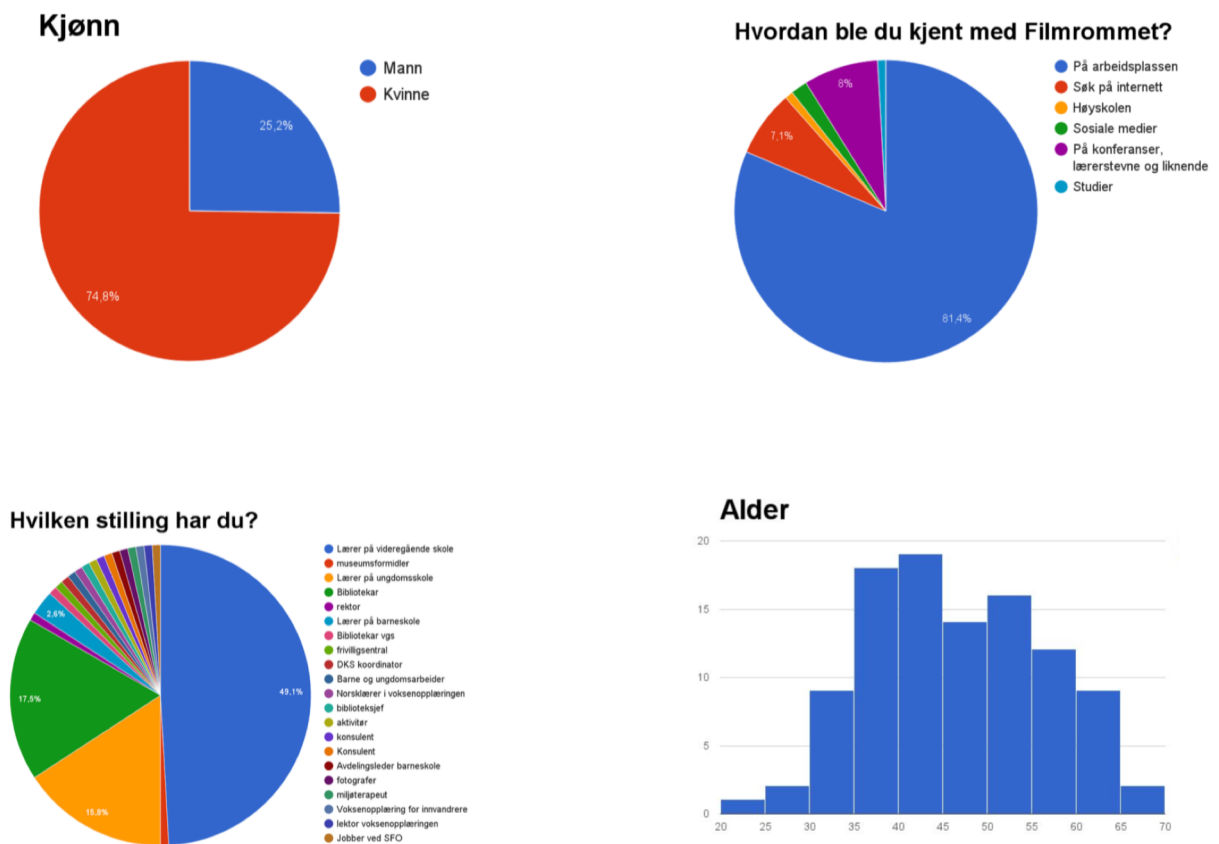
Figure 10. The Filmrommet user demographics

Summarizing the data about user demographics presented in figure 10, shows that $\approx 75\%$ the respondents are women. $\approx 50\%$ of the respondents have listed *Videregående skole* as their workplace. The average age of the respondent is 46 years.

Data collected regarding user behaviour and user preference shows that 56% of the respondents say they use Fimrommet.no for searching for movies and learning resources, while 39% say they use Filmrommet only for viewing movies. 79% plays the movie in its entirety.
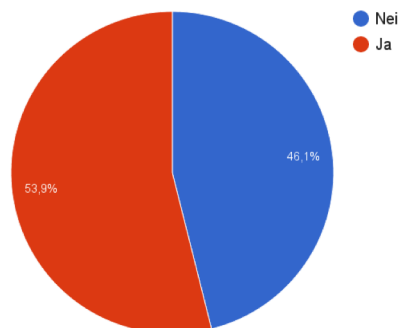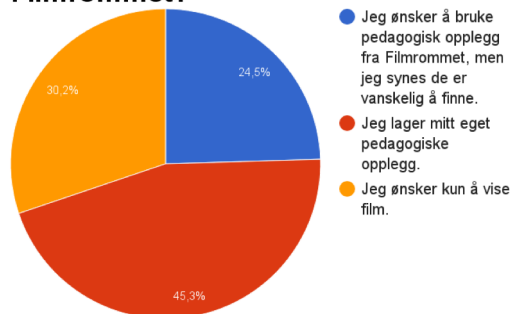
Figure 11. Usage of Filmrommet learning resources

Assessing the visibility and usage of the learning resources, presented in figure 11, shows that ≈ 46% of the respondents expresses they don't use the learning resources Filmrommet provides. Out of these respondents, ≈ 25% express that they would like to use the resources Filmrommet provides, but that they find it difficult to locate the learning resources.

Assessing the user satisfaction trough a scale of 1 to 10, where 1 represents Filmrommet being very bad and 10 being very good, shows that participants give an average rating of 6,93. The main reasons users give a high score is because they find Filmrommet easy to use and like the availability, accessibility and convenience the service provides them. The main reasons users give the score 5 or less being: lack of content(not finding the movie they are looking for), poor search functionality and due to experiencing technical problems. One source of inconvenience is having to log-in using a password and username that is unique to Filrommet.no. Only 3 respondents express explicit dissatisfaction due to poor (graphical) design of Filmrommet.

The key findings from the survey in regards to the usability goals are that users need:

- An easier and more intuitive way to browse for content, giving them explicit results and visibility of the content that is accessible through Filmrommet.
- To be presented to an accessible and well-functioning search feature.

In regards to the user pain points, experiencing technical problems related to the video-streaming is the major source for customer dissatisfaction.

Findings from analysing the survey was then taken into consideration and implemented in the subsequent activities.

Personas

Berit Bibliotekar

Bakgrunn
- 42 år
- Bibliotekar på skolebiblioteket
- Bruker mye tid på å søke etter innhold i databaser

Bekymring
- At det er enda et sted å søke etter innhold.
- At hun må gi fra seg admin-passordet til de som skal bruke Filmrommet.

Mål
- Formidle riktig innhold videre.
- Kunne kvalitetssikre innholdet.
- Ha oversikt over utvalget på Filmrommet.

Sitat
- "Det MÅ ordnes admin-login og lærer/ansatte-login"
- "Jeg viser ikke filmer selv. Min rolle er å formidle filmene som ligger på Filmrommet"

Figure 12. One of the Filmrommet Persona cards

The goal of the Persona-development was to represent and express the major needs, traits, expectations, goals and values of the intended users. The Personas aided in uncovering universal features and functionality, as well as informing design-decisions for the subsequent prototyping. The Personas have been based on qualitative and quantitative research gathered trough the survey. Persona cards are attached in *Appendix 5* and is one of the Personas are presented in figure 12.

Scenarios

Figure 13. One of the Filmrommet scenarios

The scenarios for Filmrommet were made for the existing Filmrommet-website and were based on the users represented through the Personas. Scenario-descriptions are attached in *Appendix 6* and one of the scenarios is presented in figure 13. The scenarios describe the main pathway of interaction visitors may use for accomplishing a certain goal.

Requirements Specification

The specifications are split up into 7 sections: *Data-spesifikasjoner, Tekniske-spesifikasjoner, Miljø-spesifikasjoner, Funksjonell-spesifikasjoner, Brukervennlighet-spesifikasjoner, Bruker-spesifikasjoner* and *Brukeropplevelse-spesifikasjoner*.

Due to the scope of this thesis, the requirements collected for the redesign of Filmrommet have not included all aspects the service. A draft of the specifications is attached in *Appendix 7*.

A Website Sitemap was created, with details of what the different content of the service needed to include, as can be seen in *Appendix 8*.

Both the sitemap and the requirements are not finalized and needs further refinements and consideration before it can be used as basis for implementation.

Prototyping

The digital prototypes developed for the redesign of the Filmrommet-service was made in order to meet and evaluate the requirements, usability goals and user experience goals. The prototyping process started out on the basis of doing research about state of the art UX-design, visual design and interaction design. Tools used for prototyping and testing were: Adobe Photoshop[39], InVision[40] and Adobe XD[41].
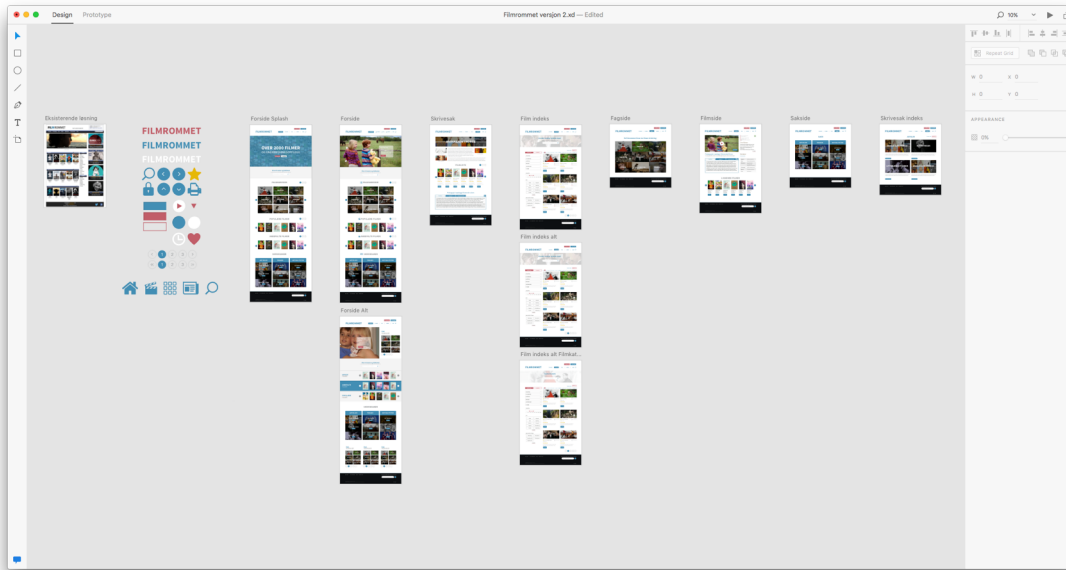
Figure 14. A screenshot from prototyping in Adobe XD.

The design-process started out in Photoshop, doing mock-ups and designing a new visual profile for Filmrommet. The 14th of March 2016, Adobe released their preview version of their brand new software Adobe Experience Design CC, also called Adobe XD. Adobe XD's mission is to provide an end-to-end environment for visual and interaction design, wire-framing, prototyping and testing. After some experimentation with this software, the decision to go with the new tool was made. Adobe XD was still in beta and lacked some of the features that would be needed in order to meet the mission of the software. Nonetheless, it provided some great flexible features for doing design-work. Compared to using Photoshop, Adobe XD delivers a workflow more suited for user interface designers. A screenshot of the prototype is presented in figure 14. The project-files from Adobe XD are attached as *Appendix 10*. Screens representing different categories of "website pages" were made in Adobe XD. These pages are: Front page(Forside), Landing page(Forside splash), Articles(Sakside), Article(skrivesak), Article index-page(Skrivesak indeks), Movie Catalogue(film indeks), Courses(fagside), Movie page(Filmside). The Prototype screens are attached as *Appendix 11*.

Even though Adobe XD consisted of some basic features for previewing and sharing an interactive design, InVision was chosen for setting up the user testing of the prototypes due to its extensive features. InVision is an online platform for prototyping web and mobile

interfaces. The screens from Adobe XD was then exported and transformed into a clickable prototype through the use of InVisions tools for setting up hotspots, enabling interaction. The service has powerful collaboration features, making it suitable for gathering design-feedback from both users and team-members. InVision enables interactive prototypes to be tested seamlessly through the use of the sharing tool. The user can open a link in their web browser, giving them the ability to interact with and navigate the prototype. The sharing tool in InVision was used when doing Usability Testing, and the interactive InVision-version of the Prototype is attached in *Appendix 13*.

Usability Testing

For evaluating the design against requirements, usability testing and interviewing was chosen as the data-gathering techniques. Usability testing of 6 participants was conducted. Where possible, sessions were held at the participant's own workplace, sitting by their desk using their own computer. The user selection was derived from data gathered through the survey, as well as taking into account what users Norgesfilm wanted to focus on. The user sampling consisted of 2 *Folkebibliotekarer*, 2 Videregåendelærere, 1 *Ungdomsskolelærer* and 1 *Barneskolelærer*.

The sessions started out with an interview. The purpose of the interview was to gather feedback related to the participant's:

- Former experience with Filmrommet.
- Relevant personal information; age, work, etc.
- How they prepare before showing movies in front of a class.
- How they access Filmrommet.
- How they use Filmrommet in their education.
- What their goals are using Filmrommet.

The participant was then presented to the prototypes on their personal computers. For evaluating the design against the usability goals, the think-aloud and observation techniques for gathering qualitative data were used. The participants were asked to explore the prototype and were given small tasks, such as; navigate to a movie, find an educational resource. Notes regarding their feedback and behaviour was captured and organized.

Several participants gave positive feedback in regards to the aesthetics and layout of the new design. The majority of the participants found the content structure intelligible and satisfactory, especially in regards to the focus on course relevance and learning resources, but some of the feedback suggests for adjustments and changes to the interface in order to make interactions more comprehensible. Usability issues and fixes are presented in *Appendix 14*. Results from the interview and the usability study are compiled in *Appendix 15*. Consent forms signed by the participants are attached in *Appendix 9*.

Usability issues were prioritized and usability fixes were included in the subsequent iteration of the prototype. This resulted focusing on:

- Designing numeric pagination for movie-lists and course-boxes.
- Designing distinguishable sorting- and filtering-options for the movie catalogue page.
- Designing icons representing the menu-items and page sections in order to increase the visual language of the service.
- Designing consistent layout-elements for distinguishing content-types.
- Enhancing visibility of the movie runtime.
- Presenting the option of playing the movie trailer.
- Presenting clues to ways the search form can be used.

Filmrommet redesigned

The concluding design of Filmrommet, attached in *Appendix 11* and *12*, suggests the blueprint for further development. Due to the limited scope of the thesis, the design suggestion presented in the prototype screens are not intended to represent all aspects of the user experiences involved when using Filmrommet. Aspects such as the design of the user account sign in process are not detailed in the prototype.

One aspect of the re-design included revamping the aesthetics of Filmrommet. As the new base font, the grotesque sans serif font family *Source Sans Pro*[42] was chosen due to its modern yet dateless appeal. A set of different font-weights are used throughout the interface in order to help break up and differentiate the density of information presented. If needed, the playful font *Gloria Hallelujah*[43] can be used in order to mix things up, as can be seen in the splash page in *Appendix 11*. The new logo is simplified, consisting only of the word Filmrommet

written in all caps with *Source Sans Pro Bold*. Regarding the colour scheme, blue[44] and red[45] were chosen in order to make Filmrommet more vibrant. After looking at the existing Filmrommet-site, and due to Filmrommet's identity being related to the colour blue, a specific colour value approximating the existing design was then defined and put to use as the new main colour. A red colour based on the triad harmony was specified and is used as an accent colour.

Multiple symbols, icons and UI-elements have been made for the new Filmrommet-design, as can be seen in figure 15. The flat design approach uses simplified aesthetics, emphasising usability. The purpose of the menu icons is for enhancing the context of use. Consistent use of bold buttons has been adopted throughout the interface in order to increase the ease of use.
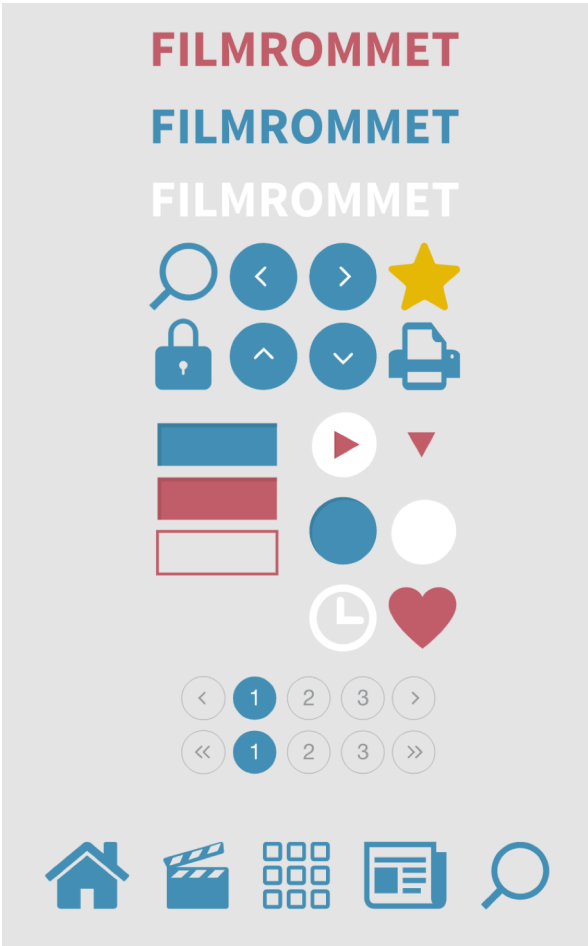

Figure 15. A set of UI-elements used in Filmrommet

The content composition is based on a grid and block structure, enabling responsive design, visualised in figure 16.
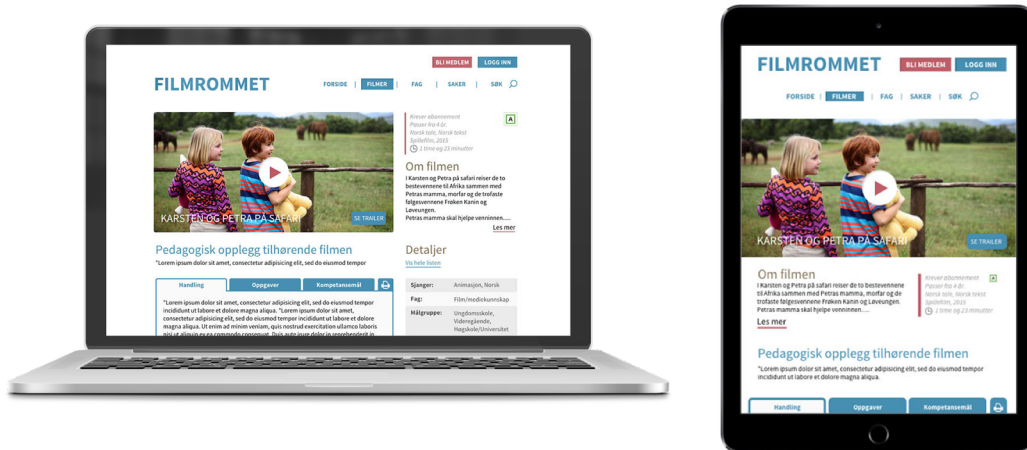

Figure 16. A mockup vizualisation of the redesigned movie page of Filmrommet

Looking at the front page, presented in *Appendix 11*("Forside.png"), from top to bottom, the top header section consists of the Filmrommet-logo, the page menu with its corresponding icons, and login- and "Become a member"-buttons. A large banner area is presented right beneath the header section. The prototype includes a full-width image/slideshow, containing featured content. This area consists of a hero image, a title, a description and a button-link. There are several ways this banner area can be put to use. An alternate design is presented in *Appendix 11*("Forside Alternate.png") were more interactive content is accessible by the user. If Filmrommet were to implement a splash page, this area could include a "Call to action"-instruction for marketing purposes. Design of a splash page is presented in *Appendix 11*("Forside Splash.png"). Continuing further down the page, a search area has been placed in order for users to easily access this requested feature. Underneath the search area is the area called *"Fagsnarvier"*. The boxes located here are shortcuts for accessing movies relevant to a specific course. Lists showing popular and recommended movies are then presented. An article section, consisting of three columns, each presenting posts in relevance to a specific content type is shown. Lastly, the footer is located at the bottom of the page.

One prominent feature of the new design is the way learning resources are implemented. As well as being included as articles, each applicable movie has its relevant learning resources

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grouped in tabs, shown beneath the movie-player, presenting learning materials in context to the movie. This is presented in *Appendix 11*("Filmside.png") and figure 17.

Figure 17. A section of the movie page showing the learning resources.

Some aspects that is not included in the new design, but that will need further investigation, are the usability of user registration and emphasis on the user onboarding[46] experience. Also, due the fact that the existing services only provide each subscriber(institution) with one user account, leading to multiple persons using the same account, personalization of content have not been implemented in the prototype.

Conclusion

The hypothesis stated in the introductory chapter has proven too excessive to be approved based on the amount of data and the methods used. Further studies and evaluation will be necessary in order to state the effect of using movies for educational purposes when using Filmrommet. One way of gathering data for analysing the effect, can be achieved through quantitative usability studies of teachers. This can imply measuring the amount of time it takes for a teacher to find the appropriate learning materials suited in a given scenario.

As a result from this thesis, a prototype has been developed, tested and validated against usability testing and design principles. The design prototype suggests some basic functionality deemed important to user experience and usability. Further development, especially in regards to defining requirements specifications, will be needed before the new design can be refined and implemented in service. Choices regarding implementing features which will reconstitute

changes regarding how the service is required to function, should be resolved. One of these features is regarding user login. If Norgesfilm is willing to support individual user account login for Filmrommet, then personalized content can be presented to the user, and this will in return enable new functionality for presenting relevant content and encourage new user experiences.

Based on data gathered and analysed from user feedback, there are three major aspects that is suggested for Norgesfilm to focus on in order to improve the usability of Filmrommet:

- Improving search functionality
- Serving content that teachers need
- Preventing technical problems experienced by the user

Appendix

Appendices listed here are attached together with this document   as individual resources.

Appendix 1: Survey questions – *"Oversikt over spørsmål for brukerundersøke Filmrommet 2016.pdf"*

Appendix 2: Raw data collected from the survey (NB: personal information related to participants has been removed) – *"Brukerundersøkelse Filmrommet 2016 (Svar).xlsx"*

Appendix 3: Keynote presentation of survey results – *"Brukerundersøkelse Filmrommet 2016 Presentasjon.pdf"*

Appendix 4: Survey-report – *"Rapport fra Filmrommet Brukerundersøkelse filmrommet 2016.pdf"*

Appendix 5: Filmrommet.no Personas – *"Personas Filmrommet.pdf"*

Appendix 6: Filmrommet.no Scenarios – *"Scenarios Filmrommet.no.pdf"*

Appendix 7: Filmrommet.no Requirements Specification – *"Specification Filmrommet.no Requirements.pdf"*

Appendix 8: Sitemap of the redesigned Filmrommet.no – *"Sitemap Filmrommet.no.pdf"*

Appendix 9: Informed Consent Forms from users – *"Informed Consent Forms from users Filmrommet.no.pdf"*

Appendix 10: Filmrommet.no Prototype, Adobe XD-project – *"Filmrommet versjon 2.xd"*

Appendix 11: Filmrommet.no Prototype, screens – *"Filmrommet Prototype Screens.zip"*

Appendix 12: Filmrommet.no Prototype, online moodboard - *https://projects.invisionapp.com/boards/EB1HAGM48YSR2/*

Appendix 13: Filmrommet.no Prototype used for user testing, online InVision Prototype(NB: this version of the prototype has later been revised and modified according to the feedback gathered from the user testing) – *https://invis.io/HR6OV4YD7*

Appendix 14: Results from the usability study including proposes for further design-iteration – *"Results from Usability testing.xlsx"*

Appendix 15: Compilation of feedback from usability testing – "*Feedback from Usability testing.docx"*

REFERENCES

Deldén, M. (2014). "Historien som fiktion: gymnasieelevers erfarande av spelfilm i historieundervisningen."

DIS, I. (2009). "9241-210: 2010. Ergonomics of human system interaction-Part 210: Human-centred design for interactive systems." International Standardization Organization (ISO). Switzerland.

Gerhardt-Powals, J. (1996). "Cognitive engineering principles for enhancing human-computer performance." International Journal of Human-Computer Interaction 8(2): 189-211.

Gibson, J. "J.(1977). The theory of affordances." Perceiving, acting, and knowing: Toward an ecological psychology: 67-82.

HEUM, A. T. "Film som faglig-pedagogisk ressurs i historie."

Karppinen, P. (2005). "Meaningful learning with digital and online videos: Theoretical perspectives." AACE Journal 13(3): 233-250.

Nielsen, J. (1994). Usability engineering, Elsevier.

Norman, D. A. (2002). The Design of Everyday Things, Basic Books.

Rogers, Y., et al. (2011). Interaction Design: Beyond Human - Computer Interaction, Wiley.

Rosenstone, R. A. (2014). History on film/film on history, Routledge.

Weinschenk, S. and D. T. Barker (2000). Designing effective speech interfaces, John Wiley & Sons.

Endnotes:

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[1] Compound annual growth rate(CAGR):
https://en.wikipedia.org/wiki/Compound_annual_growth_rate

[2] Global entertainment and media outlook 2015-2019 – Filmed entertainment:
http://www.pwc.com/gx/en/industries/entertainment-media/outlook/segment-insights/filmed-entertainment.html

[3] YouTube: www.youtube.com

[4] Netflix: http://netflix.com

[5] Figure is gathered from MM-400 Interaction Design Lecture slides by Maurice Isabwe.

[6] Article about Mental Models by Jakob Nielsen: https://www.nngroup.com/articles/mental-models/

[7] Bootstrap: http://getbootstrap.com

[8] iOS Human Interface Guidelines:
https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/index.html

[9] Heuristics are strategies and can be viewed as problem solving's "Rule of thumb"

[10] 10 Usability Heuristics for User Interface Design: https://www.nngroup.com/articles/ten-usability-heuristics/

[11] Filmcentralen.dk – www.Filmcentralen.dk

[12] Uni-login: A Danish digital ID for students and teachers http://www.stil.dk/It-og-administration/Brugere-og-adgangsstyring/For-laerere-og-elever

[13] Filmcentralen about-page: http://filmcentralen.dk/alle/om-filmcentralen-1

[14] Userneeds – a statistical research film: http://www.userneeds.com/market-research

[15] Webstatus is a qualitative and quantitative survey tool from Userneeds, that measures the user experience websites: http://www.userneeds.co.uk/webstatus

[16] NDLA.no About page: http://om.ndla.no/rapporter

[17] Ipsos MMI – A market research company: http://ipsos-mmi.no

[18] Brukerundersøkelse NDLA 2015 (Ipsos MMI): http://om.ndla.no/wp-content/uploads/Brukerundersøkelse-2015-Ipsos-MMI.pdf

[19] "Netflix Q1 16 Letter to Shareholders": http://files.shareholder.com/downloads/NFLX/1915968503x0x886428/5FB5A3DF-F23A-4BB1-AC37-583BAEF2A1EE/Q116LettertoShareholders_W_TABLES_.pdf

[20] Netflix.com: https://www.netflix.com/

[21] Netflix My List feature: https://help.netflix.com/en/node/10523

[22] Netflix live tile: http://lifehacker.com/netflix-gets-a-new-redesigned-app-for-windows-10-with-1748298456

[23] Can Netflix be used in Norwegian education: http://delrett.no/sporsmal/kan-man-bruke-spotify-i-undervisningen

[24] NRK Skole about-page: http://www.nrk.no/skole/om-nrk-skole-1.12568596

[25] *Film i historieundervisningen* av Trond Heum: http://fagsnakk.no/historie/2015/08/26/film-i-historieundervisningen/

[26] Agile software development: https://en.wikipedia.org/wiki/Agile_software_development

[27] Lean software development: https://en.wikipedia.org/wiki/Lean_software_development

[28] Design thinking: https://en.wikipedia.org/wiki/Design_thinking

[29] IDEO, A Design an Innovation Consultig Firm: https://www.ideo.com

[30] Institute of Design at Stanford: http://dschool.stanford.edu

[31] Product Design Sprint by Google: https://developers.google.com/design-sprint/

[32] How To Conduct Your Own Google Ventures Design Sprint: http://www.fastcodesign.com/1672887/how-to-conduct-your-own-google-design-sprint

[33] Figure is gathered from UXPin User Testing and Design – Improving Yelp's Website: https://studio.uxpin.com/ebooks/ux-design-in-action-yelp-website/

[34] Figure is gathered from nngroup.com: https://www.nngroup.com/articles/which-ux-research-methods/

[35] Better User Research Through Surveys: http://uxmastery.com/better-user-research-through-surveys/

[36] Useful Survey Questions for User Feedback Surveys: https://www.interaction-design.org/literature/article/useful-survey-questions-for-user-feedback-surveys

[37] Google Forms: https://www.google.com/intl/nb_no/forms/about/

[38] Google Apps for Work: https://apps.google.no

[39] Adobe Photoshop: http://www.adobe.com/no/products/photoshop.html

[40] InVision: https://www.invisionapp.com

[41] http://www.adobe.com/no/products/experience-design.html

[42] The font Source Sans Pro:
https://www.google.com/fonts/specimen/Source+Sans+Pro#charset

[43] The font Gloria Hallelujah:
https://www.google.com/fonts/specimen/Gloria+Hallelujah#charset

[44] Filmrommet Blue, Hexadecimal colour code: #468fb2

[45] Filmrommet Red, Hexadecimal colour code: #bf5e69

[46] Information about Onboarding: http://www.appcues.com/user-onboarding-academy/intro-to-user-onboarding/