

Final Assignment – " User-Centered Design Approaches of a Color-Based Communication System for Emotional Support of Employees as a Ubiquitous Computing Solution "

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ABSTRACT

AT THIS TIME, MANY RETURN FROM THE HOME OFFICE AND STUDIES ON THE EFFECTS ARE GRADUALLY PUBLISHED. THE HANS BÖCKLER FOUNDATION CONFIRMS: EMPLOYEES ARE ON AVERAGE MORE PRODUCTIVE AND MORE SATISFIED WHEN THEY WORK AT HOME. HOWEVER, THE EFFECT VARIES GREATLY FROM PERSON TO PERSON AND DEPENDS, AMONG OTHER THINGS, ON THE LIVING SITUATION (KOHLRAUSCH ET AL. 2023). SO WHY SHOULDN'T THIS WORK MODEL BECOME MORE ESTABLISHED? HOWEVER, WITH NEW OPPORTUNITIES COME NEW PROBLEMS. ONE OF THESE IS EMOTIONAL SUPPORT AND THE CONNECTION TO WORK COLLEAGUES, WHICH IS IMPAIRED BY THE PHYSICAL DISTANCES THAT HAVE ARISEN.

THIS PAPER FOCUSES ON A POSSIBLE UBIQUITOUS COMPUTING SOLUTION THAT PROVIDES FOR TRANSPORTING EMOTIONS AMONG EMPLOYEES THROUGH THE TRANSMISSION OF COLORS IN ORDER TO MOTIVATE AND SUPPORT EACH OTHER. THE EFFORTS EXPLAINED IN THE PAPER ARE BASED ON ALREADY RESEARCHED AND USER-TESTED PROPOSALS TO EXTEND THE COMMUNICATION OF INDIVIDUALS WITH COLORS. WITH THIS KNOWLEDGE, USER CENTERED DESIGN IS EXPLAINED AND USED IN A THEORETICAL APPROACH TO IDENTIFY THE STRENGTHS AND WEAKNESSES OF THE APPLICATION.

THE OVERALL GOAL OF THIS PAPER IS TO COME TO A CONCLUSION ON THE DESIRABILITY OF IMPLEMENTATION BY EXPLORING UCD METHODS AND A THEORETICAL APPLICATION IN THE DESCRIBED HOME OFFICE SCENARIO.

INTRODUCTION

As part of my final paper in the subject of Ubiquitous Computing, I engaged in the design process of a new way to provide emotional support while remote working. It examines the application of User Centered design techniques for the design of a device which allows user to anonymously convey emotions to their colleagues and receive some sort of relief through their reactions. This paper describes theoretically approaches to the identified challenges and discusses, therefore, the approach of user centered design. It concludes with identified challenges and risks while implementation.

APPLICATION CONTEXT AND ENVIRONMENT HOME OFFICE - IDENTIFICATION OF THE PROBLEM AND NEEDS OF USERS

Home offices and remote working are not a creation of the Covid-19 pandemic. However, the need to isolate increased the number of days spent working from home. Nicholas Bloom of Stanford University, who researches flexible forms of work, is quoted by the *Neue Züricher Zeitung* as saying that 30 per cent of working days will be spent in the home office in the foreseeable future (cf. Langer, 2023). The end of compulsory isolation implies a shift in focus from the need for remote working and what tasks can be performed in this case to how to get the most out of remote working (cf. Liu et al. 2020). Remote working is defined as *"a flexible work arrangement whereby workers work in locations, remote from their central offices or production facilities, the worker has no personal contact with co-workers there, but is able to communicate with them using technology"* (Di Martino & Wirth, 1990).

Because of the further establishment of remote working the effects of it should be closely examined. Findings from Wang, Liu, Qian and K. Parker in their 2020 published work: *Achieving Effective Remote Working During the COVID-19 Pandemic: A Work Design Perspective* offers fundamentals for improvement. Part of their studies were conducted as semi structured interviews in video calls. They indicated social support as necessary job resource and conducive to overcome loneliness during the period of working from home. Participants whose organization provided online platforms to boost social interactions among workers usually reported less loneliness (cf. Liu et al. 2020). Furthermore, in the interviewed sample, most comments about monitoring were positive. Some participants reported that monitoring can help them to cope with procrastination and focus on their core tasks (cf. Liu et al. 2020).

An additional study, which is considered in this paper, was conducted at my place of work, BREDEX GmbH, about working from home. It shows that overall there are more positive effects of working remotely than negative ones. In terms of productivity, most of the participants agreed that working from home increases productivity because the workplace is less crowded, noisy and

distracting. However, team spirit and sociability are somewhat reduced due to distance. When asked about emotional support, the answers varied widely. Around twenty-five percent felt that working from home had a somewhat or very negative effect on their mental state, while thirty percent felt it had no effect at all. On the other hand, nearly forty-five percent rated the impact on their mental health as somewhat or very positive. In the open-ended questions section, there was mention of the need for monitoring of developers who are slacking, and for some people the lack of social interactions while working remotely due to long distances or other issues.

One thesis for improving remote work might be that employees who receive more emotional support and monitoring from work will experience less procrastination and loneliness.

Another challenge that team leaders in particular face is sensing the mood of their colleagues in the home office, as mentioned in a Spiegel article (cf. Michaelis, 2021). This makes it more difficult for them to provide the social support that might be needed. Setting up and participating in meetings and video calls may take more time, and then there may be secrecy and other issues that prevent support. Perhaps the employee simply needs the relief and understanding that comes from an exasperated glance at the knowledgeable colleague across the desk while on the phone with a stressful customer (cf. Michaelis, 2021). Or maybe he just needs a little encouragement about a bug in his code that keeps popping up. Small social interactions like these are not easily possible when working from home.

In order to get the most out of the home office, it might be helpful to create an opportunity for emotional exchange, social support, and monitoring on a voluntary basis. The UbiComp solution that will be presented in the next part is intended to step into this gap.

DESIGN IDEA / SKETCH

The basic idea is to provide an ambient display whose functionality is similar to a buzzer. Therefore, it can be used with light touch, pressure, but also with some force. In addition, a color can be selected from a predefined color spectrum and sent to express itself. Through this variety of approaches, different emotions can be conveyed. For example, if employees are frustrated, they may choose to use the device to express their feelings with 3 strikes on the device. This is a more natural way to express the feeling and let off steam. Alternatively, they may be happy that their problem has been solved and can communicate this by choosing a green tone to show their success in solving a problem. Other users are informed about the current emotions of their colleagues and can react by touching their buzzer and sending back a color signal as relief, thumbs up or new motivation. The different emotions and reactions are expressed by different colors of the buzzer. By default, the buzzer shows the current mood of the company or team as a wavering color cloud. This is also very useful for management and leadership to determine the emotions in the team. In summary, the idea is to provide emotional support by allowing distant employees to anonymously

express current feelings and experience relief through the reactions of colleagues.

Other positive attributes of this invention are the possibility to scale it down to different scopes in the company. From the entire staff down to individual project teams could be connected at this level. In addition, it offers the possibility of monitoring employees or teams. At the end of a week or a month, it would be possible to analyze the progress of emotions in the team. With such statistical evaluations, team leaders can take the next step to address bad moods and look for solutions. This multifunctionality not only increases the application possibilities of the device, but also places specific demands on it. To guarantee a successful transmission of emotional states, the user needs an easy access to control the color being sent. The device must be robust due to the different operating methods. Intuitive use in times of stress and frustration is one of the main objectives, so the device should facilitate this use case particularly well. To achieve this, the form and application need to be carefully considered in the design process. In addition, user feedback must be collected to determine effectiveness and to understand the risk of privacy violations. Typical questions for such scenarios and technologies are How will users interpret the different colors? Is it too distracting in a work environment? How does the system convey more than one message at a time and how does the user always know what state the device is in? In order to find solutions and answers to these questions, the next part of this paper examines the literature on similar projects.

RELATED WORK

There is a whole range of devices and projects that deal with conveying emotions through color or other stimuli such as tactile stimuli. Either they are used in addition to text or without it. "Lumi Touch" is an example for an emotional communication device without text messages. The authors describe it as an interactive picture frame that allows geographically separated couples to share their feelings using color schemes and establish subtle real-time communication (cf. Chang et al. 2001). Interesting results of their research are that the use of light both as an ambient representation and as an active data transmission enables a seamless transition between passive and active attention of the user. User tests showed that the dual level of attention appeals to people. Proband connected sent colors with messages in their mind and tried to interpret the received ones (cf. Chang et al. 2001). This suggests that the idea of using color spectrums to communicate emotions might not heavily impact the concentration and is too distracting for work scenarios.

An example of priming text messages with color or vibrotactile stimuli is "RingU". It is another example of communication between close people. You can send a color or tactile effect by pressing the ring to add a feeling or other special feature to your text message (cf. Pradana et al. 2014). Both examples have in common that they focus solely on enhancing the relationship between two people. This is accomplished by adding variety to the form of communication. In both studies, the user is

expected to develop a kind of secret language in which colors and tactile stimuli are used. It takes some time to learn this language, but after that, messages and emotions can be successfully transmitted without text. In the home office use case described above, the additional challenge is that there are more than two participants. Therefore, the colors may be misinterpreted and there is likely to be some ambiguity in the application. However, the primary goal is to reduce stress and alleviate negative emotions, which might be achievable without establishing a clear messaging system. However, establishing commonalities in the colors used and the emotions portrayed could help to avoid misinterpretation. As a consequence, this should be addressed in the design process with the specific surroundings in mind.

Ambient Environments for Emotional Physical Communication is a paper that focuses on human movement as a form of emotionally expressive interaction across physical distances. Creating an emotionally sensitive environment requires additional design considerations: The system must recognize different types of interactions. It must also be able to understand and interpret what the person wants to express (cf. Li & Jianting, 2009). In this example, the authors focused on conveying emotions by interpreting gestures. This is important because of the exemplary use case in the technical solution sketch and the different input methods presented. As a result, the interpretation of colors by the system and the interpretation of different inputs must also be considered in the design.

But with a focus on users and their mental health when working from home, we need to clarify what exactly employees need. This can be achieved by applying a user-centered approach, which will be discussed in the next part.

INTERPRETING USER-CENTERED DESIGN

User centered design (UCD) is an approach to designing products, services, and systems that prioritize the needs, goals, and experiences of the user. It sets users or data generated by users as the criteria by which a design is evaluated or as the generative source of design ideas (cf. Karat et al. 1996). However, this does not ultimately imply that users should be asked for their design ideas. Rather, UCD focuses on the active involvement of the user in the design process, trying to obtain a clear understanding of exact task requirements, involving an iterative design and evaluation process, and utilizing a multidisciplinary approach (cf. Beekhuyzen et al. 2003). UCD is one of the participatory design approaches that have evolved over time from a symbolic participation of users as informants and testers to being co-designers or something in between (cf. Miah, 2004). It focuses the user's active involvement in design process and continuous observations during the designing, resulting in proper reflection of user's satisfactions during the design process (cf. Miah, 2004). There are some more general risks involved while applying UCD in a project, which are also mentioned in literature. It involves intense commitment on both sides of user and designers to acknowledge each other's competencies and

shortcomings and to try to establish a mutual dialogue (cf. Marti & Bannon, 2009). A very critical view of the role of user has Webb who said: *"users don't know what they need; users don't know what is good for them; users cannot properly articulate their needs, even when they do know them; users change their minds; users say different things to different people; users disagree with other users about what they need; users may not be real users at all"* (Webb, 1996). Gulliksen et al. (2003) adds to this: *"User studies can easily confuse what users want with what they truly need"*.

But what does this mean for dealing with user suggestions? For designers, it means digging deep to understand why users want a certain feature, or why they think their problem could be solved in a certain way. This is done by repeatedly asking why and building an understanding of the user. Only then can the design be built for the user's benefit, not at their will. Some methods, such as open-ended interviews and field studies where the user is observed, are used to gain these insights and deep knowledge about user needs. Focus groups, diary studies and questionnaires are other methods with their own advantages. A focus group allows for moderated discussions with stakeholders and designers. In a diary study, participants are asked to write down their tasks or procedures during the day, in addition to other specified information. Finally, questionnaires are useful to ask a larger group of participants for their input and to gain quantifiable insights (LeRouge & Wickramasinghe, 2013; Ohly et al. 2010). In UCD, either one of these methods or a combination of them should be used to achieve a deep understanding of the user's problems. As a result, the design should clearly address these and ideally add value to the application over time. This would be in line with UCD principles, which also mention the importance of user feedback, which should be obtained regularly in later stages (cf. Vredenburg, Isensee & Righi, 2002).

USER RESEARCH METHODS FOR THE SPECIFIC SCENARIO

In the use case described, contextual interviews should first be conducted with remote workers from different industries to understand how they deal with negative emotions and the importance of team leaders monitoring and providing emotional support. This is a very effective way to understand the potential user and get clarity on what they need. This is achieved by asking open-ended questions and frequently following up with "why" questions. The interview is designed as a conversation in which the participant shares his or her situation. Additional interviews with team leaders or executives should follow. Another method that has potential is the diary study, where participants could record how they felt throughout the day, when they felt uncomfortable with stress and frustration, and how they dealt with it. This requires quite a bit of effort and has uncertain results because of the intimacy. However, it has the strength of providing insights over time, can be done very well in the home office, and gives more self-determination. Following this approach, as described by Dennis Wixon, product concept designs should be done second, followed

by usability engineering and completed with prototype testing (cf. Karat et al. 1996).

As mentioned before, user integration can be difficult, especially in situations where users have certain fixed views and perceptions that clash with the overall aesthetic design (cf. Marti & Bannon, 2009). This is similar to having too many stakeholders involved, each wanting to incorporate their own ideas. Certainly, this could be a problem for the implementation of the buzzer. Despite the analysis of user requirements, many uncertainties remain. How do users react to emotions and what color do they use to express it, is it related to their industry? For example, certain colors might stand for something positive in their perspective, while others perceive them only negatively. This complicates the design of a solution and needs additional addressing in the UCD approach.

The color schemes and assigned emotions need to be tested in a pre-evaluation with a larger sample of subjects. They do not necessarily need to be in the home office, but should be familiar with the concept. It would be important to have a variety of occupations and work areas to test the question posed in advance. The standardized Munsell color scheme is used as the basis for deciding which color is appropriate for a negative emotion and which for a positive one. This is in the interest of UCD because, as mentioned earlier, involving users early in the design process can reduce ambiguity in the application. Five principal colors (red, yellow, green, blue, and purple) and five intermediate hues (yellow-red, green-yellow, blue-green, purple-blue, and red-purple), as well as three achromatic colors (white, gray, and black) are presented to the proband in a randomized order. His task is to associate them with either negative or positive emotions while in his work environment, such as sitting at his desk. He should also choose colors to express frustration and to respond with encouragement, comfort, or thumbs up. The goal of this study is to involve a variety of potential users from different industries and corporate positions to get a diverse picture of their impressions of color and to test the hypotheses of their different associations with colors depending on their work background. There may even be other influences not accounted for in this test, such as gender or dramatic experiences, that affect the association of colors with emotions. However, leading research in this area has not included these aspects, so they are not relevant to this study.

To make this study more accessible during working hours, it should be conducted online rather than separately in the lab. The subject should answer the questions under the influence of his workplace. This should ensure a large audience, higher participation, and a more appropriate selection of colors related to the workplace. In the appendix, a questionnaire could be used to collect further information on the occurrence of frustration in the workplace. In addition, the results could be contextualized with the demographic data and work area information collected. The result is a quantifiable assessment that can be used to make a decision about the representation of emotions. However, there may be a

need for customization in certain industries due to very different color associations.

Informed design decisions are now made based on the knowledge gained from the previous steps. For example, in order to appeal to the moment of frustration, the design needs to be robust, and the surface needs to be flexible and large enough to be struck hard with the palm of the hand. These attributes make the device more suitable for the main use case of expressing frustration. For reactions and communication with colors, it should be possible to use it with one hand. A possible solution: A control ring that can be interacted with by touch. The color can be selected with the finger in a circular motion and then confirmed and sent by pressing the buzzer. So that the user always knows what state the device is in, different states should be implemented. Default, Receive, Respond and Send are the different states that the buzzer should represent. Thanks to the delays in sending emotions at the same time, all users should always see the same state unless they respond or send an emotion of their own. However, design decisions like these need to be evaluated by involving users in testing. With their feedback, the product can be iterated and new features can be added incrementally. The user feedback which is gained through tests should often be collected with great care and speed and incorporated into product development and managing for user by making their feedback integral to product plans, priorities and decisions making (cf. Vredenburg, Isensee & Righi, 2002). Feedback is generated by establishing cycles in which the product is tested and then further developed. In early stages testing often needs to be performed with various types of prototypes (cf. Houde & Hill, 1997; LeRouge & Wickramasinghe, 2013). This is certainly more difficult to do when you are dealing with a device or something like that instead of an application on a computer.

PROTOTYPING FOR THE SPECIFIC SCENARIO

First ideas for prototyping with materials could be something like the Magic Machines Workshop, a concept by Kristina Andersen and Ron Wakkary. This is where a small group of users work with a defined set of materials to build a machine with different functions. Through presentations and discussions, there is also an active exchange in which the designer is able to learn more about how the user would like to interact with certain devices (cf. Andersen & Wakkary, 2019). The workshop could set the goal for the participants to create something to express their frustrations with while working and thereby solving their outburst. The learning from such an interactive format engages the user to a great extent, and can then be used to create a minimally viable product. Another approach is to conduct a design charrette with stakeholders. In this format, direct users, but also team leaders and other stakeholders come together in a design sprint workshop with the defined goal of, for example, coming up with a concept on how the team leader can monitor the team's emotions (cf. Dopp, et al. 2018). This is a very common approach in design when there is a direct client. The results are then used to flesh out the prototype. In a more academic environment, however, methods like rapid prototyping or the Wizard of Oz seem

more appropriate. What they both have in common is that they don't require a perfected and highly functional prototype and that participation is easy to achieve. In rapid prototyping, a mockup, an illustration or a storyboard is already used to get in touch with the potential user and to get feedback on the concept (cf. Dopp, et al. 2018). This is similar to concept testing, in which the potential of a product is defined before it is developed. With early feedback like this, designers can quickly determine if they are on the right track. The downside is that the prototype is still very abstract, and certain errors may go undetected because there is little to no interactions possible.

Wizard of Oz is a bit more complicated to pull off. It involves creating the use scenario and finding alternatives to portray the functions which the product should provide (cf. Riek, 2012). As a result, the interactions of the use of the buzzer to express emotions and get reactions must be adapted. Furthermore, due to the home office scenario, a certain distance must be established. The device from the technical solution sketch and its functions could be simulated. For example, the emotions of the subject in one room can be selected by painting a piece of paper in a certain color. Now the colleagues in another room receive a picture of this and can react by coloring their own paper with a color of their choice, which is then received by the sender. The first difficulty that comes to mind is the need to have subjects from the same company to simulate the real scenario of colleagues sharing their feelings anonymously. Second, the perception of colored paper might be completely different from the light emitted by the buzzer. Third, the work environment may be difficult to simulate due to the home office situation. In this test environment, the concept can be evaluated, but it is also possible to observe how users would interact. The disadvantage is also that it is too abstract to observe or detect errors that are easier to identify in more developed prototypes. To gain further insight and feedback, the test subjects must be interviewed afterwards about their experience. The classical usability test follows a similar concept. Subjects are supposed to test the functionality and are then asked about their experience (cf. Dopp et al. 2018; LeRouge & Wickramasinghe, 2013). The difference is that the prototype is already more advanced. Therefore, the device can already be used with light signals, receive them, and send them to the connected devices. This allows the subjects to experiment with something closer to the real experience, and thus discover ambiguities that need to be addressed before a rollout. To maintain this closeness to the real scenario, the subjects must be paired with their real colleagues. This way, real communication can be observed in the same workspace. The environment must also be similar to their workspace. Both conditions make a usability test more complicated in practice. The decision on which type of prototyping approach to take must be based on the findings and information gathered beforehand. Does the concept already solve the users' problems and meet their expectations, or does the concept need to be tested further? Regardless, user involvement should be sought through iterative testing, as envisioned by UCD, in order

to provide the best possible user experience. In the next part, the challenges and opportunities of the described usage scenario and the partially designed device are discussed.

CHALLENGES AND OPPORTUNITIES

A very common risk in the application of UbiComp is the violation of data privacy. Especially in the use cases described above, where emotions are conveyed into the company, there must be a strong awareness of respecting these boundaries. Users should not feel that they are being closely monitored and evaluated on their emotions throughout the week, resulting in performance and mood barometers. These metrics can create the risk of performance-based contract changes or terminations based on poor scores. This is where the conflict of interest between stakeholders becomes clear. On the one hand, there are the users, who should be given the opportunity to receive emotional support through anonymous use, and on the other hand, there are the managers and team leaders, who would like to individually monitor the moods of their employees. However, an evaluation is also justified, as it can be a great help for team leaders in dealing with and supporting their employees. A first solution to enable both would be weekly or monthly evaluations, where a selected part of the project team or department is analyzed without revealing individuals. With this evaluation, conspicuous problems can be uncovered and corrected in the next step. In this way, both parties can be satisfied for the time being. This has high importance because if there is no clear privacy protection, users will have a valid reason to stay away and not include the tool in their work environment.

Opportunities associated with incorporating this device into company practices are numerous. Current mood images in default mode for different scopes allow a quick pick up of experienced frustrations. In addition, the device can be used as an extension of communication and enhance sharing. It may also be utilized to provide feedback while attending events, conferences and meetings, which are main ingredients of communication while working remotely. The feedback can be given in an anonymous manner and can be helpful to stay on track or to avoid boring, unimportant digressions. Certain colors may indicate interest in a topic, while others may indicate a need to move on quickly. In this case, the buzzer must be compatible with tools such as Microsoft's Teams and can be registered as a connected device to bring into the meeting. In the same vein, the idea of using the buzzer for voting could be easily implemented. In summary, the buzzer could improve communication by providing more ways to subtly guide conversations, which could be beneficial to the work environment. The application scenario also faces challenges. Home office is mandatory after the isolation period, and some companies are already rejecting remote work and want to return to traditional work models. In addition, some of the target group can simply go to the office if they are more mentally affected by home office. Of course, this does not apply to everyone, as greater distances or other circumstances may affect this free choice. Consequently,

the possible use cases could be very small, and with only a few users in the company, the concept loses its meaningfulness.

Since ambiguity has already been mentioned in this paper, there may be other possibilities that will be explored here. The idea of using colors to express or emphasize emotions has already been explained. But the question that needs to be asked is whether the way it is described is too complicated? Does it require too much cognitive effort on the part of the user, and would another method be more appropriate? For example, a UI with options ranging from stressed to frustrated to highly satisfied could be considered. This would mean that the communication of emotions and reactions would take place as a selection process. Colors would have a fixed meaning at the expense of the user's individual freedom. But the communication becomes clearer without this additional room for interpretation. Here, the results of user testing should fill the gap as to whether appreciation of one's own statements or clear communication is more important, and whether only a reaction without a clear message is helpful in reducing frustration. Another area that needs to be explored is the device itself. Is it really necessary to build the described functionality into a new device, or could existing devices at the workplace not accommodate it? The keyboard or mouse could be considered. Both are already available with RGB illumination. So far, this is just a visual extra, but it could be used in other ways depending on the application scenario. An obvious advantage is that the space on the desk is not reduced by an additional device. Mice and keyboards are everyday items that can be found in any workplace with a computer. Disadvantages are, of course, the loss of features of the buzzer that should allow intuitive use. The mouse or keyboard can't be struck for stimulation without presumed damage. In summary, scenarios using modified mice and keyboards could be interesting for usability testing and represent a possible alternative.

DISCUSSION AND CONCLUSION

This paper discussed the idea of how emotional support could be provided in the home office environment. To this end, a review of studies on the effects of working remotely was conducted, which confirmed the need for a solution. A first technical sketch proposes a device with functions similar to a buzzer, which uses colors to convey emotions to colleagues and allows them to respond. This is based on previously researched ways to enable and support communication through color. The concept: Users can express their frustration anonymously and get the relief they need from the reaction of their colleagues. In order to verify design ideas and find user-friendly solutions, the UCD approach was examined to identify possible application situations and discuss suitable methods. The focus of this part was also to identify the risks and opportunities associated with this approach. Some ambiguities were identified in connection with the decision to use colors to convey emotions. Therefore, pre-evaluations and early involvement of users in the form of interviews and other UCD methods will be beneficial. Later on, further considerations were made and

alternative possibilities were explained, including alternative use cases, interaction methods, or replacing the buzzer with modified keyboards or mice. It is difficult to say whether the intended use case can be completed with the solution devised. However, a certain amount of optimism and interest could be observed in the discussions with my colleagues. In my opinion, the main problem is data protection and the prevention of negative effects such as dismissal in case of frequent frustration. Effectiveness also depends on user participation. If there is little interest and few people in the home office, the mutual emotional support does not really work. In any case, there is greater potential in displaying current sentiment images or the ratings over a month. This makes it possible to quickly address negative emotions in the company. When problems are solved quickly, productivity remains high and employees are more satisfied. In conclusion, more research and testing with users is needed to understand how viable the idea is while the potential for extraction exists.

While researching the topic, I discovered a certain fascination with the idea of expressing interpersonal communication through colors and replacing text messages. In any case, it would be interesting to test the hypotheses with participants from different professions and to design a suitable solution.

While UCD is a viable approach, as there are many areas where information and stakeholder and experienced involvement are needed, there may be methods to engage users that are not as obvious or take a more sustainable approach. Interesting in these holistic approaches is, for example, the creation of personas for non-users, but nevertheless affected individuals or even non-humans. With their help, applications can be designed with greater attention to inclusion and sustainability. It would certainly be interesting to explore possibilities in this area as well, and it may be possible to add more features to the application or make it accessible to more people. For example, an issue that has not been touched is color deficiencies that exclude a group of people from using the device.

Overall, the process described and the engagement with UCD enabled us to identify opportunities and risks that could arise in the course of implementation. Meanwhile, the home office usage context provides exciting topics for discussion. In the future, it will be important to continue to support users in this environment and help them solve their problems.

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