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**Identifying and overcoming Organizational
Barriers regarding Universal Design of ICT:
A case study of DNB**

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Preface

The first thing the author of this paper learned while studying ICT is that textbooks are a thing of the past. Due to the fast pace and everchanging life of technology, only a very limited amount of material printed on a piece of paper would be relevant by the time it reaches the bookshelves of a store. Throughout the author's studies, the author only bought two physical books, and only one was found to be impactful, namely "The Design of Everyday Things" by Donald A. Norman. Just as the internationally renowned organization Rehabilitation International once was named International Society for the Welfare of Cripples, the context and views change over time. As Norway is at the forefront of digitalizing services ("Digital Planet 2017 Report," 2017), it is our duty as creators of these systems, to ensure equal participation and accessibility for all. This is the motivation for this thesis. This thesis is intended to give a clear and comprehensive introduction to the master thesis and previous related work. By following the recommended guidelines (Gjester & Habib, 2017), using up to date resources and consulting with my master thesis supervisor, Evelyn Eika, the author aims to produce a thesis with both high internal and external value. By following the "Research Ethics" standard of OsloMet – Oslo metropolitan University (Jacobsen, 2018), in turn, the author also aims to produce a thesis with a solid ethical foundation.

At last the author would like to share his gratitude and appreciation to the following individuals; Laurence Habib, head of Institute of IT at OsloMet – Oslo Metropolitan University, for opening many doors to her students and always having hers open. George Anthony Giannoumis, lecture and role model at OsloMet, for being a dependable source of inspiration and admiration. Evelyn Eika, lecture and researcher at OsloMet, for providing positive reinforcement and support as the supervisor for this thesis. Lastly, the author would like to thank Miriam Begnum, lecturer, and researcher at NTNU, for laying the groundwork for this research and for being approachable and helpful.

Abstract

From June 2014, it has been a legal requirement in Norway to adhere to the Web Accessibility Guidelines 2.0 to ensure that the technologic environment is accessible to all. The law states that new solutions should adhere to these guidelines when released and that already existing solutions need to comply with the guidelines within the year 2021. The Agency of Public Management and eGovernment (DIFI) has announced which sectors that it will focus on during audits, where the banking and finance is a part of their focus area, see [2.2. Legislative background](#) for more. The banking and finance sector have also been proven to be the sector which adheres to the WCAG standard to the lowest degree. Combine this with the fact that the number of physical banks and access areas has been reduced by 50% during the last ten years, and it will become evident that the need for universally design ICT solutions is immense (“Antall ekspedisjonssteder,” 2018.).

In this study, the author will explore the existing boundaries for the successful implementation of universal design (UD) and what can be done to ensure that all users get an accessible and user-friendly banking experience. In this regard, the author has successfully contacted DNB, Norway’s most prominent banking institution, to explore which issues they are facing regarding UD. Research regarding obstructing and promoting factors of successful implementation of UD is the basis for this research which one can read more about in chapter [2.3 Impacting factors](#). This, in turn, leads to this thesis research questions, “What factors have played a central role in DNB being able to produce inaccessible web content... and what can be done to ensure more accessible solutions in the future?”. See chapter [3.2. Research question](#) for more. By using a qualitative method of investigating and evaluating tools and processes, interviewing developers, testers and decision makers the aim of this master thesis is to contribute to a more user-friendly banking experience through improving UD processes and procedures, see [3. Methodology](#) for more. The most significant discoveries are that there exist issues related to QA processes, risk evaluations leading to no top-down focus, lacking awareness, and lacking competence. As the author has been hired part-time during the research period, some of the research was conducted at DNB’s offices. Hence there are some ethical questions which have is elaborated to in chapter [5. Discussion](#). In chapter [8.3 Risk matrix](#) issues and identified risks is presented. A detailed project plan will be found in chapter [8.2 Detailed project plan](#).

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1. Introduction

Universal design has various definitions depending on context and culture. For the purpose of this thesis, the author will base his research on the following definition of universal design; “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (Mace, 1997). As universal design of ICT has become law in Norway, through the anti-discrimination act (“Diskriminerings- og tilgjengelighetsloven - Lovdata,” 2013.), businesses face new challenges to meet the demands set by the government. The Agency of Public Management and eGovernment (DIFI), which is responsible for enforcing named regulation/law, has announced several types of businesses they plan to pay particular attention to. Their statement focuses on social and economic participation in everyday life, such as public services, bank and finance, transport and travel, and media (“Prioriterte område | Universell utforming,” 2015). Not upholding this law might result in fines and damaged reputation through publicly available status reports.

DNB has stated to be the bank from A to Z (A til Å). As Norway's most prominent banking institution, DNB must stand out to encourage other businesses to follow the new regulations. In DNB's yearly report, they stated that they identify as a “Technology company with a banking license” (“Technology company with a banking license – DNB,” 2016). As a self-identified tech company, DNB should follow industry standards and best practices. DNB has an enormous chance to step ahead of the competition to offer seamless and user-friendly products where the competition falls flat. Thanks to a web crawler, a tool for systematically browse and gather metadata from websites, we can tell that DNB has hundreds of publicly available websites that need improvement with regards to the new regulations. As of 12th of May 2019, there are 600 working days until all preexisting services offered to customers has to be compliant with WCAG 2.0. The author of this thesis has had a unique chance to be a part of a universal design initiative at DNB and have been granted access to crucial personnel and documentation. This thesis will have DNB as a case-study to dive deeper into the recommended approaches and factors that impact universal design of ICT. The following research question has thus been formulated “What factors have played a central role in DNB being able to produce inaccessible web content... and what can be done to ensure more accessible solutions in the future?”. The purpose of this thesis is thus to

highlight identified obstructing factors present at DNB and present a recommended future approach.

2. Literature review

To uncover new aspects of universal design and help bring the field of study forward one needs to have a deep and comprehensive understanding of previous research within the field. This section examines previous studies that have made an impact on the field.

Subchapter [2.1 Universal design of ICT](#) gives a brief view of the concept and background of universal design, as this is essential to understanding the future work and aspects concerning to universal design. Said subchapter also highlights how accessibility has evolved during our evermore digitalized society. Subchapter [2.2 Legislative background for accessibility law and regulation](#) explores the legislative background for accessibility law within and outside of Europe and aims to give a better understanding of the legal regulations Norwegian business must adhere to. Section [2.3 Impacting factors](#) presents the research conducted within best practices regarding the implementation of Universal Design as well as the relevant business case.

2.1 Universal design of ICT

The Civil Rights Act (Civil Rights Act of 1964, 1964) set the ground for the future work of persons with disabilities in America, as the first of its kind. Realizing that one cannot discriminate based on the color of skin, race or gender, but still legally can discriminate towards persons with disabilities, people acted. As the psychologist, Peter Blanck from Syracuse University put it “The equal chance to participate in society is as old as notions of civil rights, and it is as current as today’s deliberations in the U.S. on racial and gender equality and affirmative action.” (Blanck, 2014). In the late 80’s the work towards what is today known as ADA started (Americans With Disabilities Act of 1990, 1990). The immediate actions taken in connection to late George H.W Bush signing of the Disabilities Act of 1990 was mainly aimed towards architecture and environments to be accessible. Ronald Mace from the University of North Carolina was the first person to coin the term universal design (HumanCenteredDesign.com, n.d) in the late 1980s. Helped by the ADA movement, the term was popularized and set as a legal requirement to public spaces (“History of UD | Centre for Excellence in Universal Design,” n.d). With a background in architecture and product design, he moved the concept of a product or solution to be barrier-free one step further. As everyday interactions today shift more towards digitalized solutions, the concept of universal design today apply to ICT just as much as our physical environment. In essence,

Mace believed that a solution could be barrier-free without being universally designed, but a solution that is universally designed is inherently barrier-free. The definition of universal design has been formulated in various ways. However, the most common definition used is the one formulated by Ron Mace, “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (Mace, 1997). This concept has been boiled down to 7 principles, commonly known as the seven principles of universal design (“NC State University - Universal Design Principles,” 1997):

1. **Equitable Use**
2. **Flexibility in Use**
3. **Simple and intuitive use**
4. **Perceptible information**
5. **Tolerance for error**
6. **Low physical effort**
7. **Size and space for approach and use.**

How we define disability is in this context equally relevant. Nordic European countries tend to lean towards a mixed or “gap model” of disability where one sees the goal to both lower the demands set by the solution/product and increase the abilities of the user. Under this model, disability is defined as the gap between the user’s ability and the expectations set by the solution/product (Sosialdepartementet, 2003). The national interpretation of disability

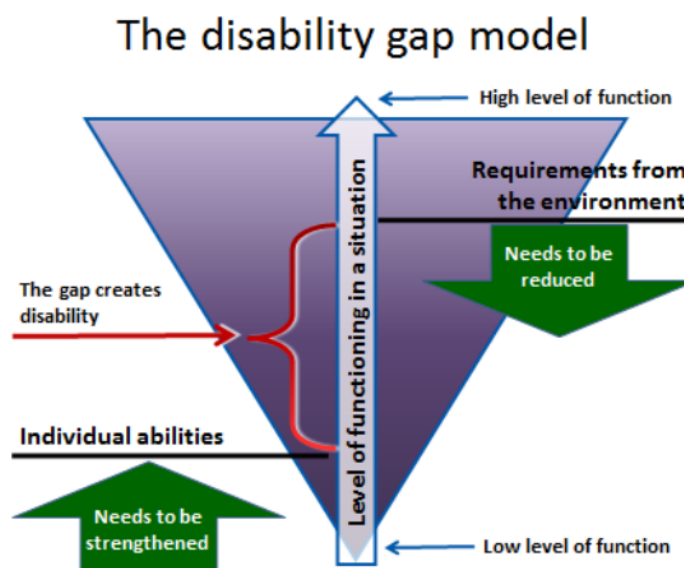


Figure 2.1 The disability gap model, based on the white paper on Dismantling of Disability Barriers (“Summary of White paper no. 40 (2002–2003),” 2003)

and universal design is central when one is to initiate research within this field of study. The disability gap model is presented below to give a better visual understanding of the concept.

In other countries where one follows a medical or social model of disability, the trend is to lean more towards terms like “Inclusive design” or “Design for all” (Persson, Åhman, Yngling, & Gulliksen, 2015). This understanding of disability is central to understanding the legislative process, which is the next sub-chapter, with regards to universal design of ICT.

2.2 Legislative background for accessibility law and regulation

On par with the right to education and free speech, there is freedom of information. The United Nations state the right as the following; “Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice.” (“OHCHR | International Covenant on Civil and Political Rights,” 1966, Article 19, § 2). Each country has the responsibility to put these rights into action, and in 2013, as society leaned more and more towards technological solutions for everyday life participation, the Norwegian government took steps to ensure that equal public access to ICT solutions through implementing the “regulation on universal design of ICT solutions.” This regulation is anchored in the anti-discrimination act of 2017 (“diskriminerings- og tilgjengelighetsloven - Lovdata,” 2013.) which again is anchored in the Convention on the Rights of Persons with Disabilities of 2006 (“Convention on the Rights of Persons with Disabilities (CRPD) | United Nations Enable,” 2006). Prior to the implementation of the regulation on universal design of ICT solutions, the Norwegian government had issued many reports such as the “Cost-benefit analysis” by Standard Norge in 2010 (“Reisekjeden - universell utforming for reisende,” 2010) that looked at the cost and benefits of making universal design a lawful requirement, Action Plan of Norway universally designed by 2025 (*Norway Universally Designed by 2025*, 2009) a strategic document on how Norway can become universally designed within 2025, and Dismantling of disability barriers (Sosialdepartementet, 2003) which looks into what approach is most beneficial when dismantling disability barriers. In the Action plan of Norway Universally designed we can find the essence of the government’s goal; “The government’s main goal for its ICT policy in general is to have an information society that is for everyone... The fact that large parts of society use digital solutions means that the consequences of being excluded are

greater, and this particularly applies to the elderly and people with disabilities.” (Norway *Universally Designed by 2025*, 2009). The regulation on universal design of ICT states that all web pages, apps, and any other publicly available services that are relying on an internet connection to work, are to be universally designed according to W3C’s standard named WCAG 2.0. A few of the guideline points were removed in the national requirement of the WCAG standard. In the cost-benefit analysis done by Standard Norge, it was estimated that implementing universal design as a legal requirement would cost 741 million NOK with a running 64 million NOK a year for maintenance (“Standard Norge - Impact assessment of ICT and universal design,” 2010). However, the value of enabling a large part of the population and limiting the cost of personalized assistive solutions for individuals with impairments proved to be greater than the cost (“Standard Norge - Impact assessment of ICT and universal design,” 2010). In turn, we can establish that on a national level, implementing universal design of ICT as a legal requirement is benefitting society as a whole, not just differently abled individuals. All improvements to existing products and solutions made publicly available pre-2014 are to be implemented within the year 2021, while new products made publicly available post-2014 are to be universally designed from the released date (Ministry of Government Administration, 2013). In “Regulating web content: the nexus of legislation and performance standards in the United Kingdom and Norway” Anthony G. Giannoumis state that a legislative universal design approach, as currently implemented in Norway, benefits the society and promotes the work towards universally designed solutions (Giannoumis, 2014). Further support of this is found by interviews conducted by Begnum where 9 out of 13 universal design experts pointed out that the current legislative scheme is considered a promoting factor for business (Harder & Begnum, 2016). In chapter [5](#). [Discussion](#), further exploration, and limitations of this aspect are presented.

2.3 Impacting factors

A common conception of developers is that accessibility is something that is done to the extent demanded by their users, “Too often, web accessibility is not perceived as central to software engineering, and the user community must remind, beg, and threaten developers to make software accessible.” (Gajos, Hurst, & Findlater, 2012). This perception of accessibility seems counterproductive, and it could be argued that developers should proactively accommodate accessible solutions as this has become a legal requirement.

Another research paper pinpointed the essence of the issue, “To build applications and content that allows for heterogeneity, flexibility, and device independence is incredibly difficult, incredibly challenging, and incredibly necessary.» (Harper & Yesilada, 2008). There is researched on what one could be considered the best practices when it comes to implementing universal design. Best practices in regards to implementing universal design of ICT could in this context be perceived as the most productive and qualitative approaches based on previous projects experiences. With an exploratory and qualitative approach, Begnum uncovered obstructive and promoting factors of universal design implementation in businesses. The research was conducted using semi-structured in-depth interviews with 13 designers and developers spread among 12 successful UD projects (Harder & Begnum, 2016). It might seem that Begnum’s work lacks some validation of the data as it seems not to use multiple research methods. This limitation, however, could be overlooked as her combined works within the last two years complement each other and, in some way, validate each other by using different research methods. As this research has been conducted within Norway and the designers and developers have firsthand experience with successful UD projects, it is beneficial to dive deeper into Begnum's findings and other related works. By finding relevant research that has investigated the same factors, the aim is to gain a more grounded basis to analyze data collected in this research. The following chapters of [2.3.1 Organizational level factors](#), [2.3.2 Process level factors](#) and [2.3.3 Individual-level factors](#) highlight Begnum's findings and put other research into perspective. The chapters are sorted after Begnum's categorizations, where the number of UD experts that agree with a factor being impactful is highlighted in parenthesis.

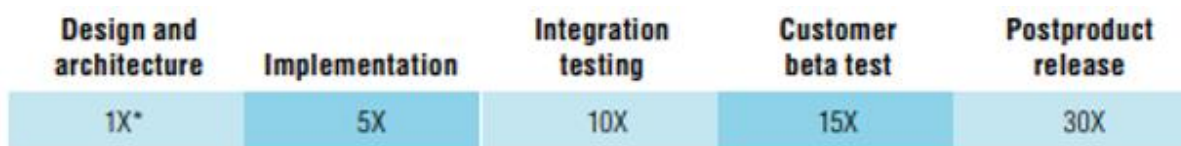
2.3.1 Organizational level factors

Through the experts interviewed, Begnum identified five different promoting factors that impacted the probability of a project to successfully implement UD, where four of them were mentioned by more than two-thirds of the experts. Underneath the categories with a more than two-thirds agreement is listed and explained in further details in order of informants that mentioned the factors. These organizational factors can mainly be addressed by higher “ranking” employees and decision-makers but will impact the organization from top to bottom. As shown below, resources and anchoring within a

company are considered the most critical organizational factors, and these in, particular, has to be addressed by decision makers.

Resources (11 of 13):

Not allocating enough resources to implement UD from the first initial development stages will only lead to higher costs, as the illustration by IBM beneath shows (“Minimizing code defects to improve software quality and lower development costs. - PDF,” 2008.). Not finding an error before testing might result in ten times the cost compared to implementing it from the design and architecture phase. Research has concluded that “... adding accessibility features earlier in development is easier and less expensive than retrofitting existing interfaces, evaluation should take place from the beginning of the design process.” (Lazar, Goldstein, & Taylor, 2015).



*X is a normalized unit of cost and can be expressed in terms of person-hours, dollars, etc.

Figure 2.2: IBM cost analysis of finding errors in later software phases (“Minimizing code defects to improve software quality and lower development costs. - PDF,” 2008.)

The description of resource factors by the participants in Begnum’s thesis proposes is available assistive technologies (for testing), human resources with competence of UD and economic resources. Blanck’s book eQuality points to the same factors; “Effective training, resources, and tools for developers are needed to effectively address this issue” (Blanck, 2014). Putting more focus on tools, training, and new processes however is costly, and budgets need to be adjusted to accommodate this additional workload.

Anchoring (10 of 13):

The anchoring factors mentioned by the participating experts in Begnum’s study are understanding, awareness and competence at all management levels, Internalized UD culture, UD strategy, and usability strategy. There is currently also a concerning issue with regards to understanding and interpretation of what work universal design actually entails (Begnum, 2016), i.e., understanding and UD strategy are needed. Microsoft’s CEO Satya Nadella recently stated during an interview that he has always been the one before he became the CEO, which internally championed accessibility work and realized something

important, “this cannot be a checkbox, this requires us to integrate into the mainstream. Universal design needs to be more culturally engraved in what we do.” (CNBC, 2018). What Nadella says again reflects that there must be a culture to go beyond what is set as formal recruitments. In the end, the goal should be accessible and user-friendly solutions, not only legal compliance.

Legislation (9 of 13):

In Norway, we are lucky enough to have universal design integrated into law, which experts in Begnum’s study view as a promoting factor. As stated by the participants of this study, legislation gives priority and feedback while it also gives support from the supervisory authority. However, as discussed in chapter [5.3 The role of national regulation in practice](#), there are some limitations to this promoting factor. Some of them concern the true motivation that such legislative enforcement gives businesses as well as the enforcement capabilities of the regulatory entity DIFI.

Top level focus (8 of 13):

As UD work requires the involvement of users from the different spectrum of disabilities there is a strong need for user-testing and an overall user-centered design approach (“ISO 9241-210:2010 - Ergonomics of human-system interaction -- Part 210: Human-centered design for interactive systems,” 2015). These methods can only be implemented if employees are given the mandate and resources to do this. The top-level focus factors mentioned by the participants of Begnum’s study are the following: that there exists a UX/UD-department, UD specialist group, ensuring UD competence, co-workers with disabilities and good-practice library.

[2.3.2 Process level factors](#)

Regarding process factors in Begnum’s study, there was six that stood out with four of them being mentioned more often by the participants. One can find an elaborated definition of the factors beneath. These factors can be viewed as initial indicators to which a project leader and other similar tiered employees should focus on to ensure UD of their projects.

UD focus (12 of 13):

It might seem obvious that one needs to have UD focus to implement universal design successfully. However, how this focus should be angled might not be as obvious. This focus

needs to be anchored within process documentation and internal policies (w3c_wai, 2019). The promoting UD focus factors are: early from needs analysis, throughout project process, requirement specification, costumer/resource priorities, in solution- and UI-design, cross groups; design for all, UD process maturity and agency collaboration.

User focus (12 of 13):

To believe that UD is only a checkbox one must tick is worrisome and counterproductive. A grounded user-centered approach and focus is central when talking about UD and has been broken down to the following factors: personification of users (user stories), early testing, frequent user feedback, frequent QA-inspections, test accessibility + usability, continuous low-cost formative testing, high-quality user testing with users who are differently abled, user needs to be prioritized and real user feedback.

Quality assurance (12 of 13):

Even though experts in Norway have a similar approach to UD as international experts (Begnum, 2017), there is no doubt that the approach to quality assurance could be more diverse. The promoting factors for quality assurance mentioned by the participants were: clear UD quality demands, test code, design and content, early code/unit quality check, milestone controls, automated validation, internal inspections (peer-inspections, basic needs, simple ATs, accessibility) and external expert inspections. In his book eQuality, Blanck, however, mentioned that "... even with attitude change through awareness, training, and a conceptual framework for web content equality, designers and developers must still build this capability into the software they engineer." (Blanck, 2014). The quality assurance process is thus crucial to ensure that every project is building accessible capabilities into their projects.

Cooperation (11 of 13):

Universal design is a complex field which includes aspects of usability, accessibility, color, shape, gestalt principles, information architecture, and logic among others. With such a complex variety of concepts interwoven into UD, it should come as no surprise that cooperation is mentioned by 11 of 13 participants in Begnum's study. The participants broke cooperation to the following central concepts and approaches: cross-disciplinary teams, interdisciplinary design, QA, discussions and user testing, established collaboration, roles and dialogue, co-location, and full team-member positions.

2.3.3 Individual-level factors

On an individual level, there were uncovered two factors that can impact the probability of universal design principles being successfully implemented in a project. Both factors were mentioned by almost all participants and have been broken down further below.

Personal qualities (13 of 13):

Working with the design of products and solutions that users are interacting with, it is hard to argue that some personal qualities are more lucrative than others. When elaborating on which personal qualities that were deemed necessary the response were: enthusiasm, empathy, innovative, and collaborative. We further find validity to these factors in the research paper “Effects of Personal Qualities and Team Processes on Willingness to Share Knowledge: An Empirical Study” (Cheng-Hua, Yuan-Duen, Wei-I, & Li-Ting, 2007) in which personal qualities like willingness to share knowledge is highlighted.

UD competence (11 of 13):

There are currently issues regarding the interpretation of universal design. The research paper “Views on universal design and disabilities among Norwegian experts” also by Begnum, concludes that a better and more unified interpretation of what it means to work with universal design of ICT is crucial (Begnum, 2016). Other researchers like Persson, Åhamn, Yngling, and Gulliksen also reference the unclear definition of such concepts as accessibility, universal design, and design for all (Persson et al., 2015). The definition of reliably humanly testable is achieved if an 80% agreement threshold among experts is achieved (“Requirements for WCAG 2.0 Checklists, Techniques, and Test Files,” 2005.). One study looked at the testability of WCAG 2.0 and found that 50% of the projects evaluated by 22 UD experts failed to meet the 80% threshold (Brajnik, Yesilada, & Harper, 2010). The authors went on to conclude that the definition of universal design is too vague. The issue of vague definition highlighted in this thesis corresponds to the factor brought forward by the participants of Begnum’s study, where a uniform understanding of universal design across groups is considered essential. Having an understanding that UD goes beyond disability as well as relevant education and experience is also mentioned by Begnum’s participants. One central action that can be taken to ensure an internal universal understanding of universal design, according to W3C, is to formulate an organizational web accessibility policy and an

accessibility statement. Implementing these actions would help the employees in big companies to be on the same page when talking about universal design.

3. Methodology

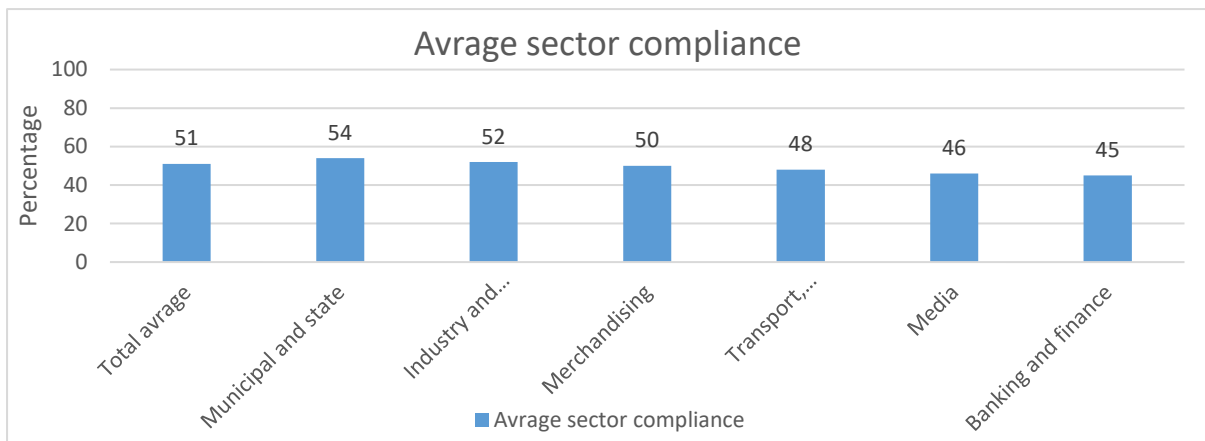
3.1 Problem statement

The author of this thesis holds a belief that all excellent research either helps solve a problem or unveil new aspects of an issue. In this sense, it helps to define a problem statement to give a clear logic to the study. The problem statement, in turn, justifies the applicability of the results that are presented in chapter [4. Results](#) and chapter [6. Conclusions](#). At the end of this chapter, one can find the problem statement that this thesis presents.

Norway is rated as one of the largest consumers of digitalized solutions (Moderniseringsdepartementet, 2017), and there is little doubt that the digital landscape needs to be accessible for all types of users. Many problems exist when talking about a successful implementation of universal design of ICT. First of all, it is no doubt that there exists an immense amount of work left for businesses trying to adhere to the regulation of universal design of ICT (DIFI, 2014). Currently, there are issues regarding the interpretation of what universal design entails (Begnum, 2016) as well as corporate focus and mandate of the employees, quality assurance and approach (Harder & Begnum, 2016). All these issues have been touched upon in the literature review and these are the issues that in the authors view apply to DNB and are likely to exist within similar large-scale companies within the same sector.

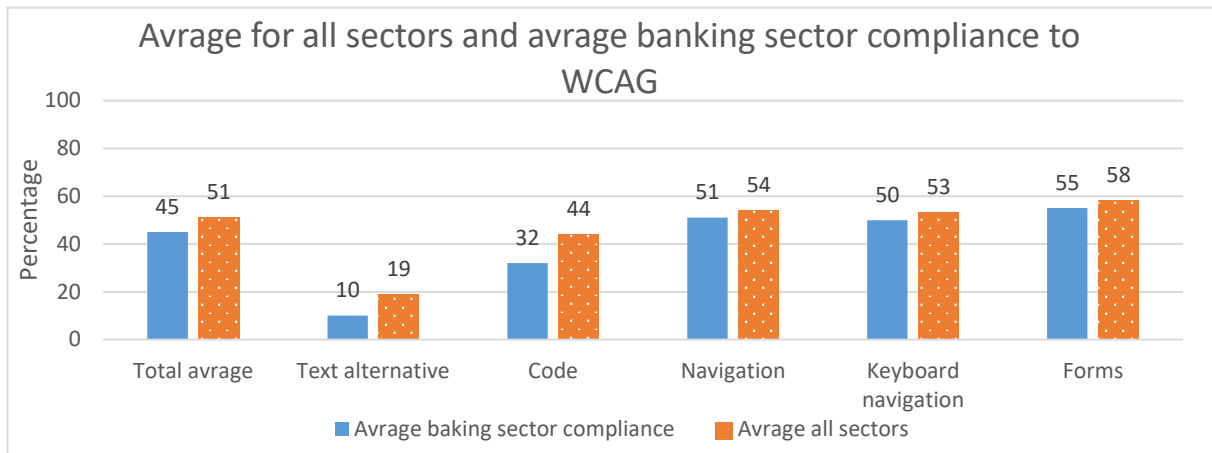
For many years, big businesses had an opportunity to improve their online solutions based on WCAG 2.0 and adhere to the new regulations. Currently, not a single businesses are adhering to the legal requirements of universal design based on the status evaluations done by DIFI on more than 250 Norwegian companies (DIFI, 2014). There are indications on how one should approach universal design of ICT (“Web Content Accessibility Guidelines (WCAG) 2.0,” 2008). Even though universal design requires organizational, process, and individual change to raise the probability of successful adherence to the standards, there currently is a need for clearly defined recommendations on how to approach the issue. Alternatively, as Begnum and Begnum stated, “Develop a method to establish a project's maturity to implement universal design based on identified best practices with regards to organizational, project and individual factors.” (Harder & Begnum, 2016) The initial

impression of the root of the problem is that big-businesses are slow to implement change, and the fact that the whole understanding of universal design is perceived to be wide and vague (Suarez, 2005). The awareness of potential consequences of failing to adhere and benefits of upholding UD might also be deemed too low. Graph no. 3.1 is translated and reformatted to represent the graph produced by Standard Norge (DIFI, 2014). This graph shows that the average compliance to WCAG 2.0 is at 51%. Said compliance rate does not mean that 51% of web pages are universally designed. It does, however, tell us that on average, web pages are fulfilling 51% of the requirements set by WCAG 2.0. Banking and finance, however, is at the lowest end of the scale with an average adherence of 45%. The low compliance rate in the banking and finance sector indicates that there are systematic problems in this sector and that there is a need to reform it. There is a lot of work left to do, and additional challenges might be associated with the fact that this sector might be the least agile.



Graph 3.1 Average sector compliance with WCAG 2.0. Based on numbers from DIFI. (DIFI, 2014)

Diving deeper into DIFI’s report, we can see that some code specific areas need more attention than others with regards to the implementation process as shown in Graph 3.2.

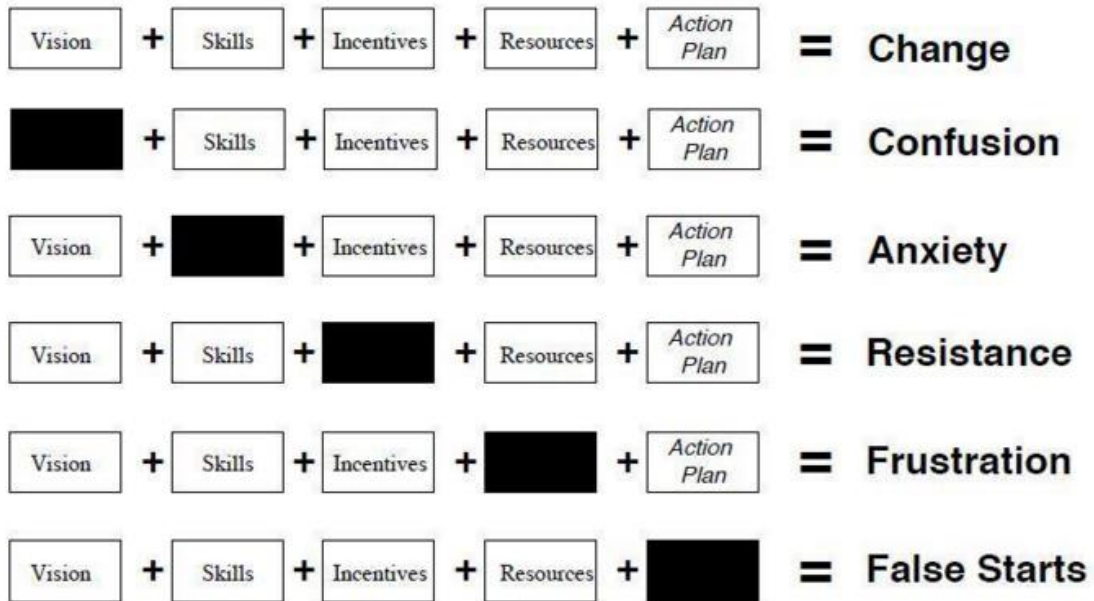


Graph 3.2 Average banking sector compliance to WCAG 2.0 broken down into sections and compared with other sectors. Based on report from DIFI. (DIFI, 2014)

Both text alternatives and code-errors (errors related to correct use of tags, etc.) are significantly lower in the banking and financial sectors than the other sectors. This might be a good indication of where to put more effort when working with improving the current solutions and might also shed light on how this sector differs from others.

As for now, universal design is listed as a nonfunctional requirement for projects at DNB, and only seem to be adhered to in small numbers. However, initially, there seems to be no quality control of this. Villa and Thousand have created a matrix where one can see the likely outcome of a complex change if a specific factor is not fulfilled. In Figure 3.3, the “Managing Complex change”-matrix is presented. This matrix shows that missing resources can lead to much frustration. In turn, it could lead to a demotivated working environment. One can also view skills in this sense as competence. Initially, one might by this matrix assume that feelings of anxiety and frustration are present when discussing the topic of universal design with employees at DNB.

Managing Complex Change



Adapted from Knoster, T., Villa R., & Thousand, J. (2000). A framework for thinking about systems change. In R. villa & J. Thousand (Eds.), *Restructuring for caring and effective education: Piecing the puzzle together* (pp. 93-128). Baltimore: Paul H. Brookes Publishing Co.

Figure 3.3 Managing Complex Change Matrix (Villa & Thousand, 2000)

Based on these audits, research papers and observations, the problem statement boils down to the following: in an ideal world, the finance and banking sector would adhere to the universal design principles through WCAG 2.0. Currently, there is little doubt that there is a need for organizational and process changes as developers are able and allowed to create content that cannot be consumed or accessed by everyone. Indeed, the developers themselves have a responsibility to adhere to these guidelines, but thanks to little awareness of positive and negative consequences, and misinterpretation of what UD is, the banking sector is enabling developers to ignore a large user-group.

3.2 Research question

The research topic of this thesis is universal design in big businesses with a focus on the banking and finance sector. This research topic is underlying in the field of human-computer interaction (HCI). As we have seen, through individual, process and organizational challenges, there is a need for clear guidelines and compiled best practices when it comes to the actual implementation of universal design within big or complex companies. Through several research papers and audits highlighting the areas of concern and an overwhelming amount of work left to complete, with regards to regulations on universal design, there is a valid and justified need for further research on said topic. Moreover, what the banking sector seems to need, is to figure out how they, holding a pivotal role in public participation of citizens, have been able to produce inaccessible banking solutions for the public market for so many years. The research question posed will address the following sub-questions:

- What factors have played a central role in DNB failing to adhere to the national legal standards regarding universal design of ICT?
- What can be done to ensure more accessible solutions?

The author has seen firsthand how a company can get anxious about the regulation of universal design, as well as how companies tend to postpone the work that needs to be done. DNB can be viewed as a social institution, containing members, rules, policies, values, practices, and barriers (March & Olsen, 2008). As DNB is a complex institution with third-party companies and overseas -consultants, overlapping responsibilities and cross-department projects, this thesis aim is to uncover a better practice to approach universal design for big banking and highlight the changes necessary to be made, on all levels from the decision makers to the “lower ladder” employees. In other words, this research aims to present recommendations for how potential barriers can be solved to promote, ensure, and achieve UD of DNB’s solutions in practice. This project aims, in a broad sense, to formulate a suggested “big business approach” to universal design, which would be most suitable for the banking and finance sector.

The author of this thesis defines big business in this context as a large company with several sources of revenue, multiple cross-department projects, with third-party consultants

involved in projects and is widely recognized as an essential party in regular social participation.

3.3 Implementation

By investigating procedures, tools, delegation of responsibility, prioritization and development, the authors aim to highlight specific procedures that can be improved, which barriers that exist and why they exist and how these barriers can be improved. In some sense this research can be viewed as action research as findings and recommendations have been presented to the management at the department of test at DNB during this study and the author has been participating in current initiatives (Brydon-Miller, Greenwood, & Maguire, 2003). Furthermore, a qualitative approach has been implemented as nine in-depth semi-structured interviews across departments, as well as tool/software evaluation has been conducted. As evaluations, observations, and interviews have been conducted a mixed methodology has been implemented for data analysis. The observations were made during the year of 2018 through working part-time with a cross-department universal design project at DNB. The process documentation was collected during 2017 and 2018 while the interviews were conducted during 2018. Work towards further generalizability has been given some focus during the data analysis as a qualitative approach struggles with regards to this (Huberman & Miles, 2002). One of the most significant disadvantages to this approach has is that it is time-consuming. Various accessibility guidelines and standards such as WCAG 2.0 and WAI-ARIA were used in this study. Furthermore, the author aim to find a way to communicate that universal design is not only a law businesses must adhere to, but also that universal design makes good business sense. Studies from Harvard have found “that online ‘sticky’ consumers – those likely to make a purchase and recommend it to others – want ‘decision simplicity,’ which means ease of website navigation and use, comprehensibility, and simplicity” (Spenner & Freeman, 2012). This might be a pivotal point to make when, potentially, trying to alter the view of UD. Besides, the authors of ARIA called Web Accessibility Initiative have given five truths that researchers must keep in mind while researching UD of ICT. “(1) there is never just one solution; (2) solutions are not simple; (3) a single solution will never work, instead, combinations of solutions are required; (4) you do not know the user or their requirements at the granularity required to make assumptions; and finally, (5) remember that work in the Web accessibility field is not only for disabled people but for organizations and people without disabilities” (Initiative (WAI), 2017). All these points have been elaborated on during

our previous subjects in the master program and were taken into account during this research.

As DNB is a large and complex organization, it proved hard to get a complete overview of all the initiatives that have been taken to raise the level of UU since 2014. Searching through the internal intranet, the author, found multiple initiatives that have been taken. The current initiative that is underway at DNB has also been under the loophole. The author has also explored more in-depth into the tools, processes, and expertise within the organization in future chapters to get a more precise basis to answer the research questions. More than 120 emails have been exchanged during this study with a wide array of roles present. Some 20+ documents containing process documentation, status reports, guidelines, and project reports have been gathered, as well as nine employees with different roles at DNB has been interviewed. In total, over 200 hours of observations were made as well. Note however, that this thesis does not intend to highlight to what extent that DNB's services are universally designed, but rather what obstacles and issues that exist. Thus this thesis will not be digging deep into what type of errors are present in products and services that DNB offers.

3.3.1 Interviews

The interviews aimed to get a better basis to answer the said research questions and to unravel the views, experience, and attitudes the employees encounter and obtain. Several questions could shed light on the issues at hand. This might lead one to believe that a questionnaire would be enough for information gathering. However, as stated in "Questionnaires, in-depth interviews and focus groups" by Adams and Cox; "If you want to identify why something has occurred, a questionnaire will provide less valid responses than in-depth interviews or focus groups because in-depth interviews and focus groups allow the respondent the freedom to express things in context that you may not have thought of before" (Adams & Cox, 2008). Since figuring out why something has happened is crucial to understand how it can be improved, the information gathering method of choice is in-depth interviews. Proper structure is essential in most processes, and interviews are no exception. Rabionet, Silvia E. has broken the interview process into six steps in her journal paper (Rabionet, 2011). The steps are represented underneath and have been applied as a process-guideline through the interview process:

- a) Selecting the type of interview

- b) Establishing ethical guidelines
- c) Crafting the interview protocol
- d) Conducting and recording the interview
- e) Analyzing and summarizing the interview
- f) Reporting the findings

As point a) already has been elaborated for; we will continue with step b) Establishing ethical guidelines. As stated in the introduction, adhering to the ethical guidelines for research at OsloMet (Jacobsen, 2018) and applying for approval for data collection by NSD are the formal requirements regarding ethics. However, the author would want to ensure that none of the potential interview participants feel pressured to participate, but rather see the value of sharing their uncensored experiences and views. As the interview protocol and interview information form should reflect, extra measures have been made to ensure that the participants are aware of their rights such as asking the participant during the interview to elaborate how he/she can go forth be removed from the study if they so wish so. As there has not been made an application for funding payouts for the participant, a jar of candies were brought along to the interviews. This made most interview participants smile and ensured that the interviewer made a welcoming impression.

When c)crafting the interview protocol, the questions where crafted on the basis on what topics that would shed light on the issue at hand. These topics mainly consist of the author's own experience at DNB before writing on the master thesis and previous research where Begnum's research are among some. The interview structure recommended by Adams and Cox were used to structure the interviews into four main stages. The structure, questions, and intentions of all the questions in the interviews are found in the appendix chapter [8.1 Interview protocol](#) (translated from Norwegian to English).

The author would at this point argue that the structure that is crafted by Adam and Cox is missing one significant step, namely identifying and choosing participants. As this study aims to reveal what challenges big business might face with implementing universal design, based on factors present at DNB, a wide variety of participants has been recruited for the interview process. As some part of the author's definition of big businesses is that they are big and complex, many different roles should be included when talking about universal design. This is as well true within DNB where everyone from test developers, publishers,

developers, architects, and decision makers all have vital roles for a successful implementation of universal design. Maximum variation sampling has thereby been applied when sampling interview participants(Coyne, 1997). Maximum variation sampling means that the participants that were chosen have the most different forms of experience (in the form of roles), and the intention is to explore the variation within the different roles the employee holds, as well as to find common core issues.

The interview participants together with department affiliation and the employee’s role are presented below. As one can see, there is a wide array of different roles and departments represented.

Participant number	Department	Role
P1	PM digital innovation	Digital business developer
P2	IT Private Marked	Test analyst
P3	PM digital innovation	Digital business developer
P4	Media & marketing	Chief editor
P5	IT Private Marked	Lead architect
P6	Digital sales	Developer
P8		Front-end developer
P9	Cross-department	Section Head
P10	Group compliance	Executive director of compliance

Multiple factors can affect the responses from an interview participant. In this study, the following factors have been deemed worthy of keeping in mind and acted to prevent them from affecting the study (Hastings, 1995). 1) Place where the interviews were conducted. 2) State of mind of the participant. 3) How the interviewer is attitude is perceived. 4) Fear of retribution of saying something wrong or revealing business sensitive information. The following corresponding measures have been taken to limit the effect of these factors: 1) The interview participant decides where the interview is conducted. 2) The participant is asked to choose the date of the interview, as well as the general mood of the participant, is expressed and considered. 3) The interviewer aims to not influence the response of the participant by not showing clear signs of reaction to responses and to let the participant

lead the conversation; interviewer only talks for 5-15 percent of the time (Adams & Cox, 2008). 4) The interview participant is made aware that the study is approved through the correct channels and repeatably made aware that the answers will be made anonymous. The interviewer is also explicitly letting the participant know that there is no aim of arresting or “prosecuting” anyone for their answers but rather unravel the factors that were affecting the participant with regards to UD.

3.3.2 Observations

During this research period, over 200 hours of observations have been made. These hours took the form of working on different projects, interacting with employees, partaking in daily, weekly and department head meetings as well as initiating two separate talks about universal design. These are more active initiatives taken during the observation-period fall into what one would call action research. For the vast majority, these hours were spent in the department of testing. However, as DNB is a large and complex company several employees from different departments were part of all of the projects I took part in during this research period. The observations done during this period is highlighted in separate subchapters in chapter [4.1 Observations](#).

3.3 Data analysis

Data from the interviews were first transcribed by the author of this thesis and washed of any identifying data. The interview data was then transferred to Nvivo 12 Pro, a qualitative analytics software acquired through OsloMet’s research license. Nvivo offers the researcher to apply nodes, categories, and correlations to the transcripts to ease the interpretation and analysis of the data collected. Having dedicated enough time into the design of the interview questions and the structure of the interview, producing meaningful and efficient nodes and categories were made easy. In total 51 nodes were formulated and spread across 16 categories. These nodes were referenced in different interviews where the nodes apply which made the comparison of related questions and statements simple. In total 235 references were made among the 51 nodes. Not only did this make it easy to produce visual representations of the rate of references to a topic but the tool also made the analysis of the more qualitative data simpler by sorting statements into categories and nodes.

For data analysis, a multi-modal approach was applied. Choice of the ideographic approach to the interview analysis was conditioned by a firm belief held by the author of the thesis

that the individuals' experiences and opinions hold a significant intrinsic value. An ideographic approach refers to an approach where one is focusing on the individual, commonly used in qualitative research like case studies. However, in order to increase the external value of this research, the author of the thesis chose to apply a second methodology for data analysis, namely a nomothetic approach. This approach is more commonly used in quantitative research but is deemed beneficial to this study due to the nature of the other sources of data, namely document and tool analysis. There are some aspects of the general experience of the DNB employees spread across departments that naturally gives indications of tendencies one can generalize within DNB, and possibly other businesses. In these cases, concepts from the nomothetic approach have been borrowed. When possible triangulation of the interview data and document analysis have been applied to put further emphasis on the results. As a large and complex institution, the data can both point to results that can be, in a broad sense, generalized through the whole institution, while other results can only be applied to specific departments. This is, in essence, the reasoning for the previously mentioned approaches and methodologies.

4. Results

This is a story about what factors that enable Norway's biggest bank, DNB, to produce inaccessible web content. The thesis argues that there must be multiple factors that enable employees to create said content and that organizational changes are needed to ensure not only legislative compliance but also a more inclusive digital environment for Norwegian citizens. The following section presents findings from the data collections, analysis, and observations made during this study. The section is divided into bite-size thematic chapters, data-type organization, for ease of interpretation and navigation. However, some statements and data from the interviews have been included in some chapters to prove further a correlation between experienced issues and other data that points in a similar direction. The contents of this chapter, together with current and previous studies make up the basis for the conclusions made in chapter [6. Conclusions](#).

4.1 Observations

The observations done during this period is highlighted in separate subchapters below.

Translations and interpretations

An initial observation made is that the WCAG 2.0 guidelines are being translated and interpreted multiple times before being used by developers. In our context, the guidelines are going through 4 different transformations before it is being used. Firstly, the regulation of universal design of ICT filters out some guidelines which are not set as a legal requirement. Then DIFI translates the guidelines from English into Norway's secondary written language, Norwegian Nynorsk. This is a written language that only is used by 12% of the population and might entail some translational concerns ("Nye tall for språket i den Norske skolen," 2015). In DNB's context, it is then translated from Norwegian Nynorsk, back to English, so that the external consultants can read and adhere to the guidelines. This form of cross-translation opens for miss-interpretation and translation errors which might hurt a project in multiple levels.

Compliance deadline

One observation made was that the main focuses of the employees familiar with UD and WCAG had been on the compliance deadline that applies to solutions available before 2014.

The main user-portal of DNB is <https://dnb.no>, and this publicly available website was put online pre-2014, and thus has the compliance deadline at the year 2021. However, considering DNBs vast web and software portfolio, like Vipps (a top-rated app for simple money transfers and payments, similar to apple-pay) that was released Mai 30th 2015, the impression still was that the employees at DNB only were focusing on the 2021 deadline for pre-2014 solutions. Whenever talking about UD, the underlying tone was that there is still some time left to get compliant. This mismanaged focus gives a false impression that the current UD state is not in violation of any regulations, which is not correct for all solutions made available post-2014.

No significant difference between internal and external UD compliance

While working on the universal design project an evaluation of the current state of UD at DNB was in their different domains. This took the form of manual and automated tests. As previously mentioned, this thesis will not allude to any of these results. However, the author would like to highlight an interesting observation made when we look at the results. As a big and complex company, DNB has outsourced some of the development of their webpages and services. These external webpages were also a part of the test scope of the project and showed that there was no significant difference in compliance rate between externally and internally developed webpages. As it is simpler to set stricter demands to third-party developers because the third-party company is the executing party, a straightforward measure to take is to improve the none functional requirement specification and increase the amount of QA that is done with regards to third-party developers.

Use of overseas consultants

DNB, just as any other large company, needs many external consultants. Many of these come from east-Asian countries where UD has not been implemented as a legal standard and thus does not have a similar amount of focus. In this regard, one could argue that overseas consultants are less likely to be aware of national legal requirements. Proper coursing and possible certification with regards to UD might prove helpful for external consultants that are either working with requirement specifications or front-end.

Good work environment

The author's observations of the general mood and enthusiasm among the employees seem to reinforce the statements made by the employees during the interviews. Even though it can be disheartening to work in a large hierarchically organization such as DNB, the employees seem happy, even despite some employees pushing for UD improvements for the last decade without much luck. Plenty of social events, multiple benefits for employees, an alluring cafeteria and a pleasant work environment, might be factors that help to keep the employees happy, and hardworking.

4.1.1 Observations of the current initiative

During the time at DNB, the author has been following and participating in the initialization of a new project called Universal Design. This project was ordered by the PM-directors (private market) and was intended to shed light on the state of universal design within DNB with regards to the cloud migration that was planned for the coming year. The thought behind this initiative was to use the opportunity that the cloud migration presented to ensure that outdated or “bad” code is not brought on to the new platform. Due to this strong correlation between the cloud migration project and the universal design project, both ended up under the same project code which in turn presented some minor difficulties for the project participants. Initially, the group consisted of two business developers who wisely decided to recruit additional expertise to the team. The final project team consisted of test analysts, application analysts, software engineers, and developers. In the end, the team consisted of 8 employees spread across the company whom all had an interest in the topic. The team decided to focus their attention on the current state of DNBs solutions and an initial recommendation on how to approach the issue with regards to the cloud migration planned. This was the focus during the first phase of the project and further iterations of the project provided that the project passes the first tollgate and receives funding might change.

The final produced content of the group is an elaborate PowerPoint presentation that is aimed towards the corporate management. The PowerPoint contains:

- Internal evaluations of external and internal webpages that are under the domain of DNB through WCAG compliance.
- An elaboration of which templates that need improvements.

- DNB.no architectural design and evaluation of maximum return of investment with regards to universal design implementation.
- Three different suggested roadmaps to achieve the goal of becoming universally designed.
- Cost estimate of implementation and cost estimate of not implementing.
- How universal design is anchored within the business's strategy, Corporate Social Responsibility (CSR) and national law.

Due to confidentiality and the content of the documents being business sensitive, more in-depth information about this document will not be presented.

As mentioned later in the findings, when elaborating on [the issues related to automated testing tools](#), the issues mentioned above arose during a presentation for the middle management that had the responsibility to bring the information presented to the corporate management. Before the presentation, one employee ran an automated test that showed that DNB's main domain had conformance of 82%. This unrepresentative number was included in the presentation to middle management. Luckily, there was experienced accessibility testers present during the presentation that could intervene and inform that the number presented was vastly misrepresentative. However, the overall impression the middle management got from the project group might have been affected. As stated during this meeting, *"it would have been a miracle if the conformance was at this level when the average conformance of the finance sector is at 42%"*. After this presentation, the decisionmakers were to decide which of the three suggested roadmaps presented they thought were the most applicable. There were some indications to which options the decision makers were leaning towards, but because the universal design project and suggested roadmaps were so tightly dependent on the cloud migration project, and that the migration project was halted at a quality gate, the universal design project never came into effect. It is unfortunate that this project, seems to have led the same fate as other UD initiatives taken at DNB, and moreover strengthens a thesis that new approaches are needed at DNB to improve the current UD state. During a previous meeting, an experienced front-end developer stated, *"We are asked to do more and more and adhere to higher standards and more complex expectations. We simply do not have the allocated time or budget to adhere to these issues and chose to postpone it indefinitely"*. This attitude towards

the accessibility guidelines are not unique and have been proven to be a reoccurring experience for developers (Harper & Chen, 2012) (Nordli, 2016). The statement highlights an increasing amount of work that only grows and grows, without the subsequent funds or time are allocated.

4.2 Process documentation and procedures

During the last 18 months processes, procedures, and previous initiatives through internal documentation have been collected and analyzed. Evidence of initiatives throughout the period 2014-2018 can be established from bottom-up initiatives based on the roles of the imitative takers. These initiatives have taken different forms and have had different shape and extent of impact. However, most of the documentation of findings and recommendations do not seem to have been followed up and lacked the impact that was needed to implement the recommendations made. As we will discuss later, the reasoning for this is probably due to unclear delegations of responsibility and anchoring and knowledge. Some of these initiatives took the form of external evaluations of web services provided with regards to universal design, while others where internal employees are trying to set up a knowledge base that other colleges could benefit from. This type of initiative is something DNB should nourish and hold up high so that it can benefit other employees looking for more information and critical resources.

Internal documentation

Only three out of the nine employees interviewed had used internal documentation with regards to UD during their time at DNB, and as one employee stated, *“The [internal] wiki-sites is a huge chaos. It might be that there is some good information well hidden, but I have not been able to use or find this information. You need to know what you are looking for and which keywords to use. So, I have not found it myself”*. From this statement, and the authors own observations during this research, we can tell that there is room for improvement when it comes to exploratory search within the internal wiki/documentation sites at DNB. A study about knowledge sharing technologies highlighted the importance of aligning activities and strategic objectives; *“It must also be remembered that proper KM [knowledge management] planning, especially the alignment of an organization’s activities and strategic objectives, must always take place before technology solutions are considered.”*(Hedgebeth,

2007). This statement highlights that further emphasis on activities and objectives must come before thinking about technologic solutions to help with said activities and objectives.

During the investigation of the process documentation, the only place where universal design is mentioned by word is in the toll gate 1 non-functional requirements. Looking into the report template that is provided for project leaders of the same non-functional requirements, only usability by design, accessibility and end-user testing is mentioned, as presented below. The problem presented with this formulation is that unless the project leader has prior knowledge to the national requirements, it is improbable that he/she will be able to provide and specify the requirements of WCAG 2.0. This coupled with the fact that competence within the field of universal design is rated among the interview subjects as the most significant contributor to lacking UD, with an average score of 7,8 out of 9, leaves little doubt that the process documentation is not extensive enough for the general project leader. The template is as dated from 2015-04-21, which might also point to the fact that the templates provided rarely get revised or updated.



Document: **Non-functional requirements**
Project: **<project name>**

1. Non-Functionality Requirements

1.1 Usability

The Usability requirements cover requirements within the following areas:

- Usability by design
- Accessibility
- End-user testing

Figure 4.1: Cropped screenshot of Non-functional requirements template document. Credited DNB.

Lacking tollgate control

The total amount of years of experience at DNB among the interview participants comes in at roughly 50 years and range from 1 to 20+ years. Only one of the interview participants had ever experienced that the project he/she was a part of had been stopped at a toll-gate due to lacking universal design, and in this case, it was after a great effort from him/herself to highlight that the project did not meet requirements set by the procedures. In essence,

these tollgates are present to ensure that a project is working according to the project specification. Another person who was interviewed could talk about how he/she had tried many times to stop other projects, with the power of the role this person held but had experienced that other decisionmakers escalated the project so that it could continue without adhering to these requirements. The fact that this happens is unfortunate and might lead to more poor-quality control. One can only assume that had the other decisionmakers been aware of the potential consequences of easing off the control of non-functional requirements, they might have been stricter during evaluations of projects passing different tollgates.

UD as a non-functional requirement

Some aspects the previous topic was also mentioned by one participant, where he/she could tell that he/she had experienced that the focus in his department had shifted too far towards delivering functionality, sacrificing non-functional requirements as a result. The participant stated the following when asked about if it was easier to leave out non-functional requirements rather than functional requirements when approaching a tollgate; *“Yes, it is, there is a great focus on delivering functionality to the customers which are in itself good. However, when it comes to softer requirements, which can be everything from universal design to documentation to the software being maintainable, logging and so forth, it is not enforced, and the requirements are put on the sideline with regards to nonfunctional requirements.”*. It is worth mentioning that the situation described by this employee might only apply to his/her department. When talking to another employee from the IT-department, he/she stated almost the opposite when asked the same question; *“...IT has had a huge focus on non-functional requirements, and it might have had the highest-ranking priority when talking about safe and stable operations”*. In short, one could argue that UD at DNB is suffering from being defined as a non-functional requirement and that other non-functional requirements get higher prioritization than UD.

Architects role with regards to UD

Because the requirement specification set for a project sets limitation to the project and its funding, the role of the architect should be looked further upon. As an architect is often the first person who gets involved in a projects first stages, namely defining functional and non-

functional requirements, he/she plays an incredibly important role for a project's prosperity and quality. As the architect explained during the interview, *"... there is a constant discussion towards the business side which might be in favor of the functional requirements, and I experience that we need to communicate why non-functional requirements also are important and that we cannot only focus on the functional requirements."* The underlying issues, as mentioned by multiple sources, might be situated in the early phases of a project. Namely, the requirement specifications. These specifications describe the products/solutions requirements, both functional and non-functional requirements and are formulated by the different product owners spread across departments, with the help of architects from the IT department. The architect continues to say the following, *"It has a lot to do with the architect's role to communicate the meaning [of none functional requirements], not only to the developers but business people as well."* As such, the architects play an essential role and thus should be well informed about the cost-benefits of including UD early in the project, ensure that the product owner understands the importance and possible risks related to UD and make sure to document proper requirement specification. Further validation of this importance comes from another employee, stating that *"There is not any information about what it is or how one does it. My impression is then that people just skip it"* and another stating the following when asked about UD documentation *"There is way too little, there is no one who knows what it is."*

Tollgate issues

Besides the issue that tollgate 1 is the only time where a project leader or project owner will encounter specific mentioning of universal design and that compliance monitoring of this stage does not seem to stop projects that are not compliant, several other concerns arise with the current tollgate structure:

- The ISO25000 standard that is used as a basis to formulate this tollgate's non-functional requirements does not take national or regional requirements or law into consideration.
- The fact that universal design is only specified in TG1 is concerning as this is only the first of many phases a project must pass before being released and accessibility testing should be done throughout multiple stages. "Because technologies,

documents, and web content change, evaluation must be ongoing.” (Lazar et al., 2015).

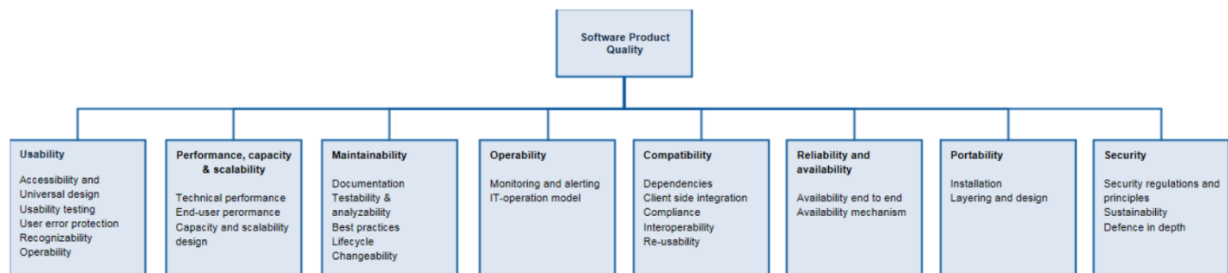
- There are only a few documents that explain that this non-functional requirement is lawfully required, and none that explain the risks that arise when not adhering to this non-functional requirement.
- There is no information about where the project participants can go to learn more, or even what requirements are set to achieve universal design. WCAG 2.0, the actual test requirements that apply by the regulation of universal design of ICT, is not mentioned.
- Non-functional requirements are less likely to be adhered to than functional requirements due to the focus on continuous delivery of functionality.
- There is multiple of other non-functional requirements that are easier to understand and that is given more focus than universal design, such as security and maintainability. This is also reflected in the complementary document that dives deeper into the non-functional requirements, where only one of the points of usability is further explained while all the other non-functional requirements are fully included and explained.

The non-functional principles template is presented on the next page

Non-Functional Principles Template

Created by Steing, Steven, last modified on Mar 20, 2018

This model is a **DNB adapted** model from ISO 25000.



1	TG	Usability	
1-1		Define a target user-group including specialist users, end-customers and other stakeholders	Which stakeholders will be part of the target user-group
1-2		End-customers must be included in design and initial test, not only in UAT	Describe how the end-customers will be used in design, initial test and UAT
1-3		Design the solution with usability in mind	How will the end-users interact with the solution, how is usability included in the design process
1-4		End-customer solutions must be designed for universal accessibility	Describe how the solution will be accessible for end-customers
1-5		User context, environment and devices must be understood	Describe how, when and where the user will use the solution. Is there a specific target device? Why limit it?
1-6		User scenarios must be tested on all target device types	Describe the target devices types and link them to user scenarios

Figure 4.2: Cropped screenshot of Non-functional Principles Template. Credited DNB.

During the last years, there have been some initiatives taken to increase the internal documentation of universal design. These have been done on an individual level and been spread on a word of mouth basis. When interviewing employees at DNB, less than half knew where they could find internal documentation on the subject, while some knew that it existed somewhere but that they did not know where to look for it (based on preliminary results).

Strategy and Corporate Social Responsibility potential

There is little doubt when looking at different priority-policies and the company's Corporate Social Responsibility (CSR) that universal design fits beautifully within most of them. Among some are 4theFuture that is an internal strategy initiative that focuses on that both solutions and employees should be fit for the future. The strategy is conceptualized with four doors that each has its own meaning and were at least three out of four of these correlates to the anchoring of universal design. The three doors are Customer insight, increased competence, and corporate social responsibility. One could even argue that the last door also fits within universal design as studies have shown that increased requirements of universal design lead workers to be more innovative and creative on how they approach and achieve the goals set by the project (Fuglerud & Sloan, 2013). When it comes to CSR,

universal design finds it anchoring within the 6th key-area highlighted by DNB. Diving deeper into DNB's Integrated annual report of 2018, the company sets itself two main focus areas from the UNs sustainable development goals. The second of which, after Goal 5: Achieve gender equality and empower all women and girls, is Goal 8: Promote sustained, inclusive and sustainable economic growth, full and equal productive employment and decent work for all. The first part of goal 8 is essentially what UD means for DNB, namely promoting sustained, inclusive and sustainable economic growth through ensuring equal access and user-friendly products and solutions ("Annual report DNB," 2018) . Equal access to manage one's own economic situation is a crucial aspect of economic freedom and should be a prioritization for DNB.

4 THE FUTURE

Skape de beste kundeopplevelsene og levere på finansielle mål

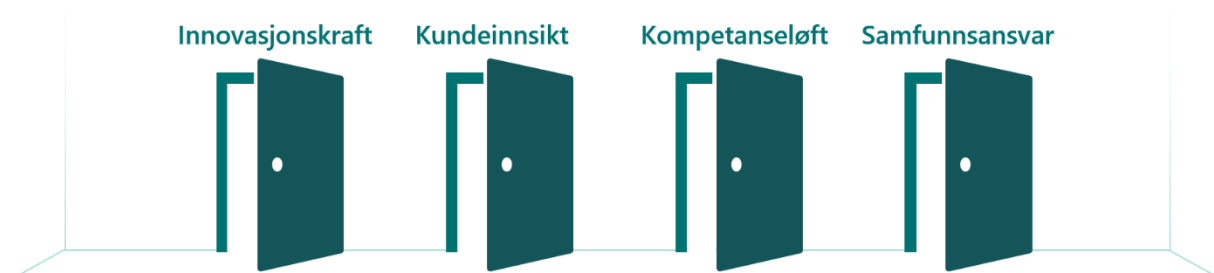


Figure 4.3: Graphical representation of internal cooperate policy, 4TheFuture. Translated: "Create the best userexperiences and deliver on financial goals. Inovation, customer insight, competence, CSR)" Credited DNB.

Testing approaches

It seems like a lack of quality control in passing tollgates, lack of knowledge, and time/budget are the most significant factors that allow the issue to continue to exist. The current approaches among the test-employees who take the initiative to test against universal design principles and WCAG are mainly focused on expert evaluation and mainly do this on a voluntary basis. Even though there has been an automated test tool that has been acquired within DNB, it is not accessible cross-department and has significant limitations and issues associated with it, which one can read more about under [Siteimprove: Automated accessibility test tool](#). It seems as new projects that work with solutions that are a part of the core-product offer of DNB might have a bit more focus on user testing. Only

one of the projects that the author have heard about during the observation period had any experience with user testing. This is even though user-involvement and testing are included in the tollgate specifications. Usability testing is essential if the actual user satisfaction is to be at focus rather than only compliance. The book “Ensuring Digital Accessibility through Processes and policies” describes the different effect of user testing and expert/automated testing the following way, “... usability testing [is] focusing more on ease of use by actual users and expert inspection and automated testing focusing more on technical accessibility.” (Lazar et al., 2015). In other words, if DNB wishes to aim beyond the national regulation and technical accessibility, they should ensure that user-testing is done and that a diverse representative user-group is included.

4.3 Tool analysis

Multiple tools are relevant to discuss regarding the topic that is being handled. At first, the author wants to highlight the automated testing tool that is being used within some branches of DNB. Followed by an elaboration on one potential learning/knowledge tool that can be proven useful in spreading the knowledge about universal design. This chapter will be focused on these two software tools that are being used within DNB.

4.3.1 Siteimprove: Automated Accessibility test tool

Siteimprove is a for-profit organization that sells automated testing tools for accessibility and GDPR. The tool its self is built up like most other automated test tools. The most commonly used accessibility test tools are Axe and Google Chrome lighthouse audit tool. As Googles audit tool uses Axe’s engine (“Google Selects Deque’s axe for Chrome DevTools,” 2017), under the copyleftist license Mozilla Public License version 2.0 (*Accessibility engine for automated Web UI testing. Contribute to dequelabs/axe-core development by creating an account on GitHub*, 2015/2018), as a baseline for their tool, the only difference between Axe and Googles services, is the presentation of its findings. Siteimporve has been shown to produce the same test scores as Axe (Duran, 2017) and due to the nature of the tests that are needed, there is a natural limit of how much such an automated tool can do. One can only assume that the decision for DNB to buy the services of Siteimprove, when other equally as good free services are available, was mainly based on the support that comes along with the tool. This tool is being used by a select few numbers of testers and developers and poses an extra barrier in that each new domain that is tested leads to a

higher cost, due to the sales model of Siteimprove. As research shows, there is a vast amount of concerns regarding automated test tools (Baazeem & Al-Khalifa, 2015). Among others are the high rate of false positives and low rate of test coverage (Vigo, Brown, & Conway, 2013). This coupled with the tendencies testers has to rely on the first results that are presented, (Tversky & Kahneman, 1974) (Harder & Begnum, 2016) automated test results can lead to concerning results. Without going too in-depth into errors that are present at dnb.no, the author wants to highlight one clear example where empty alt-tags are present throughout the website (where it should not be empty). This one can assume is due to developers not being familiar with the tag itself, as well as testers running automated tests that only looks for the presence of alt-tags but not the content. As other studies also highlight the low testability of WCAG by experts, the only recommended approach that can be given is to use a combination of automated, expert and user testing to achieve reliable results.

4.3.2 Competence training tool: Motimate

Motimate is an internally accessible training platform that offers a wide array of different training course within DNB. Everything from General Data Protection Regulation (GDPR), Corporate Social Responsibility (CSR), confidentiality, and testing -courses are available. There is currently no course that handles the concept of usability, accessibility or universal design. This platform could prove to be a great tool to spread the awareness of the universal design. As far as awareness goes, this tool could help, but the more profound understanding or knowledge of the topic mentioned as the most significant reasons to DNBs current state of UD, will most probably not be obtained from a mobile course. There is the issue of low participation on this platform, however. Currently, at the department of test, less than 20% of the full-time employees have currently conducted any of the courses available through the service.



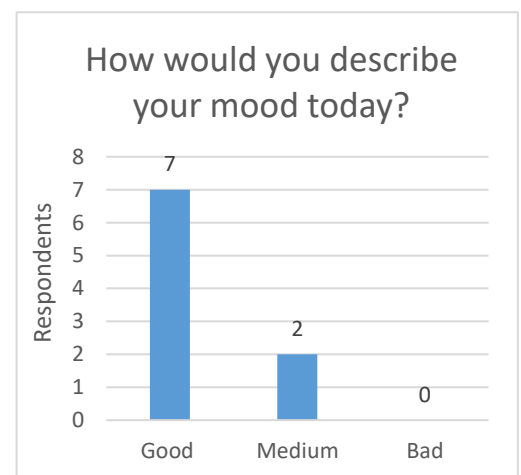
Figure 4.4: Illustration of Motimate on an iPhone

4.4 Interviews

The methods and approaches of data-analysis have been elaborated on in length in chapter [3.3 Implementation](#), [8.1 Interview protocol](#), and [3.3 Data analysis](#). Selected statements from the interviews have previously been presented in the chapters of the results where they are deemed relevant. In this chapter statements that are shedding light upon different subjects are presented and are put into the context of other data gathered. The interview results have been sorted by the nodes coded in Nvivo and presented by the structure of the interview protocol. Even though graphs are presented through a quantitative medium of graphs, the author still believes it gives a better insight into the qualitative data collected. The emphasis of the data analysis has been put on the interview participants statements and experiences, rather than the quantitative data.

4.4.1 Mood

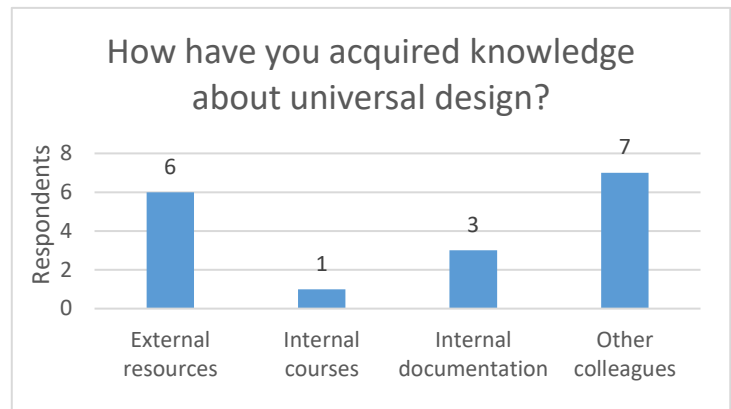
As previously mentioned, the general mood of the employees seems to be good due to multiple factors. None of the participants expressed any interpretative signs that made the interviewer doubt their statement about mood. As one can see from graph 4.5, none of the nine interview participants stated their mood as being bad. Based on this information, we can assume that none of the respondents have skewed the responses due to a bad mood. Even though most of the respondents stated being in a good mood, none of them followed up with an explanation to their good mood that could be viewed as affecting their answers in a positive way, such as winning the lottery or recently being promoted. However, one respondent replied the following: *“My mood is great, no meetings so far. A day without meetings is a day with meaning”*. When asked about the best part of the job, the most mentioned part was the people and the challenges presented.



Graph 4.5: Interview results - Mood

4.4.2 Sources of acquired knowledge

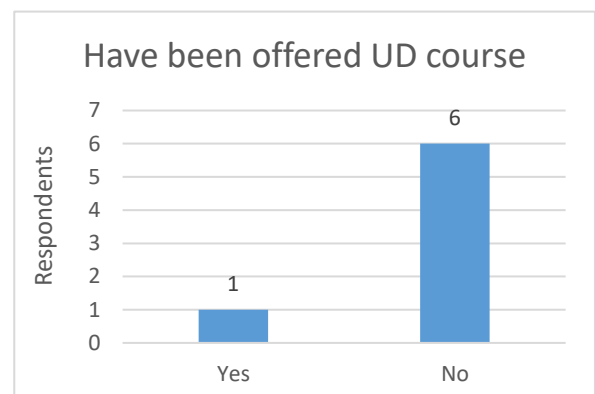
When asked about where the interview participants had acquired their knowledge about universal design, less than half stated to have used internal sources. The most common sources were other colleagues and external resources. As one employee stated about her experience with other colleagues teaching her about universal design: *“There is a community within this field [universal design]. It seems like a very small yet engaging and helpful community”*. Another employee states the following when asked the same question: *“A lot of it is based on my own initiatives. I have talked with all the people I know within the bank who has knowledge about this topic. Especially from the IT-department.”*. The most common external sources are the Norwegian regulatory organ DIFI’s websites about universal design, the regulation on universal design of ICT and the WCAG guidelines. As previously mentioned, some employees point to the lack of easily accessible internal resources which might be some of the reason why so few employees use internal documentation and resources. Among the employees that use internal resources, previous compliance evaluations and a translated version of WCAG are among the most mentioned.



Graph 4.6: Interview results – Knowledge sources

4.4.3 Offered courses

By offering courses on topics DNB deems as important, DNB could take a proactive approach to ensure relevant competence within the company. During the interviews, seven out of nine interview participants were asked if they ever had been offered coursing related to universal design. Only one employee had experienced this while the other six had not. These numbers are coherent with where employees acquire information regarding UD of ICT, namely externally. This again seems to point to the fact that UD action at DNB is more of an initiative based process

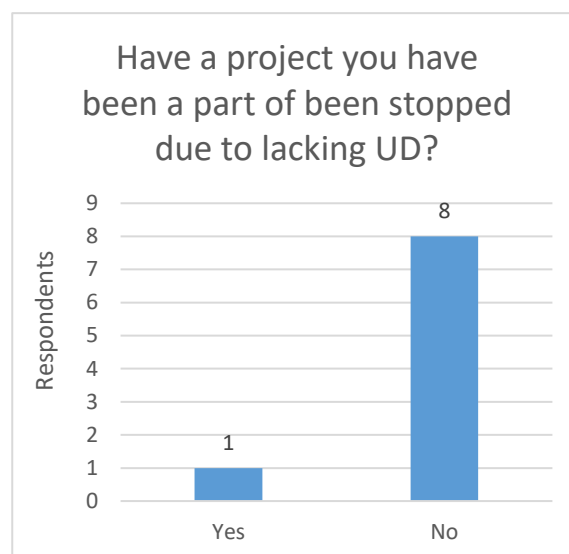


Graph 4.7: Interview results – Offered

rather than an organizational structured process. A curious note here is that the one employee that had been offered coursing was the employee with the “highest position.” No further evidence or data points to any deliberate difference in offered courses to employees based on position, and thus no assumptions regarding this can be made. One employee state that he/she had not been offered any coursing on the topic and continued with *“I have been told that I can use time on it. However, there has not been made time for it in my schedule... I have neither been given or granted access to resources or documents that could give me this knowledge. That I must find on my own or through other employees.”* If the topic of universal design is something that DNB views as valuable, and the most commonly referenced reason for DNBs current state of UD is lack of competence, DNB could benefit from taking a proactive approach and offer the relevant employees a course on universal design. One could argue that a single course on a topic is not enough to change embedded behaviors among the employees. However, one could also argue that holding the topic of UD higher by offering courses on it, some employees that never might have heard about UD might find it interesting and take it upon them self to dive deeper into the topic. There is also, as previously eluded to, the competence training tool Motimate which could prove valuable in coursing the employees. This approach has been looked upon by an employee at DNB with competence within UD, but at the time of writing, no course of UD is available on Motimate at DNB. As mentioned in the subchapter [4.3.2 Competence training tool: Motimate](#), this sort of training has some limitations related to participation and depth of understanding. In other words, creating an introduction course to the concepts of UD, and its application to DNBs services might prove successful in raising the awareness, which also was highlighted as an essential factor by the interview participants. However, due to the limitations of such an approach further actions are needed to ensure competence within the company.

4.4.4 Project stopped due to UD requirements

As previously mentioned in the subchapter [4.2 Process documentation and procedures](#), the tollgates at DNB is in place to ensure that a project is fulfilling the requirements set by the project description and project owner. The evaluators in these tollgates has the mandate and obligation to halt a project from proceeding the specific tollgate if the project is not compliant with the demands set. Some initial assumptions were based on that this quality assurance process is not working to its



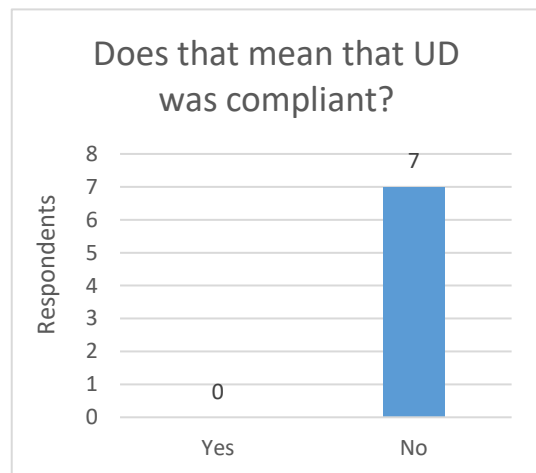
Graph 4.8: Interview results – Project stopped due to lacking UD

full extent due to the current state of UD at DNB. When asked if the interview participants had ever experienced a project he/she was a part of had been stopped from proceeding from a toll-gate due to lacking fulfillment of UD requirements, eight out of nine interview participants stated that they had not experienced this. Even when considering that two of the eight that answered no to this question had been employed at DNB for a short period of time, still six out of seven state to have not experienced this. On the other hand, one could also argue that new employees should be focused on when it comes to competence training, and thus their experience should be put more emphasis on. Among the respondents that state to not have experienced such a halt in a project we find some reflections from the respondents, such as *“I have not experienced a project being halted as a result of lacking UD, even though it should have been.”*. This reflection states both that the employee has never experienced that a project he/she has been a part of has been halted and that the employee feels like it should have been. Another employee states that *“I don’t know of any projects that have been stopped but I know of projects that have tried to be stopped due it”*. This statement is concerning due to the part that mentions projects that have themselves unsuccessfully tried to be halted, assumingly to improve the current state. This statement has a bright and a less bright take to it. On one side it is concerning that the quality gate is not halting projects that the projects participants them self believe should be improved with regards to UD. On the other hand, it is comforting to see that the integrity and belief in accessible solutions are held high among the project participants. Another

interview participant who stated no the question mentioned above answered the following: *“No, I would say that focus on this topic is quite low at this bank, and thus there are a limited amount of people who work with it.”* When looking at the one interview participant that answered yes, we find that this person has been a part of the tollgate quality assurance team. This interview participant stated that him/her self-had stopped one project that did not comply with the UD requirements. One can to some extent establish that some level of quality assurance with regards to UD is in place, but that most of the employees have never experienced it and feel like projects that they have been a part of should have been halted due to lacking UD compliance. A follow-up question was asked and will grant better insight into the quality assurance issue at hand.

4.4.5 Does that mean that UD was compliant?

In order to establish a relation between lacking UD compliance and lacking quality assurance a follow-up question to the previous question was asked to the participants; “Does that mean that universal design was compliant?”. Six out of seven who answered believed that the project they were a part of was not compliant, even though they had not experienced a halt at a toll gate. The one participant that had experienced this, as previously mentioned, sat on the other



Graph 4.9: Interview results – Was UD compliant?

side of this quality assurance process, as an evaluator, and answered that him/herself had stopped a project due to lacking UD compliance. Diving deeper into the answers regarding this question we find some more elaboration by the interview participant. *“No, they were not compliant... I have experience being told that we do not have enough to focus on it. It has not been followed up or followed up wrongly.”* The participant behind this statement continues to explain how he/she has experienced that some projects believe that they have been compliant with regards to UD because their solutions are scaling correctly to mobile and desktop, which most people with some degree of knowledge about UD knows that it is not solely about. He/She continues to underline this exact point by saying *“By this statement, we know that they have not understood what universal design is.”* The same

interview participant continues, *“I have also experienced some reports that are in other senses decent but were missing 60% of the UD tests that they should have been doing to pass the tollgate. Yet they passed [the tollgate], and the project continued. I have never experienced a project being stopped because of lacking UD; I have rather seen that it [UD] has not been prioritized”*. This statement highlights issues related to both parties on each side of the table in this process. The employee highlights both lacking knowledge and misconception of what UD is, but also how the mandate of the tollgate inspectors is not being applied when issues are related to UD. Another employee simply answered the question with, *“They did not know what it was.”* One of the participants that stated that the project he/she was a part of had tried to highlight lacking UD in their project continued to explain that the particular project was escalated to a different project team that did not have the needed knowledge of UD, and went on to pass the tollgate. This might indicate that the project participants expertise or opinions might not be taken into consideration when approaching a quality gate. Another employee sitting at the evaluation side of the tollgate stated that they have tended to trust the projects that they are fulfilling the non-functional requirements, and that there has not been any follow-up on the UD requirement. The first part of this statement, about trusting the projects own evaluation, is not corresponding to other statements made by employees at the opposite side of the tollgate that had tried unsuccessfully to halt their project at a quality gate. In summary, no interview participant could state that they either had been stopped at a quality gate due to lacking UD compliance nor could they state that this experience was due to the project is compliant. Both parties in this process seem to have the potential for improvements, both in terms of heightened awareness and competence within the field of UD, as well as proper routines when a project is up going through a quality assurance process, such as DNB’s quality gates.

4.4.6 How is lacking UD documented in a project?

Good documentation practices have been shown to deliver high value in all phases of development (Rovce, 1987), even if the documentation is out-dated (Lethbridge, Singer, & Forward, 2003) and is an integral part of every project. Documenting what has been done, what has not been done and why will give employees outside of the project a glimpse into the project and makes it possible to come back to a project for further improvements. In this regard, one would think that even though UD requirements are lacking, proper documentation of what has been implemented and what is left to improve would be

documented. This, however, is not the case, as stated by the interview participants. *“It is documented, but not looked at.”* stated one of the participants, while another said *“... the importance of this has not been taken seriously enough, I have little doubt that DNB gets fined due to this”*. Some employees also state that UD issues are documented at all and others say that they are being ignored. Two employees answered that they are documenting the issues properly through Jira and test reports, but as we will discover in the next subchapter, many employees state that they do not see themselves revisiting the documented issues related to UD. As to why documentation is not being done appropriately one can look to other statements regarding what factors is to blame for lacking UD at DNB, in this case namely awareness and competence as mentioned by the majority of the interview participants. As presented in the next chapter, the priority of delivering functionality might also be in parts to blame.

4.4.7 Do you see yourself revisiting the issues documented at a later point?

Even though one is doing a proper job documenting testing and work that has done, the work put into this documentation will hold little applied effect if one does not revisit issues logged. This, along with the prospect of the employees having a positive expectation regarding revisiting these issues, was the reasoning behind the question. Some employees state doubtfully that they hope that the issues will be revisited, while others are blunter by saying simply no. One employee highlighted that he/she feels more optimistic about improving lacking UD as the UD project the author of this thesis was a part of was established. Another employee stated that *“I don’t see that everything will get fixed within the launch and I do not think it has the highest priority. It is mostly about time and prioritization”*. Again, key factors that the interview participant view as important are highlighted, namely time and prioritization. As we have uncovered in previous chapters, time is a crucial factor that other employees also have mentioned. As time is so closely connected to cost, one can make a connection to cost as well.

4.4.8 Who should be held responsible?

Letting the interview participants elaborate on who they believe should take the blame if DIFI ended up with fining DNB for lacking UD we can get further validation to where the

issues are situated based on whom they would blame. As one employee stated, «*The upper branch, but I do not think the executive leaders at DNB knows enough about this issue. As long as there is no one above us that states that this [UD] is anchored among the leaders and there are no consequences if UD is just a small note in a finished report, I can understand why it is as it is today*». The



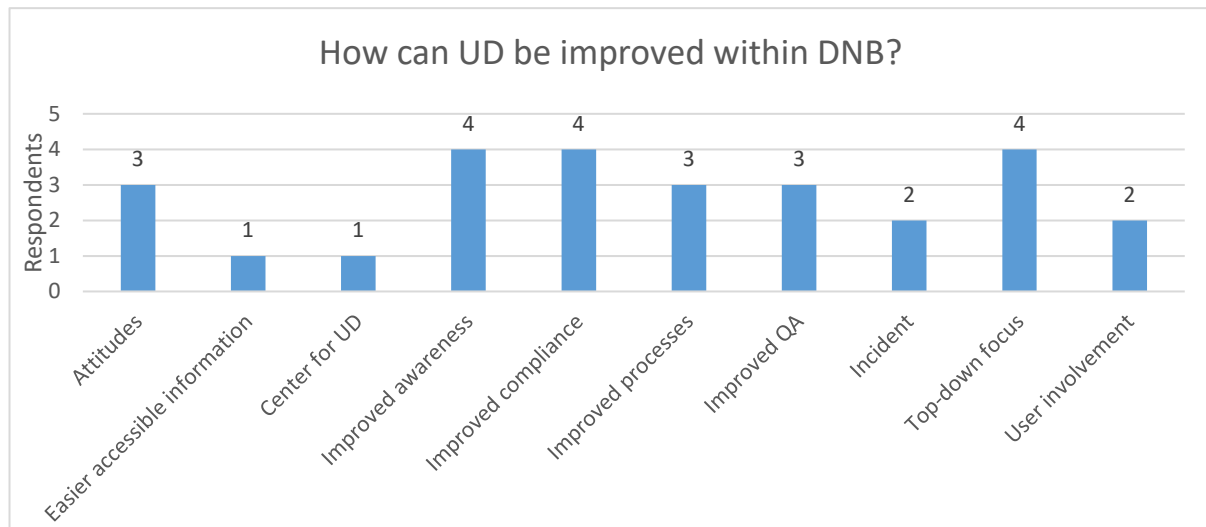
Graph 4.10: Interview results – Who should be held responsible

interviewee is here referencing the lacking awareness of this issue among the top branch. As previously highlighted, unless there is dedicated time and budget for ensuring UD compliance, little will get done. Pointing the finger at the executive branch is, in turn, stating that there is too little focus among the leaders, and thus there is no trickledown effect to department leaders and project managers. Earlier in the thesis, the perceived risk from the compliance department regarding UD has been brought forward. One head of this department stated that the perceived risk of UD was not high enough to defend bringing it up for the executive branch. Another employee stated the following, «*There is missing culture, routines, and knowledge about the topic, but I am sure that all the projects at DNB are doing their best to comply with the legal requirements.*» What one can see highlighted here is the missing culture, routines, and knowledge. These topics have been highlighted by multiple interview participants before and seem to be grounded based on the other collected and analyzed data. Other interview participants also point the finger upwards towards the executive management when blame is to be divided, «*If DIFI came at our door I would say that it is corporate management and not the operative employees of the project [that is to blame]*.” The one other party that significant blame is being given to is the product owner. «*This is not saying that we as developers or project leaders are excused from responsibility, but it is more that every solution, should have, and I do not think they do, a project leader that has the responsibility that the solution is perfect and should work as intended.*” Holding the role as the party to ensure proper quality and requirement fulfillment it is of little surprise that this role is being given blame. One can imagine that the same pressure of cost-efficiency and time-management is at least as though for the product owner as for the executing party, such as developers and testers. Thus, even if the product

owner were aware of UD and included specific UD requirements, one would have to cut cost in other necessary demand specifications unless the corporate management delegate time and budget for it.

4.4.9 How can UD be improved within DNB?

The above question was asked to get a summarized answer from the interview participants. Due to the possibility of mentioning more than one topic, graph 4.11 presented contains each node and the number of references for each node.



Graph 4.11: Interview results – How can UD be improved within DNB?

An interesting suggestion presented by one of the interview participants on how one can improve the current state of UD at DNB was to create a center of excellence for UD. This could improve the awareness and the accessibility of information and best practices. The same employee, as well as other employees, also highlight lacking clear responsibility for UD as a concern. One could argue that DNB is either lacking a clear organizational structure that delegates the responsibility, or that it is not presented in a precise manner to the employees. As previously mentioned, an incident is something that also is being brought forward as a possible way to get “... something moving along ...” as an interview participant puts it. This might hold much truth due to the risk evaluation made by the compliance department at DNB. Among the participant's answers, we also find a more aspirational answer, “We should take a position as the best in class and be a role model because I also view it as social responsibility.” This attitude or view could prove beneficial once DNB decides to put more emphasis on this topic.

5. Discussion

5.1 Limitations

As there are indeed some limitations to this study that are worth elaborating on and as Sari Knopp Biklen and Ronnie Casella explain in their book “A practical guide to the Qualitative Dissertation”, “No one can do a study that accounts for everything” (Biklen & Casella, 2007). The first of these limitations would naturally be the author's position in the company during this study. The author would like to underline that DNB does not sponsor this study and that no work with this study has been billed to DNB. At the end of 2018, the author's part-time contract as a test-analyst at DNB ended, and no further significant contact between the author and DNB has occurred after the end of said contract. The author feels confident that the relation to the business in question has not had any other effect on the study than giving ease of access and opening for the possibility to present findings during this study. However, the author feels like it is essential to be transparent about the relation to the company.

Secondly, in retrospect, the author does believe it would be beneficial to dive deeper into the user-testing aspects during the interviews. There is already scientific data available about commonly used strategies for this type of testing, and the author does think it would cast more light onto the topic at hand, both in terms of frequency of user-involvement and testing, and variety of said users disabilities. User involvement and interaction is an essential aspect of universal design that should have been included in the study. The author also acknowledges that there are no interview-participants representing business markets. It would be preferable to include participants from BM (business market) in the study as well. This, however, was attempted unsuccessfully.

Another important aspect of this study is the size and complexity of the business in question. The author has done as much as he could to acquire a proper perspective of the company and its structure. However, there is a possibility that there are additional unidentified people and processes that are working with the topic of UD. The author has however gone to as great lengths as possible to uncover the aspects and relevant entities that do, or should be involved with work related to UD of ICT.

As this paper mainly is focusing on what process and tendencies that can be improved, there is also an acknowledge chance that not all recommendations presented in [chapter 6. Conclusions](#) will be adhered to. It is vital that DNB chose the correct processes and changes that are effective for them, and the author acknowledges the vast amount of knowledge held by the employees at DNB that could affect these choices. The most important is that the changes introduced support future work to create accessible solutions into already existing processes and that a limited time-based accessibility project is not implemented, as this would in due time lead to creators still being able to produce inaccessible content, which again would lead to technical debt and increased costs.

5.2 Significance

Multiple factors identified at DNB agree with previous research. Many of the same key factors highlighted in previous studies are present at DNB as presented in [chapter 6.1](#) and subsequent recommendations have been made as presented in [chapter 6.2](#). The main difference identified in this study to previous studies is the perceived effectiveness of national regulation regarding to universal design. This difference mainly applies to the banking and finance sector as these have higher-risk factors that compete with attention and funding that UD needs. In this sense the author argues that the highlighted promoting and obstructing factors might hold different weight depending on which sector one is discussing.

The utility value of this research is applicable to most big banking and finance companies in the Nordic countries as these often are under similar universal design legal regulations as in Norway. Being a case study, it is natural that the results presented are more applicable to the company under the loop. The author still believes that this research paper will prove useful for other large businesses looking into their own issues regarding implementing universal design into their solutions.

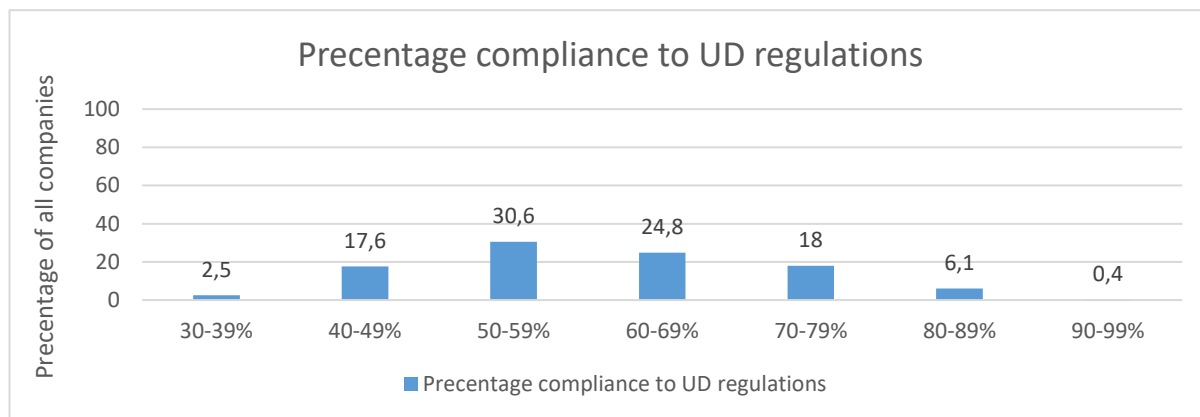
5.3 The role of national regulation in practice

The employees at the department of compliance did not view the risk of not being compliant to UD regulations as a big enough risk that it could be prioritized over other risk factors like money-laundering, GDPR, and fraud. This evaluation might be less shocking when one knows that currently, no company in Norway has ended up paying after being

fined for not adhering to the national requirements. Yes, companies like SAS and local municipalities have been fined, however, in all the cases the fines never came into effect, and effectively no single entity has paid a fine due to incomplete UD compliance. Taken into account the current status evaluation made by DIFI, it is quite disheartening how only a single entity out of 250 is above 90% compliance rate, the average compliance rate is 60%, and yet, not a single entity has felt any financial consequences because of it. Even without knowing all of this, DNBs compliance department has decided that the risk is too low to bring this topic up to the top-level corporate management, and thus, no significant investment into process changes or improved competence to improve UD at DNB has been made.

After contacting DIFI and asking for a statement on this matter, the author learned that 29 inspections had been performed by DIFI since the regulation came into effect. Out of these 29 inspections, only two of them were without significant issues. 25 of the 27 inspections left were closed after the company presented an action plan for improving the UD state. In other words, there are only two companies who have been imposed with a fine. As a student within the field of UD it is disheartening to see how with five years of an active national regulation that should act as a whip, in contrast to carrot, we still have not seen any company feeling the consequences of not following the regulation of universal design of ICT. Questions are arising when also keeping in mind that nine out of thirteen experts within UD in Begnum's paper states that a regulatory demand for UD compliance is a promoting factor for UD (Harder & Begnum, 2016). In some sense, one could argue that the presence of a regulatory entity such as DIFI is promoting UD through being the "police of UD compliance" and thus puts more attention to the legal demands. They are thus making DIFI more of an attitude and information organ of UD rather than the large enforcer of the law. In turn, aforementioned facts should make promoters of UD and accessibility reevaluate the perceived effectiveness of the argument that economic sanctions will follow for not adhering to the regulation of universal design of ICT since this does not reflect the true state of arts. As there are no real economic consequences in place the author would argue that using this argument could be perceived as unethical. Alternative arguments for promoting universal design of ICT should be considered, among some could be: search engine optimization, focusing on broadening their customer base, creating more user-friendly solutions and CSR aspects. In the end, there is little to no chance that a big company will

suffer economic fines due to in compliance based on the numbers presented and the situation explained above. In graph 5.1 the distribution of different Norwegian webpages is presented where the compliance rate is presented to give a more wholesome view into the current UD state of Norway.



Graph 5.1: Digital barriers on Norwegian websites 2018, (“Digitale barrierar på norske nettstader | Universell utforming,” 2018)

During the authors work on this thesis and the field work that has been completed the author of this paper has changed his view on the role of DIFI. Previously DIFI was viewed as the necessary big bad wolf coming to whip any company that does not comply with the regulation of UD of ICT with economic fines. However, at the time of writing the view has changed. The author of this paper instead views DIFI as the unnecessary big kind wolf that does not act to the full extent needed to ensure a more including and accessible digital environment, but rather plays a role of distributing information and present arguments supporting UD work and prioritization.

6. Conclusions

In this final chapter, the author would like to summarize the conclusions that were made based on the analysis of the collected research data and discuss possible future research. The first subchapter will summarize the findings made in relation to the first research question, namely pinpoint the main factors, which have contributed to DNB failing to adhere to the current UD regulations. Subchapter 6.2 will present the possible solutions, which could help to promote UD compliance within DNB. These conclusions are made on the basis of collected research data, and previous research highlighted in this thesis.

6.1 What factors have played a central role in DNB failing to adhere to the national legal standards regarding universal design of ICT?

Despite the fact that some attempts to improve the UD compliance have been made by the lower level employees, implementing certain appropriate practices in various projects and departments of DNB, no long-term structural changes were achieved. That fact could be attributed to the generally low level of competence in the sphere of UD as well as to the low level of awareness about the current legal requirements regarding UD among the DNB employees on all level (both development and quality assurance teams and management). On the other hand, way too often one can see a lack of strategical planning regarding UD implementation on the part of the *higher* management. In this regard, the role of the architect bears crucial importance, as it is under their mandate the specification requirements (including the non-functional requirements) and their application is monitored. A more detailed explanation of these and other central factors contributing to DNB producing inaccessible web content is presented below.

6.1.1 Quality assurance processes not being followed properly

Multiple indicators highlight that the current quality assurance process in place today is not working to the necessary extent with regards to UD. If every aspect of the QA process would have been followed correctly projects that do not adhere to the UD requirements would have been stopped and required to improve UD status before continuing. If the QA process had consequently held every project back due to lacking UD requirement fulfillment, huge costs would have been associated with it. This one can imagine would not put the QA-teams in a positive light. By the current UD state of DNBs solutions and statements from

employees, we can confirm that the QA process is one significant factor leading to inaccessible content being produced and published by DNB. Other issues that have been identified in this research are:

QA evaluators not using its mandate

QA evaluators are not halting projects that are incomplete or lack documentation of UD test or UD requirement specifications. Often times that is due to pressure regarding delivering functionality, which leads to them focusing more on functional requirements rather than non-functional requirements. It also happens due to QA evaluators lacking knowledge or awareness of the possible consequences of publishing inaccessible content such as regulatory fines, ignoring certain user groups, damaging company reputation and increased the cost by fix by fixing the issue after releasing.

Poorly formulated requirement specifications

There are indications that there are issues related to requirement specifications. Unless the project owner is willing to include non-functional UD requirements, there is little that the QA-team can do inform a project of lacking requirement adherence. It has been stated that it is the architect's role to ensure that the project owner includes all necessary specifications of a project and thus lacking UD knowledge among architects might also hold some blame.

UD focus in process documentation

The process documentation is not highlighting the impact or possible consequences of creating inaccessible web content. This might affect how the requirement specifications are formulated by the architects and product owners and in turn, leads to less than optimal testing possibilities.

6.1.2 Compliance departments evaluation of UD risks

As a top-down focus sets the stage of what a company deems important one could argue that the department of compliance's evaluation of UD not being worthy of bringing forward to the executive branch as unfortunate. Especially when previous research points to top-down focus as being a promoting factor for UD of ICT. Even though there are other risk areas like fraud and money laundering that are more common to a banking institution, DNB now identifies as a tech company with a banking license and are moving almost every all of their product and service portfolio online. This entails that accessibility issues should have a

higher priority, especially when DNB itself states that it is the bank from A to Z for people from A to Z.

The department of compliance states that it does not deem UD at DNB to hold a significant amount of risk to be able to defend bringing the topic of UD to the executive branch. This, in turn, ensures that there won't be more funds allocated to the different departments and that organization-wide changes won't be implemented. There is still the possibility of department heads making an effort to improve their own departments work on UD, but without a wholesome organizational focus on UD, it seems unlikely that a significant improvement can be expected as a result of department heads voicing their concern.

6.1.3 Missing competence and mandate.

Creators are asked to adhere to an increasing number of requirements while not being delegated more time to adhere to them. Lack of competence and a clear mandate is a factor that exists partly due to the risk evaluation performed by the department of compliance. If the topic had been presented to the executive branch, there would be potential for further investments and allocation of funding to increase the company's competence within the field of UD. Such an increase in competence funding could take the form of hiring certified experts, offer coursing to the current employees or invest in more user-involvement during development and testing of products and solutions. Such an increase in funding to different departments would also allow for the separate departments to make adjustments to their processes and ensure that UD becomes a more integrated part of their everyday operations. In this way lack of top-down focus *as an obstructing/hindering factor to the UD compliance* can also be traced to the risk-evaluation performed.

6.2 What can be done to ensure more accessible solutions?

Conclusions regarding the second part of the research question are presented in the subchapters bellow. Each subchapter contains recommendations to how DNB can approach improving their UD state. It is worth noting that all of these are possible factors that might hold value individually and that one could expect synergy effects if more of them are implemented.

6.2.1 Stricter demands towards external suppliers.

The simplest and cheapest action to take regarding improving the current state of UD at DNB would be to set stricter demands towards external suppliers and developers. Findings show that there is no significant difference between solutions developed in house at DNB or by external contractors. Setting stricter demands to competence and experience with UD towards third-party consultants, developers or testers would be a simple, cheap and partially impactful action to take. As the current situation at DNB is that UD is done on an initiative basis, only people who are aware and somewhat experienced can take said initiative. The competence that these external parties would bring might also rub off on other internal employees and thus raise the awareness of UD. After all, most contracts include a stipulation that states that the project is to conform to industry standards. WCAG 2.0 is both an internationally recognized standard which also is a legal requirement in Norway. In other words, it should not be hard to set these demands towards serious third-party developers, testers or architects.

6.2.2 Ensure that a triangulated testing approach is applied

Currently, there is no single recommended approach to UD testing at DNB. The few who actually work with testing UD demands are either using expert evaluations, automated testing tools and in some few cases also use user-testing. This study has not included user-testing approaches or diversity of included users in these user-tests. However, due to the unstructured nature of UD testing, it is highly recommended to follow a triangulated testing approach for UD testing. This entails acknowledging the issues that each testing approach holds, and try to use all three testing methodologies to ensure WCAG compliance. According to some studies, expert evaluations are flawed due to experts disagreeing with what expected results should be (Brajnik et al., 2010). As discussed in chapter [4.3.1 Siteimprove: Automated accessibility test tool](#), we also know that automated accessibility testing tools hold significant restrictions regarding test quality and test coverage. Due to the limitations highlighted with each testing approach, no single approach will be sufficient, and thus a triangulated testing approach is recommended. For said recommendation to have any effect, DNB still needs their project owners and architects to improve the non-functional requirement specifications of UD.

6.2.3 Re-evaluate UD-risk and include CSR and public perception.

Multiple sources point to the importance of a top down-focus from the executive branch to successfully implement organizational changes, such as incorporating UD into currently existing development and testing processes. It has been established that the department of compliance has conducted a risk evaluation of UD compliance. This evaluation concluded that the current risks related to incompliance did not justify bringing the topic up for the executive branch. Due to this evaluation, the executive branch has probably not been made aware of the current breach of national regulations and thus have not implemented any actions to improve on the issue. There might be risk factors beyond fines which the author questions if has been included in the current evaluation performed. The author argues that there are other risks that might not take the form of economic fines that should be incorporated into an evaluation performed by the department of compliance. Among some aspects that are deemed worthy of including in such an evaluation are; corporate social responsibility, improved user experiences, improved SEO, improved public perception of the company, opportunity to step ahead of the competition in the least UD compliant sector. In the end, if the issue of UD is not brought forward by the department of compliance , then who would? For the sake of its users and the role DNB is playing in peoples lives, DNB should not choose a passive role by waiting for an incident to happen before acting, as stated by some employees.

6.2.4 Stricter QA process with regards to UD as a non-functional requirement

Based on the research data collected and observations one can conclude that the quality assurance process has not taken universal design into account to a significant enough extent. The QA process should be stricter regarding UD requirements and hold projects accountable for not complying to the non-functional requirement of universal design. This also includes project managers to ensure that the proper competence is present at the team at the beginning of a project. The QA process is only present to ensure that a project is complying to the stated product requirements and it is the QA-teams mandate to hold a project responsible if these are not fulfilled. Improving the QA process entails; increasing awareness, increasing competence, be stricter with UD testing-documentation for the teams approach a quality gate, benefits of adhering to industry standards in accordance to self-identification (IT-company with a banking license), improve and update non-functional

requirements template, and acknowledge that the cost of fixing these issues only will rise if not taken seriously during the QA process. With power also comes responsibility, and it is both the QA-teams mandate and obligation to ensure requirement fulfillment.

6.2.5 Top-down focus to extend budgets to accommodate UD

In relation to subchapter [6.2.3 Re-evaluate UD-risk and include CSR and public perception](#), the top-down focus needs to be in place to implement UD anchoring within the already existing processes. Additionally, developers are experiencing pressure adhering to more and more requirements without being allocated more time to do so. This, in turn, leaves little room for middle management to make improvements without busting budgets. The executive branch should acknowledge the added amount of work that UD entails and made subsequent budget adjustments. In the end, if DNB ever receives an audit and fine due to non-compliance to the UD regulations, the fine will end up at the executive branch.

6.2.6 Anchor UD within internal focus policies

Even though the top-down focus is crucial, there still might be ways that middle management employees might take action. It is quite common for departments in large companies to apply for additional funding based on internal policies or focus areas. If this is the case at DNB, further exploration into the possibilities presented in the internal 4 THE FUTURE policy should be conducted. As shown in chapter [4.2 Process documentation and procedures](#) the topic of UD fits perfectly within both the 4 THE FUTURE policy and DNBs overall CSR. In other words, there might be possibilities that should be explored to ensure further funding based on the anchoring of internal policies.

6.2.7 Increase awareness and ensure competence

As discovered, there is an issue related to internal knowledge resources on the topic of universal design. The current internal documentation systems do not seem to support exploratory search, and very few employees use internal resources to acquire knowledge about the topic. DNB should take steps to improve the internal documentation and resources related to UD. There are also potential to improve the general awareness of UD through internal competence training tools like Motimate. There are however limitations to this approach as the platform mostly helps with awareness rather than competence. The need for increased awareness seems to be needed among multiple departments and do not need to be tailored to the needs of different actors. Content creators, designers, architects,

and testers all need to have a similar understanding of what UD is and what it entails at DNB, in other words, similar understanding with regards to awareness. The competence, however, should be tailored differently between departments due to the different aspects UD holds with regards to different actors. Even though initiatives have been taken by different parties prior to this thesis, it is a thankless and little impactful job that is hard to justify unless a top-down focus has been established.

6.2.8 Improve templates

There has been established an improvement potential in the current process documentation. The current templates provided to testers and architects do not emphasize the appropriate consequences of non-compliance or the proper resources one can use to learn more. This sort of improvement can to some extent be set as a requirement for the suggested QA process improvements to be successful. As an employee stated, “There is not any information about what it is or how one does it. My impression is then that people just skip it”. Even though there is some information about the topic in the templates, it is somewhat incomplete and does not support employees unfamiliar with the concept of UD.

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8. Appendices

This chapter contains all the appendices for this thesis. They include the interview protocol, detailed project plan, and risk matrix. The latter two were mainly used during the initial phases of the project.

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8.1 Interview protocol

Structure

Questions that were designed

Reasoning for questions in that group.

Background

Hello and welcome to this interview.

My name is Kristian Munter Simonsen and I work here at DNB as a test analyst at the department of test. I've invited you to this interview today with the intention of using your opinions, attitudes, knowledge, and experience to answer my research questions. I am studying Universal Design of ICT at OsloMet – Oslo Metropolitan University.

On the invitation letter, you were informed of the steps taken to safeguard your confidentiality. If you wish, I can repeat these. If not, I will just inform you once again that our conversation is being recorded. Try not to let this put any obstacles to how you express yourself. Briefly about the interview itself: I will ask you various questions regarding universal design and universal design in relation to DNB. You can answer as deeply or superficially as you

The interviews were started by giving some background information about this study so that the participant knows why the interview is conducted. The participant is also informed that he/she can leave the interview whenever he/she feels like it and that the interview will be recorded. During this introduction part, there are some points I would like to highlight as important. First, I want to make sure that the participant knows that I am working at DNB so that this does not come as any surprise if we ever were to meet at work after the interview. The author also wants to ensure the participant knows that the proper channels and approvals have been granted/used from DNB with regards to this study. As this study focuses somewhat on sensitive information, the participant is also, once more in addition to the consent form, informed that the interview will be anonymous and that the thesis will not be published without approval from DNB. By informing the

wish. I allow myself to ask follow-up questions if this should be necessary. You can choose not to answer a question if you so wish. After or during the interview, you can withdraw your statements completely if you so wish. You can reach me at XXXXXX@XXXXXX.XX or by phone: XXXXXXX. You have also received a copy of the consent form where you also will find this and other contact information.

1.1 Do you have any questions before we begin?

participant that it is possible to answer to whatever extent they feel comfortable with and that the interviewer might ask a follow-up question, this might lead the participant to think that the structure (and atmosphere) of the interview is semi-loose (semi-structured).

The consent form is based on NSD and OsloMet’s recommendations (“Informasjon til utvalget,” n.d.). The interview participant is informed once more that it is possible to withdraw from the interview both before, under and after the interview without giving any reason. Also, the contact information to the interviewer, the master supervisor, and the data protection officer at OsloMet is included in the information-paper.

To ensure that that all the information has been received loud and clear, as well as to answer any questions the participant might have before we start, the interviewee is asked if there are any questions, he/her would like to ask before we begin.

2.1 How has your day been so far?

2.2 How would you describe your mood today?

2.3 What do you do here at DNB/where do you work?

2.4 What types of projects have you worked with before starting DNB?

This part of the interview is intended for the interview participants to let off steam and give some basic information, such as mood, position, and department they belong to. If the persons day or mood is very positive or very negative, this might skew the answers and views on that specific day. What type of work the participant have been involved with before

**Letting off
steam**

<p>2.5 What do you like best about your job?</p>	<p>DNB and what the participant views as the best part of his/her job today is intended to shed light on past experiences and to bond with the participant based on possible shared experiences. As the name of the group of these questions entail, the aim is to let the participant let off some steam and as Cox and Adams explain, “If you do not allow them to unburden themselves of these issues at the beginning, you will find all your questions resulting in these points repeatedly resurfacing” (Adams & Cox, 2008).</p>
<p><i>Addressing issues</i></p> <p>3.1 What types of projects are you currently working on?</p> <p>3.2 What do you think when you hear universal design?</p> <p>3.3 How have you acquired your knowledge about universal design?</p> <p>3.4 Have you been offered training or course on the subject?</p> <p>3.5 If you are aware of the regulation of Universal Design, when did you first become aware of it?</p> <p>3.6 Have you used internal sources / documentation to expand your knowledge on the topic?</p> <p>3.7 Can you mention where / what information is available on internal sources in DNB?</p>	<p>The following questions are intended to steer the conversation more directly into the research topic and the questions at hand. This correlates with the group of these questions “addressing the issue”. As these questions will be used as a basis for all the interviews, different people with different roles might put more emphasis on different questions. This is totally fine and the introduction that is made to the participant also states this. Follow-up questions might be asked if some answer is unclear or if a new aspect /viewpoint comes into the conversation.</p> <p>However, I would like to mention that the last question, about rating from one to nine, is made particularly to collect data that summarizes</p>

<p>3.8 Have you been involved in testing or developing front-end solutions?</p> <p>3.9 How did you approach testing / order testing with regards to universal design?</p> <p>3.10 What tools / methodology was used during this process?</p> <p>3.11 How would you describe the results of the testing?</p> <p>3.12 Did you notice any errors that were repetitive / problematic?</p> <p>3.13 How would you describe your knowledge to WCAG 2.0?</p> <p>3.14 Have you ever experienced that a project has been suspended or required fulfillment of requirements due to lack of UD?</p> <p>3.14.1 If this has not happened, did the project comply to universal design requirements?</p> <p>3.14.2 How was apostate work documented / reported?</p> <p>3.14.3 Do you see yourself / you in the project returning to the absenteeism?</p> <p>3.14.4 Do you consider this as a technical debt?</p> <p>3.15 Whom do you think should be held liable if the project you were on is partially responsible for a fine by DIFI because of lacking UD?</p>	<p>the answers in a quantifiable way and that is easy to process and compare with other participants.</p> <p>There should be put some emphasis on the fact that a few of the interview participants were not asked a few specific questions because they're role is not correlating to the question or that previously answers already have shed light upon the topic. In the same way that, some participants were asked more tailored questions based on their role in the company. One example of this is the department head (P9) which is not working on a project-based level, but more delivery/management based as well as the compliance head that is not working with implementing solutions and works in a department that is separate from all other branches of DNB.</p>
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<p>3.16 Do you know where to go to learn more about UD internally in DNB?</p> <p>3.17 Do you know if there are any requirements in DnB's internal process documentation that describe UD requirements?</p> <p>3.18 I now wish you to give a rating of 1-9 after how much you think the following point is due to the lack of UD fulfillment, where 1 corresponds to "has nothing to do with the matter" and 9 "have very much of the blame":</p> <p>3.18.1 Processes 3.18.2 Expertise 3.18.3 Content Management systems 3.18.4 Test Tools 3.18.5 Budget / time 3.18.6 Attitudes</p>	
<p>4.1 How do you think DNB's approach to UU could be improved?</p> <p>4.2 Is there any more you want to add?</p> <p>Then I would like to thank you for your time and ensure you that I take your privacy seriously and will process the information you have provided with care.</p> <p>4.3 As the last question, to ensure that you are familiar with your rights as a participant in this study, where can you find information about what rights you have and how you can proceed to be removed from the survey?</p> <p>Thanks, and have a nice day</p>	<p>At this stage, the goal is to let the participant try to summarize his understanding and views on the issue. This is to clarify his/her statements and see what the participant wants to emphasize the most critical aspects of the issue. The answers might be quite different depending on what role the participant has but also allows for an open-ended summarized question at the end. To ensure that there is nothing that has been left out and that the participant has been able to talk about all aspects he/she deems important, question 4.2 is included. At the end of the survey, to ensure that the participant is aware of his rights and point-of-contact to be removed from the study if he/she so</p>

Debriefing

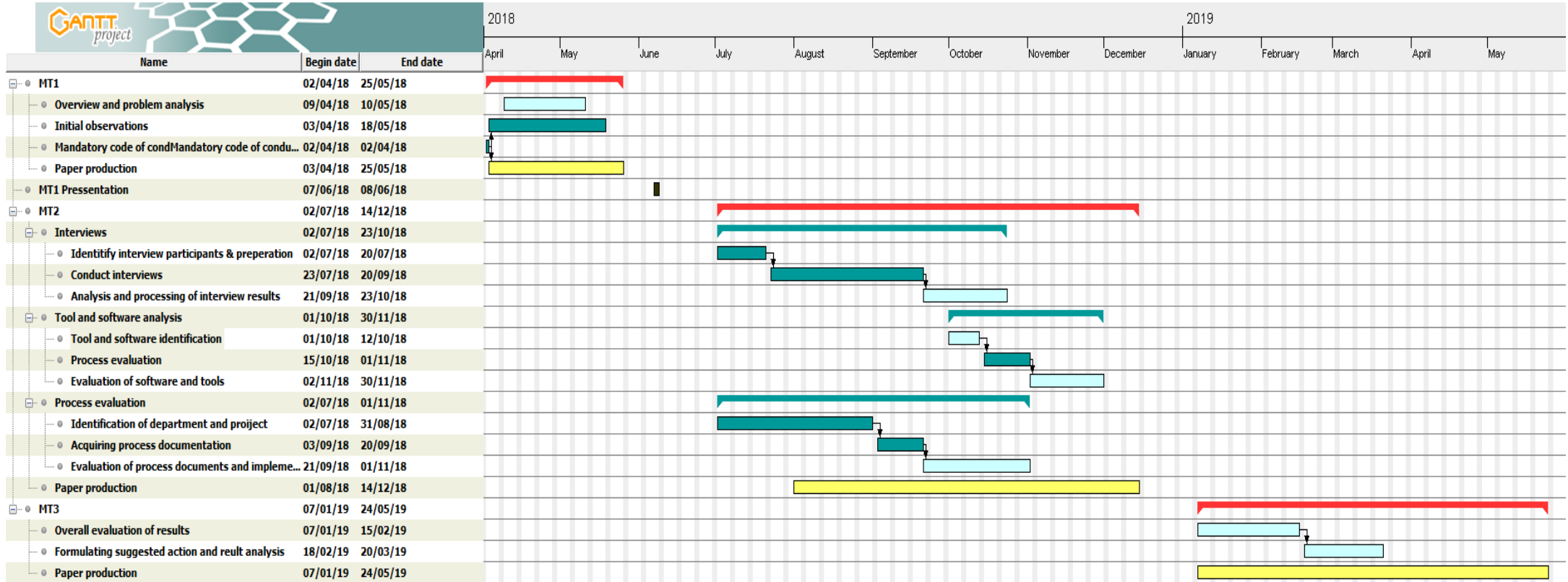
	<p>wishes, question 4.3 is asked as a quality assurance question. This question as well is intended to show a transparent and honest approach from the researcher. The interview is concluded with thanks to the participant.</p>
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8.2 Detailed project plan

To give a better insight into the planned activities and approaches it was deemed beneficial to create a Gantt diagram and a risk matrix. A Gantt chart gives a better understanding of the project's activities and dependencies, while a risk matrix helps to better identify, evaluate and control possible risks that the project faces.

8.2.1 Gantt chart

As shown below, the different part deliveries have been put into its own period (marked with peach color) with corresponding activities. The activities have been color to reflect which category it would belong to. Light blue activities are reflecting preparation and analysis, while aqua-marine colored activities reflect activities which are conducted in the field (DNB) and yellow are thesis production-based work. An arrow pointing to another activity indicates a dependency, where further progress stops until the activity is concluded. On the next page stages and activities are presented with corresponding estimated start and end date. As DNB is in the banking and finance sector, and as companies in this sector are large and less agile than other sectors, it might prove time consuming and challenging to recruit the correct type of interview participants. This is why there is allocated significant time to identify the correct interview participants.



Name	Begin date	End date
<u>MT1</u>	02/04/18	25/05/18
Overview and problem analysis	09/04/18	10/05/18
Initial observations	03/04/18	18/05/18
Mandatory code of conduct course at DNB	02/04/18	02/04/18
Paper production	03/04/18	25/05/18
MT1 Presentation	07/06/18	08/06/18
<u>MT2</u>	02/07/18	14/12/18
Interviews	02/07/18	23/10/18
Identify interview participants & preparation	02/07/18	20/07/18
Conduct interviews	23/07/18	20/09/18
Analysis and processing of interview results	21/09/18	23/10/18
Tool and software analysis	01/10/18	30/11/18
Tool and software identification	01/10/18	12/10/18
Application for accessing software	15/10/18	01/11/18
Evaluation of software and tools	02/11/18	30/11/18
Process evaluation	02/07/18	01/11/18
Identification of department and project	02/07/18	31/08/18
Acquiring process documentation	03/09/18	20/09/18
Evaluation of process documents and implementation	21/09/18	01/11/18
Paper production	01/08/18	14/12/18

MT3

07/01/19 24/05/19

Overall evaluation of results

07/01/19 15/02/19

Formulating suggested action and result analysis

18/02/19 20/03/19

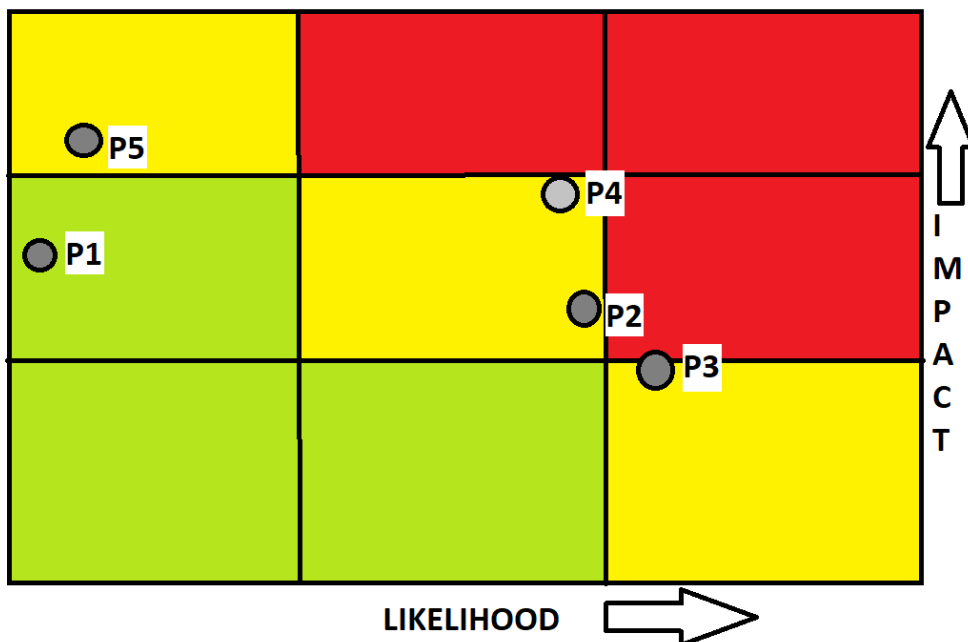
Paper production

07/01/19 16/05/19

*Dates are subject to change and are only intended as tentative/approximate dates

8.3 Risk matrix

A risk matrix was deemed necessary to get better control and overview of different risks the project has. Different identified risks have here been mapped according to the likelihood of it occurring and the impact it would have. The general rule of thumb is that if any risks are within the red area of the matrix, actions have to be made to either lessen the likelihood of it occurring or the impact the risk would have. In this case study, I have identified 5 different risks and mapped them accordingly. As seen on the matrix, none of the risks are in the red zone. However, P2, P3 and P4 are on the edge and needs attention during the study.



Risk	Likelihood	Impact	Reasoning	Overall assessment
P1 – Issues with recruiting the correct/ enough participants.	Low	Medium	As I have received the correct mandate from a cross-department head and have already announced my study to different departments, I deem the likelihood of it happening as low.	Low
P2 – Ethical issues with conducting research at the same place as I work.	Medium/ high	Medium	There has been raised some concerns regarding that a research pointing out flaws within the company might increase the probability of an investigation from DIFI. I have however made it clear that the research does not aim to evaluate the publicly available sites of DNB, but rather evaluate the processes, tools, attitudes, and routines around creating said sites. I have taken courses within DNB within code of conduct, and by following OsloMet’s ethical guidelines, I aim to counteract any occurring issues	Medium Consider actions to lower likelihood
P3 – Issues concerning reaching decision makers.	High/ medium	Low/ medium	As I am looking into DNB as a whole and, among others, how different tiers can affect the successful implementation of UD I need to conduct interviews of decision makers in different levels. This might prove difficult as they have tight schedules. However, it might be possible to contact second-hand sources, as well as the angle of the paper might be adjusted.	Medium Consider actions to lower likelihood.

<p>P4 – Too complex institution</p>	<p>Medium/ high</p>	<p>Medium /high</p>	<p>As Norway’s biggest banking and finance institution DNB is a large and complex institution. It might prove difficult to get a comprehensive overview of how the different departments work and how responsibility and decisions are divided.</p>	<p>Medium</p> <p>Consider actions to lower impact</p>
<p>P5 – Issues accessing software and tools used by developers.</p>	<p>Low</p>	<p>High/ medium</p>	<p>As a various amount of software is used for development, testing and publishing, Access to the software have to be granted. There exist solutions to apply for access to this software. Currently, I have access to some and I deem the likelihood of not being granted access as a low, but the impact as high/medium.</p>	<p>Medium</p> <p>Consider actions to lower impact</p>