Designing Information Decoration for Morning Routines

Exploring the Context of Use

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ABSTRACT
Starting and ending our day with our phones is becoming a normal thing, and starting with checking social media and email on your phone can negatively impact productivity throughout the day. This design research paper discusses how to incorporate information in home interiors, 'Information Decoration', to reduce phone usage. 'What information' is derived from interviews and literature research, namely weather. And the 'how', 'when' and 'where' is tested through a two-part co-constructing sensitizing interview, respectively the problem and the prototypes, by means of scenarios, design prototypes and a routine tracking assignment. This study shows via a thematic analysis what elements should be taking into account when designing Information Decoration for seamless integration in morning routines. Through Information Decoration at home, phone usage can be reduced in the morning, while still receiving important information, but in an unobtrusive way, and with that improve productivity.

Author Keywords
Information Decoration; Routine; Interior product design; Phone usage; Peripheral Interaction; Productivity.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Mindless scrolling on your phone, watching series on television or laptop, screens are everywhere. This ubiquitous computing will require a new approach to fit technology to our lives (Weiser & Brown, 1997). We start and end our day with our phones. And when quickly checking your email on your phone you see that Social Media notification, and a moment later you realize you let yourself be distracted again by mindless scrolling (Smith, 2013). Most applications are designed for focused attention, and together with all the notifications and incoming messages and emails, they can give the feeling that our day is being controlling (Clarke, 2020). So, smartphone usage can have negative effects on productivity (Duke & Montag, 2017).

Your morning is about setting the tone of the day and starting with your phone is not a good start of the day (Sun, 2017; Clarke, 2019; Clarke, 2020). A great morning routine can help in being more productive (Clarke, 2020). Ideally you would have a tranquil morning routine resulting in a feeling of control and achievement, focus and refreshed energy (Clarke, 2020). But at the same time you still want to receive the relevant information needed before the start of your work day, such as the weather, travel information, important news and notifications of urgent messages (Landry, Pierce & Isbell Jr., 2004; Bakker and Niemantsverdriet, 2016).

Information like this can also be filtered and shown in the background, which is similar to seeing the weather condition through the window, you only need one glance to get the core message. This kind of receiving information is called 'Information Decoration'; Aesthetics and information are blended and are in the periphery of one's attention. Only when it is necessary it would draw the attention of the user. So, Information Decoration can take away some of the distractions by portraying only relevant information at times it is needed, and the user will not need their phones as much. With all the information and technology to our lives, there is a need for such "calm technology" that moves back and forth between the center and periphery of attention (Weiser & Brown, 1997).

Research has been done in phone usage, productivity and information decoration, but not yet in combining it and exploring how this can come together and how information decoration can eventually stimulate productivity, especially in the morning which affects the rest of the day.

This paper is about 'what', 'how', 'when', and 'where' Information Decoration can be implemented to morning routines, by means of research through design. Focusing on conveying basic weather information, several simple prototypes were used to test those variables; a small carpet with shape-changing relief representing the amount of rain that day, secondly a 12 hour mapping of rain around a clock or mirror, and recordings of nature sounds with rain through a speaker. The designs will be further discussed in the Designs subsection of Methods. And with the insights concerning the variables 'what', 'how', 'when', and 'where' the main research question can be answered:

"*How can the unobtrusive and refreshing experience of Information Decoration be incorporated in home interiors for a phoneless morning routine to start a productive day?*"

The methods used during this study are qualitative. Firstly, contextual interviews were conducted to scope the problems and find a focus point, which became morning routines and productivity. After ideation and developing several prototypes to test with, an online co-constructing sensitizing study was set up with scenarios and routine tracking. After which the results were analyzed through color-coding and thematic analysis.

This study shows what elements should be taken into account to seamlessly integrate Information Decoration in morning routines, e.g. the combinability with other activities, the timing for taking action upon the information and the contact time to take in the information. Having more knowledge on the context of use and the advantages each location, modality and product brings with itself, designers can be inspired and build their concepts for seamless integration of information decoration to eventually reduce phone usage and improve productivity.

BACKGROUND

First the problem concerning phone usage and its negative effects will be discussed, followed by productivity and the relation with phone usage and morning routines. Then Information Decoration will be explained as a solution to reduce information overload and tempting notifications and next to that natural environments are argued for as a means to achieve the calming and unobtrusive experience that is needed for Information Decoration. Lastly, some related research and projects will be discussed.

Phone usage

"The smartphone is now ubiquitous in everyday life" (Duke & Montag, 2017). It has become an essential part of the modern life, especially for young adults (Srinivas, 2015). However, as the duration of mobile phone usage increases, sleep quality decreases (Akçay & Akçay, 2018). Interestingly, it was found in another study that frequent use of television and computer is not related to sleep variables, whereas mobile phone use is associated with all sleep variables (Mak et al., 2014). In a study involving students, it was found that their mobile phone use and style habits are closely associated with the stress they experience. Consequently, they are more prone for sleep deprivation, which in turn can affect their cognitive functioning and amongst other things productivity, as their sleep, circadian rhythm is disrupted (Srinivas, 2015). Smartphone usage can have negative effects on productivity, both at work and in daily life. (Duke & Montag, 2017).

Productivity

Productivity is a popular subject in the business world (Nishiyama, 2019). There are a lot of articles on morning routines to improve productivity and with that exploring the path of success.

Smartphone usage can have negative effects on productivity (Duke & Montag, 2017). When on our phones, we are constantly reacting to additional tasks, stressors, or needs of others, which makes it more difficult to effectively prioritize and get things done (Clarke, 2019). So, it does not come to a surprise that it is often suggested to minimize phone usage and not to let yourself be distracted, controlled and lose focus (Sun, 2017; Clarke, 2019; Clarke, 2020). Especially in the morning, one should not be distracted by their inbox (Smith, 2013).

Therefore, it is suggested to go out of bed after that first alarm, and not begin your day lying in bed with your phone, but rather start with some movement and 'stillness', for instance stretching or meditation (Clarke, 2019). Such morning activities reduce stress and allows to focus and be in charge of the day. Having a great morning routine can result in being more productive, achieving goals, feeling organized, but also feeling confident and fulfilled by a feeling of achievement (Clarke, 2019). On top of that, feeling productive in our day can positively influence ones sleep, in turn resulting to a more refreshed feeling in the morning (Clarke, 2019). Besides, *"Your morning is about setting the tone for the rest of the day. The best way to start is that intentional practice of saying, I'm not going to let the day distract me"* (Clarke, 2020). Information Decoration can help with that.

Information Decoration

Technology, especially with screens, is everywhere in our daily life, and most is designed for focused interaction. Therefore, the need increases to "*seamlessly fit interactions with technology into everyday routines"* (Bakker and Niemantsverdriet, 2016). One way of achieving that is through Information Decoration. This entails that information is shown in the periphery of attention through another modality than text, e.g. light, shape, or relative position change (Wu, Van Essen and Eggen, 2016). Other interesting modalities are touch or sound (Eggen & Van Mensvoort, 2009). However, sound is not a constant source of information as opposed to light, since it is not constantly present, but on the other hand you don't need to focus in one direction like with visual ques, in other words sound exists in time and over space whereas visuals exist in space and over time (Gaver, 1989). Information Decoration is basically a balance between aesthetics and information (Eggen & Van Mensvoort, 2009). When your attention is not needed, it blends into the background and becomes decoration. It then shifts to 'implicit interaction' (Bakker and Niemantsverdriet, 2016). It can act as a filter for notifications, only the most important information would be shown. In order to be in the periphery of attention, the information has to be displayed in an unobtrusive and subtle way (Wu, Van Essen, & Eggen, 2016). Another criteria is that it has to fit seamlessly, so it has to be ambient. In some cases it is also important that the information is unrecognizable for visitors for instance, to avoid undesirable exposure (Eggen & Van Mensvoort,

2009). Besides, it should be calming, reassuring and pleasant and not disturbing which also comes with being unobtrusive, but also appealing as it is decoration after all (Eggen & Van Mensvoort, 2009; Occhialini, Van Essen & Eggen, 2011).

Nature

Quite some research has been done to the benefit of exposure of nature in everyday life; Exposure of natural content, tested by means of slideshows on a tablet and imagining being there, positively influenced daily reports of mood, stress, and self-regulation (Beute, IJsselsteijn & De Kort, 2016). Moreover, restorative natural environments contributes to well-being and positive mood changes and a better performance on attention tasks (Joye & Van den Berg, 2018). This exposure can be from all kinds of natural environments, like forests or even golf courses, and the exposure can be from "*actual nature, but also to visual simulations (e.g. videos, paintings) and to olfactory (smells) or auditory components*" (Joye & Van den Berg, 2018). Nature is well-known to be calming and it is inherently captivating and gives us a moment to get away from our daily hassles and worries (see e.g., Kaplan, 1983, 1995). Therefore, this aspect will be incorporated in the calming experience aspect of the design.

Related work

A similar research project was done with a digital alarm clock. The research was about adapting routines through providing relevant information via an interface (Landry, Pierce & Isbell Jr., 2004). The problem they were tackling was that people rely on their routines and fall into them rather than making the optimal decisions. The alarm clock highlighted unusual situations, so it only showed information that was different from the day or week before, and it showed different types of information at different times, the night before, during and after the alarm in the morning. There was also the possibility to get more detailed information. Based on that, the user can decide on their alarm time depending on their schedule, what to wear depending on the weather, and when to leave for work depending on traffic (Landry, Pierce & Isbell Jr., 2004). However this clock had an interface and is just another screen, which is what this study is trying to avoid. The focus of this study is in the experience and blending it into a morning routine, and also look at the positive effects throughout the day.

An example with the aim to reduce the use of phones, in the morning and the evening, and reduces being lured into scrolling through apps, is the Mudita Alarm clock with an E-Ink screen (Thukral, 2020). With this clock you can set your alarms, it wakes you up with gentle acoustic sounds, and it also has a humidifier and air quality sensor, and timer for meditation (Thukral, 2020). This design is only focused on the tranquil experience and aesthetics and not on providing relevant information, for which one would again have to check their phone.

As for using nature sounds as information modality, a project at the department of Industrial Design of the University of Technology in Eindhoven was done called "Bird Wispering" (Eggen & Van Mensvoort, 2009). This involved sounds of a bird colony representing information to raise awareness at the office. It reacted to the movement and activities of people, for instance what place is the most silent to work at. With this project they explored the possibilities of making use of architectural space.

APPROACH

First some interviews were done to scope the problems and the focus for this study, which is shortly explained in the subsection Scoping. Afterwards, the research questions and sub-questions are discussed, followed by the design choices and the designs. The qualitative methods, data gathering and analysis techniques are described under Research method. An online method was chosen under the quarantine circumstances due to the COVID-19 virus Afterwards a description of the participants is given.

Scoping

To form the research questions, and moreover to scope the problems around phone usage, information intake and productivity and other stressors, and to gain insights into the customer journey, six participants were interviewed by means of (contextual) interviews. In addition, the participants filled in a small booklet to track their screen usage throughout the day and the sources of stress, distraction and overwhelm. Half of the participants had a crafts and design background, but more importantly there was a big age range of 32 to 76 in order to find the right target group. Not all interviews were conducted in context, at home. The details of the set-up and the results can be found in the appendices (see Appendix A).

Based on the opportunities discovered, it was decided to use morning routines and productivity as the focus of this study. The findings also provided the base for the type of information, answering the 'what' sub-question, which is weather information.

The main results and the As-Is customer journey map can be found in the appendices (see Appendix A). The decision making is explained and argued for in the Discussion section.

Research questions

The main research question was then set up: "*How can the unobtrusive and refreshing experience of Information Decoration be incorporated in home interiors for a phoneless morning routine to start a productive day?*" In addition, the following sub-questions to answer the 'what, how, when and where': "*What information is relevant to display during a morning routine and does not take away from the refreshing experience and not stimulate the urge to take your phone?*", "*How can the modalities be combined and incorporated in interior products to display information and unobtrusively and seamlessly fit in a*

morning routine?", and "*When and where should the information be displayed in home interiors to seamlessly fit in a morning routine?*"

'What information' is answered based on the (contextual) interviews that was for scoping purposes, literature research and reasoning having the experience in mind, as explained in the Discussion section. Consequently, this variable was made into a constant by setting criteria; it should not take away from the refreshing experience inherent to Information Decoration and it should not stimulate the urge to take your phone.

After the setup of the research the remaining sub-questions, with their variables how, when and where, could be answered solely based on the field study, online co-constructing sensitizing interviews. Several simple prototypes were made for that, with different modalities in different interior products to find out how, when and where information should be displayed in the morning routine. In addition, to fall back on during the interview and analysis, a routine tracking assignment was done by the participants. The 'how' is about the implementation, 'when' about the place in the morning routine, and 'where' the place in the home interior. The criteria for Information Decoration are that it has to unobtrusively and seamlessly fit in the morning routines of the participants, which is also explained more in the Background section.

Designs

For this research through design study several simple prototypes were used to test the variables (See figure 1, 2 and 3). Different types of modalities are incorporated in different interior products which can fit in a morning routine. The latter is based on a personal tracking of interior products encountered during the morning routine as part of the ideation process (See appendix B). As mentioned in the Scoping subsection, the focus lies in information about the weather, making the variable of the first sub-question, 'what', a constant.

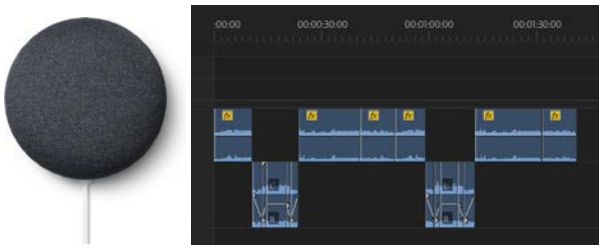

Figure 1. Nature sounds from speaker with an indication of the amount of rain that day; bird sounds with intermezzos of rain sounds. Hearing more rain simply means more rain. (left picture; Google Nest Mini)

The first design is for the modality sound, which can be listened at through a small speaker (see figure 1). Again nature was incorporated as it adds to the calming and stress reducing experience, being one of the criteria for Information Decoration (Beute, IJsselsteijn & De Kort, 2016). Local forest sounds were recorded, consisting of bird sounds. In addition, ambient rain was added in between, by recordings of a small waterfall (see figure 1). The participants listened to the sound file via their phone or computer during the online interview.

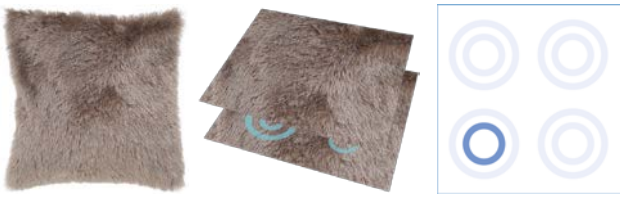

Figure 2. Textured carpet with relief indicating the amount of weather. More rings, like ripples in water, means more rain that day. (clipping mask fabric; action.com)

Secondly, a small carpet was made for the modality touch, through shape-change. The shape-change is imitated through a subtle relief of layered cardboard in between the fabric, on top of a squared piece of cardboard. The fabric is thin, soft, and calming. There is an amount of circles, like ripples in water from droplets, which corresponds to the amount of rain that day, and the size indicates whether it is more like drizzle or showers (see figure 2). During the online research study, a small video was shown of the interaction.

Figure 3. Visual indication for weather on clock and mirror. More blue per hour, means more rain. (clipping mask moss: natureathome.eu)

Thirdly, a 12 hour mapping of the weather was made, both as a clock and a mirror, for the visual light. The amount of rain at the hour in question would be indicated by the intensity of subtle blue light (see figure 3). This design was prototyped by means of a printout with a color indication. To complement the calming and refreshing design and experience that is inherent to Information Decoration, a picture of moss was used in the background. Besides, even a picture of nature can have a positive and calming effect (Joye & Van den Berg, 2018). For the online research study, a couple of photos were shown of the two prototypes.

Hypothetically, one needs to focus more on the sounds to receive the information, as it might partly be missed, as opposed to the visual indication of which the information is there whenever it is needed right away, because sound exists in time and over space whereas visuals exist in space and over time (Gaver, 1989). Visual information is also accessible from a distance, which is not so easily the case for the tactile modality as contact is needed. However, the visual modality may be less incorporated in the routine, as

you only glance at it, which may take away from the calming experience. The experience may be more present in the sounds and perhaps in feeling the texture.

Research method

The research study of three parts was set up; two co-constructing sensitizing study by means of scenarios of firstly the problem and secondly the solution, with in between a routine tracking assignment.

By means of sensitizing and co-constructing stories through scenarios, the participants get more acquainted with the problem and they can give their insights more easily into the problem around phone usage in the morning. In addition, questions around the problem are asked to get a sense of where the participants themselves stand. After this they describe their activities and phone usage of their own morning routine, solely for understanding their routine and their feedback with regard to their own experience. Then, the prototypes are introduced through photos, a video, and a recording. And in combination with in-context scenarios, it allows the participants to imagine the products in context and give their insights on when and where the designs can seamlessly fit in morning routines. Questions were asked about the meaning of the information, whether it is clear and logical. As for the scenarios, questions are asked about the experience and the correlation with the modality while comparing the different scenarios per prototype. Then insights about the degree of integration per prototype are asked and the influence of the different modalities. Lastly, they are asked to get back to their own routine and what would work for them. The complete test set up and the scenarios are put in the appendices (see Appendix C).

As mentioned before, with the situation around COVID-19, the choice was made to not let the participants experience the prototype directly. Also for practical reasons they were not send via post for instance. Therefore the prototypes were shown to the participants through photos of the visual modality designs, a video of the tactile design and a recording of the audio design. However, the relief from the extruded ring underneath the texture cannot be captured properly via a video, thus this prototype is further explained in front of the camera during the online interviews.

Data is gathered by means of scenarios and the insights based on the triggered imagination and understanding. The interviews are recorded, with consent, and transcribed manually, and the written assignment documents are collected digitally.

The results are then thematically analyzed through color-coding and clustering, To capture the results of associations and imagination from the participants, a narrative approach was used, as it is a qualitative research with answers to predominately open questions. The text is highlighted per important quote and then clustered into overlapping themes, which are defined throughout this process. So, the themes are not known beforehand other than having general themes based on the research questions, such as modality and integration, and based on the interviews questions themselves, such as experience. Defining the final themes after the interviews and leaving it open has as advantage to leave some space for completely new insights which helps in understanding the context of use by the customers, as the customer is also the focus of the study. From this the relevant themes and thus the points of attention are found, on which designers of Information Decoration can build on.

Participants

The test was done with participants who fall in the category of young professionals, who use their phone quite a lot. The age category of participants is between 22 and 40. The first part of the study, the (contextual) interviews, indicated that young professionals are more searching for ways to improve their productivity (see Findings and Discussion).

A variety in professions was aimed for to get a sense of how open people are for enriched experience of receiving information, but also to get an image of how understandable the information is for non-designers.

Of the 6 participants, 2 were interviewed together as they lived together. And as they mostly agreed with one another, they are quotes as one, C1.

FINDINGS

The relevant highlights of the (contextual) interviews and the booklets for screen usage are given first. Then the findings are explained of the main field study of the co-constructing sensitizing interviews. The transcripts can be found in the appendices (respectively see Appendix A and C).

(Contextual) interviews

From the results of the booklets, it was found that the majority of participants immediately grabbed their phone after waking up and use their phone just before going to bed. This was also said in one of the interviews: *"you actually start with your phone when you get up… see it any messages came through…"* – C1

Interestingly, it was indicated that there is a need for a morning routine that stimulates or lies a base for productivity: *"I try to sleep better and wake up to something I'm looking forward to... Still figuring out what it best for the morning*" - W1. This person did already experimented with a night routine:

"*…[I use a light] that is cozy before bed, for reading, to prepare yourself to sleep*", "*humidifier [with] light inside… [I use it] if I'm restless [and] sleep bad… you see the steam moving around, it's beautiful*" – W1

Two of the participants explicitly mentioned that Social Media can be very distracting:

"*as soon as I start looking for something on Facebook. Two minutes later I think what was I going to do again.*" – M1

"*distracted by scrolling the phone, too much unnecessary information.*" – W1

The young professional participant, W1, is more searching for ways to improve their productivity as opposed to the participants fitting in the older adults age category:

"*I try to fill as much travel and waiting time as possible with things that need to be done. So that my real free time is fully available for the things I like*", "*I don't postpone things, … [if I] feel stressed or whatever, then I'm going to deal with it and fix it.*" – W2

The three most mentioned information applications were the weather, which was "*one that never sleeps*" – W1, and "*a lot of communication*" – M1 like apps such as WhatsApp and Email were similarly important, and thirdly news. Nevertheless, one of the participants mentioned he watched news "*as little as possible […, since] eventually you can't influence it.*" – M1.

Co-constructing sensitizing interview

Problem scenario interview

All participants experienced issues because of their phone differently. One of the participants even mentioned "*I do not recognize that. … not in the morning anyways.*" – M1. The rest of the participants had experiences ranging from for instance being distracted by notifications to purposefully looking at Social Media and forgetting the time:

"*I do notice I'm grabbing my phone right away. Quickly distracted, yes, I do feel that ... I also notice that I'm very distracted with notifications.*" – C1, "*Then you're just on Instagram or Facebook, and then you think shit I have to go. Yeah, that happens all the time. And I mean I'm not the only one, I know a lot of them. … Then it's from oh wait I still have 10 minutes, I can still make a small TikTok film* " – M2

None of the participants commented they experienced the problem with the result that they forgot to check the weather, and two even mentioned the opposite: "*Yes it happens sometimes that I look at my phone while I'm still in bed, but I actually always look at the weather and otherwise I did it the day before.*" – W2.

Some actively act upon the issues with their phone, for instance "*if we have a new app, I'm going to turn off the notification.*" – C1

A few thought it was important not to wake up with their phone, but interestingly one of the participants mentioned that it is different for each person and it "*depends on how you wake up*", as she used her phone to wake up: "*And when I grab my phone to just scroll through there, I just wake up faster, instead of snoozing for an hour.*" – W2.

Prototypes scenario interview

Because of the thematic analysis approach, themes were derived from the results and to get an overview of the themes and their correlations they are organized in a word cloud (see figure 4).

Figure 4. Word cloud of the color coded themes with their correlations and importance. The four themes from the research questions are marked, the three main themes from the interview topics have rectangular blocks, and the themes that were found are grouped within those blocks, and the importance is indicated through the font size.

Knowing the information is about the **weather** was not enough for most of the participants to understand the meaning of the information. They pointed out that they needed to know that it was standing for. All the participants made associations from experience to interpret the information in the prototypes, for instance the bird sound was associate to nice weather by all the participants; "*I think it was quite a beautiful summer's day when I hear [the sound prototype] like this, in the morning somewhere.*" – C1. Only half of the participants could associate the water sound with rain.

Familiarization is needed, however when known the familiarization process would likely be quick: "*… from now on I can associate the blue with raining. But when it just appears it could take me a bit of time to understand what does the blue [of the mirror or clock] associate to*" – W1. So, not all was thought to be intuitive, for each prototype 2 to 4 participants were in the right direction of understanding the connection with rain. The carpet was least understood, for instance the texture was thought to have something to do with temperature by two; "*It's feeling, so the temperature, I think it has something to do with that.*" – M1. Only half of the participants understood there was a connection with the time and the information on the clock, and two even understood this mapping already when seeing the mirror. However, most did not see the connection with rain and figured the blue on the mirror and clock represented the sky or the temperature being cold.

As for the information intake, repetition was noticed by four participants that it would help to remember the information and would therefore be more beneficial than the other scenarios:

"And I think the second one with the carpet in the bathroom would help best, because that's repetition. Roxy (the girl in the scenarios) gets twice the information and that helps to remember." – M1

Having to remember the rain information until grabbing an umbrella was indicated by three participants to be an issue: "*… [the sound] has the problem that you can't remember it well at the moment you're at the door*" – M1. In addition, it was recognized by another participant that having to remember it might affect the experience: "*… the longer you [have to remember that] 'I shouldn't forget my umbrella', it might feel more annoying …*" – C1. Interestingly, the remaining interviewee who did also mention the benefit of repetition, did remark that sound is "*easier to remember*" – M2, answering the question concerning the logic of using sound as a means of information.

The attention, or focus, needed for taking in the information is another theme with regard to information. One mentioned that "*you need to feel actively to know about what's going on [on the carpet]*" – C1, similarly the carpet "*needs more attention*" and therefore "*the audio would be better, more pleasant*" – M1. This person therefore also found that "*the information [of the mirror] would be the easiest to take in, because you can see it in one glance*" – M1. Besides that, "*you are more consciously before the mirror*" – C1.

Another information related argument was the contact time for taking in the information and the contact time in the routine, which came up in the interviews with half of the participants. It was indicated that one spends a "*longer [time] in the bathroom than the hallway mirror.*" – W1, "*And of course we spend 2 minutes to brush our teeth*" – C1. Similarly for the clock, one may "*quickly look at*" in their bedroom at their alarm clock and spend more time in the kitchen and then "*it's much more possible to check the time.*" – W1. In addition, one mentioned that she "*[looks] often at the clock but actually rarely registers what's on there, … an then you have to look at the clock again.*" – W2. As for the carpet, "*you're going to have to take a long time to figure out what the information is*" – C1, and mentioned he wanted to see the information in "*at one glance.*" Lastly, sound could be "*missed one time*" – W2.

The time when one is more awake and aware, which can be seen as a kind of state of mind, was used as an argument against the early contact scenarios by four interviewees; "*I think the carpet in the bathroom, that it'll be nicer, because you'll be more awake [than scenario 1 in the bedroom]*" – M1, "*For me the kitchen [is more logical], since when I'm just awake and I shut off that alarm clock, I don't register much of what's on that alarm clock …*" – W2. The sound was even found to be a potential cause to fall back to sleep: "*On the other hand, if I heard [the sound] in bed in the morning, I'd fall asleep again*" – W2.

The state of mind in a more integration perspective, the timing for taking action, was also recognized as a relevant point by all but one participant;

"*I think you're not as much occupied with it in the bathroom. If [the mirror] is in the hallway, you're really occupied with going outside, putting on shoes, putting on your coat, you look outside if it's cloudy. And instead of looking outside, you look in the mirror and see if it's going to rain.*" – M1, "*…in the kitchen it's later and I'm more aware [to listen to the sound]. Also my mindset will be more towards the planning.*" – W1.

However, this can change with the amount of weather information; if it's about whether it will rain then "*I'd say try to do that in the time you need it too.*", but when "*it's about what kind of weather it's going to be today, can I wear something short or do I really have to pack fully, then I'd really prefer that as early as possible*" – C1.

Not being an entirely new action was indicated by 3 participants to be preferred for a good integration, which would also influence the pleasantness of the experience. For instance, "*... if I consciously have to walk somewhere [to that carpet] to get more information, it really feels like an extra action, so I wouldn't experience it as pleasant.*" – W2. Interestingly, one also indicated she would not want to replace an action; "*… if you don't pick up your phone in bed, why would you lie in bed for two more minutes and listen to that sound?*" – W2.

So, being part of their current routine is also an important element. All the participants have their own unique morning routine and used parts of that as arguments on whether they thought something would work or not: "*For me personally, when I go outside, I walk past the kitchen. Because we have a thermometer there, that also helps me to decide if I need a jacket, will it be cold or warm. And I think a clock would help with that.*" - M1

More importantly, it should be combined with other activities for a good integration as was mentioned by the majority of 5 participants, which was for instance the case in the bathroom when "*… you've got nothing else to do but brush your teeth at that moment. What should you do then, then you might as well use your eyes by taking in that information [from the mirror]*" - C1.

However, one participant noted that combining activities with sound can become problematic, and saw this as a reason of being less integrated in the routine:

"*In [the kitchen with the sound], this is more difficult because there may be more background noise, from boiling an egg and making a cup of coffee, that it is actually perhaps not so easy to have noise with it, because it may be drowned out by others. So I think in scenario 1 that the sound is more part of the routine than scenario 2.*" – C1

On the other hand one mentioned that sound is "*easier to combine because you can just do your thing*" – W2

Another scenario in which combining could be an issue was the bathroom and the carpet, as mentioned by one participant: "*I have this picture in my head that I'm brushing my teeth and moving my feet around, I think it's a little bit acrobatic*" – W1

Various practical issues were also addressed concerning the integration and the experience. The "*size and the distance in between of the rings*" – W1 in the carpet might influence whether people would miss part of the information. And several people mentioned that the scenario with the carpet at the front door would not be effective as a person is most likely to have shoes on than you may not feel the relief. Interestingly, one suggested that the carpet could perhaps vibrate. Another comment was about the size of the clock, the one in the bedroom was smaller, like an alarm clock, but she also mentioned "*I have the feeling that maybe [the information on the smaller clock] is not something ignorable*" – W1. Lastly, as already mentioned a bit earlier an extra action of consciously having to walk to the carpet would not be experienced as pleasant.

An interesting finding concerning the integration and, experience and feeling was that one participant saw the carpet as a potential means to bridge and enrich the 'transition' from lying in bed to getting up; "*It is quite bridging me, from being in bed and coziness towards the rest of the day. It's a good transition, which sometimes I have and sometimes I miss it.*" – W1.

Continuing on the experience and feeling, almost every participant noted they thought the recording sounded calming and "cheerful", and the carpet comfortable and soft, which suggests the design intention was correctly done. But moreover, some interesting comments were made, for instance one participant said the sound is "*… kind of heartwarming. It feels like bit of a hospitality feeling, like an assistant that tells you it's going to rain…*" – W1, and "*… in the bedroom it's probably more relaxed in a way, it works as a morning call as well*" – W1. She also made an interesting distinction between the scenarios of the carpet; "*the first one (bedroom) is very sensitive and gentle … all three locations have a very different emotional association.*" – W1. She thought the "*texture is the strongest in the [bedroom], a little bit less in the [bathroom], and a little bit less again [at the front door]" – W1.*

Going back to their own routine the participants gave their insights in where and when they would like to receive weather information. For clarity the results were also organized in a table per prototype and place through the themes of the arguments (see figure 5). Four participants thought the mirror in the bathroom would fit in their routine best, predominantly because you are "*in front of it anyway, and I'm guaranteed 2 minutes of staring at it when you brush your teeth*" – W1. However, one mentioned that "*you're less occupied with [rain information] in the bathroom*" – M1. He thought the hall would be better as you can immediately act on the information, "*you don't have to remember, you can say right away I'm gonna grab an umbrella*." He mentioned that the clock in the living room or hall would work best for his routine, as he has to wait for the bus and then "*regularly looks on the clock.*" Besides, he would want to receive the information "*when I go outside, that is the moment I am preparing for it.*" And the remaining participant thought the sounds in the bedroom would be best for his routine as he would like to receive the information as soon as possible, "*when you wake up of course, or the day before, …*" – M2. In addition, it was stated that it also depends on the amount of weather information, as said before, if it's just about rain then "*in the time you need it*" – C1, otherwise when you get dressed. Some participants mentioned a new scenario for one of the prototypes; one participant mentioned she would want to

QUOTES	Speaker	Carpet	Mirror	Clock
Bedroom	- Association from experience - Attention for information intake - Awake and aware - New action - Experience and feeling	- Intuitive - Part of routine - Means of transition	X	- Remembering - Attention for information intake - Contact time for information - Awake and aware - Part of routine - New action
Bathroom	X	- Remembering - Awake and aware - Timing for taking action - Combine with other activities - Combine with other activities - Experience and feeling	- Attention for information intake - Timing for taking action - Combine with other activities - Part of routine	X
Kitchen	- Awake and aware - Timing for taking action - Combine with other activities - Combine with other activities	X	X	- Contact time for information - Awake and aware - Combine with other activities
Hall	X	X	- Contact time for information - Remembering	X
Front door	X	- Timing for taking action - Timing for taking action - Practical integration	X	X

Figure 5. Table prototypes and locations and their positive, green, and negative, black, arguments by means of the themes.

receive the information through a wardrobe mirror, "*… you're standing in front of it the moment you get dressed. So then you also have the information when you need it.*" – W2. One also mentioned the possibility to have the mirror in the bedroom.

Besides the preference of the bathroom and combining with corresponding activities, the kitchen was preferred over the bedroom for both the speaker and the clock, both because of the time spend and the mindset; "*And in the kitchen you're actually just grabbing the stuff and you're sitting down for a while and then you glance at the clock.*" – C1, "*I'm more aware [in the kitchen], like I'm more awake to remember [the sound]*" – W1. The bedroom did have several other positive arguments, such as for the sound "*I'd feel most comfortable*" – C1, and the carpet being the "*… most strong one, probably because of the middle transition stage …*" The carpet had a few contradictory arguments, some thought it could work in the bathroom and be combined with brushing your teeth, but another person remarked that "*brushing my teeth and moving my feet around, I think it's a little bit acrobatic*" – W1. Similarly, some found that the "*urgency is greatest [at the front door,] … [I would] want to be reminded of what's waiting for me outside*" – C1, but "*when you're wearing shoes you don't feel [the texture]*" - M1.

DISCUSSION

(Contextual) interview

It was clear from the results that phones, especially because of Social Media and mindless scrolling can bring issues such as distractions, which is in line with claims from literature (e.g. Smith, 2013). Also in the morning phones can cause distraction, however this was less prominently clear.

Based on the opportunities discovered, it was decided to use morning routines and productivity as the focus of this study, for which the main quote is the following: "*I try to sleep better and wake up to something I'm looking forward to... Still figuring out what it best for the morning*" - W1

The interviews also acted as the base for the focus of the type of information, answering the 'what' sub-question; "*What information is relevant to display during a morning routine and does not take away from the refreshing experience and not stimulate the urge to take your phone?*" Weather, "*one that never sleeps*" – W1, was chosen as the other two would likely quickly turn into notifications of important emails and news, urging one to take their phone to read more about it. Besides, in literature it was advised against it to check your email first thing in the morning (Smith, 2013). In addition, one of the participants mentioned he watched news as little as possible. Weather is also more refreshing, as nature is as well, and with implementing that in interiors, the weather is brought indoors in a way.

Limitations

Six participants were interviewed by means of (contextual) interviews. However, half of the interviews were not conducted in the home context, this would ideally have been the case.

Ideally, the number of participants would have been bigger to first find out with more certainty if young professionals are the best target group, as they are more searching for ways to improve productivity and they are more likely to still find their way of working. And though this part of the study was merely a base for finding a focus point and mapping the customer journey, knowing the target group would have been more beneficial for the second part, the co-constructing sensitizing interviews.

Co-constructing sensitizing interview

As for the problem resulting from checking your phone, the problems are very differently experienced per person ranging from being distracted by notifications to purposefully looking and simply forgetting the time. Also the time of occurrence differs because most did not necessarily spend more time than intended on their phones right after waking up, but for instance experienced it just before leaving or when having a lunch break. Therefore, more research is needed to map out the problem accurately.

The findings suggest that using sound as a modality for information can be combined quite easily with other activities, however the amount of activities and the noise from those activities should remain relatively minimal. However, as hypothesized, more focus is needed, as one might miss the information. After all, sound does exist in time, rather than over time (Gaver, 1989). This could become problematic when having more detailed information. Though sound is not logical to be put in any interior product that a majority of people actually uses, it can be implemented as a multifunctional product that is widely used, or it can be added to a radio or television where sound is already involved. Furthermore, as expected the experience was found to be most comfortable and calming.

It can be concluded that information through tactility may not easily work unless the information is very minimal, since it is mostly preferred to have the information in one glance and it should not become an new completely new, separate action, in order to be integrated well. Besides, combining it with other activities could easily become a somewhat challenging multitask. In addition, it is not easily accessible from a distance. Repetition in the routine can be part of the solution, but ideally it should be combined with some activity, be it a simple one.

Visual information on the other hand, is much more flexible. More information can easily be added, but it should not become another screen. Too much information draws the information out of the periphery and into the focus area, since visuals exist in space, rather than over

space like sound (Gaver, 1989). In other words, it could require more time to absorb the information and a longer activity in a single place should be chosen to combine it with. This can perhaps be tackled through adding layers of information where the details only appear when the user decides to and interacts with the product. It was hypothesized that having to glance at something may take away being incorporated nicely, however the opposite seemed to be the case. Visual information, when incorporated in a product you already look at for some time or occasionally look at, can make for a very seamless integration.

And with that the research sub-question 'how' can be answered, though there is no explicit answer for this question. "*How can the modalities be combined and incorporated in interior products to display information and unobtrusively and seamlessly fit in a morning routine?*" It can be concluded that all modalities can work, as they all have their advantages that can be exploited when the product in which it is incorporated is well-chosen. Basically, the modality and the interior product influence each other both ways. For this, the themes that have to be taken into account most are the amount of attention needed to take it in together with how awake one is and what the contact time is in the routine and for the information.

As for the locations, the disadvantages of the bedroom is mainly about not being fully awake yet, therefore there is less attention for the information. In can be stated that this means only minimal information can be integrated. However, some may lay in bed for a bit to wake up and others stand up immediately, so this may not be the best moment for some designs. Though one participant did propose to have information incorporated to a wardrobe mirror, especially for temperature information as it affects your clothing choice.

The bathroom gives more opportunities, especially since brushing your teeth is somewhat lost time in which the participants either look around or even do other activities around the house. But again combining it with feeling information could be a bit challenging. Moreover, one is more awake and receptive to information as opposed to just after waking up.

Likewise, the kitchen has quite some opportunities, since during breakfast other visual activities and actions are taken, such as watching and listening to the news. So, both auditory and visual information can be given. However, there may be noise involved from making breakfast that could overrule any auditory information. Moreover, the layout and exact places of actions can vary a lot; from making coffee or not, like in the scenario, to quickly grabbing readymade food from the day before out of the fridge and walking to the living room to sit in front of the TV, or even skipping breakfast like one of the participant occasionally does. Lastly, like the bathroom, one is more awake and aware to receive information and remember it.

The hall and the front door are both the last place where one generally is before leaving for work and with regard to the action of taking an umbrella, this is a logical place to receive information about rain. However, when the information includes more, like the temperature, the timing is too late. Only small actions take place here, which likely allows for visual information best, or very minimal information like a simple reminder for taking an umbrella. Lastly, depending on the layout of the house, people are likely to go through the hall when going downstairs, this could be a window of opportunity as well, though very short. Then it should likely be more attention grabbing.

Based on that information, the third sub-question can be addressed: "*When and where should the information be displayed in home interiors to seamlessly fit in a morning routine?*" Similarly, this question has no absolute answer. For every location and their corresponding time there is something to be said. It is the combination of modality and interior product that can make the difference. Nevertheless, there are themes that are more important than the other, for instance the combinability with other activities and not being a new action were frequently reoccurring topics when discussing integration. The bathroom and kitchen seemed to allow for this most. However, the other locations have their advantages, such as the timing for taking action upon the information, which is also considered very relevant. In addition to the 'when', people differ in their preferences of when they wanted to receive rain information, therefore it might be good to implement some versatility into the designs.

Limitations

Ideally more participants would have been involved to be able to see more patterns and to be able to check whether the target group is well-defined.

An online method was chosen under the quarantine circumstances due to the COVID-19 virus and the prototypes were presented online. However, ideally the participants would experience the prototypes themselves rather than online. The visual prototypes come across well, however for the carpet extra explanation was given next a video of the interaction, nevertheless it was mentioned that "*the rug could also [fit in my routine], but I'm still figuring out how the physical feedback would work for me.*" – W1. Therefore the participants were not able to optimally give feedback on the experience. As for the sound, the rain was a recording of a small waterfall, however some of the participants noticed this and noted that this made it somewhat less intuitive; "*If you make the sound of rain, the ticking, that would make it a lot more natural and intuitive*" – M1. This did not seem to affect the remaining questions. In addition, the scenarios helped the participants in imagining the prototypes in context quite well.

More variations with prototypes could have been explored, such as a mirror in the bedroom. Moreover, there are more possible modalities to be explored, like the visual variation

of shape change or relative position change. Then more complete conclusions could be drawn concerning the modalities.

CONCLUSION

Co-constructing sensitizing interviews were conducted to find out how and where information decoration can be seamlessly implemented in morning routines. All the themes for argumentation can act as a guideline and inspiration source when designing for information decoration and implementing it in the diversity of routines. Designers can build on the findings and explore design opportunities based the different locations and modalities and their promising themes. For instance, you can ask yourself what can be combinable with other activities or be close to the follow-up action, with having in mind the amount of attention and contact time needed for taking the information in. Based on all this food for thought designers and design researcher can further explore the possibilities of implementing information in peoples home to eventually reduce phone usage and with that stimulate productivity in an unobtrusive way.

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