DANSK RESUME

Dette speciale omhandler hvordan digitale designere samarbejder når de arbejder remote i et hybridt arbejdsmiljø. Herunder definerer vi et hybridt arbejdsmiljø som, skift mellem at arbejde fysisk på kontoret og remote hjemmefra. Det hybride arbejdsmiljø er blevet mere udbredt efter COVID-19 pandemien og det har vist sig, at der både er fordele og ulemper ved dette. Yderligere, kan der være særlige udfordringer for digitale designere når de skal flytte deres samarbejde til at være remote. I dette projekt dækker titlen digitale designere over designere der udvikler digitale løsninger. I dette speciale undersøger vi remote samarbejde mellem digitale designere gennem et multiple casestudie, samt en evaluering af vores resultater med digitale designere.

Multiple casestudie

Dette casestudie har til formål at undersøge hvordan digitale designere samarbejder i når de arbejder remote. Casestudiet var opdelt i to faser og i første fase, undersøgte vi remote samarbejde ved at observere vores deltagere udføre en prædefineret opgave, som vi i samarbejde med en digital designer der arbejder i en offentlig virksomhed, havde lavet. Vi observerede i alt seks deltagere fordelt i tre par og vi afholdt observationen remote via Microsoft Teams. Deltagerne var studerende på 10. semester Interaktionsdesign på Aalborg Universitet og parrene var vant til at samarbejde med hinanden. Efterfølgende analyserede vi dataene med fokus på at udvælge interessante videoklip med potentiale til at vi kunne undersøge dem mere i dybden. Herefter, i fase to, afholdt vi opfølgende interviews hvor vi viste de udvalgte videoklip til deltagerne for at skabe refleksion. Dataene fra observation og de opfølgende interview blev samlet for hver case og herefter sammenlignet for at finde ligheder og forskelle mellem casene. Resultatet af de to faser i vores multiple casestudie var seks guidelines der beskriver hvordan digitale designere kan optimere samarbejdet remote.

Evaluering af guidelines med digitale designere

Vi evaluerede vores guidelines med digitale designere der arbejder i virksomheder for nærmere at undersøge om de seks guidelines passer til virksomhederne og hvilke ændringer der eventuelt skulle laves. Evalueringen bestod af et individuelt interview hvor facilitatoren præsenterede én guideline ad gangen, beskrev den og til sidst gav et eksempel på den guideline. Herefter blev deltageren bedt om at reflektere, tænke højt og give eksempler baseret på deres egne erfaringer. Der var i alt tre deltagere fra to forskellige virksomheder der alle udvikler digitale løsninger. Interviewene blev afholdt remote via Microsoft Teams og de blev både video samt lyd optaget. Herefter transskriberede vi vores interviews og baseret på dataene, blev der lavet ændringer i nogle af de seks guidelines mens andre blev beholdt uændret. Som resultat af vores multiple casestudie og evaluering med digitale designere, præsenterer vi seks endelige guidelines med eksempler fra de digitale designere vi evaluerede med og deres refleksioner.

De seks guidelines er: 1. Alle i samarbejdet skal man kunne se hinandens live interaktioner. 2. Alle i samarbejdet skal kunne have samme mulighed for at redigere. 3. Benyt et tool der tilbyder brugen af basis figurer. 4. Del inspirationskilder med alle i samarbejdet. 5. Brug samme set up når man samarbejder remote som på kontoret. 6. Uanset hvilket tools der bruges, skal resultatet digitalisere når man arbejder remote.

Vores seks guidelines beskriver hvordan digitale designere mere optimalt kan samarbejde remote og hvor nogen af dem er specifikke på funktioner i et design værktøj, relatere andre guidelines sig mere praktisk til den digitale designers computer set up. Ydermere, er vores guidelines nogle der kan tages inspiration fra når man samarbejder remote i et hybridt arbejdsmiljø.

Til fremtidig forskning ser vi mulighed for udforske de seks guidelines i andre etablerede samarbejdssituationer mellem digitale designere og relevante professioner. Under evaluering med digitale designere var der flere af dem der overvejede vores guidelines i relation til deres samarbejde med f.eks. softwareudviklere og dette gjorde os opmærksom på vigtigheden af disse andre typer af samarbejde, hvilket kunne lægge grund for fremtidigt arbejde.

Collaborating Remote: Guidelines for Digital Designers

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ABSTRACT

Remote work is increasingly becoming a part of everyday work today and has increased in popularity in the last couple of years. Companies are adopting this new way of working, and teams collaborate remotely to accommodate this. Different tools have been developed with functions that support remote work and collaboration. However, even though working remotely has many advantages, it is not without challenges for digital designers when navigating remote collaboration. We present a multiple case study with the purpose of exploring how digital designers collaborate in remote work settings and, with this understanding, how this can be supported. The study is based on observations and interviews with six master's students and resulted in six initial guidelines. These initial guidelines were further iterated upon and evaluated with three digital designers, and as a result, we developed six final guidelines. Our study contributes six guidelines that describe ways to support digital designers in remote collaborations. Based on our findings, we reflect on and discuss the use of the guidelines and their relevance to supporting digital designers in remote collaborations.

CCS CONCEPTS

• Human-centered computing • Human computer interaction (HCI).

KEYWORDS

Remote Collaboration, Digital Designer, Digital Tools, Multiple Case Study

INTRODUCTION

Remote work is here to stay. The COVID-19 pandemic has shown new directions for the potential benefits and possibilities of working hybrid and remote. Choosing to combine working co-located and remote seems to be a part of the future, as it has become increasingly popular for workers to make their own choice [1], [2]. Working in remote settings has become more prevalent in recent years, both for individual work and collaborating teams. Digital tools have significantly impacted how teams have continued collaborating while working remotely; such examples are Microsoft Teams and Zoom, which have enabled teams to communicate and collaborate remotely. Today, many digital design tools are developed with functions specific to support design teams in collaborations, for example, the tools Figma and Miro. Such tools have positively impacted design teams in the transition to collaborating remotely. These tools allow designers to collaborate and work together on creative projects, even from different locations. In 2020, Miro [3] posted an article on their website called, 'The ultimate guide to remote work.' This guide suggests five best practices to create a better remote team culture based on experiences from working at Miro. The practices are general and describe things to have in mind when at work, such as remembering to make time to, as they call it, chitchat at the beginning of a meeting to strengthen the relationship in team collaboration. Another practice is to outline goals and visions as a team in a shared document. Further, the guide describes how remote collaboration is practiced in different ways in a company and that teams often use the same collaboration tools regardless of whether they are in a fully remote company, are working co-located, or in a combination like hybrid. They use the same collaborating tools despite the collaborating team's placement, as often, one in the team will not be working co-located in the office. [3].

Several research studies within the field of HCI have studied the topic of hybrid- [4] and remote work [5]. Moreover, a study described how researchers transitioned their user-centered study from co-located to remote due to the pandemic [6]. Other studies have looked at collaborations and tools, as they studied how interaction designers use physical and digital tools for idea generation in collaborations [7]. As we see that remote work is increasingly becoming a more significant part of everyday work, it is essential to understand remote work and the challenges it

brings for collaborating teams. Even though both research studies and companies are trying to develop tools to better support collaboration, digital designers (UX/UI, Interaction designer) face new difficulties trying to navigate remote collaboration. Different things need to be considered with the new type of work as it may not be possible to convert how digital designers collaborate when they are co-located to when they collaborate remotely. To understand how this can be assisted, we need first to understand how digital designers work in remote collaborations, and this leads to our research question for this paper:

How do digital designers collaborate in remote work settings, and how can this be supported?

We seek to explore how digital designers collaborate when they work remotely, in a world where they both collaborate remote and co-located. To understand this, we conducted a multiple case study [8] which consisted of observations with participants collaborating on a predefined assignment. Afterward, we conducted follow-up interviews with the participants, and to invoke reflections we showed them video clips from the observation. Then we analyzed the collected data from the observation and the interview and developed six initial guidelines for digital designers' remote collaboration. The guidelines were then evaluated by digital designers from two different companies, resulting in six final guidelines. The guidelines are 1. *The collaborating team must be able to see each other's live interactions.* 2. *Everyone in a design collaboration must be able to have the same opportunity to edit.* 3. *Use a tool that offers the use of basic figures.* 4. *Share inspiration material within the collaboration team.* 5. *Use the same setup when collaborating remotely as when placed co-located.* 6. *Regardless of the tool, the outcome should be digitized when working remotely.* Our guidelines describe ways to support digital designers in remote collaborations and can be used by both digital designers and companies that would like to support better remote collaboration.

In the following sections, we will first introduce related work within the field of HCI. Secondly, we will describe how we planned and conducted our multiple case study and the process of how we analyzed the data. Thirdly, we describe the results of the study, six initial guidelines. Then we will explain how we evaluated the guidelines with digital designers and present the final guidelines. This will be followed by a discussion section of our guidelines concerning related work and reflections. At last, we present a conclusion on how digital designers can collaborate remotely and how to support this as well as future work.

RELATED WORK

The following section introduces related HCI research that is found interesting for our study. First, we look at how prior work has offered insights into better practices for UX teams collaborating in distributed teams. Then we present the possibilities and limitations of using online document tools in remote design collaborations and how they work compared to face-to-face collaborations. Lastly, we describe the challenges and opportunities of a digital affinity diagramming tool for distributed teams working remotely.

Best Practices for Remote Collaboration with Distributed Teams

Many larger companies like Microsoft have offices located worldwide, resulting in distributed teams working together from different cities and countries [9]. Accordingly, they are gaining a global perspective and can share different aspects across the company. As a result of working from different locations, it is crucial that the teams can work remote when collaborating. Nonetheless, working remote in distributed teams is not without challenges, for example, when collaborating teams are in different time zones. To accommodate some of the challenges, Yiu [9] proposes seven best practices for collaboration in distributed teams to form a successful project outcome. The practices are based on experience from working in a UX team at Microsoft. [9].

Yiu's [9] first practice describes that a physical kickoff meeting should be planned for every new project start. The second practice explains that the teams should have a budget for recurring visits to continue a successful collaboration. The third practice describes the importance of a good partnership within the team, where their ideas will be valued by others even if they are absent. The fourth practice presents the value of choosing the right communication channel to ensure that a message is received the intended way. Thus, writing an email indicates that the message is not urgent, and an instant message or a phone call is often used for quick check-ins. The fifth practice is to establish a good working relationship by early and frequently sharing design ideas and involving others in brainstorms. The sixth practice describes what to think about when planning meetings, so everyone in the team is considered. This means that the meeting should include a clear agenda for the participants and avoid last-minute changes. The seventh and last practice is to be mindful of other cultures and their cultural and technical differences. With this, it is essential to have open communication and mutual respect so that the project can be finalized. [9].

The paper by Yiu [9] provides a valuable guide to ensuring better practice while collaborating remotely in distributed teams. It highlights crucial aspects to improve and continue a successful collaboration when teams are placed in different locations. Further, it describes the practices concerning working in teams over distance and includes aspects of being in different time zones. Overall, we see that the practices by Yiu [9] have a more practical view on collaboration over distance. In contrast, our study focuses more on how digital designers collaborate synchronously in remote settings. Nonetheless, we find the insights from Yiu's [9] paper interesting as it sheds light on aspects that need to be considered to continue successful remote collaborations in larger teams.

Online Document Collaboration Tools

Today many different online tools support collaboration, and one of them is Google Docs, which offers different ways to collaborate remotely. Jung et al. [10] conducted a workshop study to compare design collaborations using only Google Docs with face-to-face collaborations. With this, they were to explore the possibilities and limitations of online document collaboration tools for design problem-solving activities for designers. Their study analysis indicated different influences, and they identified four possibilities and three limitations of using Google Docs for collaborations compared to face-to-face. [10].

The first possibility is Simultaneity: Possibility for Co-Creating or Divided Creating. This was found to be one of the most important possibilities. It regards the simultaneous communication and participation that Google Docs offers, as it is possible for those collaborating to input keywords simultaneously. Compared to face-to-face collaboration, they found that the participants needed to take turns and were not able to do it simultaneously. This meant that more keywords were generated when using Google Docs to collaborate, as they did not need to wait but could just write keywords in the document at the same time. Moreover, as keywords were generated, they inspired each other, and some of the keywords were connected, resulting in the creation of more keywords. [10].

The second possibility is Shareability: Possibility of Sharing without Delay. It explains how in Google Docs, it is possible to use sources like images for creative thinking, and it is possible to share them immediately after they are retrieved online. In face-to-face collaborations, the participants need to share images one after one as they present the images, for example, using Microsoft PowerPoint. In contrast, when using Google Docs, everyone can share their images simultaneously and keep inspiring each other during the process. [10].

The third possibility is Visualizability: Possibility of Visualizing Every Activity. This one presents how all communication and participation in Google Docs is visualized either using text or images. In face-to-face collaborations, design discussions are often verbal, which can confuse when concepts or aspects need to be clarified. If the participants disagree, it can be difficult for them to explain and reach an agreement face-to-face. As the participants could visualize their thoughts and specify ideas using text in Google Docs, this was not regarded as a problem. Furthermore, by visualizing it in Google Docs, the design process became more apparent, and the participants were able to see their process with directions and the choices made. [10].

The fourth possibility is Recordability: Possibility of Reminding of and Reusing Recorded Activities. This one is similar to Visualizability, which describes the visual representation of using text and images, and Recordability is the visualization recorded and saved. The recorded representations could remind the participants of the process and details when they returned.

A design process is often more than just one meeting, and by using online collaboration tools, participants can return to see the process and the ongoing design choices. However, in face-to-face collaborations, the documented parts did not often include details but did include a more extensive outcome and design decisions. Using Google Docs proved to be more efficient, as the participants could go back to see the whole process and were also able to reuse some of the material. [10].

Looking at the limitations found, the first is Lack of Visibility/Audibility for Limited Group Awareness. In contrast to face-to-face collaborations, using Google Docs to collaborate lacked visibility and audibility, which resulted in less awareness of the other participants. Moreover, with this lack, it becomes difficult to see others' intentions until they share them in the document they are collaborating in. [10].

The second limitation is Lack of Audibility for Limited Narrative, Humor, and Discussion. This limitation explains how collaborations using Google Docs often do not have discussions and narratives that include things like humor and puns. Moreover, as a result of how text makes it difficult to include longer sentences and narratives, decisions are often not based on active discussions in Google Docs. In contrast, in face-to-face collaborations, communication is often verbal, and thereby it is more natural to include humor and puns. [10].

The third and last limitation Jung et al. [10] found is Lack of Drawing Ability for Limited Designerly Ways of Thinking. This limitation regards the issue of not being able to, for example, sketch on paper when using Google Docs to collaborate. In face-to-face collaborations, designers often sketch to express and communicate ideas. Moreover, the function of drawing in Google Docs could not replace sketches on paper. As a result, the participants could not express their ideas in the intended way and had to use other methods like user scenarios to communicate and decide on an idea. [10].

In summation, Jung et al. [10] found that using Google Docs in collaborations had different possibilities and some limitations to have in mind compared to face-to-face collaborations. With this, the authors propose that looking at the Double Diamond Design Process Model [11], it would be plausible to use online document collaboration tools for the divergent thinking stages and face-to-face collaboration for the convergent thinking stages. [10].

Jung et al. 's [10] paper explains how online document collaboration tools can be used in collaborations. However, it also shows aspects that should be considered when collaborating remotely using an online collaboration tool. In contrast, we find that our work differs from their study in the ways that we do not focus on a specific tool but give the participants the possibility to choose tools, which we see as an opportunity to understand why some tools are preferred over others. Further, in a more specific manner, some of the limitations that regard the lack of visibility and audibility we do not find to be a challenge, as our study

combines digital tools with a communication platform that supports video and audio. However, we still see their findings as relevant, and the other limitations they found are worth considering as we see these as general limitations to collaborating remotely using digital tools.

Digital Distributed Affinity Diagramming Tools

Digital tools are increasingly becoming a part of everyday work for digital designers. In some ways, digital tools are trying to replicate or even replace some of the physical tools, as digital tools can enable collaborating teams to work co-located and remote. However, not all physical tools are easy to digitize, nonetheless, there have been studies trying to create and test digital tools to replicate or replace the physical tools [12]. In a study by Remy et al. [12], they developed and tested an online collaboration tool to explore the challenges and opportunities of digital tools where the distributed team is working remotely.

To examine online collaboration tools with teams that cannot work co-located, Remy et al. [12] developed a digital affinity diagram tool. Affinity diagrams are, in HCI, a collaborative sense-making approach to analyzing a set of data. Researchers use sticky notes to represent data and place the sticky notes on a wall to create clusters. Remy et al. [12] conducted a user experience study with participants who were master's students familiar with affinity diagramming from attending an HCI design course. The study consisted of remote observations, semi-structured interviews, and they analyzed the data using an affinity diagram. The results of this study were three key insights into digital affinity diagrams.

The first insight is that Digital Diagrams Reduce Awareness of Co-participants' Actions. As the name implies, the insight issues how they found that the participants struggled with not being able to see each other's position and what they were currently doing with the digital affinity board. With this, the participants could not determine if the other participants were reading the sticky notes as they could not see their body language. Consequently, they had difficulties understanding what the other participants were focusing on in the affinity board. As a result, the participants were unsure if they were to interrupt the other participants' process or even move a sticky note others were reading. [12].

The second insight is that Digital Diagrams Provide Fewer Cues About Ownership and Use. The physical affinity diagram makes it possible to see who has written the different sticky notes due to interpreting the handwriting. However, the digital diagram did not provide the ability to handwrite notes, which resulted in a lack of ownership. Another issue caused disorientation in the digital diagram, as the participants struggled to find notes others had moved. They suggested that they would like to either see the history of the note or just have some retracing of the note. [12].

The third and last insight is Digital Diagrams Save Time, Improve Manipulation and Overview. While the digital diagram has some drawbacks concerning the physical affinity diagram, it also has some advantages. The digital diagram has an unlimited supply, and any color for the sticky note is available. It does not have the problems of sticky notes that stop being able to stick to the wall, and they are much easier to move, especially when moving more than one. Another important benefit is that it is easy to edit the text in the digital diagram, just as it is easy to share the diagram with others. [12].

There is an increased demand for tools that support remote collaboration, and tools need to be developed to support this type of work. Remy et al. 's [12] study present insights that indicate how physical tools for collaborations in some ways can be digitized to be able to support remote collaborations. However, it also shows that not all functions and aspects can be converted from physical to digital tools, or at least there are some drawbacks of digitizing the tools. Nevertheless, we find the insights essential to consider when trying to understand how digital designers collaborate remotely. Furthermore, this can help our understanding of why some tools are preferred in remote collaboration.

MULTIPLE CASE STUDY

This section describes our multiple case study, which is divided into two phases, and how we analyzed the data. Further, we present the outcome of the multiple case study, which is six initial guidelines that describe what digital designers should consider when collaborating remotely.

According to Yin [8], a case study examines a case in its natural settings, and a multiple case study includes multiple similar cases. Our study was conducted from our case study protocol (appendix 1) we developed with inspiration from Yin [13]. It had the purpose of investigating how digital designers collaborate in pairs when working remotely with a focus on collaborative interactions. The multiple case study consisted of two phases: Phase one included a remote observation with participants working on an assignment followed by a small interview. Phase two consisted of follow-up interviews with the participants where selected video clips from the remote observation were shown.

Phase One

Phase one included six participants in three dyads, referred to as case A, B, and C, and the participants from each case will be referred to by the case letter and a number, e.g., A1. The participants were master's students from Aalborg University studying Interaction design in the 10th semester. They were chosen as they already have an established collaboration with each other, and we sought to observe their collaborative interactions. The assignment (appendix 2) for the remote observation was created in collaboration with a UX designer from a public sector company to develop an assignment close to reality.
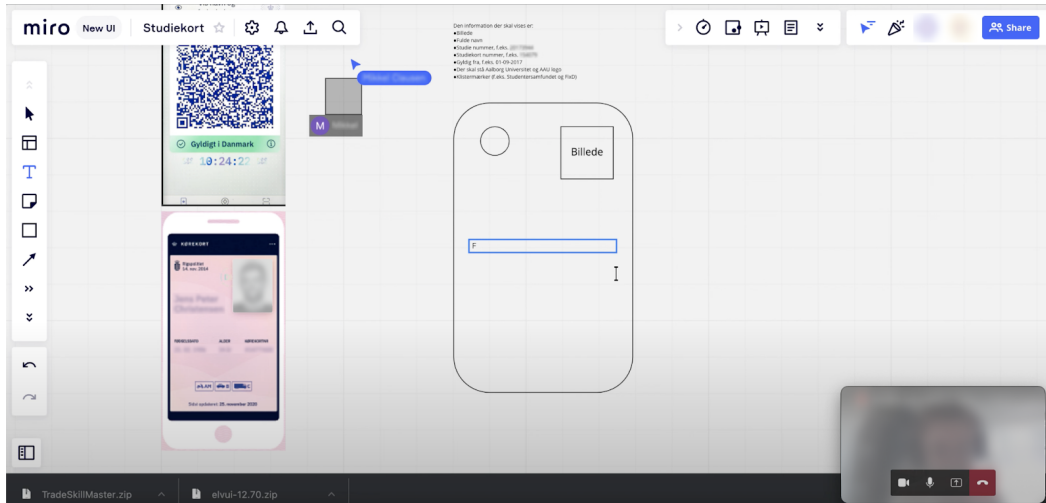
Figure 1. Picture of participant B2's screen during the assignment.

We conducted phase one remotely through Microsoft Teams to have the participants placed in their usual remote computer setup. The Teams call was video and audio recorded, and the participants recorded their screens. Figure 1 is an example from the assignment of participant B2's screen. The figure displays the live mouse interactions of participant B1 from B2's point of view, along with the live video of B1 from the Microsoft Teams call in the bottom right corner. One from the research team acted as the facilitator during the observation, and the other took notes. At the end of the observation, artifacts were collected, including the assignment's outcome and pictures of the design process.

We first analyzed the Teams video recordings in plenum to create a shared understanding within the research team, followed by combining this with the observation notes and collected artifacts. Then we analyzed the participants' screen recordings by looking through them individually and noting interesting timestamps and notes. Afterward, we looked at the timestamps and notes from each case one at a time and merged them based on the interest questions from the case study protocol (appendix 1). Further, with inspiration from Buur and Sondergaard [14], we selected video clips from both the participants' screen recordings and Teams video recordings that we found interesting and would like to investigate with the participants in phase two.

Phase Two

In phase two, we conducted individual semi-structured follow-up interviews with the participants through Microsoft Teams, and again the interviews were video and audio recorded. At the interviews, we showed the selected video clips from the observation to the participants, along with questions to invoke reflection.

The interviews were analyzed by first being transcribed. Afterward, based on the interest questions from the case study protocol (appendix 1), we clustered the transcribed data by looking at one case at a time. This was then combined with the analysis result from phase one, one case at a time. Finally, we compared the three cases by looking at the data for each interest question from the protocol. This resulted in six initial guidelines, described in the following section.

The initial guidelines

The result from this multiple case study and its two phases was six initial guidelines that describe what digital designers should consider when collaborating remotely. The initial version of the six guidelines will be described in this section by first presenting their initial number, e.g., 0.1, followed by the title, a description, and finally, examples of the guideline from phase one and two.

0.1 The collaborating team must be able to see each other's live interactions

It must be possible to see each other's live interactions to collaborate optimally in a tool. Further, it is an advantage to see each other's mouse movements, for better support of the collaboration.

During phase one, all three cases chose a digital tool that supported this, and they used the mouse to point at certain elements. To exemplify, C1 and C2 used the tool Figma to solve the assignment, and as they were collaborating, C2 followed C1's mouse movements while C1 was pointing and talking about a specific design element. When reflecting upon this situation in phase two, C2 said: *"I feel that it gives some kind of extra dimension that you feel that you are somehow sitting together even though you are sitting separately, and you are actually sitting and talking live (online)."* A1 further explains this aspect:

"It (pointing with the mouse) is just a really good function to have online, so it is a bit like the physical way of pointing."

0.2 Everyone collaborating must be able to have the same opportunity to edit

For everyone to have the same starting point in the design collaboration, all must have the same access to functions and options to edit in the tool.

During phase one, all three cases choose digital tools (e.g., Miro and Figma) where everyone collaborating has the same editing options. For example, in contrast to a situation where one person shares their screen, e.g., through Microsoft Teams, A1 states: *"It becomes a controlling environment because there is one who is going to have all the power…. And that is totally a downside for the other person, but also just in a general design perspective because then it is only one person's ideas that shine through".*

0.3 Use a tool that offers the use of basic figures

To have a quick and easy starting point for the design collaboration, it can be an advantage to choose a tool where it is possible to insert basic figures rather than drawing from scratch.

To further elaborate, everyone in phase one chose a tool where it is possible to use basic figures, and all three cases used these figures to create their designs. Several participants explained that they did it because it was a fast and easy way to create a design. Accordingly, C1 expressed that: *"It is both tools (Miro and Figma) that are good for visualizing something quickly instead of sitting separately (the collaborating team) and sketching and then showing it to each other via webcam."*

0.4 Use inspiration material in a collaborative tool

To create a shared starting point, the collaborating team can insert existing solutions and other sources of inspiration into a collaborative tool. Furthermore, it is beneficial to choose a tool that supports a quick and easy way to insert these.

Regarding phase one, one of the first things that all the participants did when working on the assignment was to insert pictures of similar products. For example, B1 and B2 inserted pictures of the danish Corona-pas app and the danish driving license app as inspiration. To further unfold, C2 explains why they used inspiration pictures when collaborating: *"I think that it was in order to ensure that we talked about the same thing."* In extension, C2 said: *"…it was to ensure that we had the same starting point to talk about things."*

0.5 Use the same setup when collaborating remotely as when co-located

The same computer setup must be used to create a smooth transition between collaborating remotely and co-located.

As an example from phase one, C1 was participating from a laptop instead of C1's typical work setup (with multiple screens, external mouse, and keyboard) and expressed multiple times that it was challenging. In continuation, it impacted the collaboration as C1 said that it would be C2 that primarily should create the design in Figma as C1 felt limited when using the mousepad on the laptop. The impact of the computer setup was also commented upon by A2, who has a computer set up at home with multiple screens, extern mouse, and keyboard and uses a laptop when working outside the home (e.g., at the university): *"I always prefer, using, e.g., Photoshop and other editing tools, whether it is editing videos or other things, on my computer at home which can handle it, it is faster. I have a large screen, so I can see things… and not (using) a trackpad like there is on the laptop that I use at the university. When working from home, there are many tools that I feel are much easier to use."*

0.6 Use digital tools when collaborating remotely

Use only digital tools when collaborating remotely to ensure that everyone collaborating can interact on the same basis.

To exemplify this, phase one showed a situation where B1 tried to show an app on his phone to B2 by holding the phone in front of the computer camera, but it did not work as intended as B2 could not clearly see it. This is further unfolded by A1 in phase two, who answered a question regarding the use of digital tools: *"Generally, I think that the approach of using the correct (digital) tools and it is fast, then it is just easier to see it (the design) when it is visual (in the digital tool)."* In continuation, A1 explained how it would work to sketch on a piece of paper and then show it to the webcam for the other person to see: *"It is a bit ridiculous to go through all these steps, in a way, it feels a bit unnecessary… it is also one of the advantages that everything takes place digitally - the ability of doing that (quickly higher fidelity)".*

EVALUATING THE GUIDELINES WITH PRACTITIONERS

We evaluated the guidelines with practitioners to further iterate and try out the guidelines. This section describes the method used to evaluate the guidelines, how the guidelines were revised, and at last, the final guidelines are presented.

The purpose was to evaluate the guidelines with digital designers from different companies to see whether the guidelines applied among digital designers. To investigate this, we conducted individual semi-structured interviews with three digital designers from two different companies that both create digital solutions, from now referred to as participant D, E, and F. The interviews followed an interview guide (appendix 3) consisting of a walkthrough of one guideline at a time with a presentation, description, and an example of the guideline. In addition, the participants were asked to reflect and comment on the guideline based on their own experience, and they were encouraged to provide examples hereof. The interviews were conducted remotely through Microsoft Teams and were video and audio recorded.

The process of examining whether or not the guideline made sense for digital designers started by transcribing the interviews and then comparing the data from the three interviews for each guideline. From this, we concluded whether the guideline should be edited, rejected or if it was acceptable. This process resulted in the final six guidelines presented in the following section.

The Final Guidelines

The final guidelines are presented with a description of the changes and examples from the evaluation with digital designers.

1. The collaborating team must be able to see each other's live interactions

Result: All three participants agreed that this guideline was relevant and essential, and therefore there are no changes to this guideline.

Argument: Participant D explained: *"Basically, if you sit two and work together, then it makes sense that you can see where each other is, and that you also have the opportunity to say that now I follow you (via the mouse), and then you can see where the person moves around and stuff like that, so we use it a lot."* In continuation, one of the participants explained that their company chose to change their primary tool because they wanted a tool that supported synchronous collaboration. Figure 2 shows a picture from phase one illustrating guideline number one, where the collaborating team can see each other's live interactions.
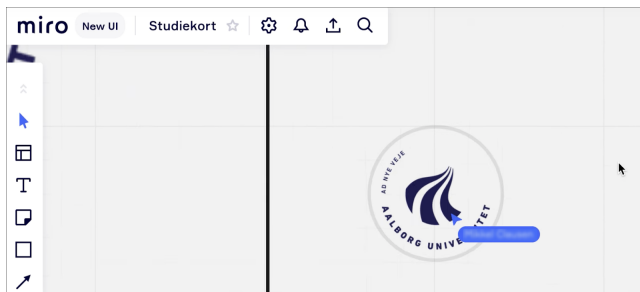

Figure 2. Screenshot of B1's screen from phase one illustrating guideline number 1 as the blue pointer is B2's and the black one is B1's.

2. Everyone in a design collaboration must be able to have the same opportunity to edit

Result: In some aspects, the participants agreed that the guideline was relevant. However, based on their insights, we changed the title to include that it should specifically be in a design collaboration.

Argument: The participants agreed that when collaborating on a specific design, it was important that those in the collaborating team had the same editing opportunities. However, if the collaboration is about sparring and feedback, they did not find it necessary, as the important thing was that everyone could access the same tool. This was explained by the participants who described that when they have the same role, for example, co-designing in a project, they must have the same opportunities.

However, it is not essential in collaborations where they have different roles, like only providing feedback. This is explained by participant E: *"It depends a bit on what kind of collaboration, because if it is really a creative collaboration, where you actually do something like design work or brainstorm around some topics, then it can be very smart that you can do it at the same time."*

3. Use a tool that offers the use of basic figures

Result: All three participants agreed to this guideline, and therefore there are no changes.

Argument: The participants explained that this guideline is relevant because basic figures make it fast and easy to create new elements. Furthermore, one participant explained that it is faster than sketching on paper. In addition, participant D explained: *"I do not think that I could imagine a tool that could not do this already."* In continuation, participant F said: *"It definitely makes the work easier."*. The digital tool Figma is one of the tools supporting this guideline, and figure 3 shows this guideline in Figma.
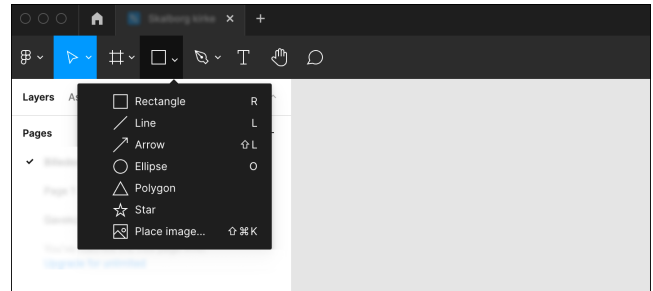

Figure 3. Illustrating guideline number 3 in the digital tool Figma (which offers basic figures).

4. Share inspiration material within the collaboration team

Result: All three participants agreed with this guideline and found it relevant. However, the title was changed to include that the inspiration material could also be used in both a physical and digital form when working remotely.

Argument: The title was changed as participant F pointed out a preference to have the material in a physical form and therefore prints the inspiration material and shares the printed material before a remote collaboration. The participants explained that they all used inspiration material. Examples of this could be pictures from a competitor's product or pictures from their own company's products to visualize the overall design. Participant D explained that: *"Of course, we go out and look at best practices from all sorts of places and take screenshots and links and all sorts of things, we do a lot of that in order not to have to start over if you can say it like that."*. Figure 4 shows a picture from phase one illustrating this guideline, where C1 and C2 share inspiration material in a digital tool while collaborating.
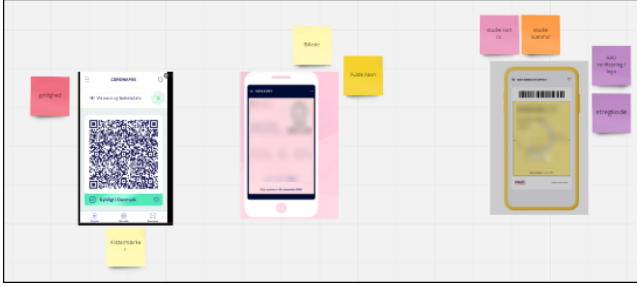
Figure 4. Picture from phase one illustrating guideline number 4, where participants C1 and C2 shared inspiration material in a digital tool.

5. Use the same setup when collaborating remotely as when placed co-located

Result: All three participants agreed that this guideline was important, and therefore there are no changes.

Argument: This guideline is more critical when frequently working remotely, as when working remotely, digital designers have a more substantial need for a correct and good setup. However, the participants all agreed that it depends on how often they work remotely and which tasks they have. For example, participant E explained: *"It depends a bit on the tasks, but if it is a collaboration where you have to be creative, and you have many programs open, then it is definitely an advantage that you also have room for it, because if you only have your laptop screen and you need to have several things open at once, then it can be really cumbersome."*

6. Regardless of the tool, the outcome should be digitized when working remote

Result: The participants had mixed opinions about this guideline, and therefore the title and description were changed, to include both physical and digital tools. Where the most important aspect was that it needs to be digitized regardless of the tool.

New description: The outcome of using a tool (physical or digital) should be digitized to ensure that everyone collaborating can interact on the same basis.

Argument: Participant D agreed to this guideline but pointed out that the most important thing was that the outcome ended digitally. Participant E had a split opinion about this guideline and explained that physical tools sometimes have other possibilities. The tools can provide more freedom and be quicker to create low-fidelity designs. It was pointed out that a combination of physical and digital tools can be beneficial if it ends up digital. Participant F was both for and against the guideline and said: *"It works really well (to use digital tools), also because then you have it all gathered afterward, and there is not a lot to gather."* However, participant F also explained: *"It is easier just to group them (Post It notes) physically than if it is (thinking pause) of course, you can do it digitally, but I do not think it gives the same overview."*

DISCUSSION

This section will first reflect on our guidelines and discuss some of their limitations. Secondly, we unfold if the guidelines mirror physical interactions or a new aspect. Thirdly, we argue how our guidelines differentiate from best practices suggested for distributed UX teams. Fourth, we describe the possibilities and drawbacks of digitizing tools for remote collaborations. Fifth, we discuss the influence of digital tools on digital designers in remote collaborations. At last, we reflect on our research approach and how we had an unexpected discovery.

Our guidelines are developed to support digital designers' remote collaboration. In essence, we find that digital designers can use the guidelines as suggestions to strengthen the collaboration between digital designers. Moreover, companies employing digital designers can also use these guidelines to improve remote collaborative settings for their employees. Besides companies that employ digital designers, we think that companies developing digital tools can take inspiration from the guidelines when designing new tools or further developing existing tools. Accordingly, the guidelines can be adapted as general for digital designers' remote collaboration. However, it is also possible to only use some of the guidelines that are found most suitable for the context as they are not dependent on using all of them at once.

As we reflect on our guidelines and how they can support remote collaboration for digital designers, one can argue that the guidelines set requirements for a tool. The same applies to the computer setup as the guideline describe how the setup should be the same regardless of working co-located or remote. Even though the guidelines set these requirements, we think they are appropriate guidelines to support remote collaboration for digital designers. Guideline number 5: *Use the same setup when collaborating remotely as when placed co-located*, can be argued to focus more on the individual part of a collaboration. However, in our minds, it still contributes to the overall collaboration in a larger context because if the guideline is followed, the collaboration will have better support and will not be affected by the difficulties a different and not suitable computer setup can cause.

The guidelines: A Mirroring or a New Aspect

In co-located design collaboration, digital designers use various gestures and interactions throughout the design process. This section will discuss how or if physical interactions and gestures in co-located collaborations can be seen in remote collaborations. To explore this, we will look at our guidelines and see if they mirror a physical interaction or present new aspects. Table 1 provides an overview of our six guidelines placed according to whether they are mirroring, presenting a new aspect, or both.

Status	Guideline
Mirroring	1. The collaborating team must be able to see each other's live interactions 4. Share inspiration material within the collaboration team 6. Regardless of the tool, the outcome should be digitized when working remote
New aspect	3. Use a tool that offers the use of basic figures 5. Use the same setup when collaborating remotely as when placed co-located
Both	2. Everyone in a design collaboration must be able to have the same opportunity to edit

Table 1. This table presents whether our six guidelines mirror a physical interaction, present a new aspect, or both.

Mirroring

It can be argued that guideline number 1: *The collaborating team must be able to see each other's live interactions*, is a mirroring of what would happen in a co-located collaboration as it is possible to see each other's interactions. As observed in phase one, our participants used the mouse to point and capture the others' attention to an object, like the physical way of pointing. Guideline number 4: *Share inspiration material within the collaboration team,* mirrors the physical way of sharing inspiration material, like creating a mood board. Participant F from evaluating the guidelines, prints the material and hangs it on the wall, but also bring it home after work. Moreover, participant F prints the same material for coworkers to use when collaborating remotely. In addition, it can be argued that guideline number 6: *Regardless of the tool, the outcome should be digitized when working remotely*, also is mirroring as the digital designers create digital solutions. However, even when using physical materials and tools, they ensure that the outcome is digitized. With this, everyone in the team has access to the material when they work co-located and remotely. To exemplify a consequence of not digitizing the work, participant D expressed: *"Recently we had a (remote) team meeting with the other developers where our team leader took (physical) notes about all the things we came up with, and when we had to work on it next time, those notes are misplaced and we could not work with it."* Based on this experience, participant D suggested that they could use a digital tool like Miro in future meetings so everyone could contribute to taking notes and everyone could see the notes.

New Aspect

Guideline number 3: *Use a tool that offers the use of basic figures*, is not a mirroring but a need that emerged from working remotely. In continuation, guideline number 5: *Use the same setup when collaborating remotely as when placed co-located*, is also a new insight that emerged. To explain, during the COVID-19 lockdown, participant D worked from home, primarily from a laptop placed at a dining table. However, after the lockdown, the company adopted a more hybrid work environment. As a result, participant D chose to create a more permanent home office with a long-lasting computer setup. With this, we see guideline number 5 as a new aspect and not a mirroring of what would happen co-located.

Both a New Aspect and a Mirroring

It can be challenging to place guideline number 2: *Everyone in a design collaboration must be able to have the same opportunity to edit*, because this guideline is both applicable when collaborating co-located and remote. When collaborating co-located digital designers have the same starting point regarding tools as they, for example, can draw on a whiteboard. Further, when collaborating remotely, it highly depends on the chosen tool, as one person might be in control of the tool, for example, in the situation of one person sharing the screen in a Microsoft Teams call. Therefore, is this guideline placed in both mirroring and as a new aspect.

Remote Collaboration in Digital Design Teams

Considering what other research studies have suggested for remote team collaboration, Yiu [9] presents seven best practices for distributed UX teams. We find that these best practices focus on how a UX team can generally have better collaboration when working in different locations. They apply in a more overall context of collaboration and have a practical aspect, as it also considers things like time differences. Furthermore, in contrast to Yiu's [9] best practices, we see that our guidelines are more focused on digital designers' collaborations in terms of being more specific about what a tool should be able to do to support remote design collaboration. A reason for this is that we see tools as an essential part of remote collaboration for digital designers. Nevertheless, we think that the best practices by Yiu [9] and our guidelines can work well together, as both suggest how to support digital designers' remote collaboration. Combining the seven best practices and our guidelines could create a better collaborative environment for digital designers working remotely.

Digitizing Tools for Remote Collaborations

The study by Remy et al. [12] developed and tested an online affinity diagram tool to investigate collaboration in a team working distributed. Their study is interesting concerning our study as digital designers use affinity diagrams, and we can relate to some of their findings on collaborating remotely. Furthermore, participant C1 and C2 from phase one used sticky notes in the digital tool Miro to structure their ideas and inputs regarding the assignment.

Remy et al.'s [12] first insight is called Digital Diagrams Reduce Awareness of Co-participants' Actions, and here they found that: *"one particular issue all groups brought up was the need for a pointer"* [12, 4]. This was explicit when discussing a specific sticky note with the others in the collaboration, as they did not know which one to look at. Similarly, our data showed the need for a pointer, as addressed in guideline number 1, as all our participants in phase one chose a digital tool that supports this function. In addition, we observed that the participant used the function to point at specific objects they were discussing. For example, A2 explained: *"... when you can see the other person's mouse all the time, you can see what it is they are actually focusing on without asking about it, whether they are reading something or whether they are in the process of adding something to their wireframe".*

The second insight from Remy et al. [12] is called Digital Diagrams Provide Fewer Cues About Ownership and Use, this included that the digital tool did not support handwriting which resulted in a lack of ownership. In relation to our findings, this might also be an issue. However, we did not include this aspect in our study as the assignment for phase one was more related to digital design. Nevertheless, this insight might be relevant for our guidelines to consider, as affinity diagrams and other relevant methods can be a part of digital designers' collaboration process.

Remy et al.'s [12] third and last insight is called Digital Diagrams Save Time, Improve Manipulation and Overview, this addresses the advantages that the online tool has unlimited supplies and space, along with it is easy to edit and share through the digital tool. We would argue that some of these advantages also can be related to other digital tools. Accordingly, we found some of the same advantages in our study. For example, participant A2 explained the advantages of unlimited space: *"In Miro, you can zoom in and out, and back and forth as much as you want, so there is always room, no matter how many people there are in a Miro board there is always room for different work and suggestions."* The advantages of digital tools are many. We find that the insights regarding digital tools [12] should be considered when digital designers choose a tool to work with in remote collaborations.

The use of Digital Tools for Digital Designers

Digital tools play a prominent role in remote design collaborations as they make it possible and support collaborative work. Jung et al. [10] present four possibilities and three limitations in their study of online document tools for design collaboration. We find that some of their possibilities and limitations share some resemblance to our guidelines, however, some were also very different.

The first possibility Jung et al. [10] describe is, Simultaneity: Possibility for Co-Creating or Divided Creating, and we see this possibility to correlate with our guideline number 2: *Everyone in a design collaboration must be able to have the same opportunity to edit.* As the possibility of Jung et al. [10], our guideline describes the importance of digital designers having the same editing

options while collaborating to ensure that everyone can contribute. Jung et al. [10] found that this possibility also made it achievable for the designers to generate more keywords than face-to-face, which could inspire each other, as they did not have to wait for their turn. Similar to our guideline, it is interesting that they also found this to be relevant for design collaborations using digital tools. Even though their possibility focused on a specific tool and our guideline resulted from using different digital tools, the essence of both was merely the same.

Another example of a possibility similar to our guidelines is the second possibility, Shareability: Possibility of Sharing without Delay [10]. It shares similarities with two of our guidelines, guideline number 1: *The collaborating team must be able to see each other's live interactions*, and guideline number 4: *Share inspiration material within the collaboration team.* The combination of these two guidelines shares parallels with the possibility by Jung et al. [10]. Guideline number 1 has aspects that relate to the part of the possibility that concerns not having a delay as the team can share and see the material immediately. Guideline number 4 is more and less the same as the possibility, as both emphasize the need to share material with the team to inspire each other.

One possibility we did not find a direct link to in our guidelines was Jung et al.'s [10] third possibility, Visualizability: Possibility of Visualizing Every Activity. Their study did not have a remote setup with video and audio when testing collaborations using Google Docs. Instead, they relied only on using Google Docs to collaborate and communicate. In our study, the participants had audio and video and could communicate through this and the chosen digital tool. However, even though we did not have the same setup as Jung et al.'s [10], we think that it was an advantage for our participants to communicate their thoughts using images and text as well as communicate via video and audio. As we did not find this type of communication a problem, it could be the combination of video, audio, and seeing each other's interaction that creates a stronger foundation for collaboration.

With the different setups in the study by Jung et al. [10] and ours, we did not find the same limitation as their first limitation, Lack of Visibility/Audibility for Limited Group Awareness. As explained, we used audio and video in our study, so the participants could see and hear each other during phase one. Moreover, something we did not control was the tools that our participants should use. However, all groups of participants chose digital tools where they were able to see each others' live interactions. In the chosen digital tools, they were not only able to see what the other person edited or created, but they could also, in contrast to Google Docs, see other participants' interactions as they moved their mouse. The second limitation, Lack of Audibility for Limited Narrative, Humor, and Discussion, we did not find relatable with our guidelines. Again, we had a different setup where we used audio and video, and our participants did use audio to humor each other. Nonetheless, as we did not experience these two limitations, it can be, as we described in the previous

paragraph, that a combination of communication channels could strengthen the collaboration.

The last limitation Jung et al. [10] found was Lack of Drawing Ability for Limited Designerly Ways of Thinking. We see some interesting aspects from this limitation, but we did not directly experience the same issues. In our study, the participants were not demanded to use a specific tool for their collaboration. Instead, they were given the assignment and told they could solve the assignment in any way they wanted. However, all participants chose a digital tool designed to support digital design collaboration, which might be due to the scope of the assignment to create wireframes for an app. Participants C1 and C2 explained that they did not solve the assignment in the study using physical tools, like sketching on paper, because they did not find that showing the paper to the webcam worked. However, they explained that when collaborating remotely on a previous project, they needed to sketch on paper and solve this issue by taking a picture of the sketch and sharing it online. This also relates to guideline number 6: *Regardless of the tool, the outcome should be digitized when working remotely*. This guideline was changed after evaluating the guidelines with digital designers, from only including digital tools, to now including physical tools. The most important aspect is that regardless of the tool, it should be digitized. The study of Jung et al. [10] draws on Schön's book, The Reflective Practitioner [15], to describe the need to use physical tools, like sketching on paper, to express ideas concerning the limitations. We find the parallels between Schön and physical tools exciting and relevant. From our evaluation of the guidelines, both participant E and F emphasized the importance of using physical tools, and for that reason, we changed guideline number 6.

Reflections on Our Research Approach

Our study examined remote design collaboration in a hybrid setting, which means a mix of remote and co-located working days. This was also the context of the assignment in phase one. Today, the participants from the multiple case study work in a hybrid setting with remote and co-located days. This means that they have experience in collaborating remotely, which might have impacted how they approached the assignment. Another aspect to consider is that this research study was conducted purely remote. As a result, it can be more challenging to establish rapport in a remote setting than co-located due to limited face-to-face and informal conversations [9]. This challenge of establishing a satisfying level of rapport can be considered in how we conducted our research study and in relation to collaborating remotely in a design team.

Another reflection of conducting this research study remotely is that we had a low level of control regarding our participant's setup and their environment, which led to what can be called an accidental discovery during phase one. In phase one, participant C1 was not placed at his typical computer setup but participated from a laptop. However, this revealed some important insights into how it affected the design collaboration, which was further unfolded in phase two. In addition, the importance of a computer setup was also mentioned by other participants, and all these insights resulted in creating guideline number 5. We argue that to have more control of the study, we could have conducted the research study in controlled settings like a lab, which would give us more control to manage the participant's computer setup and environment. Nonetheless, we could not, in the same way, have explored which tools the participants would choose, as the tools available in the study would have been made available by us.

CONCLUSION

In this paper, we explored our research question: *How do digital designers collaborate in remote work settings, and how can this be supported?* We have answered this question by conducting a multiple case study and an evaluation with digital designers, as a result, we developed six guidelines. To understand how digital designers collaborate remotely, we conducted a multiple case study that resulted in six initial guidelines. Then, digital designers from two different companies evaluated these guidelines. As a result, we proposed six guidelines that suggest different aspects worth considering for digital designers' collaboration in remote work. This paper's six guidelines and discussions contribute to a better understanding of what digital designers should have in mind when collaborating remotely, as the guidelines describe specific tool functions and computer setups. In addition, we see possibilities of exploring the guidelines in other established collaborations between digital designers and other relevant professions for future research. Thus, from evaluating the guidelines, we found that the digital designers sometimes considered our guidelines in their collaboration with software developers and product managers. This made us aware of the importance of the other types of collaboration that a digital designer has, both co-located and remote. All things considered, we find it interesting that a future study can explore these types of collaborations and if the guidelines can be applied in a larger context or needs to be refined to support these collaborations.

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