Stream of Presence:
An Awareness System

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ABSTRACT
Working from home is an increasingly widespread phenomenon and although it has obvious benefits, some of the benefits of the physical office, like the close proximity of coworkers and the social breaks this results in, are lost. This paper focuses on breaktaking when working from home and through a prototype named *Stream of Presence (SoP)* aims to prompt breaktaking using increased awareness of coworkers when working from home, this awareness being presented by displaying activity levels through LEDs. This was designed based on five design principles we defined, these being ambience, dynamic, simplicity, privacy, and connectedness. Based on a field experiment we found that *SoP* did not result in increased breaktaking and the use of work activity to create awareness failed since users were more focused on their own activity than that of their coworkers.

SUMMARY
At arbejde hjemmefra er blevet et mere og mere udbredt fænomen siden Covid-19 pandemien og det ser ikke ud til at det er noget der bliver mindre relevant i den nærliggende fremtid. Selvom det at arbejde hjemmefra har åbenlyse fordele, så mistes også nogle af fordelene ved det fysiske kontor. Et eksempel kan ses i den tætte nærhed til kollegaer og de sociale pauser, der spontant opstår. Dette speciale fokuserer på pausetagning for folk der arbejder hjemmefra og hvordan vi kan skabe en tættere relation trods den fysiske distance, for på den måde at opfordre til en mere nuanceret pausetagning.

Igennem vores redegørelse over relevante teknologier, sociale interaktioner mellem kollegaer og en forståelse af 'presence' og 'connectedness' begreberne, udformede vi fem design principper, som blev implementeret i vores designproces. Principperne var: 'Ambience', 'dynamic', 'simplicity', 'privacy', samt 'connectedness'.

Ved brug af Buxton's Design Funnel, har vi undersøgt mulige løsninger på problemet ved brug af forskellige idégenereringsmetoder. Disse metoder inkluderer: affinity diagramming, crazy-8's, Prospect Scenarios Matricer, skitsering, samt variationer af prototyper i pap, med forskellige niveauer af kompleksitet. Herigennem har vores fokus ændret sig fra at skabe sociale interaktioner til at skabe bevidsthed omkring hinanden, og vi har bl.a. lagt vægt på synkronitet, da den direkte adgang til andre mennesker fører til en større kvalitet og mængde af sociale interaktioner, brugernes anonymitet og deres visuelle repræsentation når de arbejder og holder pauser, samt
Rent praktisk har vi ud fra vores metode itereret frem til seks koncepter ned til tre variationer af det samme koncept, som adresserer designovervejelser omkring aktiv og passiv interaktion, og visualisering af arbejdsflow samt pausetagning. Ud fra disse tre udvalgte vi én som blev til vores koncept og endelige design: "*Stream of Presence*" (*SoP*).

SoP har til formål at fremme pausetagning ved hjælp af øget bevidsthed om ens kollegaer ved hjemmearbejde. Denne bevidsthed præsenteres ved at vise aktivitetsniveauer gennem lysdioder. Til at undersøge, hvorvidt vores design levede op til intentionen, implementerede vi først designet gennem tre prototyper, som var WIFI-forbundet. Derefter udførte vi et felteksperiment hjemme hos tre test-medvirkende, samt indsamlede kvalitativ data omkring deres oplevelser med hjemmearbejde generelt og deres konkrete oplevelser med brug af prototypen. Baseret på resultaterne af felteksperiment holdt op mod vores design principper, fandt vi ud af, at *SoP* ikke resulterede i øget pausetagning, og brugen af arbejdsaktivitet til at skabe bevidsthed mislykkedes, da brugerne var mere fokuserede på deres egen aktivitet end deres kollegaers. Dette peger i retning af en ændring i prioritering og implementering af design principper, en nærmere granskelse af den relevante brugergruppe, samt en nødvendighed for en større prøvestørrelse.

INHOLDSFORTEGNELSE

1 INTRODUCTION

Ever since the necessary technology has been available for it, the concept of remote work has gotten more common (Olsen, 1983) as time goes on (Golden, 2009), culminating with it being necessary to an entirely new degree during the recent Covid-19 pandemic (George et al., 2020) and the demand for remote work is seemingly not slowing down any time in the near future (Cho et al., 2022).

During Covid-19, working from home (WfH) resulted in an increase in the work hours for 2 out of 3 people, making breaks and recovery ever more crucial (Nolan et al., 2020). Cho et al. (2022) point to WfH as a potential new normal, as PwC's US Remote Work Survey (PwC, 2020), showed an increase in the amount of office workers expected to work at least one day from home.

Beside an increase in work hours, WfH merges the physical spaces of "home" and "work" (Rudnicka et al., 2020). This merge, creates both an issue in terms of transitioning between work and personal life in the home office (Rudnicka et al., 2020), by putting a strain on a person's ability to maintain a good work-life balance, as it affects their ability to feel in control of their working days and successfully complete tasks (Nolan et al., 2020), furthermore the home office's lack of a predefined social context also affects the structure of taking breaks from work (Rudnicka et al., 2022).

1.1 Social break-taking

Taking breaks during work is an essential part of the working day and is beneficial for both mental recovery and physical health (Sonnentag et la., 2017). Recovery from work refers to the phenomenon in which employees undo negative load reactions, such as fatigue that accrue from continuous work and return to pre-stress functioning (Meijman & Mulder, 1998). These informal breaks during the day may help employees momentarily recover from work related stress symptoms (Trougakos & Hedig, 2009; Fritz, 2011; Kim et al., 2017).

Kim et al. (2017) point to the relevance of micro-break activities[1] as a valuable tool for reducing the common stressor-strain link between daily basis work demands and end-of-workday negative affect. Despite focusing on work at the workplace, they found activities as relaxation or being social as mitigators for negative affect (Kim et al., 2017), pointing to the relevance of investigating these types of break activities further for people WfH.

Rudnicka et al. (2022) saw a decrease in taking breaks from work, caused by the lack of routines associated with break-taking in the home setting as well as a lack of natural break prompts from coworkers in the physical office, signalling socially acceptable times for breaktaking. Rudnicka et al., (2022) found that "without the norms that seamlessly regulated break-taking at the office – with one person's respite legitimizing another's – home workers struggled to identify whether and when they were 'allowed' a break" (p. 8/13). This points to a necessity to understand how the social norms associated with break-taking inform the physical office (Rudnicka et al., 2022) and find equivalent solutions when WfH.

[1] In this project we use Kim et al.'s (2017) definition of micro-break activities as "short respite activities that are undertaken voluntarily on a need basis between series of task episodes" (p. 30)

Home workers need to make sure they are ‘online’, they need to retain a degree of visibility in a way a person working in the physical office would not have to (Koehne et al., 2012). This necessity to advertise their availability to make sure coworkers know they can reach them points to the need for some social infrastructure to help them do their job more effectively (Koehne et al., 2012). The need for constant online presence or “connectedness” when WfH, also caused feelings of guilt when taking breaks, as workers were unable to socially justify them due to a lack of transparency of actions (Rudnicka et al., 2022). This could point to a need for a dynamic online representation of workers across distances.

In the physical office setting, Kim et al. (2017) found that social activities took the form of: Texting, using instant messenger, or phoning friends or family members; chatting with coworkers on non-work related topics; and checking personal SNS (Social networking service), all of which helped reduce the workload’s negative affect. Many of these social encounters are still possible in the home office, but chatting with coworkers on nonwork related topics is more difficult. Some remote workers have reported that being social with coworkers required much more planning than previously, and ended up taking longer than anticipated. (Rudnicka et al., 2022). Non-work related communication is both valuable and common in the physical office, and is not supported to the same degree when WfH (Whittaker et al., 1994). Non-work related communication is still possible, but the main available social aspects focus on work related communication, information sharing and planning for the sake of productivity (Hall & Nielsen, 2023), pointing to a need for a greater remote social infrastructure when WfH.

With all this in mind, we formulated the initial problem statement:

“How can an interaction design prompt breaktaking by supporting awareness of coworkers’ workflow for people working from home?

2 RELATED WORK

This section introduces our background for the section *Design Method* and covers areas we found relevant to explore regarding existing solutions for the office space (home and/or physical), in terms of communication channels; research led exploration, the element of non-work related communication happening in the physical office; and finally, by introducing the element of presence, and how it relates to our design case.

2.1 Remote communication tools and technologies

WfH puts emphasis on the communication between colleagues (both at the home office and physical office), with the physical office already having multiple communication methods in use as part of their communication ecology (Turner et al., 2010). To develop a contribution to social break-taking in a hybrid office setting (when someone uses both the home and physical office regularly), it is crucial to understand what is already there vis-à-vis existing technology and communication tools. Hall and Nielsen (2023) found that the current technology primarily focuses on aspects of *time management* (Veresani, 2021; Yuzawa & Mark, 2010; Shalawadi et al., 2021), *task awareness* (Yazawa & Mark, 2010; Shalawadi et al., 2021), or *social awareness* (Veresani, 2021; Mehmetalioglu & Schwarz, n.d.; Kirkham et al., 2013). In the following sections, we summarise five interaction designs developed for office work, which form the base of inspiration for our design case, as well as two globally

used communication channels. For each design we highlight design elements which we found relevant for our contribution.

2.1.1. Devices for time management, task awareness, and social awareness

Rainmaker (Shalawadi et al., 2021) is a tangible device for time management and task awareness. It builds on the Pomodoro[2] time management system (Cirillo, F. 2006) with LED's showcasing the pomodoro timer and introduces the act of flipping it to turn the timer on/off. A task overview can be gained by turning it on its side, and the rainmaker can be shaken to "collect" the completed tasks during the day. As the tool was liked and reported to be visually appealing, fun, and informative, it speaks to the designing of simple physical interactions embodying these qualities. (Shalawadi et al., 2021).

Halo (Veresani, 2021), also functions as a tangible device for time management, where a token prompts micro-breaks at 90-minutes intervals. One longer lunch-break is initiated by connecting the token to an interactive board. At the end of the break, the board can facilitate a shared activity of separately drawing patterns on the boards for recovery and preparation for the further work day. Due to limited evaluation of the device in use, its functionality and relevance is unaddressed (Veresani, 2021)

Where the *Rainmaker* (Shalawadi et al., 2021) provides task awareness for the individual, the *"Japanese Garden"* (Yuzawa & Mark, 2010) focuses on task awareness for a team. The physicality of the *"Japanese Garden"* consists of a small sand surface with four types of rocks. Each rock represents a type of task being worked on and allows members of a team to both communicate their current tasks as well as seeing what their coworkers are working on. As the *"Japanese Garden"* increased coordination between coworkers, it limits interruptions in work mode while being relaxing to use (Yuzawa & Mark, 2010). Its design therefore points to the value of being aware of coworkers' work state, as well as being non-intrusive in its design.

In the physical office, *Breaktime Barometer* (Kirkham et al., 2013) resembles a personal table clock, visualising when user-initiated breaks take place and lets coworkers become aware of social break activities happening so they can join them. A downside to the system was that it did not provide information on who participated in the different breaks (Kirkham et al., 2013).

For the home office, *Halo* (Veresani, 2021) provides social awareness by providing a shared drawing activity while *Logitech Hej* (Mehmetalioglu & Schwarz, n.d.), shortened to *Hej*, enables continuous communication and presence indicators through a physical desktop device for a remote collaborating team. *Hej* captures team member's movements through an embedded motion sensor and translates it into abstract visualisations of the team using moving coloured lights. The visualisations are designed to limit obstruction and create flowing movements which signal that someone is around. Furthermore, the device enables short informal conversations through microphone and speaker, and can be muted by tipping it over (Mehmetalioglu & Schwarz, n.d.).

[2] The Pomodoro time management system builds on intervals of 25 minutes of work followed by a five minute break, with a longer break every 4 intervals.

2.1.2. Remote communication channels

Some technologies are widely used in organisations to facilitate communication and are therefore hugely important for remote workers by allowing them a similar degree of availability and ability to reach coworkers when WfH.

The primary platform being *Microsoft Teams* (Microsoft, 2023) which unifies communication through texts, voice calls , and video chats, along with file sharing and editing to assist groups in staying organised across homes, enterprise, businesses, and education. The basis for the system is the creation of teams for specific groups and having channels within a team to organise countless different “rooms” for different occasions. *Teams* has a calendar which integrates with other Microsoft programs for easy synchronisation for employees, and allows individuals to set their status as “Available”, “Busy”, “Do not disturb” etc. (Figure 1). Many applications are available to integrate with Microsoft Teams to assist other areas such as task management (Ruenz, M. 2021).

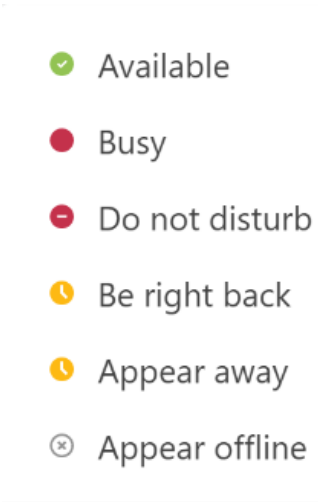

Figure 1: Microsoft Teams status setting.

Another widely used tool for communication and collaboration is *Slack* (Slack, 2023). The system focuses on similar communication features to *Microsoft Teams*, but also provides the availability of a vast catalogue of services and bots for add-ons. It is used professionally, both team-wide and organisation-wide, but is also available for private usage.
The personal use includes discovering news and information but is mainly used to support networking and social activities (Gergle, D. et al. 2016).
While Teams and Slack can be huge assets to structuring workflow, they do little to prompt breaks outside allowing them to be scheduled.

A relevant add-on service, focussing solely on facilitating social activities is *RemoteSocial* (Remote social - tools for happy and productive teams, 2021). This web based platform for remote workers, provides conversation starters for initiating casual discussions as well as activities for teams to do collectively, like playing games (Remote Social: Connect, 2021). As such platforms are not encountered in the *Microsoft* ‘universe’ it might be relevant to provide add-ons for merging the physical (home and physical office) and virtual office (Microsoft Teams).

2.2. Non-work related communication at work

With Kim et al. 's (2017) findings of social activities at the workplace positive effect, we found it relevant to dig deeper into the context of such encounters, to learn how to prompt them ourselves. Here we found the most notable ways in which communication between people in the workplace is conveyed to be: verbal communication; non-verbal communication; and technology-aided communication (e.g. emailing and instant messaging) (Ergen, E. 2010). In the following we dig into what differs between technology-aided - and verbal communication, as well as unfold the loss of non-verbal communication between distributed colleagues.

2.2.1. Non-verbal communication

As non-verbal communication covers 70-90% of all workplace communication (Gabbott, et al. 2001), a lot of natural communication is lost between distributed coworkers. With the prominence of WfH, and the most common technologies limited abilities to portray non-verbal communication it is important to know how this affects the individual worker and whether its lack needs to be mitigated.

2.2.2. Technology-aided communication

For technology-aided communication such as online meetings and chats, formal and informal communication is intertwined (Viererbl et. al., 2022). Examples can be seen for formal online meetings, where pre- and post-meeting talks are initiated spontaneously before or after; chats where employees comment on ongoing online meetings – here, formal and informal talks occur simultaneous; and follow-up communication, which often begins with a formal conversation and then turns into an informal discussion (Viererbl et. al., 2022).

For informal communication, which we relate to non-work related communication, Viererbl et. al. (2022) found that it significantly increases employees' perceptions of being informed, as well as their affective commitment, both of which increase job satisfaction. They also found that several aspects of informal communication differ in remote work situations compared with physical office situations like the number and quality of interactions between coworkers. In the physical office, employees experience informal encounters with a variety of colleagues, whereas in remote work situations, the informal interactions happen mainly with peers. Furthermore, accidental informal encounters do not occur when employees are WfH. Instead, formal communication episodes serve as opportunities to blur the lines between formal and informal communication (Viererbl et. al., 2022). As informal communication is a major part of cooperative work and also affects various work related, social and personal areas, it is not adequately supported through current means of remote work collaboration.

2.3. Designing for Awareness

In the following, we highlight relevant conceptualizations of presence (Lombard & Ditton, 1997), which we find relevant for creating awareness and understanding our design consideration used in ‘Design Methods.

Lombard and Ditton (1997) address the concept of presence as a mediated experience intended to be perceived as ‘an illusion of not being mediated’. Through their literary review of several conceptualizations of presence, they contribute with an unified explication of what presence can be understood as. The review leads to multiple conceptualizations of presence, which are both interrelated and distinct from another, of which we decide to focus

on 4 main ones, those being: Presence as realism, presence as transportation, presence as social actor in a medium and presence as social richness (Lombard & Ditton, 1997).

2.3.1 Presence

Presence as realism means “the degree to which a medium can produce seemingly accurate representations of objects, events, and people – representations that look, sound, and/or feel like the “real” thing” (p. 1). Here the authors differentiate between social realism (how “true to life” something reflects events) and perceptual realism, the realness in look, often seen in context to social realism (Lombard & Ditton, 1997). For our design case, we only found ‘social realism’ as relevant. *Presence as transportation* refers to the feeling of sharing a space through for example a communication system (Lombard and Ditton, 1997), and would in cases with high mediation be connected with notions of social telepresence and the experience of copresence (Tsui & Yanco, 2013). *Presence as social actor within a medium* refers to how mediated content can be perceived as a relationship between the user and the content presented, and relates to peoples’ ability to create bonds to mediated content representing other people (e.g. television personalities and animated avatars). And lastly, *presence as social richness* relates to concepts of intimacy and immediacy, and grows from the understanding of presence as “the extent to which a medium is perceived as sociable, warm, sensitive, personal or intimate when it is used to interact with other people" (p. 1). Studies relating to this concept often focus on measuring efficiency and satisfaction through social presence- and media richness theory.

2.3.2. Social connectedness

Regarding social presence- and media richness theory, Ijsselsteijn et al. (2003) argues that awareness systems are poorly measured, and instead introduces the concept of connectedness – the feeling of being in touch with others – as an important dimension of human communication. As our contribution can be classified as an awareness system, we find it relevant to address the notion of *social connectedness* – “[the] short-termed experience of belonging and relatedness, based on quantitative and qualitative social appraisals, and relationship salience” (Van Bel et al., 2009, p. 2/9). This was decided as a relevant design principle to make up for the loss stated in the above section. Instead Van Bel et al., (2009) relates social appraisals to social situational satisfaction, and relationship salience to feeling connected and aware of others without social contact. Van Bel et al., (2009) further states that “social connectedness intends to capture social experiences originating from recent interactions and provision of awareness information” (p. 2/9-3/9), with awareness information being information on colleagues’ whereabouts, mood, activities, and availability for contact. Our design case must therefore provide relevant awareness information to the users, to strengthen social interactions and thereby foster the experience of social connectedness. (Van Bel et al., 2009)

3 DESIGN PRINCIPLES

From the above section, we have extracted and touched upon design values which we intend to implement and explore through our design method. We have therefore formulated these design values into ‘design principles’ which were used to guide reflections through the ideation, and will come into play in the “Implementation” section and function as evaluation criteria. This section covers these principles and their theoretical context.

3.1 Ambiance

Ambiance is about a feeling or mood associated with a particular place, person, or thing (Gross 2002). Ambient interfaces present digital information through subtle changes in the user's physical environment. Common variations of this include lighting, sound, or movements (Gross 2002). They possess properties of calm technology that are particularly useful when designing for users that want or need permanent background information without disruption in their main tasks (Weiser & Brown 1996).

3.2 Dynamic

Dynamic concerns a continuous and productive activity or change (Hu et al., 2021). The design of visual information as dynamic and interactive makes it more attractive to use. With the use of visual dynamic design, it is possible to stimulate curiosity to convey information. Visual information, combined with the concept of dynamic design, can create a richer and more diverse perception and give the audience a stronger sense of belonging (Hu et al., 2021).

3.3 Simplicity

Simplicity regards the quality or condition of being easy to understand or do (Loranger, 2015). Simplicity does not necessarily limit the expressivity of interfaces. Adding features that have little to no value to most users undermines people's innate abilities to collect and process information efficiently. Keeping the number of options at a reasonable level allows people to make decisions more easily and complete tasks faster (Loranger, 2015).

3.4 Privacy

Privacy refers to the intent of decreasing the possibility of feeling monitored by coworkers (Wang B. et al., 2021) It relates to how the users are represented when using the device and what is displayed of their identity to others.

3.5 Connectedness

Related to the degree of representation (realism) used in order to provide awareness information to gain intimacy between remote coworkers (social richness); a shared space for gaining these info (transportation); and how the users bond to the content and becomes aware of each others work patterns (social actor within medium) (Lombard & Ditton, 1997) – all together creating a natural feeling of belonging and relatedness between remote users (social connectedness) (Van Bel et al., 2009).

4 DESIGN METHOD

Following Buxton's design funnel (Buxton 2007), this section covers the design process of our prototype "Stream of Presence" (SoP) – from idea to concept ready for implementation – by elaborating on the methods used, the decisions made, and the reasoning behind them.

4.1 Framing the initial problem

With a foundation in Hall and Nielsen (2023), our initial framing focused on break-taking in the remote workspace. To get an overview of the concepts Hall and Nielsen (2023) touch upon, we wrote each concept on a sticky note and pinned it onto our bulletin board. Using affinity diagramming each concept was then grouped into categories (Figure 2).

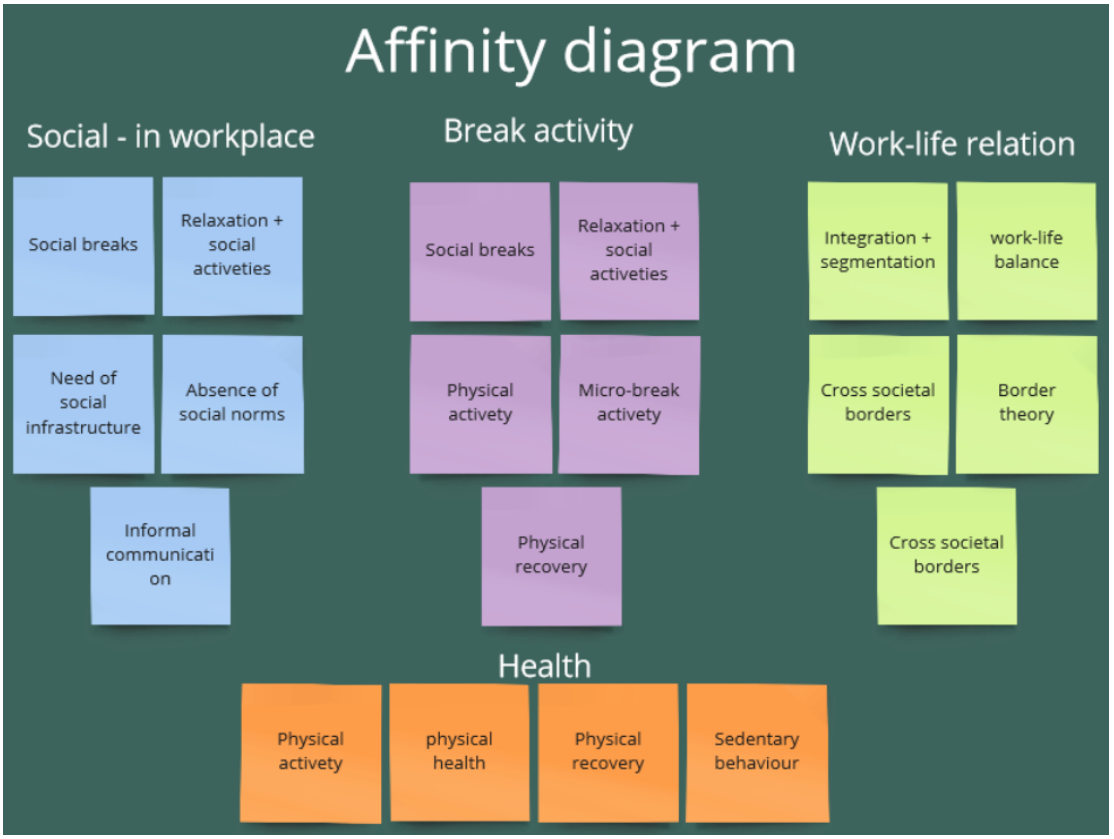

Figure 2: Affinity Diagram with four themes: Social; Break activity; Work-life relation; and Health.

4.2 Initial idea generation

Based on the keywords from the affinity diagram, we discussed possible entry points for the concept design and then performed a crazy 8's, with a focus on facilitating social break activities, based on the importance of social interactions in the workplace (Kim et al., 2017). After our crazy 8's session we agreed that we could still use more ideas, making us do four further one minute sketching sessions. In total we ended up having 36 sketches, exploring a variety of social activities or devices for social activities (examples can be seen in Figure 3). We then briefly explained our ideas to each other and each selected the 3-4 of our own sketches we felt had the most potential. Explaining these choices helped us understand what each person saw as valuable elements in the ideas, but it also made us aware of the need for a narrower focus as our ideas took very different parameters into account: we needed a set of design considerations to guide our process, and corner our focus for creating valuable idea generation.

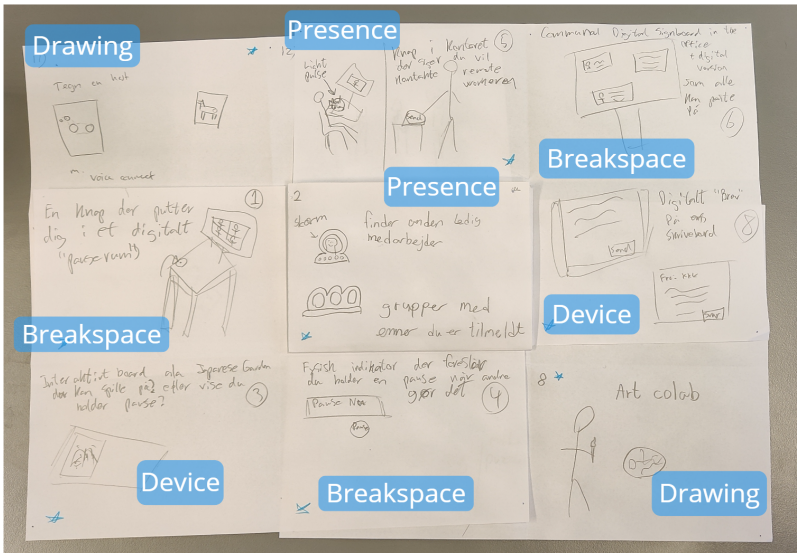

Figure 3: Selected sketches from Crazy 8's with their associated themes: Breakspace; Drawing; Presence; and Device.

We compared our sketches to try and figure out the main focus of the designs and how they differed. We found that the designs differed in what time the users were interacting with each other and their location when interacting. Some designs had the user interactions happen simultaneously like a live video call, whereas other ideas used a system similar to an email or a message board with asynchronous interactions. As for the location, some designs allowed for interaction between people working from home and people in the physical office, whereas others were strictly for WfH. Some designs also addressed other completely different perspectives such as minimising sedentary behaviour, but as we viewed the time and location of interactions as the most important principles of our design conceptualization, they were selected for further exploration. Inspired by Essence's (Aagen, 2022) prospect scenarios we drew a four-quadrant matrix based on our time and location principles (Figure 4).

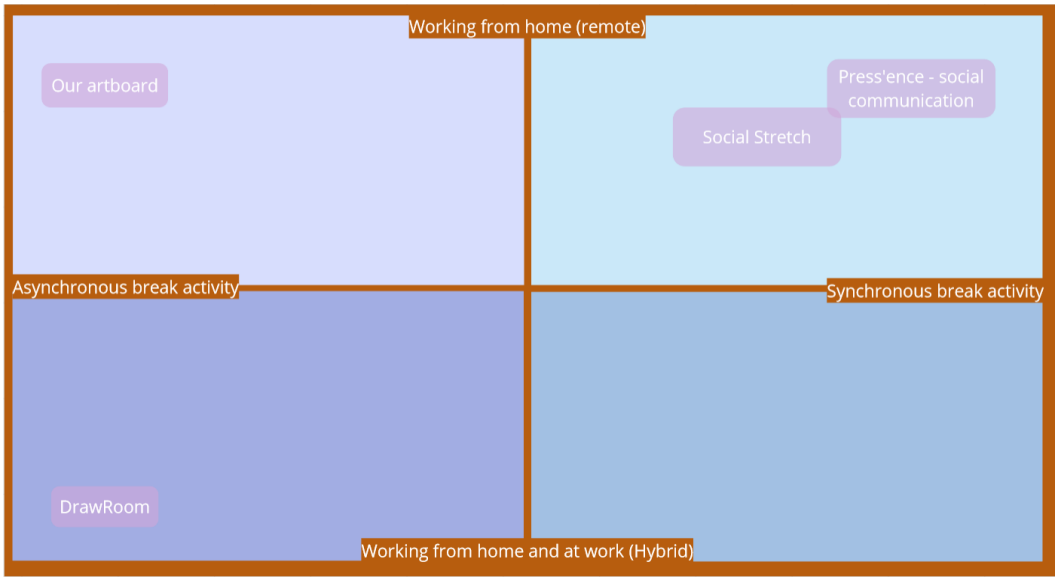

Figure 4: Matrix 1 for Time/Location, with the resulting ideas written inside it.

Using this matrix (Figure 4) we each sketched further ideas for social break activities, one idea for each of the four quadrants. These 12 ideas from Matrix 1, were linked to both ideas from our crazy 8's, but also related to mentally and bodily experiences with social break, which occurred through our project work as a group. As a source for ideation, we experimented with a large variety of social break activities like: Playing a game of table football; going collectively for water; playing card games; sitting in silence on personal devices; casual discussion; drawing games; doodling; standing up for 10 minutes; stretching; fooling around; interacting with co-located groups and people; ect. Each of these break activities were performed randomly and was used as a source for inspiration, and inspired us to think more elaborately on what is lost socially when WfH, and which activities were engaging and fun. Continuously we discussed and reflected on which of these social break activities would be transferable to WfH. By also WfH ourselves we became aware of how much having other people physically around you naturally prompts more social interactions. This led us to find synchronous interactions between remote parties important, since the direct access to other people lead to a greater quality and quantity of social interactions.

With a focus on social interactions as a break activity, we could not exclude the relevance of asynchronous social interactions since they are much less disruption in relation to interrupting workflow. This focus also moved our aim to a social interaction system, and caused us to move away from interactions between homeworkers and people at the physical office, since the perceived benefit for the people at the physical office was very low compared to that of the remote workers. This was the starting point of having our design focus be synchronous interactions and remote-to-remote communication. As seen in Figure 4, the most relevant ideas for our design case were drawing activities happening asynchronously (DrawRoom and Our ArtBoard), and two synchronous ideas addressing instant connect (Press'ence) and remote user visualisation (Social Streatch) (See Figure 5 for sketch representation).

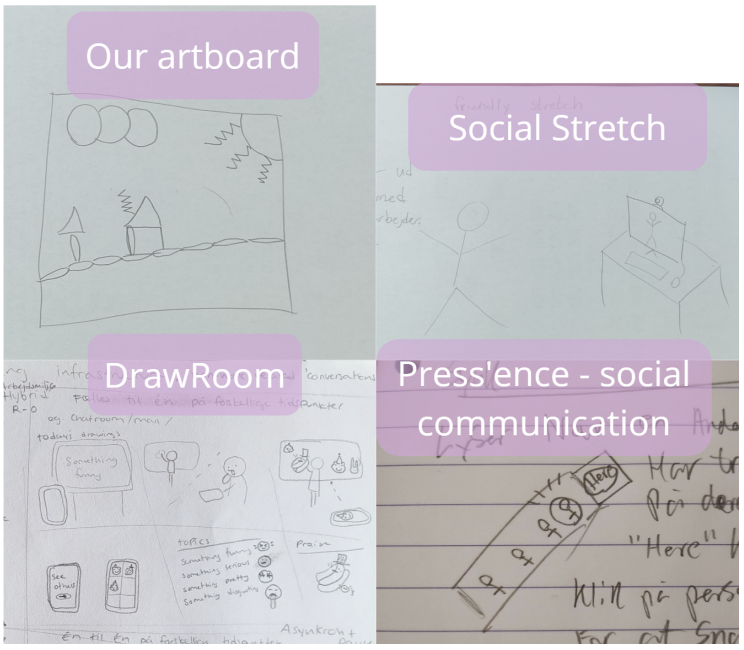

Figure 5: Visualisation of sketches rooting in Matrix 1.

Based on a discussion of our contributions to Matrix 1, the literature and design of *Halo* (Veresani, 2021), along with our own experiences on the matter, we decided to focus on shared drawing activities. As we saw the creative element as non-intrusive, fun, and an easy conversation starter we went to explore the concept for both asynchronous and synchronous interactions between remote users. We made two low fidelity paper-prototypes: one for a solely synchronous social drawing activity (ShapeDraw), and one that also allowed for asynchronous interaction (DrawBoard). (see Figure 6 for both prototypes). Both paper prototypes intended to create a space for sharing drawings – either by drawing together using shapes, or by sharing drawings as a way to unite remote colleagues (Presence as transportation and social richness (Lombard & Ditton, 1997) and social connectedness (Van Bel et al., 2009)).

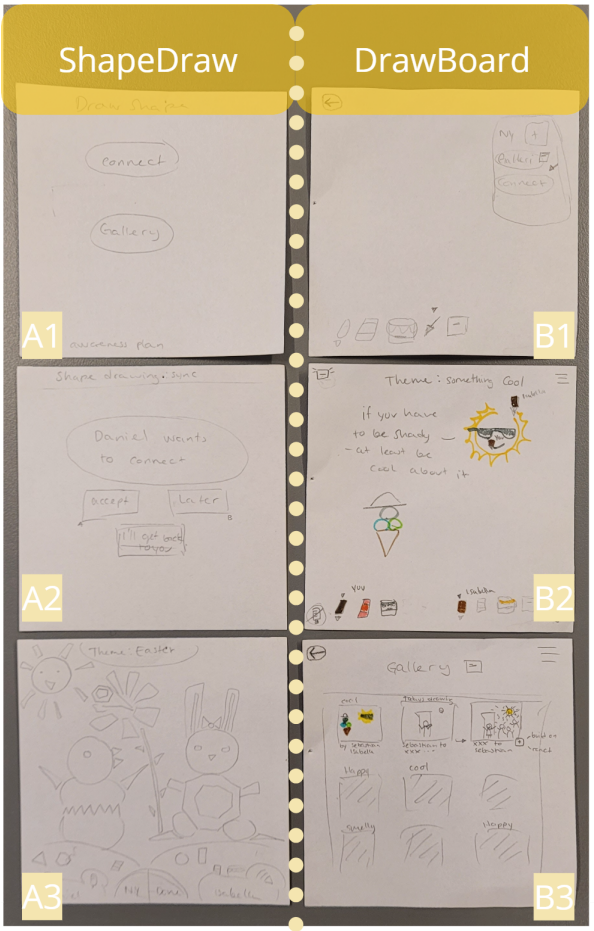

Figure 6: Examples of paper prototypes: *ShapeDraw* (A1, menu; A2, invite to instant drawing-task ;A3, collective drawing) and *DrawBoard* (B1, drawing board; B2, doodling to theme on shared board; B3, gallery).

As our initial design focus was a device for social interaction that provided the possibility of a social break activity, we had the issue of how to prompt this interaction to take place. When WfH the lack of a consistent and continuous awareness of each other was a noticeable disadvantage compared to being in the same physical room as other people. Based on this a new concept took form called *The Shadow* (Figure 6), which presented elements from Social Stretch (Figure 5), with its visual representation of remote users, as well as all Lombard and

Ditton's (1997) selected concepts of presence (social richness; realism; transportation; and social actor within medium).

This became the first step towards focusing on social connectedness (Van Bel et al., 2009) and contributing with an awareness system.

Figure 7: *The Shadow* paper prototype.

The Shadow consisted of a physical design for the desktop providing co-presence of and for remote coworkers. At this stage, *The Shadow* was intended to provide visual awareness of remote users as obscured bodily representations as well as a communication channel. It would use the user's camera to create a shadowy silhouette of them which would be seen on their coworkers own *The Shadow*-devices, displaying all their coworkers in silhouette form on the devices. Its inspiration came from *Hej* (Mehmetalioglu & Schwarz, n.d.), installation art (E.g. Daniel Rozin's PomPom mirror[3]) and a want of an alternative to the usual static statuses seen in remote communication channels (like being labelled as "online" on Microsoft Teams), and thereby formed the first design principle: *Dynamic*.

4.3 Paper Prototype Exploration

We decided to proceed with developing *The Shadow*, as its simplicity and ambiance was desirable alongside its potential for ambiently enhancing the feeling of social connectedness, which thereby form the following design principles (*Ambiance* and *Simplicity*). This moved the considerations in terms of time and location, to synchronous and remote-to-remote interaction. A limitation of *The Shadow* is that it requires camera access to detect movement, which could lead to feelings of being constantly monitored and we therefore decided to further explore nuances and degrees of anonymity as part of the design principle: *Privacy* . As *The Shadow* relied on the bodily figures or body language to communicate when someone was taking a break, we also explored anonymity in relation to the switch between work and breaks.

[3] https://vimeo.com/128375543

Based on these reflections we brainstormed by making individual sketches of design ideas focusing on anonymous representations of users, and then a second four quadrant matrix (Figure 8) for exploring the visual representation of users and their workflow in relation to working and taking breaks. Figure 8 illustrates Matrix 2, with its horizontal 'anonymity' axis exploring privacy, and its vertical 'display' axis for exploring how the view affected the ambiance, dynamic, and simplicity of the collective experience.

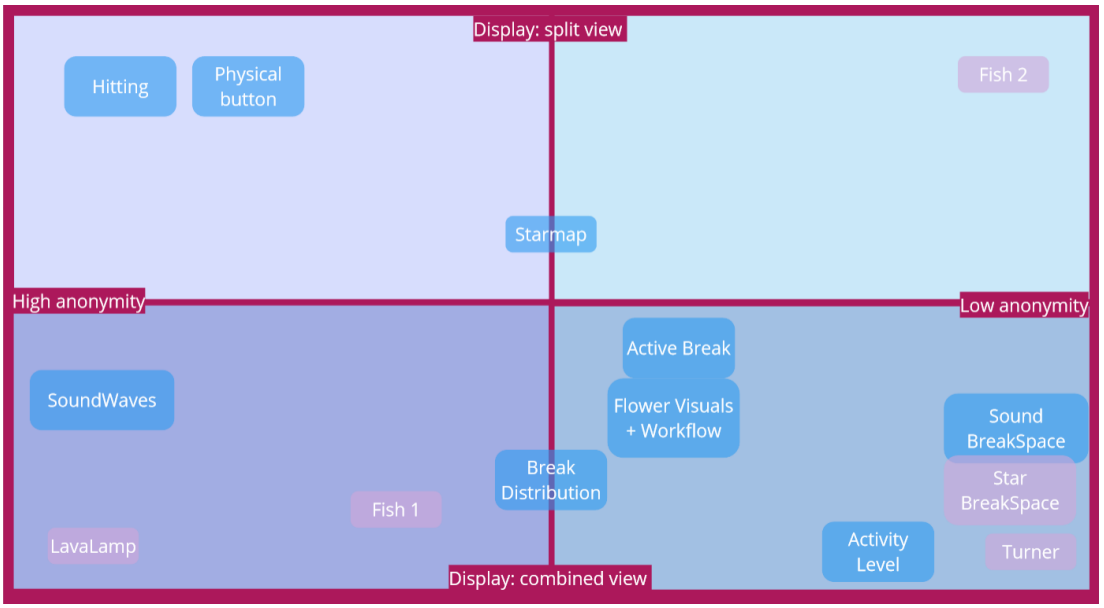

Figure 8: Matrix 2 for Anonymity/Display, with the selected individual sketches in blue, and the ideas formed by the matrix in pink.

The sketches were distributed to each quadrant, and then discussed in terms of presence (Lombard & Ditton, 1997), interaction, aesthetic value, detection and display of work/break mode. The sketches can be seen in appendix 6.

As we were confused about the degrees of anonymity for breaktaking and working, we made a third matrix (Figure 9) to help us discuss the value of providing anonymity when either working or taking a break.

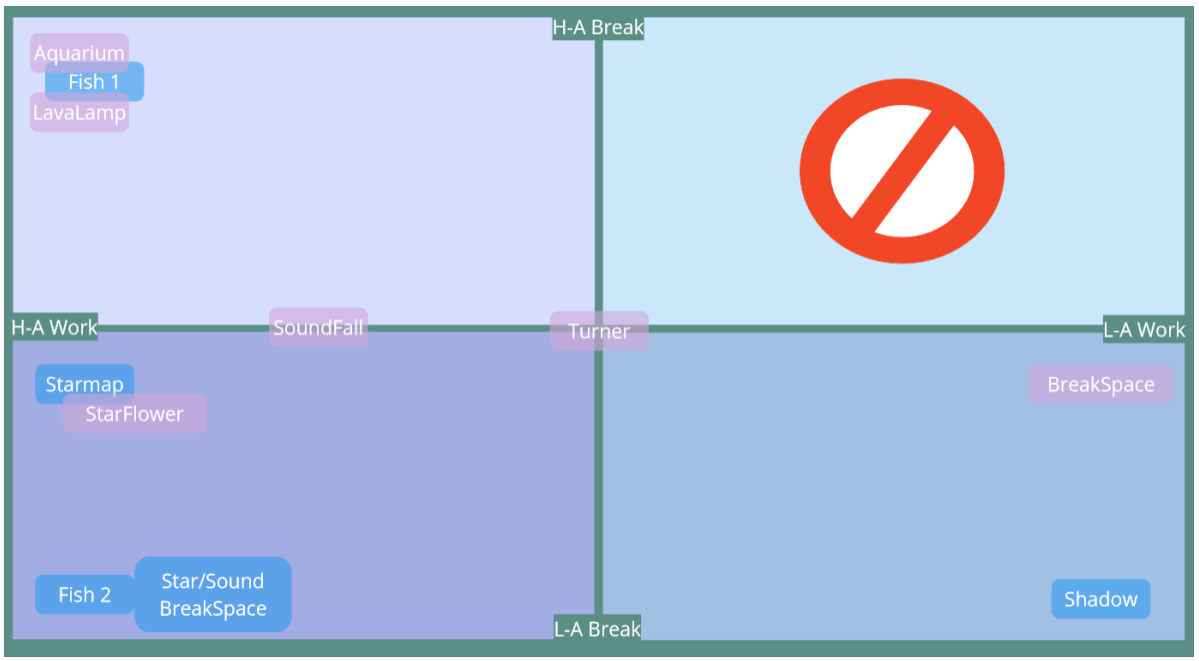

Figure 9: Matrix 3 for Work/Break visualisations with variations in anonymity.

Matrix 3 (Figure 9) focused solely on the anonymity of the users while either on break or working. The axes of the matrix went from high anonymity (H-A) to low anonymity (L-A) with one axis focusing on a user's representation while break-taking and the other while working. *The Shadow* was set as the minimum viable level of anonymity, to prevent people from feeling surveilled. We eliminated the quadrant focusing on high anonymity when working and low anonymity at breaks as it seemed unfit for the design for social connectedness, and had a high possibility of giving the experience of being monitored. Then we related our concepts from Matrix 2 to Matrix 3 in order to better compare and discuss them.

Based on this understanding of anonymity when taking breaks or working, we created six concrete concepts as paper prototypes (Figure 10: BreakSpace; Turner; Aquarium; StatFlower; LavaLamp; and SoundFall), formed around the ideas presented in Matrix 2. With these concepts we faced a new design consideration: whether the break detection should depend on active user inputs or passive measures. For the six concepts, two addressed active measures (BreakSpace; Turner), and the rest passive (Aquarium; StarFlower; LavaLamp; SoundFall). For illustrating the concepts variations in focus on anonymity when working or taking breaks, these are shown in pink at Matrix 3 and the most prominent ideas leading up to the concepts are shown in blue.

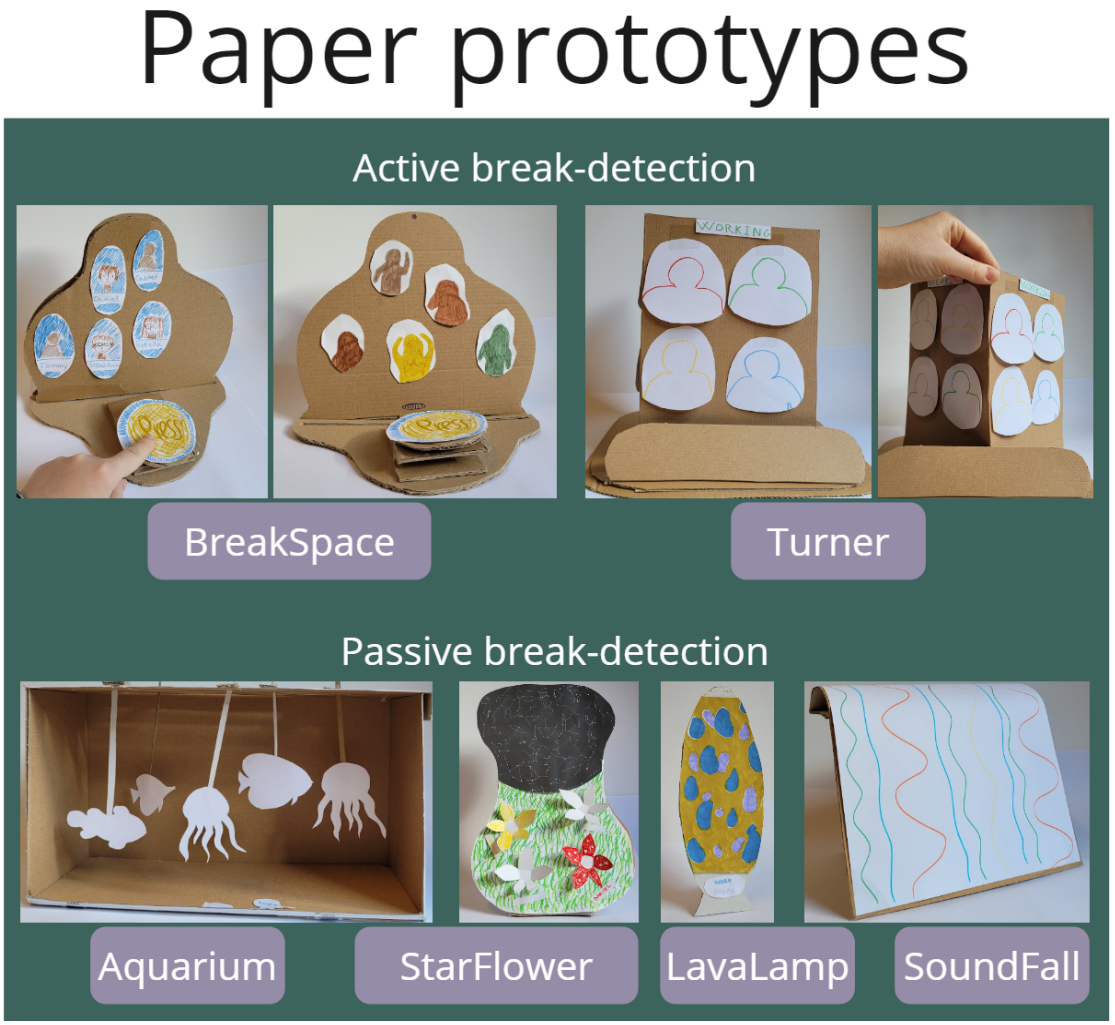

Figure 10: The six paper prototypes.

These paper prototypes were inspired by the sketches in appendix 6 and are as follows:

Active paper prototypes:
The Turner conceptualises going from work to on break (or the opposite) by turning the physical device. At all times the user would be able to see how many other people are also working/on break depending on their own status. This concept has roots in 'Turner'.

BreakSpace builds on "The Shadow", but like *The Turner* has two separate modes: a work mode and a break mode. It would have silhouettes visible (like in *The Shadow*, see Figure 7) when in break mode. As this recognizability was found relevant for social interactions, the idea was further to include an audio channel for talking. For the work-mode, coworkers would still be able to identify who else is working through the visibility of a nametag or personalised image. To switch between the modes a simple tangible button was included.

Passive paper prototypes:
SoundFall visualises user activity through sound waves in a waterfall shape. This concept is meant as an abstract and dynamic symbolization of the workflow of your coworkers, aiming for an awareness device that is simplistic but also aesthetically pleasing.

LavaLamp borrows the aesthetics of old-school lava lamps but uses two colours of bubbles to distinguish between people working or taking a break. Each bubble represents a coworker with the movement of the bubble being affected by the activity of the associated coworker. This lets the LavaLamp act as an abstract overall representation of the “office”.

Aquarium uses a similar concept to the *LavaLamp* but uses the aesthetic of fish to differentiate between work and break-mode. Furthermore, it is not intended to illustrate a collective work-flow, only the distribution of modes to improve the experience of social connectedness.

StarFlower also presents the distribution between at-work modes side by side, but through a separated view as the work mode is kept anonymous and is represented by twinkling stars, whereas the break-takers are identified by their name lighting up alongside a flower. The aesthetic idea was to imitate a landscape painting at night, with a starry sky in the top half and a flowery meadow at the bottom half, for a calming view.

4.4 ‘Awareness Concept’ Concretisation

After discussing the pros and cons of these six concepts, we decided to continue working on *SoundFall*, *LavaLamp,* and *The Turner* as they embodied simplicity and privacy in their aesthetics, and presented workflow in a dynamic and ambient way. Furthermore, as a concretization of the final concept, their differences in physicality could present three variations of a consistent awareness concept.

We therefore formulated the core of the awareness concept to be: 1) a *dynamic look*, 2) *anonymous user representation*, and 3) *workflow awareness*. These three elements would come into play by visualising workflow and/or breaktaking and detecting the change either automatically or having the user do it manually. Concept names are kept for consistency.

The variations are:

SoundFall conceptualises workflow-variations in an ambient and dynamic visual representation. It should be a physical device placed on the office table, next to the work-computer and passively detect the user’s workflow.

LavaLamp inhabits the concept of *SoundFall* but builds on by distinguishing between variations in workmodes and break-taking. Variations between workmodes and break-taking would be passively detected.

Turner embodies the concept of *LavaLamp* but makes the break-taking into an active choice, by turning the device. It would require the device to have two sides: one for the visualisation of the workflow and one for break-taking. The workflow would still be passively measured by the device.

The table below (Table 1), presents an overview of these variations of concept in relation to design principles and design considerations.

	SoundFall	*LavaLamp*	*Turner*

Ambiance	X	X	X
Dynamic	X	X	X
Active interaction	-	-	X
Passive interaction	X	X	-
Simplicity	X	X	X
Privacy	X	X	X
Visualise breaktaking	-	X	X
Visualise workflow	X	X	X
Social Connectedness	X	X	X

Table 1: Overview of design principles used in each of the prototypes.

By having three variations of a consistent awareness concept, we addressed two design considerations of whether to visualise break activity along with the workflow, and whether to use active interactions or not. Furthermore, we also faced the potential of evaluating two concepts against each other. With this in mind, we went on to explore materials and behaviour of each of the three concept variations.

In the end we selected to only work with the LavaLamp variation of the awareness concept, as it presented the middleground. Here passive activity tracking would ensure a dataflow, whereas the visualisation of both breaktaking and workflow, would ensure awareness of both states. In the following, we will therefore only address our consideration regarding the input and outputs, as well as the material form of LavaLamp, which was renamed *Stream of Presence* (SoP in short) as a final concept name.

4.5 'Stream of Presence' concept

The intention of the SoP concept was providing a sense of connectedness to coworkers when WfH, and prompting breaks using awareness information on workflow and breaktaking. Visually, users would be provided with signals about their coworkers workflow as well as their own. This design choice was made partly to illustrate the anonymity of all

users for smaller teams. In case users become aware of which light signals their own workflow, we thought this information might affect their awareness of their own workflow. For the SoP concept, we had considerations regarding the concrete technology that could allow detection of workflow and breaktaking, as well as the logic for controlling the output.

4.5.1 Activity tracking

When discussing how to passively track coworkers' work mode, we brainstormed different sensors we could use to measure inputs from the user like using keyboard- and mouse-inputs, a movement sensor, a proximity sensor and a sound sensor. By discussing how to measure different work modes, and the switching between them, we landed on using mouse- and keyboard inputs in intervals to measure the user's work activity. Regarding the passively sensing of break-taking, we defined a longer absence of mouse or keyboard interactions as a sign. Though this passive measure will not always be technically correct, we find it valuable as it would provide awareness of coworkers' workflow, both when active or in a lull While this might exaggerate the actual break taking, it will make it more visible that breaks do happen, and is intended to encourage a social infrastructure and the norm in the home office that it is ok to take breaks, and as the visualisations of breaks are anonymous, specific coworkers are not outlined in a negative way for taking breaks. Alternatively, coworkers can also take a break while sitting at the computer and interacting with it. As this break would not be detected either, it points to further examination. Likewise, it points to our design intention of breaks happening away from the computer.

4.5.2 Activity Logic

To measure the user's activity level as intervals, we need to define the length of the intervals as well as the amount of them. We discussed varieties of logics and investigated the average mouse click. Here we found that in recent studies, the average computer user clicks their keyboard varies from around 38000 times per day which is around 4750 keystrokes per hour (Clarke. 2017) to around 7400 times per hour (Dhaka, Vl. et al 2018)). This indicates that the actual number of clicks per day may vary from person to person and especially from task to task, and that it is difficult to create intervals that fit every use case.

Bearing this in mind, we reach an algorithm for determining the activity level based on key-inputs for a set time. Here each activity level was placed within an interval. Then depending on the key-inputs within the timeframe, the level would be calculated and a signal sent. For simplicity we went with three activity levels: 'No Activity' which would signal breaktaking, 'Low Activity' (later altered to 'Activity' for positive connotations), indicating an activity, and 'High Activity', indicating intense working.

4.5.3 Material exploration

We discussed which materials would make the most sense for the project based on our experience with prototyping previously. We decided not to work with digital screens to provide an alternative display of information in contrast to a computer screen. We also looked at what was available both at campus and at home, and found an old prototype from an earlier semester project. This prototype consisted of two rows of LEDs in blue or red, and helped us explore the idea of working with light due to its simplicity and easy accessibility, both in terms of ordering and retrieving the materials, as well as the coding behind it. Beside testing on the old prototype, we had investigated using an LED 8x8 matrix or neopixel rings, but realised that RGB LEDs were a better match, as they were easy to use and acquire. By

selecting RGB LEDs as the source for our visual output, we shifted the visual intention to relate more to our paper prototype of *SoundFall*.

4.5.4 Visual conceptualization

For the aesthetics of the concept, we wanted it to capture our design principles of ambient, dynamic, privacy, simplicity, and connectedness. With SoP's conceptual base in *LavaLamp*, the visual exploration took at starting point in the intentions of the paper prototype.

The visual intentions of *LavaLamp* were as follows: By representing the coworkers through dynamic bubbles, the principle of simplicity and privacy would be used. Ambience would be through the device's physicality, the bubble's dynamic movement, along with the overview of workflow variations, illustrated by colour and speed variations for each bubble. All together providing awareness of coworkers workflow, and creating a sense of connectedness.

As our visual intentions were limited by material access and abilities, we went to explore potential materials as part of the implementation. Here we settled on using RGB LEDs which provided the ability for exploring variations in colour choices for 'No Activity', 'Activity', and 'High Activity'. Due to this choice, we were unable to implement the original idea of work mode representation through moving bubbles, and instead aimed towards the visual aesthetic of *SoundFall*, with pulsating light for the dynamic movement. For the visual appearance of the LEDs, we intended for all activity levels to provide dynamic visual feedback, as a contrast to status icons from eg. Microsoft Teams.

For 'No Activity', we saw a correlation between traditional pause-screens, on e.g.Window-devices, and an RGB LED changing between its colours slowly. We therefore settled on this representation of break-taking. We agreed that a constant flow of colour change would partly resemble "pause-screens" but could also symbolise the unknown set of user activities performed in the break.

For the 'Activity' and 'High Activity' levels, with the means of providing a dynamic representation of workflow awareness, we agreed to use a pulsating light. Here the LED would be constantly turned on/off through a slow dimmer. The intention was that as long as a user is working the light will pulse, so as to provide a dynamic representation of working. We also discussed that the workflow pulsation could be altered by the intensity of keystrokes, for providing more nuances to the act of working. Here we also saw 'High Activity' as an indication of the need for a break. As the three activity levels would present different visuals, we thought it to be doable to interpret what mode different coworkers were in, without being able to distinguish coworkers from one another addressing both the connectedness and privacy design principle.

For the physicality of the prototype, and the arrangement of lights, we decided to further explore the visual concept of *SoundFall* as we found the visuals aesthetic, simplistic, and effective. We therefore made sketches to visualise each of our ideas of how to implement them into a physical design (See Figure 11).

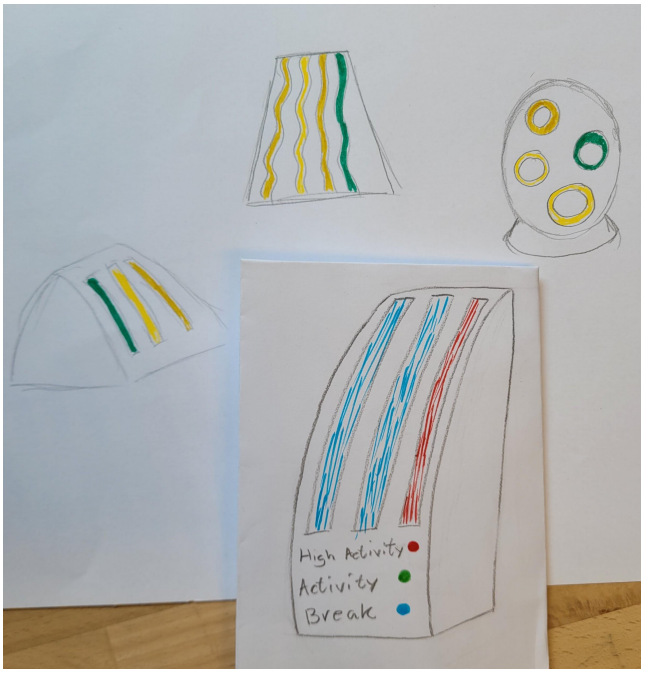

Figure 11: Sketches of final designs for implementation.

5 IMPLEMENTATION OF ‘STREAM OF PRESENCE’

This section covers the build and implementation of our final prototype *Stream of Presence* (*SoP*). Including the physical design, behaviour, and code that brings the concept to life. The end of this section is dedicated to the design principles used and how they were implemented in practice.

5.1 Low fidelity implementation

As a part of the semester we participated in Design Expo ‘23. For this we produced the first prototype of SoP, by using cardboard, translucent air foam, three wired RGB LEDs, aluminium foil, two Arduinos, and a powerbank. Each arduino ran a closed loop, one controlling one LED with a ‘break signal’, and one controlling two LEDs with an ‘activity signal’.

For this initial prototype, the ‘activity signal’ was pulsating blue light, whereas the ‘break signal’ was a colour flow, going through blue, purple, red, yellow, green, turquoise, and then returning to blue. The dynamics of all three lights were shown simultaneously. Blue was used because of its soothing nature, whereas the colour change was seen as a symbol of the unspecified behaviour. By building this prototype, we were provided with insights into how to improve our building techniques for a high fidelity prototype implementation. The low fidelity prototype can be seen in Figure 12.

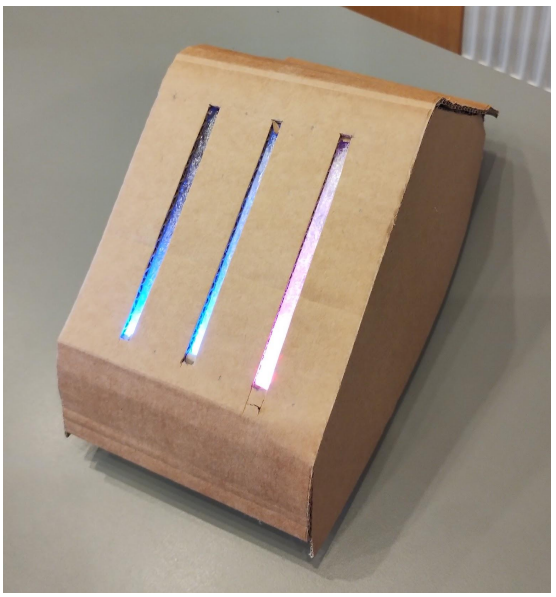

Figure 12: Low fidelity prototype used for Design Expo.

5.2 High fidelity implementation

Based on our low fidelity prototype of *Stream of Presence* (SoP), we started building three identical prototypes based on the sketch in Figure 11. We used cardboard for the high fidelity prototype as it's easy to form and yet resistant. For similarity, we made a template for the form, and made three in total: one for each participant. In each box three vertical lines were cut with an RGB LED in each. The LEDs were wired to resistors varying between 110-220 Ohm. Each of these lines and their corresponding LED would represent a user's workflow with one representing the user and the other two representing the coworkers. Because the lights were too sharp, translucent air foam was glued to the inside of the holes and around the LEDs in each prototype. The LEDs were glued to the inside of the prototype below the holes. On the outside, the prototypes were painted white for a more neutral look. Inside the box was an ESP32 microcontroller capable of wi-fi connection. Through these microcontrollers the prototypes could be "linked" making the LED's change colours based on each person's "activity" level in real time. The code on the ESP32 controlling the LEDs can be seen in appendix 1.

Figure 13: The final prototype SoP (lights turned off).

5.2.1 Light design of activity levels

The visuals of the three levels of activity ('No Activity', 'Activity' and 'High Activity') were changed due to technical limitations. Instead for the colour code of the activity levels, we used the primary colours of the RGB – Red, Green, and Blue. As a reference to Microsoft Teams use of colours (See Figure 1), "Activity" was green, which Teams use to sign availability, and "High Activity" red, which Teams use to signal 'busy' or 'do not disturb'. Blue was therefore used for "No Activity" and signalling a break taking place, which is not incorporated in Teams (Instead Teams use yellow to represent when someone is away). As blue furthermore is generally seen as a calming colour, we found it suitable for signalling break-activity. As illustrated in Figure 13, we included a sign for the colour-coding for minimising the mental process of reading the light signals. As the light signals were intended to inform coworkers about each others breaktaking and workflow, as well as provide self awareness for the individual users, the use of red for "High Activity" was also intended as a signal to when it might be relevant to take a break, like a stop-signal, in case the red light had been on for a longer period of time. Initially we wanted the lights to be changed simultaneously, as presented in the low fidelity prototype implementation (Figure 12), but due to technical limitations, only one LED was turned on at a time.

5.2.2 Coding the activity logic

To record the activity of the participants we needed a way of tracking the users activity level. To achieve this we decided on tracking the amount of keyboard presses and mouse clicks and then determining the activity level based on that. The logic for switching activity levels was as follows: The system would measure for some time period "X" and then during that

period count every keypress and mouse click as an activity indicator “Y”. If that activity indicator was = 0 the system was set to “No Activity”; if it was below some threshold “Z” that we set it would be “Activity”; and if it was above the threshold “Z” it would be “High Activity”. After an activity level was set, the indicator “Y” would reset and a new time period would begin. We decided that the time period “X” would be 2 and a half minutes (150 seconds) and the threshold “Z” would be 250 inputs.

Mode:	*No Activity*	*Activity*	*High Activity*
Input(Y) / Minutes(X)	0 input for 2.5 minutes	1-249 input for 2.5 minutes	250< input for 2.5 minutes

Table 2: Activity logic for the three activity levels.

To measure and track this activity we developed a python program which would run on the participants’ computer while the prototype was in use. This program would employ the previously explained logic and then send a signal corresponding to the measured activity level to a MQTT server, which would relay this to the prototype(s) and change the LEDs accordingly. This program can be found in appendix 2. The programs in appendix 1 and 2 were both written with assistance from the AI tool chatGPT.

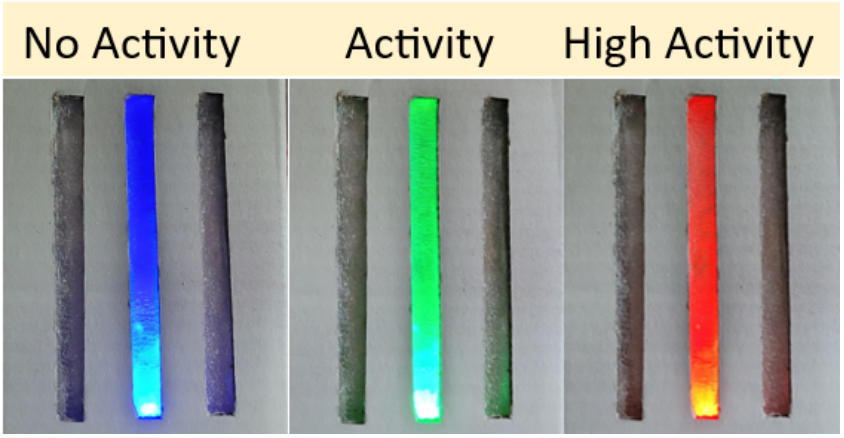

Figure 14: The visual implementation of the three activity levels in one of the prototypes.

5.3 Usage of Design Principles

The following section will cover how the design principles have been used to guide the design of the prototype.

5.3.1 Ambience

We used our design principle ambiance when designing the light on the prototype. The three LEDs would fade the different colours in and out making the change in lights smoother and less distracting. We used the three main colours of RGB LEDs (red, green and blue). We also decided to have the lights at a slight angle so they would not shine directly into the users eyes when looking at it, to further aid this we added a layer of translucent Air Foam around the LED’s and a backside of aluminium foil, this served to increase the spread of the light but reduce the intensity of it. Microsoft Teams is an example of a more static solution to

communicate your status. It is the aim of this prototype to contribute a more ambient solution.

5.3.2 Dynamic
The colour changes would help provide an idea of what the general workflow currently is. The lights would also be used to convey the information about the users activity levels passively and constantly be changing throughout use making it very dynamic.

5.3.3 Simplicity
We kept the simplicity of the prototype high by having very little information conveyed and even less to distract from that information. The box was sleek and only as big as it needed to be for the necessary technology to fit inside it. As seen on Figures 11 and 13 we also added some text indicating what activity each colour corresponded to, in case the user forgot. The prototype was painted a matte white so it had a very neutral colour that would fit in on most people's desks without clashing in colour with its surroundings.

5.3.4 Privacy
We decided on a high degree of anonymity to avoid feelings of being surveilled, we did this by not having any indication of which light was connected with each user, and by only representing a vague representation of the users activity level and not the users themselves or what they were actually doing. As mentioned the users work/break status was represented in terms of their activity level, with the coloured LEDs changing colours accordingly.

5.3.5 Connectedness
To enhance the feeling of connectedness and awareness we decided the light would be updated constantly throughout the day in relatively short intervals (every 2.5 minutes) to highlight the fact that there are other people actively on the other side of their device. This was also one of the reasons why we decided on the fading pattern of the LEDs, to make them seem more "alive".

6 EVALUATION
With the *SoP* prototype complete we needed to evaluate it to ensure our design method satisfied our research goal. To do so we first performed a pilot test ourselves before performing a field experiment on three participants who regularly worked from home.

6.1 Pilot test
As we were all familiar with the concept, the pilot test was performed to ensure technical reliability, as well as to get a feeling with the performance of the light visuals. The pilot test consisted of the three members of our group WfH on this project while using the prototype. During this test we experienced technical unreliability due to bad wire-connections, which were fixed before the field experiment. We responded positively to the look and feel of the fading LEDs and their colour change, however the frequency of the light changes were off. We tested with an interval of 2.5min and 250 input threshold and afterwards discussed our experience and decided that the threshold for reaching 'high activity' should be lower. Based on this pilot test we decided that every 2.5 minutes seemed the most fitting for changing the activity mode, and that the amount of inputs to reach 'high activity' should be lowered from

250 inputs to 150. The activity valuable for the three modes were as following, before the Field Experiment:

Mode:	*No Activity*	*Activity*	*High Activity*
Input / Minutes	0 input for 2.5 minutes	1-149 input for 2.5 minutes	150< input for 2.5 minutes

Table 3: Changes made for 'Activity' and 'High Activity' intervals based on pilot test.

6.2 Field Experiment

Next we conducted a field experiment. Stol and Fitzgerald (2018) define a field experiment as a research strategy set in a natural setting to gain maximum potential for realism of the context (in this case the context of WfH with its limited social connectedness to coworkers). They present two strategies for studies conducted with a high degree of realism: field study and field experiment. Contrary to field studies, for field experiments "researchers manipulate some properties or variables in the research setting so as to observe an effect of some kind" (p.11:12). In our case, our prototype is the manipulation, which lowers the degree of naturalism from their regular WfH days. As we need to understand their regular experience as well, without affecting them through the prototype, we divided our data gathering between before and after the field experiment.

6.2.1 Participants

The participants for the field experiment needed to regularly work from home; work in a physical office setting; have frequent social encounters with each other; and have an awareness of each others' workflow. Examples of this work setting can be found in open offices where co-workers work as a team but also maintain individual tasks. For the test to seem natural and to provide a relevance for social connectedness, we needed a group of people who work together on a daily basis and know each other. We collaborated with a team specialised in contaminated soil in a large consulting engineering firm, and had three test participants that fulfilled all of our requirements.

	Participant 1 (P1)	*Participants 2 (P2)*	*Participant 3 (P3)*
Age	38	27	29
Occupation	Consultant	Graduate Consultant	Consultant
Time at company	4 years	6 months	6 months
Years of experience with remote working	4+ years	2,5 years (2 while studying)	1+ year (more from studying)

Gender	F	M	F

Table 4: Basic demographic information on participants: P1; P2; P3.

6.2.2 Data gathering

To gather data we used semi structured interviews (Kvale and Brinkmann, 2015). We did this to get qualitative data from the participants about their experience using the prototype, and to allow additional observations from the participants that we did not think to ask about. This would also allow the participants to go in more detail into the aspects that affected them the most during the experiment.

As mentioned in 'Field Experiment' we needed to gather data before and after the experiment. The pre-interview was performed the evening before the experiment, focusing on experiences of remote working at the firm, relations to colleagues, their home office and how they work from home, as well as habits relating to breaktaking when WfH.. The post-interview was performed after the end of their day working from home and focused on their thoughts on using the prototype, including: the visual design; their usage; their actual breaktaking; and their feeling of connectedness to coworkers. Both pre- and post-interview questions (in Danish) can be found in appendix 4. Apart from the interview, we also conducted a text-string of the participants' change in workmodes registered by the program on their computer.

6.2.3 Setup and test

Before the experiment we made a setup-plan, and estimated it to take 15 minutes. For the setup we each had to bring the prototype (No1; No2; No3) assigned to the participant (P1; P2; P3), and an USB stick, each with a program for tracking user inputs (#1; #2; #3) assigned for each prototype. The code on the prototypes had already had the participants local internet access incorporated, the internet information being gathered in advance at the pre-interview.

The setup-plan was as follows, in order:

1. Have the participants fill out a consent form (see appendix 3). The consent form allowed us to use the interviews for this project, take pictures of their setup, gain access to their wifi information, and run the python program on their computers that was required for the prototype to work.
2. Install the python program on their work computer.
3. Turn on the prototype.
4. Call group members to ensure technology is running at all three locations.
5. Ask if participants had any questions about how to use the prototype.
6. Take a picture of their home office setup.
7. Plan a time for the post-interview.
8. Provide contact info in case of any issues.

Practically, the prototype would be placed at the work desk at each user's WfH location, within the eyesight of the users when they are sitting or standing in front of the desk, but not directly in front of them. Examples of setups with the prototype can be seen in Figure 15.

Figure 15: Two examples of the setup at P2 and P3.

The experiment took place in the user's own homes where they normally WfH. This builds on the necessity of a natural setting for the field experiment, which mimics the natural use-case as much as possible and thereby strengthens the value of the results. We arranged with all participants for the setup time at 09:00 am at their home. Starting each prototype at the same time was important for the data to run consistently between each test site. After the setup, we left for the duration of their work day. This was done to make as little impact as possible on the users normal workday. After they finished working we came to retrieve the prototype and conduct the post-interview.

6.2.4 Limitations

For the field test two limitations occurred for P3, firstly we did not introduce the participant properly to the fact that the prototype visualised all participants' workflow. Secondly, the program on P3's computer only ran correctly from setup time and until lunch. Hereafter the default settings kicked in, and their light on the prototype kept showing the last displayed colour. As we knew from the pre-interview that P3 always locks her PC when leaving it, we assume this caused the error as it turned off the data-signal. Another limitation was our technical inability to present the light signal for each participant simultaneously, which might have helped P3 understand the concept more indirectly.

6.2.5 Analysis

To analyse the data gathered from the interviews we used the qualitative research technique content analysis. Hsieh and Shannon (2005) define the method as "the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (p. 1278). Hsieh and Shannon (2005) define three approaches: conventional content analysis; directed content analysis; and summative content analysis. For our research we have selected the directed approach as we saw it as the best fit into our content, where we want to investigate our design choices, which stem from prior literature. Hsieh and Shannon (2005) define "the goal of a directed content analysis is to validate or extend conceptually a theoretical framework of theory (p. 1281). For our case, we want to validate our implementation of our design principles (Ambiance; Dynamic; Simplicity; and Connectedness) and design considerations (Active/Passive interaction; Break/work visualisation), which emerged through our design process.

These will function as coding schemes or themes for the analysis, and be used to structure the results so that they can be discussed. As a means of structure and accessibility to the interview, we used systematic text condensation (Malterud, 2012) to make the six interviews into text pieces based on the identified themes (design principles and design considerations). The outcome of the analysis can be found in appendix 5.

7 RESULTS

The following section covers the results from the directed content analysis and systematic text condensation. The three participants will be referred to as P1, P2 and P3. The section is divided in two parts: one focusing on the results from both interviews, with the findings divided into themes guided based on our design principles and considerations; and the second illustrating the graphs based on data of each participants' activity tracking.

7.1 Preliminary findings

Through a preliminary interview we sought to understand the participants' work habits associated with WfH. These findings illustrate the variations in the three participants' experience of working from home, addressing their motivation; what they miss; the communication between colleagues; and their breathtaking habits. These findings will be used to discuss the rationale behind the participants' experience with testing the SoP prototype.

> P1 regularly works from home, due to the freedom it gives by having a soft transition between weekends and work, and for avoiding disruptions caused at the office. She has a good home office, and feels more effective when WfH. Her communication with coworkers is mostly work-related, and the social aspect is her biggest motivator to work at the office. She struggles to remember to take breaks at home and even sometimes uses her lunch break to do extra work. When she takes breaks is mainly to collect thoughts, get outside if the weather is nice, or feels hungry.
>
> P2 rarely works from home, and only does it for practical reasons, like expecting a package. He prefers to work at the office, because the settings are better and he feels more productive. He finds it difficult to work from home, when he lacks work tasks. He too has mainly work-related communication with coworkers, when collaborating, and finds it easier to get in touch at the office compared to Teams. He feels more distracted when WfH, e.g. by his cellphone, and has no clear distinction between work and break-time at the home office. He also takes longer lunch breaks and every time he finishes a work task.
>
> P3 works from home occasionally due to practical reasons, like when she needs her car for an errand, and feels she uses the day more efficiently. She prefers to work at the physical office, as she does not have a home office setting, and feels less productive at home. She also uses the physical office for socialising, and feels less connected to those who work a lot from home. Sometimes she sends private messages to one close coworker, though the main interaction with coworkers is work-related. She also uses her calendar a lot, and sometimes checks whether the others are online. . . She feels that she gets enough breaks throughout the day, where many of them are prompted by practical tasks like grocery shopping, laundry, and dishwashing. These breaks are often longer than the ones she takes at work eg.

coffee breaks. She also takes breaks when her work feels monotonous, and looks at social media, online shopping, or at news. Sometimes she works in the evening if she does not reach her hours, and often takes off her smartwatch when WfH because it becomes an annoying distraction, when it prompts her to be active.

During the field experiment the activity of the participants was recorded. This was done to get an idea of the variation in their workflow when working within the presence of the prototype, both to see the amount of breaks they take and the distribution of them, as well as to compare the work pattern to the insight we gained from the preliminary interview. The results of the different participants have been modelled into graphs to evaluate and compare their activity. Through the post interview it became evident that some activities, like meetings, were marked as no activity since there was too little input on the computer.

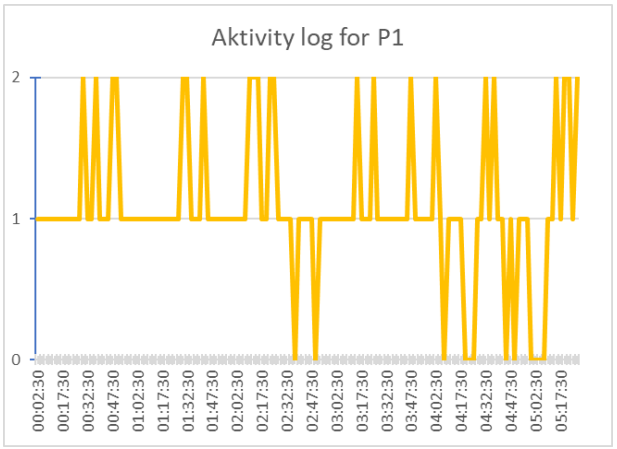

Table 5: Activity log for P1. Duration in time from around 9:15-14:30pm.
0 = 'No Activity'; 1 = 'Activity'; 2 = 'High activity'.

The activity log above of P1 confirms her own feelings of finding it difficult to take breaks when WfH. There does not appear to be any longer breaks which could mean that she worked through the lunch break. The graph shows that she is in high activity a lot of the time. As she also had Teams meetings and expressed frustration with her activity being on 'break' when working, the longer duration of 'No Activity' at the end of the day, might be her attending meetings.

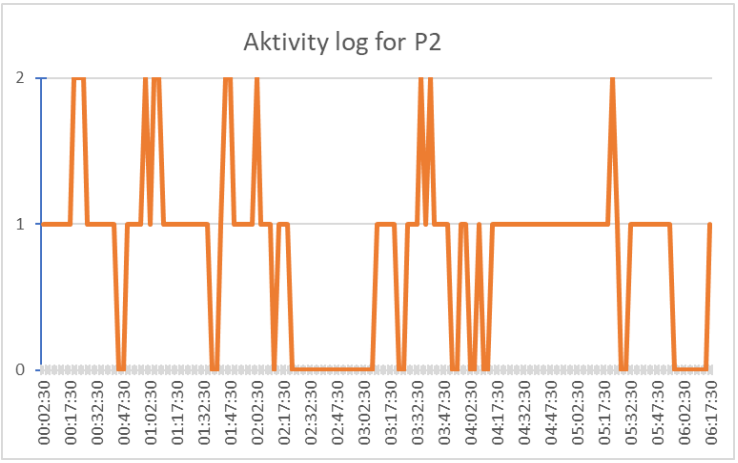

Table 6: Activity log for P2. Duration in time from around 9:15-15:30.
0 = 'No Activity'; 1 = 'Activity'; 2 = 'High activity'.

P2 stated that he preferred to take a long lunch break and shorter breaks around it which the graph seems to confirm. P2 stated in the post-interview, that the device had recorded a meeting as false breaks which could explain the reason for “break” appearing at the end of the day. The findings of the post-interview will be expanded upon in the next subsection. As the graf future present a fluid variation between the different activity levels, could be an indication that our activity intervals were otherwise representative.

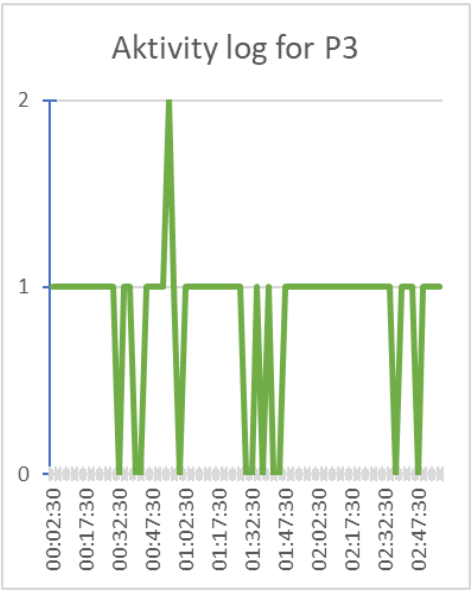

Table 7: Activity log for P1. Duration in time from around 9:15-12:00.
0 = ‘No Activity’; 1 = ‘Activity’; 2 = ‘High activity’.

The graph seen above of P3 is shorter than the others due to technical issues. As P3 has the habit of turning off her work computer, each time she leaves it, it is possible that this action turned off the key-logger responsible for measuring her activity, when she went for lunch. Though she normally often takes breaks, the activity tracking shows a high amount of smaller breaks, and only one case of ‘High Activity’. This behaviour might be linked to the fact that she felt highly disturbed by the prototype, and had to move physically away from it to concentrate on her work. This will be elaborated on in the following subsection.

7.2 Main findings

The main findings are divided into coding categories based on the five design principles.

7.2.1 Ambience

For ambience we had a focus on the lights in the prototype not being distracting, but noticeable. P2 and P3 found the lights to be disturbing for their workflow. P2 found it hard to focus with the constant shift in colour and intensity, especially the red colour was dominant. P2 did also report being more careful about remembering to take breaks, since there was a physical reminder. P3 liked the three lights but was disturbed by the presence of the prototype claiming that the lights were too large and too rapidly changing. P3 also felt less productive using the prototype while P1 found the lights to be calm and was not disturbed. Instead, P2 generally did not notice the prototype much outside of meetings “*I mostly noticed them during meetings when I wasn’t looking at the screen all the time*”.

7.2.2 Dynamic

The dynamic aspect of the prototype was how it presented the information about the different activity levels by using changes in colour. P1 was curious about which light represented her, she reported when seeing a red light (high activity), she thought "*who is that? Is it me? Is it the others?*". There was a time when two were glowing blue (indicating breaks) and one was glowing red and she thought "*ok, since I'm not taking a break, I can't be the one who's blue*". P1 also said that if she saw that her light was green (low activity) and the other two were blue, she felt pressured to work more "*for me it provokes some mixed emotions, if i see the other two are green and mine is blue, then i get that feeling of "no, i'm doing something, i'm in a meeting" and then i feel pressured to do even more"*". If multiple lights were blue she felt she should work more to make sure her light was not blue, whichever one it was. She discovered how the system tracked her activity during a meeting because she had not typed anything for a while and hers turned blue even though she was not taking a break, however she did not think about which of the lights corresponded to her co-workers "*the focus was on myself*". P2 similarly experienced frustration at their light indicating a break when in a meeting.

P3 found the lights to be too big and changing too rapidly: "I think that if it was a small bulb, I think I would be less disturbed than it lighting up all the way". P3 also expected consistency in colour choice. She found that the colours were changing too quickly and that the constant change between the three lights was disturbing. She would have preferred for the lights to be lit in the same colour for a longer duration. P3 reported that the choice of colours are ok but would have preferred it to replicate the colours of Microsoft Teams: red; yellow; and green.

P2 reported that he thought the intensity of light was fine but found it annoying that it pulsated. He would prefer the lights to be more static and to get dynamics by adding smooth transitions between the colours. He had no objection to the choice of colours but found it annoying to have to wait to see everyone's activity level.

7.2.3 Simplicity

The simplicity of the prototype was in its recognizability of variations in workflow as well as its physical design.

P2 found the device to be big considering its functionality, but liked the shape. P3 agreed that it should be smaller and stated as an orderly person at the desk she only wants the most necessary on display. P3 would have liked a black design to compliment the other desk objects that are predominantly black. P3 felt that more introduction and purpose of the design was important to properly utilise the design. She found It okay that it is anonymous, but would like to know which light represented her: "I think it's a bit strange, I don't know which one I am.".P3 further stated, that the light should be smaller as well, as she found them distracting for her workflow. P1 found it to be just fine.

7.2.4 Privacy

Privacy referred to what degree of anonymity the information about the participants would be conveyed and how that would be represented visually.

P2 could guess where he was represented in the design. He thought it was representative of his level of activity. He had an idea who the others were, but wasn't sure. He thought it made sense to be anonymous if the purpose was to gain insight into a colleague's activity.

He felt a little bit like he was being watched and felt he had to be productive because of it, stating: “I feel a little bit watched. You can feel that it is keeping track of how efficient you are when you work from home”.

P1 did not think the prototype correctly represented her work effort, especially when she sat in meetings, still working, but having her light indicate a break “ “when *i'm in a meeting, in principle, i'm not taking a break*””. If the prototype was something provided by an employer, she would have felt more negatively about it because it did not properly represent her work effort “*if i was a manager or something, i’d think - “hey it's a bit too many breaks my employee is taking”, which it wouldn't be*”, and “*the accurate representation is important, my breaks are my breaks and my work is my work*”. She was curious as to which light represented her, but still thought it was fine that it was anonymous. She did not consider which of the lights corresponded to which of her colleagues. She thought it could feel a bit like surveillance but that it could have motivated more breaks if she herself was not represented on the prototype and it was just her co-workers.

P3 also would like the level of anonymity to be more clearly explained to avoid confusion. She would have liked it to say eg. “player 1” to clearly state it was anonymous. She was not aware of which light identifies her but would have liked to know. “*I think it's a bit strange, I don't know which one I am.*” She noticed it glowing blue after lunch indicating a break, but did not notice it recording breaks otherwise.

7.2.5 Connectedness

P2 was aware of the prototype throughout the day and thought it was fun to be able to see the activity level of the others. He estimated that he looked at it four to five times an hour. By using the prototype, he was more concerned about whether colleagues are busy and whether they potentially needed a break than he considered it for himself.

P2 felt he gained greater insight into his colleagues' work flow and became more aware of how much his colleagues work stating: “*I already knew how much they worked in the office, but you become more aware of how much they work and how busy they are, but also when they take breaks*”. P1 did not gain the same level of insight into her colleagues' work flow and did not feel any presence from her colleagues. Simarlily P3 stated that she did not feel more closely connected with colleagues through the prototype, as she was not aware of the prototype illustrating her coworkers workflow. (This could likely have been avoided by a more in depth explanation of the prototype’s behaviour).

P2 believed it would be extra rewarding with people you rarely see in your team like people in support roles or people from other offices. “My section is in Aalborg and then we have some we work with in Aarhus, Vejle, and Odense. There, I could well imagine that you would feel a closer relationship with them if they were included.” He also found it more manageable than Microsoft Teams as it is always available, physically on the desk. He felt the prototype has brought him closer to his colleagues. P3 did not feel like it contributed to something that cannot be achieved through the functionality of Microsoft Teams. P3 felt a bit watched and was confused as to why her colleagues should know when she would take a break and did not see the relevance of knowing if the others were taking a break: “After all, I'm going home to not be with my coworkers. I know I said I miss them when not in the office, but there's a

reason for working home anyway. I'm here to be more productive and less disturbed.” and further added “At home things are done according to me, whereas at work you become a little more streamlined”.

P2 also noticed a difference when seeing the activity of his colleagues. He felt it more acceptable to take a break when his colleagues did, but at the same time he didn't feel it was acceptable to take a break when they didn't. He stated: “I feel a little bad about taking a break when the others are red, but on the contrary, it's more okay when they light up blue.”
P3 was similarly not prompted to breaktaking by others doing so stating: “I don't think it's more acceptable to take a break because others take a break. You do your thing"

P3 felt that it is not very transparent that the lights represent coworkers and that an introduction to the prototype is necessary for new users to understand it. She also lacked connection to the prototype because she couldn't find out when she had been highly productive according to the prototype, but knew herself. P3 felt a bit surveilled by the prototype but felt that "Perhaps if there were more people involved, but that would also be potentially disturbing ... but the thing about us being only three, it's a little weird somehow".

8 DISCUSSION

In this paper we have been trying to answer the following problem statement:
“How can an interaction design prompt breaktaking by supporting awareness of coworkers’ workflow for people working from home?

We used lights pulsating and changing colours based on user activity as a way of creating awareness of the participants' coworkers. We thought that having the lights respond in real time to the users activity would make the connection to them more “human”, as you could actively see changes in your coworkers behaviour, and thereby have a more direct link to them than a status display on Microsoft Teams would provide. However, in practice this effect was lost on our participants. The main reason for this was the way we chose to showcase their behaviour: Through their activity. It turned out that having the users own activity displayed was very distracting, as the users primarily became extra aware of their own work, rather than that of their coworkers. This led to some unintentional consequences, the primary being that the system did not help prompt breaks in any way as we had hoped, since they never felt much connected to their coworkers'. In cases where a participant *did* notice their coworkers' presence it had the opposite effect, like when P1 felt they should work more because of the prototype displaying them as taking breaks and P2 felt more motivated to work than take a break when they saw others taking breaks.

Another perspective is that it is not a lack of awareness, but it is what that awareness ends up meaning to the user. The current prototype shows each user their own and their co-workers activity levels and expects them to parse that increased awareness into taking more breaks. As it turned out the participants were much more likely to see a certain activity level, and be inspired to raise it, rather than lower it. Furthermore the fact that the prototype did not always *accurately* display the participants activity levels created frustrations since a participant would think they were doing good work, then seeing the prototype tell them something different. This was especially apparent when the participants were in meetings, actively working, but because they were not typing on the keyboard or clicking their mouse,

the prototype would indicate they were on break. We had foreseen problems with the accuracy, and it was one of the reasons we decided to make the lights anonymous, however in practice the participants managed to figure out which light represented themselves. We had also assumed that it would not be a problem if the prototype would report more breaks than were actually being taken, since this could lead to increased break taking, which was ultimately the goal. In practice this did not occur, as P1 said “if i see the other two are blue, i don’t get the feeling of “of they’re taking a break I should also take a break” it was the opposite like: “hey I need to work, I shouldn’t take a break”. This could point to the relevance of removing the variation between ‘Activity’ and ‘High Activity’ as this pointed their awareness more towards efficiency and working more, and being annoyed when the break-signal was incorrect. Though we thought ‘High Activity’ would signal the need of a break, it seemed it instead caused a feeling of competition between the coworkers (P1), as well as an awareness of when others needed a break (P2).

The idea behind the prototype was simulating the physical workplace where spontaneous breaks happen throughout the day because of having coworkers physically around you, however there are some flaws in our transfer of this concept to the home office. Firstly with the prototype you are being made explicitly aware of when your co-workers are actively working and when they are taking breaks, at the physical office typically you would not actively be focused on how much or how little your coworkers are working in a moment to moment situation. And secondly the prototype provides no actual prompt to take a break, whereas in the physical office something as simple as a coworker coming over to your desk, or going elsewhere and running into a coworker can actively start a social break. The prompt there lies in the human physicality and proximity. It could therefore be relevant to incorporate a way for interacting between remote coworkers, another alternative could be to look more in depth at who actually has a benefit of this type of awareness system. As seen with both P2 and P3, who had little issue with taking breaks from work, and did not work from home that often. P1 on the other hand did use her home office regularly, had issues with taking breaks in it, and missed the office mostly for the social situations. As this aspect was not covered in our introduction, it would seem relevant to explore further who the target group is, although our test is limited in this regard since we only evaluated with three participants. Another direction could be instead of activity, the prototype would display availability, thereby shifting the focus to *when* a user is available for a social interaction, instead of how much or how little they are working at the moment.

8.1 Interaction design of the prototype

The lights were designed with ambience in mind to foster presence without having to take too much attention away from the actual work. This was done using pulsating lights, they were however criticised for being too large and intrusive which created a decrease in focus, an alternative design could reduce the size and intensity of the lights.

The cycle of the three lights fading in and fading out was deemed too slow for the participants, an alternative design could have all three lights on at once, with soft fades happening only on colour changes. This could also increase the feeling of connectedness, by being able to constantly see the other users activity, rather than having to wait for the cycle to complete.

When designing the prototype we decided against having the users themselves decide when they were taking a break and when they were working. This was done to avoid situations where users choose not to press the “pause button” since they knew other people would see it and did not want to be seen as slacking off, thereby discouraging breaks. It was also possible that the users would forget this manual feature and thereby not use it. However, as it turned out removing this choice also removed some agency from the users, and instead resulted in frustrations where the system said they were taking a break when they were in fact working. This could also argue for the relevance of using proximity sensing of the user, detecting them in front of their work station to indicate work, as an alternative to keylogging. Another choice to consider would also be to include a ‘do not disturb’-action. This could partly compensate for the removal of a ‘high activity’ measurement as well as be preferable as an easy access point for those, not fond of plotting too much into their calendar.

8.2 Future work

An alternative design (which was also suggested by P1) could be removing the light representing the user and only having lights for their co-workers. This would prevent users from getting distracted by their own workflow and remove frustration of the system misrepresenting a users work activity. If the system had been more directly focused on actively providing break prompts, or was entirely focused on providing a better sense of connectedness, perhaps it would have been more successful. P2 did report being more aware of his colleagues' workflow, although neither of the other participants did, however this still did not result in increased breaktaking for P2. An alternative design could implement buttons which would set the user into “break mode” or even “meeting mode” when they themselves chose to, giving more control to the user to hopefully alleviate frustrations of the activity indicator. As this absence of input would be defined through a predefined set of intervals, it would take time for it to detect abruptly physical absence of coworkers. Therefore, we found it relevant to include a proximity sensor in the awareness system, for measuring when someone physically leaves their computer. As this measure is also not always correct, its relevance for passive break-detection follows the argument above. Further evaluation could also be done on a larger group of people to see partly the effect on a broader group of people, but also to investigate the upper limit for how many coworkers it is relevant to include where it still provides connectedness. Based on our current findings, our design principle of ambience seems to be unfulfilled, as P2 and P3 were disturbed by the prototype’s presence. This points to the need for the dynamic design principle to be less prominent, and the simplicity design principle to be further explored.

9 CONCLUSION

Through this report we tried to answer the question: *“How can an interaction design prompt breaktaking by supporting awareness of coworkers’ workflow for people working from home?”*. To do this we created the concept *Stream of Presence* (*SoP*), an awareness system that aims to encourage breaktaking for people WfH. We based this design on five design principles: Ambience, dynamic, simplicity, privacy, and connectedness. *SoP* aims to encourage breaktaking for a user through an increased awareness of their coworkers. This is done by tracking and presenting the user’s and their coworkers' workflow to make them aware of when breaktaking happens and encouraging them to take breaks themselves.

To evaluate the system we first conducted a pilot test on ourselves, after which we conducted a field experiment on three participants. Through the field experiment and the accompanying interviews we found that using work activity as a way to prompt breaks had unintended consequences, in that participants focused much more on their own work effort than their coworkers and their breaktaking. We also found that the indirect break prompt we had counted on was ineffective and the participants' use of *SoP* did not result in increased breaktaking or awareness of their coworkers. Finally we suggested some design recommendation for similar systems or future work on *SoP* based on our findings. Overall the prototype (SoP) was not able to prompt breaktaking by supporting the awareness of people wfh.

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Appendix 1. Program for the ESP32

Note: Some variables changed for the sake of privacy

```
#include <WiFi.h>
#include <Adafruit_MQTT.h>
#include <Adafruit_MQTT_Client.h>

//Defining credentials for WiFi and MQTT
#define WIFI_SSID "wifissid" //Insert users Wi-Fi SSID
#define WIFI_PASSWORD "wifipassword" //Insert users Wi-Fi Password
// Adafruit IO credentials
#define AIO_SERVER "io.adafruit.com"
#define AIO_SERVERPORT 1883
#define AIO_USERNAME "myAIOusername"
#define AIO_KEY "myAIOkey"

//Initialize WiFi and MQTT Clients
WiFiClient wifiClient;
Adafruit_MQTT_Client mqttClient(&wifiClient, AIO_SERVER, AIO_SERVERPORT, AIO_USERNAME,
AIO_KEY);

// Set up Adafruit IO MQTT feed
Adafruit_MQTT_Subscribe ledFeed = Adafruit_MQTT_Subscribe(&mqttClient,
AIO_USERNAME "/feeds/led-feed");
Adafruit_MQTT_Subscribe ledFeed2 = Adafruit_MQTT_Subscribe(&mqttClient, AIO_USERNAME
"/feeds/led-feed2");
Adafruit_MQTT_Subscribe ledFeed3 = Adafruit_MQTT_Subscribe(&mqttClient, AIO_USERNAME
"/feeds/led-feed3");

// Define LED pins and variables for first LED
#define RED_LED1 23
#define GREEN_LED1 22
#define BLUE_LED1 21
int currentBrightness = 0;
int pin = -1;
int lastPin = -1;

// Define LED pins and variables for second LED
#define RED_LED2 18
#define GREEN_LED2 19
#define BLUE_LED2 5
int currentBrightness2 = 0;
int pin2 = -1;
int lastPin2 = -1;

// Define LED pins and variables for third LED
#define RED_LED3 27
#define GREEN_LED3 14
#define BLUE_LED3 12
int currentBrightness3 = 0;
int pin3 = -1;
int lastPin3 = -1;

// Define variables for the fadeColor function
int fadeAmount = 5;
```

```
//Function for connecting to Wi-Fi
void connectToWiFi() {
  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
  Serial.print("Connecting to Wi-Fi...");
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("Connected!");
}

//Function for connecting to the MQTT Server
void connectToMQTT() {
  mqttClient.connect();
  while (!mqttClient.connected()) {
    Serial.println("Connecting to MQTT...");
    mqttClient.connect();
    delay(5000);
  }
  Serial.println("Connected to MQTT and subscribed to feeds");
  mqttClient.subscribe(&ledFeed);
  mqttClient.subscribe(&ledFeed2);
  mqttClient.subscribe(&ledFeed3);
}

// Function for fading the colour of the associated Pin the LED is on
void fadeColor(int pin) {
  int fadeAmount = 5;
  int brightness = 0;
  int currentPin = pin;

  // Fade in
  for (brightness = 0; brightness <= 255; brightness += fadeAmount) {
    analogWrite(currentPin, brightness);
    delay(45);
  }

  // Fade out
  for (brightness = 255; brightness >= 0; brightness -= fadeAmount) {
    analogWrite(currentPin, brightness);
    delay(45);
  }

}

void setup() {
  Serial.begin(115200);
  //Serial.begin(9600);


  pinMode(RED_LED1, OUTPUT);
  pinMode(GREEN_LED1, OUTPUT);
  pinMode(BLUE_LED1, OUTPUT);

  pinMode(RED_LED2, OUTPUT);
```

```
  pinMode(GREEN_LED2, OUTPUT);
  pinMode(BLUE_LED2, OUTPUT);

  pinMode(RED_LED3, OUTPUT);
  pinMode(GREEN_LED3, OUTPUT);
  pinMode(BLUE_LED3, OUTPUT);

  connectToWiFi();
  mqttClient.subscribe(&ledFeed);
  mqttClient.subscribe(&ledFeed2);
  mqttClient.subscribe(&ledFeed3);
  connectToMQTT();

}

void loop() {

  // Ensure MQTT connection is still active
  if (!mqttClient.connected()) {
    Serial.println("Connection lost. Reconnecting...");
    mqttClient.disconnect();
    mqttClient.connect();
    mqttClient.subscribe(&ledFeed);
    mqttClient.subscribe(&ledFeed2);
    mqttClient.subscribe(&ledFeed3);
  }

  // Process MQTT messages
  Adafruit_MQTT_Subscribe *subscription;

  while ((subscription = mqttClient.readSubscription(500))) {
      //Checks the feed for the first LED
    if (subscription == &ledFeed) {
      // Parse MQTT message
      char message[10];
      strncpy(message, (char*)ledFeed.lastread, strlen((char*)ledFeed.lastread));
      message[strlen((char*)ledFeed.lastread)] = '\0';
      Serial.println("Received message: " + String(message));

      // Toggle LED based on message
      if (strcmp(message, "NA") == 0) {
        pin = BLUE_LED1;
      }
      else if (strcmp(message, "LA") == 0) {
        pin = GREEN_LED1;
      }
      else if (strcmp(message, "HA") == 0) {
        pin = RED_LED1;
      }
    }

     //Checks the feed for the second LED
    else if (subscription == &ledFeed2) {
     // Parse MQTT message
      char message[10];
      strncpy(message, (char*)ledFeed2.lastread, strlen((char*)ledFeed2.lastread));
```

```
      message[strlen((char*)ledFeed2.lastread)] = '\0';
      Serial.println("Received message: " + String(message));

      // Toggle LED based on message
      if (strcmp(message, "NA") == 0) {
        //Serial.println("Debug: FEED 2 NA MESSAGE SUCCESS");
        pin2 = BLUE_LED2;
      }
      else if (strcmp(message, "LA") == 0) {
        pin2 = GREEN_LED2;
      }
      else if (strcmp(message, "HA") == 0) {
        pin2 = RED_LED2;
      }
    }

     //Checks the feed for the third LED
        else if (subscription == &ledFeed3) {
     // Parse MQTT message
      char message[10];
      strncpy(message, (char*)ledFeed3.lastread, strlen((char*)ledFeed3.lastread));
      message[strlen((char*)ledFeed3.lastread)] = '\0';
      Serial.println("Received message: " + String(message));

      // Toggle LED based on message
      if (strcmp(message, "NA") == 0) {
        pin3 = BLUE_LED3;
      }
      else if (strcmp(message, "LA") == 0) {
        pin3 = GREEN_LED3;
      }
      else if (strcmp(message, "HA") == 0) {
        pin3 = RED_LED3;
      }
    }
  }

// Fade in the new pins
fadeColor(pin);
lastPin = pin;

fadeColor(pin2);
lastPin2 = pin2;

fadeColor(pin3);
lastPin3 = pin3;

}
```

Appendix 2. Python program for the users computer

Note: Some variables changed for the sake of privacy and two similar programs were created with the only change being in the “FEED_NAME” variable, so each computer would send to their own feed.

```
import time
import sys
import atexit
from pynput import keyboard, mouse
from Adafruit_IO import Client, Feed, RequestError

# Output file
output_file = "output.txt"

class OutputLogger:
        def __init__(self, file):
        self.file = file
        self.stdout = sys.stdout

        def write(self, message):
        self.stdout.write(message)
        self.file.write(message)
        self.file.flush()

        def flush(self):
        self.stdout.flush()
        self.file.flush()

# Open the output file in append mode
file = open(output_file, "a")

# Create an instance of OutputLogger to capture the standard output
output_logger = OutputLogger(file)

# Redirect sys.stdout to the OutputLogger instance
sys.stdout = output_logger

# Register a function to save the output file upon program termination
atexit.register(lambda: file.close())


# Set up Adafruit IO client and feed
ADAFRUIT_IO_USERNAME = "myAIOusername"
ADAFRUIT_IO_KEY = "myAIOkey"
FEED_NAME = "led-feed"
PRINTOUT = "0"

try:
        aio = Client(ADAFRUIT_IO_USERNAME, ADAFRUIT_IO_KEY)
        feed = aio.feeds(FEED_NAME)
except RequestError:
        feed = Feed(name=FEED_NAME)
        feed = aio.create_feed(feed)

# Set up input counters
key_count = 0
click_count = 0

# Set up signal function
def send_signal(signal):
        print(f"{PRINTOUT}")
```

```
        aio.send_data(feed.key, signal)

# Set up input listeners
def on_press(key):
        global key_count
        key_count += 1

def on_click(x, y, button, pressed):
        global click_count
        if pressed:
        click_count += 1

# Set up input monitors
keyboard_listener = keyboard.Listener(on_press=on_press)
mouse_listener = mouse.Listener(on_click=on_click)

# Start input monitors
keyboard_listener.start()
mouse_listener.start()

# Set up main loop
while True:
        # Wait for 2.5 minutes
        time.sleep(150)

        # Determine signal based on input counts
        if key_count == 0 and click_count == 0:
        signal = "NA" #No Activity
        PRINTOUT = "0"

        elif key_count + click_count < 150:
        signal = "LA" #Low Activity
        PRINTOUT = "1"

        else:
        signal = "HA" #High Activity
        PRINTOUT = "2"

        # Send signal to Adafruit IO feed
        send_signal(signal)

        # Reset input counts
        key_count = 0
        click_count = 0

# Stop input monitors
keyboard_listener.stop()
mouse_listener.stop()
```

Appendix 3. Consent Form (Danish)

Fortrolighedserklæring til brug af lydoptagelser

I forbindelse med studerende _____

og deres speciale på 10. semester omhandlende sociale aspekter af hjemmearbejde, giver jeg hermed min tilladelse, til at sessioner må bruges som en del af den studerendes uddannelse ud fra følgende aftaler og specificeringer:

Jeg giver min tilladelse til,	JA	NEJ
- at sessionerne må optages på lyd	☐	☐
- at skriftlig beskrivelse og analyse af materialet i anonymiseret form må bruges i forbindelse med projektrapport.	☐	☐
- at have software installeret der måler tastatur aktivitet under testen	☐	☐
- at afgive mit netværks id samt kode til opsætning af testen	☐	☐

Forudsætningen for denne samtykkeerklæring er, at alt materiale bliver opbevaret sikkert og fortroligt i henhold til Datatilsynets krav. Materialet bliver opbevaret indtil endt eksamen i juni 2023, hvorefter det slettes. Alle, der har tilladelse til at se materialet, har tavshedspligt. Det er altid muligt at trække denne samtykkeerklæring tilbage, hvorefter lydmateriale samt kodeord vil blive slettet.

_____ _____

Deltagers navn Studerendes navn

_____ _____

Dato Deltagers Underskrift

Appendix 4. Interview guides (Danish)

Pre-test interview

Intro

1) Hvad er din alder?
2) Hvad er din stilling?
3) Hvor længe har du været hos Cowi?
4) Hvordan er din arbejdsmæssige relation til de to andre participants?
5) Hvor mange års erfaring har du med at arbejde hjemmefra?
6) Identificerer du dig som mand/kvinde/etc?
7) Hvad er dine WIFI oplysninger?

Remote arbejde ift arbejdsplads

1) Er du en del af et eller flere teams hos Cowi?
    a) Hvilke?
    b) Hvor store (ca. antal medarbejdere)?
2) Hvor ofte arbejder du hjemmefra?
    a) Hvorfor?
3) Er der nogen forskelle på din måde at arbejde hjemmefra og på kontoret
4) Arbejdede I mere hjemme under Covid-19?
    a) Har Cowi ændret sig ift. hjemmearbejde efter Covid-19? (evt. sociale tiltag ift hjemmearbejde / personlige tiltag?)
    b) Hvilke fordele oplever du?
    c) Hvilke ulemper oplever du?

Relation til kollegaer på kontoret og hjemmefra

(Fokus på de tre testpersoner)

1) Hvor ofte interagerer du med dine kollegaer på kontoret (testdeltagere)?
    a) Hvilken type interaktioner er det? (arbejds- vs ikke arbejdsrelateret?)
        i) Hvad er balancen mellem arbejdsrelateret og ikke arbejdsrelateret interaktioner?
2) Hvor ofte interagerer du med dine kollegaer når du arbejder hjemmefra?
    a) Hvilken type interaktioner er det? (arbejdsrelateret vs ikke arbejdsrelateret?)
        i) Hvad er balancen mellem arbejdsrelateret og ikke arbejdsrelateret
    b) Hvilke kommunikationsværktøjer bruger du inden for arbejdstiden? (e.g. teams, facebook messenger, Slack etc.)

Hjemmekontoret

1) Hvor er din hjemme arbejdsstation?
    a) Kan vi tage nogle billeder?
2) Føler du at du er mere eller mindre produktiv når du arbejder hjemmefra?
    a) Når du ikke er helt så fokuseret på dit arbejde, hvor kigger du så hen?
3) Hvad savner du mest fra kontoret, når du arbejder hjemmefra?
    a) Gør du noget for at minimere det tab?
4) Hvad savner du mest fra hjemmekontoret, når du er på kontoret?

Pause

5) Føler du, at du får nok pauser, når du arbejder hjemmefra?

a) Hvad får dig til at tage pauser (hjemme vs. kontor)
b) Hvad laver du når du holder pauser?
c) Hvornår holder du pauser?
d) Hvor lange er de pauser du holder på hjemmekontoret?
e) Hvilke klare forskelle er der fra når du holder pause på kontoret til når du arbejder hjemmefra?
f) Oplever du en forandring på din ikke arbejdsrelaterede kommunikation når du arbejder hjemmefra, end når du er på kontoret?

Afsluttende bemærkninger

1) er der noget du har tænkt over?
2) Er det noget du vil tilføje?
3) Har du nogle spørgsmål ift projektet?

Post-test interview

Design

1) Hvad synes du om designet af prototypen?
   - æstetik, størrelse, form
   - Positive/negativ
2) Hvad synes du om lysene?
   - farver, lysniveau, dynamik
   - Er det forstyrrende?
   - Hvad tænker du, når du ser lysene?

Brug

1) Er du opmærksom på den?
2) Hvor ofte kigger du på den i løbet af en arbejdsdag?
3) Hvad lægger du mærke til, når du ser på prototypen?
4) Er du bevidst om hvilket lys der identificerer dit eget arbejdsflow?
   a) (Hvis du kunne se hvilket lys der var dig, synes du det var repræsentativt for dit arbejdsflow)
   b) Tænker du over, hvem af dine kollegaer der er symboliseret i hvilket lys?
5) Synes du det er godt eller dårligt at prototypen er anonym? (Er den for lidt/meget anonym)
   a) Hvad med ift. pauserne?
   b) Føler du dig overvåget af at bruge prototypen?
6) Hvilke frustrationer har du ved “prototypen”?
7) Hvilke positive oplevelser havde du med “prototypen?”

Pauser

1) Hvilke typer pauser har du holdt i dag?
2) Påvirker det din måde at arbejde på, at du kan se hvornår andre arbejder/holder pause?
   a) Synes du det er mere acceptabelt at holde pause når du ser der er andre i “pause mode”?
   b) Synes du det arbejds/pause-flow protypen viser stemmer overens med hvad du forventede?
   c) Synes du, at din arbejdsmængde er ændret pga prototypen?
3) Synes du, at du får indsigt i dine kollegers arbejdsflow?
   a) Hvem synes du, det ville være relevant at inkludere i designet (ift kollegaer)?

Presence/connectedness

1) Føler du at prototypen bidrager med noget nyt som du ikke opnår gennem dine traditionelle kommunikationskanaler
2) Føler du at du er tættere forbundet til dine kollegaer? (via prototypen)
3) Fik du bedre indsigt i kollegaer's arbejdsflow og gav det noget?
4) Kunne du have lyst til at have prototypen eller lignende stående fast på dit hjemmekontor?

Afslutning

1) Har du nogle supplerende bemærkninger?
2) Har du nogle spørgsmål?
3) (Er der noget du mangler at uddybe?)
   Tak for deltagelsen i projektet → Giv gavekurv

Appendix 5. Systematic Text Condensation based on interviews (Danish)

Preliminary interview:

	Rationale for hjemmearbejde	Fysiske rammer	Aktivitet	Pausetagning	Sociale interactioner i hjemmekontoret	Andet
P1	Arbejder hjemmefra for flexibilitet	Udstyr fra Cowi	Bruger frokostpauser til at arbejde i (ved godt hun ikke burde)	Får ikke taget nok pauser	Kan savne det sociale ved længere perioder med hjemmearbejde	Menneskekontakt er motiverende men også forstyrrende
	Arbejder hjemmefra mandag/fredag for blød overgang	Arbejder nogen gange udenfor	Føler sig mere effektiv	Bruger frokostpauser til at arbejde i (ved godt hun ikke burde)	Kun arbejds-relateret kommunikation	Snak på kontoret om små sociale pauser
	Fortrækker at møde på teams når der er mange møder	Hjemmekontor lokaliseret i stuen		får små pauser i løbet af dagen (f.eks. tager kaffe under møde)	Sparring og møder kan blive til causal samtale	
	Færre forstyrrelser på hjemmekontoret Mindre 'på' ift at folk kan henvende sig - skal sende en mail i stedet Kan samle tanker og nyder stilhed			Bruger træning som afbræk fra arbejde Tager pause for at 1) samle tanker; 2) føler sig sulten; 3) komme udenfor i godt vejr	Skriver eller ringer på Teams Kan ikke få hjælp og dele frustationer på hjemmekontoret	
P2	Praktiske årsager for hjemmearbejde, f.eks. Modtage pakke	Dårligere rammer end fysisk kontor	Mindre produktiv end på kontoret	Bliver distraheret af mobilen	Sker når der samarbejdes med andre	Nemmere at snakke på kontoret end ringe på teams
	Fortrækker at arbejde fra fysisk arbejdsplads - mere produktiv, nemmere kommunikation og socialt element	Arbejder fra gæsteværelset	Arbejder på konkrete opgaver og opgaver der kræver fordybdelse	Bliver mere distaheret (gør rent og længere frokost)	Påpasselig med at ringe hvis ser folk er røde i teams kalender	
	Arbejder hjemmefra 1/14 dage		Ikke tydelig pådeling mellem pause og arbejde	Laver overspringshandler når der ikke er en oplagt opgave Holder længere frokorstpause holder naturlige pauser - mangler noget eller skal have en kop kaffe Holder pauser efter arbejdsopgaver Holder små pauser på mobilen (10-15 min varihed) Tænker ikke over længden af små pauser Ikke tydelig pådeling mellem pause og arbejde	Primært arbejds-relateret interaktoner med kollegaer	

P3	Arbejder hjemmefra ca. 1 gang om ugen	Arbejder fra stuen eller soveværelset	Bruger meget sin Teams Kalender	Tager pauser når hun føler for det	Arbejdsrelateret kommunikation til kollegaer	Føler det er mere ok at arbejde hjemmefra i Ingenør-branchen, sammenlignet med tidliger kommunalt arbejde
	Gør det af praktiske årsager	Stuen: Spisebord eller sofa	"hjemmearbejde er mere når du ved hvad du skal gøre og har en meget streng deadline, at man sætter sig hjem ofte – i hvert fald for mit vedkommende " (16:23-16:32)	Bruger praktiske gøremål i hjemmet som pause - vasker tøj, handler ind, opvask	Kontakter kollegaer gennem mødeindealdelser eller opkald	Synes der er mange som arbejder hjemmefra to dage om ugen på kontoret
	Føler hjemmearbejde giver flere timer i døget fordi P3 kan nå mere rent praktiskt	Soveværelse: sengen	Arbejder om aftenen, hvis der ikke bliver arbejdet nok timer i løbet af dagen	Pauser derhjemme tager længere tid end pauser på fysisk kontor	Har ringere kendskab til dem på kontoret som arbejder meget hjemme	Låser PC hver gang hun forlader den (Vane fra tidligere: kommunal-arbejdsplads)
	Kan føle sig mere doven efter hjemmeabrjedsdag	Savner fysisk kontor - sidder bedre og savner sine to skærme	Bruger aktiv kalender til at organisere dag - både for egen skyld og for kollegaer	Bliver mere forstyrret hjemme - praktiske gøremål	Bruger arbejdspladsen til at socialisere og får mindre social samvær af at arbejde hjemme	Tager Garmin ur af ved hjemmearbejde, da det er forstyrrende ift aktivitetstracker
	Rart at have fri-fri efter arbejdsdag - huslige pligter er blevet gjort	Har bedre kaffe end på kontoret	Arbejder gerne under frokost for at kunne gå tidligere	15-30 min pause med praktiske gøremål	Kontakter ikke rigtig kollegae når der arbejds hjemmefra, med mindre man skal bruge dem til noget	Bruger flextid
		Ville gerne have et hjemmekontor	Behov for afbræk i arbejdsopgaver	1 times frokostpause	Interagere både med andre der sidder hjemme og folk på kontoret	Arbejdspladsen har tillid til at man arbejder når man arbejder hjemme - ikke samme tillid på tidligere arbejdsplads
			Føler sig midre produktiv	Holder frokost og i løbet af eftermiddagen, hvor P3 bliver træt	Tjekker hvem der er online, hvis P3 har chattet med nogen	Ikke betalt frokostpause
				Får nok pauser - nogen gange for mange	Ringer til felt personer gennem mobilen	Kollegaer dækker socialt behov til dagligt i høj grad
				Pauser er også distration af overprinsghandlinger	Tekst beskeder bruges mere til ikke arbejdsrelateret kommunikation og kun til nære kollegaer	Fysisk kontor påvirker pausetagning - socialt faktum - minimerer pauser med sociale medier og mere linked og ingenøren
				Behov for pause når der arbejdes længe på samme opgave - ensformig		Nemmere at få nye opgaver på kontoret, hvis man mangler noget at lave - det med at være ny
				Pauseaktivitet med medier: facebook, onlineshopping, tictoc, instagram, se serier, linkedIn		Oplever en variation ift hvordan kollegaer bruger kallenderen

Post interview:

Ambiance	Dynamic	Active/passive interaction	Simplicity	Work/Break visualisation	Connectedness
P2: Han synes til tider den var lidt forstyrrende når han skulle koncentrere sig.		P2: Han kunne godt gennemskue måden vi målte aktivitet (mus + tastatur) Han tænker ikke flere aktivitetsniveauer ville forbedre.	P2: Han synes den er stor i forhold til dens funktion. Han kan godt lide formen på den.	P2: Kunne godt gætte sig selv. Han synes den var repræsentativ for hans aktivitetsniveau. Han havde en idé om, hvem der var hvem af de andre, men var ikke sikker.	P2: Han var opmærksom på den og synes det var sjovt at kunne se de andres aktivitetsniveau. kiggede på den under arbejde, vurdere det til 4 til 5 gange i timen
P2: Lægger mest mærke til den røde farve, måske fordi den er mere aggressiv		P2: Synes det var lidt træls at den lyser blåt når han arbejder. misreræsentation.	P2: Skal vente på at se alles aktivitetsniveau hvilket tager tid.	P2: Han synes det giver mening at være anonym hvis formålet er at få indsigt i kollegers aktivitet. Han følte en lille smule at han blev overvåget og holdt op på at han var effektiv	P2: Han tænker mere over om kollegaer har travlt og om potentielt mangler pause end ham selv
P2: Han bliver mere opmærksom på at huske at holde pause da der er en fysisk reminder.	P1: Hvis hun så den lyste Rød så tænkte hun "hvem er det? er det mig?", der var et tidspunkt hvor 2 lyste blå og 1 lyste rød og hun tænkte "ok, altså jeg holder ikke pause, så jeg kan ikke være den som er blå"		P3: Ønsker den mindre – er et ordensmenneske på skrivebord → kun det mest nødvendige. Lys er for store	P1: Synes ikke at den repræsenterede hendes arbejdsindsats, når hun sad i møde tastede hun ikke på tastaturet, men hun arbejdede jo stadig Hvis det var nogeat hun havde fået den af en arbejdsgiver ville hun synes den var træls fordi den ikke viste rigtigt hvor meget hun lavede	P2: Føler han har fået større indsigt i sine kollegers arbejdsflow og er blevet mere opmærksom på hvor meget hans kolleger arbejder. Han mener det kunne være ekstra givende med folk man ser sjældent. (andre afdelinger i temaet).
P1: hun var generelt optaget af sit arbejde, men lagde mærke til den engang imellem (især når hun holdte møder)	P1: hvis hun så at hendes var grøn og de 2 andre var blå, følte hun sig presset til at vise "ej, jeg laver noget" og føler sig presset til at lave mere Hvis flere af dem lyste blå følte hun at hun burde lave mere for at få hendes til ikke at være blå opdage hvordan systemet virkede da hun holdte møde fordi hun ikke havde tastet noget og hendes blev blå, selvom hun arbejdede		P3: Man kunne lave en sort én med tre små farver på. Ville bedre matche resten af kontormiljøet	P1: blev nysgerrig på hvad hendes lys lyste og hvilket det var. synes det var fint at hun var anonym, men tænkte alligevel over hvilken en der var hende. tænkte slet ikke over hvilke 2 lys der var hendes kollegaer	P2: Han synes det er mere overskueligt end teams da det hele tiden er tilgængeligt. Han føler det har fået ham tættere på hans kollegaer

P3: "der fokuserede jeg mere på mit arbejde, fordi så kigger jeg ikke herop på. For da jeg sad heroppe, var den forstyrrende" "Der er for meget lys der skifter farve hele tiden og tænker: Hov! Hvorfor er du blå? Jeg sidder og skriver lige nu " (02:13)	P3: De tre lys bliver nævnt som en positiv ting		P3: Stor i størrelsen – lys er forstyrrende – skiller sig ud ift. omgivelser	P1: synes det kunne føles lidt som overvågning. tror den kunne have motiveret mere til pause hvis hun ikke kunne se sig selv og kun hendes kollegaer, det at hendes blev blå gjorde det lidt konkurrence-agtigt for hende at hun arbejdede mere	P2: Føler det er mere acceptabelt at holde pause når de andre gør det. føler ikke det er så acceptabelt at holde pause, når de andre ikke gør.
P3: Forstyrret over prototypes tilstedeværelse – svært ved at fokusere på arbejde	P3: Lys er for store og skifter for hurtigt "Jeg tror at hvis det var en lille pære så tror jeg at jeg var mindre forstyrret end at det lyser hele vejen op her (...) behov for en lille stribe (03:17-03:24) "Det er lidt forstyrrende at den skifter sådan, og så går den hen til den næste, og så hen til den næste lige om lidt... det er sådan lidt... " ()		P3: Har ikke tænkt så meget over funktionen af prototypen – har kun tænkt over at den skifter lys hele tiden	P3: Forvirret over for at prototypen viser blå når P3 sidder og skriver "Jeg går ud fra at den symboliserer det I har skrevet hernede, og så tænker jeg mens jeg sidder og laver noget: Hvorfor lyser du blå lige nu? - jeg holder ikke en pause" (04:03-04:12)	P1: fik ikke indsigt i hendes kollegaers arbejdsflow og følte ikke noget presence fra hendes kollegaer
P3: Mest opmærksom når P3 har siddet ved siden af den fordi P3 var forstyrret – føler at have kigget for meget på den – hver gang der er ændringer i lyset "Jeg har lidt kigget på den hver gang den har skiftet lys" (06:00) Måtte flytte sig for at få fokus på arbejde	P3: Forventninger til arbejdsflow: Havde forventet den var mere konsekvent i farven – skifter hurtigt og hele tiden – skifter konstant mellem de tre felter – forventede den lyste længere tid ad gangen i samme farve		P3: mangler forklaring og et videre formål med prototypen for at få noget ud af den	P3: Synes man var meget rød og stiller spørgsmålstegn ved om det er dækkende for den reelle produktivitet	P3: "så tror jeg faktisk jeg vil føle mig overvåget... altså sådan: hvorfor skal P1 og P2 vide hvornår jeg holder pause?"

Farverne for modes er ok – p3 er teams fikseret – ville gerne alliere det med teams farven: rød; gul; grøn – perspektiverer rød til headphones der lyser rødt og det at være bussy Teamsfarver: pink = syg/ferie/fraværende – Gul = away, pausemode. P3 mener det sker automatisk efter 2 min – Grøn = ledig, men hvis ikke du er så aktiv bliver den gul – rød = sætter selv til, medmindre du er i et opkald, har et møde, eller booket kalenderen i Outlook	P3: P3: For dynamisk i skift af lys		P3: Føler sig mere produktiv på arbejdet og i går end ved brug af prototypen – endnu mindre produktiv	P3 ønsker anonymiteten tydligere forklaret. "Så skulle I have skrevet navne for hinanden eller et eller andet... eller have forklaret det bedre til at starte med... (interviewer forklarer privatiserings design princip)... nååår, jamen så et med 'player 1; player 2; player 3, eller et eller anden"". (05:29)	P3: Ikke tænkt over hvem der er hvem ift. lyset – kan finde information gennem teams "Jeg har ikke gået ind og holdt øje med folk på Teams, det synes jeg er underligt at skulle til at overvåge folk (interviewer: nej det skal du heller ikke)... Men jeg ville være nødt til at se på Teams for at finde ud af hvem der er mest optaget" (07:22-07:34) "Hvis det var en som lyste blå, kunne jeg se (hypotetisk) hvem der holdt pause på teams" (07:36)
P1: Lyset var slet ikke generende, dejlig blød.			P3: "Det kan vi godt lide, når man er på arbejdsmarkedet (...) det har jeg selv tænkt over som studerende: alt er meget i flow, og man kan hurtigt lave aftaler om. Det hele er nemt og dejligt og man har masser af tid. Hvor på arbejdsmarkedet der bliver det hele statisk og kalendersat (...) nu begynder man bare at have et behov for at være statisk i sit liv (...) ellers går du næsten ned med stress nærmest, hvis ikke du holder dig statisk". (18:44-19:20)	P3: Ikke opmærksom på hvem der identificerer P3 – behov for genkendelighed "Så meget har jeg ikke studeret den i dag, jeg har skulle arbejde og tjene penge" (06:57)	P3: "jeg har ikke følt mig så connected med den for jeg har ikke kunne finde ud af hvornår jeg sådan har været høj-produktiv ifølge den der – men ved det selv

P2: Han synes intensiteten af lys var fint men irriterende at den pulserede. vil foretrække mere statisk og med glidende overgange mellem farverne. Han havde det fint med farverne	Farverne for modes er ok – p3 er teams fikseret – ville gerne alliere det med teams farven: rød; gul; grøn – perspektiverer rød til headphones der lyser rødt og det at være bussy Teamsfarver: pink = syg/ferie/fraværende – Gul = away, pausemode. P3 mener det sker automatisk efter 2 min – Grøn = ledig, men hvis ikke du er så aktiv bliver den gul – rød = sætter selv til, medmindre du er i et opkald, har et møde, eller booket kalenderen i Outlook			P3: Det er ok at den er anonym, men ville gerne vide hvem P3 selv er "jeg synes det er lidt mærkeligt jeg ikke ved hvilken én jeg selv er"	P3: Føler sig på en måde overvåget "Måske hvis der var flere med, men det ville også være forstyrrende (hypotetisk) ... men det der med vi kun er tre, det er lidt underligt på en eller anden måde" (09:04-09:09)
				P3: Tænkte over at den lyste blå efter frokost – føler ikke den har registreret andre pauser	P3: det ikke er gennemskueligt at det er kollegaer;
					P3: "Interviewer: Ville du synes det var relevant for dig, hvem der holder pause? P3: nej, hvis man arbejder effektivt ift. sin måde, så er det ok. Du har en deadline og hvis folk når den, så er det fint nok" (10:15-10:27).

					P3: "Interviewer: Ville du synes det var relevant for dig, hvem der holder pause? P3: nej, hvis man arbejder effektivt ift. sin måde, så er det ok. Du har en deadline og hvis folk når den, så er det fint nok" (10:15-10:27).
					P3: Ser mulighed for prototypes relevans i studieliv – mangel på at møde deadlines – slacker "Her er folk professionelle, så jeg er lige glad med om P1 er mest produktiv om aftenen, så skal P1 lave om aftenen selvfølgelig, og P2 er måske mest produktiv om morgenen, så skal P2 selvfølgelig mødes helvedes tidligt om morgenen, hvis bare vi når vores deadlines som vi har aftalt. Men det gør man jo her for ellers bliver man fyret. Det er jo lidt noget andet med arbejde." (12:04)

					P3: "Herhjemme er det ligegyldigt (om jeg ved de andre holder pause). Jeg tager jo hjem for ikke at være sammen med mine kollegaer. Jeg ved godt jeg sagde, jeg savner dem når jeg ikke er (på kontoret), men der er en grund til jeg også smutter hjem jo (I: hmm), jeg er her jo for at være mere produktiv og mindre forstyrret. Så det er jo for at undgå kaffepausen, hvor folk render op. Så der giver den (prototypen?) ikke helt mening: bare fordi Emil drikker kaffe, skal jeg jo ikke drikke kaffe herhjemme, bare fordi han gør det derhjemme" (13:00- 13:20) "herhjemme er lidt mere på mine principper, hvor på arbejdet bliver man lidt mere strøm(-lignet), man vil gerne være social også. Hvis folk drikker kaffe og man tænker 'åh jeg kunne godt bruge en pause' fordi jeg ser de andre har pause, så går man jo op og holder en pause". (13:26-13:40)

					P3: Føler sig ikke tættere forbundet med kollegaer gennem prototypen Fik ikke bedre indsigt i arbejdsflow – kunne hvis p3 havde fået en dybere forklaring af prototypen ift. hvem det var og har heller ikke lyst til at have den stående

Appendix 6. Initial Sketches