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# Multimedia Slideshow Maker

Letting users create multimedia slideshows without experience in video editing

June 2020





Norwegian University of  
Science and Technology

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Submission date: June 2020

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Master's programme in Music, Communication and  
Technology

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# Abstract

This thesis describes the design and development of a tech platform where a mobile application creates slideshows from multimedia content uploaded in a web application titled "Multimedia Slideshow Maker" (MSM). The project is carried out for an external partner, Alight AS, for a project called Alight. Alight is a mobile tech platform aiding caregivers in sending personalised video sessions to patients with dementia. This thesis aims to determine to what degree MSM can be used independently by a caregiver, without instructions from others or prior experience in video editing. MSM was designed and developed in iterations based on feedback from experienced evaluators and tested with end-users. The system has been compared to similar applications, where both strengths and limitations of MSM were discovered. The test results showed several usability problems, where solutions to each problem are discussed. Participants were to a large extent able to use MSM without instructions from others, where MSM enabled them to create a multimedia slideshow without requiring experience in video editing. The sample size, however, might not account for all differences in abilities among caregivers.

*Keywords: Multimedia slideshow, usability, web and mobile app development, user interface design, dementia and caregivers, music and reminiscence therapy*

## **Acknowledgements**

I wish to thank all the people who assisted me during this project. Thanks to Andreas Bergsland for guiding me through each stage of the process. Thanks to Anders-Petter Andersson and Espen Sira for guidance in design and user interaction. Thanks to Alight AS for providing me with this great project, and to Even Brenna for excellent technical support and guidance. I am grateful to all research participants, who have been essential for the thesis. Thanks to my family, friends, and my girlfriend, Rakel Standal Hatlestad, for invaluable support through my studies.

## **Accompanying blog**

You can read a shorter and less detailed version of this thesis at <https://mct-master.github.io/masters/2020/06/13/MSM-Varpe.html>

# Table of Contents

Figures .....	ix
Tables .....	x
1 Introduction.....	11
1.1 Background .....	11
1.2 The purpose of the thesis .....	12
1.3 Outline.....	13
2 Theory, context and similar applications .....	15
2.1 Dementia .....	15
2.2 Music therapy .....	16
2.3 Reminiscence therapy .....	17
2.4 A Mobile Multimedia Reminiscence Therapy Application.....	18
2.5 Similar web-based applications .....	20
2.6 Usability, accessibility and inclusion .....	23
3 Methods and design .....	25
3.1 Web app development .....	26
3.2 Choosing a design method.....	29
3.3 The design phase .....	30
3.4 Developing the mobile app .....	48
4 User testing of the current web app design.....	54
4.1 Choosing best-suited methods .....	54
4.2 Privacy in user testing.....	55
4.3 Preparing for online user testing.....	55
4.4 Conducting user tests .....	56
4.5 Selecting participants.....	57
5 Analysis and results .....	59
5.1 Thematic analysis.....	59
5.2 Participants' rating of experience with technology .....	62
5.3 Learnability .....	62
5.4 Efficiency .....	66
5.5 Memorability.....	66



5.6	Error rate .....	66
5.7	Satisfaction .....	70
5.8	Summary of results .....	75
6	Discussion .....	76
6.1	The critical problem .....	76
6.2	Serious problems .....	77
6.3	Minor problems .....	77
6.4	Limitations of heuristic evaluation.....	77
6.5	Limitations of user tests .....	78
6.6	The development process .....	79
6.7	Important technical limitations.....	79
6.8	Strengths and limitations compared to similar tools .....	80
6.9	Comparison with the Mobile Multimedia Reminiscence Therapy Application.....	82
7	Conclusion .....	83
8	Future work .....	84
	References .....	85
	Appendices.....	89
	Appendix A – Webform, original (Norwegian).....	89
	Appendix B – Webform, English translation.....	92

# Figures

Figure 2.1: Task analysis of Multimedia Reminiscence Therapy App.....	19
Figure 3.1: System overview .....	25
Figure 3.2: Technical overview of MSM.....	29
Figure 3.3: Login form (First iteration) .....	32
Figure 3.4: Register form (First iteration) .....	32
Figure 3.5: Multimedia upload page, without content (First iteration).....	34
Figure 3.6: Multimedia upload page, with content (First iteration) .....	34
Figure 3.7: Login form (second iteration).....	36
Figure 3.8: Registration form (second iteration) .....	37
Figure 3.9: Multimedia upload page, without content (second iteration) .	37
Figure 3.10: Multimedia upload page, with content (second iteration)....	38
Figure 3.11: Multistep form, image upload, without content (third iteration).....	40
Figure 3.12: Multistep form, images, with content (third iteration) .....	40
Figure 3.13: Multistep form, music (third iteration) .....	41
Figure 3.14: Multistep form, video (third iteration).....	41
Figure 3.15: Login page (current iteration) .....	43
Figure 3.16: Home page.....	44
Figure 3.17: Multistep form, title-input-field.....	44
Figure 3.18: Multistep form, music (current iteration) .....	45
Figure 3.19: Multistep form, Images, without content (current iteration)	45
Figure 3.20: Multistep form, images, with content (current iteration) ....	46
Figure 3.21: Multistep form, video (current iteration) .....	47
Figure 3.22: Submitted form.....	47
Figure 3.23: Multimedia slideshow app, displaying image.....	49
Figure 3.24: Multimedia slideshow app, authentication .....	51
Figure 3.25: Multimedia slideshow app, play .....	51
Figure 3.26: Technical overview of multimedia slideshow app.....	52
Figure 5.1: plus/cross icon.....	63
Figure 5.2: Upload box for images .....	64
Figure 5.3: "Lag slideshow" button .....	65
Figure 5.4: Dragging to rearrange in Firefox .....	67
Figure 5.5: Invalid password.....	68
Figure 5.6: Dragging multiple videos to upload box.....	69
Figure 5.7: Rejected content feedback .....	69
Figure 5.8: Placeholder characters .....	70
Figure 5.9: Preview of uploaded images .....	72
Figure 5.10: image page, instructions and progression .....	73
Figure 5.11: instructions and progression .....	74

# Tables

Table 3.1: Evaluation of authentication pages, first iteration.....	33
Table 3.2: Evaluation of "multimedia upload page", first iteration.....	35
Table 3.3: Evaluation of second iteration .....	39
Table 3.4: Evaluation of third iteration .....	42
Table 5.1: Thematic analysis of feedback and observations .....	60
Table 6.1: Features and functionality of MSM and similar tools .....	81

# 1 Introduction

The number of people in Norway and the rest of the world with dementia is increasing every year. It is currently an incurable disease and affects not only people with dementia but also their caregivers, families, and the entire society (World Health Organization, 2019). However, it is possible to support and improve the lives of people with dementia and their caregivers. Music and reminiscence therapy are two types of therapies that can be a part of this care and are currently being used for this purpose (Istvandy, 2017). As the number of people with dementia is rising, we need to be able to provide care in the patients' own homes and be able to care for more people at once.

## 1.1 Background

This project is carried out with an external partner and company, Alight AS, on a project called Alight. Alight is currently a mobile tech platform for healthcare workers at nursing homes and the home healthcare service. The platform is connecting the healthcare worker to a patient, aiding and sending personalised video sessions to patients with mild to moderate dementia. The tech platform is divided into a web application (web app) for the healthcare worker and a mobile application (mobile app) for the patient.

These so-called "personalised sessions" are developed by Soundio AS together with NKS Olaviken and Bergen Teknologitviking, where they observed music therapy sessions, interviewed community workers, patients and their next of kin, and developed the application further in workshops together with music therapists (Hynninen et al., n.d.). A personalised session consists of a combination of:

- Personalised image slideshow with personalised music.
- Video of the healthcare worker (exercise, live playing, breathing exercise etc.), or other personalised videos.

Alight AS emanated from Soundio AS to be independent in its mission to develop Alight based on the research that was done.

In the current state of Alight, employees at Alight AS are doing the task of gathering material (images, video and music), and creating a video out of the material in a video editing software. This is then sent to the healthcare worker, who uploads it in the web app, and sends it to the patient.

Moving forward, Alight's vision is to let any caretaker use the tech platform independently, to care for people with mild to moderate dementia. A caretaker can be a therapist, home nurse, family, friend etc. It is important to note that the caretaker will be responsible for gathering appropriate material (music, images, video) that are personalised to the patient. Why this personalisation is important will be explained in chapter two.

## **1.2 The purpose of the thesis**

In this thesis, I am developing a solution that eliminates the need for manual video editing by employees at Alight AS and lets a caretaker make video sessions on their own. A caretaker can be a person without any experience in video editing and may even have limited experience using web apps. therefore, the solution must be a system where most of the editing is done by the system itself and have a user interface with a high level of usability.

The solution is a web/mobile platform independent from the current platform of Alight, but with a future intention of integration. The system automatically creates multimedia slideshows on a mobile app from multimedia content that is uploaded to the web app. The multimedia slideshow follows the structure of the current sessions that are being made by Alight AS, where all images are shown in a series together with music, and the video is displayed after the slideshow of images is finished. The web app is named Multimedia Slideshow Maker (MSM) and will be the main focus of this thesis. Still, the thesis will describe how the web app and the mobile app works, both individually, and together in creating these multimedia slideshows.

The developed platform consists of a web app that is meant for a caregiver and a mobile app that is meant to be used by a patient with dementia. There are several questions I would like to ask related to the use of the developed application and its purpose. The mobile app is not developed to an extent where it can be tested with patients with dementia and will be a step for further research. Assessment of the effectiveness of music and reminiscence therapy in a mobile solution is also beyond the scope of the thesis. The main aim of this thesis is to assess the usability of the web app through iterative development and user testing.

Research question:

To what degree can the Multimedia Slideshow Maker be used independently by a caretaker, without instructions from others or prior experience in video editing?

Research question two:

What are the strengths and limitations of MSM compared to similar technologies?

Related to research question two, I will compare the developed solution to similar technologies, find the strengths and limitations of MSM, and discuss what differentiates MSM from the others. On the commercial market, there exist similar web apps for making multimedia slideshows. I have found three web apps that I believe are the closest to mine:

- Magisto; markets itself as an AI (artificial intelligence) based video creation and editing platform (Magisto, n.d.-b).
- Adobe Spark Video; markets itself as a video maker that lets the user create videos without design skills (Adobe Spark, n.d.).
- Animoto; markets itself as an easy to use, quick to learn, video slideshow maker (Animoto, n.d.-b).

With regards to research question 2, I have also included technology that is not yet brought to the market. In a research article published in the Journal of Healthcare Engineering in 2018 by Danish Imtiaz et al. the authors describe the development of a multimedia reminiscence therapy mobile application for people with Alzheimer's type dementia, where a caregiver can make individualised multimedia slideshows for patients.

### **1.3 Outline**

Chapter two will take a closer look at dementia and its challenges, and how music and reminiscence therapy can be used to deal with some of these challenges. Next, I will describe similar applications to MSM and lastly, investigate three terms that are related to usability. Chapter three describes the development of the web app; how the user interface is designed using methods that are aimed at reaching a good level of usability; and how the mobile app is developed to make multimedia slideshows. Chapter four gives a detailed description of why and how user testing is applied to find usability problems, leading to chapter five, where I analyse and discuss the results. In chapter six I will discuss how a potential caregiver is affected by the usability problems, in the use of MSM. Chapter six will also compare the developed platform to similar

applications to find the strengths and limitations that are present. Lastly, a conclusion will be addressed, and future work will be proposed.

## **2 Theory, context and similar applications**

### **2.1 Dementia**

According to the World Health Organization (World Health Organization, 2019), dementia is a syndrome which usually is chronic and progressive. Dementia causes deterioration in cognitive functions, which affects memory, thinking, orientation, comprehension, calculation, learning capacity, language, and judgement. WHO writes that dementia is one of the major causes of disability and dependency among older people worldwide, and there is no available cure or way to alter its progression. The syndrome can be overwhelming for the people who have it, but also impact cares, family and society at large, in physical, psychological, social and economic ways.

In 2019, around 50 million people worldwide have dementia, and nearly 10 million more will be added each year (World Health Organization, 2019). In Norway there are no valid estimates of the occurrence of dementia, but is estimated to be between 70 000 and 104 000 (Nasjonal kompetansetjeneste, 2017). Every year approximately 10 000 people in Norway gets dementia (Helsenorge, 2018). The Norwegian Institute of Public Health (NIPH) (Norwegian Institute of Public Health, 2015) estimates that there are approximately 71 000 people with dementia among home care recipients and nursing home residents. NIPH writes that there are around 300 000 close relatives of dementia in Norway and that the disease can cause great stress among the relatives. They further mention a national plan called The Dementia Plan 2020, which describes the standard for care and support for people with dementia and their relatives, where person-centred care is key. They end with saying that the recommended treatment is aimed at achieving better function and quality of life.

As the occurrence of dementia is rising, there is a need for new and innovative ways of improving quality of life for those that are affected, and a strategy can be to improve the availability of music and reminiscence therapy for both caregivers and people with dementia. The next section will take a closer look at music therapy and how it is used for this purpose.



## 2.2 Music therapy

"Music therapy is recognized as an established health profession that uses music to facilitate therapeutic processes. Even without a professional music therapist, many patients and clinicians listen to or play music to manage stress, anxiety, and pain in clinical settings." (Kemper & Danhauer, 2005, p. 283).

"Music has direct and indirect effects on physiological and clinical symptoms. Carefully selected music can reduce stress, enhance a sense of comfort and relaxation, offer distraction from pain, and enhance clinical performance" (Kemper & Danhauer, 2005, p. 287).

Even Ruud (2008) writes about the importance of having a humanistic perspective on music therapy, where humans must be understood from its history, culture and social context. Ruud writes that when the medical practice is criticised, it is often because of too much focus on disease, subcomponents of the body and its faults. Still, Ruud expresses the need for cooperation across natural sciences and humanistic science to complement music therapy. "The humanistic form of music therapy is not only based on explanations of a disease and the client's deficiencies, but build upon, collaborate on, and expands the client's resources" (My translation of Ruud 2008, p. 8). Music therapy should afford its time and presence, create trust and listen. Ruud also expresses that the experience of music and how it affects us depends on our musical background, influence, our choice of music, and the situation we are in while experiencing the music. Removing one component will change the meaning. This is an important premise for using music therapy as a health practice.

Tone Sæther Kvamme (2008) argues that music therapy is a vital necessity for people with dementia. Kvamme writes that her impression is that most people who work with music in elderly care in Norway have a resource-oriented approach, meaning that they do not work directly towards symptoms or problems in the patient, but rather look for available resources. Even Ruud referred to in Kvamme (2008) argues that our memories associated with music can give a picture of who we are, what Ruud calls "Identitetens lydspor" (EN: "The soundtrack of identity"). Kvamme argues that music can work well in communication and contact with people suffering from dementia because it can activate large parts of the brain and reach undamaged areas, breaking a barrier caused by language – and memory loss. She writes related to this that music can give people with dementia access to feelings, help them express

themselves, awake memories, strengthen their identity, and also give a sense of achievement and affiliation.

A randomized control study by Guétin et al. (2009), conducted in a population of patients suffering from mild to moderate Alzheimer's type dementia, utilized a method of music therapy called Individual Receptive Music Therapy. This method takes the patient's musical taste into account, where the patient is listening to the chosen music. The study concludes that this form of music therapy encourages cognitive stimulation, allowing patients to recall autobiographical memories and images which contributes to the treatment of anxiety and depression in patients suffering from Alzheimer's type dementia.

The research shows that music therapy in several ways can improve the quality of life of a person with dementia, and how it is necessary to individualise/personalise the music to the recipient. The next section will discuss reminiscence therapy and its potential to be used to improve the quality of life for people with dementia.

### **2.3 Reminiscence therapy**

"RT involves the discussion of memories and past experiences with other people using tangible prompts such as photographs or music to evoke memories and stimulate conversation" (Woods et al., 2018, p. 1).

In an intervention review by Woods et al. (2018) on reminiscence therapy for dementia from the Cochrane library, the authors investigated the effect of RT on people living with dementia and their caretakers. The review included 22 randomised controlled trials involving RT for people with dementia and accounted for differences in their implementation of RT. The authors concluded that the effects of RT on people with dementia vary, depending on the implementation and whether it took place in care homes or the community. Still, there was some evidence that RT can improve quality of life, cognition, communication and possibly mood in some circumstances, although all benefits were small. The review did not find any benefits for the carers. The authors express a need for more randomised controlled studies with clear, detailed treatment protocols. The study did not consider music therapy.

A systematic review by Istvandy (2017) found five studies that exclusively utilized an intervention combining music and reminiscence therapy. These aimed to improve one or more aspect of mental health among the elderly, with three of the studies focusing on people with dementia. The review found positive effects in four out of the five studies,

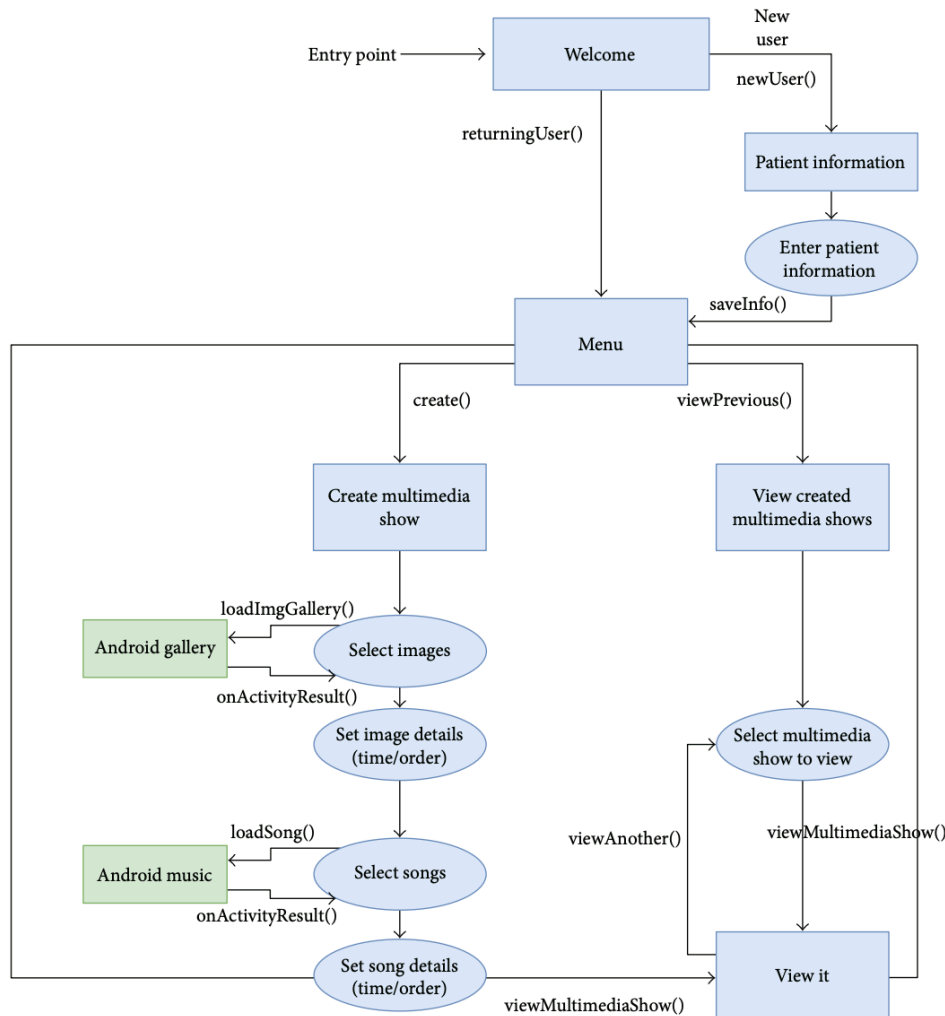
with effects on the mental well-being of participants, especially stress, anxiety and depression, but found a gap in the effects on social and emotional well-being. The study could not determine what is the successful delivery of the combination of music and reminiscence therapy and underlines the importance of having future research with clearer practice protocols and incorporation of qualitative methods.

There is a need for more research in the field, and related to this project, there is a need for more research on the use of music and reminiscence therapy in a mobile solution, and if this has the potential to help both people with dementia and their caregivers. The following research article will take a closer look at this use-case.

## **2.4 A Mobile Multimedia Reminiscence Therapy Application**

In a research article published in the Journal of Healthcare Engineering, Imtiaz et al. (2018) describe the development of a very similar application to Alight. They are proposing a mobile app where the goal is to address behavioural and physiological symptoms of dementia (BPSD), reduce caregiver burden, and delay nursing home placement. The study is based on reminiscence and individualized music therapy, where past memorable events are recalled using photos, videos and music. The article describes the development of a multisensory multimedia-based mobile app where images, music and video of a past memorable event of the patient are put together into what they call a "multimedia show". They present the application as a single app where a caregiver can choose pictures, videos, images and music, located on the phone. This will then be incorporated into a multimedia show, which will be saved and available to play by the individual with dementia. The authors write that the caregiver will choose pictures, videos and music related to a memorable event of the patient, and if there is no music associated with the event, the application will find music of that period to make the multimedia show. How the application can do this, is not described in the article.

Figure 2.1 shows the task analysis of the developed application with accompanying input and output events. The figure fails to show where to select and add videos, but I will guess that videos can be added in the step where a user can pick files from the Android gallery.



**Figure 2.1: Task analysis of Multimedia Reminiscence Therapy App. From “A Mobile Multimedia Reminiscence Therapy Application to Reduce Behavioral and Psychological Symptoms in Persons with Alzheimer’s” by Imtiaz, D., Khan, A., & Seelye, A., 2018, Journal of Healthcare Engineering, 2018, p. 7. Copyright © 2018 Danish Imtiaz et al.**

The authors write that they have made a user-friendly application for both the caregiver and the patient. They do not mention how they have developed it to be user-friendly, but they do mention a plan for a clinical study where participants will provide feedback on the user experience, likes and dislikes about the multimedia app solution.

The authors do not mention who the caregiver is, but they do mention that it most likely will be an older person, that may not have much experience in using computers or smartphones. They raise this as a challenge in designing the application. Since they mention that the application is meant for multiple individuals affected by Alzheimer’s type dementia, I guess that the phone or tablet will belong to the caregiver. Since one of the authors’ goals is to delay nursing home placement, I

assume the caregiver will bring the phone/tablet to the patients' home. The authors mention that they will do further research on the effects of RT on people with dementia, using the developed application.

The authors do not study the usability of the application but mention that usability will be accessed during a clinical trial. The article focuses more on system development and testing the effects of reminiscence – and music therapy through a mobile application on people with AD and their caregivers. Assessing the therapeutic effects is very important in assessing the value of the application as a whole. Still, I believe that another important aspect is to develop an application that has a high level of usability since caregivers can be just about anyone. This is why I will assess to what degree a caregiver can make multimedia slideshows by his/her own, without experience in video editing, using the developed web app.

## **2.5 Similar web-based applications**

On the commercial market, there exist several web apps for making multimedia slideshows. The following sections will examine three applications that resemble the system developed in this thesis: Magisto, Adobe Spark Video and Animoto. The review is based on my observations and tests.

### **2.5.1 Magisto**

Magisto markets itself as an AI (artificial intelligence) based video creation and editing platform (Magisto, n.d.-b). Images, videos and music can be added, either from a personal library, a library of previously uploaded media, or from a stock library. Magisto leaves most of the editing to be done by their AI-based Emotion Sense Technology (Magisto, n.d.-a). Their technology does visual, audio and story-telling analysis to edit the video. It can lower the volume of the selected music if there is speech in a video, stabilize videos, detect the topic of the selected media, and more.

The Magisto video creation process is divided into three steps: Media, editing style and music. The steps can be completed in any order.

#### **2.5.1.1 Media section**

A combination of images and videos can be added in the media section, even several of each media type. The user can decide the length of the final video or set it to automatic. The pace can be set; how long each

photo is shown (fast, medium or slow). Magisto does not let the user decide in which order images and videos should be displayed.

#### **2.5.1.2 Editing section**

The editing style section lets the user choose between several effects. These can be transition effects, filters, added graphics and more. An editing style must be chosen, where a “no filter”-style will only add a Ken Burns effect to the images. The Ken Burns effect is a type of panning and zooming effect. The intensity of the effects can be decided, and the orientation can be set to automatic, horizontal, square or landscape.

#### **2.5.1.3 Music section**

The music section lets a user add a single song and choose if the audio mix should be balanced, music only, or prefer footage. In my experience, the music is always played too loud to be able to hear the sound from the video. A user is not able to choose if the music should stop while a video is playing.

#### **2.5.1.4 Final step**

When all content is added, a title can be added, and a preview can be created. Magisto will then make a video file based on the content, editing choices and its AI-based Emotion Sense Technology. This video is saved to the account’s library and can be shared or downloaded

### **2.5.2 Adobe Spark Video**

Adobe Spark Video (ASV) markets itself as a video maker that lets the user create videos without design skills (Adobe Spark, n.d.). In ASV the process starts with adding a title to the video. The next step is to choose a story template or to start from scratch. Choosing a template will provide a predefined image/video structure, a structure similar to Google Slides or Microsoft PowerPoint, only that ASV has a horizontal list of slides. In each slide, an image, video, icon or text, can be added. Text can be written on images and videos, and in-browser microphone recordings let the user add recordings to slides. Rearranging the slides is also possible.

ASV offers video trimming, where a video clip can be a maximum of 30 seconds. In ASV, the user cannot add multiple images or videos at once. A slide must be selected before adding an image or video, and the process must be repeated for the number of slides needed. For each slide, the display time must be set, with a minimum of one second and a maximum of 30 seconds.

With ASV, images can be added from a personal library, free images from the web or Adobe's stock library. Music can be added at any time, from a personal library or a categorised library in ASV.

If the user chooses to do add music, it will play during the total display time of the slides. The user cannot choose when the music should play or if it should stop during videos. The volume of the music can be set by the user. Only one song can be added.

At any time, a theme can be chosen. Depending on the theme, ASV will add a combination of filters, transition effects and a Ken Burns effect. The final video can be set to be displayed in square or widescreen.

The final video can be previewed, shared or downloaded, and ASV will generate a video file.

### **2.5.3 Animoto**

Animoto markets itself as an easy to use, quick to learn, video slideshow maker (Animoto, n.d.-b). Animoto separates its video slideshow maker into what they call a "Storyboard" and a side panel with features. In the storyboard, a combination of images, text slides and logo slides may be added. As with ASV, text and/or direct microphone recordings can be added to every image or video on the storyboard. Every element/slide can be dragged and dropped to rearrange. In Animoto, the display time of each slide has to be set manually.

Images, videos and music can be added, either from a stock library or a personal library. Animoto has features for trimming the song, changing the volume, and looping. Only a single song can be chosen, and the music will play over all images and videos. Animoto lets the user chose a style, decide the aspect ratio, and add colour filters. Depending on the chosen style, Animoto will add transitions effects, Ken Burns and more.

Animoto does not guide the user to do anything in a particular order. Hovering over an image/video slide will present several options. Options include setting the display time, adding text, microphone recordings, changing, copying or deleting the image, and even more if pressing the "edit"-button. This will even let the user crop images and trim videos.

When content is added, the video can be previewed and produced. Producing the video involves adding a title, date, producer-name and description. Animoto will then generate a video file, using what they call Cinematic A.I technology to edit the video (Animoto, n.d.-a).

#### **2.5.4 Summary**

The three web-based applications share a common goal; striving to make a video maker that is easy to use. They provide a selection of editing styles (transitions, filters and effects), and they all generate video files from the content. The number of editing possibilities varies. Magisto leaves most of the editing to the AI-based Emotion Sense Technology, giving the user fewer options. ASV gives the user more editing possibilities, including video trimming, reordering of media, in-browser microphone recordings and more. Animoto is the application with most editing capabilities, including every feature present in ASV, and more. Another common functionality for all of them is that the chosen music will still play if a video with sound is added. There is no option to have the music stop while a video is playing.

The next section will cover three terms that are important to know for making a web app that is easy to use, as all the mentioned applications strive to do.

### **2.6 Usability, accessibility and inclusion**

Developing a web app involves choosing a development environment, programming and design. No matter how advanced the system is made to be, the most important factor is usability. Without caregivers being able to use MSM independently and without experience in video editing, there is little point in developing it.

“Usability is most often defined as the ease of use and acceptability of a system for a particular class of users carrying out specific tasks in a specific environment” (Holzinger, 2005, p. 71). The class of users that MSM is meant for, are caregivers. As mentioned, a caregiver can be a health worker, a family member, friend, anyone with a relation to a person with dementia. This means the end-user can be young, old, tech-savvy or inexperienced in using web apps. When it comes to users having different abilities and disabilities, it is necessary to mention the term accessibility.

The World Wide Web Consortium (W3C) writes that web accessibility means that people with disabilities can equally perceive, understand, navigate, and interact with websites and tools (w3c\_wai, n.d.-a). Designing a web application with great accessibility then means to make it usable for people who are blind, deaf, or any other disability, like for instance all the disabilities caused by dementia. W3C writes that the main focus of accessibility is on people with disabilities, but that focusing on



accessibility will improve usability for everyone, for instance, those with age-related functional limitations.

W3C provides several guidelines for making a website or web application more accessible, called Web Content Accessibility Guidelines (WCAG). A summary of the WCAG 2.1 guidelines are listed on their website (w3c\_wai, n.d.-b), where some of the guidelines listed are:

- Provide text alternatives to non-text content
- Provide captions and other alternatives for multimedia
- Make it easier for users to see and hear content
- Make all functionality accessible from a keyboard
- Make text readable and understandable
- Help users avoid and correct mistakes

The third important aspect of developing a highly usable user interface is inclusion. W3C writes that inclusion is about diversity, sometimes referred to as “universal design” or “design for all”. W3C mention several issues that inclusion addresses, including computer literacy and skills, internet connectivity, age, geographic location and language.

Accessibility is important for making a web app easy to use for everyone, but more work is required to reach a good level of accessibility. This will be an essential part of developing the user interface of the mobile app for people with dementia, but that is beyond the scope of this thesis. However, I believe it is important to think in terms of design for all when designing a web app meant for caregivers. Making a web app that should be accessible for people with disabilities is however beyond the scope of the thesis.

### 3 Methods and design

During this master’s project, a prototype mobile tech platform, consisting of a web app and a mobile app has been developed (Figure 3.1). The web app titled MSM is meant for a caregiver, where the caregiver can upload media content (images, video and music). The mobile app is meant for the patient, where a multimedia slideshow is created from the content uploaded in MSM. In the scope of this thesis, the goal is to develop a system that can be used independently by a caretaker, without instructions from others or prior experience in video editing.

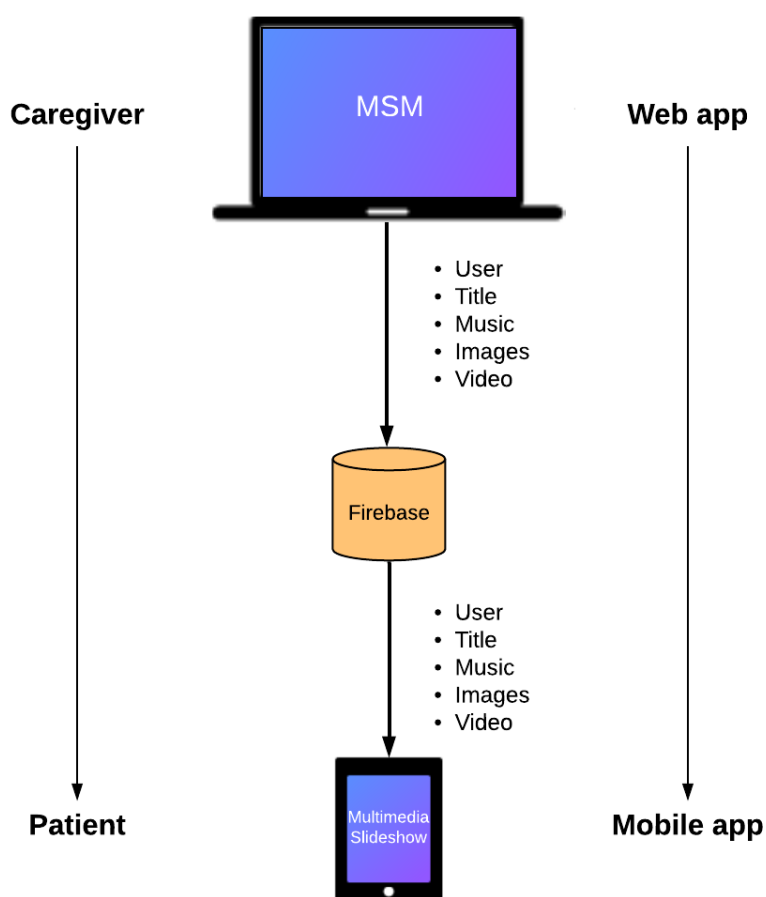


Figure 3.1: System overview

Magisto, Animoto and ASV all generate a video file from the provided content. The system developed during this thesis does not generate a video file, and there is a reason for it. In a system where a caregiver will need to find music that is going to be consumed by another person, there is an immediate concern when it comes to sharing what may often be copyrighted material. A potential solution to this issue could be to integrate a music streaming service, like Spotify or Tidal, where the app is tied to a music streaming service license. Having this in mind, the mobile app is developed to make the multimedia slideshow in real-time, with the potential to stream music while the slideshow of images is playing.

Even though the main focus of this thesis is on the usability of the web app's user interface, I saw it as necessary to develop the mobile app, and to connect the two platforms. This way I was able to see if it was a feasible solution, and participants involved in user tests of the web app were able to see the purpose and result of the content they put together in the web app.

The following section will describe the development process of the web app, before moving on to a more detailed description of the design phase. At the end of this chapter, I will describe the development of the mobile app and how it can make multimedia slideshows.

### **3.1 Web app development**

For a couple of months before the master's thesis started I had been working in web development for Alight AS, using a JavaScript library called React for building user interfaces. Being already familiar with the much popular library, I saw it as a good choice for me to develop the user interface of MSM.

I started with developing most of the necessary functionalities, before focusing on the design of the user interface. As mentioned, the mobile app is doing the task of putting all content together into a multimedia slideshow. The web app, however, is the platform where the caregiver will decide the content of the multimedia slideshow, with a minimal choice to edit the outcome. The reason for giving the user minimal editing choice is that any caregiver should be able to use the application independently, without instructions from others or prior knowledge in video editing.

#### **3.1.1 Intro to React**

In React, the entire user interface is built from React Components. Components are bits of code, either a JavaScript function or class, that

whenever it runs, returns React elements that describes how the user interface should appear. A component can consist of a single button or more complex elements like a form. The advantage of making a user interface out of components is that the same pieces of code can be reused throughout the entire application. A component can be simple or complex but thinking in terms of reusability is the key to write less code for an application, making the development process go faster. An entire application consists of a hierarchy of such components that communicate together. I could go on for several pages to explain React more in detail, but hopefully, this explanation is enough to establish an understanding of the absolute basics of how React works.

### **3.1.2 Developing the user interface and managing backend**

I could have used plain HTML, JavaScript and CSS to build the application, but a library like React makes the job easier and faster. In addition to this, I have used external libraries for improved workflow, pre-styled elements, backend management and higher abstractions of functionalities of the browser.

The most important feature of the application is to let the user upload media content. The user should be able to upload a song, images and a video. This feature is provided through a web form, where the user can upload media in steps and then submit the data to a server. It is becoming more and more common to let a user upload content by dragging it into the browser, to a defined area. This was implemented with the help of a library called React Dropzone. To make the user able to decide the order in which the images should be displayed, I wanted a highly interactive feature where the user can drag and drop images to rearrange. This was a challenge to implement, but through a library called React DND (DND stands for Drag and Drop) it was made possible. It was also a challenge that React Dropzone and React DND caused conflicts when used together in the same area of the viewport. This was due to a race condition, where both libraries tried to handle an operation at the same time. Introducing a small delay to one of the operations fixed the issue.

Another important feature of the application is to be able to share data between the web app and the mobile app. Currently, the system does not let a user send content to another account/user. The plan is that a caregiver should have one account, and each patient their own. The caregiver should then be able to choose which patient to send the content to when using MSM. This will be implemented at a later stage when MSM

potentially will be integrated with Alight. To evaluate the web app and for letting the potential caregiver see the result, the content is uploaded to a server and connected to the same account, making it accessible on the mobile app.

Connecting the two platforms required a backend with authentication, database and storage. For this, I used a backend service from Google, called Firebase. Firebase authentication was used to let a user register for an account which can be accessed on both the web app and the mobile app. Firebase Storage was used to store all uploaded media content. Firebase Database was used to store all metadata about the uploaded content; where each file is located, the order of images and the title of the multimedia slideshow. Currently, the title is not used by the mobile app.

Styling the user interface has been the biggest and most important challenge, as the user interface should be used independently by a caregiver, without instructions from others or prior experience in video editing. Styling was done through the use of CSS, pre-styled elements from a library called React Bootstrap, Icons from Material UI, and some dynamic style changes through the use of Styled Components.

A final technical overview of the web application can be seen in Figure 3.2. In the next chapter, I will describe the process of designing the web app.

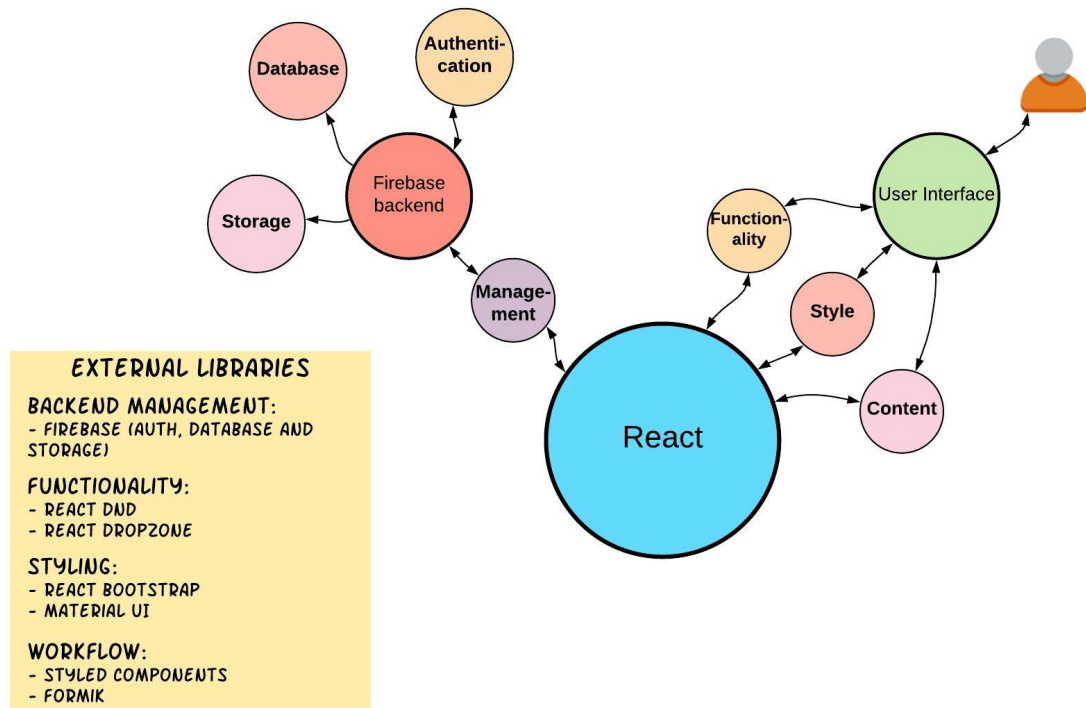


Figure 3.2: Technical overview of MSM

### 3.2 Choosing a design method

When designing and developing a system that is meant to be used by an end-user, it is common to have the user in focus during the design and development stages to be able to reach a high level of usability. A method that focuses on users during all stages of design and development is User-centered design (UCD). According to the Interaction Design Foundation (*What Is User Centered Design?*, n.d.), UCD is an iterative process where you first try to understand the context of use, before specifying the user requirements. This is done through techniques such as surveys, interviews and brainstorming. Then, you develop design solutions and evaluate the design against the user requirements. Several iterations of the four phases are done until a satisfying result is reached.

The process, going through understanding the context of use and requirements, design, development and evaluation, is usually split among a number of people. As the interaction design foundation writes, the design team should consist of professionals from across disciplines. In developing a web application, this can be researchers (psychologists,

ethnographers), designers (interaction designer, graphics designer), developers (front-end developers, back-end developers), and more.

As a team of one, I found that two methods for reaching a high degree of usability described by Holzinger (2005) were more applicable for this project. These methods are User Inspection Methods and User Test Methods, where the inspection methods are done without end-users, and the test methods, with end-users. In the next section, I will describe how I have used the User Inspection Methods in the design phase.

### 3.3 The design phase

Firstly, the web app needs to fulfil all general design guidelines. According to Holzinger (2005), five usability characteristics should be considered:

- **Learnability:** User can rapidly begin working with the system.
- **Efficiency:** User who has learned the system can attain a high level of productivity.
- **Memorability:** Casual user can return to the system after a period of non-use without having to relearn everything.
- **Low error rate:** Users make fewer and easily rectifiable errors while using the system, and no catastrophic errors occur.
- **Satisfaction:** Pleasant to use.

To ensure that usability characteristics were being followed in the design, I used a method called Heuristic Evaluation (HE). This is a method from what Holzinger describes as Usability Inspection Methods, where usability specialists judge whether the system follows established usability principles or not. Holzinger gives an example of usability principles that are used, which are Nielsen's Usability Heuristics (NUH):

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

As mentioned, HE requires usability specialists to evaluate the design. I managed to recruit two interaction design specialists, an associate professor who has done a lot of studies on the interaction between people and music technology, and one web – and app developer with experience in developing user interfaces.

During the design phase, I went through several iterations, improving the design and functionality of the web app based on feedback from the evaluators. I did, however, deviate from a point that Holzinger makes about letting the specialists inspect the system alone. I had video meetings, sharing my screen, showing the web app, receiving feedback during meetings. This was not the case for one of the evaluators, who received screenshots of the web app, and inspected the system alone. It can be argued that the web app should have been hosted on the web, letting the evaluators go through the system interactively, but at this point, I had not configured hosting. In the following chapters, I will go through the design phase of the web app, where I will describe each iteration. The feedback is evaluated against Nielsen's Usability Heuristics where it applies, and a potential solution will be given to every problem.

### **3.3.1 Designing the user interface using Heuristic Evaluation**

#### **3.3.1.1 First iteration**

In the first iteration, I had implemented pages for authentication (Figure 3.3 and Figure 3.4), a feature for being able to connect the web app and mobile app, where a user can register for an account that can be accessed on both platforms. The authentication pages were then evaluated by the evaluators, which can be seen in Table 3.1.



A login form on a blue-to-purple gradient background. It features two input fields: 'Epost' with the value 'bruker@eksempel.com' and 'Passord' with masked characters '\*\*\*\*\*'. Below the fields are two buttons: 'Logg inn' and 'Registrer bruker'.

Epost  
bruker@eksempel.com

Passord  
\*\*\*\*\*

Logg inn

Registrer bruker

**Figure 3.3: Login form (First iteration)**

A registration form on a blue-to-purple gradient background. The title 'Registrer bruker' is underlined. It features two input fields: 'Epost' with the value 'bruker@eksempel.com' and 'Passord' with masked characters '\*\*\*\*\*'. Below the fields is a button labeled 'Opprett bruker'.

Registrer bruker

Epost  
bruker@eksempel.com

Passord  
\*\*\*\*\*

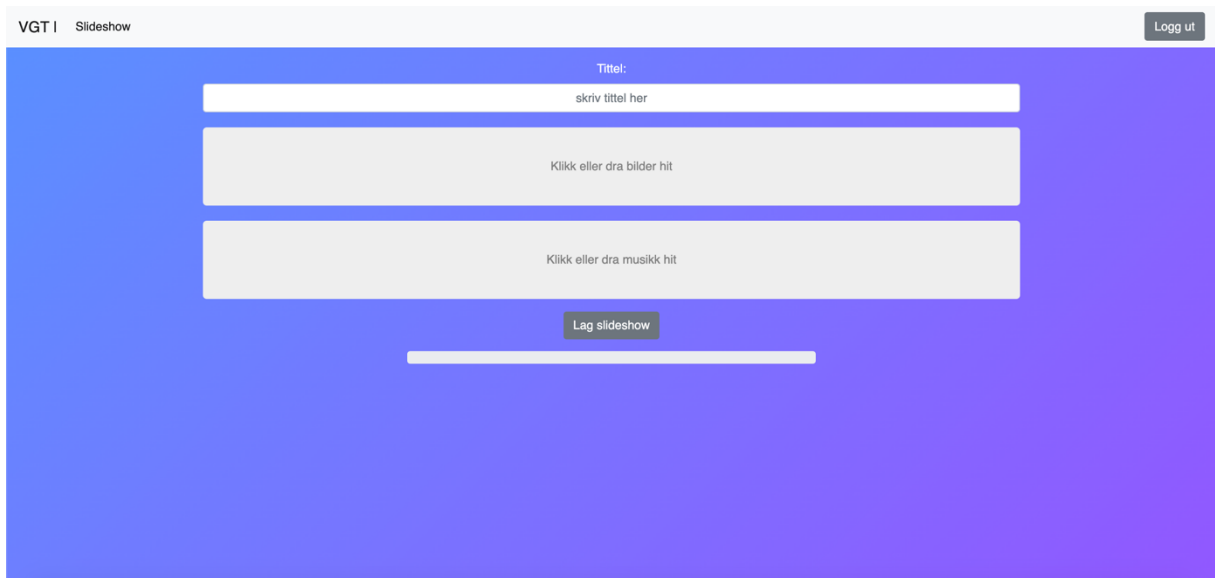
Opprett bruker

**Figure 3.4: Register form (First iteration)**

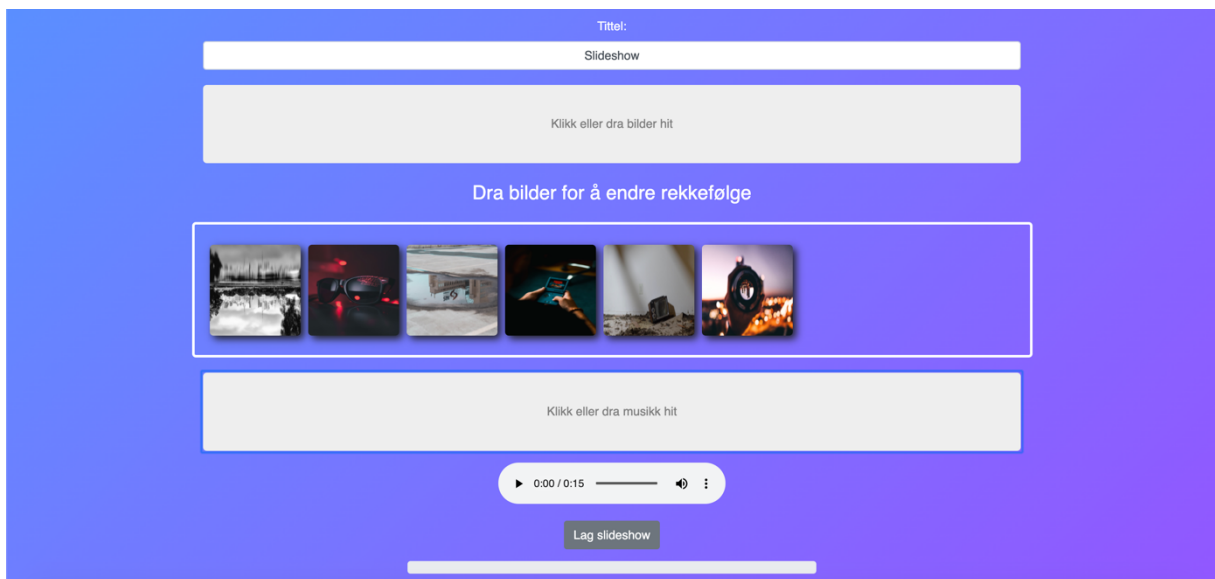
**Table 3.1: Evaluation of authentication pages, first iteration**

Feedback	Problem	Potential solution
The authentication pages lack a title/name	NUH: Standard, Recognition rather than recall  User will not know what they are signing into. They will have to remember what page they have been explained to visit.	Add a title
The width of the input fields is different on the two pages	NUH: Consistency  May influence user satisfaction when there are inconsistencies	Make the input fields equal length
Both "Registrer bruker" (EN: "Register user") and "Opprett bruker" (EN: "Create user") are used for the same purpose	NUH: Consistency  The user might be confused whether the two wordings mean the same thing and provide the same action	Use one of the two wordings.

The next page the evaluators went through was the "multimedia upload page", which is the main part of the application (Figure 3.5 and Figure 3.6). Here, a user is supposed to add a title, upload images, reorder images and upload a song, before submitting it. Table 3.2 shows the feedback, describes the problem and gives a solution.



**Figure 3.5: Multimedia upload page, without content (First iteration)**



**Figure 3.6: Multimedia upload page, with content (First iteration)**

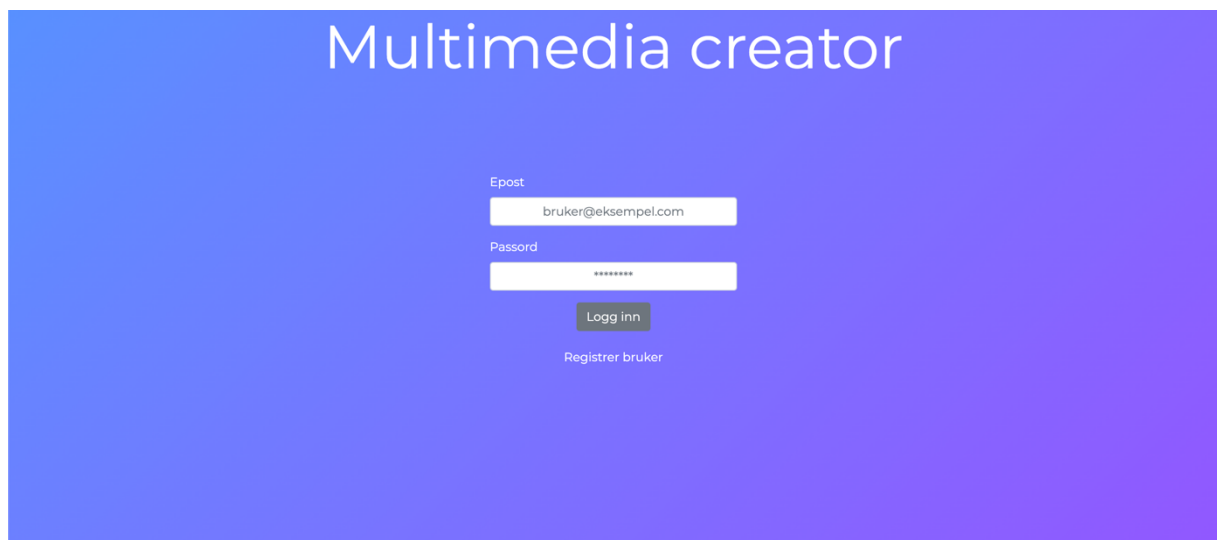
**Table 3.2: Evaluation of "multimedia upload page", first iteration**

Feedback	Problem	Potential solution
<p>The words "VGT" and "Slideshow" do not imply any meaning</p>	<p>NUH: Consistency and standard and match between system and real world.</p> <p>The words are not consistently used through the application. They appear ones and will probably confuse a user. They do not guide the user to any valuable action.</p>	<p>Remove the words.</p>
<p>The image and music previews are separated from each other, divided by the upload box for music, which makes it unclear what is being put together to a multimedia slideshow.</p>	<p>NUH: Recognition rather than recall.</p> <p>The user has to remember the purpose of the application. The interface does not guide the user towards making a multimedia slideshow.</p>	<p>Make the preview of uploaded content clearer to the user.</p>
<p>It is unclear if a user can upload multiple songs or not.</p>	<p>NUH: User control, error prevention, efficiency of use</p> <p>The user may only upload one song, but the text says, "upload music here", not telling the user that only one song should be uploaded. Errors can potentially occur, where users will try to upload several songs and fail.</p>	<p>Make it clear to the user that only one song can be uploaded.</p>

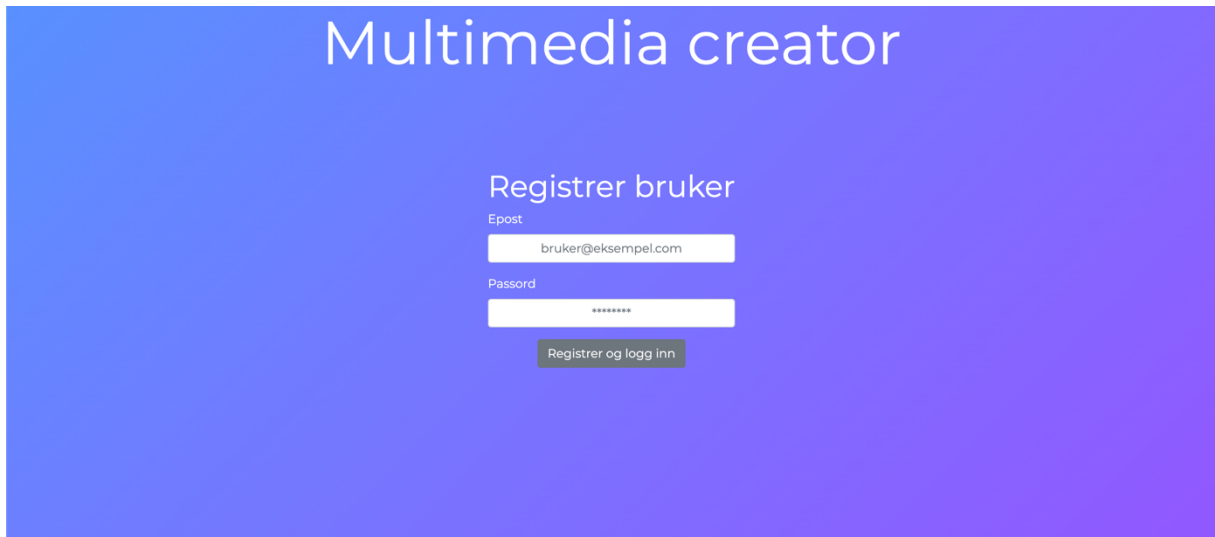
After the first iteration, it was clear that the web app had several issues related to NUH. There were several inconsistencies in wordings and design of elements. There was a lack of following a standard of providing information to what application was just visited. Looking at any other website or web app on the internet, most have a title/name somewhere on the page, in most cases at the top. Other issues related to error prevention, the efficiency of use, and user control, was also discussed. The next section will cover how these problems were improved, and what new design issues that occurred.

### 3.3.1.2 Second Iteration

In the second iteration, I revised the login – and registration page, where I gave the application a name/title, which at this time was «Multimedia creator», as can be seen in Figure 3.7 and Figure 3.8. The same figures show that the input fields were adjusted to have equal lengths, and the wording was improved to be consistent.

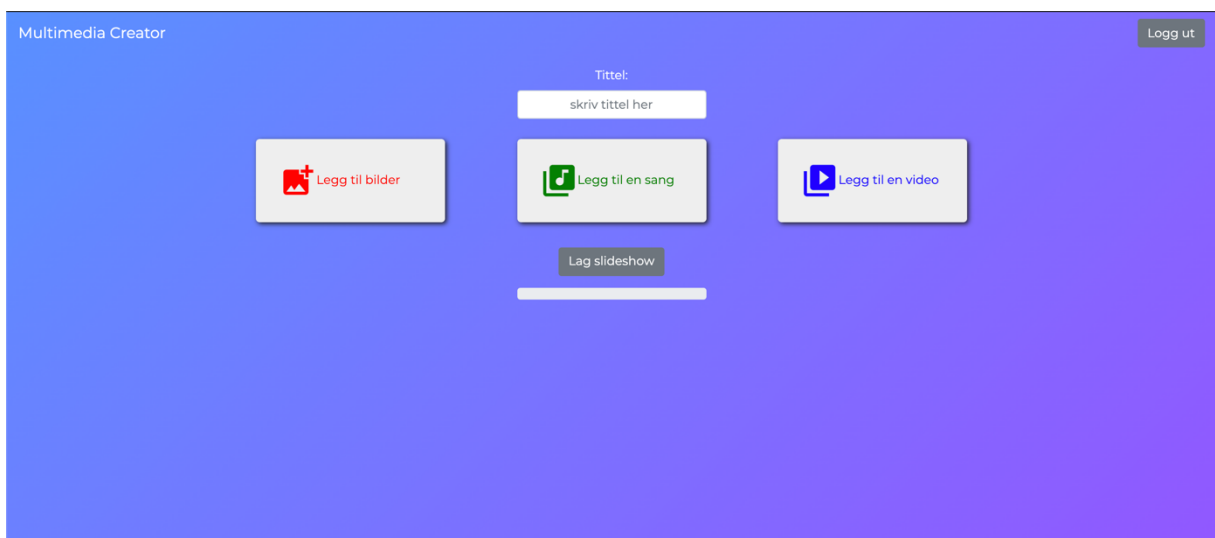


**Figure 3.7: Login form (second iteration)**



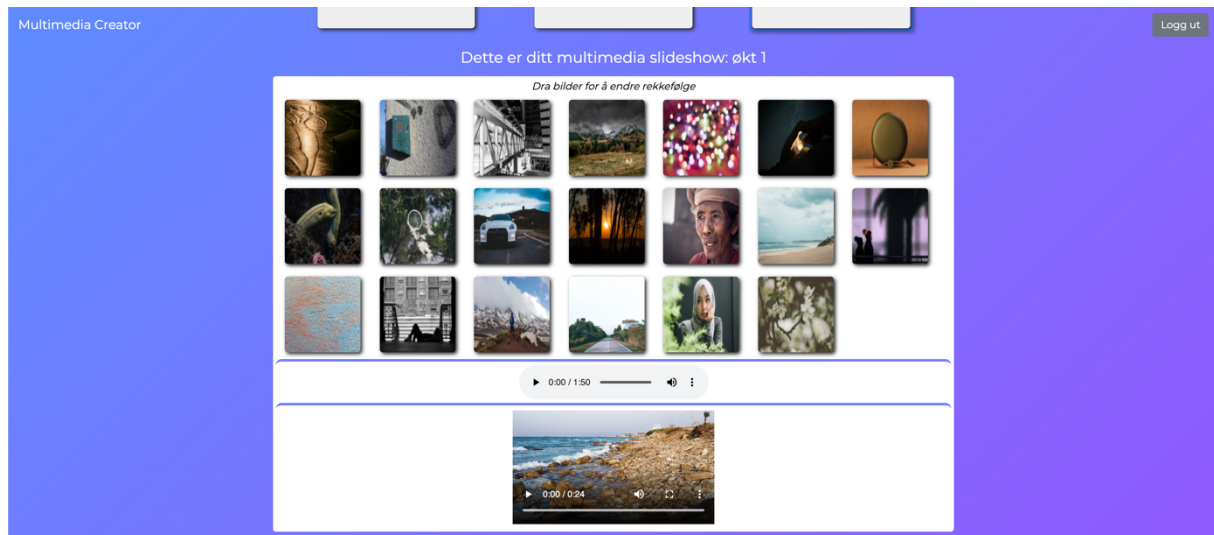
**Figure 3.8: Registration form (second iteration)**

On the "multimedia upload page" (Figure 3.9), I removed "VGT" and "Slideshow", and added the name of the application in the top left corner. I changed the layout of the buttons, adding the functionality of uploading a video as a new feature, and also adding icons to each button. Icons were added to better illustrate the action of each button. The wording on the upload button for adding music was changed from "Legg til musikk" (EN: "Add music") to "Legg til en sang" (EN: "Add a song") to make it more clear to the user that only one song can be uploaded.



**Figure 3.9: Multimedia upload page, without content (second iteration)**

In response to the feedback about a lack of illustration of what content was being put together, I made a single container for all the uploaded media to be previewed in, as can be seen in Figure 3.10. The whole page is not shown because of the scroll view position.



**Figure 3.10: Multimedia upload page, with content (second iteration)**

Table 3.3 shows the results of the evaluation of the second iteration. it was clear that there were still problems with consistency and an unclear process of making a multimedia slideshow. I was also not happy with the user having to scroll the page while going through the process. For these reasons, I redesign the process of uploading media content.

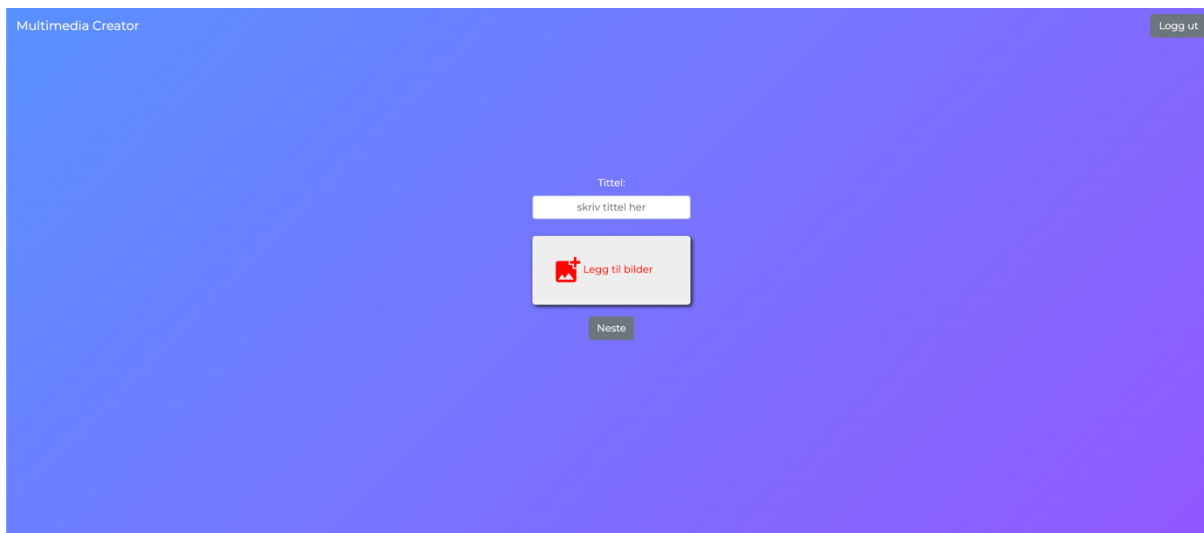
**Table 3.3: Evaluation of second iteration**

Feedback	Problem	Potential solution
The uploaded media suddenly appears on the page. There is a lack of connection between the “upload buttons” and the previewed content.	NUH: Consistency.  It can be confusing to the user that content suddenly appears on the page, and there is a lack of connection between the user’s action and how the content is displayed on the page.	Change the entire process of uploading content.
There is an unclear separation between the different media types.	NUH: Consistency  The different media types are not labelled, and it might confuse a user.	Same as above.

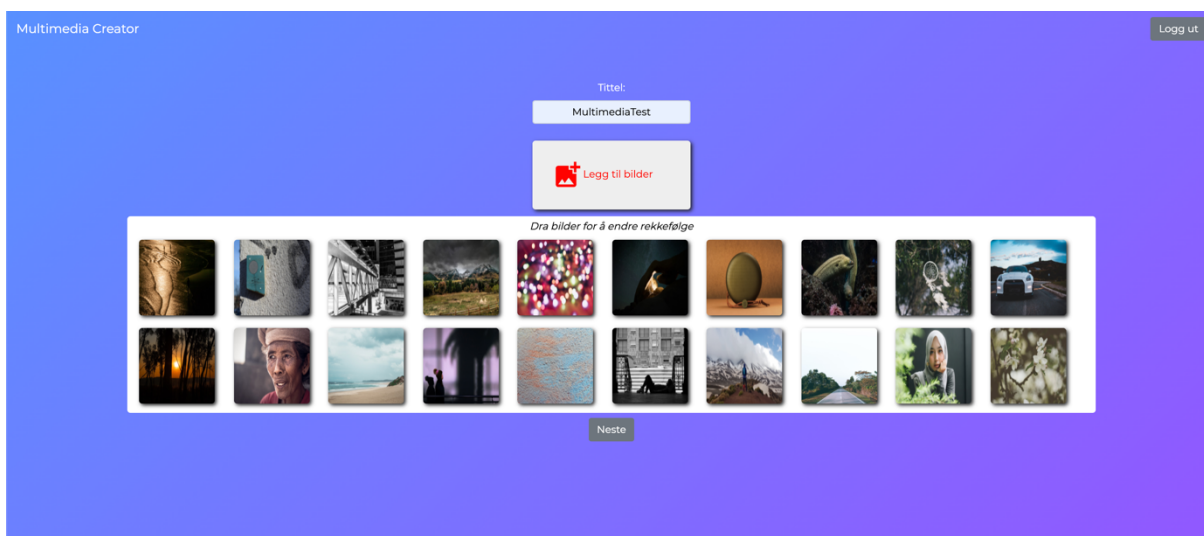
### **3.3.1.3 Third iteration**

In the third iteration, I changed the multimedia upload page to a multistep form. This was done to avoid scrolling behaviour on the page, to establish a better link between upload boxes and previewed media, and to make the process of making a multimedia slideshow clearer. Figure 3.11- Figure 3.14 shows every step in the form in the order it is presented in the web app.

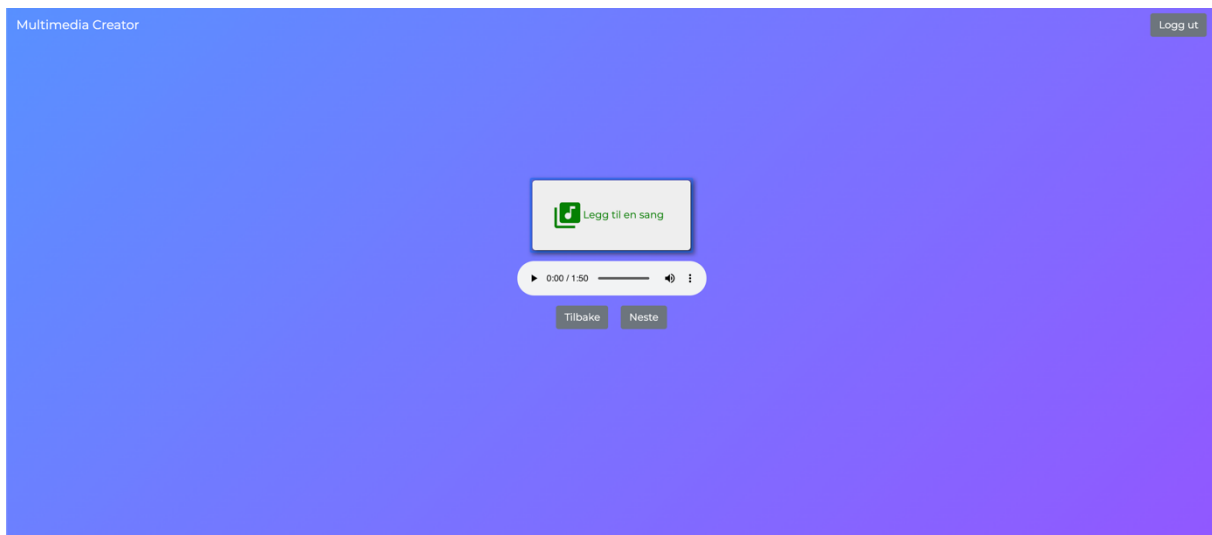




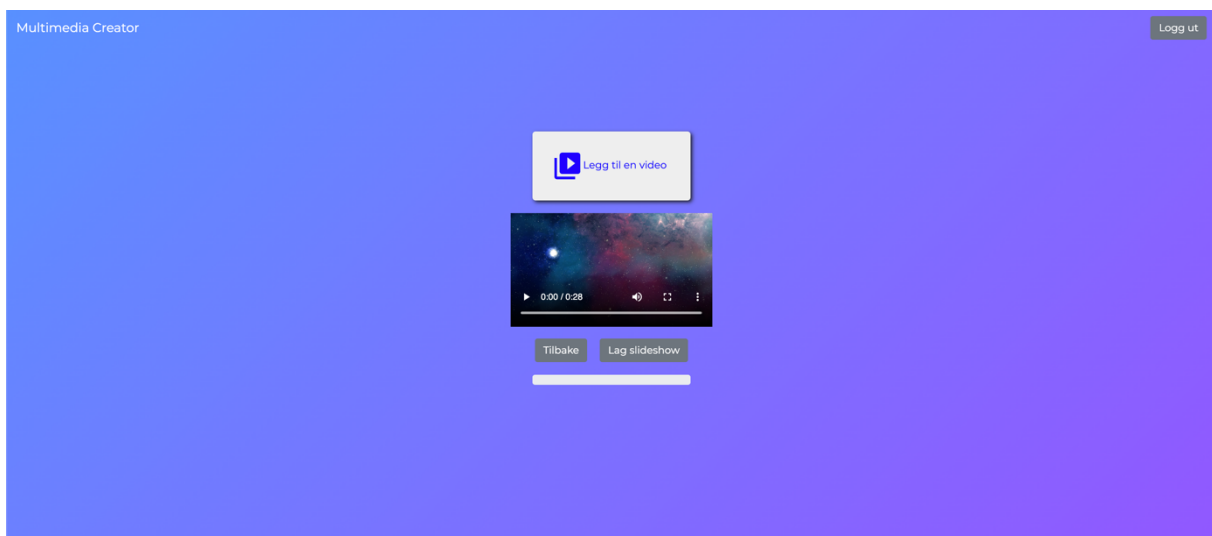
**Figure 3.11: Multistep form, image upload, without content (third iteration)**



**Figure 3.12: Multistep form, images, with content (third iteration)**



**Figure 3.13: Multistep form, music (third iteration)**



**Figure 3.14: Multistep form, video (third iteration)**

The third iteration showed a new design for the whole upload-process. It went from a single page application to a multistep form. With a new design, there were new challenges. Table 3.4 shows the evaluation of the third iteration. I wanted to avoid scrolling on each page, and this led me to adjust the placement of all elements based on the amount of content appearing on the page. This led to elements moving around the viewport, which should not happen according to an evaluator. The upload-process was missing a clear progression and the visual appearance could be improved. This led to the fourth and current iteration, where these issues were addressed.

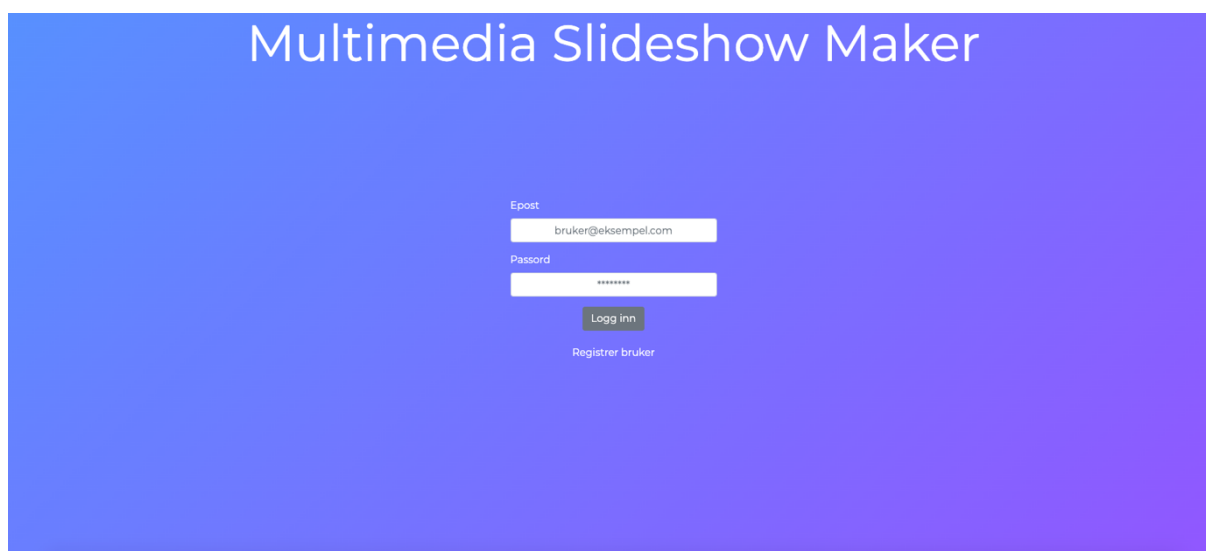
**Table 3.4: Evaluation of third iteration**

Feedback	Problem	Potential solution
<p>Elements are moving around on the page as the user interacts with the upload buttons.</p>	<p>NUH: Consistency.</p> <p>The interactive elements should always be located in the same place of the viewport at all times. As elements are moving around, the user must recognize the new placement of an element each time it moves.</p>	<p>Give each element its permanent position in the viewport.</p>
<p>The input field, "Title", could have its own step in the form.</p>	<p>NUH: Aesthetics, user control and consistency.</p> <p>The title, placed on the "image page" may make the user think that the title is added to the images and not the entire presentation. Also, it does not look good.</p>	<p>Give "Title" its own step in the form.</p>
<p>The multistep form would benefit from having an indication of progression.</p>	<p>NUH: Visibility of system status, recognition rather than recall</p> <p>The user has to remember how far in the process he/she</p>	<p>Add progression-indicator.</p>

	has gotten and have no idea what comes next.	
The elements could cover more space on each page.	NUH: Aesthetics. This might affect the user's satisfaction.	Enlarge each element.

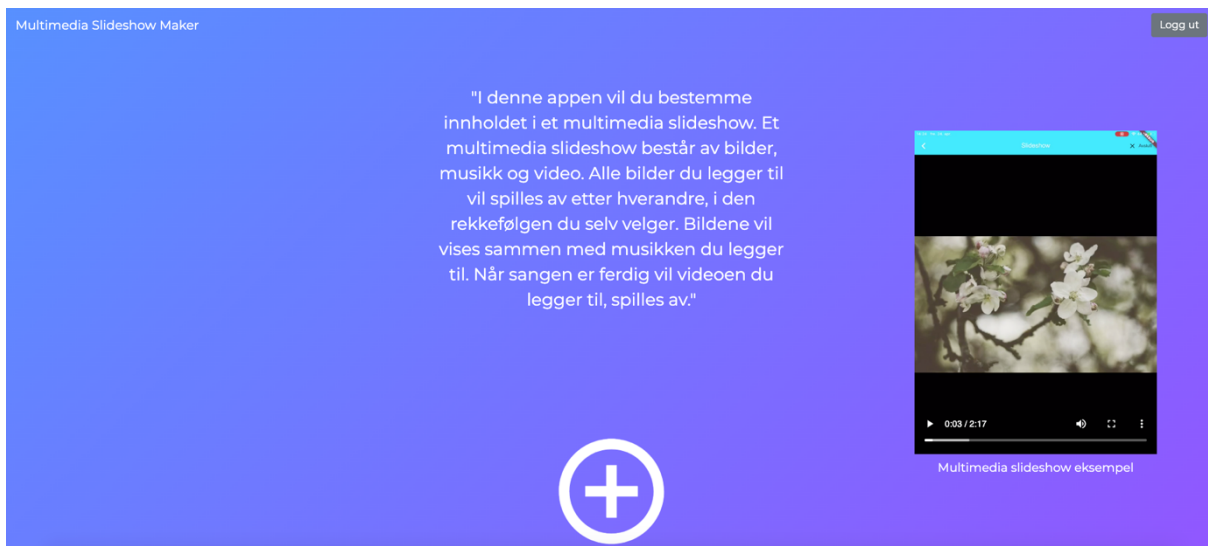
### 3.3.1.4 Current iteration

In the fourth iteration, I had improved the interface based on all feedback I received during the earlier iterations. I changed the name of the web app to "Multimedia Slideshow Maker" (Figure 3.15).



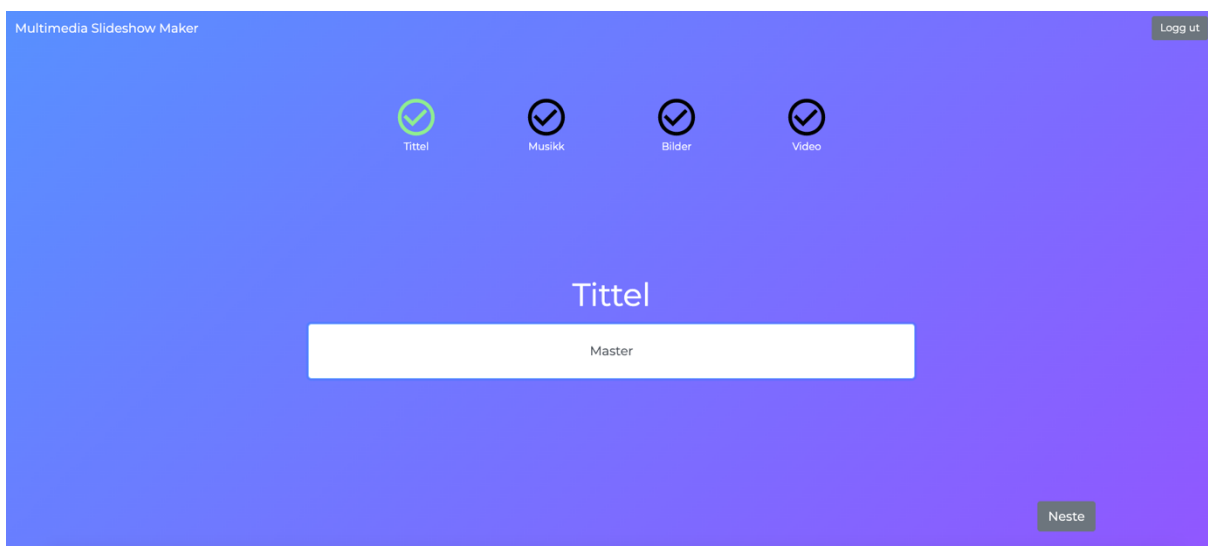
**Figure 3.15: Login page (current iteration)**

To make users understand the purpose of the application without needing a thorough explanation, I added a "home page" (Figure 3.16), where I give a textual instruction on how to use it, and a video example of how the result may appear on an iPad.



**Figure 3.16: Home page**

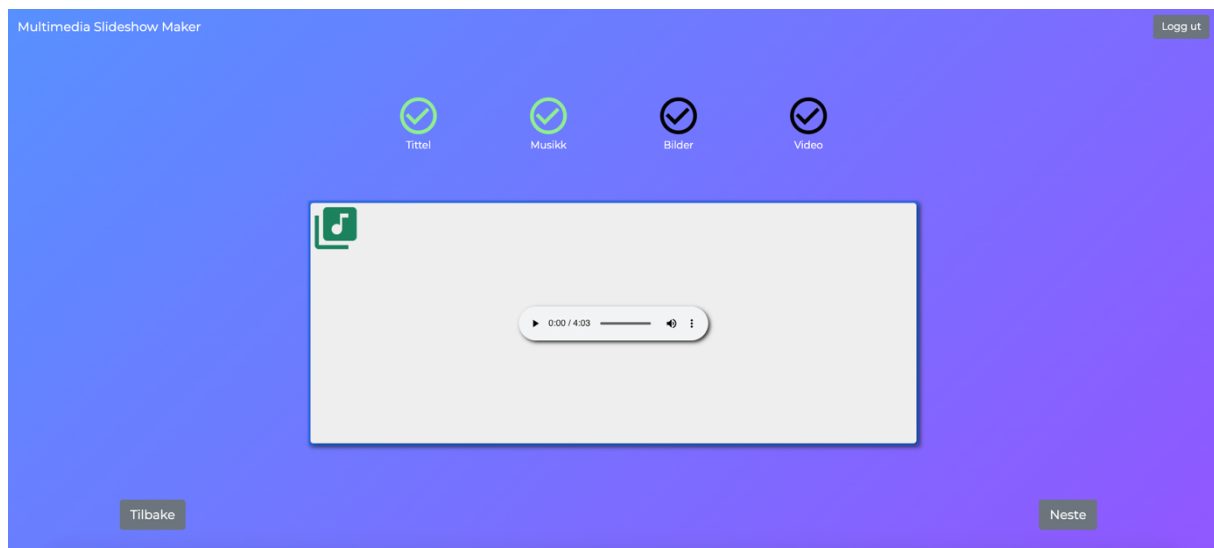
Figure 3.17 shows the "title input field", given a step of its own. The same figure shows that I have added check mark symbols at the top of the page. These symbols turn green when the user enters a value in the respective step. This was made to illustrate the progression the user makes throughout the form.



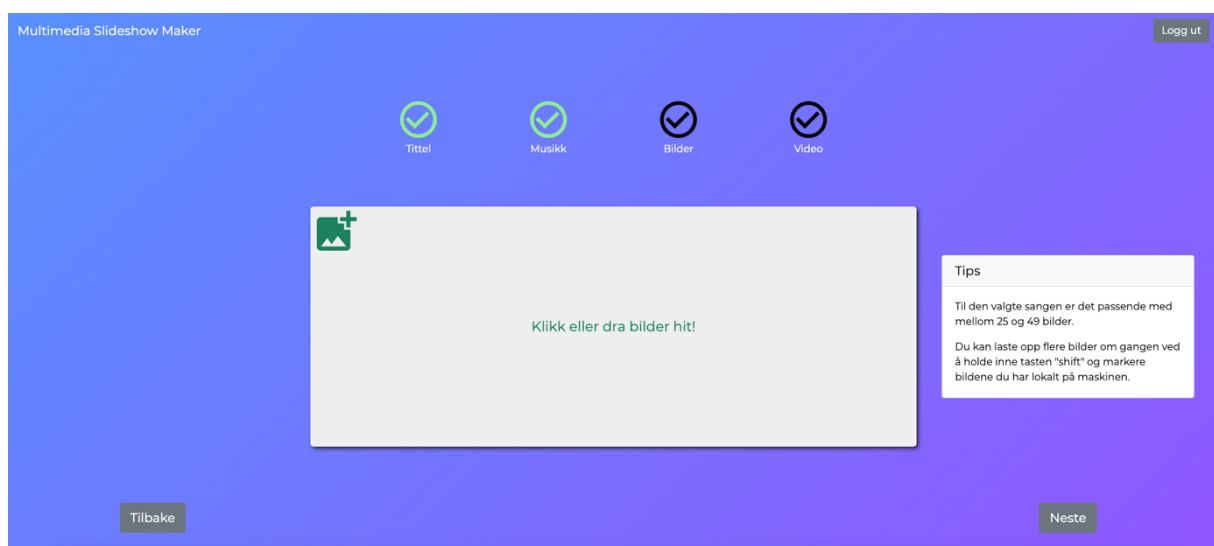
**Figure 3.17: Multistep form, title-input-field**

Figure 3.18-Figure 3.20 shows a change to the upload buttons, to what I would rather call "upload boxes". These act as both an interactive element, which a user can click or drag images to, and a preview

container. This was not done in earlier iterations because of the challenge where two events related to the “drag and drop” feature happened at the same time. When this was fixed, I could make the upload boxes. Having an upload box as both the interactive element for uploading and for previewing content, helped fix the issue of elements moving around the viewport. Also, the link between the user’s action of uploading content and where the content ends up being previewed was made clearer.



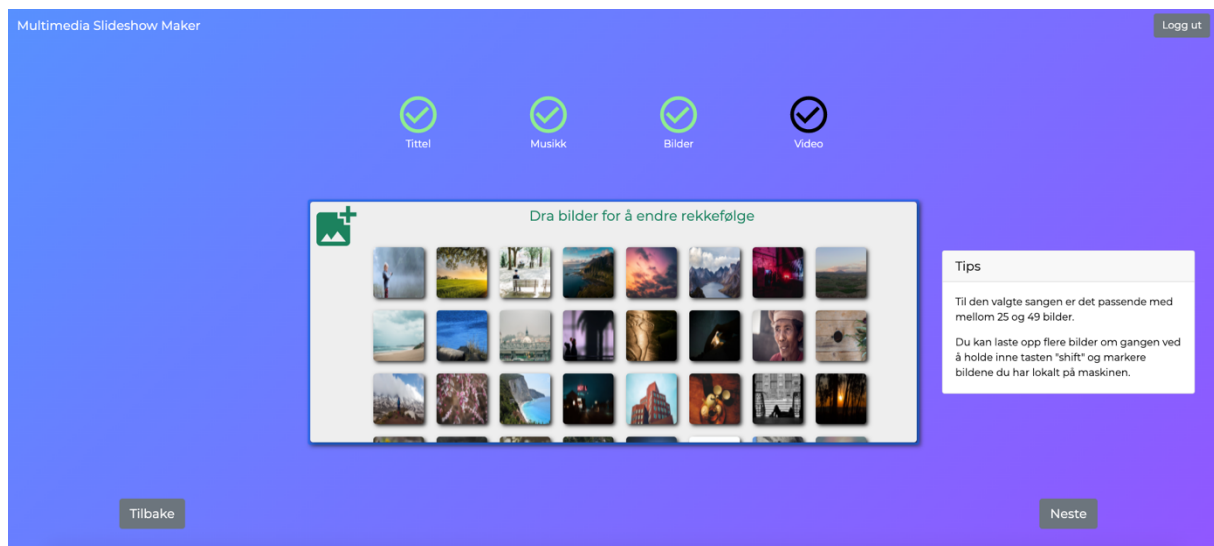
**Figure 3.18: Multistep form, music (current iteration)**



**Figure 3.19: Multistep form, Images, without content (current iteration)**

Figure 3.20 shows a white container with text on the right side of the input/preview container. The first sentence tells the user how many images are suitable for the song that the user has uploaded in the previous step. I saw it as necessary to add because of how the system is made. The mobile app plays the entire song, deciding the display time of each image based on the length of the song and the number of images (length of song / number of images). Currently, I have set a minimum display time of 5 seconds, and a maximum of 10 seconds.

Further research on what display time is best suited for a person with dementia, considering the practice of reminiscence therapy, should be done.

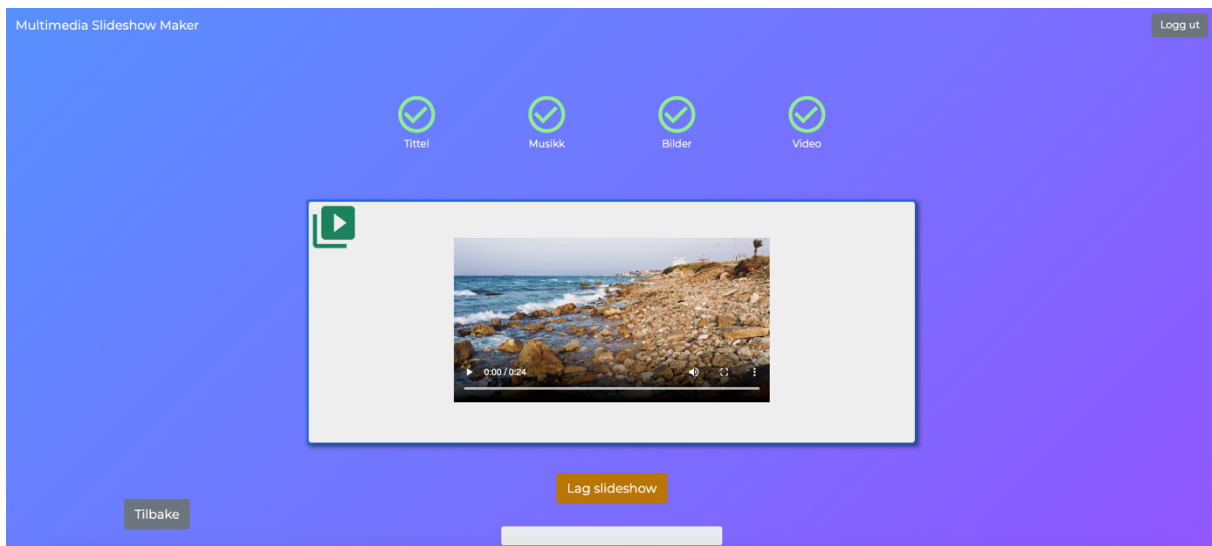


**Figure 3.20: Multistep form, images, with content (current iteration)**

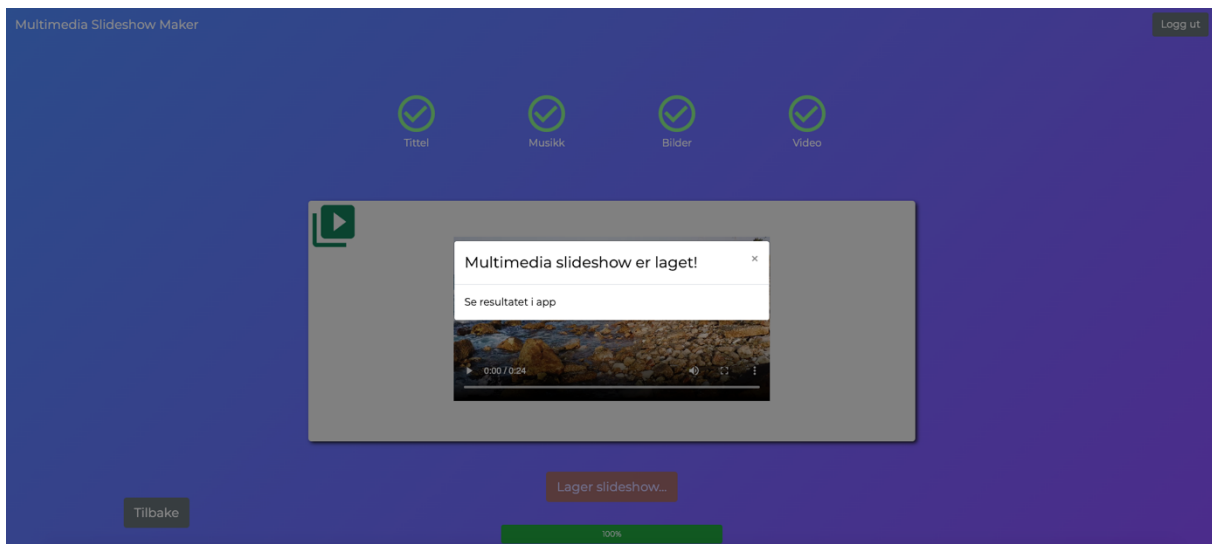
When a title, a song, images, and a video is added, the user can press the submit button, "Lag slideshow", to upload all content (Figure 3.21). During submission, a progress bar, as can be seen at the bottom of Figure 3.22, runs from 0% to 100%. When it is finished, the user is prompted with a modal. A modal is a popup box/element that displays over the current page. The prompted modal tells the user that the multimedia slideshow is finished and that it can be seen in the multimedia slideshow app. When the user closes the modal, the user is navigated back to the home page.

After making the current iteration I decided it was time for testing with potential real users. If it was not for time constraints, I would have tested it with the evaluators and done one more iteration, since new features,

elements and pages were added to the application. Testing with end-users would help me answer to what extent a caregiver can use MSM without instructions from others or prior experience in video editing. Before going through the user test process, I will describe the development of the mobile app, which handles the uploaded content and makes a multimedia slideshow.



**Figure 3.21: Multistep form, video (current iteration)**



**Figure 3.22: Submitted form**



### **3.4 Developing the mobile app**

When developing a mobile app there are multiple considerations to make. There are several Software Development Tools to choose from. There are native app development tools, like Xcode for IOS and Android Studio for Android. There also exist cross-platform software development tools, like React Native and Flutter, where one codebase works for multiple platforms. React Native should not be confused with React, although they are closely related. React is for web development, while React Native is for cross-platform mobile development.

Making an app available for both IOS and Android means that the app will be available for more people. As Alight should be as easily available as possible for people with dementia, the choice of software development tool was narrowed down to either React Native or Flutter. By choosing one of these I would only have to learn one development environment and programming language for developing for the two platforms.

When choosing between these two, I had a set of criteria:

- Firebase support (backend development platform)
  - Firebase Authentication (login)
  - Cloud Firestore (Database)
- Audio, video and image support
- Large and well-documented package manager (packages and libraries)
  - Including libraries for image slideshows
- Easy to learn
- Strong community

After researching both tools with these criteria in mind, I found that both fit my criteria and would be suitable for developing the multimedia slideshow app. Therefore, I tried to make a simple image slideshow app in both environments. Even though React Native uses JavaScript as its programming language, a language I am most comfortable with, I found that implementing the image slideshow with flutter was the easiest, even though its programming language is Dart, which I had no experience using. Flutter was easier to learn and get started with, meeting all my criteria and ended up becoming the tool of choice for app development.

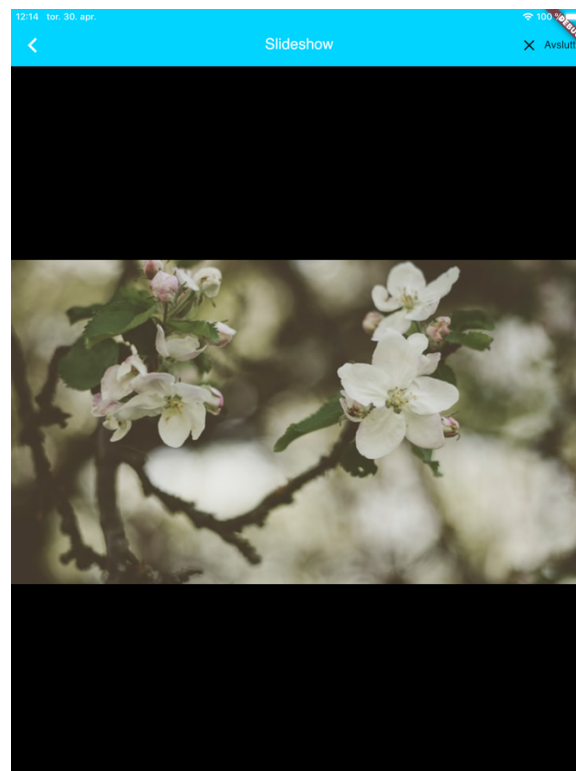
#### **3.4.1 Making an image slideshow**

I first developed an app that fetched images from the web and displayed images as a slideshow. In Flutter, an app is made from “widgets”, which are the building blocks of an App’s user interface. Widgets are Flutter’s

equivalent of the web browser's Document object model (DOM), where Flutter's object model is a widget tree, and every element is a widget itself. This is closely related to how React works, where Widgets are called Components.

For building the slideshow I used a combination of Flutter's built-in widgets and an external widget (package) called "carousel slider". The carousel slider widget takes optional arguments, where I could alter its behaviour and style to make it display images as I wanted.

An apparent challenge with this approach was that images fetched from the web take time to download before they can be displayed. For many applications, it might be ok with a placeholder image, like a loading bar being displayed while the image is downloaded, but for this application, the image must be ready to display when the slideshow starts. The solution to this problem was to precache the images, meaning that the images would be stored in the cache memory, and then start the slideshow when all images are stored. The slideshow can then retrieve the images from the cache, which is fast enough to be displayed without any need for a placeholder image. An example of how an image is displayed can be seen in Figure 3.23. It is also possible to flip the mobile/tablet to view it in full screen.



**Figure 3.23: Multimedia slideshow app, displaying image**

### **3.4.2 Adding music**

It was important to have the functionality to read music from a URL, not having to download the song before playing it. This way it can be integrated with a music-streaming API in the future. It was also important to get the duration of the song, to be able to set the duration of each image. Figuring out what flutter package was suitable for handling audio, was a process of reading documentation and testing out several options. I ended up with an external flutter package called "just\_audio" for handling audio, which has all these features.

The slideshow of images was developed to last for the duration song, where the display time of every image adds up to the length of the song. I chose to set a maximum display time of ten seconds and a minimum display time of five seconds.

As mentioned earlier, there is a need for more research on how long a patient with dementia wants to view an image. Are five seconds too short to be able to recognise the image? Are ten seconds too long, making the patient restless, agitated or bored?

In the current version of the app, there is not implemented a pause-functionality or a timeline to skip back and forth throughout the multimedia slideshow. I see these functionalities as necessary where the patient is watching the slideshow together with a caregiver, and the patient wants to discuss a memory related to an image. Also, images are contained within a set aspect ratio of 16:9 and do not properly scale all image formats. These issues will be addressed in a future version of the app.

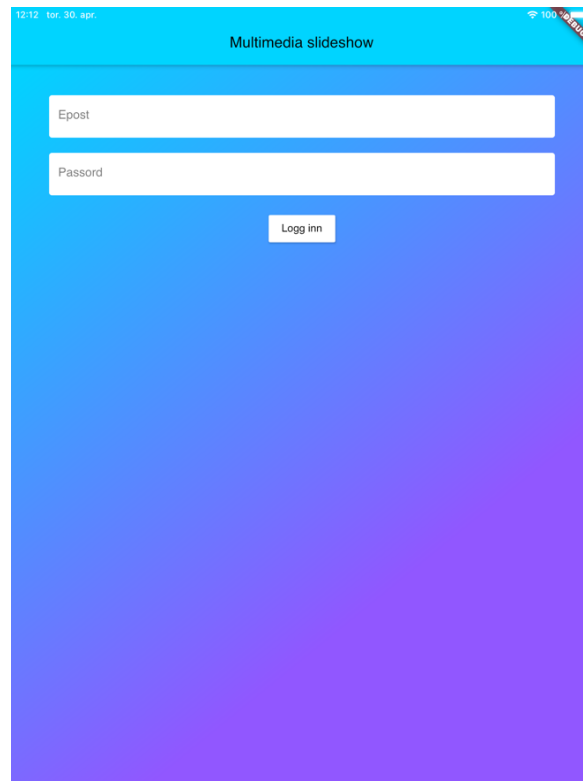
### **3.4.3 Adding video**

For adding video to the multimedia slideshow, I chose a Flutter package called "chewie". Chewie can play video from a URL and can auto-play when it is added to the user interface. The video is always played after the image slideshow is finished playing. This is done by replacing the carousel slider (image slideshow) widget with the chewie-widget after the song is finished playing.

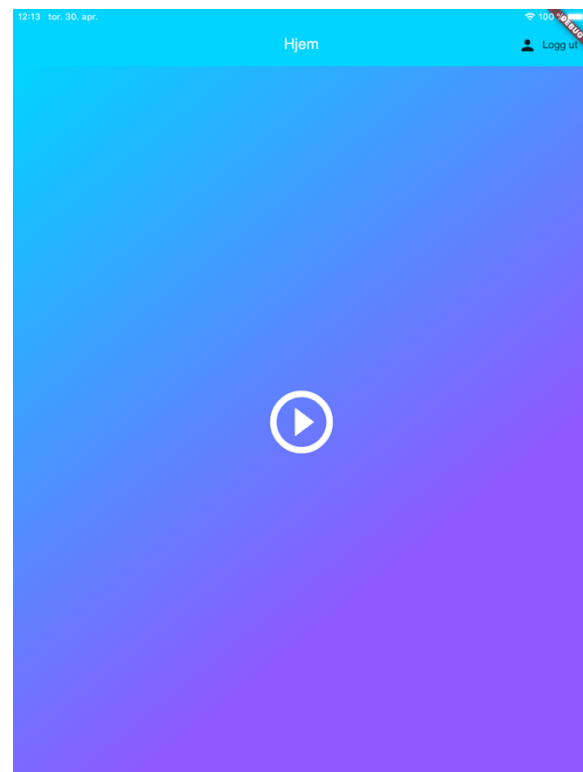
### **3.4.4 Adding authentication**

To connect the web app and the mobile app I added authentication, using Firebase. Firebase provides authentication for many platforms, including Flutter for Android and IOS. When signing in to the mobile app (Figure 3.24) with the credentials registered on the web app, the content that is

uploaded in MSM with the same account can be played as a multimedia slideshow (Figure 3.25).



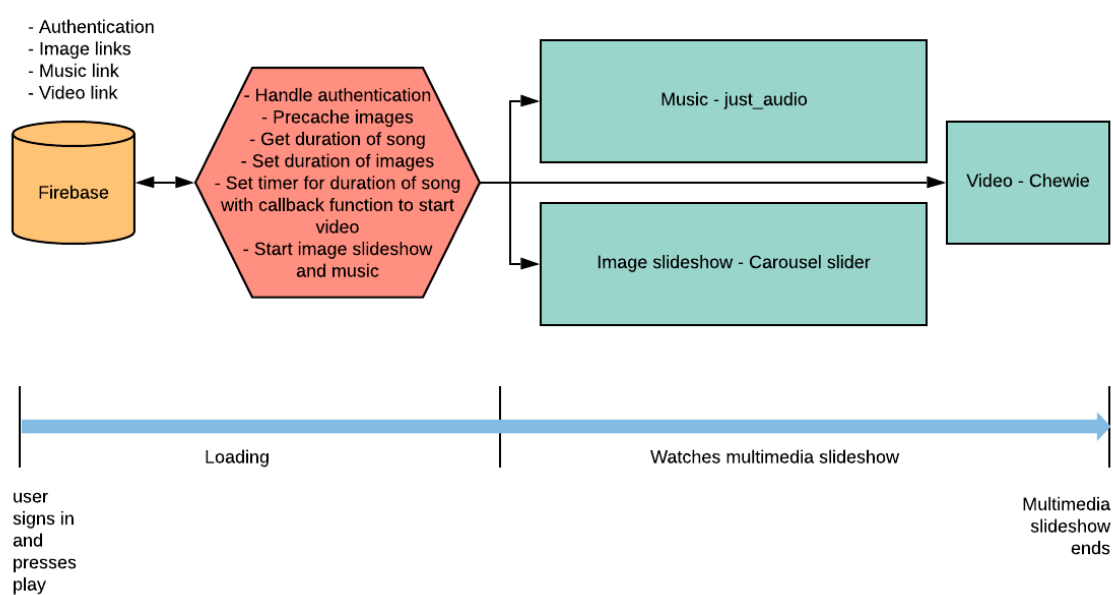
**Figure 3.24: Multimedia slideshow app, authentication**



**Figure 3.25: Multimedia slideshow app, play**

### 3.4.5 Final overview of the mobile app

When a user signs in to the app, there are only two options, to either logout or play the multimedia slideshow (Figure 3.25). For now, the system lets a user make a single slideshow, replacing the old when a new one is made. In the future, the system will let the user make multiple slideshows, letting the user choose from a list in the app. When the user presses play, the app fetches data from firebase and prepares the media for viewing. While this is performed, an animated loading figure is displayed. When the data is ready, the multimedia slideshow will automatically start. Figure 3.26 shows a technical overview of the mobile app, where the blue line illustrates the process a user has to go through from start to finish, and the figures above tell which parts of the system that is working while the user navigates and interacts with the interface.



**Figure 3.26: Technical overview of multimedia slideshow app**

A limitation of the design is that the wait time is determined by the user's network speed and the number of images that have to be precached. If the app is going to be used in a patient's home, the system then requires that the patient has an internet connection. As dementia is a syndrome that mainly affects older people (World Health Organization, 2019), internet availability among elderly people in Norway should be considered. Medienorge shows that the number of people age 67-79 years old with access to the Internet has gone from 66% in 2010 to 94% in

2018 (medienorge, n.d.). This shows that the Internet is becoming more and more available for everyone, including the elderly, and should not be a problem in Norway.

Another concern is if an elderly person with dementia will be able to use a mobile tablet and the developed app, but that is a step for further development, testing and research.

The wait time for displaying the video can be reduced if precaching is divided into bulks. For instance, the five first images can be precached when the user presses play, and the remaining images can be precached while the multimedia slideshow is playing. This will, however, make the future functionality of having a timeline for skipping further into the slideshow, more difficult to implement.

# 4 User testing of the current web app design

## 4.1 Choosing best-suited methods

After reaching a design that mostly satisfied the general design guidelines, I used a method that is fundamental to achieve a high level of usability, and that is to test with end-users. Testing with end-users, which in my case was potential caregivers, provided me with information about how they use the system and the problems they had with the user interface. Holzinger (2005) describes three methods for user testing: thinking aloud (THA), field observation, and questionnaires/interviews.

THA involves briefing the user, making sure the user thinks out loud while testing the system. This will reveal why users do something, and at the same time, the users' comments can reveal their preferences and information about system performance. THA will help users focus and concentrate, which is both an advantage and a disadvantage. The advantages are that it can help uncover problems at the root of the system, avoiding later misconception and confusion, and the test session will go faster. A disadvantage is that it results in less natural interaction with the system.

Field observation involves visiting users in their environment/workplace. In my case, the system is thought to be used in the caregiver's home or workplace (ex: health institution). While the user is testing the system, the observer should take notes, and be as invisible to the user as possible to ensure normal working conditions. This method focuses on major usability issues that will be very clear to the observer.

Questionnaires and interviews are useful for studying how end-users use the system and their preferred features. Especially interviews can provide subjective user preferences, satisfaction and possible anxieties, and questionnaires can be used to compile statistics. The biggest disadvantage is that this is an indirect method, where it only collects information about the user's opinions about the user interface. As a collector and analyst, discrepancies between subjective and objective user reactions must be accounted for.

A usability study by Jacobsen et al. (1998) let four Human-Computer Interaction (HCI) research evaluators examine four hours of videotapes of

users testing a system while thinking aloud. Here they found that only 20 % of the problems were detected by all the evaluators, and 46% were detected by only a single evaluator. Effects that the evaluators have on the usability process is referred to as The Evaluator Effect. To ensure a better problem detection rate, I chose to include all of the three aforementioned methods. Besides, each method has its focus and advantage, and by combining them I could potentially draw from the different advantages.

## **4.2 Privacy in user testing**

Since there was no purpose in collecting personally identifiable data (name, age, IP, gender, occupation, diagnosis etc.), I chose to only collect anonymous data. The user tests involved video conferencing, where neither video nor audio was recorded. Each participant received an ID under video conferencing, which they could enter in the interview/questionnaire. This way I could link the video conference session to the answers from the interviews, without personal data being exposed. Every participant consented to join after being informed of what a user test session involved and what data was collected.

## **4.3 Preparing for online user testing**

User tests were carried out over video conferencing. Since the use of a web app means that the user will be on a computer, it was seen as an appropriate method. All participants were joining from their homes, which can be an environment where a caregiver will use the application. The user tests did not involve any participant joining from a workplace/office/institution. Though the surrounding environment can have an impact on the usability of the app, I do not see it as a disadvantage at this stage of the process.

Performing user tests online involved preparation beforehand, where I prepared:

- A folder with test-media (images, music and video files).
- Beta testing of mobile app for both android and IOS.
- Hosting of the web app.
- A web questionnaire.

As the web app involves uploading media content, I provided a folder with example media that each participant could use during testing. I could not expect participants having relevant media on their computer, and I was not interested in receiving sensitive data from participants. I did,



however, try to make the content interesting for each participant by providing several musical genres, types of images and videos. The test media folder was shared with participants on Google Drive, where I guided each individual to download the folder during the meeting. With most participants I guided while they were sharing their screen, striving to make it as easy as possible for the participant in the preparation phase.

The state of the *mobile* app was not ready for user testing. It was in an early stage, where I knew it did not follow the general design guidelines. Also, the app is not only meant to be used by the caregiver, but also a person with dementia. As I said in the introduction, the evaluation of the usability of the mobile app is not a part of this thesis. Still, the main functionality of the mobile app was developed, where a user can sign in and watch the generated multimedia slideshow. I wanted participants to be able to see the result of the media they put together during the test of the web app. This involved guiding each participant through the installation of a beta release of the app.

#### **4.4 Conducting user tests**

I had one-on-one test sessions with all participants, where the participant connected to the web-based video conferencing tool Whereby<sup>1</sup>. Whereby was chosen because of its incredible ease of use. The participant only needs a web-browser and joins my conference room by pressing a provided link.

The test session started with an introduction to the purpose of Alight and MSM. I also informed the participant to think out loud and give comments to what they experienced while going through the system. Finally, I gave the participant the option to share the screen, which every participant agreed to. I could then observe the participant's actions.

During testing, I gave simple instructions to what the participant was supposed to do, for instance, "register a user and sign in" and "make a multimedia slideshow". I could then observe his/her actions, and if anything went wrong with the system during testing. Still, it is important to keep the user test as realistic as possible. "A minimum of assistance is given by those running the evaluation, except when participants get completely stuck or need information that is not readily available to them" (Petrie & Bevan, 2009, p. 22). After the participant had gone through all

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<sup>1</sup> <https://whereby.com/>

the steps involved in creating a multimedia slideshow, I let the participant sign into the app to watch the multimedia slideshow that was made.

After the test was finished, I went through a questionnaire together with the participant. The original thought was to have the questionnaire as a supplement, but I realised it was better to be used as an interview. This was partly because the questions could be hard to understand and I figured that going through it together with the participants would make the process easier, and we would be able to discuss each question and related problem. It was then used as an interview, where we discussed their experience and the problems they had with the system. Usually, in an interview, the interviewer writes down the answers of the interviewee, but in this case, the interviewee wrote down the answers. This may be a very unusual way of doing an interview, but I thought it might eliminate myself from misinterpreting their problems.

#### **4.5 Selecting participants**

There are many different recommendations as to how many participants are needed for user testing. According to Petrie and Bevan (2009), this depends on where in the development process you are when evaluating; if there are several types of users; and on the confidence required in the result. According to Petrie and Bevan, there should be between 5 and 8 participants in early formative evaluations, and between 8 and 30 participants in summative usability testing. Holzinger (2009) suggests 3-30 participants for user testing, depending on the evaluation technique. The purpose of doing the user test was to uncover potential usability problems. This in itself would help determine where in the development process I was and help determine to what degree users can understand and use MSM independently, without instructions from others or experience in video editing.

Recruiting people for a user test over video conference was a challenge. I wanted participants of different age, as MSM is supposed to be used by anyone who wants to care for a person with dementia. As people with dementia are usually elderly people, they may have family in their 40-60s who may act as a caregiver. My assumption is that older people, in general, have less experience using web applications. People in their 20s have grown up with the use of computers and will likely have more experience than older people. Because of time constraints and that I did not have any funds to pay participants, I chose to recruit people I knew. There may be several advantages to choosing people I know. To some extent, I have an idea of the participant's experience with technology

before recruiting. Based on this knowledge, I could adjust the preparation required to fit each individual's level, to some extent. It also led me to be able to recruit people I thought had less experience with the use of web applications, with the idea that a less experienced person would find it more difficult to use MSM. But also, those with more experience, that could compare the web app to other web apps, and the standards and consistencies they were used to. Maybe the participants who know me would have a harder time to answer honestly, afraid to hurt my feelings, but I was sure to let each participant know that the more honest they were, the better it was for me. I will also argue that a participant who does not know me, would be more hesitant to be honest, especially over a video interview.

I chose four people in their 50s and four in their late 20s, a total of eight participants. Of the eight participants, two participants had experience with video editing. The aim is to design a system that can be used without experience in video editing, but I thought it would be valuable to also get some feedback from those who are experienced.

While performing the tests I noticed the same problems occurring with several participants. After eight participants I felt I had enough feedback to be able to go back and do another design iteration. Preferably I would have done improvements based on the feedback, and then continued with another user test, but in the scope of this master's thesis, it ends with the results from the first and only user test.

# 5 Analysis and results

## 5.1 Thematic analysis

After finishing the user tests, I had notes from what I observed with each participant, from what they said when they were thinking out loud, and the written responses to the interviews. I have used the process of thematic analysis to analyse the data set. "Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 79). Braun & Clark (2006) describes the process/phases of doing thematic analysis as:

1. Familiarising with the data
  - a. Transcribe, read and re-read, noting down ideas
2. Generating initial codes
  - a. Coding interesting features in the data, and collecting data relevant to each code
3. Searching for themes
  - a. Collecting codes into potential themes and gathering data relevant to each theme
4. Reviewing themes
  - a. Checking if the themes work in relation to the coded extracts and the entire dataset
5. Defining and naming themes
  - a. Refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme
6. Producing the report
  - a. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating to the research question and literature

The necessity of thematic analysis could be clearer if I had a large data set, and especially if I had transcriptions of interviews, where a lot of text is irrelevant for answering a research question. I can argue that I did extraction/coding while doing the interviews. This was where the participants wrote a formulation of the problem after we had discussed the problem. The discussion led to shorter and more on point answers, making the data set less cluttered with irrelevant data. Nevertheless, I gathered my notes and data from the questionnaires into a single collection, where I extracted phrases/codes of relevant problems and suggestions. I noted the frequency of each problem and grouped phrases/codes into themes that describe the problems (Table 5.1). The

problems are then evaluated against Holzinger’s (2008) usability characteristics (Learnability, efficiency, memorability, low error rate and satisfaction), which will help answer to what degree MSM can be used independently, without instructions from others, where the usability of the web app fails, and how it can be improved.

**Table 5.1: Thematic analysis of feedback and observations**

<b>Themes</b>	<b>Extracted phrases</b> (number of participants experiencing the problem)	<b>Observations</b> (Number of participants observed)
Visibility	<p>“skipped a step without knowing why” (1)</p> <p>“The images should be in a bigger format” (3)</p> <p>“More instructions during the process of uploading content” (1)</p> <p>“Clearer illustration of progression on upload-pages” (1)</p>	<p>Participant did not recognise going past image page before trying to add images to the video-upload-box (1)</p> <p>Participant moved closer to the screen to view images (1)</p>
Confusing elements	<p>“A large transparent image appears while rearranging images in Firefox” (1)</p> <p>“Placeholder text does not disappear when clicking/entering input field” (1)</p> <p>“Unsure were to click to drag images to the box. Expected a button” (1)</p> <p>“Pressing the plus-icon to start was not evident” (4)</p>	<p>Participant clicked media icon in upload boxes to upload content. When asked they said it looked like the place to click (4)</p> <p>Participant used some time on “home page” before asking if the plus/cross-icon should be pressed to start (3)</p>

		Participant had to be told to press the plus/cross-icon to start (1)
Missing error prevention and feedback	<p>"Had too few characters in password" (1)</p>	<p>Participant entered fewer than six characters when making password and was notified by the system that at least six characters should be entered (1)</p> <p>Participant tried to upload two videos at once and noticed that it was not possible. The system feedback was not properly indicating that it was not allowed. (1)</p>
User control and freedom	"Want to click check-icons to navigate between pages"	Participant was clicking the check-icons to try and navigate to/from the different steps in the form (title, music, images, video)
Design	<p>"Visual look can be improved" (3)</p> <p>"Want higher contrast between next/back-buttons and background"</p>	

## **5.2 Participants' rating of experience with technology**

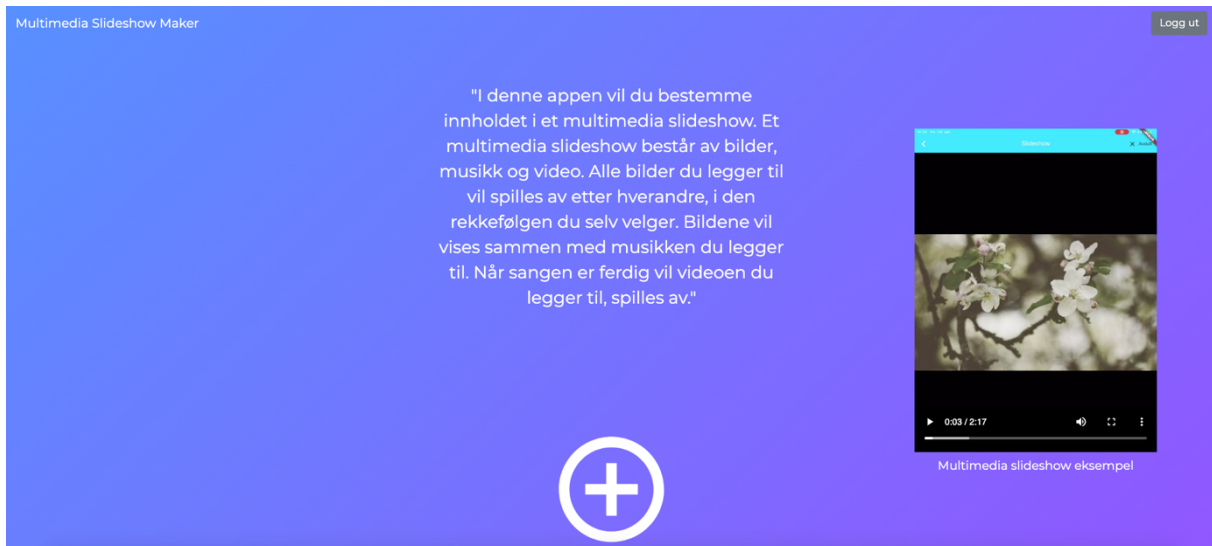
Before going through the user test, I asked each participant to rate their experience with computers, websites, web apps and video editing software using a Likert scale. The scale ranged from "no experience" (0) to "much experience" (5). The results can be viewed in Appendix B.

My goal was to find most participants who had little or no experience in video editing, as that is a part of the research question. Six out of eight participants had no or very little experience with video editing software. Most participants reported having much experience with computers and websites, but when it came to the use of web apps, several participants reported less experience. I was sure to describe both in writing and orally what the difference between a website and a web application is. The difference is that in a web application the user typically has to sign in with an account, and the user has the option to generate content. Examples of web applications are Facebook, Google Gmail or photo editing software like Pixlr. Examples of websites are blogs or online newspapers (vg.no). Still, the terms "website" and "web application" are very much used interchangeably, and it is sometimes hard to grasp the difference between them when explained. It is therefore hard to validate if the participants actually have less experience with web apps than websites.

## **5.3 Learnability**

### **5.3.1 Perceived affordance, consistency and standards**

When participants were asked if the application was easy to learn and if it was easy to get started, most participants said it was easy to learn, but one element was standing out as a confusing element that hindered people from getting started making multimedia slideshows. The element in question was the plus/cross-icon on the home page, which can be seen at the bottom of Figure 5.1.



**Figure 5.1: plus/cross icon**

On most if not all e-commerce websites there is a shopping cart icon in the upper right corner of the website. Often, this icon does not have a label attached to it. They can do this because it has become a consistency and standard among e-commerce websites. Fulfilling consistency and standards is as seen earlier, one of the ten usability heuristics by Nielsen. The plus/cross icon on the home page, however, is not a standard. The reason why I describe the icon as a "plus/cross"-icon, is because that's the two words that have been used by participants when they describe their problem with it. Three participants had to ask if they were supposed to click on it, and one participant had to be told to click on it to get further. There are at least two related problems with the icon.

1. It does not tell the user "Start making a multimedia slideshow" by itself.
2. It does not afford "to click" for every user

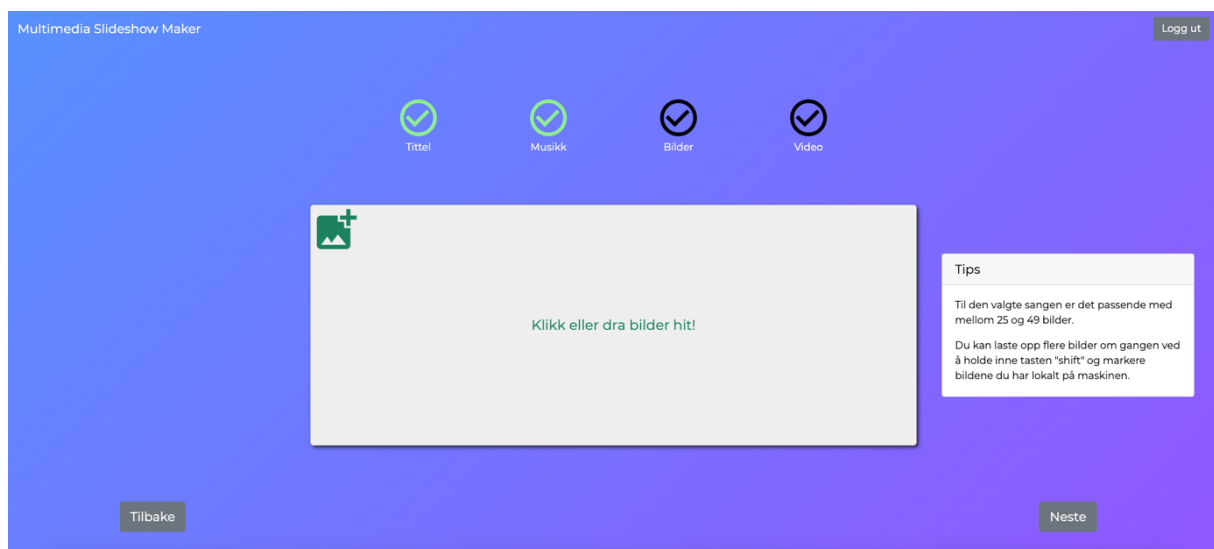
It shows a problem with "perceived affordance", a term coined by Norman (2004), about whether the user perceives that some action is possible. Norman has brought this term into design, based on the original invention of the term "affordance" by J. J. Gibson, which refers to "the actionable properties between the world and an actor" (Norman, 2004, p. 2). In web design, the user (actor) and object (world) are separated by a screen. The object is neither real nor physical, and that is why Norman writes that as a designer you can only control perceived affordances.

A potential easy solution to this problem can be to add a label, and to maybe change the icon and make it appear more "clickable". If the icon was replaced with a circle with the text "Click here to make a slideshow" or "Click here to start", and also given it a shadow to make it look more



3D, it should be a lot clearer to the user. The text would explicitly say that the user has to do an action of “clicking”, tell the user where to click, and describes what the action does. The 3D effects can potentially make the area be perceived as more “clickable”.

Another part of the web application that can be improved in terms of perceived affordance, is the upload boxes for media content. Figure 5.2 shows the upload box for images, where there is an icon in the upper left corner. There exist many variations of this icon, and it is popularly used to illustrate images. In this case, the icon for images is merged with a plus-sign, to convey the message “add images”. In the centre of the box, there is a text that says, “Click or drag images here”. The intention of adding the ability to drag content to the box was to give the user more freedom. If the user already has navigated to a folder with images, it can lead to fewer steps for the user to perform, given that the user is familiar with this functionality. It is a feature that has become more and more common over the last years, but a user that is inexperienced with using web applications might not have encountered this feature before. Adobe Spark Video, Animoto and Magisto all support this feature, but only Magisto informs the user that this is possible. I will compare MSM to these technologies in chapter 6.



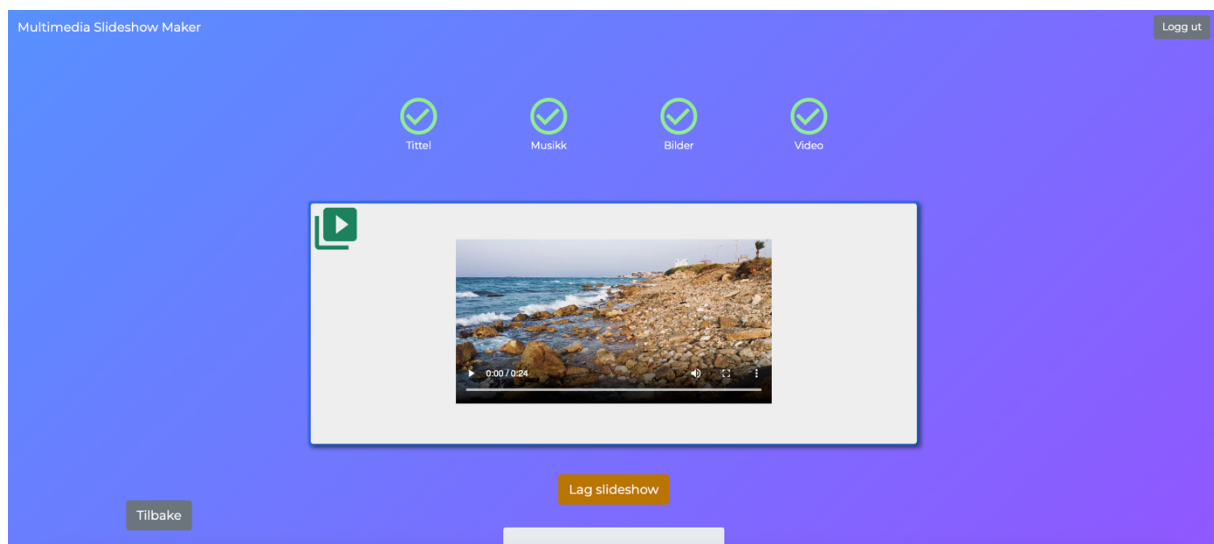
**Figure 5.2: Upload box for images**

Most participants chose to click to add images. Three participants were observed to click the icon, which is fine, but one participant said: “I was unsure where to click to drag images into the box...I expected to click on a button”. The participant says, “click to drag”, which may tell that the

participant is not used to the feature of dragging content into a defined area to upload content since it is not necessary to click inside the browser to drag content from the computer. Nevertheless, the participant decides to click the icon after a short while, and when the file browser opens, it seems that the participant understands the functionality.

A potential solution to this problem could be to move the icon from the corner to the middle and add the text "Click here or drag images to the box" underneath the icon. When the user adds content, the icon can be moved dynamically to the corner, with a label that says "Click to add more images" on the image page or "click to replace video/music" on the other pages, since the user is only allowed to add a single video and song.

A potential problem related to consistency is the "Lag slideshow" button (EN: "Make slideshow") in the last step of the form. The button can be seen with a brown background colour in Figure 5.3. One participant expected a "Finish" button placed where the "Next" button is placed on the previous pages. After hearing this, I agree that the button is better to be placed there to keep the design consistent across all steps in the design. The user has pressed "next" three times in the same location of the viewport, and it makes sense to follow the same pattern on the last page, even though it is the final stage.



**Figure 5.3: "Lag slideshow" button**

The three aforementioned problems are to a certain extent failing to meet the requirements of consistency and standards and perceived affordance.

This leads to the user having to think before acting and may require that the user has to learn what action leads to the intended result. The section examined how the problems can be improved in terms of consistency and perceived affordance, potentially making the design more intuitive, easier to use and easier to get started.

## **5.4 Efficiency**

Since the application is yet fairly simple, with the ability to only create a single multimedia slideshow, it is a bit hard to measure the efficiency of the web app. One participant mentioned that there needs to be a feature to see previously made slideshows. In the current version, this is not yet implemented but will be included in a future version. When this is implemented, a new user test can be done where efficiency can be better evaluated. When the participants were asked if they could easily make several multimedia slideshows by going through the process again, they all said yes. Several participants said it was a fast process, and some expressed that they could easily make a new multimedia slideshow.

## **5.5 Memorability**

Holzinger (2008) describes memorability as: "a casual user can return to the system after a period of non-use without having to relearn everything". During user testing, I have not explained to the participants what to do in the steps to make a multimedia slideshow, except for one participant, who I had to tell to press the plus/cross-icon to start. Three participants asked if they should press the plus/cross-icon to start, and they were told to try and press it. After every participant had pressed the icon, they understood the purpose and had learned its action. Still, it should be improved so that the user knows its action before pressing it. 4/8 participants went through the application without asking any questions on how to proceed and completed every step on their own. There should be enough textual and visual instructions on the pages that a casual user can return after a while without having to relearn anything, at least given that the plus/cross-icon is improved, as explained in the previous section. There should however be done another test at some point with the same users to better evaluate memorability.

## **5.6 Error rate**

Ideally, when developing an application, no errors should occur, especially not critical errors which makes the application unusable. Luckily, no critical errors occurred during user testing. There were, however, errors that affected the participants on some level.

### 5.6.1 Technical error - Dragging to rearrange in Firefox

One participant experienced that images appeared in a large format while dragging to rearrange images (Figure 5.4). This happened in the Mozilla Firefox web browser. I do not yet know why this is happening in Firefox, as it does not happen in Google Chrome or Safari. Regardless, a solution needs to be found, as it can cause frustration for the user, making the overall use, less satisfactory.

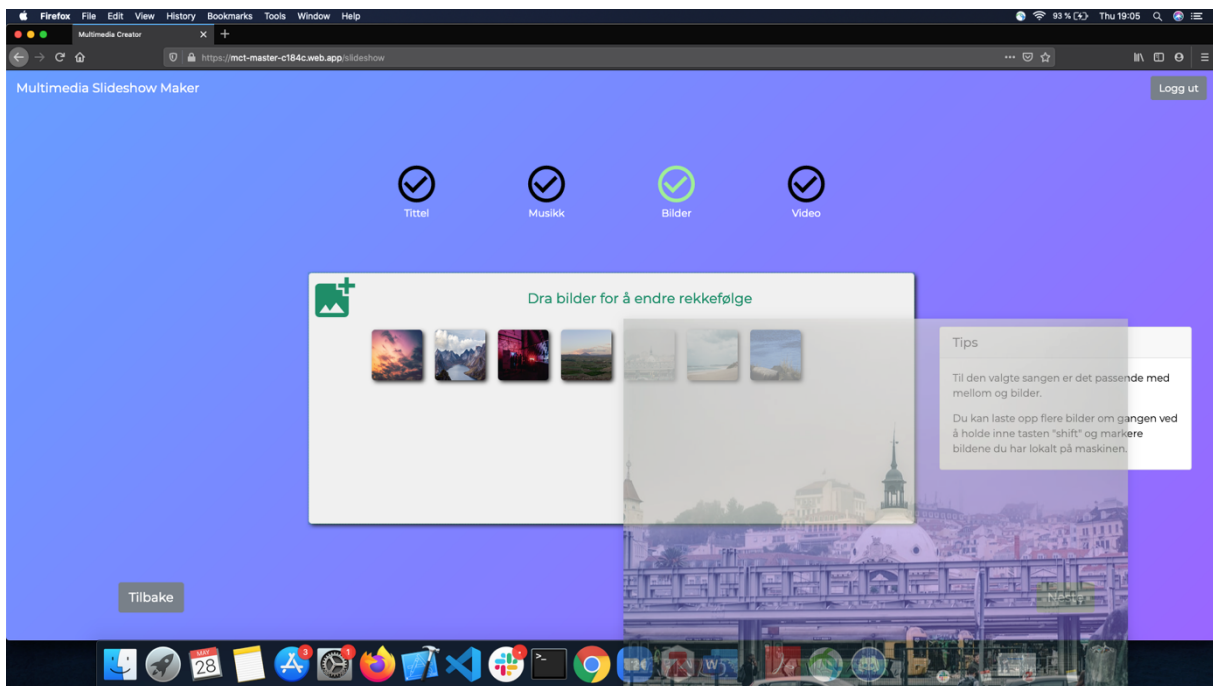
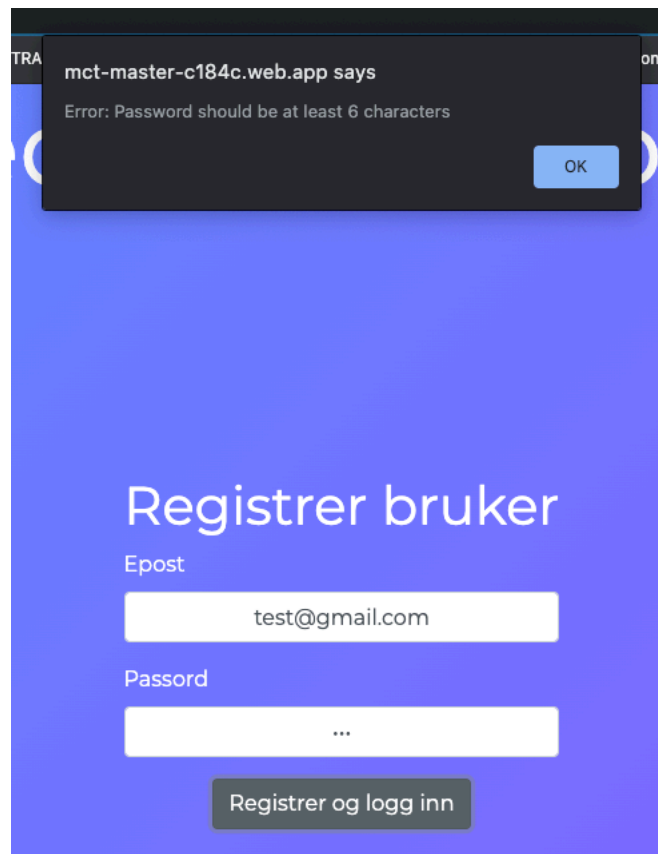


Figure 5.4: Dragging to rearrange in Firefox

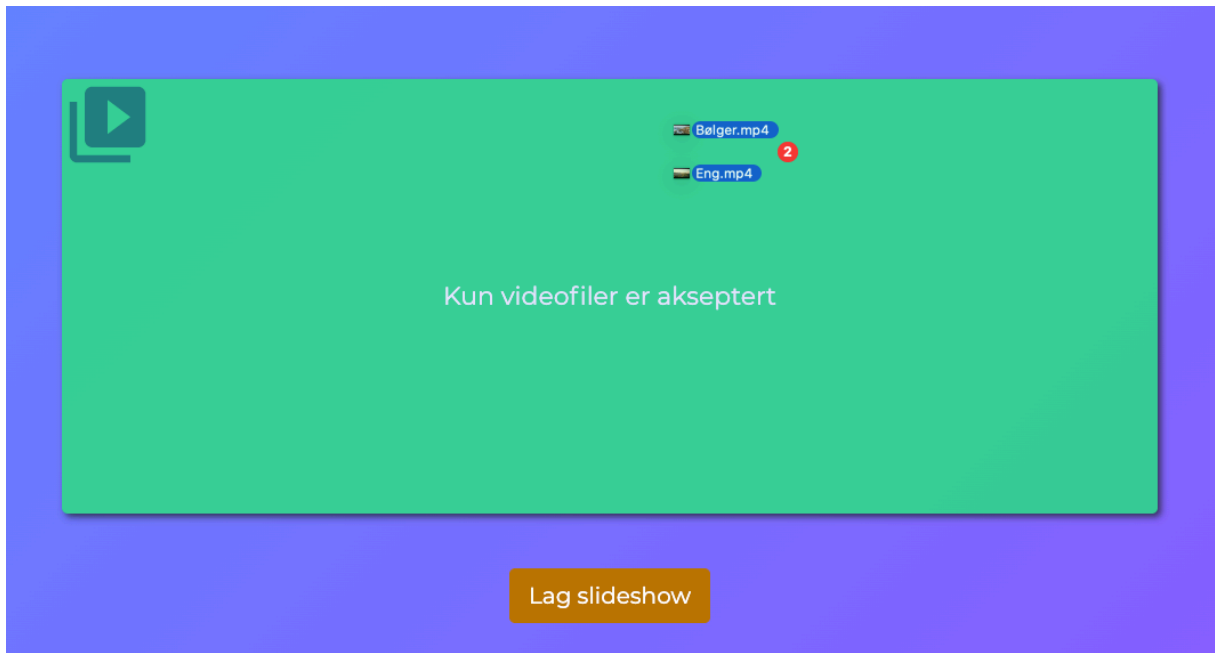
### 5.6.2 Unhandled errors and missing feedback

A participant was observed to enter an invalid password when registering for an account. The participant was then prompted with an error message, which can be seen in Figure 5.5. The error comes from Firebase, which is the backend that handles authentication. Firebase does not allow passwords under six characters, and that is what the error message says. First of all, this is an unhandled event by the application, where it should at least provide the error message in the user's language, which in this case is Norwegian. Second of all, the user could have been instructed to make a password with more than six characters before/while entering a password. This could help prevent the error from happening in the first place.



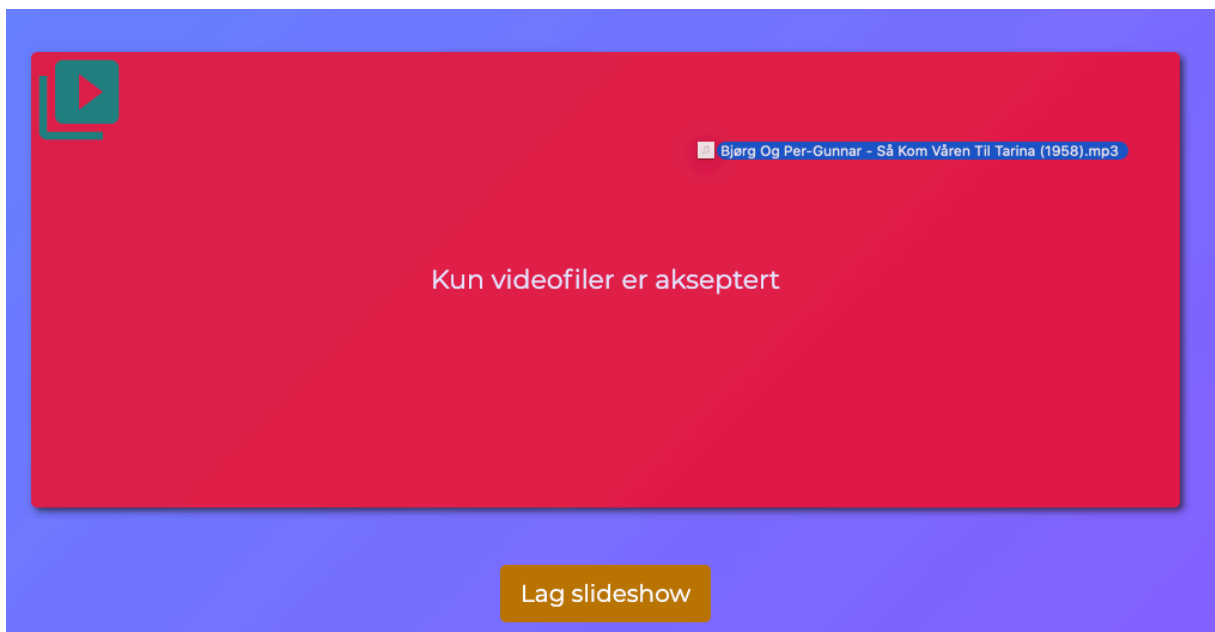
**Figure 5.5: Invalid password**

A participant experienced an error while trying to add two videos at the same time. It is not possible to click and choose multiple videos, however, it is possible to drag multiple videos into the upload box. This is what a participant tried to do, and Figure 5.6 shows what happens when a user drags multiple videos over the upload box. This is yet another unhandled event. The box turning green is used to indicate that the content is accepted, which in this case it should not be. When the user drops the files, no content is added to the box. The text says, "Only video files is accepted", which indicates to me that the system recognizes that something is wrong, but it is showing the wrong feedback because the particular event is not handled properly.



**Figure 5.6: Dragging multiple videos to upload box**

Figure 5.7 shows how the application in the event of trying to add a song to the video upload box, handles the event and gives proper feedback to a user. The box turns red, as the colour red usually symbols error, and the text says, "Only video files are accepted", telling the user what file types belong in this box. This is the type of handling that needs to be added to the case where a user tries to add multiple videos.



**Figure 5.7: Rejected content feedback**

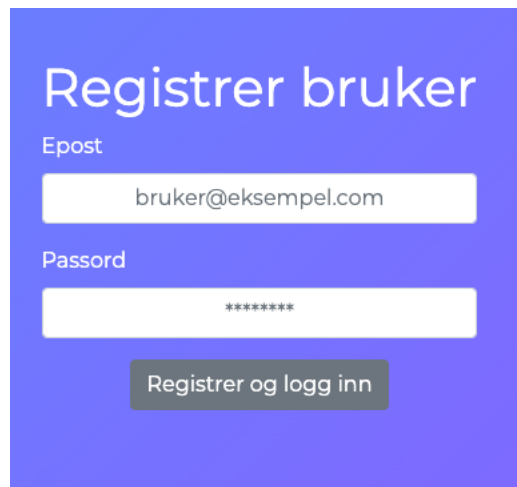
Having a low error rate is important for having good user satisfaction. Providing proper instructions to the user to avoid errors from happening is even more important. Users should also be clearly notified of why an action is not possible and provide a solution to the problem. This section examined the unhandled errors, and how these can be fixed.

## 5.7 Satisfaction

When it comes to user satisfaction, all other usability characteristics play a role. Also, there may be design flaws that can confuse or in some way make it harder for the user to interact with the user interface.

### 5.7.1 Placeholders

One participant experienced that the placeholder characters in input fields were confusing (Figure 5.8). When the participant placed the cursor in the input field, the placeholder text did not disappear, which made the participant think that the field was pre-defined. When starting to type, the participant realised that the text was replaced by the entered values.

The image shows a registration form on a blue background. At the top, the title "Registrer bruker" is written in white. Below the title, there are two input fields. The first is labeled "Epost" and contains the text "bruker@eksempel.com". The second is labeled "Passord" and contains seven asterisks "\*\*\*\*\*". Below these fields is a button with the text "Registrer og logg inn".

**Figure 5.8: Placeholder characters**

Katie Sherwin, a Senior User Experience Specialist with the Nielsen Norman Group, argues that placeholders in form fields are harmful (Sherwin, 2014). She mentions the exact issue that the participant experienced, that the user might think there is already a default value entered. She also lists several other problems, where most of them are related to the scenarios where the input field is not labelled. Still, with a label, she mentions issues with accessibility, where the default light-grey colour of the placeholder in many cases has poor contrast against

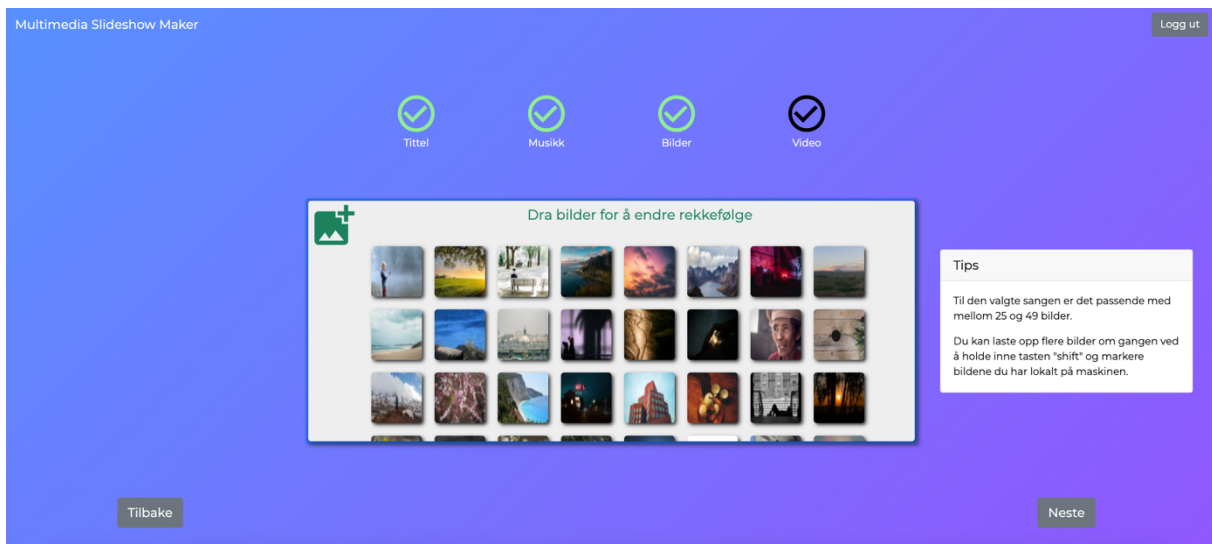
backgrounds and that not all screen readers read placeholder text aloud. If I were to remove the placeholder text when the user enters the field, another issue appears, where the user has to remember what the placeholder text said. A more specific issue related to my way of using the placeholders is that the placeholder does not help the user much. The star-characters in the password field should rather have been replaced with "must have at least 6 characters", which would have helped reduce the risk of a user experiencing an error, as one participant did. Still, Sherwin argues that that the help-text should be placed outside the form field so that the user does not have to remember the text when starting to input values.

### **5.7.2 Small size on images**

Another inconvenience that appeared while user testing was that the preview images of uploaded content were too small for some participants. One participant was observed moving closer to the screen, and including the observed participant, three participants reported that the images should be bigger, or at least possible to view in a bigger format.

As can be seen in Figure 5.9, the images are quite small, which is usually referred to as "thumbnails". The small size is used to avoid too much scrolling behaviour, as the upload box has a limited size. But, as seen from the user tests, the images are too small for its purpose. With age, it is common that eyesight becomes more and more reduced. It is very important that every user, even with reduced eyesight should be able to see the images clearly, without having to move closer to the screen, to be able to rearrange them to their choosing.





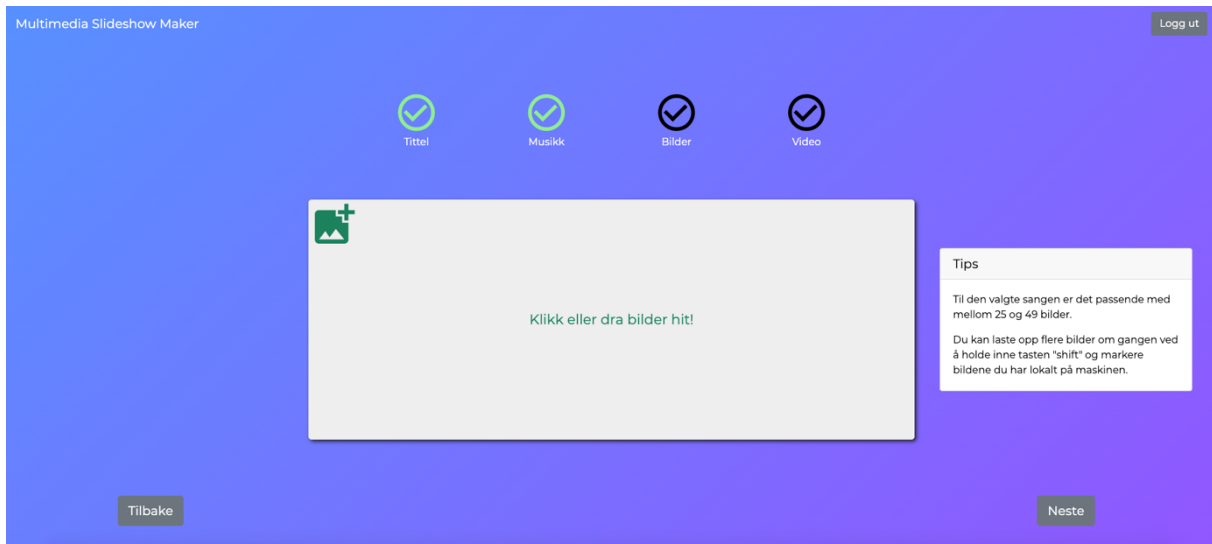
**Figure 5.9: Preview of uploaded images**

A solution to this problem can be to increase the size of all images, adding more need for scrolling. To reduce the need for scrolling, the size of the entire upload box can be increased, giving more room for each image. Another solution is to dynamically enlarge the image when the user hovers the cursor over it, or let the user click on the image to view it in a bigger format. I think a combination of these potential solutions can help make the interaction more accessible and satisfying for every user.

### **5.7.3 Graphics design**

Other responses that could tell something about the users' satisfaction are comments related to graphics design. Comments received were: "Visual design can be improved", "a little bit extreme colours", and "should be sent to a graphics designer". I do not consider myself as an expert graphics designer, but still, graphics design is important for a website to both look pleasant and to provide information in a way that is both accessible and memorable to the user.

A participant expressed that there could be more instructions and a clearer progression in the making of a multimedia slideshow. Figure 5.10 shows that the upload box has some writing in the middle, where it says, "click or drag images here", and an icon illustrating "images" in the corner. There is no title on the page, saying "Image page", which there could have been to make it more explicit. In terms of showing progression, there are checkmarks at the top, where the steps that are finished (title and music) have turned green.



**Figure 5.10: image page, instructions and progression**

To better illustrate where the user is in the progression, a potential solution could be to use dynamic graphics. Figure 5.11 shows a dynamic change in the size of the checkmarks, where the size is increased for the current page the user is on. It is a slight touch that seems to improve the feel of progressing through the form, which may not be as convincing when viewing it as a collage. Nevertheless, it has to be tested with real users to see if this dynamic graphics effect makes the progression through the form clearer. This can also be combined with giving the user the ability to click each icon to navigate between pages, as one participant expressed the need for. This would increase the user's freedom and lead to fewer clicks for those who frequently use the application, which can improve how efficient a user can be.

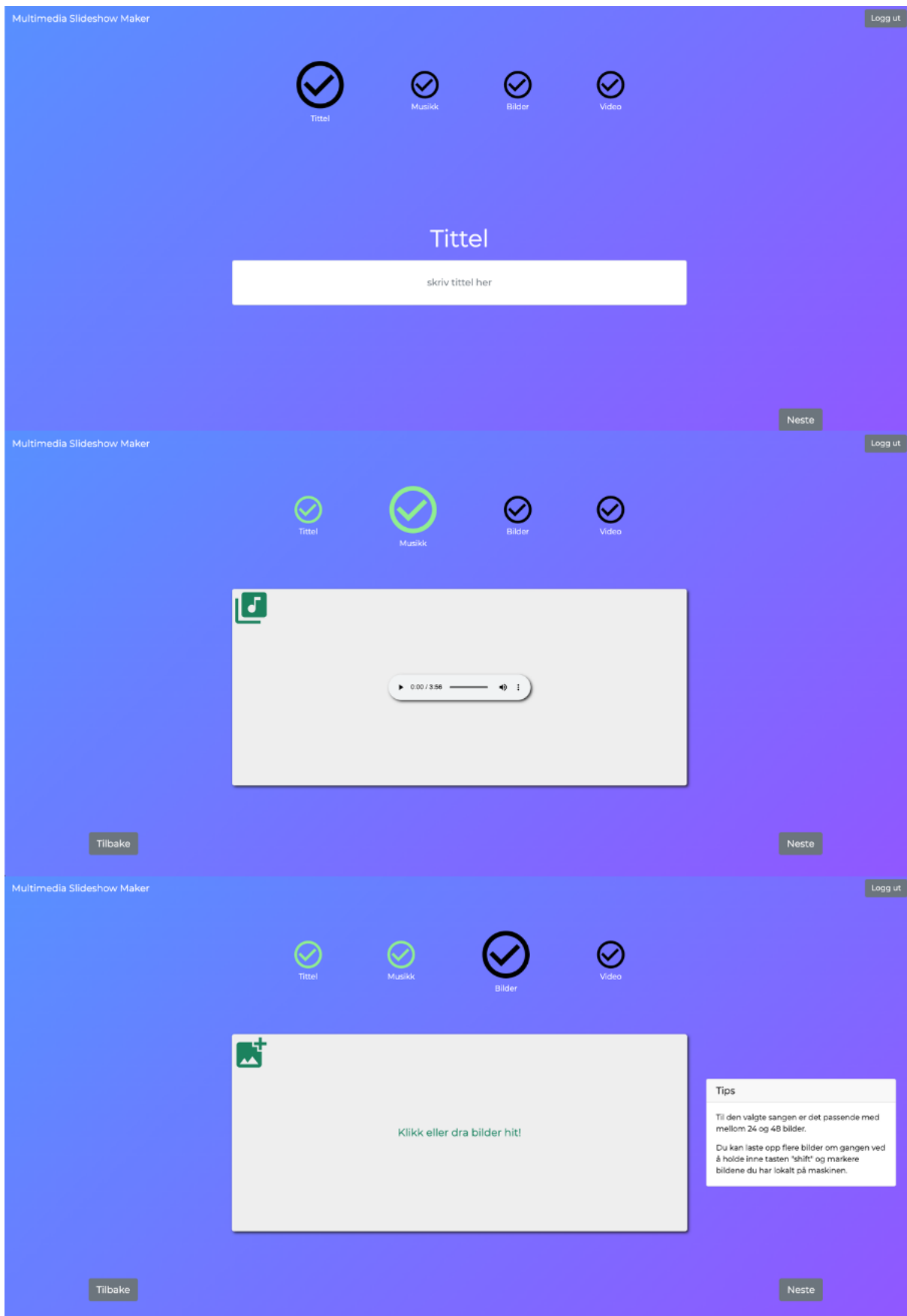


Figure 5.11: instructions and progression

This section examined problems which can lead to a less satisfied user and provided solutions to each problem. Placeholders should be avoided if possible, images should be possible to view in a bigger format, making it more accessible for everyone, and instructions and illustration of progression can be improved.

## **5.8 Summary of results**

Through the use of thematic analysis, the observations and written feedback have been organized to be able to extract relevant information about the problems the participants faced while using the web application. The problems have then been evaluated against Holzinger's usability characteristics, and solutions have been proposed. The next chapter will examine the severity of each problem, to be able to determine to what degree a caregiver can use MSM independently, without instructions from others or prior experience in video editing.

## 6 Discussion

I have previously mentioned "The Evaluator Effect" from Jacobsen et al. (1998), where it was said that each evaluator will discover different problems and that a single evaluator will not find every problem, at least not with THA as the only method. Another aspect of The Evaluator Effect, described in the same study, is that each evaluator will rank the severity of a problem differently. This effect, on both problem detection and severity rating, is supported in another study, by Hertzum et al. (2014). Hertzum & Jacobsen (2001) writes that the simplest way of coping with The Evaluator Effect is to involve multiple evaluators, but still, it will not be completely eliminated. This is supported by Nielsen (1994). Even though the effect will be present, especially as I am a single evaluator, I think it is important to describe the problems that have been encountered in terms of severity. This will help guide the development process in terms of which problems should be fixed first and give insight to what degree MSM can be used independently by a caregiver. After discussing the problems in terms of severity, I will discuss limitations of the methods that are used, discuss challenges in development, and compare MSM to similar applications. The following definitions of severity ratings are inspired by Nielsen (1994), where I have taken the freedom to categorise and define the problem statements.

### 6.1 The critical problem

I will define a critical problem as a frequently occurring problem that can cause a user to be unable to proceed.

It was clear that the plus/cross icon on the home page was the most reported problem, and as it is the first step in creating a multimedia slideshow, the problem is critical. One participant had to be told to click the icon to proceed and three other participants had to ask if they should click on it. It can be considered whether the participants eventually would have tried to click the icon in a natural scenario, without the observer being present. Still, the level of uncertainty will affect the user's efficiency. The uncertainty shown by the participants may also lead a user to become annoyed by the lack of instructions, ending with the user leaving the application in frustration.

This is the only problem I will categorize as critical, standing in the way of letting most potential caregivers use the application independently. This should be the first problem to be addressed in the improvement of the user interface.

## **6.2 Serious problems**

I will define a serious problem as a problem that occurs frequently and will negatively affect efficiency and satisfaction.

Four participants reported that the previews of uploaded images were too small. One participant was observed to move closer to the screen to see what each image portrayed. In the current version of the app, the only form of editing a user can do, is to reorder images. It is therefore essential that every user, including those with reduced eyesight, can be able to do so without having to make an extra effort. This can cause the user to not want to explore the possibility of reordering images in the first place and become frustrating for the user when they try.

A problem also related to image previews and reordering, was a participant that experienced that while grabbing images, a big transparent version of image appeared. These issues combined can cause an even greater frustration for a user, and therefore both issues should be fixed.

## **6.3 Minor problems**

I will define a minor problem as an issue that should be improved to increase the user's satisfaction.

From the feedback and observations, there were some smaller issues participants had with the application that can be improved. These issues did not prevent participants from using the application but were rather issues related to the overall satisfaction and the user's ability to be efficient. Minor problems included missing error preventions (not critical errors), placeholder text that may confuse the user, partly unclear instructions, and limitations in illustration of progression in the form. Even though these problems may not hinder users from being able to use the application, they should be fixed to increase satisfaction and let the user be more efficient.

There were also several comments saying that the overall visual design could be improved, where only one person explicitly said that the colours were "a bit extreme". This is not a direct problem, but still an important part of the application when it comes to how pleasant it is to use.

## **6.4 Limitations of heuristic evaluation**

During the design phase, the design has been evaluated against Nielsen's Usability Heuristics by people with experience in user interaction. Two of the four evaluators were considered specialists. As mentioned earlier, this

might have led to fewer problems being uncovered before going through with user testing. This method does not cover accessibility well. Though the application is not designed to work well for people with disabilities, thinking and evaluating in terms of accessibility could have uncovered the problems participants experienced with small-sized images, contrast and images appearing in a big format while dragging in Firefox. Petrie & Bevan (2009) writes that the first step in checking if a web application follows established accessibility guidelines, like those provided by W3C, is to undertake a preliminary accessibility review. This involves several tests, and two of the mentioned are:

- Test website in a range of browsers
- Change the display colour to greyscale to check contrast

These tests could have been performed before testing with end-users. Being more aware of potential caregivers having reduced eyesight could have led to a better-suited size on images.

The Evaluator Effect would also be present in HE but having four evaluators have likely helped reduce the effect.

## **6.5 Limitations of user tests**

As the user tests were carried out with a total of eight participants, it is not expected that all problems are covered. Since the web app is meant for a caregiver, which can be a family member, friend, health worker, it is necessary to expect that this will be people with a range of abilities and disabilities. Disabilities are here referred to issues such as reduced eyesight or limited motor skills, which are not necessarily thought of as disabilities. People also have a range of skills, some have experience in video editing and the use of web applications, while others do not. In the recruitment of participants, some issues of diversity and inclusion was addressed, including age and computer literacy and skill. Still, I cannot expect to have covered every potential caregiver with eight participants.

I Included two participants who had experience in video editing, though the research question is to assess if MSM can be used without this experience. I can to some extent argue, based on the observations, that even with the experience, they faced the same or even additional challenges with using MSM. I could say that MSM differs from video editing software, and it is not designed to be one. Close to all editing is done by the system itself, except giving the user the possibility to reorder images. The goal is not to make a video editing platform, but the future of the application may hold more editing capabilities, and it is then

important to limit the need for video editing skills, in a similar way that Magisto, Animoto and ASV do for its users.

As a single evaluator, using the methods of THA, observation and interview, I cannot expect to have covered all usability problems that have occurred, according to The Evaluator Effect. I could have recruited some of the evaluators from the design process to help with the user tests. This would likely have led to more usability problems being uncovered.

## **6.6 The development process**

The development process was a process of research of development environments and development tools/libraries, and programming. Developing in a cross-platform environment has a great advantage in terms of time needed to develop for both Android and IOS. Still, Flutter is a relatively new tool, with the first stable release (Flutter 1.0) released in December 2018 (Flutter, n.d.). With most new releases there will be flaws/bugs, and some bugs have been encountered in the development process. These can sometimes be very time consuming, but due to communities like Stack Overflow<sup>2</sup> it has been possible to solve bugs to be able to proceed with programming. This finally led to a result that did the job of putting the content provided into a multimedia slideshow, though with its limitations.

Making MSM was less of a technical challenge than the mobile app but focused more on usability. Still, there were challenges as mentioned, with conflicting libraries, and time constraints leading to usability being prioritised over adding more functionalities that are seen in similar applications.

Nevertheless, the system does its intended job, where a caregiver can upload media content and it will be displayed as a multimedia slideshow on the mobile app.

## **6.7 Important technical limitations**

Currently, the platform has technical limitations on the web app, backend, and the mobile app. One limitation that did not appear during user testing, is that a user cannot delete media when it is uploaded. The user can upload a song or video and it will replace the currently uploaded

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<sup>2</sup> <https://stackoverflow.com/>



content, but this is not intuitive. The user is not able to replace or delete images.

The backend does not compress any of the uploaded media, which is required at least for images since there is a limit to how big the images can be when precaching them in the mobile app.

The mobile app does not account for different aspect ratios on images in an optimized way. Currently, the app works best for images in landscape format.

Last but not least, the web app does not let a user send the multimedia slideshow to another account, which is needed to let a caregiver send multimedia slideshows to an account belonging to a person with dementia. This functionality was not needed for testing MSM's usability and was left to be a part of future work.

## **6.8 Strengths and limitations compared to similar tools**

As mentioned in the previous section, there are technical limitations that have to be solved before it can be integrated as a part of Alight. In this section, I will describe how MSM compares to Animoto, Magisto and ASV.

Table 6.1 lists the most important technical features and functionalities found in all applications. It is important to note that most of these features and functionalities are based on my observations and tests of the user interfaces, with little insight into what happens in the backend.

**Table 6.1: Features and functionality of MSM and similar tools**

	<b>MSM</b>	<b>Animoto</b>	<b>Magisto</b>	<b>ASV</b>
Multiple Images	✓	✓	✓	✓
Multiple videos	X	✓	✓	✓
Multiple songs	X	X	X	X
Image rearrangement	✓	✓	✓	✓
Ken Burns effect	✓	✓	✓	✓
Multiple transitions, filters and effects	X	✓	✓	✓
Automatic display time of images	✓	X	✓	X
Multiple images can be uploaded in a single action	✓	✓	✓	X
Exports video file	X	✓	✓	✓
Undo/delete media	X	✓	✓	✓
Image cropping	X	✓	X	✓
Video trimming	X	✓	X	✓
Defining aspect ratio	X	✓	✓	✓
In-browser microphone recordings	X	✓	X	✓
Can add text to media	X	✓	X	✓
Music plays over video	X	✓	✓	✓
AI-based editing	X	✓	✓	X

What separates MSM most from the other applications is that MSM has a single purpose. MSM follows a predefined structure, defined by Alight AS, where it starts with displaying images while the song is playing, and when the song is finished, the video is displayed. The videos that are added, can be greetings from the caregiver, explanations of exercises, musical presentations and other. Because of this, the music must stop playing when the video starts. In all the other applications, music will play over the video, which does not fit the use-case of MSM.

Magisto is what I will consider the closest application to MSM. It leaves most of the editing to the system itself and gives the users a minimal amount of editing features. Though it can be interesting for experienced users to have more editing capabilities, like those seen in Animoto and ASV, it will be important to still keep MSM as easy to use for the inexperienced user.

## **6.9 Comparison with the Mobile Multimedia Reminiscence Therapy Application**

The app proposed by Imtiaz et al. (2018) shows similarities in technical application, research and purpose. The authors researched dementia, reminiscence - and music therapy. They give a detailed explanation of a developed application where a caregiver can make a multimedia show from images, music and videos. The biggest difference from MSM is that they have a single mobile application for both the caregiver and the person suffering from dementia. This means that the phone/tablet running the application must be shared by a caretaker and the patient, and all media content must be available on the device itself. In most cases the application will likely be used by a patient together with a caregiver, depending on the severity of dementia. Having it as a single application may present limitations to how responsibility can be shared between caregivers. In my opinion, the part of the application involving presentation of the multimedia show, should be easily shared between caregivers. Let's say a health worker puts together a multimedia show for a patient living at home. If one caregiver could send the multimedia show over the Internet to another account, any caregiver; friend, family, health worker can view the presentation together with the person with dementia.

## 7 Conclusion

This thesis has covered the design and development of a system that facilitates a potential caregiver to make multimedia slideshows for a patient with dementia. The primary focus has been to evaluate the usability of the Multimedia Slideshow Maker (MSM). The preliminary design and development process has been guided through the use of Heuristic Evaluation and iterative development. User tests were carried out, where techniques such as thinking aloud, field observation and interviews were applied. The results indicated room for improvement in learnability, efficiency, memorability, error rate, and satisfaction, where solutions to each problem were discussed. Participants were to a large extent able to use MSM without instructions from others, where MSM enabled them to create a multimedia slideshow without requiring experience in video editing. The sample size, however, might not account for all differences in abilities among caregivers. The comparison with Magisto, Animoto, and ASV showed both strengths and limitations of MSM. MSM can benefit from incorporating some of their editing features, but without adding too much complexity, which can affect its usability in terms of efficiency and learnability for an inexperienced user. With MSM leaving close to all editing to be done by the system itself, it likely eliminates the need for video editing skills. It was also argued that MSM can hold an advantage over the proposed application by Imtiaz et al. (2018) in terms of accessibility for both caregivers and patients.

## **8 Future work**

There are potential solutions to usability problems that should be implemented in the design. Along with usability problems, there is a need for optimizing the system to account for images of different aspect ratios, limitations to the number of possible images to be added, and compression of media, optimized for a mobile phone. functionalities such as deletion and replacement of uploaded media should be added. More editing capabilities can be implemented, but without making it difficult to use by an inexperienced user.

The thesis examined how music and reminiscence therapy can be used to improve the quality of life for patients with dementia. There is still a need for more research into the effects of these forms of therapy delivered through a mobile app, on both the patient and the caregiver. The user interface of the mobile app has yet to be designed in terms of usability and accessibility for people with dementia. A similar process of iterative design and user testing can be performed, leading to an app that can be evaluated in terms of therapeutic effectiveness and usability.

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# Appendices

## Appendix A – Webform, original (Norwegian)

05/06/2020

Brukertest av verktøyet "Multimedia Slideshow Maker" – Rapport - Nettskjema

### Rapport fra «Brukertest av verktøyet "Multimedia Slideshow Maker"»

Innhentede svar pr. 5. juni 2020 09:55

- Leverte svar: **8**
- Påbegynte svar: **0**
- Antall invitasjoner sendt: **0**

#### Med fritekstsvar

Jeg er en student ved NTNU i Trondheim som i forbindelse med min masteroppgave ved "Music, Communication and Technology" utvikler en web/mobil-løsning for et eksternt selskap, Alight AS. Web/mobil-løsningen omfatter en webapplikasjon (nettside) hvor du kan laste opp bilder, musikk og video, og en mobilapplikasjon som automatisk setter dette sammen til det jeg velger å kalle et "multimedia slideshow" (NO: Multimedia presentasjon).

Løsningen er en del av et større prosjekt, Alight, som har som mål å utvikle en teknologisk plattform rettet mot å hjelpe personer med mild til moderat demens eller kognitiv svikt, basert på prinsipper fra musikkterapi og reminisenssterapi.

Med denne undersøkelsen ønsker jeg å teste brukervennligheten til min utviklede webapplikasjon. Målet med dette er å finne svakheter og styrker i funksjonalitet og design, slik at dette kan forbedres i en fremtidig versjon.

#### Konfidensialitet

I undersøkelsen vil jeg ikke spør om personlig identifiserbare opplysninger. All data som samles inn vil være anonyme, og data vil lagres i maksimalt 6 mnd.

#### Foreberedelser

Før du kan svare på dette nettskjemaet, må du ha gått gjennom en avtalt videosamtale med meg, hvor du har utført brukertest av webapplikasjonen. Du har også mottatt en epost fra meg (varpe1992@gmail.com). Denne eposten inneholder ditt ID-nummer, som du skal skrive inn i første spørsmål.

#### Spørsmål knyttet til din opplevelse av brukervennligheten til webapplikasjonen

Takk for at du har tatt deg tid til å brukerteste min webapplikasjon, og for at du tar deg tid til å svare på dette nettskjema!

Hvor lang tid det tar å svare, avhenger av hvor mange kommentarer du har til hvert spørsmål. Jeg setter stor pris på alle kommentarer du måtte ha, uansett hvor kritiserende de måtte være, så ikke vær snill!

#### Hva er ditt ID-nummer? \*

Dette finner du i en tilsendt epost fra meg (varpe1992@gmail.com)

- 6
- 3
- 7
- 8
- 4
- 5
- 1
- 2

#### Rangering av din kompetanse innen bruk av teknologi

Fra 0: Ingen erfaring  
Til 5: Mye erfaring

Forskjell på nettside og webapplikasjon er at i en webapplikasjon må du typisk logge inn, og du har muligheten til å generere innhold selv (eks: Facebook). En nettside er statisk, og du kan dermed ikke endre innholdet (eks: vg.no)

#### Svar fordelt på antall

	0	1	2	3	4	5
Bruk av PC/MAC	0	0	1	0	2	5
Bruk av nettsider	0	0	0	0	2	6
Bruk av webapplikasjoner	1	0	0	2	3	2
Bruk av videoedigeringsverktøy (Adobe Premiere, Apple Final Cut el.)	4	2	0	0	1	1

<https://nettskjema.no/user/form/submission/report.html?id=146780>

1/3

**Svar fordelt på prosent**

	0	1	2	3	4	5
Bruk av PC/MAC	0 %	0 %	12,5 %	0 %	25 %	62,5 %
Bruk av nettsider	0 %	0 %	0 %	0 %	25 %	75 %
Bruk av webapplikasjoner	12,5 %	0 %	0 %	25 %	37,5 %	25 %
Bruk av videoredigeringsverktøy (Adobe Premiere, Apple Final Cut el.)	50 %	25 %	0 %	0 %	12,5 %	12,5 %

**Var webapplikasjonen lett å lære?**

Var det enkelt å komme i gang?

- Ja som erfaren databruker det var enkelt. Litt vanskelig å forstå hva man skulle helt i starten. Noen steder kan enkle labler gjøre det enklere å forstå hva man skal eller hva som skjer på skjermen. F.eks ved plusstegnet i starten eller underveis i produksjon av slideshow
- Usikker på om eg skulle starte med å trykke på krysset.
- Ja
- Applikasjonen var i stor grad intuitiv. Enkelheten bidro til å veilede gjennom prosessen.
- Ja!
- å forstå at eg skulle trykke på pluss teknet for å starte var ikkje helt innlysande
- Ja, ganske rett frem
- ja, men eg klarte å gå forbi et steg uten å hvit kvifor. Var usikker på kvar eg skulle klikke for å dra bilder mv. inn i boksen.

**Hvordan opplevde du effektiviteten?**

Opplever du at du enkelt kan lage til flere multimedia presentasjoner, ved å gjenta prosessen?

- Kan enkelt lage flere presentasjoner, men vet ikke helt hvor de blir lagret. Trenger funksjonalitet for å se tidligere slideshows og sånt.
- Ja
- Ja
- Det gikk fort å lage et slideshow.
- Ja!
- jada
- Ja
- ja, kunne lett laga ein ny!

**Opplevde du at feil oppstod under brukertesten?**

Dette for eksempel være om siden lukket seg, låste seg, eller noe annet som virket galt.

- Nei.
- Nei
- Nei
- Feilfri opplevelse.
- Nei.
- nei
- Nei
- Nei, men hadde for få teikn når eg laga passord.

**Hvor tilfredsstillende var opplevelsen av bruken?**

- Jeg likte at det gikk fort og var en kort prosess. Selve prosessen når man lagde slideshowet kunne vært mer oversiktlig. Både mer instruksjon og progresjon kunne vært bedre.
- God
- Svært
- Manglende smilefjes. 7/10.
- Eg blei ikkje irritert, så tilfredsstillende var god!
- enkel
- Ganske tilfredsstillende.
- Var lett og raskt å lage presentasjonen.

**Har du kommentarer til design?**

Farger, kontrast, knapper, tekst, visning av opplastet materiale etc.

- Ønsker mer labels, eller piler eller containers for å gjøre appen mer behagelig og intuitiv. Nyttig funksjonalitet, men bør sendes inn til en grafisk designer.
- Kunne tenke meg at bilder vart vist i større format.
- 1) - Ved innglogging bør eksempelteksten forsvinne i det pekeren plasseres i feltet. 2) - Alle funksjonsknapper, som f.eks. "NESTE" kan være tydeligere. 3) - Forklarende tekster/tips, etc. kan i en del tilfeller plasseres i drag&drop feltet. 4) - Ved endring av rekkefølge på bilder/thumbnails i Firefox kommer det opp et stort transparent bilde som er forstyrrende. 5) - Visuell design kan forbedres.
- Kunne vært bedre kontrast på noen av knappene. Manglende mulighet til å se bilder i stort format. Tittel på første side kunne vært sentrert. Litt ekstreme farger.
- Vinduet der ein legger til video/film/bilder kan gjerne vere nokon hakk større. Uklart kva funksjon den kvite linja under "lag slide show" knappen har før den kjem til bruk. Kanskje løysinga kan vere å plassere den ein annan stad på sida.
- Når eg var ferdig med samansetninga av bilder musikk og video saknar eg ein ferdig knapp til høgre.
- Kunne vert større eksempelbilder
- Eg forventet å trykke på ein knapp for å få opp dialogboks med filene. Dette kan vere ulik frå brukar til brukar. Min kommentar er basert på min erfaring og bruk av ikt.

**Har du andre kommentarer knyttet til brukervennlighet?**

- Gøy å bruke

05/06/2020

#### Brukertest av verktøyet "Multimedia Slideshow Maker" – Rapport - Nettskjema

- Opplevde at opplastingsvinduet åpner seg når jeg skulle klikke og dra bilder for å endre rekkefølge. Skulle ønske jeg kunne høre lyden medan jeg la til bildene.
- Applikasjonen kan utvikles slik at du kan skille mellom flere brukernivåer; f.eks. en basic versjon for de som har ingen eller svært lite erfaring med applikasjoner og en som er mer avansert, med flere redigeringsfunksjoner.
- Kunne godt ha hatt navigasjon gjennom side ikonene.
- Ingenting å utsette.
- Kunne vore fint å kunne ha ein tekstboks å skrive i til td bildene
- Nei
- Nei,

#### Har du noen kommentarer til gjennomføringen av brukertest?

- Litt stress å laste ned app og registrere bruker og laste ned filer til pcen. Litt vanskelig med guiding over samtale.
- Har fått litt meir kompetanse i datahandtering ved gjennomføring av testen. Opplevde at brukertesten gikk fint.
- Veldig greit.
- Hadde brukertest over videochat med delt skjerm. Det gikk veldig greit å gjennomføre brukertest på denne måten.
- Veldig fin gjennomføring i frå eit smittevernsperspektiv. Tryggande at ein ikkje lagrar personopplysingar. Veldig god gjennomføring der utviklar kommuniserer med meg over video samstundes som eg gjennomfører prosessen. Alt i alt ein veldig kjekk opplevelse!
- Gikk greit . Fint å gå gjennom saman.
- Nei
- Nei, god veiledning gjennom testen. Men kan vere avhengig av kompetanse til den som skal teste.

Se nylige endringer i Nettskjema (v1023\_0rc1)

## Appendix B – Webform, English translation

05/06/2020

User test of the tool «Multimedia Slideshow Maker»

[Type here]

### **Report from «User test of the tool «Multimedia Slideshow Maker»»**

#### **Replies obtained per June 5, 2020 9:55 AM**

- Answers delivered: 8
- Replies started: 0
- Number of invitations sent: 0

#### **With free text answers**

I am a student at NTNU in Trondheim who, in connection with my master's thesis at "Music, Communication and Technology", develops a web / mobile solution for an external company, Alight AS. The web / mobile solution includes a web application (website) where you can upload photos, music and video, and a mobile application that automatically puts this together into what I choose to call a "multimedia slideshow" (NO: Multimedia presentation).

The solution is part of a larger project, Alight, which aims to develop a technological platform aimed at helping people with mild to moderate dementia or cognitive failure, based on principles of music therapy and reminiscence therapy.

With this survey I want to test the ease of use of my developed web application. The goal of this is to find weaknesses and strengths in functionality and design so that this can be improved in a future version

#### **Confidentiality**

In the survey I will not ask for personally identifiable information. All data collected will be anonymous and data will be stored for a maximum of 6 months.

#### **Preparations**

Before you can respond to this web form, you must have gone through an agreed video call with me, where you have conducted user testing of the web application. You have also received an email from me ([varpe1992@gmail.com](mailto:varpe1992@gmail.com)). This email contains your ID number, which you will write into the first question.

#### **Questions related to your experience of usability of the web application**

Thank you for taking the time to user test my web application and for taking the time to respond to this web form! How long it takes to answer depends on how many comments you have on each question. I really appreciate any comments you may have, no matter how critical they may be, so please don't be nice!

#### **What is your ID number? \***

You can find this in an email from me ([varpe1992@gmail.com](mailto:varpe1992@gmail.com))

- 6
- 3
- 7

/ tips, etc. can in some cases be placed in the drag & drop field. 4) - When changing the order of images / thumbnails in Firefox, a large transparent image appears which is disruptive. 5) - Visual design can be improved.

- Could have been better contrast on some of the buttons. Missing option to view large format images. Title on the first page could have been centred. Slightly extreme colours.
- The window where you add video / movie / pictures could preferably be some notches bigger. It is unclear what function the white line under the "make slideshow" button has before it comes to use. Maybe the solution may be to place it in another place on the site.
- When I finished the mix of pictures music and video, I miss a finished button to the right.
- Could have been larger example images
- I expect to press a button to open a dialog box with the files. This can be different from user to user. My comment is based on my experience and use of ICT.

#### **Do you have other comments on the usability?**

- Fun to use
- Experienced that upload window opened when I had to click and drag pictures to change order. Wish I could hear the song while I added the pictures.
- The application can be developed so that you can distinguish between several user levels; e.g. a basic version for those who have no or very little experience with applications and one that is more advanced, with more editing features.
- Could well have had navigation through the page icons.
- No
- It would be nice to be able to have a text box to write on for example the pictures
- No
- No

#### **Do you have any comments to the user test process?**

- A bit of a hassle to download app and register user and download files to pc. A bit tricky with guiding over conversation.
- Have gained a little more expertise in data management when conducting the test. Experienced that the user test went well.
- Very fine.
- Had user test over video chat with shared screen. It was very easy to perform user tests in this way.
- Very nice implementation from an infection prevention perspective. Ensuring that one does not store personal information. Very good process where the developer communicates with me over video as I complete the process. All in all, a very nice experience!
- Went okay. Nice to go through together.
- No
- No, good guidance through the test. But may depend on the competence of the person to test.

05/06/2020

User test of the tool «Multimedia Slideshow Maker»

[Type here]

- 8
- 4
- 5
- 1
- 2

### Ranking of your expertise in the use of technology

From 0: No experience

To 5: A lot of experience

The difference between a website and a web application is that in a web application you typically have to sign in and you have the ability to generate content yourself (ex: Facebook). A webpage is static, so you can't change its content (ex: vg.no)

### Answers by number

	0	1	2	3	4	5
Use of PC/MAC	0	0	1	0	2	5
Use of websites	0	0	0	0	2	6
Use of web applications	1	0	0	2	3	2
Use of video editing software (Adobe Premier, Apple Final Cut etc.)	4	2	0	0	1	1

### Answers by percent

	0	1	2	3	4	5
Use of PC/MAC	0%	0%	12.5%	0%	25%	62.5%
Use of websites	0%	0%	0%	0%	25%	75%
Use of web applications	12.5%	0%	0%	25%	37.5%	25%
Use of video editing software (Adobe Premier, Apple Final Cut etc.)	50%	25%	0%	0%	12.5%	12.5%

### Was the application easy to learn?

Was it easy to get started?

- Yes, as an experienced computer user it was easy. A little difficult to understand what to do at the very beginning. In some places, simple labels can make it easier to understand what one is to do or what happens on the screen. For example, at the plus sign in the beginning or during the production of slideshows.
- Not sure if I should start by pressing the cross.
- Yes
- The application was largely intuitive. The simplicity helped guide the process.
- Yes!
- To understand that I had to press the plus sign to start was not completely obvious
- Yes, pretty straight forward
- yes, but I managed to go past a step without knowing why. Was unsure of where to click to drag pictures, etc. into the box.

**How did you experience the efficiency?**

Do you experience that you can easily make several multimedia presentations by repeating the process?

- Can easily make several presentations, but not sure where they are stored. Need functionality to see previously made slideshows and such.
- Yes
- Yes
- Making a slideshow went fast
- Yes
- Yes
- Yes
- Yes, could easily have made a new

**Did you experience errors during user testing?**

This can for example be if the page closed itself, locked itself, or something else that seemed wrong.

- No
- No
- No
- Fault free experience
- No
- No
- No
- No, but I had too few characters when making a password

**How satisfying was the experience of use?**

- I liked that it went fast and was a short process. The process itself when creating the slideshow could have been more straightforward. Both more instruction and progression could have been better.
- Good
- Very
- Missing smiley face. 7/10.
- I was not annoyed, so the satisfaction was good!
- Simple
- Quite satisfying.
- Was easy and quick to make the presentation

**Do you have comments to the design?**

Colours, contrasts, buttons, preview of uploaded material etc.

- Want more labels, or arrows or containers to make the app more comfortable and intuitive. Useful functionality but should be submitted to a graphic designer.
- Wish that pictures were shown in larger format.
- 1) - When logging in, the example text should disappear as the pointer is placed in the field. 2) - All function buttons, such as "NEXT" may be clearer. 3) - Explanatory texts